



CSIR COMPENDIUM OF TECHNOLOGIES 2021



Council of Scientific & Industrial Research
New Delhi, India



CSIR COMPENDIUM OF TECHNOLOGIES 2021



**Conceptualization and Developed by
CSIR-National Institute of Science Communication and Policy Research
(CSIR-NIScPR)
(erstwhile CSIR-NISTADS)**

**Council of Scientific and Industrial Research
New Delhi, India**

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Disclaimer

The CSIR Compendium of Technologies 2021 has been compiled by CSIR-NIScPR based on the technology details provided by different CSIR laboratories at TRL 6 and above. The compendium is based on the validation of these technologies by experts in eight CSIR themes. Selected technologies for this compendium are those that have been validated by the experts at TRL 6 and above. The laboratories that are not represented here are those whose technologies were found to be below TRL 6. Some of the laboratories have not participated in this exercise and hence their technologies could not be taken up for TRL assessment. There are 12 technologies in Chemicals theme which need further validation as the committee has not reached a conclusion. CSIR-NIScPR has done this whole exercise based on inputs received from laboratories and final selection was based only on expert assessment. A total of 467 technologies at TRL 6 and above were identified for assessment, out of which 154 technologies were not considered for this compendium as they were generic. However, these technologies might have potential in rural entrepreneurship. This compendium contains a total of 313 technologies.

Printed & Published by CSIR- National Institute of Science Communication and Policy Research, New Delhi

First Published 2021

First Edition

ISBN: 978-81-954211-2-1

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सचिव

वैज्ञानिक और औद्योगिक अनुसंधान विभाग तथा

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Government of India

Ministry of Science and Technology

Council of Scientific & Industrial Research

Department of Scientific & Industrial Research

Foreword



It gives me great pleasure to release 2021 version of **CSIR Compendium of Technologies** developed by the CSIR-National Institute of Science Communication and Policy Research (CSIR-NIScPR) with the guidance from Technology Management Directorate (CSIR). CSIR has developed a large number of technologies that have catalyzed the growth of domestic industry across various sectors, helped to strengthen MSME, and provided new opportunities for startups. Many of the technologies developed are protected by patents and thus have given India a strategic and tactical edge in technology competitiveness. CSIR with its large infrastructure of laboratories and technical manpower is extremely successful in creating groundbreaking technologies at the laboratory scale, and many technologies have reached the market. However, this is a large scope for successful translation of many technologies from laboratory to market.

This year CSIR-NIScPR has taken the lead to update **CSIR Compendium of Technologies 2021** with a methodological framework developed in-house and with the help of several leading experts of technology management. The compendium has gone through two tiers of scrutiny i.e. first at the lab level and then by the external experts, who were from Industry, Academia and R&D system of the country. A total of 313 technologies having achieved TRL 6 and above are summarized along with Lab-wise and Theme-wise synthesis of the technologies.

I do hope that many of the technologies listed here will go on to touch the lives of the common people in the country and collectively uplift the society to higher levels of affluence.

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Acknowledgement



I am delighted that the CSIR Compendium of Technologies 2021 was released on the occasion of ‘Sankalan Event’ of India International Science Festival (IISF-2020) on 4th March 2021. I would like to thank Dr Shekhar C Mande, DG CSIR & Secretary, DSIR who has given the responsibility to CSIR-National Institute of Science Communication and Policy Research (CSIR-NIScPR) for carrying out the Technology Readiness Level (TRL) assessment of the technologies developed in thirty six laboratories of CSIR, which are at TRL 6 and above, and present it in the form of a compendium for ready access to various stakeholders. I also thank the Technology Management Directorates of CSIR Head Quarter for their support at every stage of this work.

During this whole process of TRL evaluation, Directors of various CSIR laboratories along with the Theme Directors provided their valuable support and guidance. I thank them for their efforts and motivation. The revalidation and assessment of the technologies that led to the final assignment of TRLs would not have been possible without the extensive involvement of experts from Academia, Research Institutes and Industry. I sincerely thank all the subject experts for the time and efforts they had given for this important task. I congratulate my scientists and also the technical staff who had actively participated and contributed to this compendium. I like to thank Dr Anjan Ray, Director CSIR-IIP, who had periodically discussions with scientists of CSIR-NIScPR, drawing their attention to the methodological framework and salient aspects of Technology Readiness Levels (TRLs).

I do hope that this Compendium will be a useful guiding document for various stakeholders including the industry and different line ministries.

Prof. Ranjana Aggarwal
Director, CSIR-NIScPR



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Acronyms

TRL	Technology Readiness Level
TRA	Technology Readiness Assessment
AEISS	Aerospace, Electronics and Instrumentation & Strategic Sector
ANB	Agriculture, Nutrition & Biotechnology
CLP	Chemical (including Leather) and Petrochemicals
CIE	Civil, Infrastructure & Engineering
E3OW	Ecology, Environment, Earth & Ocean Sciences and Water
EED	Energy Conventional and non-conventional and energy devices
HTC	Healthcare NCE, Biologics, Diagnostic, Genomics
4M	Mining, Minerals, Metals and Materials
Lakh	0.1 Million, 100 Thousand
Crore	10 Million



Highlights of Compendium

- India's policy shift towards innovation and entrepreneurship brings a strong thrust for creating indigenous products based on technologies with the potential for economic growth & social welfare.
- CSIR, with its huge infrastructure of laboratories and technical manpower, has created groundbreaking technologies at the laboratory scale, and many have also reached the market. Yet, there is scope for successful translation of many technologies from laboratory to market.
- Rigorous evaluation has identified these technologies through critical and informed assessment of their readiness levels.
- The processes included close consultation with the laboratories that generated the technologies and involved a wide range of domain experts.
- A coordinating body steered the rigorous process of identifying the technologies with Director NISTADS as Nodal, a core coordinating group and research groups for each theme.
- The documents makes the information accessible to industry and other stakeholders.
- The technologies fall under 8 themes identified by CSIR: Aerospace, Electronics and Instrumentation & Strategic Sectors (AEISS), Agriculture, Nutrition and Biotechnology (ANB), Chemical (Including Leather) and Petrochemicals (CLP), Civil, Infrastructure, and Engineering (CIE), Ecology, Environment, Earth and Ocean Sciences & Water (E3OW), Energy Conventional and Non-conventional & Energy Devices (EED), Healthcare, Biologics, Diagnostics and Genomics (HTC), Mining, Minerals, Metal and Materials (4M).
- This compendium shortlists 313 CSIR technologies that are promising (TRL 6 & 7) and market-ready (TRL 8 & 9)
- Many technologies are protected by Intellectual Property Rights (IPR) filed in the US, giving India an edge in technology competitiveness.
- Among them, 61 % are most promising (TRL 6 and TRL 7), and 39% are ready for market (TRL 8 and TRL 9) with huge potential for further innovation and commercialization.
- More than half of the technologies identified are from Agriculture, Nutrition and Biotechnology (ANB) (28%) and Mining, Minerals, Metal and Materials (4M) (24%) combined.
- Technologies at progressive TRLs exhibit a downward trend highlighting challenges in moving to a higher TRL scale.

Executive Summary

A decisive shift in India's policy towards innovation and entrepreneurship has been triggered by the clarion call given by Prime Minister Shri Narendra Modi for “Make in India” and “Atmanirbhar Bharat” (self-reliant India). This brings a strong thrust among others for creating products based on technologies developed in India that can lead to economic growth and social welfare. However, developing technologies would not serve the purpose if they are not matched with the requirements of the market and the people and if information about availability is not available in time to the stakeholders. This urgent requirement calls for synthesis and integration of various technologies being developed in different scientific institutions and their mapping to critical user requirements and national missions. CSIR has developed a large number of technologies that have catalysed the growth of domestic industry across various sectors, helped to strengthen MSME, and has provided new opportunities for start-ups. Many of the technologies developed are protected by patents and thus have given India a strategic and tactical edge in technology competitiveness. CSIR, with its large infrastructure of laboratories and technical manpower, is extremely successful in creating groundbreaking technologies at the laboratory scale, and many technologies have reached the market. However, there is a large scope for successful translation of many technologies from laboratory to market. For the technologies developed by CSIR to become key drivers for realising the goals and objectives set by the newer initiatives of present government, there is a need for calibration and benchmarking of the technological value chains associated with each and every technology coming out of the laboratory. It becomes imperative in this context to have a critical assessment of technologies developed by CSIR and have an informed assessment of their technology readiness.

One of the critical tool that provides a robust framework for technology assessment is the Technology Readiness Levels (TRLs). It is a system engineering tool that was created to perform maturity evaluation of technology. This scale was developed more than 25 years ago by the National Aeronautics and Space Administration (NASA) to ensure that appropriate technology was reliable enough to be integrated into space systems. The technology life cycle, which also encompasses the TRL, is visually described in the technology life cycle diagram or whale chart (Fig.1). The figure describes a technology life cycle from its gestation to death. Technology readiness is the state from the conceptualization to the adolescence stage of the life cycle.

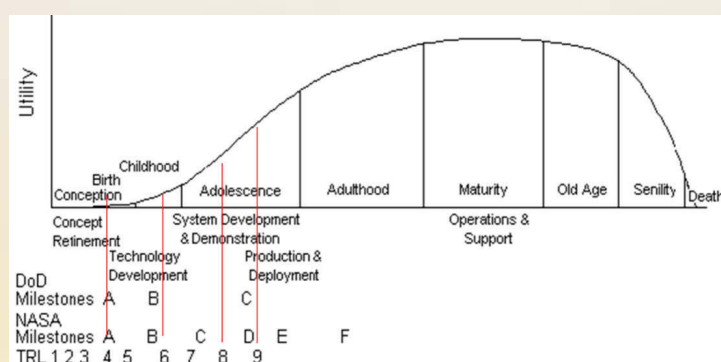


Figure 1. Technology life cycle as described by NASA

Acknowledged Dr. Archita Bhatta, Vigyan Prasar, DST for copy editing and proof reading of the executive summary and chapter 1

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Another way of looking at the TRL is taking into consideration a business model of a product/technology. The initial phase where technology development requires a lot of R&D investments is called the bleeding phase. Figure 2 shows a typical business model of technology with respect to time.

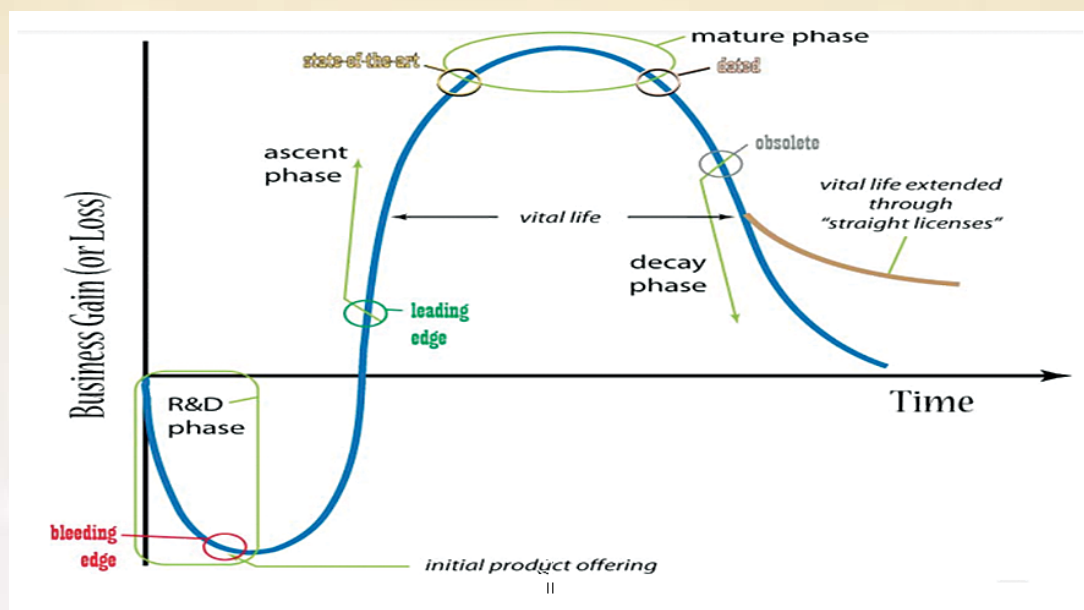


Figure 2. Technology readiness with business model

The slope of the curve initially is negative as there is an investment and no profit is envisaged; after that, there is a point where the curve becomes asymptotic, which is called the leading edge. Here onwards, the technology starts returning benefits. When the curve actually reaches the break-even condition, it is known as the leading edge. The bleeding phase can also be considered as the TRL assessment phase. Over the years, the scales have been suitably modified with the essential characteristics remaining same to suit different environments and sectors. Feedback loops have been constructed within the TRLs to address the limitations of the linear model which this framework employs. From OECD to European Investment Bank, one can observe TRL approach being used. One of the factors that has motivated the use of this scale is the value it provides in terms of a broad assessment of the gap of the technology with the market (this includes innovation to commercialization).

Technology Readiness approach is based on the implicit assumption that technologies with higher TRLs may cost less to develop and integrate in comparison to those at lower levels, i.e., they require additional time, effort, and money to reduce technology and development risk to an acceptable level. Providing a set of criteria for evaluating the technology being developed can capture the whole value chain of a technology development process and identify the actions required to move the technology at a higher level. Technologies with higher TRLs become more attractive for the industry. Technology readiness levels are determined through a series of questions and exit criteria for each TRL. This allows for a qualitative assessment of TRL based on the number of criteria satisfied at each level. Fulfilment of these criteria needs evidence and documents like certification, test reports, analysis, and other assessments.

CSIR had decided to benchmark all of its technologies based on the Technological Readiness Level (TRL) framework. A Compendium of technologies at TRL 6 and above was released by Dr. Shekhar C Mande in 2019 with initiative from erstwhile Research Planning & Business Development Division (RPBDD) of CSIR under the leadership of Dr. Anjan Ray. This compendium had a total of 244 technologies, with each technology having details such as technology name, the developer

CSIR laboratory, and a summary of the technology. Now CSIR-NISTADS has taken the lead to update CSIR technology compendium 2021 with a methodological framework developed in-house and with the help of several leading experts of technology management. The idea is to identify the technologies which are at TRL 6 and above level and place them in a technology compendium. Based on inputs from all the CSIR laboratories of TRL 6 and above resulted in a total of 467 technologies at TRL 6 and above. These technologies were selected for evaluation (the evaluation is detailed under methodology below). Suitable care was taken so that there was no double occurrence of any technology in the selected set. The final evaluation resulted in identifying 313 technologies at the level of TRL 6 and above. The compendium covers these technologies.

Methodology

CSIR has several initiatives to translate laboratory lead to marketable/value-added technologies/products and thereby enhancing interactions and connecting with stakeholders for enabling ease of doing technology licensing. One of the initiatives is a thematic approach to harness multidisciplinary talent and infrastructure for solving specific challenges in identified sectors. To achieve this purpose, eight theme directorates have been formed to cover specific sectors.

The classification of technologies was thus based on eight CSIR themes viz., Aerospace, Electronics and Instrumentation & Strategic Sectors (AEISS), Agriculture, Nutrition and Biotechnology (ANB), Chemical (Including Leather) and Petrochemicals (CLP), Civil, Infrastructure and Engineering (CIE), Ecology, Environment, Earth and Ocean Sciences & Water (E3OW), Energy Conventional and Non-conventional & Energy Devices (EED), Healthcare, Biologics, Diagnostics and Genomics (HTC), Mining, Minerals, Metal and Materials (4M).

Technologies at TRL 6 and above that were assigned by the laboratories were chosen for the analysis. All the technologies identified at TRL 6 and above in the previous compendium were also chosen for evaluation. The TRL-wise analysis was divided into two categories; most promising technologies at TRL 6 and TRL 7 and ready for market at TRL 8 and TRL 9.

TRL assessment was undertaken by following a systematic and uniform approach for each of the eight themes. Each technology under a theme was evaluated thoroughly before assigning a TRL to it. The key steps of the process followed can be briefly summarized in Figure 3.

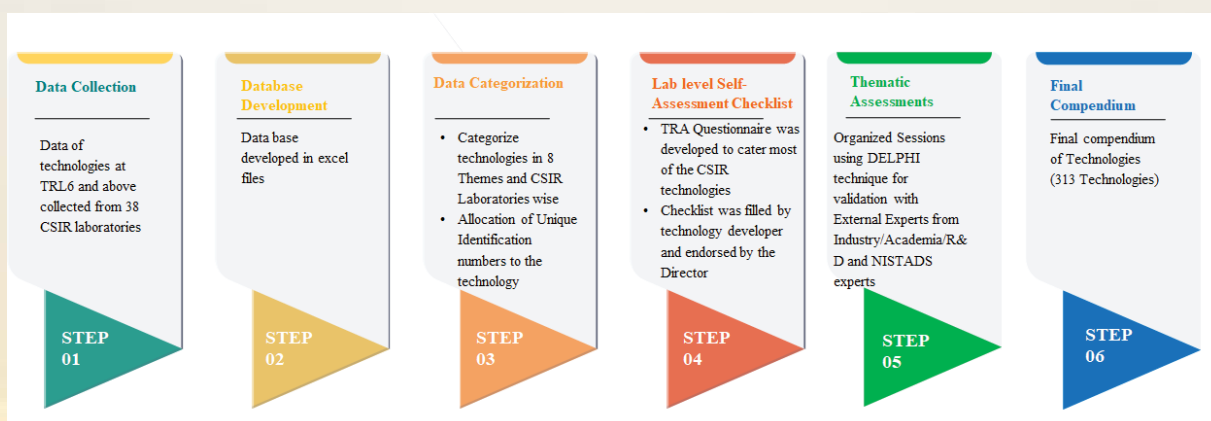


Figure 3. Roadmap for Development of CSIR Compendium of Technologies-2021.

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The broad steps followed are further distinguished as below :-

1. CSIR-NISTADS delineating a coordinating body with Director NISTADS as Nodal, a core coordinating group with Project Advisor, Project Leader and research groups for each theme.
2. Framework developed for assessment including formulation of a questionnaire for assessing inputs from each innovator of the technology developed.
3. Each research group engaging with the laboratories that had submitted their technologies under this theme to get details of each technologies submitted. This included the process of filling up the questionnaire and verification by the Director of the respective laboratory.
4. Selection of experts for each theme with the broad guideline that each theme group to have experts from academia, research institute, industry.
5. Evaluation of each theme input done by the completion of process cited in 3 above by core group
6. Assessment report prepared for each theme for interaction with subject experts.
7. Series of interactive virtual sessions for each theme with Director, Core Group and Research team of that theme.
8. Final Assignment of TRLs.

Overview of the 313 Technologies at TRL 6 and Above

A database covering 18 parameters that highlighted the different aspects of each technology was created based on inputs from all the CSIR laboratories. This covered a total of 467 technologies at TRL 6 and above. The database was further categorized under eight CSIR themes and 38 CSIR Laboratories. After the final evaluation by the external experts, a total of 313 technologies at the level of TRL 6 and above were placed in the compendium. The selected technologies covered in the compendium were also delineated in the database. The technologies selected for the compendium under eight CSIR themes are highlighted in Figure 4.

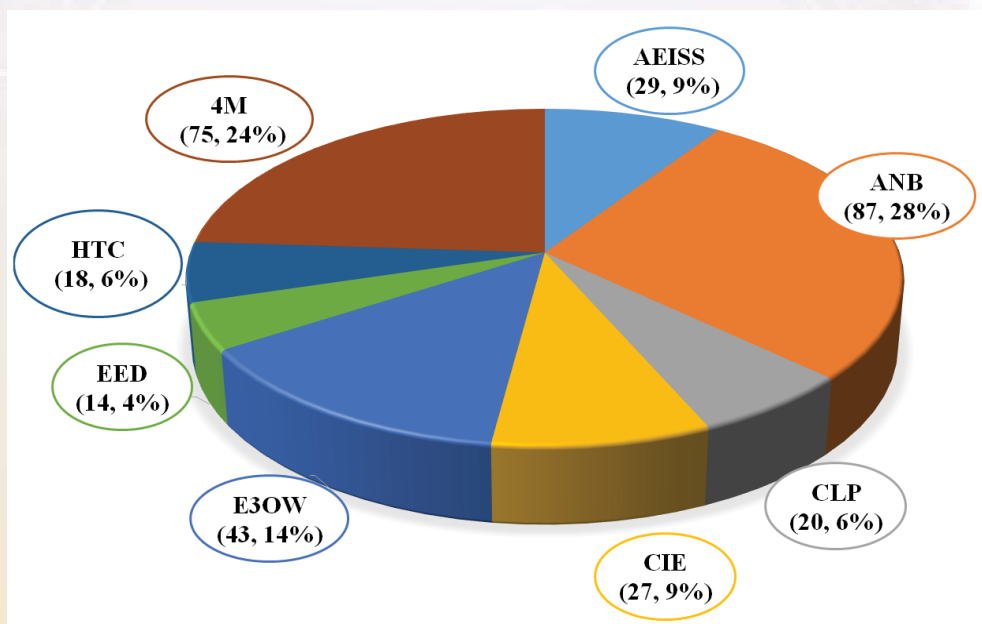


Figure 4. Theme-wise Distribution of Technologies.

Note: AEISS: Aerospace, Electronics, and Instrumentation & Strategic Sectors, ANB: Agriculture, Nutrition and Biotechnology, CLP: Chemical (Including Leather) and Petrochemicals, CIE: Civil, Infrastructure and Engineering, E3OW: Ecology, Environment, Earth and Ocean Sciences & Water, EED: Energy Conventional and Non-conventional & Energy Devices, HTC: Healthcare, Biologics, Diagnostics and Genomics, and 4M: Mining, Minerals, Metal and Materials.

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One can observe from the graph that more than half of the technologies are from Agriculture, Nutrition and Biotechnology (ANB) and Mining, Minerals, Metal and Materials (4M) combined. This underscores the strong portfolio of CSIR in these themes. See figure 4 for the facts.

The number of selected technologies at TRL 6 and TRL 7, respectively, are 110 and 81. While the number of selected technologies at TRL 8 and TRL 9, respectively, are 51 and 71. In terms of percentage, the technologies at TRL 6, TRL 7, TRL 8, and TRL 9, respectively, are 35%, 26%, 16% and 23% of total selected technologies in the compendium (Figure 5). The share of most promising technologies (at TRL 6 and TRL 7) and ready for market (TRL 8 and TRL 9), respectively, are 61% and 39% (Figure 5).

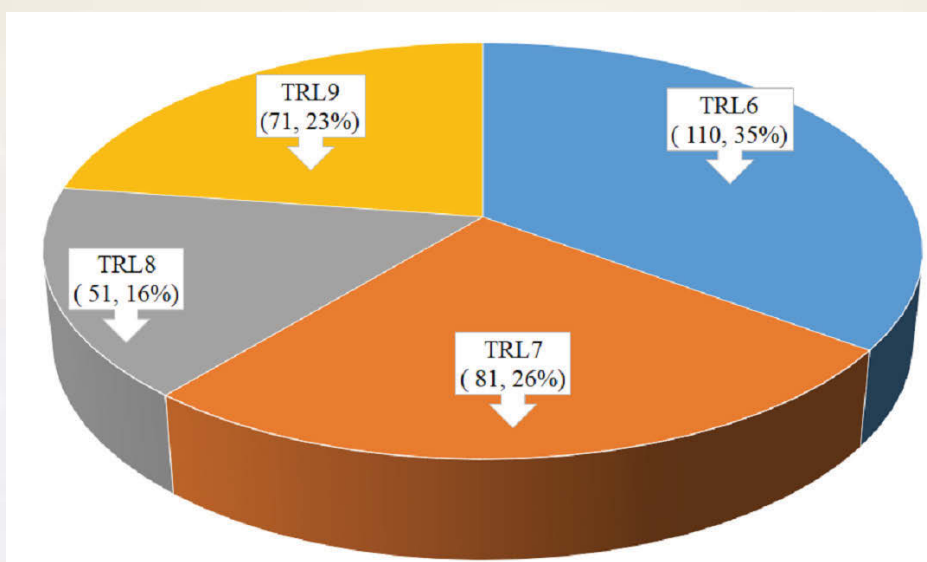


Figure 5. Selected technologies at different TRLs (in absolute number and percentage)

The technologies at progressive TRLs exhibit a downward trend. It shows the difficulty in moving to higher TRL scale (Figure 6).

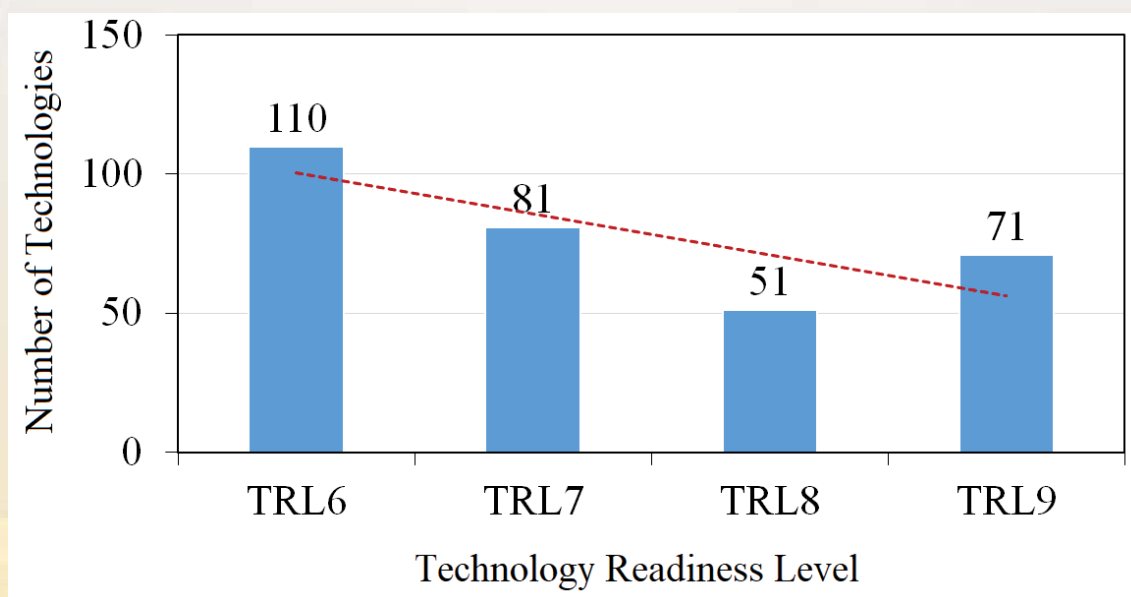


Figure 6. Number of selected technologies at different TRLs.

Theme Wise Highlights

Aerospace, Electronics and Instrumentation & Strategic Sector (AEISS)

There were 32 technologies identified under TRL 6 and above. Based on the expert assessment, twenty-nine technologies were selected for TRL 6 and above and were reassigned to appropriate TRL levels by the external experts.

Highlights of Selected Technologies (TRL 6 and above) in AEISS

The number of technologies at TRL 6, TRL 7, TRL 8 and TRL 9 are 6, 9, 3, and 11, respectively. It makes a strong assertion of technology readiness in this theme, with almost 38% of technologies among the selected being at TRL 9.

The average cost of technology development at different TRLs were: 17.37 lakhs (TRL 6), 4100 lakhs (TRL 7), 100 lakhs (TRL 8), and 76 lakhs (TRL 9) (Figure 7). An important aspect that emerges is the high cost of technology development at TRL 7. This underscores a strong capital support, and plausibly other complementary support systems are required to move the technologies from this stage to higher technology levels. Figure 7 highlights some of the above facts.

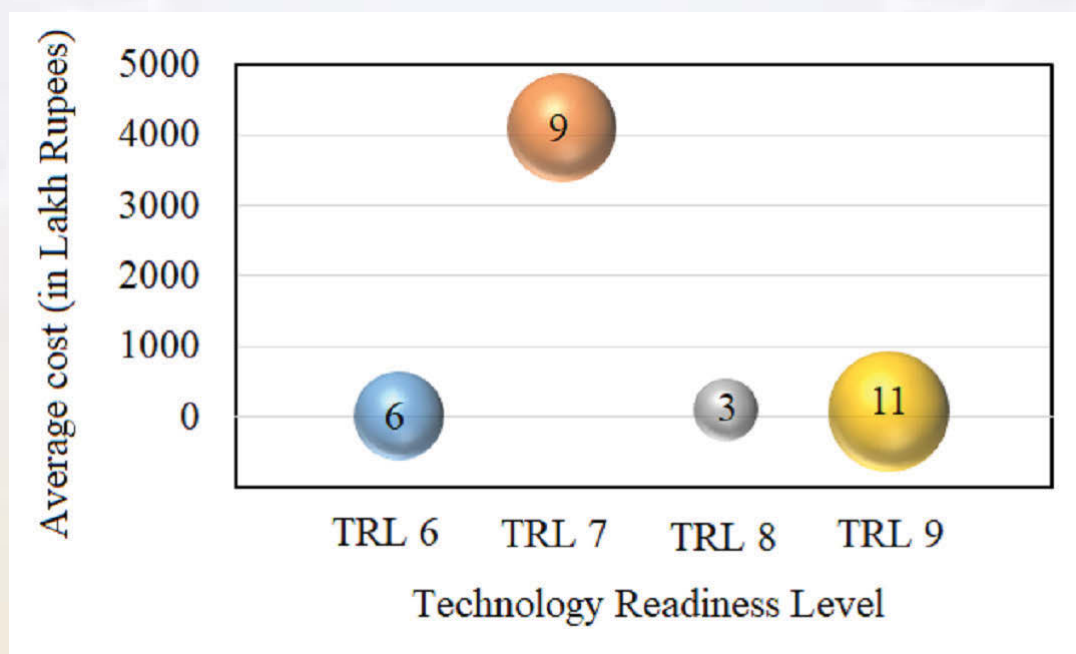


Figure 7. Average cost and number of technologies at different TRL in the theme AEISS.
The centre of Bubble describes the value at Abscissa and Ordinate.

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List of Technologies at TRL 9 in AEISS

Sr. No	Technology ID	CSIR-Lab	Technology Name
1	TECH-THEME_1_NAL-012	CSIR-NAL	Location of Bullet on Target System Detection and Hit Visualization using Acoustic 'N'- wave Identification (DHVANI)
2	TECH-THEME_1_NAL-013	CSIR-NAL	Location of Bullet on Target System Acoustic Based Hit Identification and Analysis System (ABHIAS)
3	TECH-THEME_1_NAL-014	CSIR-NAL	Wankel Rotary Combustion Engine 55hp
4	TECH-THEME_1_NAL-015	CSIR-NAL	Manufacturing of Cocured Composite Structures for Aircraft with Autoclave Moulding Technology
5	TECH-THEME_1_NAL-017	CSIR-NAL	Autoclave – Industry Grade, Lab Scale, and Desktop
6	TECH-THEME_1_NAL-018	CSIR-NAL	Radomes for Airborne and Weather Applications
7	TECH-THEME_1_NAL-019	CSIR-NAL	Multi Zone Hot Bonder
8	TECH-THEME_1_NAL-025	CSIR-NAL	NAL FOQA flight data analysis system
9	TECH-THEME_1_NAL-027	CSIR-NAL	DRISHTI TRANSMISSOMETER- A runway visibility measuring system
10	TECH-THEME_1_NPL-031	CSIR-NPL	Long Afterglow Phosphor Powders (Patent No: India 225682, JP2003292951)
11	TECH-THEME_1_NPL-032	CSIR-NPL	Apparatus for polarization vs. Electric field measurement at various frequencies in thin-film samples(Patent No: 458DEL2015)

Agriculture, Nutrition & Biotechnology (ANB)

There were 161 technologies identified under TRL 6 and above. Based on the expert assessment, 87 technologies were selected for TRL 6 and above and were reassigned to appropriate TRL levels by external experts.

Highlights of Selected Technologies (TRL 6 and above) in ANB

The number of technology at TRL 6, TRL 7, TRL 8 and TRL 9 are 41, 16, 17 and 13, respectively. 47% of Technologies are at TRL 6, and 34% of the total selected technologies are ready for the market, i.e., technologies at TRL 8 and above.

The average cost of technology development at TRL 6, TRL 7, TRL 8, and TRL 9 are ₹ 13.28 Lakhs, 22.91 Lakhs, 4.8 Lakhs and 7.6 Lakhs, respectively. An important aspect that emerges is the high cost of technology development at TRL 7. This underscores a strong capital support is required to move the technologies from this stage to higher technology levels. Figure 8 highlights some of the above facts.

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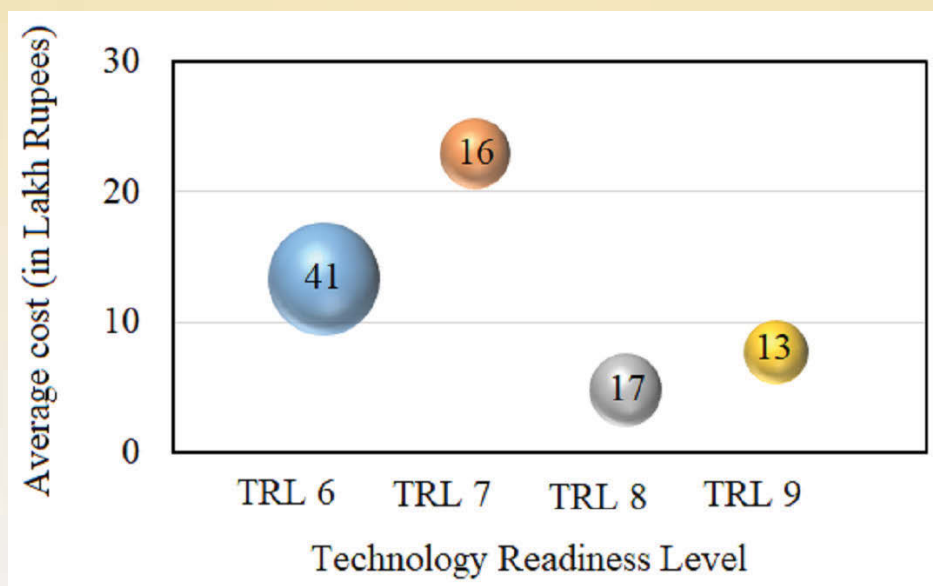


Figure 8. Average cost and number of technologies at different TRL in the theme ANB.

List of Technologies at TRL 9 in ANB

Sr. No	Technology ID	CSIR-Lab	Technology Name
1	TECH-THEME_2_CCMB-002	CSIR-CCMB	Improved Samba Mahsuri (RP BIO 226): a bacterial blight disease resistant and low GI (diabetic friendly) rice variety
2	TECH-THEME_2_CIMAP-074	CSIR-CIMAP	Flomop-Herbal insect repellent floor mopping formulation
3	TECH-THEME_2_CIMAP-078	CSIR-CIMAP	Mos-Ex- Herbal mosquito repellent body lotion
4	TECH-THEME_2_CIMAP-081	CSIR-CIMAP	Relaxomap-Anti-inflammatory pain relieving oil
5	TECH-THEME_2_CIMAP-085	CSIR-CIMAP	Poly Herbal Toothpaste-Herbal tooth care formulation
6	TECH-THEME_2_CIMAP-088	CSIR-CIMAP	Hankool Pulse-Hand Sanitizing formulation
7	TECH-THEME_2_CIMAP-089	CSIR-CIMAP	CIM Paushak
8	TECH-THEME_2_CIMAP-090	CSIR-CIMAP	CIM Phal-Se
9	TECH-THEME_2_NBRI-140	CSIR-NBRI	Herbal toothache gel
10	TECH-THEME_2_NBRI-141	CSIR-NBRI	Herbal Floor Cleaner
11	TECH-THEME_2_NBRI-142	CSIR-NBRI	Herbal Toothpaste (Zenthodent)
12	TECH-THEME_2_NIIST-151	CSIR-NIIST	Fresh Ginger processing Technology
13	TECH-THEME_2_NIIST-152	CSIR-NIIST	Dehumidified drier for food/agri produces

Chemicals Including Leather and Petrochemicals (CLP)

Forty-seven technologies were identified at TRL 6 and above under this theme. Based on expert opinion, there were 20 technologies selected and were reassigned to appropriate TRL levels by external experts.

Highlights of Selected Technologies (TRL 6 and above) in CLP

The number of technologies at TRL 6, TRL 7, TRL 8 and TRL 9 are 7, 3, 3 and 7, respectively. It makes a strong assertion of technology readiness in this theme, with almost 50% of technologies among the selected being at TRL 8 and above. While about 50% of the technologies are at TRL 6 and TRL 7. Figure 9 highlights some of the above facts.

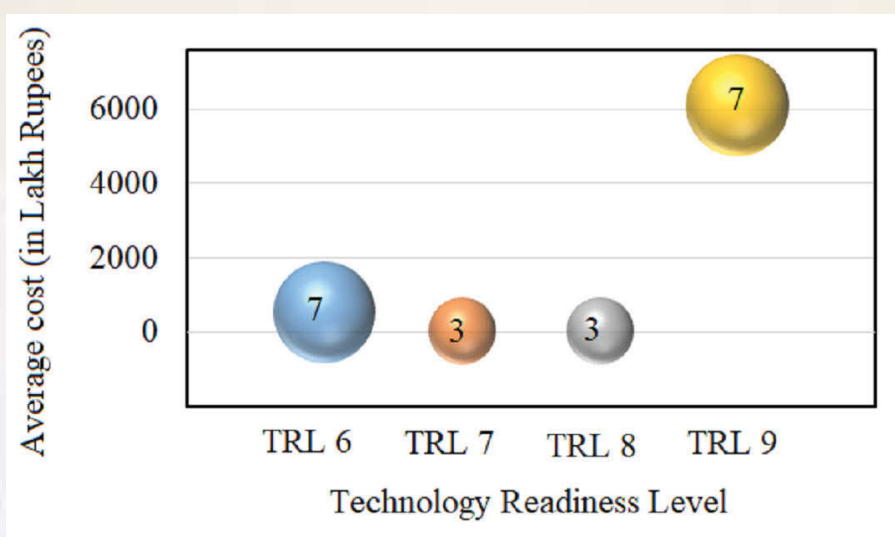


Figure 9. Average cost and number of technologies at different TRL in the theme CLP.

The average cost of technologies at TRL 6, TRL 7, TRL 8 and TRL 9 are ₹ 527 Lakhs, 29 Lakhs, 35 Lakhs and 6109 Lakhs, respectively. An important aspect that emerges is the high cost of technology development at TRL 9.

List of Technologies at TRL 9 in CLP

Sr. No	Technology ID	CSIR-Laboratory	Technology Name
1	TECH-THEME_3-CLRI-013	CSIR-CLRI	Chemo Autotrophic Activated Carbon (CAACO) technology for wastewater treatment
2	TECH-THEME_3-CLRI-015	CSIR-CLRI	Fenton Activated Carbon Catalytic Oxidation(FACCO) process for the treatment of high strength wastewater
3	TECH-THEME_3_IICT-029	CSIR-IICT	Process development, scale-up studies, and basic design for a continuous commercial plant of 4000 MTA capacity for Para Tert Butyl Toluene (PTBT)
4	TECH-THEME_3_IICT-030	CSIR-IICT	Process development, scale-up studies, and basic design for a commercial plant of 3000 TPA capacity for Para Tert Butyl Benzoic Acid (PTBBA)
5	TECH-THEME_3_IIP-032	CSIR-IIP	Simultaneous Production of US Grade Gasoline and High Purity Benzene from FCC C6 Heart Cut Naphtha
6	TECH-THEME_3_IIP-033	CSIR-IIP	Visbreaking of Petroleum Residual Fractions (Soaker with internals)
7	TECH-THEME_3_IIP-036	CSIR-IIP	Wax De-oiling Technology for Production of Paraffin and Microcrystalline Waxes

Civil Infrastructure and Engineering (CIE)

Thirty-four technologies were identified at TRL 6 and above under this theme. Based on expert opinion, 27 technologies were selected at TRL 6 and above and were reassigned to appropriate TRL levels by external experts.

Highlights of Selected Technologies (TRL6 and above) in CIE

Figure 10 shows that about 52% of the selected technologies in this theme are at TRL 6 and TRL 7, while about 48% of the selected technologies in this theme are at TRL 8 and above, which are ready for the market. The number of selected technologies at TRL 8 is maximum, while the selected technologies at TRL 9 are minimum in this theme. Figure 10 highlights some of the above facts.

The average cost of the technologies at TRL 6, TRL 7, TRL 8, and TRL 9 are ₹ 12.5 Lakhs, 7.3 Lakhs, 15.61 Lakhs and 54 Lakhs, respectively. An important aspect that emerges is the high cost of technology development at TRL 9. Figure 10 highlights some of the above facts.

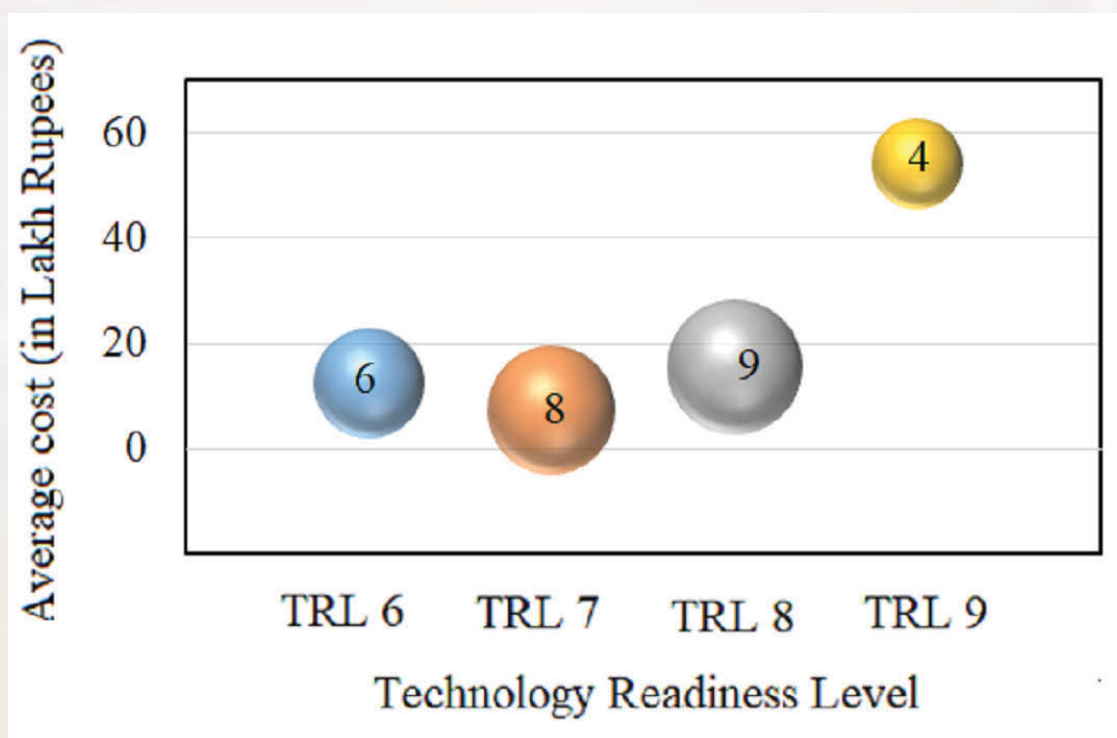


Figure 10. Average cost and number of technologies at different TRL in the theme CIE.

List of Technologies at TRL9 in CIE

Sr. No	Technology ID	CSIR-Laboratory	Technology Name
1	TECH-THEME_4_CRRI-023	CSIR-CRRI	AarogyaPath" National Healthcare Supply Chain Management Platform
2	TECH-THEME_4_CRRI-024	CSIR-CRRI	Mobile Bridge Inspection Unit (MBIU)
3	TECH-THEME_4_CRRI-028	CSIR-CRRI	Process for laying roads using cold mix technology
4	TECH-THEME_4_NEIST-029	CSIR-NEIST	Modular Brick from Brahmaputra River Bed Sand

Ecology, Environment, Earth and Ocean Sciences and Water (E3OW)

Total 47 technologies were identified at TRL 6 and above under this theme. Based on expert opinion, there were 43 technologies selected at TRL 6 and above for the compendium and were reassigned to appropriate TRL levels by external experts.

Highlights of Selected Technologies (TRL 6 and above) in E3OW

Out of 43 selected technologies in this theme, the number of selected technologies at TRL 9 are maximum. This shows many technologies have reached high promising levels. During the evaluation, it was also found that many of them have been transferred, and some in different stages of commercialisation. Among the 43 technologies, some were reassigned to higher TRL and some to lower TRLs based on critical examination. Figure 11 highlights some of the above facts.

The average cost of technologies at TRL 7 and TRL 9 are almost the same, while the technologies at TRL 6 have the lowest average cost. The cost involved in translation to higher TRLs is underscored by these statistics. The average cost of TRL 7 and TRL 9 is about ₹ 60 Lakhs, whereas TRL 6 and TRL 8 are ₹ 6.4 Lakhs and 40 Lakhs, respectively. Figure 11 highlights some of the above facts.

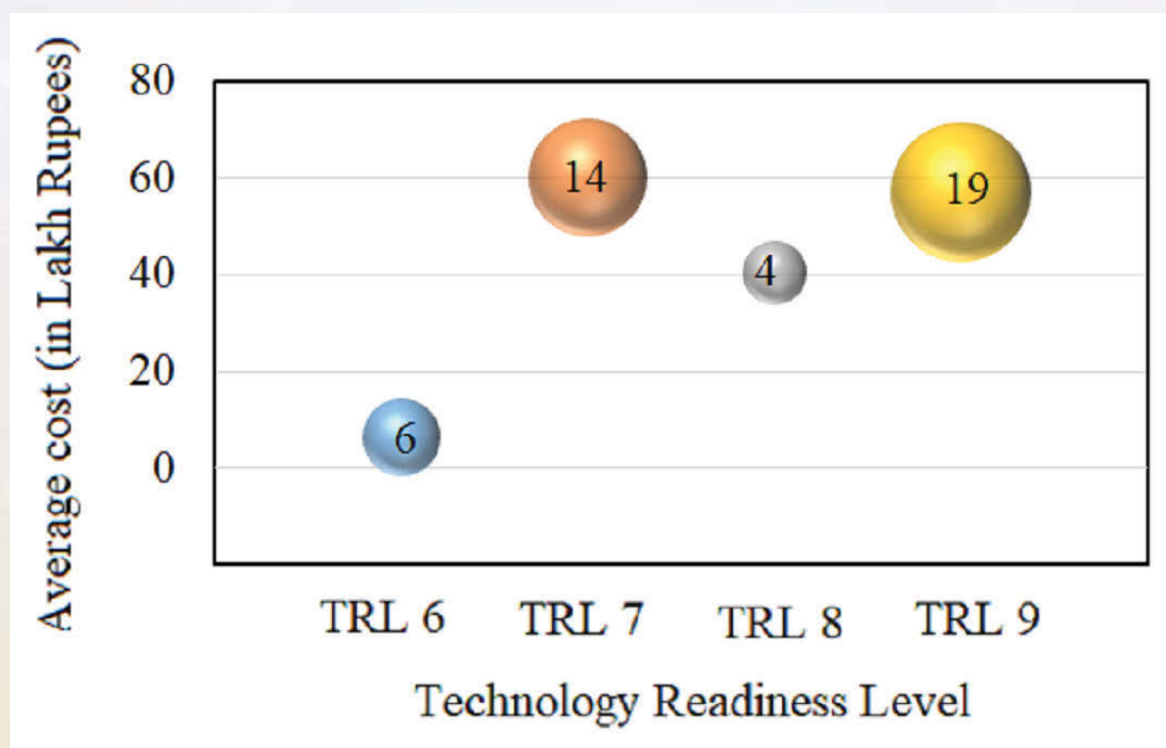


Figure 11. Average cost and number of technologies at different TRL in the theme E3OW.

EXECUTIVE SUMMARY

List of Technologies at TRL9 in E3OW

Sr. No	Technology ID	CSIR-Laboratory	Technology Name
1	TECH-THEME_5_CCMB-002	CSIR-CCMB	Universal Primer Technology for Identification of Animal Species
2	TECH-THEME_5_IICT-007	CSIR-IICT	Anaerobic Gas lift Reactor (AGR): A High rate biomethanation technology to treat organic solid waste for the generation of biogas and bio manure
3	TECH-THEME_5_IICT-011	CSIR-IICT	Atmospheric Water Generator (AWG) with Remineralization
4	TECH-THEME_5_IICT-013	CSIR-IICT	Novel Inexpensive Membrane System as Import Substitute for Production of Demineralized Sterile Water
5	TECH-THEME_5_IITR-016	CSIR-IITR	Oneer-An electronic device for the disinfection of drinking water
6	TECH-THEME_5_NEERI-023	CSIR-NEERI	Phytorid technology
7	TECH-THEME_5_NEERI-024	CSIR-NEERI	Restoration of nallah with ecological units
8	TECH-THEME_5_NEERI-025	CSIR-NEERI	Wind augmentation purifying unit (wayu-ii)
9	TECH-THEME_5_NEERI-026	CSIR-NEERI	Passive ambient air-pollutant removal system
10	TECH-THEME_5_NEERI-027	CSIR-NEERI	Neerdhur
11	TECH-THEME_5_NEERI-030	CSIR-NEERI	Greendispo
12	TECH-THEME_5_NIIST-045	CSIR-NIIST	Biofilter: Technology for Industrial Odour Control
13	TECH-THEME_5_NIIST-046	CSIR-NIIST	BFBR:A high-rate anaerobic Reactor for complex wastewater treatment
14	TECH-THEME_5_NIO-047	CSIR-NIO	Autonomous Vertical Profiler (AVP)for profilingcoastal waters
15	TECH-THEME_5_NPL-050	CSIR-NPL	Acoustical Lightweight Interior Dry Wall Panel for High Sound Insulation(knowhow)
16	TECH-THEME_5_NPL-051	CSIR-NPL	Noise Absorptive Barrier(For Metro/Railway/ Highway/Airport Noise Abatement) (knowhow)
17	TECH-THEME_5_NPL-054	CSIR-NPL	PM2.5 sampler (patent/know how update)
18	TECH-THEME_5_CSMCRI-056	CSIR-CSMCRI	Hollow fiber ultrafiltration membrane manufacturing technology
19	TECH-THEME_5_CSMCRI-057	CSIR-CSMCRI	Technology for the manufacturing of thin-film composite reverse osmosis membrane for desalination and water purification

Energy Conventional and Non-conventional and Energy Devices (EED)

Total 15 technologies at TRL 6 and above were identified under this theme. Based on expert opinion, total 14 technologies were selected for the compendium 2021. Among the 14 technologies, some were reassigned to higher TRLs and some to lower TRLs based on critical examination.

Highlights of Selected Technologies (TRL6 and above) in EED

The presence of most technologies in this theme in TRL 7 and TRL 9 is an important indication of a strong presence in the high technology value chain. Figure 12 highlights some of the salient facts.

EXECUTIVE SUMMARY

The average cost of the technologies at TRL 7 is the highest, which is about ₹ 42 Lakhs. While the average cost is the lowest for the technologies at TRL 6 under this theme. An important aspect that emerges is the high cost of technology development at TRL 7. Figure 12 highlights some of the above facts.

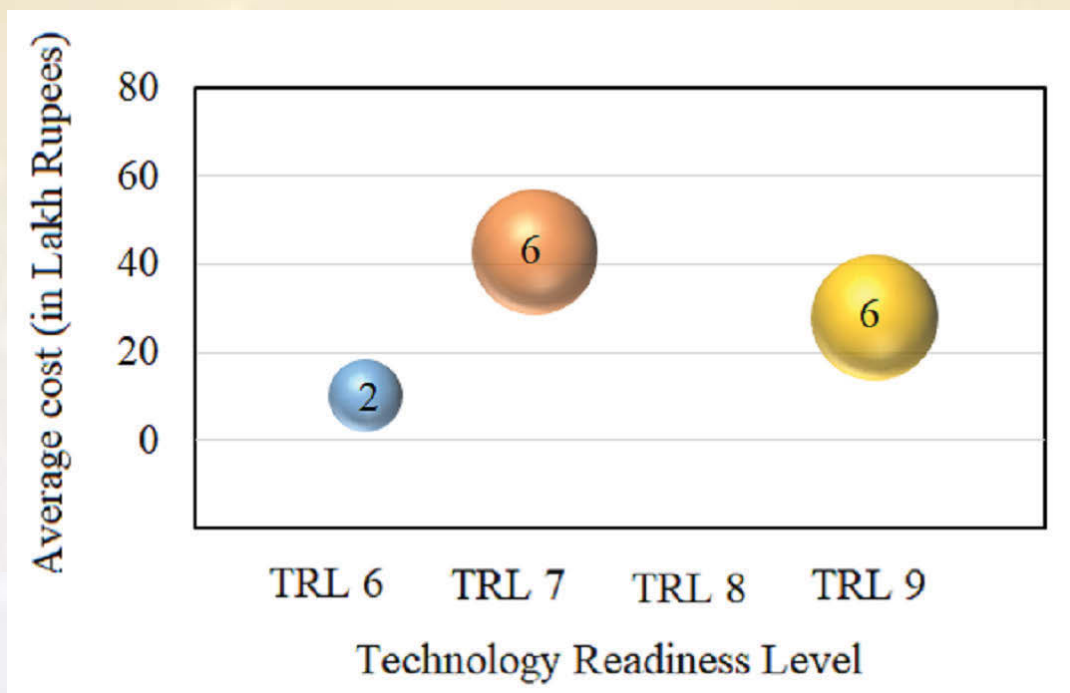


Figure 12. Average cost and number of technologies at different TRL in the theme EED.

List of Technologies at TRL 9 in EED

Sr. No	Technology ID	CSIR-Laboratory	Technology Name
1	TECH-THEME_6_CSIO-003	CSIR-CSIO	Industrial Energy Management System based on LonWorks Technology
2	TECH-THEME_6_CSIO-004	CSIR-CSIO	Industrial Energy Management System based on MODBUS Technology
3	TECH-THEME_6_CSIO-005	CSIR-CSIO	Induction Motor Efficiency Monitoring System (IMEMS)
4	TECH-THEME_6_IIP-009	CSIR-IIP	An Improved Domestic Cooking Burner for PNG
5	TECH-THEME_6_CIMFR-013	CSIR-CIMFR	Technology for production of soft coke
6	TECH-THEME_6_CIMFR-014	CSIR-CIMFR	Technology for Non-Recovery Type Coke Oven, Drag Type coke oven with Stamp Charging and Coke Quenching

Healthcare NCE, Biologics, Diagnostic, Genomics (HTC)

Total 41 technologies were identified at TRL 6 and above under this theme. Based on expert opinion, total 18 technologies at TRL 6 and above were selected for the compendium and were reassigned to appropriate TRL levels by external experts.

EXECUTIVE SUMMARY

Highlights of Selected Technologies (TRL 6 and above) in HTC

The contribution of selected technologies at TRL 6 is maximum. The large presence of technologies at TRL 6 level calls for attention. Figure 13 highlights some of the important facts.

The average cost of the technologies at TRL 7 is the highest under this theme which is about ₹ 70 Lakh. While the average cost of other technologies at TRL 6, TRL 8, and TRL 9 is less than ₹ 25 Lakhs. An important aspect that emerges is the high cost of technology development at TRL 7. Figure 13 highlights some of the above facts.

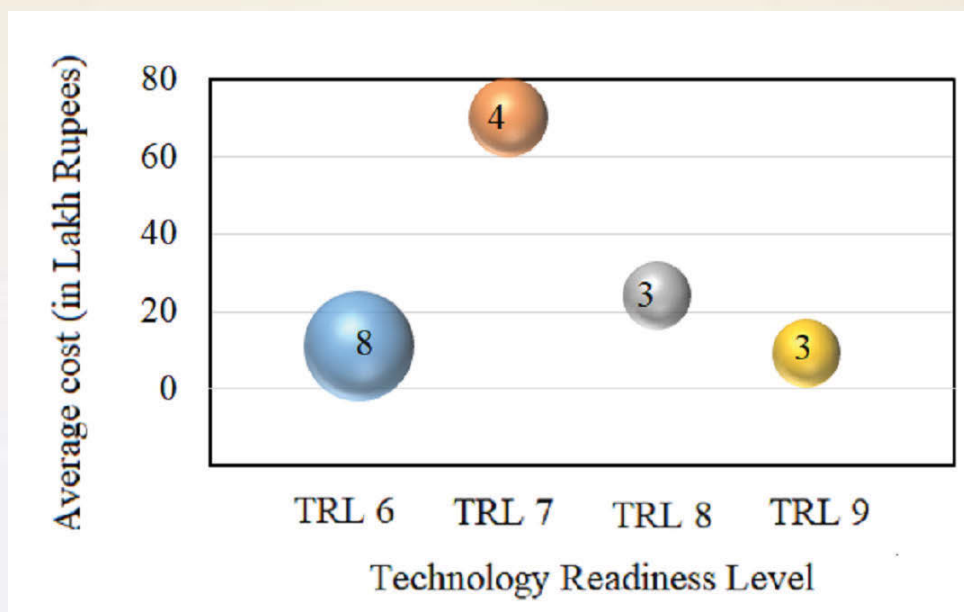


Figure 13. Average cost and number of technologies at different TRL in the theme HTC.

List of Technologies at TRL9 in HTC

Sr. No.	Technology ID	CSIR-Laboratory	Technology Name
1	TECH-THEME_7_CSIO-003	CSIR-CSIO	Electrostatic Disinfection Machine
2	TECH-THEME_7_IGIB-012	CSIR-IGIB	RT PCR kit for COVID 19 testing
3	TECH-THEME_7_IIMM-045	CSIR-IIMM	Gluconate salts: production of metal-Gluconates

Mining, Minerals, Metals and Materials (4M)

Total 88 technologies were identified at TRL 6 and above under this theme. Based on expert opinion, total 75 technologies were selected for the compendium. The technologies at TRL 6 are higher than technologies at other TRL. While the technologies ready for market are about 26% of total selected technologies under this theme (Figure 14).

Highlights of Selected Technologies (TRL6 and above) in 4M

The contribution of selected technologies at TRL 6 is maximum in this theme, which is about 45% of the total selected technologies. While the contribution of selected technologies at TRL 7 is about 28% of the total selected technologies, which is the second highest contribution in this theme. On the other

hand, the number of selected technologies at TRL 8 and TRL 9, respectively, are 12 and 8, which are about 16% and 10% of the total selected technologies in this theme, respectively. Figure 14 highlights some of the above facts.

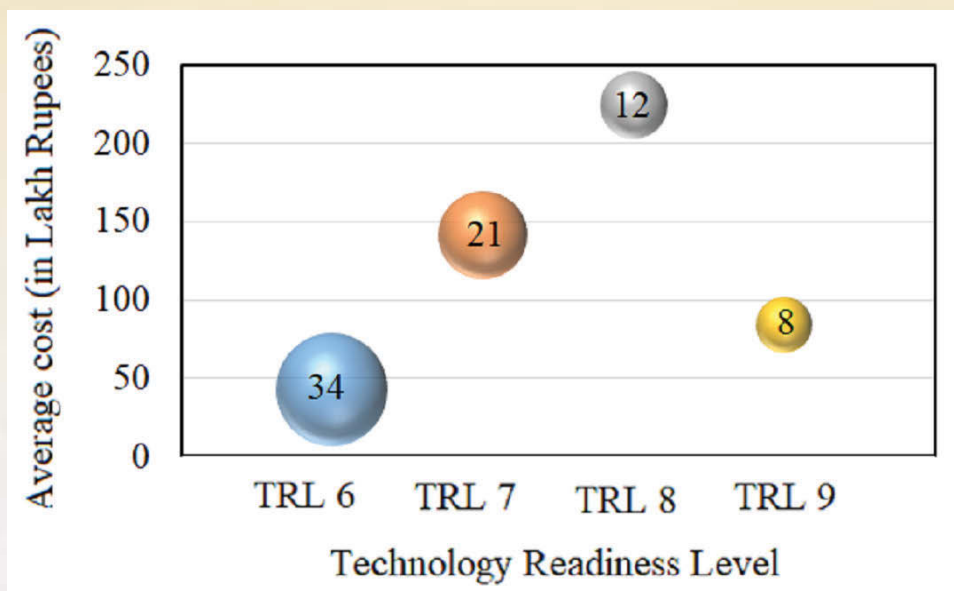


Figure 14. Average cost and number of technologies at different TRL in the theme 4M.

The average cost of technologies at TRL 8 is higher in this theme. An important aspect that emerges is the high cost of technology development at TRL 8. Figure 14 highlights some of the above facts.

List of Technologies at TRL 9 in 4M

Sr. No.	Technology ID	CSIR-Laboratory	Technology Name
1	TECH-THEME_8_CGCRI-005	CSIR-CGCRI	SpecialityBorosilicate Glass Bead: An Innovative Material For Nuclear Safety
2	TECH-THEME_8_CIMFR-025	CSIR-CIMFR	Ash filling in Opencast mines
3	TECH-THEME_8_CIMFR-026	CSIR-CIMFR	Paste backfilling in underground metal mines
4	TECH-THEME_8_CIMFR-028	CSIR-CIMFR	Truck Mounted Mobile Coal Sampler for Instant Coal Ash & Moisture Analyser at Site from Railway Wagon/Truck
5	TECH-THEME_8_IMMT-040	CSIR-IMMT	Alum from Aluminium Dross Residue
6	TECH-THEME_8_NIIST-043	CSIR-NIIST	VIRTUAL CASTING – Affordable State-of-the-Art Software for Casting Process Design. Commercial name: FLOW+ module in AutoCAST X1
7	TECH-THEME_8_NML-048	CSIR-NML	Column Flotation Technology for Processing of Fine Minerals and Ores
8	TECH-THEME_8_NML-056	CSIR-NML	Anti-Tarnishing Lacquer for Silver and Copper-based Alloys

Recommendation and Policy Suggestion

The assessment exercise that led to the assignment of TRLs of the technologies developed by CSIR at different levels has shown many positive aspects:

- At the base level of TRL 6 and TRL 7, several innovative and futuristic technologies exist which can be tapped for further up-gradation and translation.
- Many technologies have reached levels 8 and 9 that have huge potential for further innovation and commercialization.
- The average cost of technologies at TRL 7 was found to be very high, this evidence calls for a further revisit of the technologies stuck at TRL 6 and TRL 7 for over a period of time.
- It also underlines a need for a further revisit by the developing laboratory that can engage with other CSIR laboratories for technologies that are in TRL 6 and TRL 7, particularly those have not moved ahead to higher TRL levels over a period of time.
- New complementary skills, new approaches, and other technology inputs from other CSIR laboratories can push the translation towards higher TRL.
- CSIR needs to explore the 'OPEN Innovation' approach, which calls for developing strategic linkages with industry to develop the technologies further. New models like co-production, equity sharing can be explored to strengthen the open innovation approach.
- Labs with technologies that have not moved to higher TRL levels over a period of time can be strengthened in terms of expertise, skills, and new approaches through collaboration.

Chapter-1 Synthesis of CSIR Technologies

Data collection and evaluation

A database covering 18 parameters that highlighted the different aspects of each technology was created based on inputs from all the CSIR laboratories. This covered a total of 467 technologies at TRL6 and above. The database was further categorized under eight CSIR themes and 38 CSIR Laboratories.

After the final evaluation by the external experts, a total of 313 technologies at the level of TRL 6 and above were placed in the compendium. The selected technologies covered in the compendium were also delineated in the database.

Table 1: Parameters used in the CSIR Compendium of Technologies Database

Field No.	Parameter	Field No.	Parameter	Field No.	Parameter
1	Title of technology	7	Applications	13	Industrial partners
2	Technology Code (UID)	8	Technology benchmarking	14	Plant set up for final product:
3	Laboratory	9	Technology readiness level assessment	15	IPR status details
4	Executive Summary	10	Scale of development	16	Potential market/ techno-economics
5	Keywords	11	Status of commercialization	17	Environmental safety certification
6	Salient Features	12	Tentative cost of development	18	Nodal scientist details

CSIR Laboratory-wise Analysis

Some important aspects emerged from the database of technologies at TRL 6 and above. CSIR-NML technologies have the highest contribution in the compendium at-and-above TRL 6 among

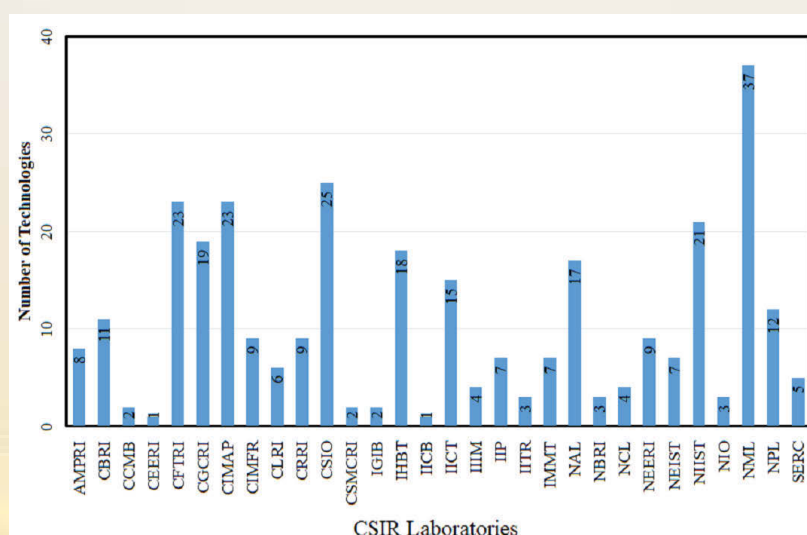


Figure 1. CSIR Lab-wise distribution of selected technologies at TRL6 and above.

SYNTHESIS OF CSIR TECHNOLOGIES

all the laboratories. This is followed by CSIR-CSIO, CSIR-CIMAP, CSIR-CFTRI and CSIR-NIIST (Figure 1). Table 2 highlights the 313 technologies at TRL6 and above from different CSIR Laboratories.

Table 2: List of Selected Technologies (TRL 6 & above) of Different CSIR Laboratories

CSIR Lab	TRL 6 & Above	CSIR Lab	TRL6 & Above	CSIR Lab	TRL 6 & Above
CSIR-AMPRI	8	CSIR-CSIO	25	CSIR-NAL	17
CSIR-CBRI	11	CSIR-CSMCRI	2	CSIR-NBRI	3
CSIR-CCMB	2	CSIR-IGIB	2	CSIR-NCL	4
CSIR-CEERI	1	CSIR-IHBT	18	CSIR-NEERI	9
CSIR-CFTRI	23	CSIR-IICB	1	CSIR-NEIST	7
CSIR-CGCRI	19	CSIR-IICT	15	CSIR-NIIST	21
CSIR-CIMAP	23	CSIR-IIIM	4	CSIR-NIO	3
CSIR-CIMFR	9	CSIR-IIP	7	CSIR-NML	37
CSIR-CLRI	6	CSIR-IITR	3	CSIR-NPL	12
CSIR-CRRI	9	CSIR-IMMT	7	CSIR-SERC	5

The inputs received from different laboratories of technologies at TRL 6 and above were used as a filter to identify unique technologies in the CSIR Compendium of Technologies 2019 at TRL 6 and above. Further, based on the evaluation exercise, 92 technologies from the previous compendium were selected at TRL 6 and above. These 92 technologies were included in our database. Figure 2 represents the number of selected technologies from each laboratory in a bar graph, including technologies included from the previous compendium (herein referred to as repeated technologies) for each laboratory. It was observed that CSIR-CGCRI has repeated almost 89% of its technologies, CSIR-CSIO has repeated 56% of its technologies, CSIR-NML has repeated 54% of its technologies, CSIR-NAL has repeated 47% of its technologies, CSIR-CBRI has repeated 45.5% of its technologies and CSIR-IMMT has repeated 43% of the selected technologies (Figure 2).

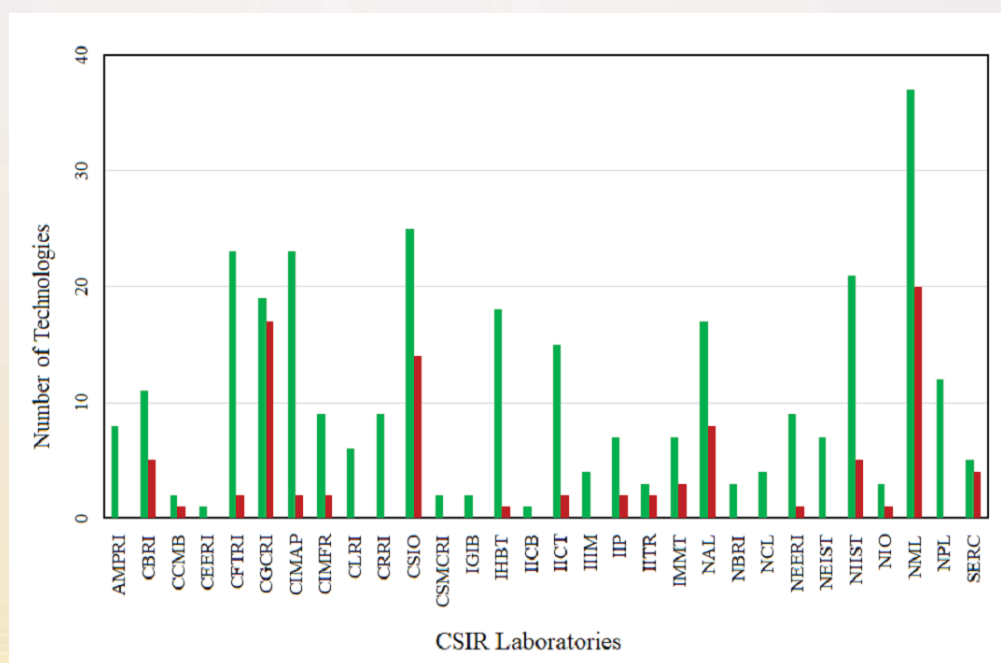


Figure 2. Number of selected technologies (green) and number of repeated technologies (red) of different CSIR Labs. The repeated technologies are the technologies of the CSIR Technology Compendium 2019 re-assessed in CSIR Technology Compendium 2021.

Figure 3 shows repetitions occurred in all the eight themes with maximum repetition, almost 53%, occurring in the Theme 4M; out of 75 selected technologies, 40 technologies are repeated. Under this theme the major share of technologies comes from CSIR-CGCRI and CSIR-NML, which is almost 70%. It can be observed from Figure 2 that most of the technologies from these laboratories are repeated. On the other hand, we see the lowest share of repeated technologies (~10%) in the theme CLP. It may be noted that most of the laboratories contributing to this theme have very low share of repeated technologies (Figure 3).

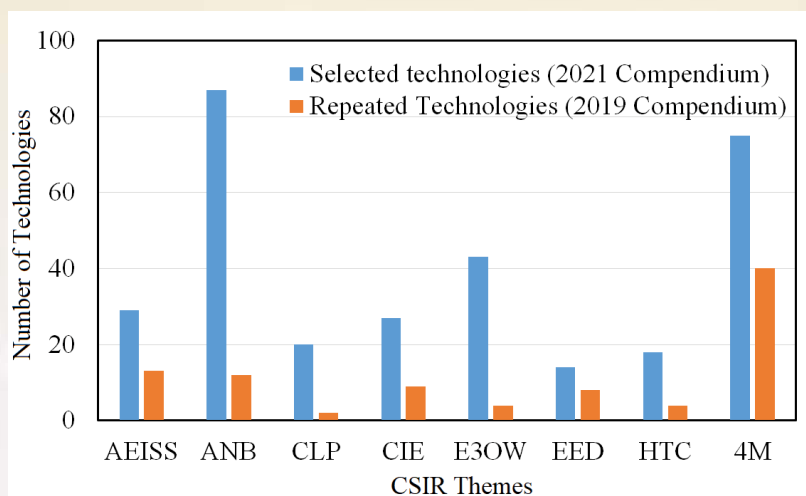


Figure 3. A theme-wise comparison of the selected technologies and repeated technologies.

Figure 4 represents the change in TRL from CSIR Compendium of Technologies 2019 to CSIR Compendium of Technologies 2021. Total 92 repeated technologies were analysed to check the changes in TRL. There was no change in TRL of 40 technologies. 16 technologies have been upgraded on TRL scale with an increase in level 1 from TRL 6 to TRL 7 or TRL 7 to TRL 8 or TRL 8 to TRL 9. Four Technologies have been upgraded with an increase in level 2; final TRL assignment may be TRL 8 or TRL 9. Only 2 technologies have upgraded with an increase in level 3; final assignment will be at TRL 9.

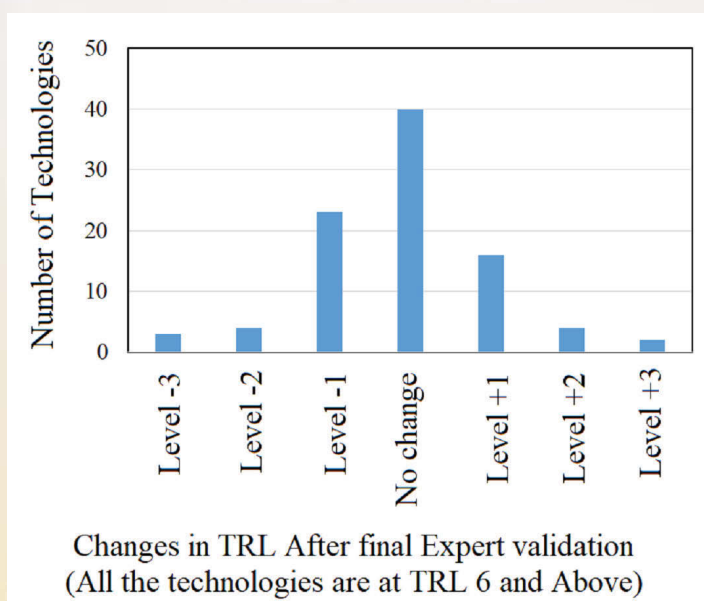


Figure 4. Observed changes in the TRL of the technologies re-assessed for CSIR Compendium of Technologies 2021. No change implies that the technology has been re-assessed at the same TRL. Positive changes (Level +1, Level+2 and Level+3) imply upgradation in the TRL of the technology. Similarly, negative changes (Level -1, Level-2 and Level -3) imply scaled down in the TRL. Only the technologies at TRL 6 and above are considered.

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Similarly, 23 Technologies have been scaled down based on expert opinion with decrease in level 1, 4 technologies downgraded with decrease in level 2 and 3 technologies downgraded with decrease in level 3.

Theme-wise analysis

CSIR-NISTADS has identified a total of 467 technologies at TRL 6 and above in all eight different themes. A comparative data of received and selected technologies is given in Figure 5. Total 313 technologies at TRL 6 and above were selected for the compendium 2021 that covered technologies of 30 CSIR laboratories. Agriculture, Nutrition and Biotechnology (ANB), Mining, Minerals, Metals and Materials (4M) themes have contributed to the maximum number of technologies for the compendium. The energy theme has received fewer technologies compared to other themes and had the least number of technologies selected for the compendium. Figure 6 highlights the above facts.

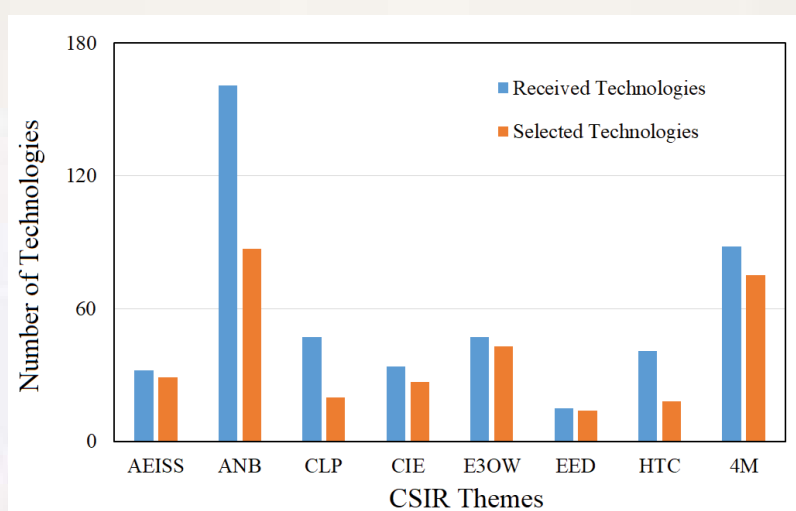


Figure 5. Theme-wise received and selected technologies for the compendium

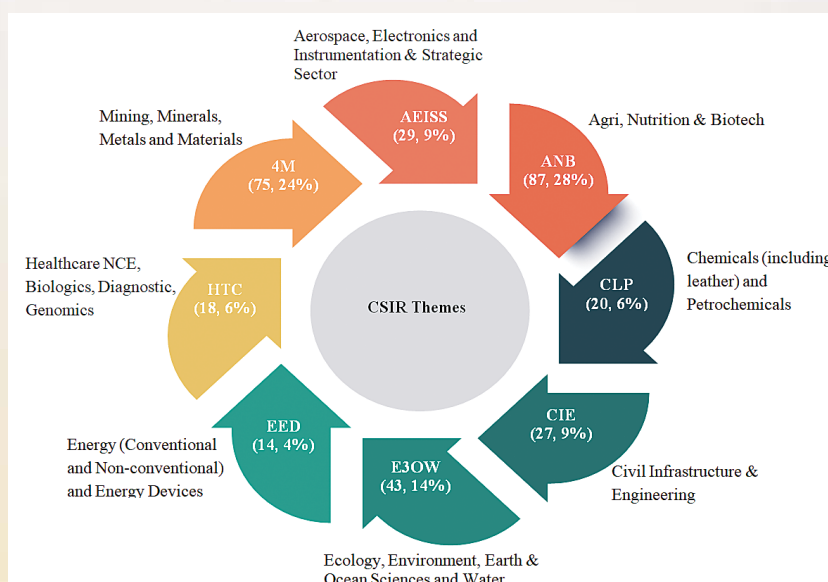


Figure 6. Share of selected technologies at TRL6 and above in different eight themes.

Refer Methodology in the Executive summary for details

Received covers the systematic process of identifying the set of 467 technologies. This is highlighted in methodology

Theme 1: Aerospace, Electronics and Instrumentation & Strategic Sector (AEISS)

A total of 29 technologies were assessed at TRL 6 or above in theme AEISS. Among these, the major share of 11 technologies have been assessed at TRL 9. There are 6, 9, and 3 technologies assessed respectively at TRL 6, TRL 7 and TRL 8. Under this theme, 6 CSIR laboratories have contributed their technologies at TRL 6 and above; CSIR-CEERI and CSIR-CGCRI each with 1 technology, CSIR-CSIO with 5, CSIR-IIP with 1, CSIR-NAL with 17, and CSIR-NPL with 4 technologies. A large share of technologies under this theme is contributed by CSIR-NAL which is half point above 58%, out of which more than 50% technologies are at TRL 9. Around 65% of CSIR-NAL technologies under this theme is at-and-above TRL 7.

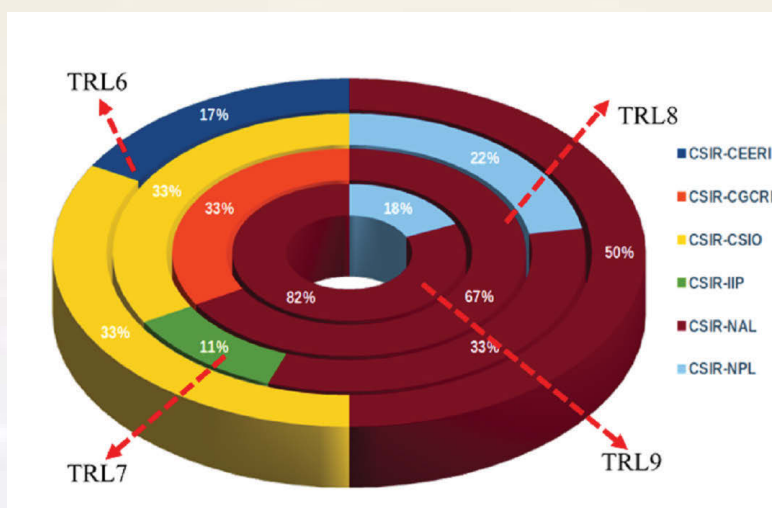


Figure 7. Doughnut plot representing technology share from the CSIR laboratories under the theme AEISS. Rings from outside to inside represent respectively TRL 6, TRL 7, TRL 8, and TRL 9.

Theme 2: Agriculture, Nutrition & Biotechnology (ANB)

This theme has a major share of 27% in all 313 selected CSIR technologies. Under this theme, 11 CSIR laboratories have contributed their technologies assessed at-and-above TRL6. A large share comes from CSIR-CFTRI and CSIR-CIMAP – each of both have contributed with almost 26% of the technologies. This is followed by CSIR-IHBT contributing nearly 20% of its technologies. A total of 13 technologies have been assessed at TRL 9.

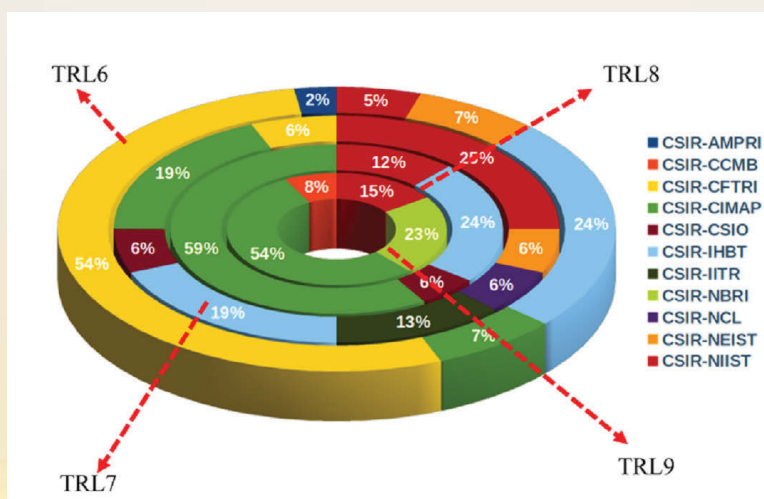


Figure 8. Doughnut plot represents technology share from the CSIR laboratories under the theme ANB. Rings from outside to inside represent respectively TRL 6, TRL 7, TRL 8, and TRL 9.

Theme 3: Chemicals Including Leather and Petrochemicals (CLP)

A total of 20 technologies from 7 CSIR labs have been assessed at-and-above TRL 6 under this theme. A major contribution comes from CSIR-CLRI, CSIR-IICT, and CSIR-IIP which covered 75% of the assessed technologies. Among 20 selected technologies, 35% have been assessed at TRL6 and same percentage of technologies have been assessed at TRL 9; see Figure 9 for the percentage share from each contributing lab in the respective TRL. Based on the above observation, it may be inferred that the major contribution comes from CSIR-CLRI, CSIR-IICT, and CSIR-IIP under this theme.

Figure 9. Same as figure 6, doughnut plot representing technology share from the CSIR laboratories under the theme CLP. Circles from outside to inside represent respectively TRL 6, TRL 7, TRL 8, and TRL 9.

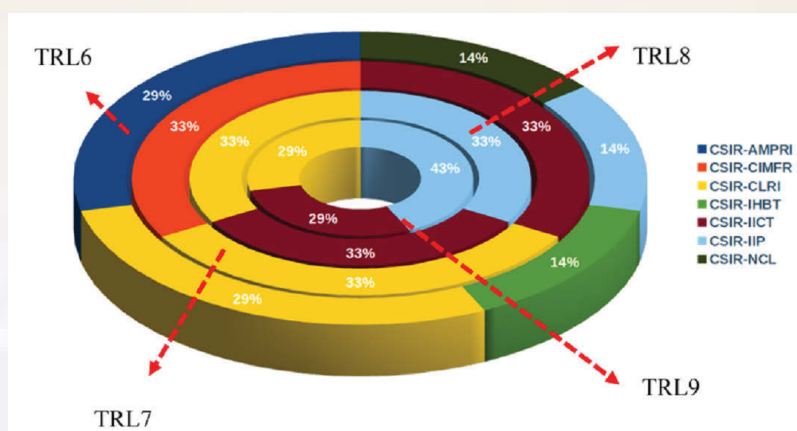


Figure 9. Same as figure 6, doughnut plot representing technology share from the CSIR laboratories under the theme CLP. Circles from outside to inside represent respectively TRL 6, TRL 7, TRL 8, and TRL 9.

Theme 4: Civil Infrastructure and Engineering (CIE)

Twenty seven technologies were selected from 5 CSIR labs at and above TRL 6 under this theme. One-third number of technologies have been assessed at TRL 8, nearly 30% assessed at TRL 7, 22% at TRL 6, and nearly 15% at TRL 9. Nearly 74% of the technologies have been contributed by CSIR-CRRI and CSIR-CBRI.

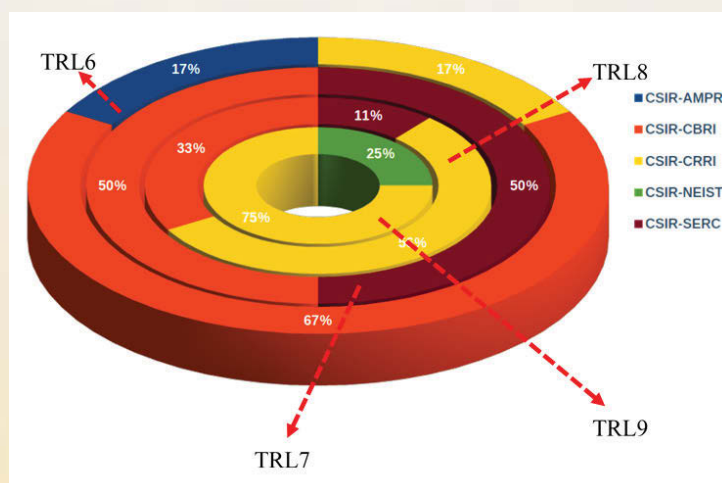


Figure 10. Doughnut plot representing technology share from the CSIR laboratories under theme4. Circles from outside to inside represent respectively TRL 6, TRL 7, TRL 8, and TRL 9.

Theme 5: Ecology, Environment, Earth and Ocean Sciences and Water (E3OW)

Forty-three technologies were selected from 12 CSIR labs at and above TRL 6 under this theme. Major contribution comes from CSIR-NEERI, CSIR-IICT, CSIR-NIIST and CSIR-NPL, which is around 72% of the total number of technologies assessed at and above TRL 6. Almost 44% technologies are at TRL 9, around 33% at TRL 7, and 23% of technologies assessed at TRL 6 and TRL 8.

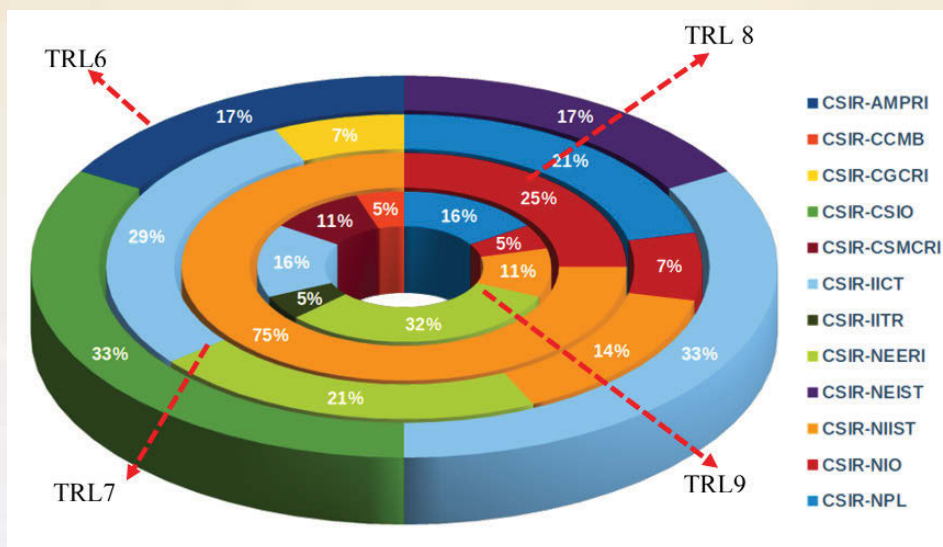


Figure 11. Doughnut plot representing technology share from the CSIR laboratories under theme5. Circles from outside to inside represent respectively TRL 6, TRL 7, TRL 8, and TRL 9.

Theme 6: Energy Conventional and non-conventional and energy devices (EED)

Fourteen technologies were selected from 6 CSIR labs under this theme. Major contribution comes from CSIR-CSIO, which is around 57%. There are more than 85% of technologies assessed at TRL 7 and TRL 9 combined. No technology has been assessed under the bracket of TRL 8.

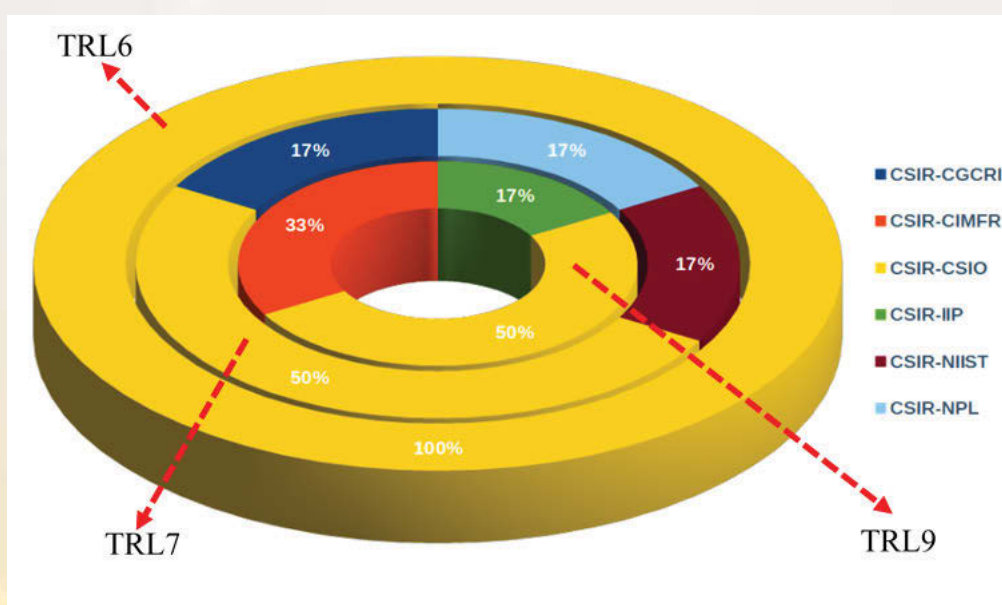


Figure 12. Doughnut plot representing technology share from the CSIR laboratories under theme6. Circles from outside to inside represent respectively TRL 6, TRL 7, and TRL 9.

SYNTHESIS OF CSIR TECHNOLOGIES

Theme 7: Healthcare NCE, Biologics, Diagnostic, Genomics (HTC)

Eighteen technologies were selected from 7 CSIR labs at-and-above TRL 6 under this theme. Major contribution comes from CSIR-CSIO and CSIR-IIIM, which is around 55% combined. There are almost 44% technologies at TRL 6 and around 22% at TRL 7. Rest of the technologies have been assessed above TRL 7.

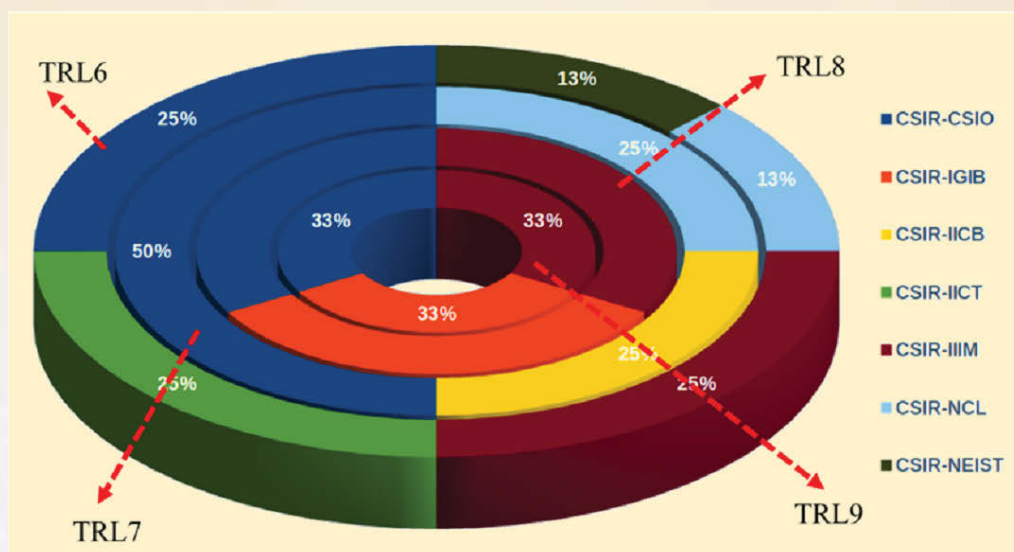


Figure 13. Doughnut plot representing technology share from the CSIR laboratories under theme 7. Circles from outside to inside represent respectively TRL 6, TRL 7, TRL 8, and TRL 9.

Theme 8: Mining, Minerals, Metals and Materials (4M)

Seventy five technologies have been selected from 8 CSIR labs at TRL 6 and above under this theme. This theme has the second largest share in the number of all CSIR technologies assessed at TRL 6 and above. Major contribution comes from CSIR-NML and CSIR-CGCRI, which is slightly above 70%. More than 45% of technologies were assessed at TRL 6, around 28% at TRL 7, 16% at TRL 8, and around 10% at TRL 9. Further break-up depicting contribution of each CSIR laboratories for TRL 6 at-and-above is shown in Figure. 14.

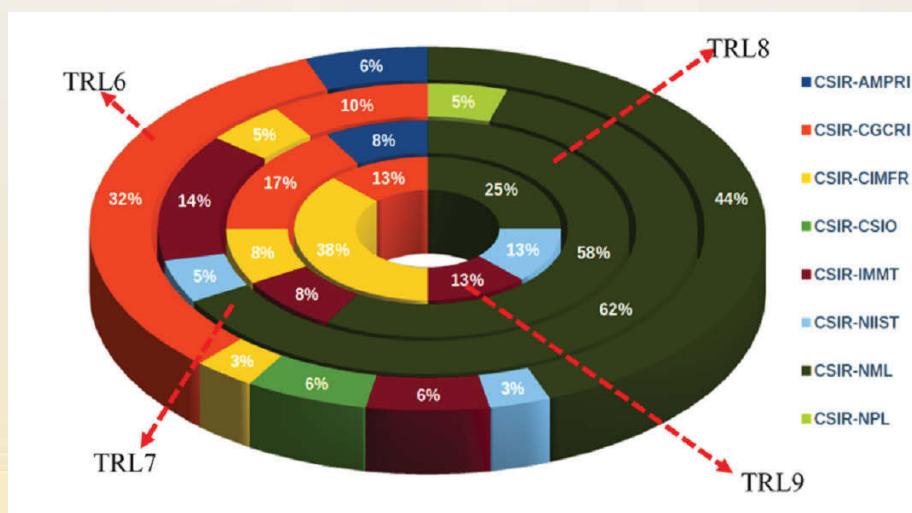


Figure 14. Doughnut plot representing technology share from the CSIR laboratories under theme 8. Circles from outside to inside represent respectively TRL 6, TRL 7, TRL 8, and TRL 9.

Chapter-2 Theme-wise List of Technologies

Sr. No.	Technology Name	Lab	TRL	Page No.
Aerospace, Electronics and Instrumentation & Strategic Sector (AEISS)				
1	Design and Development of 2.6 MW S-band Tunable Pulse	CSIR-CEERI	6	53
2	Er-Doped Fiber Amplifier (EDFA)	CSIR-CGCRI	8	55
3	Earthquake Warning System (EqWS)	CSIR-CSIO	7	57
4	Intelligent Seismic Sensing Node for Elephant Movement Detection	CSIR-CSIO	6	59
5	Divya Nayan: A Personal Reading Machine for Visually Impaired	CSIR-CSIO	7	61
6	AutoCEPH: A Software for 2-D Computerized Cephalometric Analysis as a Web Service	CSIR-CSIO	7	63
7	Ligament Injury Assessment & Therapy Device for Motor-Rehabilitation of Soldiers "L-GEAR"	CSIR-CSIO	6	65
8	Bio-Aviation Fuels: Renewable Fuels for Strategic Sector	CSIR-IIP	7	67
9	HANSA-NG Aircraft	CSIR-NAL	7	71
10	Location of Bullet on Target System Detection and Hit Visualization using Acoustic 'N'- wave Identification (DHVANI)	CSIR-NAL	9	73
11	Location of Bullet on Target System Acoustic Based Hit Identification and Analysis System (ABHIAS)	CSIR-NAL	9	75
12	Wankel Rotary Combustion Engine 55 hp	CSIR-NAL	9	77
13	Manufacturing of Cured Composite Structures for Aircraft with Autoclave Moulding Technology	CSIR-NAL	9	79
14	Process Technology for Continuous Preparation of Carbon Fiber	CSIR-NAL	7	81
15	Autoclave – Industry Grade, Lab Scale and Desktop	CSIR-NAL	9	83
16	Radomes for Airborne and Weather Applications	CSIR-NAL	9	85
17	Multi Zone Hot Bonder	CSIR-NAL	9	87
18	Technical Know-How for Processing of Nickel-Titanium (NiTi) Shape Memory Alloy (SMA) Products for Engineering and Biomedical Applications	CSIR-NAL	8	89
19	Eco-Friendly Process for the Preparation of Corrosion Resistant Sealed Anodized Coatings on Aircraft Aluminium Alloy	CSIR-NAL	6	91
20	Tapecasting Technology for Ceramic Substrates	CSIR-NAL	6	93
21	NAL MRA 1426/1427 GMR Magnetic Sensor	CSIR-NAL	8	95
22	NAL FOQA Flight Data Analysis System	CSIR-NAL	9	97
23	Drishti Transmissometer- A Runway Visibility Measuring System	CSIR-NAL	9	99
24	SUCHAN mini UAV	CSIR-NAL	6	101
25	Bi level Positive Airway Pressure System (Bi+AP V1)	CSIR-NAL	7	103
26	Long Afterglow Phosphor Powders (Patent No: India 225682, JP2003292951)	CSIR-NPL	9	105

THEME-WISE LIST OF TECHNOLOGIES

27	Apparatus for Polarization vs Electric Field Measurement at Various Frequencies in Thin Film Samples(Patent No: 458DEL2015)	CSIR-NPL	9	107
28	Cross Floating Valve (Know-How)	CSIR-NPL	7	109
29	Development of Free Standing and Flexible Carbon Nanotube Paper (Know-How)	CSIR-NPL	7	111
Agriculture, Nutrition & Biotechnology (ANB)				
30	Environment Friendly Multifunctional Bamboo Composite Material for Modern Housing and Structures	CSIR-AMPRI	6	117
31	Improved Samba Mahsuri (RP BIO 226): a Bacterial Blight Disease Resistant and Low GI (Diabetic Friendly) Rice Variety	CSIR-CCMB	9	119
32	Nutra Chikki with added Spirulina	CSIR-CFTRI	6	121
33	A Process for Flavour Essence from Decalepis Hamiltonii/Hemidesmus Indicus Roots	CSIR-CFTRI	6	123
34	A Process for the Preparation of β -carotene and Mineral Fortified Buns	CSIR-CFTRI	6	125
35	Edible Rice Bran	CSIR-CFTRI	6	127
36	Soy Protein Hydrolysate	CSIR-CFTRI	6	129
37	Sesame Dehulling-Dry Process	CSIR-CFTRI	6	131
38	Dehydrated Shelf Stable Egg Cube	CSIR-CFTRI	6	133
39	Shelf-Stable Egg Crunchy Bites	CSIR-CFTRI	6	135
40	Shelf-Stable Chicken Tit Bits	CSIR-CFTRI	6	137
41	Virgin Coconut Oil (VCO)	CSIR-CFTRI	6	139
42	Process for the Production of Spray Dried Coconut Milk Powder	CSIR-CFTRI	6	141
43	Quick Cooking Germinated Dehydrated Pulses	CSIR-CFTRI	6	143
44	Expanded Horse Gram	CSIR-CFTRI	6	145
45	Turmeric Powder from Fresh Turmeric Rhizome	CSIR-CFTRI	7	147
46	Ragi Malt-Enzyme Rich	CSIR-CFTRI	6	149
47	RTE Low Fat Flaked Jowar Snacks (Sweet and Savoury)	CSIR-CFTRI	6	151
48	Neera Bottling	CSIR-CFTRI	6	153
49	Continuous Vibro Fluidized Bed Roaster using Flue Gas	CSIR-CFTRI	6	155
50	Maize Dry Milling System	CSIR-CFTRI	6	157
51	Integrated Rubber Roll Sheller Hulle	CSIR-CFTRI	6	159
52	Tiny Rice Mill	CSIR-CFTRI	6	161
53	Parboiling and Drying Plant (2 & 4TPH)	CSIR-CFTRI	6	163
54	Continuous Ragi Mudde Making Machine	CSIR-CFTRI	6	165
55	Cracknil-Herbal Anti-Crack Cream	CSIR-CIMAP	8	167
56	Lip Balm-Lip Care Formulation	CSIR-CIMAP	6	169
57	Acne Preventive Face Wash- Anti Acne Herbal Formulation	CSIR-CIMAP	8	171
58	Flomop-Herbal Insect Repellent Floor Mopping Formulation	CSIR-CIMAP	9	173
59	Swabee- Natural Surface Disinfectant	CSIR-CIMAP	8	175
60	Cleangerm-Natural Aromatic Floor Cleaner	CSIR-CIMAP	8	177
61	Mospray-Herbal Mosquito Repellent Spray	CSIR-CIMAP	8	179
62	Mos-Ex-Herbal Mosquito Repellent Body Lotion	CSIR-CIMAP	9	181

THEME-WISE LIST OF TECHNOLOGIES

63	Mosrep- Mosquito Repellent Agarbatti	CSIR-CIMAP	8	183
64	Pain Chhoo-Herbal Pain Balm	CSIR-CIMAP	8	185
65	Relaxomap-Anti-Inflammatory Pain Relieving Oil	CSIR-CIMAP	9	187
66	Painjaa-Anti-Inflammatory Pain Relieving Gel	CSIR-CIMAP	8	189
67	Naari-Skin Hygienic Medicated Sanitary Pad	CSIR-CIMAP	8	191
68	Herbichew-Tobacco and Nicotine Free Herbal Mixer	CSIR-CIMAP	8	193
69	Poly Herbal Toothpaste-Herbal Tooth Care Formulation	CSIR-CIMAP	9	195
70	Menthofresh-Herbal Oral Cleanser	CSIR-CIMAP	7	197
71	Hankool Pulse-Hand Sanitizing Formulation	CSIR-CIMAP	9	199
72	Cim Paushak	CSIR-CIMAP	9	201
73	Cim Phal-Se	CSIR-CIMAP	9	203
74	Acne Cure Gel	CSIR-CIMAP	6	205
75	After Shave Gel	CSIR-CIMAP	6	207
76	Mosquito Repellent Cream	CSIR-CIMAP	7	209
77	Psoriacim Cream	CSIR-CIMAP	7	211
78	Advanced Electrostatic Sprayer	CSIR-CSIO	8	213
79	Crispy Fruits and Vegetables for Avoiding Post Harvest Losses	CSIR-IHBT	7	215
80	Ready to Eat Foods for Ethnic Cuisines Himachali Cuisines (Kangri Dham: Contains Four Separate Preparations i.e. Rajmah, Black Gram, Urad Dal, Sweet and Sour Flavoured Dry Fruits), Punjabi Foods, South Indian Foods	CSIR-IHBT	8	217
81	Food Products from Seabuckthorn (Hippophae Rhamnoides)	CSIR-IHBT	6	219
82	Novel Food Products from Sohiong (Prunus Nepalensis)	CSIR-IHBT	6	221
83	Protein and Fiber Enriched Cereal Bars (Variants: Granola Bars, Protein Bars, Low Calorie Bars)	CSIR-IHBT	8	223
84	Iron and Zinc Enriched Spirulina Based Food Products (Nut and Chocolate Bars, Instant Soup Mixes, Beverage Mixes)	CSIR-IHBT	8	225
85	Vitamin D ₂ Enriched Shiitake Mushroom Products: Ready to Reconstitute Products Instant Soup Mixesbeverage Mixes Ready to Eat Energy Bars	CSIR-IHBT	6	227
86	Iron Enriched Fruit Bars and Candies	CSIR-IHBT	6	229
87	Buckwheat Bars and Noodles	CSIR-IHBT	6	231
88	Protein Mix for Beverages	CSIR-IHBT	8	233
89	Tea Catechins	CSIR-IHBT	7	235
90	Tea Wine	CSIR-IHBT	6	237
91	Technology for Preparation of Tea Vinegar	CSIR-IHBT	6	239
92	Stevia Powder and Stevia Liquid Drops (Low Calorie Sweetener)	CSIR-IHBT	6	241
93	Early Flowering in Lilium and Tulip through Hydroponic Cultivation	CSIR-IHBT	6	243
94	Captive Cultivation of Shiitake Mushroom and its Enrichment with Vitamin D ₂	CSIR-IHBT	6	245
95	Improved Bee Hive for Quality and Hygeinic Extraction of Honey	CSIR-IHBT	7	247
96	Ao Kit (Argemone Oil Detection Kit)	CSIR-IITR	7	249
97	Mo Check (Mustard Oil Check)	CSIR-IITR	7	251
98	Herbal Toothache Gel	CSIR-NBRI	9	253
99	Herbal Floor Cleaner	CSIR-NBRI	9	255

THEME-WISE LIST OF TECHNOLOGIES

100	Herbal Toothpaste (Zenthodent)	CSIR-NBRI	9	257
101	High Throughput Mass Spectrometry Method for the Detection of Pesticide Residues and Contaminants from Food and Produce	CSIR-NCL	7	259
102	Tp-16 Biofertilizer	CSIR-NEIST	7	261
103	Op-12 Biofertilizer	CSIR-NEIST	6	263
104	Citronella Jor Lab C-5	CSIR-NEIST	6	265
105	Lemongrass Jor Lab L-8	CSIR-NEIST	6	267
106	Fresh Ginger Processing Technology	CSIR-NIIST	9	269
107	Dehumidified Drier for Food/Agri Produces	CSIR-NIIST	9	271
108	Value Added Syrups from Palm Neera and Coconut Neera	CSIR-NIIST	6	273
109	Process for Preparation of White Pepper	CSIR-NIIST	7	275
110	Organism and Process for Production of Beta Glucosidase (BGL)	CSIR-NIIST	6	277
111	Rice Grain Analysis Software, Ver 1.0	CSIR-CSIO	7	279
112	Endophytic Bacterial Formulation–Plant Tonic	CSIR-NIIST	8	281
113	Ready to Cook Dehydrated Vegetables/Vegetable Mixes	CSIR-NIIST	8	283
114	Dehydrate Fruits and Fruit Preserve in Honey	CSIR-NIIST	7	285
115	Functional Vegetable Oils Based on Red Palm Olein (RPO) for Culinary use with Enriched Carotenoids and Optimum Fatty Acid Profile	CSIR-NIIST	7	287
116	Technology for Red Palm Olein (RPO) Based Soft Gel as Vitamin A Supplement for Combating Vitamin A Deficiency	CSIR-NIIST	7	289
Chemical (Including Leather) and Petrochemicals (CLP)				
117	Fly Ash Based Advanced (Cement Free) Geopolymer Concrete for Rigid Pavement Roads	CSIR-AMPRI	6	293
118	Advanced Pavers Block from Copper Tailings	CSIR-AMPRI	6	295
119	Odor Abatement for Tanneries	CSIR-CLRI	6	297
120	Co-Digestion of Tannery Solid Wastes for Biogas Generation	CSIR-CLRI	7	299
121	Chemo Autotrophic Activated Carbon (CAACO) Technology for Wastewater Treatment	CSIR-CLRI	9	301
122	Fenton Activated Carbon Catalytic Oxidation(FACCO) Process for the Treatment of High Strength Wastewater	CSIR-CLRI	9	303
123	Sequential Oxidic-Anoxic Bioreactor (SOABR) for Primary Treatment of Wastewater	CSIR-CLRI	6	305
124	Waterless Chrome Tanning Technology (WCTT)	CSIR-CLRI	8	307
125	Process for 5-Hydroxymethylfurfural (5-Hmf) Production from Biomass	CSIR-IHBT	6	309
126	Hydrazine Hydrate Technology (HH), for M/s Gujarat Alkalies & Chemicals Limited, Vadodara	CSIR-IICT	7	311
127	Process Development, Scale-Up Studies and Basic Design for a Continuous Commercial Plant of 4000 MTA Capacity for Para Tert Butyl Toluene (PTBT)	CSIR-IICT	9	313
128	Process Development, Scale-Up Studies and Basic Design for a Commercial Plant of 3000 TPA Capacity for Para Tert Butyl Benzoic Acid (PTBBA)	CSIR-IICT	9	315
129	Process Development, Scale-Up Studies and Basic Design for a Commercial Plant of 3000 TPA Capacity for Para Tert Butyl Methyl Benzoate (PTBMB)	CSIR-IICT	8	317
130	Simultaneous Production of US Grade Gasoline and High Purity Benzene from FCC C6 Heart Cut Naptha	CSIR-IIP	9	319

THEME-WISE LIST OF TECHNOLOGIES

131	Visbreaking of Petroleum Residual Fractions (Soaker with Internals)	CSIR-IIP	9	321
132	Sweetening Catalyst-Thoxcat ESTM	CSIR-IIP	8	323
133	Waste Plastics to Fuel and Petrochemicals	CSIR-IIP	6	325
134	Wax De-oiling Technology for Production of Paraffin and Microcrystalline Waxes	CSIR-IIP	9	327
135	Process Development for the Synthesis of Dialkyl Ethers by Dehydration of Alcohols using Mix Metal Oxide Catalyst	CSIR-NCL	6	329
136	Thermo-Gravimetric Reactor (TGR)	CSIR-CIMFR	7	331
Civil Infrastructure and Engineering (CIE)				
137	Advanced Hybrid Composite Wood and Wood Substitute (AC-Wood)	CSIR-AMPRI	6	337
138	C-Brick Machine-Capacity 5000 Bricks per 8 hrs. Shift (Upgraded Version)	CSIR-CBRI	7	339
139	Fire Retardant Water Based Clear/Transparent Coating for Wood and Wood Based Interiors	CSIR-CBRI	8	341
140	Manufacture of Paver Block and Other Building Components i.e. Tiles/Bricks from C&D Waste	CSIR-CBRI	7	343
141	Hybrid Rebar Coupler	CSIR-CBRI	6	345
142	Process Know-How for Manufacturing of Nano-Lime	CSIR-CBRI	6	347
143	Process Know-How for Manufacturing of Silica Nano Particles (SNPs)	CSIR-CBRI	6	349
144	Development of Thermal Insulated Vermiculite Tiles	CSIR-CBRI	8	351
145	Fire Retardant Water Repellent Canvas	CSIR-CBRI	7	353
146	Imaging of Hidden Anomalies in Concrete and Stone Masonry Structures using Ultrasonic Pulse Velocity	CSIR-CBRI	7	355
147	Building Products from Kotastone Waste	CSIR-CBRI	8	357
148	Horizontal Boring Machine for Making Underground Bores	CSIR-CBRI	6	359
149	Design of Noise Barrier Based on Different Frequencies (a) Low Frequency Noise Barrier Configuration (b) Middle Frequency Noise Barrier Configuration and (c) High Frequency Noise Barrier Configuration	CSIR-CRRI	8	361
150	Pothole Repair Machine	CSIR-CRRI	6	363
151	Kisan Sabha Mobile App	CSIR-CRRI	8	365
152	Car Driving Simulator with Driver Diagnostic and Training Method and Extended Products	CSIR-CRRI	8	367
153	Rejuvenator for Recycling of Asphalt Pavement Material for Hot in Plant and Hot In Situ Recycling of Bituminous Pavement (with the Trade Name of REJUPAVE)	CSIR-CRRI	8	369
154	Customized Bitumen Emulsion for Mix Seal Surfacing based on Aggregates of U.P. State	CSIR-CRRI	8	371
155	“AarogyaPath” National Healthcare Supply Chain Management Platform	CSIR-CRRI	9	373
156	Mobile Bridge Inspection Unit (MBIU)	CSIR-CRRI	9	375
157	Process for Laying Roads using Cold Mix Technology	CSIR-CRRI	9	377
158	Modular Brick from Brahmaputra River Bed Sand	CSIR-NEIST	9	379
159	Eco-Friendly Geopolymer Concrete Blocks	CSIR-SERC	8	381
160	Cost Effective Durable Water Tanks using Flowable Cement Mortar	CSIR-SERC	7	383
161	Toilet Unit Using Thin Precast Concrete Segmental Panels	CSIR-SERC	7	385

THEME-WISE LIST OF TECHNOLOGIES

162	Textile Reinforced Concrete Prototyping Technology (TRCPT)	CSIR-SERC	7	387
163	Innovative Disaster Resistant Lightweight Prefabricated Building Systems using EPS Panels	CSIR-SERC	7	389
Ecology, Environment, Earth & Ocean Sciences and Water (E3OW)				
164	Nano Alumina Adsorbent Based Water Filter for Arsenic and Fluoride Removal	CSIR-AMPRI	6	393
165	Universal Primer Technology for Identification of Animal Species	CSIR-CCMB	9	397
166	Water Purification through Ceramic Filters	CSIR-CGCRI	7	399
167	Process Technology for Separation of Phosphor Material from CFL Waste/Recycling of Waste CFLs and Tubelights	CSIR-CSIO	6	401
168	Electrostatic Dust Mitigation and Smog Control Device	CSIR-CSIO	6	403
169	Anaerobic Gas Lift Reactor (AGR): A High Rate Biomethanation Technology to Treat Organic Solid Waste for the Generation of Biogas and Bio Manure	CSIR-IICT	9	405
170	Renewable Biohydrogen (H ₂) and Platform Chemical from Biogenic (Solid /Liquid) Waste	CSIR-IICT	7	407
171	Rapid and Green Composter	CSIR-IICT	6	409
172	Compact and Low Cost Vertical Modular Ro/Nf/Uf Systems for Defluoridation of Ground Water and Purification of Surface Water	CSIR-IICT	7	411
173	Atmospheric Water Generator (AWG) with Remineralization	CSIR-IICT	9	415
174	Technology Package for Production of Packaged Drinking Water Facility	CSIR-IICT	7	417
175	Novel Inexpensive Membrane System as Import Substitute for Production of Demineralized Sterile Water	CSIR-IICT	9	419
176	Nanofiltration (NF) Process for Separation of Corrosive Chloride Ions from Steel Industrial Wastewater	CSIR-IICT	7	421
177	Extraction of Impurity-Free Sodium Thiocyanate Solvent from Aqueous Solutions in Acrylic Fiber Industry	CSIR-IICT	6	423
178	Oneer-An Electronic Device for the Disinfection of Drinking Water	CSIR-IITR	9	425
179	Phytorid Technology	CSIR-NEERI	9	429
180	Restoration of Nallah With Ecological Units	CSIR-NEERI	9	431
181	Wind Augmentation Purifying Unit (Wayu-ii)	CSIR-NEERI	9	433
182	Passive Ambient Air-Pollutant Removal System	CSIR-NEERI	9	435
183	Neerdhur	CSIR-NEERI	9	437
184	High Rate Transpiration System	CSIR-NEERI	7	439
185	Greendispo	CSIR-NEERI	9	441
186	Municipal Wastewater Treatment using Immobilized Microbial Culture-Bio Phytorem System	CSIR-NEERI	7	443
187	Neerflush (Automatic Mechanical Urinal Flusher)	CSIR-NEERI	7	445
188	Wood Care Formulation	CSIR-NEIST	6	447
189	Process for Development of Weather Resistant Coir Geotextile	CSIR-NIIST	7	449
190	Biodegradable Cutleries, Cups, Glass and Plates from Agri Wastes (Wheat Barn, Sugar Cane Bagasse, Rice Husk, Fruit Peels and Pineapple Leaves)	CSIR-NIIST	8	451
191	Modular Onsite Wastewater Treatment Cum Resource Recovery Unit	CSIR-NIIST	8	453
192	Bioprocess for Treating Perchlorate (Rocket Fuel) Contaminated Water and Soil	CSIR-NIIST	7	455

THEME-WISE LIST OF TECHNOLOGIES

193	Compact Food Waste Biogas Plant	CSIR-NIIST	8	457
194	Biofilter: Technology for Industrial Odour Control	CSIR-NIIST	9	459
195	BFBR: A High-Rate Anaerobic Reactor For Complex Wastewater Treatment	CSIR-NIIST	9	461
196	Autonomous Vertical Profiler (AVP) for Profiling Coastal Waters	CSIR-NIO	9	463
197	Controlled Thruster Driven Autonomous Underwater Vehicles (AUV) for Oceanographic Exploration and Profiling	CSIR-NIO	8	465
198	A Sea Bed Resident Event Driven Profiling System for use in Coastal Waters	CSIR-NIO	7	467
199	Acoustical Lightweight Interior Dry Wall Panel for High Sound Insulation (Know-How)	CSIR-NPL	9	469
200	Noise Absorptive Barrier (for Metro/Railway/Highway/Airport Noise Abatement) (Know-How)	CSIR-NPL	9	471
201	Process for the Preparation of Zinc Peroxide Nano-Particles (Patent No. US 8,715,612: 2013) and an Antimicrobial Agent and Preparation thereof (Patent No. IN 1338 Del2014)	CSIR-NPL	7	473
202	Environmental Conditions Monitoring Device	CSIR-NPL	7	475
203	Pm2.5 Sampler (Patent/Know-How Update)	CSIR-NPL	9	477
204	Recycling of Plastic Waste Into Tiles for Societal Usage	CSIR-NPL	7	479
205	Hollow Fiber Ultrafiltration Membrane Manufacturing Technology	CSIR-CSMCRI	9	481
206	Technology for the Manufacturing of Thin Film Composite Reverse Osmosis Membrane for Desalination and Water Purification	CSIR-CSMCRI	9	483
Energy Conventional and Non-Conventional and Energy Devices (EED)				
207	Specialty Optical Fibers	CSIR-CGCRI	7	487
208	VEERA: Virtual Intelligence Techniques for Rehabilitation	CSIR-CSIO	7	489
209	Industrial Energy Management System Based on LonWorks Technology	CSIR-CSIO	9	491
210	Industrial Energy Management System Based on MODBUS Technology	CSIR-CSIO	9	493
211	Induction Motor Efficiency Monitoring System (IMEMS)	CSIR-CSIO	9	495
212	Pump Efficiency Monitoring System (PEMS)	CSIR-CSIO	7	497
213	Finger Gesture Based Control Module for Intelligent Patient Vehicle	CSIR-CSIO	6	499
214	Building Energy Management Software (BEMS)	CSIR-CSIO	6	501
215	An Improved Domestic Cooking Burner for PNG	CSIR-IIP	9	503
216	Semi-Automatic Equipment's for Large Area Dye-Sensitized Solar Module Fabrication	CSIR-NIIST	7	505
217	Carbon Composites Bipolar Plates for Hydrogen Based fuel cell Applications (Patent No: 766/DEL/2010)	CSIR-NPL	7	507
218	Technology for Production of Soft Coke	CSIR-CIMFR	9	509
219	Technology for Non Recovery Type Coke Oven, Drag Type Coke Oven with Stamp Charging and Coke Quenching	CSIR-CIMFR	9	511
220	Air Conditioner Efficiency Meter (ACE Meter)	CSIR-CSIO	7	513
Healthcare NCE, Biologics, Diagnostic, Genomics (HTC)				
221	Exoskeleton Device (ExoD) for Rehabilitation of Mobility Impaired Patients	CSIR-CSIO	7	517
222	Postural Stability Assessment System	CSIR-CSIO	8	519

THEME-WISE LIST OF TECHNOLOGIES

223	ORGAN-Biomechatronic Rehabilitative Solutions for Children with Congenital Hemi-Paresis	CSIR-CSIO	7	521
224	Electrostatic Disinfection Machine	CSIR-CSIO	9	523
225	Development of Patient Specific Orthopaedic & Maxillofacial Implants	CSIR-CSIO	6	525
226	Respiration Assistive Intervention Device-Respi AID	CSIR-CSIO	6	527
227	FnCas9 Editor Linked Uniform Detection Assay (FELUDA).	CSIR-IGIB	8	529
228	RT PCR Kit for COVID19 Testing	CSIR-IGIB	9	531
229	Rapid Diagnostic Kit for Detection of Kala-Azar from Serum and Urine Samples	CSIR-IICB	7	533
230	Glucocorticoid Receptor (GR)-Targeted Liposomal Platform for Aggressive and Drug-Resistant Cancer	CSIR-IICT	6	535
231	Novel Cationic 17-Estradiol-Substituted-Estradiol Derivatives with Anti-Cancer Activity	CSIR-IICT	6	537
232	Selective Detection and Analysis of Small Molecules	CSIR-NCL	6	539
233	Know-How for “Continuous Process for Production of Paracetamol”	CSIR-NCL	7	541
234	Herbal Anti-Fungal Formulation	CSIR-NEIST	6	543
235	(Crocus Sativus) Capsule Formulation: Saffron Based Nutraceutical Product	CSIR-IIIM	6	545
236	Gluconate Salts: Production of Metal-Gluconates	CSIR-IIIM	9	547
237	Fermentation Process for Docosahexaenoic Acid (DHA) Production	CSIR-IIIM	8	549
238	Bacterial Cellulose Patches	CSIR-IIIM	6	551
Mining, Minerals, Metals and Materials (4M)				
239	Diagnostic Lead free X-ray Shielding Tiles for X-ray, CT- Scanner Room and Cath Lab	CSIR-AMPRI	8	557
240	Closed Cell Aluminium Composites Foams	CSIR-AMPRI	6	559
241	Aluminium Metal Matrix Composites and Hybrid Composites	CSIR-AMPRI	6	561
242	Specialty Borosilicate Glass Bead : An Innovative Material For Nuclear Safety	CSIR-CGCRI	9	563
243	High Density Radiation Shielding Window Glass for Nuclear Hot Cell Application	CSIR-CGCRI	8	565
244	Low Moisture Castable (45-75% Al ₂ O ₃)	CSIR-CGCRI	6	567
245	Mag-Chrome Refractory Aggregates from Friable Chrome Ore	CSIR-CGCRI	6	569
246	Mullite Refractory Aggregates from Bauxite	CSIR-CGCRI	6	571
247	Mag-Al Spinel Refractory Aggregates	CSIR-CGCRI	6	573
248	70-90% Alumina Cement Free Dense Self Flowing Castable	CSIR-CGCRI	6	575
249	Orbital Eye Ball Implant	CSIR-CGCRI	6	577
250	Ceramic Biomedical Implants (Hip Joint Prosthesis)	CSIR-CGCRI	6	579
251	Bioactive Glass Coating for Dental Application	CSIR-CGCRI	6	581
252	Synthetic Bone Graft Material	CSIR-CGCRI	6	583
253	Optical Fiber Bragg Grating (FBG) Based Sensors for Smart Infrastructure and Industrial Process Monitoring	CSIR-CGCRI	8	585
254	Moisture Sensor (5-95% RH) Moisture Meter (5-100 ppm Moisture)	CSIR-CGCRI	6	587
255	Pottery and Low Cost Earthen Wares	CSIR-CGCRI	6	589

THEME-WISE LIST OF TECHNOLOGIES

256	Fabrication of Specialty Refractory Pot and Manufacturing of High Density Specialty Glass Cullet for Radiation Shielding Applications	CSIR-CGCRI	7	591
257	Technology of Packaged Fiber Laser	CSIR-CGCRI	7	593
258	Ash Filling in Opencast Mines	CSIR-CIMFR	9	595
259	Paste Backfilling in Underground Metal Mines	CSIR-CIMFR	9	597
260	Paste Backfilling in Underground Coal Mines	CSIR-CIMFR	6	599
261	Truck Mounted Mobile Coal Sampler for Instant Coal Ash & Moisture Analyser at Site from Railway Wagon/Truck	CSIR-CIMFR	9	601
262	Yielding Steel Prop	CSIR-CIMFR	8	603
263	CSIR-CIMFR Blast Guide	CSIR-CIMFR	7	605
264	Economical Production of Highly Porous Metal Organic Frameworks (MOF) from Zinc Scrap	CSIR-CSIO	6	607
265	Materials for Optical Detection of Selenium in Water	CSIR-CSIO	6	609
266	Column Flotation Technology for Flotation of Low Grade Fines Ores and Mineral	CSIR-IMMT	7	611
267	Maximise the Iron Recovery from Low and Lean and Low Grade Iron Ore Resources	CSIR-IMMT	8	613
268	Maximise the Recovery of Flaky Graphite in Beneficiation Process of Natural Graphite Ore	CSIR-IMMT	7	615
269	Designed Screw Scrubber Equipment for Mineral Processing	CSIR-IMMT	6	617
270	Maximisation of Iron Recovery from Lean/Low Grade Iron Ore Resources by Reduction Roasting Technique	CSIR-IMMT	7	619
271	Alum from Aluminium Dross Residue	CSIR-IMMT	9	621
272	Eye-On-Pellet-: Online Pellet Size Analyzer for Pelletization Industries	CSIR-IMMT	6	623
273	An Environmentally Friendly Process for the Production of High Grade Synthetic Rutile from Low Grade Ilmenite	CSIR-NIIST	7	625
274	Virtual Casting-Affordable State-of-the-Art Software for Casting Process Design. Commercial name: FLOW+ Module in AutoCAST X1	CSIR-NIIST	9	627
275	Functionally Graded Aluminum Alloy and Composite Products and Process Technology	CSIR-NIIST	6	629
276	Eco-Friendly Flotation Reagents for Sillimanite, Limestone and Coal	CSIR-NML	7	631
277	Column Flotation Technology for Processing of Fine Minerals and Ores	CSIR-NML	9	633
278	Yellow Tungsten Oxide and Tungsten Metal Powder from Heavy Alloy Scraps	CSIR-NML	8	635
279	Nanosized Hydroxyapatite Powder	CSIR-NML	8	637
280	Geo-Polymer Cement	CSIR-NML	7	639
281	Paving Blocks from Fly Ash, Blast Furnace Slag, Steel Slag, and other Industrial Wastes	CSIR-NML	7	641
282	Energy Efficient Coke Brass and Bell Metal Melting Furnace	CSIR-NML	8	643
283	Production of Ferrite and Pigment Grade High Purity Monodispersed Iron Oxide from Waste Chloride Pickle Liquor and other Iron Rich Sources	CSIR-NML	7	645
284	MagStar: A Portable Magnetic Hysteresis and Barkhausen Emissions Based Electromagnetic Device for Non-Destructive Evaluation of Steel Structure/Component	CSIR-NML	8	647
285	Anti-Tarnishing Lacquer for Silver and Copper-based Alloys	CSIR-NML	9	649

THEME-WISE LIST OF TECHNOLOGIES

286	PABI: Portable Automated Ball Indentation System	CSIR-NML	7	651
287	FlawGuard.: A Cost Effective Device for Defect Detection in Wire during Cold Drawing	CSIR-NML	8	653
288	Recovery of Lead from Zinc Plant Residue	CSIR-NML	6	655
289	Development of Synthetic Flux and a Process for De-phosphorization of Steel in Induction Furnace	CSIR-NML	6	657
290	MagSys: A Portable Giant Magneto-Impedance (GMI) Based Magnetic Sensing Device for NDE Applications	CSIR-NML	7	659
291	Ultrasonic Flow Gauge: A Device for Fluid Flow Rate Measurement through a Narrow Tube	CSIR-NML	7	661
292	Microwave-IR Sort: Rapid, Reliable, Non-invasive Technology for Iron Ore Compositional Analysis	CSIR-NML	6	663
293	Recovery of Cobalt from Discarded Li-ion Batteries of Mobile Phone	CSIR-NML	6	665
294	Highly Metallised Low Sulphur Directly Reduced Iron (DRI) from Iron Ore Slime and Rejected/Middling Coal	CSIR-NML	6	667
295	Dip Cleaner cum Brightener for Gold and Diamond	CSIR-NML	7	669
296	Beneficiation of Low-Grade Iron Ores	CSIR-NML	7	671
297	Highly Metallised Directly Reduced Iron (DRI) from Mill Scale and Lean Grade Non Coking Coal in Tunnel Kiln	CSIR-NML	8	673
298	Dip Cleaner/Tarnish Remover for Silver	CSIR-NML	7	675
299	Certified Reference Materials	CSIR-NML	8	677
300	Copper Concentrate from Copper Ores	CSIR-NML	7	679
301	Dry Beneficiation of Non Coking coal for Application in Thermal Power and DRI	CSIR-NML	6	681
302	Beneficiation of Tungsten Ores Salient Features	CSIR-NML	7	683
303	Anti-Corrosive Chemical for Steel Sheet, Rebar and Wire	CSIR-NML	6	685
304	Annealing Simulator Device	CSIR-NML	7	687
305	Ultra-β: A Portable Nonlinear Ultrasonic Device	CSIR-NML	6	689
306	Recovery of Gold from Waste Mobile Phones and Scraps of Various Equipment	CSIR-NML	6	691
307	Process for Production of Highly Metallised Directly Reduced Iron Cylinders (DRIC) from Lean Grade Raw Materials	CSIR-NML	6	693
308	Pellet-Sinter Composite Agglomerate (PSCA) of Iron Oxide Fines for use in Blast Furnace	CSIR-NML	6	695
309	Production of Directly Reduced Iron (DRI)	CSIR-NML	6	697
310	Wide Metallic Glass Ribbon Processing Unit	CSIR-NML	6	699
311	Cyanide Free Alkaline Electrolyte and Electrochemical Process for Rust Removal from Plain Carbon Steel Components	CSIR-NML	6	701
312	Cyanide Free Process for Leaching and Recovery of Gold	CSIR-NML	6	703
313	Commercial Process for the Recovery of High Purity Gold and Silver (Know-How)	CSIR-NPL	7	705

Chapter-3 CSIR Laboratories-wise List of Technologies

Sr. No.	Technology Name	Themes	TRL	Page No.
CSIR-Advanced Materials And Process Research (CSIR-AMPRI)				
1	Diagnostic Lead free X-ray Shielding Tiles for X-ray, CT-Scanner Room and Cath Lab	4M	8	557
2	Environment Friendly Multifunctional Bamboo Composite Material for Modern Housing and Structures	ANB	6	127
3	Fly Ash Based Advanced (Cement Free) Geo-Polymer Concrete for Rigid Pavement Roads	CLP	6	293
4	Advanced Pavers Block from Copper Tailings	CLP	6	295
5	Advanced Hybrid Composite Wood and Wood Substitute (AC-Wood)	CIE	6	337
6	Nano Alumina Adsorbent Based Water Filter for Arsenic and Fluoride Removal	E3OW	6	393
7	Closed Cell Aluminium Composites Foams	4M	6	559
8	Aluminium Metal Matrix Composites and Hybrid Composites	4M	6	561
CSIR-Central Building Research Institute (CSIR-CBRI)				
9	Fire Retardant Water Based Clear/Transparent Coating for Wood and Wood Based Interiors	CIE	8	341
10	Development of Thermal Insulated Vermiculite Tiles	CIE	8	351
11	Building Products from Kotalstone Waste	CIE	8	357
12	Fire Retardant Water Repellent Canvas	CIE	7	353
13	Imaging of Hidden Anomalies in Concrete and Stone Masonry Structures using Ultrasonic Pulse Velocity	CIE	7	355
14	C-Brick Machine-Capacity 5000 Bricks per 8 hrs. Shift (Upgraded Version)	CIE	7	339
15	Manufacture of Paver Block and Other Building Components i.e. Tiles/Bricks from C&D Waste	CIE	7	343
16	Hybrid Rebar Coupler	CIE	6	345
17	Process Know-How for Manufacturing of Nano-Lime	CIE	6	347
18	Process Know-How for Manufacturing of Silica Nano Particles (SNPs)	CIE	6	349
19	Horizontal Boring Machine for Making Underground Bores	CIE	6	359
CSIR-Centre for Cellular and Molecular Biology (CSIR-CCMB)				
20	Improved Samba Mahsuri (RP BIO 226): a Bacterial Blight Disease Resistant and Low GI (Diabetic Friendly) Rice Variety	ANB	9	119
21	Universal Primer Technology for Identification of Animal Species	E3OW	9	397

CSIR LABORATORIES-WISE LIST OF TECHNOLOGIES

CSIR-Central Electronics Engineering Research Institute (CSIR-CEERI)				
22	Design and Development of 2.6 MW S-band Tunable Pulse	AEISS	6	53
CSIR-Central Food Technological Research Institute (CSIR-CFTRI)				
23	Turmeric Powder from Fresh Turmeric Rhizome	ANB	7	147
24	Nutra Chikki with Added Spirulina	ANB	6	121
25	A Process for Flavour Essence from Decalepis Hamiltonii/Hemidesmus Indicus Roots	ANB	6	123
26	A Process for the Preparation of β -carotene and Mineral Fortified Buns	ANB	6	125
27	Edible Rice Bran	ANB	6	127
28	Soy Protein Hydrolysate	ANB	6	129
29	Sesame Dehulling-Dry Process	ANB	6	131
30	Dehydrated Shelf Stable Egg Cube	ANB	6	133
31	Shelf-Stable Egg Crunchy Bites	ANB	6	135
32	Shelf-Stable Chicken Tit Bits	ANB	6	137
33	Virgin Coconut Oil (VCO)	ANB	6	139
34	Process for the Production of Spray Dried Coconut Milk Powder	ANB	6	141
35	Quick Cooking Germinated Dehydrated Pulses	ANB	6	143
36	Expanded Horse Gram	ANB	6	145
37	Ragi Malt-Enzyme Rich	ANB	6	149
38	RTE Low Fat Flaked Jowar Snacks (Sweet and Savoury)	ANB	6	151
39	Neera Bottling	ANB	6	153
40	Continuous Vibro Fluidized Bed Roaster using Flue Gas	ANB	6	155
41	Maize Dry Milling System	ANB	6	157
42	Integrated Rubber Roll Sheller Hulle	ANB	6	159
43	Tiny Rice Mill	ANB	6	161
44	Parboiling and Drying Plant (2 & 4TPH)	ANB	6	163
45	Continuous Ragi Mudde Making Machine	ANB	6	165
CSIR-Central Glass & Ceramic Research Institute (CSIR-CGCRI)				
46	Specialty Borosilicate Glass Bead : An Innovative Material for Nuclear Safety	4M	9	563
47	High Density Radiation Shielding Window Glass for Nuclear Hot Cell Application	4M	8	565
48	Er-Doped Fiber Amplifier (EDFA)	AEISS	8	55
49	Optical Fiber Bragg Grating (FBG) based Sensors for Smart Infrastructure and Industrial Process Monitoring	4M	8	585
50	Water Purification through Ceramic Filters	E3OW	7	399
51	Specialty Optical Fibers	EED	7	487
52	Fabrication of Specialty Refractory Pot and Manufacturing of High Density Specialty Glass Cullet for Radiation Shielding Applications	4M	7	591
53	Technology of Packaged Fiber Laser	4M	7	593
54	Low Moisture Castable (45-75% Al_2O_3)	4M	6	567

CSIR LABORATORIES-WISE LIST OF TECHNOLOGIES

55	Mag-Chrome Refractory Aggregates from Friable Chrome Ore	4M	6	569
56	Mullite Refractory Aggregates from Bauxite	4M	6	671
57	Mag-Al Spinel Refractory Aggregates	4M	6	573
58	70-90% Alumina Cement Free Dense Self Flowing Castable	4M	6	575
59	Orbital Eye Ball Implant	4M	6	577
60	Ceramic Biomedical Implants (Hip Joint Prosthesis)	4M	6	579
61	Bioactive Glass Coating for Dental Application	4M	6	581
62	Synthetic Bone Graft Material	4M	6	583
63	Moisture Sensor (5-95% RH) Moisture Meter (5-100 ppm Moisture)	4M	6	587
64	Pottery and Low Cost Earthen Wares	4M	6	589
CSIR-Central Institute of Medicinal and Aromatic Plants (CSIR-CIMAP)				
65	Flomop-Herbal Insect Repellent Floor Mopping Formulation	ANB	9	173
66	Mos-Ex-Herbal Mosquito Repellent Body Lotion	ANB	9	181
67	Relaxomap-Anti-Inflammatory Pain Relieving Oil	ANB	9	187
68	Poly Herbal Toothpaste-Herbal Tooth Care Formulation	ANB	9	195
69	Hankool Pulse-Hand Sanitizing Formulation	ANB	9	199
70	CIM Paushak	ANB	9	201
71	CIM Phal-Se	ANB	9	203
72	Cracknil-Herbal Anti-Crack Cream	ANB	8	167
73	Acne Preventive Face Wash-Anti Acne Herbal Formulation	ANB	8	171
74	Swabee-Natural Surface Disinfectant	ANB	8	175
75	Cleangerm-Natural Aromatic Floor Cleaner	ANB	8	177
76	MOSPRAY-Herbal Mosquito Repellent Spray	ANB	8	179
77	MOSREP-Mosquito Repellent Agarbatti	ANB	8	183
78	Pain Chhoo-Herbal Pain Balm	ANB	8	185
79	Painjaa-Anti-Inflammatory Pain Relieving Gel	ANB	8	189
80	NAARI-Skin Hygienic Medicated Sanitary Pad	ANB	8	191
81	Herbichew-Tobacco and Nicotine Free Herbal Mixer	ANB	8	193
82	Menthofresh-Herbal Oral Cleanser	ANB	7	195
83	Mosquito Repellent Cream	ANB	7	209
84	PsoriaCIM Cream	ANB	7	211
85	Lip Balm-Lip Care Formulation	ANB	6	169
86	Acne Cure Gel	ANB	6	205
87	After Shave Gel	ANB	6	207
CSIR-Central Institute of Mining and Fuel Research (CIMFR)				
88	Technology for Production of Soft Coke	EED	9	509
89	Technology for Non Recovery Type Coke Oven, Drag Type Coke Oven with Stamp Charging and Coke Quenching	EED	9	511
90	Ash Filling in Opencast Mines	4M	9	595
91	Paste Backfilling in Underground Metal Mines	4M	9	597

CSIR LABORATORIES-WISE LIST OF TECHNOLOGIES

92	Truck Mounted Mobile Coal Sampler for Instant Coal Ash & Moisture Analyser at Site from Railway Wagon/Truck	4M	9	601
93	Yielding Steel Prop	4M	8	603
94	Thermo-Gravimetric Reactor (TGR)	CLP	7	331
95	CSIR-CIMFR Blast Guide	4M	7	605
96	Paste Backfilling in Underground Coal Mines	4M	6	599
CSIR-Central Leather Research Institute (CSIR-CLRI)				
97	Chemo Autotrophic Activated Carbon (CAACO) Technology for Wastewater Treatment	CLP	9	301
98	Fenton Activated Carbon Catalytic Oxidation (FACCO) Process for the Treatment of High Strength Wastewater	CLP	9	303
99	Waterless Chrome Tanning Technology (WCTT)	CLP	8	307
100	Co-Digestion of Tannery Solid Wastes for Biogas Generation	CLP	7	299
101	Sequential Oxic-Anoxic Bioreactor (SOABR) for Primary Treatment of Wastewater	CLP	6	305
102	Odor Abatement for Tanneries	CLP	6	297
CSIR-Central Road Research Institute (CSIR-CRRI)				
103	“AarogyaPath” National Healthcare Supply Chain Management Platform	CIE	9	373
104	Mobile Bridge Inspection Unit (MBIU)	CIE	9	375
105	Process for Laying Roads using Cold Mix Technology	CIE	9	377
106	Design of Noise Barrier Based on Different Frequencies (a) Low Frequency Noise Barrier Configuration (b) Middle Frequency Noise Barrier Configuration and (c) High Frequency Noise Barrier Configuration	CIE	8	361
107	Kisan Sabha Mobile App	CIE	8	365
108	Car Driving Simulator with Driver Diagnostic and Training Method and Extended Products	CIE	8	367
109	Rejuvenator for Recycling of Asphalt Pavement Material for Hot in Plant and Hot In Situ Recycling of Bituminous Pavement (with the Trade Name of REJUPAVE)	CIE	8	369
110	Customized Bitumen Emulsion for Mix Seal Surfacing Based on Aggregates of U.P. State	CIE	8	371
111	Pothole Repair Machine	CIE	6	363
CSIR-Central Scientific Instruments Organisation (CSIR-CSIO)				
112	Industrial Energy Management System Based on LonWorks Technology	EED	9	491
113	Industrial Energy Management System Based on MODBUS Technology	EED	9	493
114	Induction Motor Efficiency Monitoring System (IMEMS)	EED	9	495
115	Electrostatic Disinfection Machine	HTC	9	523
116	Postural Stability Assessment System	HTC	8	519
117	Advanced Electrostatic Sprayer	ANB	8	213
118	Divya Nayan: A Personal Reading Machine for Visually Impaired	AEISS	7	61
119	AutoCEPH: A Software for 2-D Computerized Cephalometric Analysis as a Web Service	AEISS	7	63
120	Earthquake Warning System (EqWS)	AEISS	7	57

CSIR LABORATORIES-WISE LIST OF TECHNOLOGIES

121	Rice Grain Analysis Software, Ver 1.0	ANB	7	279
122	VEERA: Virtual Intelligence Techniques for Rehabilitation	EED	7	489
123	Pump Efficiency Monitoring System (PEMS)	EED	7	497
124	Air Conditioner Efficiency Meter (ACE Meter)	EED	7	513
125	Exoskeleton Device (ExoD) for Rehabilitation of Mobility Impaired Patients	HTC	7	517
126	ORGAN-Biomechatronic Rehabilitative Solutions for Children with Congenital Hemi-Paresis	HTC	7	521
127	Intelligent Seismic Sensing Node for Elephant Movement Detection	AEISS	6	59
128	Ligament Injury Assessment & Therapy Device for Motor-Rehabilitation of Soldiers "L-GEAR"	AEISS	6	65
129	Finger Gesture Based Control Module for Intelligent Patient Vehicle	EED	6	499
130	Building Energy Management Software (BEMS)	EED	6	501
131	Process Technology for Separation of Phosphor Material from CFL Waste/Recycling of Waste CFLs and Tubelights	E3OW	6	401
132	Electrostatic Dust Mitigation and Smog Control Device	E3OW	6	403
133	Development of Patient Specific Orthopaedic & Maxillofacial Implants	HTC	6	525
134	Respiration Assistive Intervention Device-Respi AID	HTC	6	527
135	Economical Production of Highly Porous Metal Organic Frameworks (MOF) from Zinc Scrap	4M	6	607
136	Materials for Optical Detection of Selenium in Water	4M	6	609

CSIR-Central Salt and Marine Chemicals Research Institute (CSIR-CSMCRI)

137	Hollow Fiber Ultrafiltration Membrane Manufacturing Technology	E3OW	9	481
138	Technology for the Manufacturing of Thin Film Composite Reverse Osmosis Membrane for Desalination and Water Purification	E3OW	9	483

CSIR-Institute of Genomics and Integrative Biology (CSIR-IGIB)

139	RT PCR Kit for COVID19 Testing	HTC	9	531
140	Fncas9 Editor Linked Uniform Detection Assay (FELUDA).	HTC	8	529

CSIR-Institute of Himalayan Bioresource Technology (CSIR-IHBT)

141	Ready to Eat Foods for Ethnic Cuisines Himachali Cuisines (Kangri Dham: Contains Four Separate Preparations i.e. Rajmah, Black Gram, Urad Dal, Sweet and Sour Flavoured Dry Fruits), Punjabi Foods, South Indian Foods	ANB	8	217
142	Protein and Fiber Enriched Cereal Bars (Variants: Granola Bars, Protein Bars, Low Calorie Bars)	ANB	8	223
143	Iron and Zinc Enriched Spirulina Based Food Products (Nut and Chocolate Bars, Instant Soup Mixes, Beverage Mixes)	ANB	8	225
144	Protein Mix for Beverages	ANB	8	233
145	Crispy Fruits and Vegetables for Avoiding Post Harvest Losses	ANB	7	215
146	Tea Catechins	ANB	7	235
147	Improved Bee Hive for Quality and Hygeinic Extraction of Honey	ANB	7	247
148	Food Products from Seabuckthorn (Hippophae Rhamnoides)	ANB	6	219

CSIR LABORATORIES-WISE LIST OF TECHNOLOGIES

149	Novel Food Products from Sohiong (<i>Prunus Nepalensis</i>)	ANB	6	221
150	Vitamin D ₂ Enriched Shiitake Mushroom Products: Ready to Reconstitute Products Instant Soup Mixes Beverage Mixes Ready to Eat Energy Bars	ANB	6	227
151	Iron Enriched Fruit Bars and Candies	ANB	6	229
152	Buckwheat Bars and Noodles	ANB	6	231
153	Tea Wine	ANB	6	237
154	Technology for Preparation of Tea Vinegar	ANB	6	239
155	Stevia Powder and Stevia Liquid Drops (Low Calorie Sweetener)	ANB	6	241
156	Early Flowering in <i>Lilium</i> and <i>Tulip</i> Through Hydroponic Cultivation	ANB	6	243
157	Captive Cultivation of Shiitake Mushroom and its Enrichment with Vitamin D ₂	ANB	6	245
158	Process for 5-Hydroxymethylfurfural (5-hmf) Production from Biomass	CLP	6	309
CSIR-Indian Institute of Chemical Biology (CSIR-IICB)				
159	Rapid Diagnostic Kit for Detection of Kala-azar from Serum and Urine Samples	HTC	7	533
CSIR-Indian Institute of Chemical Technology (CSIR-IIT)				
160	Process Development, Scale-Up Studies and Basic Design for a Continuous Commercial Plant of 4000 MTA Capacity for Para Tert Butyl Toluene (PTBT)	CLP	9	313
161	Process Development, Scale-Up Studies and Basic Design for a Commercial Plant of 3000 TPA Capacity for Para Tert Butyl Benzoic Acid (PTBBA)	CLP	9	315
162	Process Development, Scale-Up Studies and Basic Design for a Commercial Plant of 3000 TPA Capacity for Para Tert Butyl Methyl Benzoate (PTBMB)	CLP	8	317
163	Anaerobic Gas Lift Reactor (AGR): A High Rate Biomethanation Technology to Treat Organic Solid Waste for the Generation of Biogas and Bio Manure	E3OW	9	405
164	Atmospheric Water Generator (AWG) with Remineralization	E3OW	9	415
165	Novel Inexpensive Membrane System as Import Substitute for Production of Demineralized Sterile Water	E3OW	9	419
166	Hydrazine Hydrate Technology (HH), for M/s Gujarat Alkalies & Chemicals Limited, Vadodara	CLP	7	311
167	Renewable Biohydrogen (H ₂) and Platform Chemical from Biogenic (Solid/Liquid) Waste	E3OW	7	407
168	Compact and Low Cost Vertical Modular RO/NF/UF Systems for Defluoridation of Ground Water and Purification of Surface Water	E3OW	7	411
169	Technology Package for Production of Packaged Drinking Water Facility	E3OW	7	417
170	Nanofiltration (NF) Process for Separation of Corrosive Chloride Ions from Steel Industrial Wastewater	E3OW	7	421
171	Rapid and Green Composter	E3OW	6	409
172	Extraction of Impurity-Free Sodium Thiocyanate Solvent from Aqueous Solutions in Acrylic Fiber Industry	E3OW	6	423
173	Glucocorticoid Receptor (GR)-Targeted liposomal Platform for Aggressive and Drug-Resistant Cancer	HTC	6	535
174	Novel Cationic 17-Estradiol-Substituted-Estradiol Derivatives with Anti-Cancer Activity	HTC	6	537

CSIR LABORATORIES-WISE LIST OF TECHNOLOGIES

CSIR-Indian Institute Of Integrative Medicine (CSIR-IIIM)				
175	Gluconate Salts: Production of Metal-Gluconates	HTC	9	547
176	Fermentation Process for Docosahexaenoic Acid (DHA) Production	HTC	8	549
177	Iim-141 (Crocus Sativus) Capsule Formulation: Saffron Based Nutraceutical Product	HTC	6	545
178	Bacterial Cellulose Patches	HTC	6	551
CSIR-Indian Institute of Petroleum (CSIR-IIP)				
179	Wax De-Oiling Technology for Production of Paraffin and Microcrystalline Waxes	CLP	9	327
180	An Improved Domestic Cooking Burner for PNG	EED	9	503
181	Simultaneous Production of US Grade Gasoline and High Purity Benzene from FCC C6 Heart Cut Naphtha	CLP	9	319
182	Visbreaking of Petroleum Residual Fractions (Soaker with internals)	CLP	9	321
183	Sweetening Catalyst-Thoxcat ESTM	CLP	8	323
184	Bio-Aviation Fuels: Renewable Fuels for Strategic Sector	AEISS	7	67
185	Waste Plastics to Fuel and Petrochemicals	CLP	6	325
CSIR-Indian Institute of Toxicology Research (CSIR-IITR)				
186	Oneer-An Electronic Device for the Disinfection of Drinking Water	E3OW	9	425
187	AO Kit (Argemone Oil Detection Kit)	ANB	7	249
188	MO Check (Mustard Oil Check)	ANB	7	251
CSIR-Institute of Minerals & Materials Technology (CSIR-IMMT)				
189	Alum from Aluminium Dross Residue	4M	9	621
190	Maximise the Iron Recovery from Low and Lean and Low Grade Iron Ore Resources	4M	8	619
191	Column Flotation Technology for Flotation of Low Grade Fines Ores and Mineral	4M	7	611
192	Maximise the Recovery of Flaky Graphite in Beneficiation Process of Natural Graphite Ore	4M	7	613
193	Maximisation of Iron Recovery from Lean/Low Grade Iron Ore Resources by Reduction Roasting Technique	4M	7	615
194	Designed Screw Scrubber Equipment for Mineral Processing	4M	6	617
195	Eye-On-Pellet:- Online Pellet Size Analyzer for Pelletization Industries	4M	6	623
CSIR-National Aerospace Laboratories (CSIR-NAL)				
196	Location of Bullet on Target System Detection and Hit Visualization using Acoustic 'N'-Wave Identification (DHVANI)	AEISS	9	73
197	Location of Bullet on Target System Acoustic Based Hit Identification and Analysis System (ABHIAS)	AEISS	9	75
198	Wankel Rotary Combustion Engine 55 hp	AEISS	9	77
199	Manufacturing of Cured Composite Structures for Aircraft with Autoclave Moulding Technology	AEISS	9	79

CSIR LABORATORIES-WISE LIST OF TECHNOLOGIES

200	Autoclave-Industry Grade, Lab Scale and Desktop	AEISS	9	83
201	Radomes for Airborne and Weather Applications	AEISS	9	85
202	Multi Zone Hot Bonder	AEISS	9	87
203	NAL FOQA Flight Data Analysis System	AEISS	9	97
204	Drishti Transmissometer-A Runway Visibility Measuring System	AEISS	9	99
205	Technical Know-How for Processing of Nickel-Titanium (NiTi) Shape Memory Alloy (SMA) Products for Engineering and Biomedical Applications	AEISS	8	89
206	NAL MRA 1426/1427 GMR Magnetic Sensor	AEISS	8	95
207	Bi Level Positive Airway Pressure System (Bi+AP V1)	AEISS	7	103
208	HANSA-NG Aircraft	AEISS	7	71
209	Process Technology for Continuous Preparation of Carbon Fiber	AEISS	7	81
210	SUCHAN mini UAV	AEISS	6	101
211	Eco-Friendly Process for the Preparation of Corrosion Resistant Sealed Anodized Coatings on Aircraft Aluminium Alloy	AEISS	6	91
212	Tapecasting Technology for Ceramic Substrates	AEISS	6	93
CSIR-National Botanical Research Institute (CSIR-NBRI)				
213	Herbal Toothache Gel	ANB	9	253
214	Herbal Floor Cleaner	ANB	9	255
215	Herbal Toothpaste (Zenthodent)	ANB	9	257
CSIR-National Chemical Laboratory (CSIR-NCL)				
216	High Throughput Mass Spectrometry Method for the Detection of Pesticide Residues and Contaminants from Food and Produce	ANB	7	259
217	Know-How for “Continuous Process for Production of Paracetamol”	HTC	7	541
218	Selective Detection and Analysis of Small Molecules	HTC	6	539
219	Process Development for the Synthesis of Dialkyl Ethers by Dehydration of Alcohols using mix Metal Oxide Catalyst	CLP	6	329
CSIR-National Environmental Engineering Research Institute (CSIR-NEERI)				
220	Phytorid Technology	E3OW	9	429
221	Restoration of Nallah with Ecological Units	E3OW	9	431
222	Wind Augmentation Purifying Unit (wayu-ii)	E3OW	9	433
223	Passive Ambient Air-Pollutant Removal System	E3OW	9	435
224	Neerdhur	E3OW	9	437
225	Greendispo	E3OW	9	441
226	High Rate Transpiration System	E3OW	7	439
227	Municipal Wastewater Treatment using Immobilized Microbial Culture-bio Phytorem System	E3OW	7	443
228	Neerflush (Automatic Mechanical Urinal Flusher)	E3OW	7	445
CSIR-North East Institute Of Science & Technology (CSIR-NEIST)				
229	Modular Brick from Brahmaputra River Bed Sand	CIE	9	379
230	TP-16 Biofertilizer	ANB	7	261

CSIR LABORATORIES-WISE LIST OF TECHNOLOGIES

231	OP-12 Biofertilizer	ANB	6	263
232	Citronella Jor Lab C-5	ANB	6	265
233	Lemongrass Jor Lab L-8	ANB	6	267
234	Wood Care Formulation	E3OW	6	467
235	Herbal Anti-Fungal Formulation	HTC	6	543
CSIR-National Institute for Interdisciplinary Science and Technology (CSIR-NIIST)				
236	Fresh Ginger Processing Technology	ANB	9	269
237	Biofilter: Technology for Industrial Odour Control	E3OW	9	459
238	BFBR: A High-Rate Anaerobic Reactor for Complex Wastewater Treatment	E3OW	9	461
239	VIRTUAL CASTING-Affordable State-of-the-Art Software for Casting Process Design. Commercial name: FLOW+ Module in AutoCAST X1	4M	9	627
240	Dehumidified Drier for Food/Agri Produces	ANB	9	271
241	Endophytic Bacterial Formulation-Plant Tonic	ANB	8	281
242	Ready to Cook Dehydrated Vegetables/Vegetable Mixes	ANB	8	283
243	Dehydrate Fruits and Fruit Preserve in Honey	ANB	7	285
244	Biodegradable Cutleries, Cups, Glass and Plates from Agri Wastes (Wheat Barn, Sugar Cane Bagasse, Rice Husk, Fruit Peels and Pineapple Leaves)	E3OW	8	451
245	Modular Onsite Wastewater Treatment Cum Resource Recovery Unit.	E3OW	8	453
246	Compact Food Waste Biogas Plant	E3OW	8	457
247	Process for Preparation of White Pepper	ANB	7	275
248	Functional Vegetable Oils Based on Red Palm Olein (RPO) for Culinary use with Enriched Carotenoids and Optimum Fatty Acid Profile	ANB	7	287
249	Technology for Red Palm Olein (RPO) Based Soft Gel as Vitamin A Supplement for Combating Vitamin A Deficiency	ANB	7	289
250	Process for Development of Weather Resistant Coir Geotextile	E3OW	7	449
251	Bioprocess for Treating Perchlorate (Rocket Fuel) Contaminated Water And Soil	E3OW	7	455
252	Semi-Automatic Equipment's for Large Area Dye-Sensitized Solar Module Fabrication	EED	7	505
253	An Environmentally Friendly Process for the Production of High Grade Synthetic Rutile from Low Grade Ilmenite	4M	7	625
254	Organism and Process for Production of Beta Glucosidase (BGL)	ANB	6	277
255	Functionally Graded Aluminum Alloy and Composite Products and Process Technology	4M	6	629
256	Value Added Syrups from Palm Neera and Coconut Neera	ANB	6	273
CSIR-National Institute of Oceanography (CSIR-NIO)				
257	Autonomous Vertical Profiler (AVP) for Profiling coastal Waters	E3OW	9	463
258	Controlled Thruster Driven Autonomous Underwater Vehicles (AUV) for Oceanographic Exploration and profiling	E3OW	8	465
259	A Sea Bed Resident Event Driven Profiling System for use in Coastal Waters	E3OW	7	467
CSIR-National Metallurgical Laboratory (CSIR-NML)				
260	Column Flotation Technology for Processing of Fine Minerals and Ores	4M	9	633
261	Anti-Tarnishing Lacquer for Silver and Copper-Based Alloys	4M	9	649

CSIR LABORATORIES-WISE LIST OF TECHNOLOGIES

262	Yellow Tungsten Oxide and Tungsten Metal Powder from Heavy Alloy Scraps	4M	8	635
263	Nanosized Hydroxyapatite Powder	4M	8	637
264	Energy Efficient Coke Brass and Bell Metal Melting Furnace	4M	8	643
265	MagStar: A Portable Magnetic Hysteresis and Barkhausen Emissions Based Electromagnetic Device for Non-Destructive Evaluation of Steel Structure/Component	4M	8	667
266	FlawGuard.: A Cost Effective Device for Defect Detection in Wire during Cold Drawing	4M	8	653
267	Highly Metallised Directly Reduced Iron (DRI) from Mill Scale and Lean Grade Non Coking Coal in Tunnel Kiln	4M	8	673
268	Certified Reference Materials	4M	8	677
269	Eco-Friendly Flotation Reagents for Sillimanite, Limestone and Coal	4M	7	631
270	Geo-Polymer Cement	4M	7	639
271	Paving Blocks from Fly Ash, Blast Furnace Slag, Steel Slag, and other Industrial Wastes	4M	7	641
272	Production of Ferrite and Pigment Grade High Purity Monodispersed Iron Oxide from Waste Chloride Pickle Liquor and other Iron Rich Sources	4M	7	645
273	MagSys: A Portable Giant Magneto-Impedance (GMI) Based Magnetic Sensing Device for NDE Applications	4M	7	659
274	Ultrasonic Flow Gauge: A Device for Fluid Flow Rate Measurement through a Narrow Tube	4M	7	661
275	Dip Cleaner Cum Brightener for Gold and Diamond	4M	7	669
276	Beneficiation of Low-Grade Iron Ores	4M	7	671
277	Dip Cleaner/Tarnish Remover for Silver	4M	7	675
278	Copper Concentrate from Copper Ores	4M	7	679
279	Beneficiation of Tungsten Ores Salient Features	4M	7	683
280	Annealing Simulator Device	4M	7	687
281	PABI: Portable Automated Ball Indentation System	4M	7	651
282	Recovery of Lead from Zinc Plant Residue	4M	6	654
283	Development of Synthetic Flux and a Process for De-phosphorization of Steel in Induction Furnace	4M	6	657
284	Microwave-IR Sort: Rapid, Reliable, Non-invasive Technology for Iron Ore Compositional Analysis	4M	6	663
285	Recovery of Cobalt from Discarded Li-ion Batteries of Mobile Phone	4M	6	665
286	Highly Metallised Low Sulphur Directly Reduced Iron (DRI) from Iron Ore Slime and Rejected/Middling Coal	4M	6	667
287	Dry Beneficiation of Non-Coking Coal for Application in Thermal Power and DRI	4M	6	681
288	Anti-Corrosive Chemical for Steel Sheet, Rebar and Wire	4M	6	685
289	Ultra-β: A Portable Nonlinear Ultrasonic Device	4M	6	689
290	Recovery of Gold from Waste Mobile Phones and Scraps of Various Equipment	4M	6	691
291	Process for Production of Highly Metallised Directly Reduced Iron Cylinders (DRIC) from Lean Grade Raw Materials	4M	6	693
292	Pellet-Sinter Composite Agglomerate (PSCA) of Iron Oxide Fines for Use in Blast Furnace	4M	6	695

CSIR LABORATORIES-WISE LIST OF TECHNOLOGIES

293	Production of Directly Reduced Iron (DRI)	4M	6	697
294	Wide Metallic Glass Ribbon Processing Unit	4M	6	699
295	Cyanide Free Alkaline Electrolyte and Electrochemical Process for Rust Removal from Plain Carbon steel Components	4M	6	701
296	Cyanide Free Process for Leaching and Recovery of Gold	4M	6	703
CSIR-National Physical Laboratory (CSIR-NPL)				
297	Long Afterglow Phosphor Powders (Patent No: India 225682, JP2003292951)	AEISS	9	105
298	Apparatus for Polarization vs Electric Field Measurement at Various Frequencies in Thin Film Samples (Patent No: 458DEL2015)	AEISS	9	107
299	Acoustical Lightweight Interior Dry Wall Panel for High Sound Insulation (Know-How)	E3OW	9	469
300	Noise Absorptive Barrier (For Metro/Railway/Highway/Airport Noise Abatement) (Know-How)	E3OW	9	471
301	PM2.5 Sampler (Patent/Know-How Update)	E3OW	9	477
302	Cross Floating Valve (know-How)	AEISS	7	109
303	Development of Free Standing and Flexible Carbon Nanotube Paper (Know-How)	AEISS	7	111
304	Process for the Preparation of Zinc Peroxide Nano-Particles (Patent No. US 8,715,612: 2013) and an Antimicrobial Agent and Preparation Thereof (Patent No. IN 1338 DEL2014)	E3OW	7	473
305	Environmental Conditions Monitoring Device	E3OW	7	475
306	Recycling of Plastic Waste into Tiles for Societal Usage	E3OW	7	479
307	Carbon Composites Bipolar Plates for Hydrogen Based Fuel Cell Applications (Patent No: 766/DEL/2010)	EED	7	507
308	Commercial Process for the Recovery of High Purity Gold and Silver (Know-How)	4M	7	705
CSIR-Structural Engineering Research Center (CSIR-SERC)				
309	Eco-Friendly Geopolymer Concrete Blocks	CIE	8	381
310	Cost Effective Durable Water Tanks using Flowable Cement Mortar	CIE	7	383
311	Toilet Unit Using Thin Precast Concrete Segmental Panels	CIE	7	385
312	Textile Reinforced Concrete Prototyping Technology (TRCPT)	CIE	7	387
313	Innovative Disaster Resistant Lightweight Prefabricated Building Systems Using EPS Panels	CIE	7	389

Chapter-4 4.1 Aerospace, Electronics and Instrumentation & Strategic Sector (AEISS)

Introduction

Lab-wise Contribution

Total 29 technologies have selected in the compendium. In terms of number of technologies, CSIR National Aerospace laboratories has contributed 17 technologies which the highest contribution. CSIR-CSIO and CSIR-NPL, respectively, have contributed 5 and 4 technologies. While CSIR-CEERI, CSIR CGCRI and CSIR-IIP have contributed one-one technologies in the compendium. (Figure 1).

In percentage of total technology, CSIR-NAL, CSIR-CSIO and CSIR-NPL, respectively, have contributed about 59%, 17% and 14% of total technology selected. While CSIR-CEERI, CSIR CGCRI and CSIR-IIP, respectively, have contributed 3% each laboratory. (Figure 1).

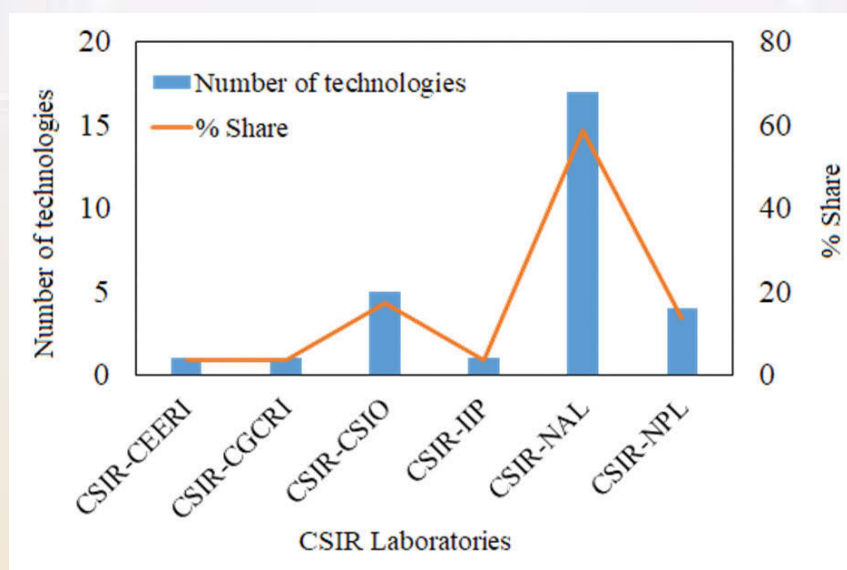


Figure 1. Number of technologies (left y axis, blue filled bars) and % share of contributing labs (right y axis, solid line) of the 6 CSIR Laboratories.

On the other hand, the average cost of the technology developed by the CSIR-IIP is higher than other labs. The average cost of technology of CSIR-IIP is ₹ 21600 Lakhs while the average cost of technology developed by CSIR-NAL is ₹ 1324 Lakhs. The average cost of technologies developed by CSIR-CEERI, CSIR-CGCRI, CSIR-CSIO, CSIR and NPL, respectively, are ₹ 40 Lakhs, ₹ 100 Lakhs, ₹ 37 Lakhs and 4.1 Lakhs (Figure 2).

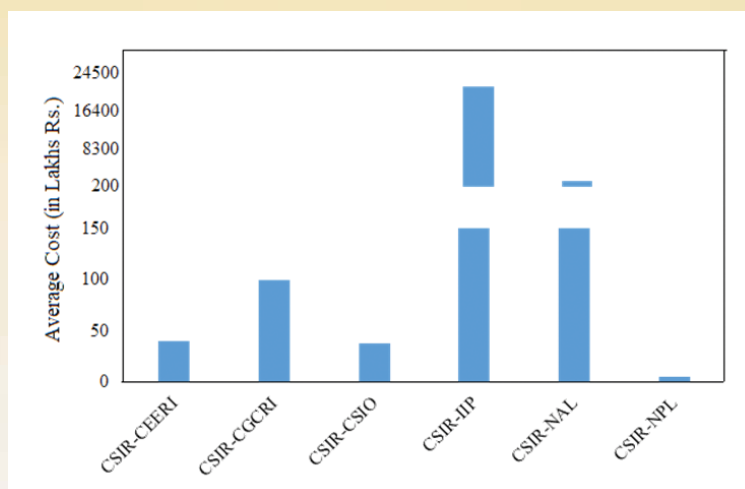


Figure 2. Average cost of the technology development on different CSIR Laboratories.

Assessment of TRL

The TRL-wise distribution of technologies of the respective laboratory shows that only CSIR NAL and CSIR-NPL, respectively, have contributed 8 and 2 at TRL 9 technologies. CSIR-NPL has highest TRL 9 technologies. CSIR-CEERI has contributed 1 technology of TRL 6 (blue filled bars). CSIR-CGCRI has contributed one technology at TRL 8 (yellow filled bars) and CSIR-IIP has contributed one technology of TRL 7 (red filled bars). CSIR-NPL has contributed 4 technologies in which 2 technologies at TRL 8 and 2 technologies at TRL 9. CSIR-CSIO has contributed 5 technologies in which 2 and 3 technologies, respectively, are at TRL 6 and TRL 7. Similarly, CSIR-NAL has contributed 17 technologies in compendium in which 3, 3, 3 and 8 technologies are at TRL 6, TRL 7, TRL 8 and TRL 9 respectively (Figure 3).

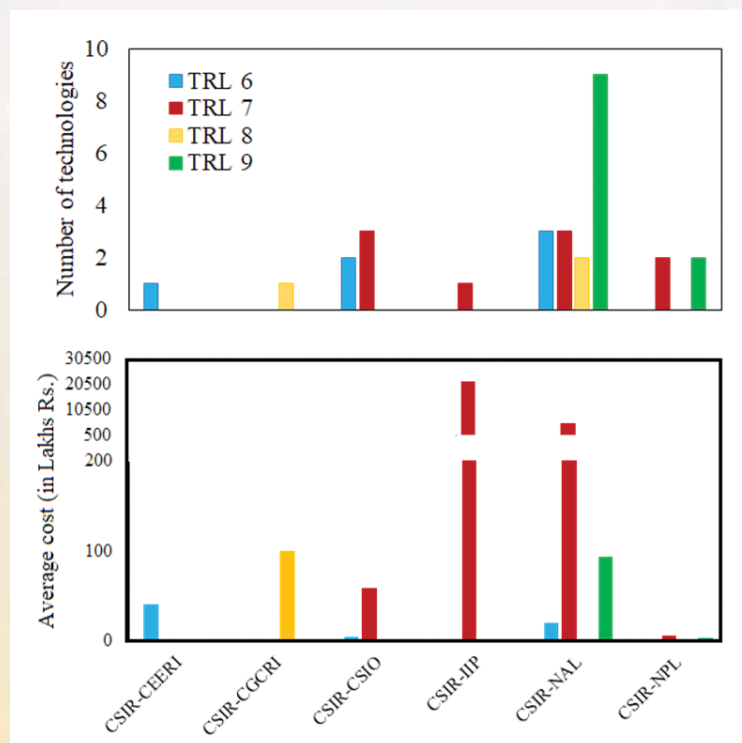


Figure 3. TRL wise distribution of technology (top panel) and average cost (bottom panel) of the respective CSIR laboratory.

4.1 AEROSPACE- ELECTRONICS AND INSTRUMENTATION & STRATEGIC SECTOR (AEISS)

The average cost of CSIR-CEERI is ₹ 40 Lakhs of the technologies at TRL 6. While the average cost of CSIR-CGCRI is ₹ 100 Lakhs which have only one technology at TRL 7. The average cost of technology at TRL 6 and TRL 7 of CSIR-CSIO, respectively, are ₹ 4.7 Lakhs and ₹ 50 Lakhs. The average cost of the technology at TRL 7 of CSIR-IIP is ₹ 21600 Lakhs which is highest among others. The average cost of TRL 6, TRL 7, TRL 8 and TRL 9 of CSIR-NAL, respectively, are, 20, 5040, 15, and ₹ 120 Lakhs (Figure 3). The highest cost technology is “Bio-Aviation Fuels: Renewable Fuels for Strategic Sector” and the second highest technology is developed by CSIR-NAL is “Process Technology for Continuous preparation of Carbon Fiber”.

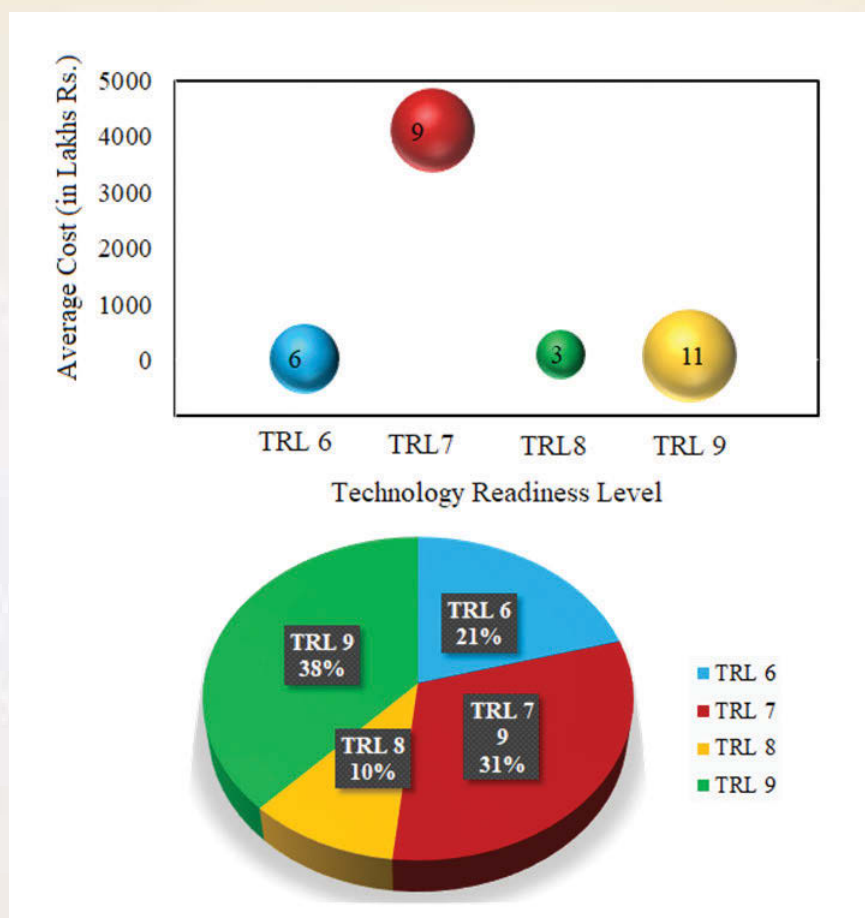


Figure 4. TRL wise distribution of technology of the respective CSIR laboratory.

The number of technologies at TRL 6, TRL 7, TRL 8 and TRL 9, respectively, are 6, 9, 3 and 11. While the average cost of Technologies at TRL 6, TRL 7, TRL 8 and TRL 9, respectively, are ₹ 17.37 Lakhs, ₹ 4100 Lakhs, ₹ 100 Lakhs and ₹ 76 Lakhs (Figure 4). The average cost of technology at TRL 7 is higher than the average cost of TRL 6, TRL 8 and TRL 9. On the other hand, number of technologies at TRL 9 are more than in comparison of other TRL level (Figure 4).

Major Highlights:**List of Technologies at TRL 9**

Sr. No	UID	Lab	Technology Name
1	TECH-THEME_1_NAL-012	CSIR-NAL	Location of Bullet on Target System Detection and Hit Visualization using Acoustic 'N'- wave Identification (DHVANI)
2	TECH-THEME_1_NAL-013	CSIR-NAL	Location of Bullet on Target System Acoustic Based Hit Identification and Analysis System (ABHIAS)
3	TECH-THEME_1_NAL-013	CSIR-NAL	Wankel Rotary Combustion Engine 55hp
4	TECH-THEME_1_NAL-015	CSIR-NAL	Manufacturing of Cocured Composite Structures for Aircraft with Autoclave Moulding Technology
5	TECH-THEME_1_NAL-017	CSIR-NAL	Autoclave – Industry Grade, Lab Scale and Desktop
6	TECH-THEME_1_NAL-018	CSIR-NAL	Radomes for Airborne and Weather Applications
7	TECH-THEME_1_NAL-019	CSIR-NAL	Multi Zone Hot Bonder
8	TECH-THEME_1_NAL-025	CSIR-NAL	NAL FOQA Flight Data Analysis System
9	TECH-THEME_1_NAL-027	CSIR-NAL	DRISHTI TRANSMISSOMETER- A Runway Visibility Measuring System
10	TECH-THEME_1_NPL-031	CSIR-NPL	Long Afterglow Phosphor Powders
11	TECH-THEME_1_NPL-032	CSIR-NPL	Apparatus for Polarization vs Electric Field Measurement at Various Frequencies in Thin Film Samples

1. DESIGN AND DEVELOPMENT OF 2.6 MW S-BAND TUNABLE PULSE MAGNETRON

UID: TECH-THEME_1_CEERI-002

LABORATORY OF ORIGIN | CSIR-CEERI, PILANI

EXECUTIVE SUMMARY

High power pulsed magnetrons (in particular) act as RF source in medical LINAC systems, hence have applications in medical electronics. CSIR-CEERI successfully developed S-band 2.6 MW tunable pulsed magnetron with the support of Department of Information Technology, (Medical Electronics & Telemedicine Division), Ministry of Communications & Information Technology, Govt. of India. The scope of the project was the indigenous magnetron which has to retrofit in existing medical LINAC systems, thus replacing an imported magnetron already used in the system. The developed magnetron was tested on LINAC Test setup and the performance of the system was at par with the imported magnetron.

KEYWORDS

Tunable magnetron, Medical LINAC, Particle accelerator

SALIENT FEATURES

Peak Power Output	2.6 MW
Frequency	2.998 MHz
Tuning range	10 MHz (2992 to 3002)
Cathode	Indirectly Heated
Heater voltage (typical)	8.5 V
Anode Voltage	9 A
Magnetic Field	1550 ± 25 Gauss
Pulse Width	4.5 μ s
PRF	250 Hz

APPLICATIONS

The magnetron tube is for use as an RF source for 4 – 6 MeV Linacs used in radiotherapy machines for medical applications (cancer treatment). This magnetron tube also finds application in dual energy, mobile, and fixed cargo screening machines used for security checks in border areas, and at airports & harbours.

TECHNOLOGY BENCHMARKING

Yes

TECHNOLOGY READINESS LEVEL ASSESSMENT

TRL assessment is 6



4.1 AEROSPACE- ELECTRONICS AND INSTRUMENTATION & STRATEGIC SECTOR (AEISS)

SCALE OF DEVELOPMENT

The technology was successfully demonstrated to the intended end user.

STATUS OF COMMERCIALIZATION

Under commercialization in partnership with industry M/s Panacea Medical Technologies Pvt. Ltd., Bangalore.

TENTATIVE COST OF DEVELOPMENT

₹ 40 Lakhs

INDUSTRIAL PARTNERS

Know how transfer to M/s Panacea Medical Technologies Pvt. Ltd., Bangalore.

PLANT SET UP FOR FINAL PRODUCT

Not yet

IPR STATUS DETAILS (PATENTS/COPYRIGHT/TRADEMARK SECURITY IN INDIA/ABROAD)

No

POTENTIAL MARKET/TECHNO-ECONOMICS

Radiation Therapy uses the principle of radiation exposure on cancerous tumour cells to kill/ treat cancer. Medical LINACs (linear accelerators) used for the radiation therapy requires efficient RF sources for its operation. The 2.6 MW pulsed power magnetrons are well suited as a RF power source in medical LINACs. The RF waves are pulsed into the LINACs waveguide system by the pulsed magnetron. The magnetron controls the power and frequency of RF wave which in turn determines the energy and the dose of the X-rays produced. In addition the need to inspect cars, trucks, and cargo containers calls for a Cargo Scanning System as a modular solution in mobile, gantry, and fixed configuration for complex inspection. These systems are useful in detecting threats, inspect cargo, and find hidden counter threats in most challenging environments like border control, custom, homeland security, and international commerce. High power pulsed magnetrons i.e. 2.6 MW can also be efficient RF sources for such cargo scanning systems. Other uses of magnetrons are in microwave heating and radar applications.

ENVIRONMENTAL SAFETY CERTIFICATION

Not Yet

NODAL SCIENTIST DETAILS

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2. ER-DOPED FIBER AMPLIFIER (EDFA)

UID: TECH-THEME_1_CGCRI-004

LABORATORY OF ORIGIN | CSIR-CGCRI, KOLKATA

EXECUTIVE SUMMARY

EDFA is one of the key components for both Community-Antenna Television (CATV) signal broadcasting and Fiber-To-The-Home (FTTH) Technology. Erbium Doped Fiber Amplifier (EDFA) jointly developed with M/s SFO Technology Pvt. Ltd. Cochin is already in the market. It is an assembly of a special kind of optical fiber and a series of electronic inputs with controls which when fitted intermittently along optical fiber cable lines restores energy loss during transmission and ensures high quality picture, sound and connectivity. CSIR-CGCRI was entered into a commercial agreement for developing completely packaged EDFA for Cable TV Network with M/s SFO Technologies Pvt. Ltd., Cochin. Till now more than 500 EDFA modules (4 ports EDFA having output power +16 dBm on each port with signal power -10 dBm to 10 dBm) was sold by M/s SFO Technology Pvt. Ltd. to different CATV companies in India and even in USA.



KEYWORDS

Cable TV network, CAVT, Erbium doped

SALIENT FEATURES

- Erbium-Doped Fibers (EDF) which is the main component of EDFA were fabricated at CGCRI. Three US patents were granted to CGCRI for fabrication of such specialty EDFs.
- The different parameters mainly EDF length and pump power were optimized carefully to get very good quantum efficiency (~ 80%) and output signal to noise ratio.
- Indigenous technology development.
- Competitive cost of EDFA modules in the demanding CATV market.
- Fabrication of specialty EDFs which were US/PCT patented by CGCRI.
- Optimization of all the related parameters like fiber length, pump power etc to develop the efficient and cost-effective EDFA modules.
- Performance repeatability and environmental testing of the modules by field-trials.
- Up-gradation of the modules as per market demand.
- Wide operating input signal range (-6 to +3 dBm).
- Automatic Power Control Circuit.

APPLICATIONS

CATV Network, FTTH (Fiber-To-The-Home) Technology.

TECHNOLOGY BENCHMARKING

The technology is benchmarked with similar technologies.

4.1 AEROSPACE- ELECTRONICS AND INSTRUMENTATION & STRATEGIC SECTOR (AEISS)

TECHNOLOGY READINESS LEVEL ASSESSMENT

TRL assessment is 8

SCALE OF DEVELOPMENT

Commercialized with M/s SFO Technology Pvt. Ltd.

STATUS OF COMMERCIALIZATION

Commercialized in partnership with industry. Till now more than 500 EDFA modules (4 ports EDFA having output power +16 dBm on each port with signal power -10 dBm to 10 dBm) sold by M/s SFO Technology Pvt. Ltd. to different CATV companies in India and even in USA.

TENTATIVE COST OF DEVELOPMENT

₹ 100 Lakhs.

INDUSTRIAL PARTNERS

M/s SFO Technologies Pvt. Ltd. Cochin, Kerala.

PLANT SET UP FOR FINAL PRODUCT

Yes

IPR STATUS DETAILS (PATENTS/COPYRIGHT/TRADEMARK SECURITY IN INDIA/ABROAD)

Patented, US Patent No. 6851281 and 6889528, 6751990B2.

POTENTIAL MARKET/TECHNO-ECONOMICS

Network in cable TV and communication.

ENVIRONMENTAL SAFETY CERTIFICATION

The safety aspects including environmental safety addressed and documented.

NODAL SCIENTIST DETAILS

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Phone No.: 033-2322 3285

3. EARTHQUAKE WARNING SYSTEM (EQWS)

UID: TECH-THEME_1_CSIO-005

LABORATORY OF ORIGIN | CSIR-CSIO, CHANDIGARH

EXECUTIVE SUMMARY

Earthquake Warning System is a technological intervention to avert colossal loss of human life and infrastructure as earthquake forecasting is not yet possible. An earthquake warning system is the solution provided herein to activate the appropriate actions for safety, during impending earthquake. Earthquake Warning System (EqWS) is network of a number of Seismic Sensing Nodes (SSN) consisting of seismic sensors, communication, processors. It is devised for regional notification of a substantial earthquake while it is in progress. SSNs communicate to the master server-EqWS Graphical User Interface located at Central Control Room (CCR) for generating alert signals.

KEYWORDS

Earthquake early warning, Seismic

SALIENT FEATURES

- **EqWS-Seismic Sensing Node (SSN)**
SSN is equipped with accelerometer sensor, GPS, Processor, and IoT (Internet of Things) communication modules. SSNs are capable of sensing and distinguishing the cultural noise from actual seismic event.
- **GRAPHICAL USER INTERFACE (EQWS-GUI)**
Eqws-gui is the main user interface which provides information regarding latest event details, event log of all seismic activities and health status of all connected seismic sensing nodes.
- **HEALTH OF STATION**
Several operational parameters of all the ssns connected to this network are displayed at eqws-GUI to depict the health of the SSN.
- **CURRENT TRIGGERED STATION**
It displays details of all current triggered stations. A true event is declared on the basis of programming parameters and the Latest Event Information section is updated.
- **EVENT INFORMATION**
It displays the latest true seismic event which is sensed by more ssns along with the Peak Ground Acceleration (PGA) sensed by the triggered SSN along with earthquake signature from the first triggered stations.
- **REPORT**
A report is generated for all the true events and the following programmable three levels have been defined for severity-based warning.

APPLICATIONS

- EqWS developed may be utilized to safeguard installations such as Refineries, Nuclear establishments, Power Plants, Airports, Hospitals etc. by stopping/initiating the emergency facilities as per requirement.



Front panel of the developed SSN



4.1 AEROSPACE- ELECTRONICS AND INSTRUMENTATION & STRATEGIC SECTOR (AEISS)

- Earthquake warning system is the solution provided herein to activate the appropriate actions for safety need customization.

TECHNOLOGY BENCHMARKING

The technology is benchmarked with similar technologies.

TECHNOLOGY READINESS LEVEL ASSESSMENT

TRL assessment is 7

SCALE OF DEVELOPMENT

The Pilot scale demonstration in the field conditions is successfully done and the technology prototype has been tested in the actual field conditions and addressed all the critical scaling issues and available for licensing. This technology deployed in field at Delhi Metro.

STATUS OF COMMERCIALIZATION

No

TENTATIVE COST OF DEVELOPMENT

₹ 25 Lakhs

INDUSTRIAL PARTNERS

The technology Deployed in Delhi Metro.

PLANT SET UP FOR FINAL PRODUCT

No

IPR STATUS DETAILS (PATENTS/COPYRIGHT/TRADEMARK SECURITY IN INDIA/ABROAD)

Patented

POTENTIAL MARKET/TECHNO-ECONOMICS

Metro rail, High speed trains, real estate, hospitals, vital installations.

ENVIRONMENTAL SAFETY CERTIFICATION

Not yet

NODAL SCIENTIST DETAILS

Mr. Satish Kumar

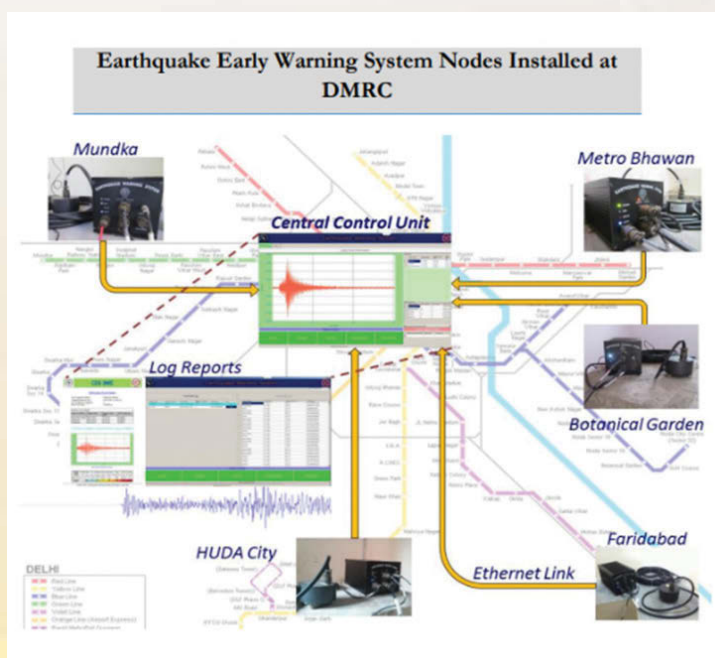
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4. INTELLIGENT SEISMIC SENSING NODE FOR ELEPHANT MOVEMENT DETECTION

UID: TECH-THEME_1_CSIO-006

LABORATORY OF ORIGIN | CSIR-CSIO, CHANDIGARH

EXECUTIVE SUMMARY

Intelligent Seismic Sensing Node (eleSeisAlert) is a customizable intelligent system which is capable of interfacing with a number of seismic sensors i.e. geophone arrays for detecting and classifying any minute change in ground vibration generated due to a target source. This system can be adapted for a wide range of ground sensing applications – perimeter monitoring, wildlife surveillance by training the embedded algorithms with target data. Currently the system is deployed for sensing movement of wild elephants at Kansrao range, Rajaji National Park, Uttarakhand. The technology has its usage for reduction of elephant death due to rail accident which not only conserve the bio-diversity but also reduces the loss incurred to Indian railways due to accidents. A spin-off version of the similar technology can be also as an early warning device for prevention of crop-raiding animals in agricultural fields.



KEYWORDS

Seismic, Early warning, Wildlife conservation, Crop raiding, Surveillance

SALIENT FEATURES

- This is a seismic sensing-based customizable intelligent system which is capable of interfacing with a number of seismic sensors, in-built of detection and recognition algorithms.
- Seismic sensors could detect single elephant movement from a distance of approximately 20 m.
- This system can be adapted for a wide range of applications by training it in the relevant experimental sites.

APPLICATIONS

- Generation of alert signals on the presence of elephants to the rail authorities or signal to ward off elephants in identified corridors.
- Smart perimeter monitoring system to monitor the movement of wildlife from the sanctuaries into cities and illegal movement of humans (poachers) into sanctuaries/parks.
- Smart highway's wildlife monitoring system to monitor the movement of wildlife at identified animal corridors.

TECHNOLOGY BENCHMARKING

The technology has benchmarked with similar technologies.

TECHNOLOGY READINESS LEVEL ASSESSMENT

TRL assessment is 6

SCALE OF DEVELOPMENT

The technology demonstrated to intended end user successfully.

4.1 AEROSPACE- ELECTRONICS AND INSTRUMENTATION & STRATEGIC SECTOR (AEISS)

STATUS OF COMMERCIALIZATION

No

TENTATIVE COST OF DEVELOPMENT

₹ 8 Lakhs/ 200 m of land.

INDUSTRIAL PARTNERS

No

PLANT SET UP FOR FINAL PRODUCT

No

IPR STATUS DETAILS (PATENTS/COPYRIGHT/TRADEMARK SECURITY IN INDIA/ABROAD)

No

POTENTIAL MARKET/TECHNO-ECONOMICS

Railway lines passing through forest areas, protection of agricultural field.

ENVIRONMENTAL SAFETY CERTIFICATION

The safety aspects including environmental safety addressed and documented.

NODAL SCIENTIST DETAILS

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Digging trench and Laying of Geophone Sensors



Seismic Sensing Node and Control and Command Server for alert generation



5. DIVYA NAYAN: A PERSONAL READING MACHINE FOR VISUALLY IMPAIRED

UID: TECH-THEME_1_CSIO-007

LABORATORY OF ORIGIN | CSIR-CSIO, CHANDIGARH

EXECUTIVE SUMMARY

Divya Nayan is a reading machine for visually impaired or illiterate person where any printed or digital document can be accessed in the form of speech output. The device uses a contact line scanner for acquiring the image of a printed document. User manually scans the document by placing the machine on printed document without knowing the direction of text flow, over the document to be read. It uses optical character recognition technique to convert the image into text and a text to speech converter, further converts the text into audio. The audio files are organized in the machine and can be listened back. The device is standalone, portable, completely wireless and IoT enabled. The device can analyse a multicolumn document to provide seamless reading and is capable of page, text, and word level navigation while reading. It has currently support for reading Hindi and English but can be further configured to other Indian and foreign languages. The device is equipped with user inter-faces such as internal speaker, rechargeable battery, USB, headphones, SD card, Wi-Fi and Bluetooth to control the machine.



KEYWORDS

Personal reading machine, OCR, TTS, Document management, IoT

SALIENT FEATURES

- **Wireless & Portable:** The device is standalone, portable, completely wireless and IoT enabled.
- **Multi-functional:** Read printed, e-books, e-news, recording and reading speech.
- **Multilanguage:** Currently supports Hindi and English documents reading in Indian accent.
- **Online Processing:** Document, Batch Processing Organisation.
- **Document storage:** Sync Document.

APPLICATIONS

Divyanayan is a reading machine for visually impaired or illiterate persons where printed or digital document can be accessed in the form of speech output. This portable device can scan and read approximately fifty pages, depending upon the size and content, once fully charged and can store more than ten thousand pages with converted information. The device has all features of a mobile/portable IoT (Internet of Things) device.

TECHNOLOGY BENCHMARKING

The technology has benchmarked.

TECHNOLOGY READINESS LEVEL ASSESSMENT

TRL assessment is 7

4.1 AEROSPACE- ELECTRONICS AND INSTRUMENTATION & STRATEGIC SECTOR (AEISS)

SCALE OF DEVELOPMENT

The prototype has been developed and tested in actual field conditions and addressed all the critical scaling issues. End to end testing of the system from start to final product in the target production/operational environment is in process. The technology is transfer to Central Electronics Limited, New Delhi.

TENTATIVE COST OF DEVELOPMENT

₹ 90 Lakhs

INDUSTRIAL PARTNERS

CSIR CSIO transferred the technology to Central Electronics Limited, New Delhi.

STATUS OF COMMERCIALIZATION

Commercialization is under process.

PLANT SET UP FOR FINAL PRODUCT

In Process

IPR STATUS DETAILS (PATENTS/COPYRIGHT/TRADEMARK SECURITY IN INDIA/ABROAD)

No

POTENTIAL MARKET/TECHNO-ECONOMICS

The device may create an impact on approx. 19 million visually impaired worldwide with 50% of the blind population in India and among which 47% are illiterate that require the support of regional language.

ENVIRONMENTAL SAFETY CERTIFICATION

The safety aspects including environmental safety addressed and documented.

NODAL SCIENTIST DETAILS

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6. AUTOCEPH: A SOFTWARE FOR 2-D COMPUTERIZED CEPHALOMETRIC ANALYSIS AS A WEB SERVICE

UID: TECH-THEME_1_CSIO-008

LABORATORY OF ORIGIN | CSIR-CSIO, CHANDIGARH

EXECUTIVE SUMMARY

The cephalometric analysis tool identifies various soft and bony tissue landmarks and their relationship on cephalometric radiograph to diagnose facial growth abnormalities prior to treatment, evaluation of progress in middle of treatment and conclusion of treatment to ascertain that the goals of treatment have been met. The cephalometric analysis tool was successfully developed and evaluated at AIIMS, Delhi. As software tool it has also been copyright protected. AutoCEPH is available as SaaS (software as a service) over the cloud at <http://ci.csio.res.in>. It is currently being utilized by a number of government and private practitioners from India and abroad and can perform 16 lateral analysis.

KEYWORDS Cephalometry, Landmarking, Orthodontics, Cloud services, Cephalometric analysis, Digital cephalogram, Superimpositions, Lateral analysis

SALIENT FEATURES

AutoCEPH© is a 2-D cephalometric analysis software, now being provided as a web service 17 lateral analysis; 3 PA analysis, Automatic curve tracing, Superimpositions, Multiple image format support, Report generation, Patient repository management, Patient treatment history, Auto-prompt, image utilities, Zoomed pane, Landmarks help image with definition.

APPLICATIONS

A cloud based software to assist doctors perform cephalometric analysis of their patients.

TECHNOLOGY BENCHMARKING

The technology has benchmarked with similar technologies.

TECHNOLOGY READINESS LEVEL ASSESSMENT

TRL assessment is 7

SCALE OF DEVELOPMENT

The Pilot scale demonstration in the field conditions is successfully done and the technology prototype has been tested in the actual field conditions and addressed all the critical scaling issues.

STATUS OF COMMERCIALIZATION

The web service is being used by the users in more than 13 countries free of cost.

TENTATIVE COST OF DEVELOPMENT

₹ 60 Lakhs

INDUSTRIAL PARTNERS

It is a web service setup at CSIR-CSIO Chandigarh.

4.1 AEROSPACE- ELECTRONICS AND INSTRUMENTATION & STRATEGIC SECTOR (AEISS)

PLANT SET UP FOR FINAL PRODUCT

It is a web-based service.

IPR STATUS DETAILS (PATENTS/COPYRIGHT/TRADEMARK SECURITY IN INDIA/ABROAD)

No

POTENTIAL MARKET/TECHNO-ECONOMICS

About 400 MDS doctors per year are added in India and a large number are already practicing. The global Cephalometric Analysis 2D Software Module market is anticipated to rise at a considerable rate during the forecast period, between 2020 and 2026. In 2020, the market was growing at a steady rate and with the rising adoption of strategies by key players, the market is expected to rise over the projected horizon. Based on the end users/applications, market share and growth rate for the application, including:

- Government sector.
- Education and Academia sectors.

Major regions covered currently by AutoCEPH cloud services are: India, Spain, Kosovo, Italy, Uganda, Australia, Russia, Brazil, Poland, Nepal, Philippines, Japan, Peru, USA, UAE, Malaysia, and Switzerland.

ENVIRONMENTAL SAFETY CERTIFICATION

The safety aspects including environmental safety has not yet taken.

NODAL SCIENTIST DETAILS

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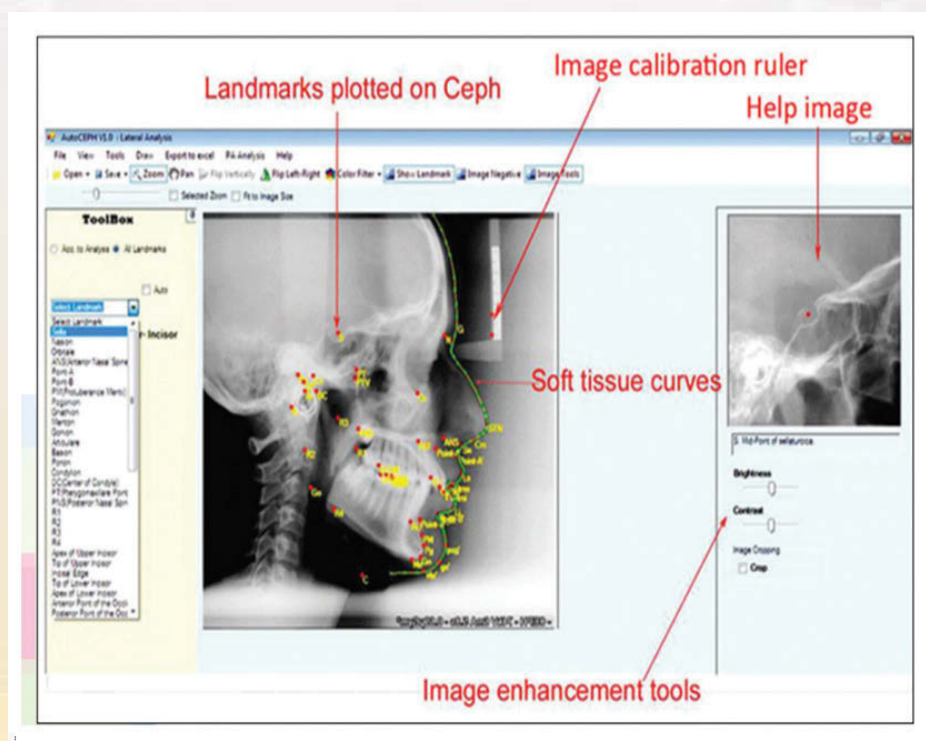


Figure On Screen digitization using AutoCEPH (Version 1.0). Source: Mahto, et al, Journal of Indian Orthodontic Society, 2016

7. LIGAMENT INJURY ASSESSMENT & THERAPY DEVICE FOR MOTOR-REHABILITATION OF SOLDIERS “L-GEAR”

UID: TECH-THEME_1_CSIO-009

LABORATORY OF ORIGIN | CSIR-CSIO, CHANDIGARH

EXECUTIVE SUMMARY

L-GEAR is a wearable device for motor rehabilitation of patients suffering from ligament injury, frozen shoulder and ACL. This technology aims to extract motor ingredients through data mining from wearable sensors. This will help patients/soldiers suffering from disabilities, ligament injuries due to strenuous working style in a goal-directed therapy process. It involves expected achievement of ROM values to examine their effect toward clinical assessment. Subjects are required to complete standard training tasks-flexion extension, abduction, external and internal rotation of the affected shoulder joint; and Dorsiflexion & Plantar flexion movements, Passive Knee Flexion & Extension (in laying position) of knee for evaluation and recording of their performance.



KEYWORDS

Wearable sensors, Rehabilitation, Augmented reality

SALIENT FEATURES

Bio-feedback Sensor Modules

Wearable and light weight, Degree of Freedom: 6, 3-axis gyroscope, 3-axis accelerometer, Wireless data transfer: Bluetooth Connection @ 9600 baud rate, Battery backup: Two hour of Therapy session, Battery: 3.7v, 500 mAh Li-Po, Battery Low/Charging Indication, ON/OFF slider switch, Micro USB charging port, Programming/firmware update Interface: Wired ISP, Dual layer PCB Size: 31 x 34 mm, Technology: Surface Mount, 3D Printed Casing/Enclosure, Module Size: 38 x 54 x 16 mm, Light Weight (<30 grams), Ergonomic Design.

Software Module

- Acquires real time data from sensor modules (Max. Seven modules @ 9600 baud rate).
- Real time visualization of acquired bio-feedback.
- Assessment of Shoulder and Knee ROM.
- Therapy modules for Shoulder & Knee Injury Rehabilitation.

APPLICATIONS

- ROM assessment of the affected joint (shoulder/knee).
- Goal oriented therapy with bio-feedback actuated Software therapy modules.

TECHNOLOGY BENCHMARKING

The technology has benchmarked with similar technologies.

4.1 AEROSPACE- ELECTRONICS AND INSTRUMENTATION & STRATEGIC SECTOR (AEISS)

TECHNOLOGY READINESS LEVEL ASSESSMENT

TRL assessment is 6

SCALE OF DEVELOPMENT

The Pilot scale demonstration in the field conditions is successfully done and the technology prototype has been tested in the actual field conditions and addressed all the critical scaling issues.

STATUS OF COMMERCIALIZATION

The industry partner have identified.

TENTATIVE COST OF DEVELOPMENT

₹ 1.50 Lakhs

INDUSTRIAL PARTNERS

M/s Oceanic Fitness, Mohali, M/s Biomed Inc., New Delhi.

PLANT SET UP FOR FINAL PRODUCT

Not yet

IPR STATUS DETAILS (PATENTS/COPYRIGHT/TRADEMARK SECURITY IN INDIA/ABROAD)

No

POTENTIAL MARKET/TECHNO-ECONOMICS

The developed technology will assist in the effective and efficient rehabilitation of soldiers and other patient population requiring rehabilitation for ligament injuries. This will enable early recovery, possible in home base environment, which will save direct and indirect health costs.

ENVIRONMENTAL SAFETY CERTIFICATION

The safety aspects including environmental safety addressed and documented.

NODAL SCIENTIST DETAILS

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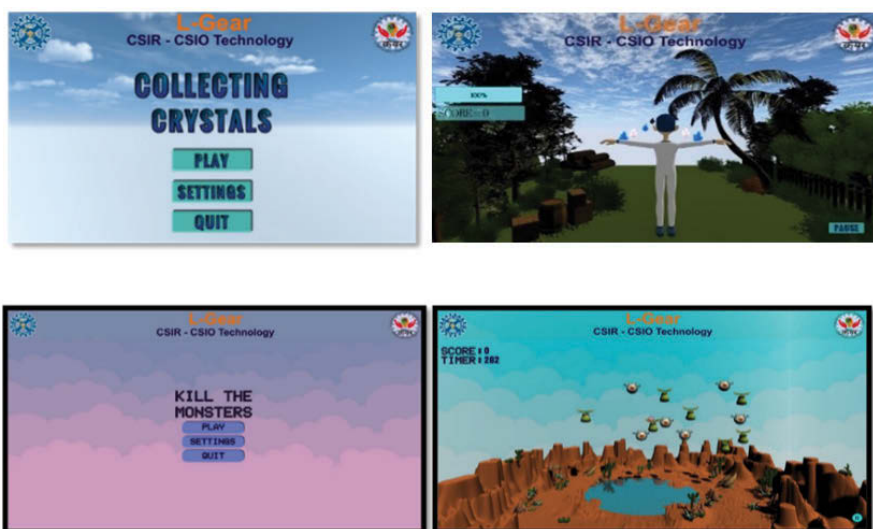
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8. BIO-AVIATION FUELS: RENEWABLE FUELS FOR STRATEGIC SECTOR

UID: TECH-THEME_1_IIP-010

LABORATORY OF ORIGIN | CSIR-IIP, DEHRADUN

EXECUTIVE SUMMARY

There is a great business opportunity for biofuels in the aviation sector. International Civil Aviation Organization's (ICAO), Carbon Offset and Reduction Scheme for International Aviation (CORSIA) makes it mandatory for international aircraft operators to purchase the required offsets for the growth in CO₂ emissions above 2020 levels. To meet the demand for green fuels by International airlines (due to CORSIA), adequate availability and mechanisms for distribution for these fuels are required. India could become the only country in Asia capable of meeting the huge bio-jet fuel demand, thus making Indian airports an attractive hub for international airlines. It will increase air-traffic to India, create more jobs with a national manufacturing facility. On feedstock supply chain side more jobs will be created in rural, tribal areas due to farming and afforestation activities to grow oil-bearing plants and trees. It is expected to provide fuel security to nation and to Indian defense in particular. CSIR-IIP has developed a single-step catalytic process, which is non-infringing, patented, uses a proprietary catalyst and can process wide-range of feedstocks (plant-derived non-edible, waste, low-cost oils) to produce drop-in biofuel for air and road transport purposes. In addition, our technology reduces the cost of production of bio-jet fuel, when compared to the competing 2-step technologies available from US and Europe.



KEYWORDS

Bio-Fuels, Renewable fuels

SALIENT FEATURES

- Single step process (Lower Investment and Operating cost).
- Reduces Overall Carbon Emissions.
- Renewable feed, <10 ppm sulphur in products.
- By products-Diesel (80-90 cetane) & Naptha (<10 ppm sulphur).

APPLICATIONS

Renewable fuels for strategic sector. Single-step catalytic process, which is non-infringing, patented, uses a proprietary catalyst and can process wide-range of feedstocks (plant-derived non-edible, waste, low-cost oils) to produce drop-in biofuel for air and road transport purposes.

TECHNOLOGY BENCHMARKING

The technology has benchmarked

TECHNOLOGY READINESS LEVEL ASSESSMENT

TRL assessment is 7

4.1 AEROSPACE- ELECTRONICS AND INSTRUMENTATION & STRATEGIC SECTOR (AEISS)

SCALE OF DEVELOPMENT

First Bio-Aviation Fuel Flight on 27th August, 2018 flown by Spicejet and on 26th January, 2019 Republic Day flypast by Indian Air Force on Russian An-32 aircraft for the first time.

- CSIR-IIP has also started continuous production of Bio-Jet Fuel from the hydroprocessing of Non-Edible oil.

STATUS OF COMMERCIALIZATION

Under production

TENTATIVE COST OF DEVELOPMENT

- Plant Life 10 years; 110 TPD feed processing; Capital Investment 28.8 million US\$; H₂ at US\$ 2.6/kg; Pdt: Diesel at US\$ 1/liter and Naphtha at US\$ 0.8 /liter .
- The infrastructure for a Bio-Jet fuel production plant is very similar to a Hydrocracker Unit, with consumption number – 0.02-0.03 mt H₂/mt oil processed.
- Total Capital investments = 28.8 million US \$ (Equipment Cost).
- Hydroprocessing Cost – US\$ 0.2/Kg (Excluding raw material cost – H₂ and Non-edible oil)

INDUSTRIAL PARTNERS

Chhattisgarh biofuel development authority, Raipur, Indian Airforce, BOEING, Spicejet, MOIL, Reliance Industries Limited, MITSUBISHI.

IPR STATUS DETAILS (PATENTS/COPYRIGHT/TRADEMARK SECURITY IN INDIA/ABROAD)

Patented, 3039DEL2012; WO2014/049621A1; 3144DEL2012; 3441DEL2012; 2622DEL2014; WO/2016/038633; EP3191565A1; US20170253808; 4093DEL2015; US15/645,629; IN201611023588.

PLANT SET UP FOR FINAL PRODUCT

CSIR-IIP has started production of Bio-Jet Fuel.

POTENTIAL MARKET/TECHNO-ECONOMICS

Producer

- Refinery an ideal choice for Bio-Jet plant.
- Integrated Unit – Less Investment; 12% IRR.
- Product prices more acceptable to all stakeholders as compared.
- Operational Experience, Auxiliary Units, easily Integrated.
- Stand-Alone Producers – Capital Intensive but can collaborate with product users and purchase agreements/buyback agreements be established for capital sharing.

End Users

- Transportation sector Fuels (Road/Rail/Air).
- Sustainable Bio-Fuels, Alternate Energy Resource.

Benefits

- Make In India, Contribution to GDP & Import substitution with respect to Bio-Jet fuels ₹ 8000 Cr/annum*
- Additional job creation – direct & indirect 2500-3000 people.
- Carbon emission savings to meet CORSIA agreement /Paris accord obligations 232TPD.
- Reduced emissions & carbon savings equivalent to Cr./annum** @ 10% Bio-ATF blending in ATF @ ₹ 100/Kg Bio-ATF selling Price ** @ Social cost of carbon @ 24US\$/ton of CO₂.

ENVIRONMENTAL SAFETY CERTIFICATION

The safety aspects including environmental safety addressed and documented.

NODAL SCIENTIST DETAILS

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9. HANSA-NG AIRCRAFT

UID: TECH-THEME_1_NAL-011

LABORATORY OF ORIGIN | CSIR-NAL, BENGALURU

EXECUTIVE SUMMARY

New generation Hansa Aircraft called Hansa-NG is being developed by incorporating state of the art technologies and design improvements in the present type certified Hansa-3 aircraft based on operator's feedback and inputs received from the Light Trainer Aircraft Users. CSIR-NAL and M/s Mesco Aerospace Ltd have collaborated and took up the joint development of Hansa-New Generation (NG) Aircraft project titled Design, Development and Certification of Hansa-NG aircraft. Apart from incorporating the design improvements such as glass cockpit, steerable NLG, heated Pitot, LED type lights, improved ingress/egress, it is also proposed to enhance the aircraft performance (range & endurance) & production rate by installing the advanced Rotax 912 iSc Sport engine with aerodynamically efficient cowling and latest JIPREG manufacturing process.



KEYWORDS

HANSA-NG aircraft, Glass cockpit, Hobby flying, Trainer aircraft, Rotax engine.

SALIENT FEATURES

IFR Certification, New MIP with Glass Cockpit, Advanced Fuel Efficient Engine, Increased Range & Endurance, Improved Engine Cowling shape, Option of using MoGas or Avgas fuel, Landing Gear Wheel Fairings, Steerable Nose Wheel, Electrically Operated Flap, Heated Pitot unit & LED type Lights, Improved Manufacturing Process, Improved Ingress/Egress, Better Cockpit Aesthetics & Ergonomics, Provision for Baggage.

APPLICATIONS

Hansa-NG aircraft ideally suited for ab-initio flying training, sport & hobby flying.

TECHNOLOGY BENCHMARKING

The technology has benchmarked.

TECHNOLOGY READINESS LEVEL ASSESSMENT

TRL assessment is 7

SCALE OF DEVELOPMENT

The pilot scale demonstration in the field conditions is successfully done and the technology prototype testing is in process in the actual field conditions and addressed all the critical scaling issues.

STATUS OF COMMERCIALIZATION

Collaboration with M/s Mesco Aerospace Limited for design development certification, production and marketing of Hansa Next generation.

4.1 AEROSPACE- ELECTRONICS AND INSTRUMENTATION & STRATEGIC SECTOR (AEISS)

TENTATIVE COST OF DEVELOPMENT

Basic Version : ₹ 80 Lakhs; Advanced Version : ₹ 120 Lakhs

INDUSTRIAL PARTNERS

Collaboration with M/s Mesco Aerospace Limited

PLANT SET UP FOR FINAL PRODUCT

Not yet

IPR STATUS DETAILS (PATENTS/COPYRIGHT/TRADEMARK SECURITY IN INDIA/ABROAD)

No information

POTENTIAL MARKET/TECHNO-ECONOMICS

The older version Hansa-3 Aircraft is certified by the Director General of Civil Aviation, under FAR-23, amendment 23-42 using the requirements of JAR-VLA dated 26th April 1990, including amendment VLA9//2/1. India Type Certificate No. 7-12/94-RD-TC-1 dated 1st February 2000. Totally 14 aircraft have been built and 11 aircraft have been sold to MoCA/DGCA which were allotted to different flying clubs in India. HANSA-NG: To be certified under CS-VLA. Collaboration with Mesco Aerospace Limited, for design, development, certification, production and marketing of Hansa-Next Generation. The market potential in India alone is about 100-150 aircraft.

ENVIRONMENTAL SAFETY CERTIFICATION

The safety aspects including environmental safety not addressed.

NODAL SCIENTIST DETAILS

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10. LOCATION OF BULLET ON TARGET SYSTEM DETECTION AND HIT VISUALIZATION USING ACOUSTIC ‘N’- WAVE IDENTIFICATION (DHVANI)

UID: TECH-THEME_1_NAL-012

LABORATORY OF ORIGIN | CSIR-NAL, BENGALURU

EXECUTIVE SUMMARY

Marksmanship training requires positive and negative reinforcement of shooting techniques immediately after each shot is fired. CSIR-NAL developed ‘DHVANI’–“Detection and Hit Visualization using Acoustic ‘N’-wave Identification”. Location of Bullet on Target System (LOBOTS) is an indigenous, cost effective electronic target training system for perfecting soldier marksmanship skills by accurately determining the location of bullet impact on the target during training. It works for all supersonic weaponry used by Indian Armed and paramilitary forces.



KEYWORDS

Marksmanship, Dhvani, Electronic target, Bullet, Training

SALIENT FEATURES

- Automated Range Control with database management.
- Variable firing positions without any re-calibration.
- Exercises as per SAO 12/S/85 and facility for user defined exercise setting.
- Seamless wireless network with Ethernet enabled network.
- Roaming Firing Point Officer (RFI) and Firer End Display Interface (FEDS).
- Interactive and User Friendly GUI.
- Power on self diagnostic and real time diagnostic during the exercise.
- Pop Up Target System with Self Healing Targets and simulation units for illumination, smoke and flash.
- Unit Level Package for firer management and performance evaluation outside the range.
- All weather-proof carbon fiber composite sensor bar.

APPLICATIONS

- Automated system to detect bullet using supersonic acoustic detection and localization of hits on target by acoustic time delay estimation methods.
- Cost effective electronic target training systems for perfecting soldier marksmanship skills by accurately determining the location of bullet impact on the target.

TECHNOLOGY BENCHMARKING

The technology has benchmarked.

TECHNOLOGY READINESS LEVEL ASSESSMENT

TRL assessment is 9

4.1 AEROSPACE- ELECTRONICS AND INSTRUMENTATION & STRATEGIC SECTOR (AEISS)

SCALE OF DEVELOPMENT

The Pilot scale demonstration in the field conditions is successfully done and the technology prototype has been tested in the actual field conditions and addressed all the critical scaling issues. Plant has set up and under production with Bharat Electronics Limited using this technology.

STATUS OF COMMERCIALIZATION

CSIR-NAL has inked a License Agreement with PSU Bharat Electronics Limited (BEL) for manufacturing and commercialization of these target systems.

TENTATIVE COST OF DEVELOPMENT

₹ 20 Lakhs

INDUSTRIAL PARTNERS

Bharat Electronics Limited (BEL).

IPR STATUS DETAILS (PATENTS/COPYRIGHT/TRADEMARK SECURITY IN INDIA/ABROAD)

PLANT SET UP FOR FINAL PRODUCT

Plant has set up for production.

POTENTIAL MARKET/TECHNO-ECONOMICS

The target customers are Indian Army, Navy, Air Force, NSG, BSF and all security groups using rifles with supersonic ammunition. Estimated demand about 16000 units for 2000 shooting ranges with an average of 8 lanes per range. Technology Transferred to BEL, Bangalore.

ENVIRONMENTAL SAFETY CERTIFICATION

The safety aspects including environmental safety addressed and documented.

NODAL SCIENTIST DETAILS

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11. LOCATION OF BULLET ON TARGET SYSTEM ACOUSTIC BASED HIT IDENTIFICATION AND ANALYSIS SYSTEM (ABHIAS)

UID: TECH-THEME_1_NAL-013

LABORATORY OF ORIGIN | CSIR-NAL, BENGALURU

EXECUTIVE SUMMARY

CSIR-NAL developed ABHIAS is an indigenous, cost effective electronic target training system for perfecting soldier marksmanship skills by accurately determining the location of bullet impact on the target during training. It works for all supersonic and subsonic weaponry used by the Indian armed forces, paramilitary forces and police forces.

KEYWORDS

Marksmanship, Abhias, Electronic target, Bullet, Weaponry training

SALIENT FEATURES

- Indigenous design tailor made for Indian Armed Forces and Paramilitary Forces with high degree of ruggedisation to meet Mil Grade Standards. Configured out of COTS item to ensure low post sale maintenance cost.
- Automated Range Control with database management
- Variable firing positions without any recalibration.
- Exercises as per SAO 12/S/85 and facility for user defined exercise setting.
- Seamless wireless network with Ethernet enabled network.
- Roaming Firing Point Officer (RFI) and Firer End Display Interface (FEDS).
- Interactive & User Friendly GUI.
- Power on self diagnostic and real time diagnostic during the exercise.
- Unit Level Package for firer management and performance evaluation outside the range.
- All weather-proof carbon fibre composite sensor bar.

APPLICATIONS

ABHIAS is an indigenous, cost effective electronic target training system for perfecting soldier marksmanship skills by accurately determining the location of bullet impact on the target during training.

TECHNOLOGY BENCHMARKING

The technology has benchmarked.

TECHNOLOGY READINESS LEVEL ASSESSMENT

TRL assessment is 9

SCALE OF DEVELOPMENT

The Pilot scale demonstration in the field conditions is successfully done and the technology prototype has been tested in the actual field conditions and addressed all the critical scaling issues. The plant has been set up with industry partner Bharat Electronics Limited.



4.1 AEROSPACE- ELECTRONICS AND INSTRUMENTATION & STRATEGIC SECTOR (AEISS)

STATUS OF COMMERCIALIZATION

CSIR-NAL has inked a License Agreement with PSU Bharat Electronics Limited (BEL) for manufacturing and commercialization of these target systems.

TENTATIVE COST OF DEVELOPMENT

₹ 20 Lakhs

INDUSTRIAL PARTNERS

Bharat Electronics Limited

PLANT SET UP FOR FINAL PRODUCT

The plant has setup with industry partner Bharat Electronics Limited.

IPR STATUS DETAILS (PATENTS/COPYRIGHT/TRADEMARK SECURITY IN INDIA/ABROAD)

POTENTIAL MARKET/TECHNO-ECONOMICS

The target customers are Indian Army, Navy, Air Force, NSG, BSF and all security groups using rifles, LMG, and close quarter weapons. Estimated demand about 16000 units for 2000 shooting ranges with an average of 8 lanes per range. Technology Transferred to BEL, Bangalore.

ENVIRONMENTAL SAFETY CERTIFICATION

The safety aspects including environmental safety addressed and documented.

NODAL SCIENTIST DETAILS

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12. WANKEL ROTARY COMBUSTION ENGINE 55 HP

UID: TECH-THEME_1_NAL-014

LABORATORY OF ORIGIN | CSIR-NAL, BENGALURU

EXECUTIVE SUMMARY

Wankel Rotary Combustion Engine (WRCE) has gained considerable interest as a viable power plant for small aircraft and Unmanned Aerial Vehicles (UAVs) due to its inherent advantages on many counts. CSIR-NAL has established considerable expertise in analysis, materials, manufacture and operation of Wankel engines over the past two decades.

KEYWORDS

Wankel, UAV, Rotary, Hand gliders, Nishant, Panchi

SALIENT FEATURES

- High power to weight ratio.
- Simplicity in design due to less number of components.
- Fewer moving parts.
- Low noise and vibration.
- Smooth power output.
- Ease of balancing.

APPLICATIONS

This type of engines are used for powering smaller air vehicles and also in automotive (Mazda, and Racing Cars), hybrid vehicles as range extenders, out-board motor for boats and other industrial applications in particular for compact power generators.

TECHNOLOGY BENCHMARKING

The technology has benchmarked

TECHNOLOGY READINESS LEVEL ASSESSMENT

TRL assessment is 9

SCALE OF DEVELOPMENT

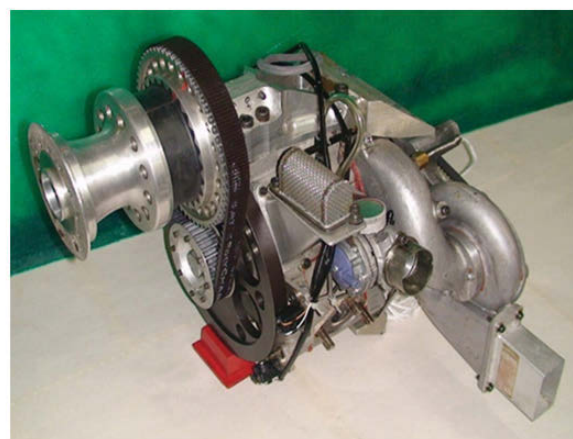
The Pilot scale demonstration in the field conditions is successfully done and the technology prototype has been tested in the actual field conditions and addressed all the critical scaling issues. Prototype engines successfully flight tested on the NISHANT UAV.

STATUS OF COMMERCIALIZATION

Technology is given to DRDO for defence applications and limited series production of 20 engines were completed.

TENTATIVE COST OF DEVELOPMENT

₹ 15 Lakhs



4.1 AEROSPACE- ELECTRONICS AND INSTRUMENTATION & STRATEGIC SECTOR (AEISS)

INDUSTRIAL PARTNERS

VRDE, DRDO.

IPR STATUS DETAILS (PATENTS/COPYRIGHT/TRADEMARK SECURITY IN INDIA/ABROAD)

Jointly held by CSIR-NAL and DRDO.

PLANT SET UP FOR FINAL PRODUCT

POTENTIAL MARKET/TECHNO-ECONOMICS

For defence application- Technology is given to DRDO for defense applications and limited series production of 20 numbers 55 hp engines were completed. Presently this technology is direct substitute for an imported 51 hp engine for DRDO's NISHANT UAV. The cost of the indigenous engine is around 40 percent less than the imported one during the limited series production stage. The cost will further come down during the mass production.

ENVIRONMENTAL SAFETY CERTIFICATION

The safety aspects including environmental safety addressed and documented.

NODAL SCIENTIST DETAILS

Director

CSIR-National Aerospace Laboratories, Bengaluru

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13. MANUFACTURING OF COCURED COMPOSITE STRUCTURES FOR AIRCRAFT WITH AUTOCLAVE MOULDING TECHNOLOGY

UID: TECH-THEME-1_NAL-015

LABORATORY OF ORIGIN | CSIR-NAL, BENGALURU

EXECUTIVE SUMMARY

Manufacturing of primary aircraft composite structures for fighter aircrafts, transport category aircrafts and UAVs with autoclave moulding technology. Structures like wing, horizontal and vertical tails, fuselage shells, control Surfaces like rudder, elevator, aileron, flaps etc. have already been developed for LCA-Tejas and SARAS aircrafts. Parts developed for LCA have entered Series Production.

KEYWORDS

Composite, Moulding, Aircraft, co-cured



SALIENT FEATURES

- Autoclave processing of prepregs is a well-established technology in the aircraft industry. It offers excellent reliability and part quality mandated for airworthy parts. This technique remains a benchmark for competing processes. Parts with fiber loading of 58-60% and void content less than 1% can be produced using this technology.
- CSIR-NAL has developed cocuring technology indigenously to realize highly integral structures for aircraft programs. The primary benefits of co-curing are reduction in part count, elimination of fasteners, reduced assembly and associated costs and elimination of stress concentration zones due to fastener holes, elimination of fuel leakage etc. The total structure is realized in shorter time compared to the traditional fastened structure.
- More than fifteen LCA aircrafts have taken to skies with composite structures manufactured at CSIR-NAL and extensive flight testing has been done with composite parts performing excellently.
- Some of the structures developed have won prestigious awards in international forums like JEC Asia innovation awards in 2013, 2015 and 2016.

APPLICATIONS

Structures like wing, horizontal and vertical tails, fuselage shells, control Surfaces like rudder, elevator, aileron, flaps etc. developed for LCA-Tejas and SARAS aircrafts. Parts developed for LCA have entered Series Production.

TECHNOLOGY BENCHMARKING

The technology has benchmarked with similar technologies.

TECHNOLOGY READINESS LEVEL ASSESSMENT

TRL assessment is 9

4.1 AEROSPACE- ELECTRONICS AND INSTRUMENTATION & STRATEGIC SECTOR (AEISS)

SCALE OF DEVELOPMENT

The Pilot scale demonstration in the field conditions is successfully done and the technology prototype has been tested in the actual field conditions and addressed all the critical scaling issues. Proven through successful demonstration of autoclave moulding technology both on civil and fighter. The final product based on the technology is used in LCA Tejas and SARAS aircraft.

STATUS OF COMMERCIALIZATION

For the LCA program,

- CSIR-NAL has transferred the technology to HAL.
- CSIR-NAL has tied up with Tata Advanced Materials Ltd. as production partner for the supply of critical composite parts for series production.
- Moreover, the technology can be commercialized based on the specific structure that needs to be developed.

TENTATIVE COST OF DEVELOPMENT

₹ 500 Lakhs

INDUSTRIAL PARTNERS

HAL, Tata Advanced Materials Ltd.

IPR STATUS DETAILS (PATENTS/COPYRIGHT/TRADEMARK SECURITY IN INDIA/ABROAD)

PLANT SET UP FOR FINAL PRODUCT

Yes, Tata Advanced Materials Ltd.

POTENTIAL MARKET/TECHNO-ECONOMICS

LCA aircrafts have taken to skies with composite structures manufactured at CSIR-NAL and extensive flight-testing has been done with composite parts performing excellently.

For the LCA program,

- CSIR-NAL has transferred the technology to HAL.
- CSIR-NAL has tied up with Tata Advanced Materials Ltd. as production partners for the supply of critical composite parts for series production.

Moreover, the technology can be commercialized based on the specific structure that needs to be developed.

ENVIRONMENTAL SAFETY CERTIFICATION

The safety aspects including environmental safety addressed and documented.

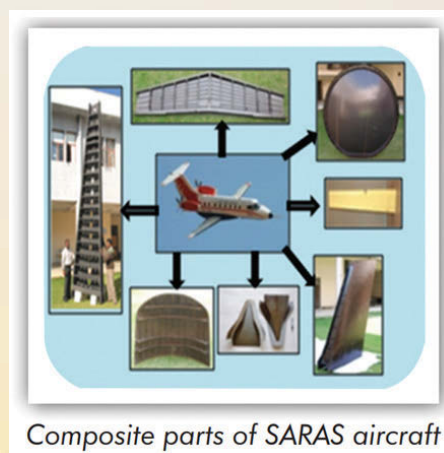
NODAL SCIENTIST DETAILS

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Composite parts of SARAS aircraft

14. PROCESS TECHNOLOGY FOR CONTINUOUS PREPARATION OF CARBON FIBER

UID: TECH-THEME_1_NAL-016

LABORATORY OF ORIGIN | CSIR-NAL, BENGALURU

EXECUTIVE SUMMARY

Characterized by high tensile strength, high stiffness, fatigue resistance and light weight, carbon fibers are the preferred reinforcement material in the advanced composites in aerospace and other high performance structural applications.

KEYWORDS

Carbon fiber, Special acrylic fiber

SALIENT FEATURES

- Fully Integrated Technology.
- Polymer production at 35 kg/h rate.
- Precursor fiber spinning at 5 TPA.
- Conversion of Precursor fiber to Carbon fibers at 5 TPA.

APPLICATIONS

- Carbon fiber composites in aircraft structures such as wings, rudder, elevator, aileron, flaps etc. in SARAS and TEJAS.
- As composites in heat shields in Re-entry vehicle structures.

TECHNOLOGY BENCHMARKING

The technology has benchmarked.

TECHNOLOGY READINESS LEVEL ASSESSMENT

TRL assessment is 7

SCALE OF DEVELOPMENT

The Pilot scale demonstration in the field conditions is successfully done and the technology prototype has been tested in the actual field conditions and addressed all the critical scaling issues. Pilot plant scale employing continuous processes at rates suitable for development/small scale production. Standard modulus grade carbon fibers NAL-CF1 is certified by CEMILAC for aerospace application.

STATUS OF COMMERCIALIZATION

Currently working with a public sector enterprise MIDHANI and a Government agency to set up production plant with CSIR-NAL technology.

TENTATIVE COST OF DEVELOPMENT

₹ 15000 Lakhs



4.1 AEROSPACE- ELECTRONICS AND INSTRUMENTATION & STRATEGIC SECTOR (AEISS)

INDUSTRIAL PARTNERS

M/s MIDHANI Enterprise

IPR STATUS DETAILS (PATENTS/COPYRIGHT/TRADEMARK SECURITY IN INDIA/ABROAD)

POTENTIAL MARKET/TECHNO-ECONOMICS

Currently working with a public sector enterprise MIDHANI to set up production plant with CSIR-NAL technology. Market potential in India about 100TPA for strategic sector alone. The cost of production is sensitive to production capacity. For strategic and defense 300 tons per year will be quite viable. For general industrial applications, a capacity of 1000 to 1200 tons per year will be commercially viable.

PLANT SET UP FOR FINAL PRODUCT

Currently working with a public sector enterprise MIDHANI to set up production plant with CSIR-NAL.

ENVIRONMENTAL SAFETY CERTIFICATION

The safety aspects including environmental safety addressed and documented.

NODAL SCIENTIST DETAILS

Director

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15. AUTOCLAVE – INDUSTRY GRADE, LAB SCALE AND DESKTOP

UID: TECH-THEME_1_NAL-017

LABORATORY OF ORIGIN | CSIR-NAL, BENGALURU

EXECUTIVE SUMMARY

NAL's expertise in designing and building Aerospace Grade Autoclaves is evident from the number of autoclaves that are in operation in the country right from the Desktop to Lab scale to Industrial grade. Lab scale and Desktop Autoclaves are very popular in Academic institutions. Industrial grade autoclave were supplied to Defence and Space establishments. Nations Largest autoclave (5.5 m dia and 10m length) is under fabrication for VSSC, Trivandrum.

KEYWORDS

Autoclave, Desktop, Lab scale, Industrial, Composites structure

SALIENT FEATURES

- Fail safe and easy to operate.
- Auto, semi-auto and manual modes of operation.
- Davit arm/Hinged door with lock ring less design.
- Pressurised motor with health monitoring.
- PC, PLC, Front-end controllers and Recorder based C & I architecture.
- Multiple level safeties.
- Heater power steering logic.
- Advanced insulation system for minimal energy losses.
- Identification and management of single point failures.
- Advanced process control software with remote monitoring.
- Master and stand by computer control.

APPLICATIONS

Manufacture of composite structures for strategic aerospace, automobile, education and allied sectors.

TECHNOLOGY BENCHMARKING

The technology has benchmarked.

TECHNOLOGY READINESS LEVEL ASSESSMENT

TRL assessment is 9

SCALE OF DEVELOPMENT

Commercialized

STATUS OF COMMERCIALIZATION

Successfully Commercialized, available in market and supplied to several MSMEs in the country like ASL-Hyderabad, VSSC Trivendrum, ADE Bengaluru, SHAR-ISRO Harikota, IIT Kanpur, IIT-Bombay, IIT-Delhi, IIT-Hyderabad, MIT-Manupal, ISAC-Bengaluru, IIT-Chennai, IIT-Guwahati.



4.1 AEROSPACE- ELECTRONICS AND INSTRUMENTATION & STRATEGIC SECTOR (AEISS)

TENTATIVE COST OF DEVELOPMENT

Desktop : ₹ 25 lakhs, Lab-scale: Rs. 85 lakhs, Industry Grade : Depending on the size varies from ₹ 150 lakhs to ₹ 2000 Lakhs.

INDUSTRIAL PARTNERS

KRR Engineering Pvt. Ltd. and Unique Chemoplant Equipment are the industry partner for autoclave lab scale. DATASOL (B) Pvt. Ltd., Lakshmi Engineering Works and Milvus Aero Solutions Pvt. Ltd. are industry partner for Desktop Autoclave.

PLANT SET UP FOR FINAL PRODUCT

Yes, the product are under production.

IPR STATUS DETAILS (PATENTS/COPYRIGHT/TRADEMARK SECURITY IN INDIA/ABROAD)

Patent under process

POTENTIAL MARKET/TECHNO-ECONOMICS

The technology has been transferred to several MSMEs in the country. These industries have generated a revenue of about 40 crore as on date. It is envisaged that the Indian market potential is about ₹ 100-150 crore in the next 5-6 years.

ENVIRONMENTAL SAFETY CERTIFICATION

The safety aspects including environmental safety addressed and documented

NODAL SCIENTIST DETAILS

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Industrial grade Autoclave



Lab scale Autoclave



Power panel for Industrial grade Autoclave



Desktop Autoclave

16. RADOMES FOR AIRBORNE AND WEATHER APPLICATIONS

UID: TECH-THEME_1_NAL-018

LABORATORY OF ORIGIN | CSIR-NAL, BENGALURU

EXECUTIVE SUMMARY

Radome is a structural and weatherproof enclosure protecting the radar antenna while causing minimal attenuation to the radar signals. Fibre reinforced polymer composite materials have emerged as the designers choice for radomes due to their unique properties of high specific strength/stiffness, Electromagnetic (EM) transparency, light weight and non-corrosiveness. These materials can be moulded into different geometries as required and become cost effective based on the choice of appropriate processing techniques. NAL has developed cost competitive manufacturing technologies for airborne and ground based weather radomes of strategic significance. Nose cone radome of Jaguar maritime aircraft & Spherical radome for protection of Doppler Weather Radars of IMD are the outcome of the indigenous effort that have culminated successful technology transfers to industry.



Jaguar nose cone composite radome

KEYWORDS

Airborne radome and Weather radome

SALIENT FEATURES

- The Airborne nose cone radome has been developed using a novel Resin Injection Technology (RIT) that includes development of contoured fabric pre-forms and closed mould pressure assisted high temperature resin injection. The radome has successfully met the stringent airworthiness qualification standards of CEMILAC, DRDO and has been flight tested.
- The Ground Based Weather Radome is a spherical radome of diameter 12.88 m. It has 66 polygonal panels fabricated using PolyUrethane (PU) Foam core glass epoxy sandwich composite. A cost-effective wet lay-up and Room Temperature vacuum bag moulding process has been adopted. The Radome is designed to withstand 250 km/h wind speed with gusts upto 300 km/h.

APPLICATIONS

- Airborne Nose Radome for fire control radar of Jaguar Maritime Fighter Aircraft Fleet (IAF).
- Ground Based Radomes for protection of Doppler Weather Radars of IMD which includes the Indian coastline and hilly regions of the North-East.

TECHNOLOGY BENCHMARKING

The technology has benchmarked.

TECHNOLOGY READINESS LEVEL ASSESSMENT

TRL assessment is 9

4.1 AEROSPACE- ELECTRONICS AND INSTRUMENTATION & STRATEGIC SECTOR (AEISS)

SCALE OF DEVELOPMENT

- Technology tested in real/ field trials at full scale.
- CEMILAC airworthiness certification obtained & radomes are in service of IAF since 2008.
- Under production with HAL and BEL Navi Mumbai.

STATUS OF COMMERCIALIZATION

- ToT of Airborne Radomes to HAL, Bangalore completed in 2013.
- ToT of Weather Radomes to BEL, Navi Mumbai completed in 2014.

TENTATIVE COST OF DEVELOPMENT

Airborne Radome: ₹ 15 Lakhs, Weather Radome : ₹ 150 Lakhs both technologies are for strategic application.

INDUSTRIAL PARTNERS

HAL and BEL, Navi Mumbai.

IPR STATUS DETAILS (PATENTS/COPYRIGHT/TRADEMARK SECURITY IN INDIA/ABROAD)
No

PLANT SET UP FOR FINAL PRODUCT

Yes, HAL and BEL Navi Mumbai.

POTENTIAL MARKET/TECHNO-ECONOMICS

Strategic & Space application

- Airborne Radome: ToT to HAL, Bangalore. 7 production radomes have been manufactured at HAL.
- Weather Radome: ToT to BEL, Navi Mumbai. The manufacturing facility has been established at BEL Navi Mumbai.
- Strategic & Space application.
- Weather radomes are installed at SHAR-Sriharikota, Bhuj-Gujarat, Kochi-Kerala, Gopalpur-Orissa, Cherrapunji-Meghalaya.
- Potential Market: Strategic & Space application.
- Weather Radome: ToT to BEL, Navi Mumbai. The manufacturing facility has been established at BEL Navi Mumbai.
- Weather radomes are installed at SHAR-Sriharikota, Bhuj-Gujarat, Kochi-Kerala, Gopalpur-Orissa, Cherrapunji-Meghalaya.

ENVIRONMENTAL SAFETY CERTIFICATION

The safety aspects including environmental safety addressed and documented.

NODAL SCIENTIST DETAILS

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17. MULTI ZONE HOT BONDER

UID: TECH-THEME_1_NAL-019

LABORATORY OF ORIGIN | CSIR-NAL, BENGALURU

EXECUTIVE SUMMARY

Hot bonder is a special purpose equipment that enables in situ bonded repair of Aircraft/Helicopter structures, wind turbine blades and other advanced composite structures. Multi zone hot bonder enables bonded repairs, simultaneously at multiple locations, while maintaining the temperature uniformity. Using this feature one can carry out, large and complex repairs along with test coupons with very good cure quality.

KEYWORDS

Composite, Repair, Hot bonder, Structures

SALIENT FEATURES

- High performance and cost effective repair kit.
- Advanced features for complex and multiple repair.
- 7" Colour touch screen (PLC-HMI) controller.
- 2 simultaneous repairs with independent.
- 12-zone temperature control.
- Menu driven program to create, run, view Cure Cycles (CC).
- Online and offline reporting/printing.
- Hold, modify and continue or extend CC.

APPLICATIONS

- To perform in situ repair/hot bonding of aircraft/automobile structures used in aircraft, helicopter, UAV, Wind turbine blades, automobile etc.
- Complex and multiple repairs along with test coupons.
- Thermo-forming of foams for aircraft structures.

TECHNOLOGY BENCHMARKING

The technology has benchmarked.

TECHNOLOGY READINESS LEVEL ASSESSMENT

TRL assessment is 9

SCALE OF DEVELOPMENT

Commercialized, and the product based on this technology has started selling into the market and received order ₹ 1.1 Crore.

STATUS OF COMMERCIALIZATION

The Technology is commercialized and started production and sale. The Non-exclusive ToT licenses have been taken by M/s SAN Process Automation, Bengaluru and M/s Ajay Sensors, Bengaluru.



4.1 AEROSPACE- ELECTRONICS AND INSTRUMENTATION & STRATEGIC SECTOR (AEISS)

TENTATIVE COST OF DEVELOPMENT

₹ 15 Lakhs

INDUSTRIAL PARTNERS

M/s SAN Process Automation, Bengaluru. and M/s Ajay Sensors, Bengaluru.

PLANT SET UP FOR FINAL PRODUCT

Yes

IPR STATUS DETAILS (PATENTS/COPYRIGHT/TRADEMARK SECURITY IN INDIA/ABROAD)

Nil

POTENTIAL MARKET/TECHNO-ECONOMICS

Serves as an important import substitution for the strategic sector. Technology transferred to two MSMEs in Bangalore. There is an expected demand of 100 systems spread over a time period of 8-10 years. The potential clients will be strategic market consisting of the Air Force, HAL, DRDO and civil aircraft MRO and abroad.

ENVIRONMENTAL SAFETY CERTIFICATION

The safety aspects including environmental safety addressed and documented.

NODAL SCIENTIST DETAILS

Director

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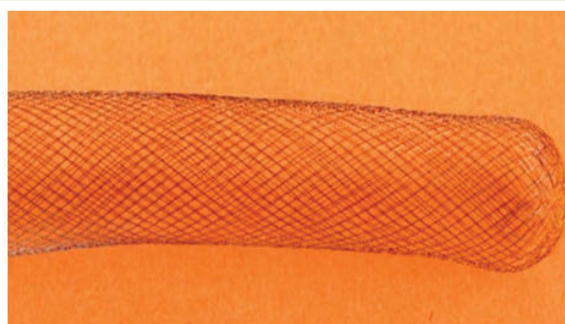
18. TECHNICAL KNOW-HOW FOR PROCESSING OF NICKEL-TITANIUM (NITI) SHAPE MEMORY ALLOY (SMA) PRODUCTS FOR ENGINEERING AND BIOMEDICAL APPLICATIONS

UID: TECH-THEME_1_NAL-020

LABORATORY OF ORIGIN | CSIR-NAL, BENGALURU

EXECUTIVE SUMMARY

NiTi SMAs finds wide usage in a variety of smart systems and devices pertaining to engineering and biomedical fields. Engineering applications: sensors and actuators, frangibolt, pin-puller, pipe coupling, vibration dampeners, etc. Biomedical applications: orthodontic arch wires, guide wires, stent-grafts, flow diverters, bone staples, etc.



KEYWORDS

Shape memory alloy, Sensors, Actuators, Wires, Stent

SALIENT FEATURES

The process technology for NiTi SMA fabrication has been successfully demonstrated in industries in commercially viable scale. Technical know-how is ready for transfer to industries Production Version.

- Indigenous technology for fabrication of NiTi SMAs in various product forms (wires/strips/rods).
- Technical know-how for processing of alloys with shape memory effect and superelastic behaviour.

APPLICATIONS

- Engineering applications: sensors and actuators, frangibolt, pin-puller, pipe coupling, vibration dampeners, etc.
- Biomedical applications: orthodontic arch wires, guide wires, stent-grafts, flow diverters, bone staples, etc.

TECHNOLOGY BENCHMARKING

The technology has benchmarked.

TECHNOLOGY READINESS LEVEL ASSESSMENT

TRL assessment is 8

SCALE OF DEVELOPMENT

- The process technology for NITI SMA fabrication has been successfully demonstrated in industries in commercially viable scale.
- Technical know-how is ready for transfer to industries production version.

STATUS OF COMMERCIALIZATION

Licensing of the process technology to MIDHANI, Hyderabad for commercial production.

4.1 AEROSPACE- ELECTRONICS AND INSTRUMENTATION & STRATEGIC SECTOR (AEISS)

TENTATIVE COST OF DEVELOPMENT

₹ 40-50% less than the imported cost.

INDUSTRIAL PARTNERS

M/s MIDHANI, Hyderabad.

IPR STATUS DETAILS (PATENTS/COPYRIGHT/TRADEMARK SECURITY IN INDIA/ABROAD)

Process know-how developed indigenously, no patents filed, IPR with CSIR-NAL.

PLANT SET UP FOR FINAL PRODUCT

Yes, NiTi semi-finished products (Plates/Rods/Strips/Wires/Springs) for Engineering applications are manufactured and sold by M/s MIDHANI, Hyderabad using CSIR-NAL Process Technology.

POTENTIAL MARKET/TECHNO-ECONOMICS

Licensing of the process technology to M/s MIDHANI, Hyderabad for commercial production. India has a huge market potential of more than ₹ 1000 crore for NiTi SMA products with an annual growth rate of 10 to 14%.

ENVIRONMENTAL SAFETY CERTIFICATION

The safety aspects including environmental safety addressed and documented.

NODAL SCIENTIST DETAILS

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19. ECO-FRIENDLY PROCESS FOR THE PREPARATION OF CORROSION RESISTANT SEALED ANODIZED COATINGS ON AIRCRAFT ALUMINIUM ALLOY

UID: TECH-THEME_1_NAL-022

LABORATORY OF ORIGIN | CSIR-NAL, BENGALURU

EXECUTIVE SUMMARY

A chromate free pretreatment process for the corrosion protection of aerospace aluminum alloy. The coating system is chromate free corrosion protective system for aluminum alloys with societal impact.

KEYWORDS

Chromate free coating, Anodized coating

SALIENT FEATURES

- At present no chromate free technology is available for the corrosion protection of AA 2024 alloys used in aircraft applications.
- An indigenous and cost effective process has been developed.
- The coating system is chromate free corrosion protective system for aluminum alloys with societal impact.
- This process can also be used in automobile sectors.

APPLICATIONS

Aluminum alloy structural components.

TECHNOLOGY BENCHMARKING

The technology has benchmarked.

TECHNOLOGY READINESS LEVEL ASSESSMENT

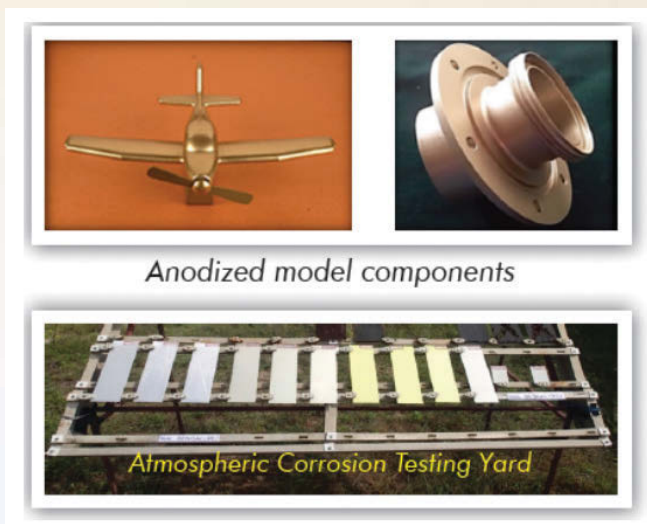
TRL assessment is 6

SCALE OF DEVELOPMENT

The Pilot scale demonstration in the field conditions is successfully done and the technology prototype has been tested in the actual field conditions and addressed all the critical scaling issues. Process Clearance from CEMILAC (RCMA (F&F-FOL)/NAL/223-06/443/C-01/2018/01; dated 07/05/2018) has been obtained. Collaborative efforts are in progress between CSIR- NAL and ARDC, HAL to establish 5000 Ltrs anodization facility at ARDC, HAL. Discussions held with various divisions of HAL and ADA for Type Approval of the process by CEMILAC.

STATUS OF COMMERCIALIZATION

Establishing the scale up plant for this process is in progress. Organizations like ADA and AR&DC, HAL have shown interest for this process technology apart from M/s Airbus and M/s Boeing Industries.



4.1 AEROSPACE- ELECTRONICS AND INSTRUMENTATION & STRATEGIC SECTOR (AEISS)

TENTATIVE COST OF DEVELOPMENT

No or very minimal cost, existing anodization plant for pretreatment for the corrosion protection of aerospace aluminum alloy can be used with minor modifications.

INDUSTRIAL PARTNERS

HAL

IPR STATUS DETAILS (PATENTS/COPYRIGHT/TRADEMARK SECURITY IN INDIA/ABROAD)

An improved process for the preparation of corrosion resistant sealed anodized coatings on aluminum alloy, Indian Patent (App. No. 159/DEL/2015); US Patent No. U.S 15/543,153. An International patent application pending (no. PCT/IN2016/050003 filed on 6 January 2016).

PLANT SET UP FOR FINAL PRODUCT

Establishing the scale up plant for this process is in progress

POTENTIAL MARKET/TECHNO-ECONOMICS

Organizations like ADA and AR & DC, HAL have requirement for this process technology apart from M/s Airbus and M/s Boeing Industries. Chromate-free coating systems to be in place by 2026 as per NASF forecast.

ENVIRONMENTAL SAFETY CERTIFICATION

The safety aspects including environmental safety addressed and documented.

NODAL SCIENTIST DETAILS

Director

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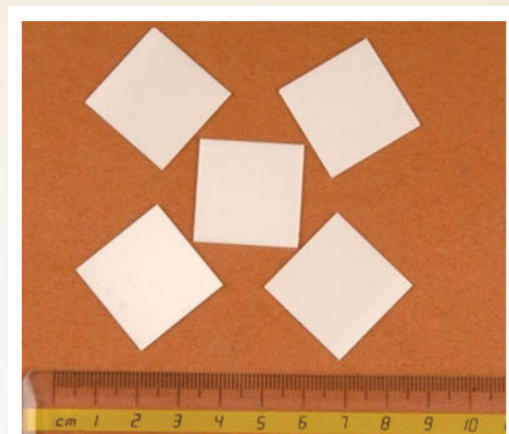
20. TAPECASTING TECHNOLOGY FOR CERAMIC SUBSTRATES

UID: TECH-THEME_1_NAL-023

LABORATORY OF ORIGIN | CSIR-NAL, BENGALURU

EXECUTIVE SUMMARY

Alumina ceramic substrates are in great demand in the country for space and electronics industries and they are being imported. Zirconia substrates find application in the fabrication of Solid Oxide Fuel Cells (SOFC) and oxygen sensors. CSIR-NAL has developed alumina and zirconia substrates. The properties of indigenously developed alumina ceramic substrates exceed the benchmarked specifications. The technology has been transferred to M/s Carborundum Universal Ltd. (CUMI) and CUMI has successfully commissioned an industrial scale tapecasting facility for the production of ceramic substrates.



KEYWORDS

Alumina, Zirconia

SALIENT FEATURES

100-650 μm thick alumina and yttria stabilized zirconia (YSZ) tapes with <90 nm roughness.

APPLICATIONS

- Electronics Industry.
- Aerospace Sector-high temperature co-fired ceramics, thermal knife and oxygen sensor.
- Energy Sector-Solid oxide fuel cells.

TECHNOLOGY BENCHMARKING

The technology has benchmarked.

TECHNOLOGY READINESS LEVEL ASSESSMENT

TRL assessment is 6

SCALE OF DEVELOPMENT

The technology successfully demonstrated to the industry partner and the technology transferred to M/s Carborundum Universal Ltd. (CUMI), Hosur.

STATUS OF COMMERCIALIZATION

The technology has been transferred to M/s Carborundum Universal Ltd. (CUMI) and CUMI has successfully commissioned an industrial scale tapecasting facility for the production of ceramic substrates.

TENTATIVE COST OF DEVELOPMENT

₹ 500- 700 per piece

4.1 AEROSPACE- ELECTRONICS AND INSTRUMENTATION & STRATEGIC SECTOR (AEISS)

INDUSTRIAL PARTNERS

M/s Carborandum Universal Ltd., Hosur, Tamil Nadu.

PLANT SET UP FOR FINAL PRODUCT

Yes, M/s Carborandum Universal Ltd., Hosur, Tamil Nadu.

IPR STATUS DETAILS (PATENTS/COPYRIGHT/TRADEMARK SECURITY IN INDIA/ABROAD)

Patented, 2338/DEL/2015. Indian patent (Filed) 30/07/2015.

POTENTIAL MARKET/TECHNO-ECONOMICS

Technology transferred to M/s Carborandum Universal Ltd., Hosur, Tamil Nadu. Sales of space electronics substrates will increase by USD 8.6 billion by 2022.

ENVIRONMENTAL SAFETY CERTIFICATION

The safety aspects including environmental safety addressed and documented.

NODAL SCIENTIST DETAILS

Director

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21. NAL MRA 1426/1427 GMR MAGNETIC SENSOR

UID: TECH-THEME_1_NAL-024

LABORATORY OF ORIGIN | CSIR-NAL, BENGALURU

EXECUTIVE SUMMARY

The MRA 1427/1426 magnetic sensor utilizes Giant Magneto-Resistive (GMR) technology, where highly sensitive unshielded GMR elements are configured in a form of single Wheatstone bridge. The Wheatstone bridge generates a differential output voltage with respect to magnetic field gradient along the sensor's sensitive direction. Each resistor has 4-5 k Ω nominal resistance and output of the bridge is purely ratiometric with the power supply voltage. Due to our unique technology and design, MRA 1427 is highly sensitive and has the ability to detect signals at the wide air gap. The excellent thermal and voltage stability makes it suitable for challenging environments. The MRA 1427 GMR.



KEYWORDS

Composite, Repair, Hot bonder, Structures

SALIENT FEATURES

• Sensing element configuration	:	Wheatstone bridge configuration
• Bridge resistance	:	6.4 $\pm$ 5% k Ω
• Input voltage	:	1-30 V
• Field Range	:	5-100 G, unipolar
• Saturation of GMR Sensor Elements	:	$\pm$ 300 G
• Single Resistor Sensitivity	:	0.033%/G
• Temperature Coefficient of Resistance	:	0.033 Ω /°C
• Temperature dependence of GMR	:	-0.03%/ °C
• Operating Temperature Range	:	-70 to 130 °C

APPLICATIONS

- Gear tooth speed sensing.
- Direction and motion sensing.
- Linear and rotary speed sensing.
- Linear and rotary position sensing.

TECHNOLOGY BENCHMARKING

The technology has benchmarked.

TECHNOLOGY READINESS LEVEL ASSESSMENT

TRL assessment is 8

4.1 AEROSPACE- ELECTRONICS AND INSTRUMENTATION & STRATEGIC SECTOR (AEISS)

SCALE OF DEVELOPMENT

The Pilot scale demonstration in the field conditions is successfully done and the technology prototype has been tested in the actual field conditions and addressed all the critical scaling issues and ready for commercialization.

STATUS OF COMMERCIALIZATION

Ready for commercialization.

TENTATIVE COST OF DEVELOPMENT

The tentative cost of the GMR based speed sensor is about ₹ 130 with NAL developed GMR chip costing about ₹ 15-20.

INDUSTRIAL PARTNERS

M/s Jayashree Electron Pvt. Ltd.

PLANT SET UP FOR FINAL PRODUCT

Not yet

IPR STATUS DETAILS (PATENTS/COPYRIGHT/TRADEMARK SECURITY IN INDIA/ABROAD)

Patented , Patent filed in India - 3689/DEL; 1221/DEL; 449/DEL.

POTENTIAL MARKET/TECHNO-ECONOMICS

As per the market analysis, the overall magnetic revolution sensor market revenue would be 279 million US\$ with a corresponding volume of 1347 million units by the year 2016.

ENVIRONMENTAL SAFETY CERTIFICATION

The safety aspects including environmental safety addressed and documented.

NODAL SCIENTIST DETAILS

Director

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22. NAL FOQA FLIGHT DATA ANALYSIS SYSTEM

UID: TECH-THEME_1_NAL-025

LABORATORY OF ORIGIN | CSIR-NAL, BENGALURU

EXECUTIVE SUMMARY

Black Box Analysis for all aircrafts. NALFOQA is used for flight data analysis by engineering, operations and flight safety apart from certification agency itself.

KEYWORDS

Black box analysis, Software

SALIENT FEATURES

- Modular design with easy to use GUI based application.
- Can be configured for any aircraft with any configuration of words per second (WPS).
- Multi-level security protection with password.
- Software is active protected with node locked license Easy to use GUI where customer can debug problems and solve.
- Can be configured for fixed wing and rotary wing aircrafts also.

APPLICATIONS

- The software package proven in the industry for more than a decade.
- Currently the software is being used by Air India (Delhi & Mumbai), Alliance Air and DGCA.

TECHNOLOGY BENCHMARKING

The technology has benchmarked.

TECHNOLOGY READINESS LEVEL ASSESSMENT

TRL assessment is 9

SCALE OF DEVELOPMENT

The Pilot scale demonstration in the field conditions is successfully done and the technology prototype has been tested in the actual field conditions and addressed all the critical scaling issues and ready for commercialization.

STATUS OF COMMERCIALIZATION

Ready for technology transfer. Currently this technology is used by Air India (Delhi & Mumbai), Alliance Air and DGCA.

TENTATIVE COST OF DEVELOPMENT

The license of imported software cost 3 times the indigenous cost and the RE is very high.

INDUSTRIAL PARTNERS

This technology is used by Air India (Delhi & Mumbai), Alliance Air and DGCA.



4.1 AEROSPACE- ELECTRONICS AND INSTRUMENTATION & STRATEGIC SECTOR (AEISS)

PLANT SET UP FOR FINAL PRODUCT

It is Software.

IPR STATUS DETAILS (PATENTS/COPYRIGHT/TRADEMARK SECURITY IN INDIA/ABROAD)

The software has copyright in India.

POTENTIAL MARKET/TECHNO-ECONOMICS

NALFOQA software package proven in the airline industry for more than a decade. NALFOQA has potential to be used for any type of aircraft.

ENVIRONMENTAL SAFETY CERTIFICATION

The safety aspects including environmental safety addressed and documented.

NODAL SCIENTIST DETAILS

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23. DRISHTI TRANSMISSOMETER- A RUNWAY VISIBILITY MEASURING SYSTEM

UID: TECH-THEME_1_NAL-027

LABORATORY OF ORIGIN | CSIR-NAL, BENGALURU

EXECUTIVE SUMMARY

Drishti gives runway visibility information to pilots and AWMS gives information on weather parameters like Wind speed, Wind Direction, Pressure, Humidity, Temperature and Dew Point on the runway. The weather sensors are mounted on a Frangible - Flexible 10 meter eco-friendly free standing mast with provision for ease of maintenance of sensors. The above parameters are very essential for airports aiding safe landing and takeoff operations of Aircrafts.

KEYWORDS

Drishti, Runway visibility, Airport

SALIENT FEATURES

DRIS

- Base Line : 30 m
- Measurement Range of Visibility : 10-10000 m
- Reporting Range : MOR :10-3000m RVR: 50-2000 mHTI

AWMS

Measurement Range of Parameters

Pressure	:	600 to 1100 hpa
Temperature	:	-40 to +60°C
Relative Humidity	:	0 to 100%
Wind Speed	:	0 to 100 knots
Wind Direction	:	0-360°
Visibility	:	10-10000 m

Software

In Industry standard LabView Platform for data acquisition, computation with self diagnostics and also with provision for web enabling.

Communication

- Dual mode of Communication both through cable and WiFi.
- Secured-encrypted -Bi Directional communication through concept of Virtual Private Network.
- The data of both AWMS and Drishti are web enabled with METAR and MET Report as per ICAO standards.

APPLICATIONS

- Drishti and AWMS are Mandatory systems for Airport operations.
- Drishti measures visibility on the runway and is reported to pilots through Air traffic control room.



4.1 AEROSPACE- ELECTRONICS AND INSTRUMENTATION & STRATEGIC SECTOR (AEISS)

- AWMS measures all the weather parameters required for airport operations wherein the weather sensors are mounted on a 10 meter Mast as per the requirement of International Civil Aviation organization.

TECHNOLOGY BENCHMARKING

The technology has benchmarked.

TECHNOLOGY READINESS LEVEL ASSESSMENT

TRL assessment is 9

SCALE OF DEVELOPMENT

The Pilot scale demonstration in the field conditions is successfully done and the technology prototype has been tested in the actual field conditions and it is under production. 47 DRISHTI supplied to international airports and 54 supplied to 18 Indian Air force airbases stations.

STATUS OF COMMERCIALIZATION

Commercialized, 47 DRISHTI supplied to international airports and 54 supplied to 18 Indian Air force airbases stations.

TENTATIVE COST OF DEVELOPMENT

₹ 20 Lakhs per system

INDUSTRIAL PARTNERS

Central Electronics Limited and EL and Tata Power SED (TPSED).

IPR STATUS DETAILS (PATENTS/COPYRIGHT/TRADEMARK SECURITY IN INDIA/ABROAD)

Patented, Patent: 1 filed (patent application No. 2251/DEL/2015), 3 in filing process, Copyrights: 21 Trade Mark: Sanctioned.

PLANT SET UP FOR FINAL PRODUCT

Yes, CEL and Tata Power SED

POTENTIAL MARKET/TECHNO-ECONOMICS

Already in Market: 47 nos of Drishtis are installed in 21 international Civilian Airports in the country. 54 Systems are installed in 18 IAF Airbases. Technology transferred to CEL, Ghaziabad. About 180-200 numbers for both strategic and civil applications.

- Drishti is 1/4th the cost of similar Imported equipment.
- AWMS is 1/2 the price of the imported system.
- Has saved foreign exchange to the country.
- Rugged System and easy maintenance.

ENVIRONMENTAL SAFETY CERTIFICATION

The safety aspects including environmental safety addressed and documented.

NODAL SCIENTIST DETAILS

Director

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24. SUCHAN MINI UAV

UID: TECH-THEME_1_NAL-028

LABORATORY OF ORIGIN | CSIR-NAL, BENGALURU

EXECUTIVE SUMMARY

Suchan is an all-composite, lightweight, modular mini UAV designed and developed by CSIR-NAL. It is designed to meet high altitude operation requirements and has a ceiling altitude of 5000 m ASL. Indigenously designed and developed this mini-UAV is a far more cost efficient solution than other UAVs. Parameter Specifications Wing Span : 1.85 m Length : 1.5 m Weight : ~5 kg Range : 8-10 km Endurance : 60-90 minutes Speed : 10-20 m/s .Operating Altitude : 500 m AGL, 15,000 ft ASL ceiling altitude.



Autopilot: PSOC based Controller Auto Pilot developed by NAL In-house developed Control laws
GCS : In-house developed software hosted on Rugged, Waterproof Laptop Mission planning, Video relay/recording.

KEYWORDS

Suchan, UAV, Surveillance

SALIENT FEATURES

Parameter Specifications

Wing Span: 1.85 m; Length : 1.5 m; Weight : ~5 kg; Range : 8-10 km; Endurance : 60-90 minutes;
Speed: 10-20 m/s

Operating Altitude: 500 m AGL, 15,000 ft ASL ceiling altitude.

Autopilot: PSOC based Controller Auto Pilot developed by NAL In-house developed Control laws.

GCS: In-house developed software hosted on Rugged, Waterproof Laptop Mission planning, Video relay /recording.

Payloads: Interchangeable Daylight or Thermal Camera with Gimbal control and Mapping Payload.

Launch and Recovery: Hand-Launch and Belly Landing.

Portability: 2 Man portable system.

APPLICATIONS

- Surveillance Application: Raster Scan Survey of large areas, Static and Moving Object Tracking, Detection, Recognition and Identification of Objects.
- Geospatial Mapping Applications: Open Cast Mines, Sand Ridges, Agricultural Mapping, Other Civil Applications.

TECHNOLOGY BENCHMARKING

The technology has benchmarked.

TECHNOLOGY READINESS LEVEL ASSESSMENT

TRL assessment is 6

4.1 AEROSPACE- ELECTRONICS AND INSTRUMENTATION & STRATEGIC SECTOR (AEISS)

SCALE OF DEVELOPMENT

The technology has been benchmarked and the prototype has been demonstrated.

STATUS OF COMMERCIALIZATION

Ready for commercialization and Transfer of Technology.

TENTATIVE COST OF DEVELOPMENT

₹ 20 Lakhs

INDUSTRIAL PARTNERS

In-house

IPR STATUS DETAILS (PATENTS/COPYRIGHT/TRADEMARK SECURITY IN INDIA/ABROAD)

In the process of obtaining Design Patent and Trademark: SUCHAN.

PLANT SET UP FOR FINAL PRODUCT

Nil

POTENTIAL MARKET/TECHNO-ECONOMICS

Cost effective system for surveillance and mapping applications. Requirement of about 1000-1500 systems for various application like surveillance, agriculture and land mapping.

ENVIRONMENTAL SAFETY CERTIFICATION

Nil

NODAL SCIENTIST DETAILS

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25. BI LEVEL POSITIVE AIRWAY PRESSURE SYSTEM (BI+AP V1)

UID: TECH-THEME_1_NAL-030

LABORATORY OF ORIGIN | CSIR-NAL, BENGALURU

EXECUTIVE SUMMARY

The System operates in the following three modes

Continuous Positive Airway Pressure (CPAP):

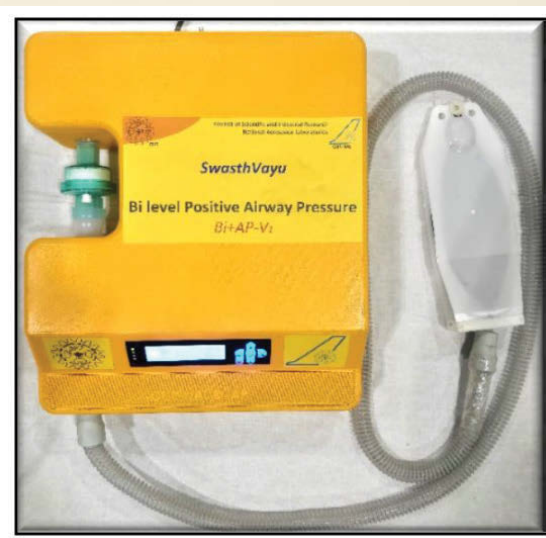
The ventilator provides Continuous fixed Positive Airway Pressure (CPAP).

Timed Mode:

The ventilator provides timed breath delivery with Pressure Support Ventilation. The unit cycles between the IPAP and EPAP levels based solely on the timing intervals.

Spontaneous/Timed (S/T Mode):

The ventilator provides spontaneous or timed breath delivery with Pressure Support Spontaneous Ventilation. The unit cycles between the IPAP and EPAP levels in response to patient triggering. This mode synchronizes patient breath cycle with the ventilation mechanism.



KEYWORDS

Non-invasive Ventilator for Covid-19

SALIENT FEATURES

- Three modes of operations-continuous, Timed and Spontaneous.
- Automatic and manual operation.
- Easy to use User Interface.
- Programmable respiration cycle.
- Statistics of each patient for diagnostics.

APPLICATIONS

BiPAP ventilator named Swasth Vayu, a non-invasive (involves use of masks or similar device) breathing support device, for the use of non-critical non-ICU cases of Covid-19.

TECHNOLOGY BENCHMARKING

The technology is benchmarked with similar technologies.

TECHNOLOGY READINESS LEVEL ASSESSMENT

TRL assessment is 7

SCALE OF DEVELOPMENT

The Pilot scale demonstration in the field conditions is successfully done and the technology prototype has been tested in the actual field conditions and addressed all the critical scaling issues. The Industrial partner has set up the plant for final product and received orders from hospitals by ToT partners.

4.1 AEROSPACE- ELECTRONICS AND INSTRUMENTATION & STRATEGIC SECTOR (AEISS)**STATUS OF COMMERCIALIZATION**

Commercialized with 7 Industries

TENTATIVE COST OF DEVELOPMENT

₹ 45000 per unit

INDUSTRIAL PARTNERS

- Unimech Aerospace & Manufacturing Pvt. Ltd., Bangalore.
- Kavitul Technologies Pvt. Ltd., Vadodara.
- M/s Apollo Computing Laboratories (P) Ltd., Hyderabad.
- Datasol (B) Pvt. Ltd., Bangalore.
- Paras Defence & Space Tech., Navi Mumbai.
- Nfotech Digital Engineering Pvt. Ltd., Bangalore.

PLANT SET UP FOR FINAL PRODUCT

Yes Plant has set up.

IPR STATUS DETAILS (PATENTS/COPYRIGHT/TRADEMARK SECURITY IN INDIA/ABROAD)

No

POTENTIAL MARKET/TECHNO-ECONOMICS

Technology transferred on Non- Exclusive License to 7 industries in the country. The ventilator is developed for use only for mild and moderate patients of Covid-19 in the country for meeting urgent requirement of the country facing shortage of ventilators.

ENVIRONMENTAL SAFETY CERTIFICATION

The safety aspects including environmental safety is in process.

NODAL SCIENTIST DETAILS

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26. LONG AFTER GLOW PHOSPHOR POWDERS (PATENT NO: INDIA 225682 JP2003292951)

UID: TECH-THEME_1_NPL-031

LABORATORY OF ORIGIN | CSIR-NPL, NEW DELHI

EXECUTIVE SUMMARY

The Long Afterglow Phosphor (LAP) absorbs visible or Ultra Violet (UV) lights for less than 10 minutes in the daylight and glows in dark by emitting visible light for hours together. These are special kind of photon energy storage and emitting materials, readily excited by ambient lights. CSIR-NPL has developed and patented LAP powders that emit multiple colors such as: yellowish green (~8-12 hours), blue (~2-3 hours) and red (about half an hour) for a dark adapted human eye. Further, these powders require no continuous supply of excitation energy to get charged up. These powders are non-radioactive, non-hazardous and re-chargeable in nature and the shelf life is more than 15 years. These phosphors find wide-range of applications in defense, domestic, commercial as well as in scientific domains.

KEYWORDS

Phosphor, Afterglow, Phosphorescence, Dark-vision, Inorganic materials

SALIENT FEATURES

- Indigenously created Non-radioactive and non-toxic luminescent material activated by visible light, with afterglow time ranging from half an hour to ~10 h for highlighting critical objects in the dark.
- The material glows for a long time after light is switched off, thus it is not required to keep electricity turned on at night.
- The phosphor material can be excited by different kind of light sources ranging from invisible UV to visible sun, tube light & that from incandescent electric bulb.
- The materials can be optimized to specific after-glow times as required and the color of light emitted can also be varied to an extent.

APPLICATIONS

Marking of warning signs, electrical switches, important equipment, escape routes etc. It can be used as a path finder in industrial environment during black out conditions, find out different components in dark if these are painted with this material, painted on switches so they can be timely switched of during power outage & prevent damage to appliances due to power surges.

TECHNOLOGY BENCHMARKING

The technology has been benchmarked.

TECHNOLOGY READINESS LEVEL ASSESSMENT

TRL assessment is 9



4.1 AEROSPACE- ELECTRONICS AND INSTRUMENTATION & STRATEGIC SECTOR (AEISS)

SCALE OF DEVELOPMENT

The Pilot scale demonstration in the field conditions is successfully done and the technology prototype has been tested in the actual field conditions and addressed all the critical scaling issues and Industrial partner/manufacturer has setup the plant for final product.

STATUS OF COMMERCIALIZATION

Commercialized

TENTATIVE COST OF DEVELOPMENT

₹ 3.00 Lakhs (approx)

INDUSTRIAL PARTNERS

M/s Kataline Infra Products Pvt. Ltd., Nagpur.

PLANT SET UP FOR FINAL PRODUCT

Yes, M/s Kataline Infra Products Pvt Ltd., Nagpur.

IPR STATUS DETAILS (PATENTS/COPYRIGHT/TRADEMARK SECURITY IN INDIA/ABROAD)

Patented, Patent No.: India 225682, JP2003292951.

POTENTIAL MARKET/TECHNO-ECONOMICS

There is a tremendous market potential for these long afterglow materials in the industries involved in designing Warning signage boards, Emergency escape route markings for traffic vehicles on highways, Paint and Glass manufacturing for making creative and decorative articles, etc.

ENVIRONMENTAL SAFETY CERTIFICATION

The safety aspects including environmental safety addressed and documented.

NODAL SCIENTIST DETAILS

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27. APPARATUS FOR POLARIZATION VS ELECTRIC FIELD MEASUREMENT AT VARIOUS FREQUENCIES IN THIN FILM SAMPLES (PATENT NO: 458DEL2015)

UID: TECH-THEME-1_NPL-032

LABORATORY OF ORIGIN | CSIR-NPL, NEW DELHI

EXECUTIVE SUMMARY

An apparatus that measures electric polarization of ferroelectric samples at various frequencies is described. This invention is particularly suitable for measurements in thin film samples. This apparatus employs technique for offset removal; compensation setup for lossy dielectric. It facilitates in-situ monitoring and on screen plotting of PE loop; real time calculation of saturation field (E_{sat}), coercive field (E_c), saturation polarization (P_s) and remnant polarization (P_r); data acquisition and data saving in file for future analysis. PE loop of 20/80 Piezoelectric capacitor (Standard Sample) of Radiant technology and the comparison of data taken by developed setup and Radiant precision multiferroic tester at 100 Hz) and PE loop at 1 kHz after applying corrections for lossy dielectric on 20/80 piezoelectric capacitor in parallel with 4.9 M Ω resistor.



KEYWORDS

Ferroelectric, Polarization, Electric field, Hysteresis, Thin film

SALIENT FEATURES

- Data acquisition.
- Performing measurement at different frequency, amplitude, and waveform with in-situ monitoring and on-screen plotting.
- Real-time calculation based on measured values.
- Data saving in file for future analysis.

APPLICATIONS

Application in Ferroelectric hysteresis, Large signal CV, IV, PUND/pulse polarization measurement, Fatigue, Imprint measurement, Small signal capacitance, Read, write pulse measurement, Retention measurement, Compensation values measurement for lossy sample, Pulsed IV, Leakage current measurement.

TECHNOLOGY BENCHMARKING

The technology has been benchmarked with similar technologies.

TECHNOLOGY READINESS LEVEL ASSESSMENT

TRL assessment is 9

4.1 AEROSPACE- ELECTRONICS AND INSTRUMENTATION & STRATEGIC SECTOR (AEISS)

SCALE OF DEVELOPMENT

The Pilot scale demonstration in the field conditions is successfully done and the technology prototype has been tested in the actual field conditions and addressed all the critical scaling issues and the technology is transferred to ATOS Instruments Marketing Services, Bengaluru.

TENTATIVE COST OF DEVELOPMENT

₹ 3 Lakhs

INDUSTRIAL PARTNERS

ATOS Instruments Marketing Services, Bengaluru.

PLANT SET UP FOR FINAL PRODUCT

Yes

IPR STATUS DETAILS (PATENTS/COPYRIGHT/TRADEMARK SECURITY IN INDIA/ABROAD)

Patented, Patent No: 458 DEL2015, Applied for copyright registration (ref no. 058CR2017) on 14/08/17.

POTENTIAL MARKET/TECHNO-ECONOMICS

Groups working on ferroelectric thin film samples may be benefitted. Academic/research institutes carrying on research in the field of ferroelectric, multiferroic thin film materials. Industries working on ferroelectric RAM, ferroelectric sensors.

ENVIRONMENTAL SAFETY CERTIFICATION

The safety aspects including environmental safety addressed and documented.

NODAL SCIENTIST DETAILS

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28. CROSS FLOATING VALVE (KNOW HOW)

UID: TECH-THEME_1_NPL-033

LABORATORY OF ORIGIN | CSIR-NPL, NEW DELHI

EXECUTIVE SUMMARY

High pressure hydraulic Cross Floating Valve (CFV) is the best suggested way to minimize the time and help to improve the accuracy of pressure calibration of pressure balances. This manually operated indigenous developed valve at CSIR-NPL has various advantages over conventionally available pneumatically actuated constant volume valves. The CFV has novelties and simple design. The technology is now ready for commercialization for the interested industry.



Fig: Snapshot of the developed Cross Floating Valve with its piston (Laboratory working model)

KEYWORDS

Metrology, Calibration, Pressure balance, Cross-float valve

SALIENT FEATURES

- High strength piston developed used in high pressure range of calibration.
- Unique & simple design for manual operation.
- Range of calibration-Atmospheric to 2000 Bar.
- Low maintenance.
- No power and pneumatic actuation required.

APPLICATIONS

- In calibration setup of Dead weight testers or pressure balances accredited laboratories.
- These CFVs are also used in other application where pressure in two pressure balance are need to be reconnected and disconnected with minimum perturbation of volume on either side.

TECHNOLOGY BENCHMARKING

The technology has been benchmarked with similar technologies.

TECHNOLOGY READINESS LEVEL ASSESSMENT

TRL assessment is 7

SCALE OF DEVELOPMENT

The Pilot scale demonstration in the field conditions is successfully done and the technology prototype has been tested in the actual field conditions and addressed all the critical scaling issues.

STATUS OF COMMERCIALIZATION

Under commercialization process.

4.1 AEROSPACE- ELECTRONICS AND INSTRUMENTATION & STRATEGIC SECTOR (AEISS)**TENTATIVE COST OF DEVELOPMENT**

₹ 0.50 Lakh

INDUSTRIAL PARTNERS

Nil

PLANT SET UP FOR FINAL PRODUCT

Nil

IPR STATUS DETAILS (PATENTS/COPYRIGHT/TRADEMARK SECURITY IN INDIA/ABROAD)

No

POTENTIAL MARKET/TECHNO-ECONOMICS

Required in pressure calibration laboratory.

ENVIRONMENTAL SAFETY CERTIFICATION

The safety aspects including environmental safety addressed and documented.

NODAL SCIENTIST DETAILS

Dr. Sanjay Yadav

Sr. Principal Scientist

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29. DEVELOPMENT OF FREE STANDING AND FLEXIBLE CARBON NANOTUBE PAPER (KNOWHOW)

UID: TECH-THEME_1_NPL-034

LABORATORY OF ORIGIN | CSIR-NPL, NEW DELHI

EXECUTIVE SUMMARY

Freestanding Carbon Nano Tube (CNT) film (Buckypaper) is a very important material for various applications i.e. batteries electrode, super capacitors, actuators, sensors, conducting reinforcement, EMI shielding and structure application. A process has been developed to prepare different size of flexible CNT papers i.e. 10 cm dia, 20 cm × 20 cm and 35 cm × 35 cm. These thin free standing papers are prepared by steps of dispersion, ultra-sonication and vacuum filtration of CNTs.

KEYWORDS

Carbon nanotube

SALIENT FEATURES

- Purity >90% (carbon content).
- IG/ID ratio >1.5 (Laser 514 nm).
- Diameter distribution 10-110 nm.
- The present technology is a cost effective approach towards the preparation of flexible freestanding paper by utilizing low cost ingredient in the processing.



APPLICATIONS

Application in Batteries and Fuel Cells, Supercapacitors, Reinforcement, Lightning protection, EMI Shielding, Armour Plating, Heat Sinks, Air and Liquid Filtration, Conductive Composites.

TECHNOLOGY BENCHMARKING

The technology has been benchmarked.

TECHNOLOGY READINESS LEVEL ASSESSMENT

TRL assessment is 7

SCALE OF DEVELOPMENT

The Pilot scale demonstration in the field conditions is successfully done and the technology prototype has been tested in the actual field conditions and addressed all the critical scaling issues.

STATUS OF COMMERCIALIZATION

No

TENTATIVE COST OF DEVELOPMENT

₹ 10.00 Lakh

4.1 AEROSPACE- ELECTRONICS AND INSTRUMENTATION & STRATEGIC SECTOR (AEISS)

INDUSTRIAL PARTNERS

No

PLANT SET UP FOR FINAL PRODUCT

No

IPR STATUS DETAILS (PATENTS/COPYRIGHT/TRADEMARK SECURITY IN INDIA/ABROAD)

No

POTENTIAL MARKET/TECHNO-ECONOMICS

Battery industry, Aerospace industry, Electronic industry, Automobile and defense sector.

ENVIRONMENTAL SAFETY CERTIFICATION

The safety aspects including environmental safety addressed and documented.

NODAL SCIENTIST DETAILS

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Chapter-4 4.2 Agriculture, Nutrition & Biotechnology (ANB)

Introduction

Under the thematic approach adopted by CSIR, Agriculture, Nutrition & Biotechnology (ANB) Theme has several thrust areas that include-Enhancing Farmers Productivity/Area/Time Through Varietal Development, Agro Technology Optimization and Process Development, Combating Malnutrition, Conservation of Rare, Endangered & Threatened Plants, Meeting the Needs of Industrial Enzymes, Synthetic Biology & Next Generation Gene edited Plants, 2G Bioethanol, Development of Alternative Poultry Feeds, Precision Organic Agriculture, Preventing Post Harvest Losses.

Lab-wise contributions

Total 11 CSIR-Labs participated under this theme have contributed to the selected 87 technologies included in this compendium. Participating Labs include AMPRI, CCMB, CFTRI, CIMAP, CSIO, IHBT, IITR, NBRI, NCL, NEIST, NIIST (Table 1).

Table 1: Lab-wise contributions

	TRL6	TRL7	TRL8	TRL9
AMPRI	1	0	0	0
CCMB	0	0	0	1
CFTRI	22	1	0	0
CIMAP	3	3	10	7
CSIO	0	1	1	0
IHBT	10	3	4	0
IITR	0	2	0	0
NBRI	0	0	0	3
NCL	0	1	0	0
NEIST	5	2	0	2
NIIST	0	3	2	0
Total	41	16	17	13

TRL Assessment

Total selected 87 technologies are included in this compendium. There are 41 technologies above TRL 6, 15 technologies are above TRL 7, 18 technologies are above TRL 8, 13 technologies are above TRL 9. TRL 6 is maximum for CSIR-CFTRI, TRL 7 is maximum for CSIR-CIMAP and CSIR-IHBT both, TRL 8 is maximum for CSIR-CIMAP and TRL 9 is maximum for CSIR-CIMAP. Table 1 shows that there are 22 technologies qualified in TRL 6 of CSIR-CFTRI, 10 technologies for CSIR-IHBT, 5 for CSIR-NEIST, 3 for CSIR-CIMAP and 1 for CSIR-AMPRI. The same Table 1. shows that 3 technologies qualified in TRL 7 for CSIR-CIMAP & CSIR-IHBT both, 2 for CSIR-NEIST,

4.2 AGRICULTURE, NUTRITION & BIOTECHNOLOGY (ANB)

CSIR-IITR & 3 for CSIR-NIIST and 1 for CSIR-CFTRI, CSIR-CSIO & CSIR-NCL. Technologies qualified in TRL 8 are 10 for CSIR-CIMAP, 4 for CSIR-IHBT, 2 for CSIR-NIIST and 1 for CSIR-CSIO. Likewise, 7 technologies qualified in TRL 9 for CSIR-CMAP, 3 for CSIR-NBRI, 2 for CSIR-NEIST and 1 for CSIR-CCMB. Figure 1. describes Lab wise contribution and TRL levels of the selected technologies.

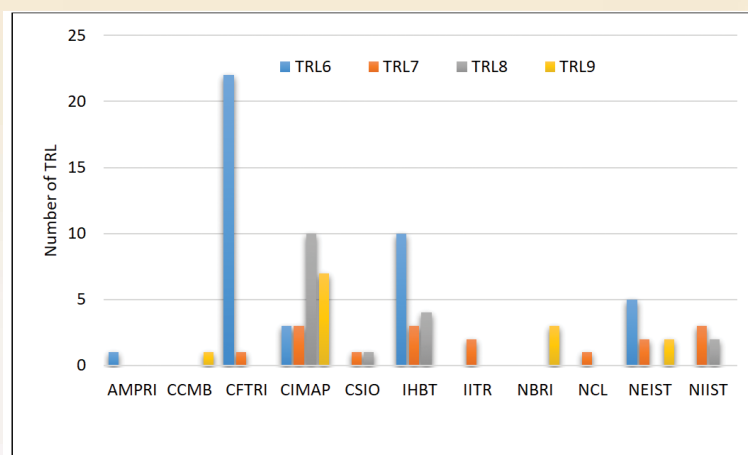


Figure 1. Lab wise contribution and TRL levels of the selected technologies.

Technologies scaled down

Total 21 technologies have been revised for TRL levels. Out of these, 13 technologies were scaled down. This includes 10 technologies of CSIR-CIMAP, 1 of CSIR-NIEST, 1 of CSIR-CSIO and 1 CSIR-NIIST.

Technologies scaled up

Out of Total 21 technologies 8 has been scaled up. Out of these 2 technologies were scaled up for CSIR-CIMAP, 3 of CSIR-IHBT, 2 of CSIR-NEIST and 1 of CSIR-NIIST.

Average cost of development and TRL

Average cost the technologies at TRL levels is shown in Figure 2. Total cost at TRL ₹ 9-18 Lakhs, at TRL ₹ 8-3 Lakhs, TRL ₹ 7-9 Lakhs, TRL 14 Lakhs.

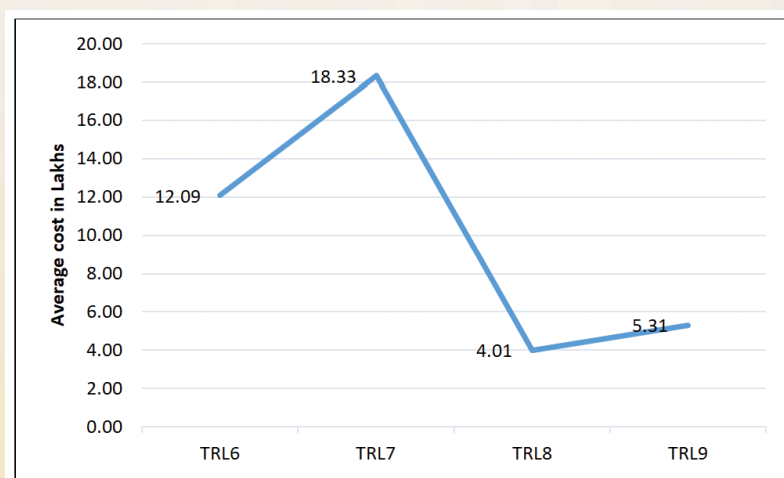


Figure 2. Average cost of the selected technologies and TRL levels.

Major highlights

All the technologies mentioned below are at TRL 9:

- **Improved Samba Mahsuri (RP BIO 226):** a bacterial blight disease resistance and low GI (Diabetic friendly) rice variety:

Improved Samba Mahsuri is resistant to bacterial blight and has the same high yield (5 tonnes/ha) and exceptional eating and cooking quality characteristics of Samba Mahsuri. Under bacterial blight infection, it gives ~ 40% more yield than the susceptible varieties like Samba Mahsuri. Improved Samba Mahsuri has low glycemic index (i.e. a value of 50.99), which is amongst the lowest value for several rice varieties tested and is thus good for diabetics. Improved Samba Mahsuri matures 7-10 days earlier than Samba Mahsuri and thus may be helpful for farmers in saving the input cost. Improved Samba Mahsuri is suitable for direct seed sowing and machine harvesting. It fetches premium price like Samba Mahsuri and other elite fine-grain type rice varieties. Suitable area of cultivation is Samba Mahsuri (BPT 5204) and other fine grain rice growing areas where bacterial blight is a constraint.

- **Mosquito repellent cream 094**

The formulation is effective against imiquimod induced psoriasis in mice. The present lead is a non-steroidal drug with plant origin and is effective topically at the conc. of 2% in cream formulation. The phytomolecules combination has a strong anti-psoriatic action against imiquimod induced psoriasis. Combining anti-psoriatic effect of the phytomolecules along with emollient effect of cream is proved to be a good approach in the management of psoriasis. This formulation is effective in psoriasis like skin inflammation by alleviating PASI score and the level of psoriasis specific cytokines along with common inflammatory cytokines.

- **Clean germ – natural aromatic floor cleaner 076**

The wide range of floor disinfectants and cleaner products are flooded in the market but most of them are contained harmful chemicals such as sodium hypochlorite, hydrogen peroxide, alkylbenzyl dimethyl ammonium chlorides and potassium hydroxide and also based on phenol or acid, which gives adverse effects on human health as well as on environment. CSIR-CIMAP has scientifically developed a unique formulation of natural aromatic floor cleaner that contains active molecules from plant sources. Lemon fresh natural floor disinfectant is intended to remove the harmful germs from the floors and providing healthy environment.

- **Painjaa-anti-inflammatory pain relieving gel 082**

CSIR-CIMAP has scientifically developed a novel formulation which contains active ingredients from natural sources for relieving muscular strain and inflammation. A plants based natural anti-inflammatory pain relieving formulation. Easily absorbed by the skin, resulting fast action. Cool to warm sensation. Non-greasy and non-staining. Provides long time effect. Safe and non-irritant to the skin.

- **Hearbal tooth paste (Zenthodent) 142**

Institute has scientifically developed a novel formula to develop a herbal toothpaste, which contains minimum number of herbal ingredients to treat periodontal problem and yellowing/staining of teeth. It is very effective to prevent cavity formation. It does not contain triclosan (carcinogen) and synthetic chemical preservatives. It is safe to use without any adverse effects. Salient features: No triclosan (a carcinogenic agent). No chemical preservative. Most effective against cavity forming bacteria. Cleansing property.

30. ENVIRONMENT FRIENDLY MULTIFUNCTIONAL BAMBOO COMPOSITE MATERIAL FOR MODERN HOUSING AND STRUCTURES

UID: TECH-THEME_2_AMPRI-001

LABORATORY OF ORIGIN | CSIR-AMPRI, BHOPAL

EXECUTIVE SUMMARY

The technology comprises know how of manufacturing multifunctional bamboo composite material for modern housing and structures using abundantly available bamboo as a raw material. The newly developed bamboo composite material can serve as a competitive, sustainable and environment friendly alternative material, useful in the construction of smart green buildings as it has very attractive features like, aesthetic appearance, acoustic & thermal insulation. It also possesses excellent stiffness and strength properties essentially required for any structural application in the construction industry. This bamboo composite material has been developed as a multifunctional construction material using a renewable resource material. The property of bamboo composite material is superior to natural products such as teak wood in terms of stiffness, strength, moisture contents, uniformity and consistency. A finished product of bamboo composite has economical advantages over the finished teak wood as well as bamboo-wood-composites of similar specifications available in the market. The developed bamboo composites material can be converted to panels of different thicknesses with different widths and lengths. These panels have applications as wall-panels, partitions, coverings, decoration laminates, floorings, thermal/ electrical insulations, doors, windows, table tops, false ceilings, roofs etc. The thicker sections can be used as structural elements such as beams, columns, trusses, benches, floor support, decks, frames for doors, windows etc. Bamboo Composites would also provide an option to create fast, affordable, and stylish disaster relief housing to help victims recover with dignity. The transfer of this technology will be advantageous to the bamboo cultivators located in various parts of India and also help in the generation of employment.



KEYWORDS

Bamboo, Composite, Alternative to teak wood, Structural properties, Employment generation potential

SALIENT FEATURES

- Multifunctional bamboo composite material for modern housing and structures.
- Bamboo as a raw material and environmental friendly.
- Can be converted to panels of different thicknesses.

APPLICATIONS

These panels have applications as wall-panels, partitions, coverings, decoration laminates, floorings, thermal/electrical insulations, doors, windows, table tops, false ceilings, roofs etc. The thicker sections can be used as structural elements such as beams, columns, trusses, benches, floor support, decks, frames for doors, windows etc. Bamboo composites would also provide an option to create fast, affordable, and stylish disaster relief housing to help victims recover with dignity.

4.2 AGRICULTURE, NUTRITION & BIOTECHNOLOGY (ANB)

TECHNOLOGY BENCHMARKING

Yes, Technology benchmarked with similar technologies and appropriate standards.

TECHNOLOGY READINESS LEVEL ASSESSMENT

TRL - 6

SCALE OF DEVELOPMENT

No pilot scale demonstration and technology prototype. Critical scale up issues are not resolved. Manufacturer has set up the plant for final product using the technology.

STATUS OF COMMERCIALIZATION

Final product based on the technology is not selling into the market.

TENTATIVE COST OF DEVELOPMENT

₹ 10.00 Lakhs

INDUSTRIAL PARTNERS

Yes

PLANT SET UP FOR FINAL PRODUCT

Yes, Industrial partner manufacturer setup the plant for final product using the technology.

IPR STATUS DETAILS (PATENTS/COPYRIGHT/TRADEMARK SECURITY IN INDIA/ABROAD)

NA

POTENTIAL MARKET/TECHNO-ECONOMICS

Potential in Construction Industry India is the world's second most populous country, housing around 18% of the world population (1.25 billion people). Despite strong growth in housing supply in recent years, India still faces a shortage of houses—especially in urban areas, which comprises 35% of the country's population. According to the 'White Paper-Indian Housing Industry' by research and consultancy firm RNCOS, it is expected that the urban shortage will reach to 34.1 million units by 2022. The government has announced its ambitious plan of "Housing for All by 2022" in urban areas and it has broadened its Credit Linked Subsidy Scheme (CLSS) to include Middle Income Group (MIG) and also offered incentives across the value chain. Bamboo Composites would provide an option to create fast, affordable, and stylish disaster relief housing to help victims recover with dignity. The properties of bamboo composites are superior to natural products such as teak wood in terms of strength, moisture contents and dimensional stability under different environment, uniformity and consistency. A finished product of bamboo composite has economical advantages over the finished teak wood as well as bamboo-wood-composites of similar specifications available in the market.

ENVIRONMENTAL SAFETY CERTIFICATION

No environmental safety aspects addressed and documented.

NODAL SCIENTIST DETAILS

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31. IMPROVED SAMBA MAHSURI (RP BIO 226): A BACTERIAL BLIGHT DISEASE RESISTANT AND LOW GI (DIABETIC FRIENDLY) RICE VARIETY

UID: TECH-THEME_2_CCMB-002

LABORATORY OF ORIGIN | CSIR-CCMB HYDERABAD

EXECUTIVE SUMMARY

- Improved Samba Mahsuri is resistant to bacterial blight and has the same high yield (5 tonnes/ha) and exceptional eating and cooking quality characteristics of Samba Mahsuri.
- Under bacterial blight infection, it gives ~ 40% more yield than the susceptible varieties like Samba Mahsuri.
- Improved Samba Mahsuri has low glycemic index (i.e. a value of 50.99), which is amongst the lowest value for several rice varieties tested (reported by ICMR-National Institute of Nutrition (ICMR-NIN) through clinical model study) and is thus good for diabetics.
- Improved Samba Mahsuri matures 7-10 days earlier than Samba Mahsuri and thus may be helpful for farmers in saving the input cost.
- Improved Samba Mahsuri is suitable for direct seed sowing and machine harvesting.
- It fetches premium price like Samba Mahsuri and other elite fine-grain type rice varieties.
- Suitable area of cultivation is Samba Mahsuri (BPT5204) and other fine grain rice growing areas where bacterial blight is a constraint.

KEYWORDS

Improved samba mahsuri, Diabetic-friendly, Bacterial-blight resistant

SALIENT FEATURES

- Resistant to bacterial blight, has low glycemic index.
- Suitable for direct seed sowing.

APPLICATIONS

For a company involved in rice grain business, Improved Samba Mahsuri can be sold in the market as diabetic friendly rice (low GI rice) at about ₹ 80-100/Kg.

TECHNOLOGY BENCHMARKING

Yes, Technology benchmarked with similar technologies and appropriate standards.

TECHNOLOGY READINESS LEVEL ASSESSMENT

TRL - 9

SCALE OF DEVELOPMENT

Yes, registered as new variety, Distribution of seeds to farmer and farmers use the seed for every growing season.

STATUS OF COMMERCIALIZATION

Yes, Final product based on the technology started selling into the market.

4.2 AGRICULTURE, NUTRITION & BIOTECHNOLOGY (ANB)

TENTATIVE COST OF DEVELOPMENT

₹ 50 Lakhs

INDUSTRIAL PARTNERS

Grain has been licensed already to 1 company in Chhattisgarh and another MoA is under process of signing.

PLANT SET UP FOR FINAL PRODUCT

Yes, Industrial partner manufacturer setup the plant for final product using the technology.

IPR STATUS DETAILS (PATENTS/COPYRIGHT/TRADEMARK SECURITY IN INDIA/ABROAD)

Yes

POTENTIAL MARKET/TECHNO-ECONOMICS

In the absence of bacterial blight infection, Improved Samba Mahsuri yields the same as Samba Mahsuri. Under conditions of bacterial blight infection, it yields 20 to 50% more than Samba Mahsuri. Taking a minimum of 20% yield advantage under conditions of infection, an extra ton/hectare of paddy is produced. This gives an extra income to farmers without any additional investment. Improved Samba Mahsuri has low glycemic index (i.e. a value of 50.99), which is amongst the lowest value for several rice varieties tested and is thus good for diabetics. Farmers can expect higher price for Improved Samba Mahsuri.

ENVIRONMENTAL SAFETY CERTIFICATION

Yes. Environmental safety aspects addressed and documented.

NODAL SCIENTIST DETAILS

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32. NUTRA CHIKKI WITH ADDED SPIRULINA

UID: TECH-THEME_2_CFTRI-009

LABORATORY OF ORIGIN | CSIR-CFTRI, MYSORE

EXECUTIVE SUMMARY

Chikki is a ready to eat traditional sweet snack consumed by all sections of population in India. The product can be utilized under the label ready to eat sweet snack or enriched snacks and supplied to school children or pre-schoolers or any other specific target group as a ready to eat food and a concentrated source of energy and protein, as it is very popular. Initiatives to use Spirulina to combat malnutrition have been taken up in various parts of India and clinical studies have been carried out establishing the beneficial effects of inclusion of Spirulina in diet. The main ingredients of the product are Jaggery, peanuts, Spirulina powder and natural flavor. The Chikki could be produced with added Spirulina at the levels of 2 to 5%. The chikki prepared with added Spirulina has a declared shelf life of 3 months. The product is sensorially acceptable.

KEYWORDS

Spirulina, Chikki, Groundnut, Jaggery, Nutrition

SALIENT FEATURES

- The chikki prepared with added Spirulina has a declared shelf life of 3 months.
- Ingredients of the product are Jaggery, peanuts, Spirulina powder.

APPLICATIONS

The main ingredients of the product are Jaggery, Peanuts, Spirulina powder and natural flavor. The Chikki could be produced with added Spirulina at the levels of 2 to 5%.

TECHNOLOGY BENCHMARKING

Yes, Technology benchmarked with similar technologies and appropriate standards.

TECHNOLOGY READINESS LEVEL ASSESSMENT

TRL - 6

SCALE OF DEVELOPMENT

No pilot scale demonstration and technology prototype. Critical scale up issues are not resolved.

STATUS OF COMMERCIALIZATION

Final product based on the technology not selling into the market.

TENTATIVE COST OF DEVELOPMENT

₹ 0.50 Lakhs

INDUSTRIAL PARTNERS

No

PLANT SET UP FOR FINAL PRODUCT

No

4.2 AGRICULTURE, NUTRITION & BIOTECHNOLOGY (ANB)

IPR STATUS DETAILS (PATENTS/COPYRIGHT/TRADEMARK SECURITY IN INDIA/ABROAD)

NA

POTENTIAL MARKET/TECHNO-ECONOMICS

The Indian traditional foods are well accepted by all sections of society and hence could be excellent vehicle to deliver the nutritional benefits of Spirulina. Spirulina is known for its characteristic odour which puts a lot of limitation on its acceptance by consumers. A Chikki formulation was developed to overcome the major challenge of Sensory acceptance of Spirulina and deliver the Spirulina at the recommended level (by FSSAI) of about 1 g per serving. The product has been found to be well accepted by the consumers, especially children. The addition of Spirulina to traditional Chikki improves the protein and micronutrient profile of the product making it suitable for combating the Malnutrition among children, adolescent girls, pregnant and lactating mothers. Spirulina chikki is positioned in the Traditional Food niche of the market. The product takes the advantage of the consumers' preference for traditional foods to meet their nutritional needs. The product is also positioned to cater to the nutritional programmes of Women and Child Development Dept. of Govt. of India targeted at combating malnutrition among children, adolescent girls, pregnant and lactating mothers.

ENVIRONMENTAL SAFETY CERTIFICATION

No. Environmental safety aspects not addressed and documented.

NODAL SCIENTIST DETAILS

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33. A PROCESS FOR FLAVOUR ESSENCE FROM DECALEPIS HAMILTONII /HEMIDESMUS INDICUS ROOTS

UID: TECH-THEME_2_CFTRI-012

LABORATORY OF ORIGIN | CSIR-CFTRI, MYSORE

EXECUTIVE SUMMARY

The proposed technology is based on a natural product from plant sources. The flavour extract is free from solvents. So this is a strong positive feature of the technology for edible purposes. Nutraceutical potential has been attributed to the various bioactive constituents analysed in the prepared formulation which are otherwise known for their antioxidant contribution. Moreover, it can be used directly with appropriate dilutions as per end users requirements for imparting flavour to food products.

KEYWORDS

Tuber, Vanillin isomer, Flavonoids, Phenolics, Antioxidant activity

SALIENT FEATURES

- Natural product from plant sources.
- The technology for edible purposes.

APPLICATIONS

Nutraceutical potential and Health benefits.

TECHNOLOGY BENCHMARKING

Yes, Technology benchmarked with similar technologies and appropriate standards.

TECHNOLOGY READINESS LEVEL ASSESSMENT

TRL - 6

SCALE OF DEVELOPMENT

No pilot scale demonstration and technology prototype. Critical scale up issues are not resolved.

STATUS OF COMMERCIALIZATION

No. Final product based on the technology not is selling into the market.

TENTATIVE COST OF DEVELOPMENT

₹ 2.0 Lakhs

INDUSTRIAL PARTNERS

No

PLANT SET UP FOR FINAL PRODUCT

No

4.2 AGRICULTURE, NUTRITION & BIOTECHNOLOGY (ANB)

IPR STATUS DETAILS (PATENTS/COPYRIGHT/TRADEMARK SECURITY IN INDIA/ABROAD)
NA

POTENTIAL MARKET/TECHNO-ECONOMICS

A good number of flavour incorporated products are available in the Indian market. For example, Bakery products are generally sold in the name of instant flavour mixes available in the market are with usually with strawberry, badam, pista, etc. We recommend to incorporate *D. hamiltonii*/*H. indicus* root tubers extract rich in 2-Hydroxy 4-Methoxy Benzaldehyde, (a vanillin isomer) which not only imparts health benefits but also gives the necessary flavour similar to that of vanilla essence.

ENVIRONMENTAL SAFETY CERTIFICATION

Environmental safety aspects not addressed and documented.

NODAL SCIENTIST DETAILS

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34. A PROCESS FOR THE PREPARATION OF β -CAROTENE AND MINERAL FORTIFIED BUNS

UID: TECH-THEME_2_CFTRI-016

LABORATORY OF ORIGIN | CSIR-CFTRI, MYSORE

EXECUTIVE SUMMARY

The buns were fortified with natural source of β -carotene, iron and zinc from synthetic food grade sources. The natural source of β -carotene used does not require any pre- processing and is feasible for large scale processing. By substituting the hydrogenated fat used in this bakery product provides other vitamins in addition to β -carotene. Bioaccessibility of minerals and β -carotene is enhances in the buns. The retention of β -carotene on processing and stability on storage was satisfactory. The quality of buns was found to be acceptable. The process know-how of the buns has a practical application in the production of micronutrient rich buns which serves one of the national strategies of using a sustainable food based approaches for alleviation of existing multi- micronutrient deficiencies.

KEYWORDS

Carotene, Buns, Fortified

SALIENT FEATURES

- Natural source of β -carotene used does not require any pre-processing and is feasible for large scale processing.
- The retention of β -carotene on processing and stability on storage was satisfactory.

APPLICATIONS

The buns were fortified with natural source of β -carotene, iron and zinc from synthetic food grade sources.

TECHNOLOGY BENCHMARKING

Yes, Technology benchmarked with similar technologies and appropriate standards.

TECHNOLOGY READINESS LEVEL ASSESSMENT

TRL - 6

SCALE OF DEVELOPMENT

No pilot scale demonstration and technology prototype. Critical scaling issues not resolved.

STATUS OF COMMERCIALIZATION

Final product based on the technology is not selling into the market.

TENTATIVE COST OF DEVELOPMENT

₹ 25 Lakhs

INDUSTRIAL PARTNERS

No

PLANT SET UP FOR FINAL PRODUCT

No

4.2 AGRICULTURE, NUTRITION & BIOTECHNOLOGY (ANB)

IPR STATUS DETAILS (PATENTS/COPYRIGHT/TRADEMARK SECURITY IN INDIA/ABROAD)
NA

POTENTIAL MARKET/TECHNO-ECONOMICS

The product can be used for alleviation of iron, zinc and vitamin A deficiencies for children of 2-10 Yrs.
The product is highly liked by children.

ENVIRONMENTAL SAFETY CERTIFICATION

Environmental safety aspects not addressed and documented.

NODAL SCIENTIST DETAILS

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35. EDIBLE RICE BRAN

UID: TECH-THEME_2_CFTRI-018

LABORATORY OF ORIGIN | CSIR-CFTRI, MYSORE

EXECUTIVE SUMMARY

Rice bran is a nutraceutical rich and highly nutritious by-product of rice milling industry. The CSIR-CFTRI has developed a process where full fat rice bran prone to oxidative rancidity is stabilized by enzymatic treatment. The enzymatically processed product contains nutraceutical components such as co-enzyme Q10, oryzanol, tocopherols and soluble fibres. The product is palatable and can be incorporated into various food products as a functional component. The product contains about 15% protein. Improved functional properties for better retention of the nutrients and nutraceuticals with improved digestibility. Improved attributes such as dispersibility, water absorption capacity, protein solubility was noticed. Soluble fiber was enhanced and can be incorporated as a source of fiber. The product has a shelf life of 3 months at room temperature.

KEYWORDS

Rice bran, Soluble fiber, Vitamin E, Oryzanol, CoQ10

SALIENT FEATURES

A Nutraceutical rich and highly nutritious by-product of rice milling industry.

APPLICATIONS

The product is palatable and can be incorporated into various food products as a functional component. The product contains about 15% protein. Improved functional properties for better retention of the nutrients and nutraceuticals with improved digestibility. Improved attributes such as dispersibility, water absorption capacity, protein solubility was noticed. Soluble fiber was enhanced and can be incorporated as a source of fiber.

TECHNOLOGY BENCHMARKING

Yes, Similar technology already available and with appropriate slandered.

TECHNOLOGY READINESS LEVEL ASSESSMENT

TRL - 6

SCALE OF DEVELOPMENT

No, pilot scale demonstration, technology prototype and critical scaling issues not done.

STATUS OF COMMERCIALIZATION

No, Final product based on the technology not started selling into the market.

TENTATIVE COST OF DEVELOPMENT

₹ 15 Lakhs

INDUSTRIAL PARTNERS

No

PLANT SET UP FOR FINAL PRODUCT

No

IPR STATUS DETAILS (PATENTS/COPYRIGHT/TRADEMARK SECURITY IN INDIA/ABROAD).
NA

POTENTIAL MARKET/TECHNO-ECONOMICS

India is the second largest producer of rice in the world, with annual production exceeding 152 million metric tons (FAOSTAT, 2012, <http://faostat.fao.org>). Each year, 63 to 76 million tons of rice bran (rice milling by-product) is produced in the world and more than 90% of rice bran is sold cheaply as animal feed. Therefore stabilized edible rice bran will be a good candidate to fulfill the rising demand for organic & natural ingredients coupled with increased alertness to prevent and control the lifestyle diseases such as diabetes, cardiovascular diseases among others. Edible rice bran can be incorporated in various food formulations for improving the nutritional quality of the products: Soups, beverages, bread, cookies and vermicelli (breakfast ingredient).

ENVIRONMENTAL SAFETY CERTIFICATION

Environmental safety aspects not addressed and documented.

NODAL SCIENTIST DETAILS

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36. SOY PROTEIN HYDROLYSATE

UID: TECH-THEME_2_CFTRI-021

LABORATORY OF ORIGIN | CSIR-CFTRI, MYSORE

EXECUTIVE SUMMARY

CFTRI has a process for the preparation of protein hydrolysates using single enzyme and double enzyme systems. These are covered by two Indian patents. The product characteristics are:

- Creamish yellow powder with free flowing characteristics.
- Concentrated source of protein.
- Easily digestible and freely soluble in water.
- 2% w/v solution in distilled water is almost neutral.
- Can be an ingredient for preparation of high protein and speciality foods like high Protein beverages, geriatric foods and athletic foods.
- The process results in a 36% yield on flour basis. The degree of hydrolysis is 33%.
- The trypsin inhibitor content is reduced by ~ 70% and there is no detection of Lipoxxygenase or urease activities. These are undesirable factors, which are Antinutritional factors in soy flour. The presence of lipoxxygenase leads to the production.
- There were no losses in the amino acid composition due to processing. Thus it was Possible to retain the nutritive value of the protein in the hydrolysate.
- The bitterness perception minimum threshold was 0.2 gm/100 ml.

KEYWORDS

Protein hydrolysate, Soybean, Enzyme hydrolysed protein, Soluble protein, Protein powder.

SALIENT FEATURES

- Preparation of protein hydrolysates using single enzyme and double enzyme systems.
- There is no detection of Lipoxxygenase or urease activities. These are undesirable factors, which are anti-nutritional factors in soy flour.

APPLICATIONS

Easily digestible and freely soluble in water.

TECHNOLOGY BENCHMARKING

Yes, Technology benchmarked with similar technologies and appropriate standards.

TECHNOLOGY READINESS LEVEL ASSESSMENT

TRL - 6

SCALE OF DEVELOPMENT

No pilot scale demonstration and technology prototype. Critical scaling issues not resolved.

STATUS OF COMMERCIALIZATION

Final product based on the technology has not selling into the market.

TENTATIVE COST OF DEVELOPMENT

₹ 50.0 Lakhs

4.2 AGRICULTURE, NUTRITION & BIOTECHNOLOGY (ANB)

INDUSTRIAL PARTNERS

No

PLANT SET UP FOR FINAL PRODUCT

No

IPR STATUS DETAILS (PATENTS/COPYRIGHT/TRADEMARK SECURITY IN INDIA/ABROAD)

NA

POTENTIAL MARKET/TECHNO-ECONOMICS

Protein and health supplements, beverage industry, food industry, flavour industry, animal feed industry, geriatric and convalescent foods, sports nutrition.

ENVIRONMENTAL SAFETY CERTIFICATION

Environmental safety aspects not addressed and documented.

NODAL SCIENTIST DETAILS

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37. SESAME DEHULLING – DRY PROCESS

UID: TECH-THEME_2_CFTRI-023

LABORATORY OF ORIGIN | CSIR-CFTRI, MYSORE

EXECUTIVE SUMMARY

The novel dry dehulling process developed by CFTRI uses indigenous dehuller (Patented in India - 'A DEVICE FOR DRY MILLING OF GRAINS', DEL/380/2001). The sesame seeds are dehulled in this machine without any pre-conditioning. The dehulled seeds are water washed, dried and graded. This process does not use any chemical/bleaching agents. Water requirement is also lower compared to the wet dehulling processes. The quality and yield of dehulled seeds is comparable to any other process in practice. The dry milling process does not need any pre-conditioning or any chemical treatment prior to or during dehulling. The dehuller is patented. The product obtained by this process is natural and retains all nutrients. The product is free from any chemical residues. Dehulling systems (Ref. US patent No: 4693903) uses simultaneous water and steam injection in to an attrition mill. MASETO process of Spain, comprises of a seven step processing method with water-steam conditioning. The CFTRI dry dehulling process does not need any preconditioning. The dehuller is also indigenous and patented.

KEYWORDS

Sesame seeds, Dehulled sesame, Protein rich seeds, Low anti-nutrient seeds, Low oxalic acid sesame.

SALIENT FEATURES

- The sesame seeds are dehulled in this machine without any pre-conditioning.
- The dehulled seeds are water washed, dried and graded.
- This process does not use any chemical/bleaching agents.
- Water requirement is also lower compared to the wet dehulling processes.

APPLICATIONS

The dry milling process does not need any pre-conditioning or any chemical treatment prior to or during dehulling.

TECHNOLOGY BENCHMARKING

Yes, Technology benchmarked with similar technologies and appropriate standards.

TECHNOLOGY READINESS LEVEL ASSESSMENT

TRL - 6

SCALE OF DEVELOPMENT

No pilot scale demonstration and technology prototype. Critical scaling issues not resolved.

STATUS OF COMMERCIALIZATION

Final product based on the technology is not selling into the market.

TENTATIVE COST OF DEVELOPMENT

₹ 2.0 Lakhs

INDUSTRIAL PARTNERS

No

4.2 AGRICULTURE, NUTRITION & BIOTECHNOLOGY (ANB)

PLANT SET UP FOR FINAL PRODUCT

No

IPR STATUS DETAILS (PATENTS/COPYRIGHT/TRADEMARK SECURITY IN INDIA/ABROAD)

Patented in India - 'A DEVICE FOR DRY MILLING OF GRAINS', DEL/380/2001

Dehulling systems - US patent No: 4693903.

POTENTIAL MARKET/TECHNO-ECONOMICS

Export market, bakeries, food industry, confectioneries.

ENVIRONMENTAL SAFETY CERTIFICATION

Environmental safety aspects not addressed and documented.

NODAL SCIENTIST DETAILS

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38. DEHYDRATED SHELF STABLE EGG CUBE

UID: TECH-THEME_2_CFTRI-026

LABORATORY OF ORIGIN | CSIR-CFTRI, MYSORE

EXECUTIVE SUMMARY

Egg cube is a novel product made by using egg liquid, binders and permitted additives.

- Egg cubes can be prepared separately from whole egg liquid, albumin and yolk.
- The mix was processed under optimized conditions and made in to pieces.
- The pieces were dried under optimum conditions and packed under metalized pouches.
- The product further can be used in curry preparation. During curry preparation, the shelf stable pieces are rehydrated. The ultimate use of the product is like cube, which can be used for various culinary preparations.
- Can be made available in different flavours e.g. garlic, onion and pepper.
- Nutritionally rich with quality protein and shelf stable for 6 month at room temperature.
- No chemical/synthetic preservative added.



KEYWORDS

Convenience and protein rich product, Ready to use shelf stable, No chemical/synthetic preservative

SALIENT FEATURES

- Novel product made by using egg liquid, binders and permitted additives.
- Can be made available in different flavours e.g. garlic, onion and pepper.

APPLICATIONS

- Nutritionally rich with quality protein and shelf stable for 6 month at room temperature.
- No chemical/synthetic preservative added.

TECHNOLOGY BENCHMARKING

Yes, Technology benchmarked with similar technologies and appropriate standards.

TECHNOLOGY READINESS LEVEL ASSESSMENT

TRL - 6

SCALE OF DEVELOPMENT

No pilot scale demonstration and technology prototype. Critical scaling issues not resolved.

STATUS OF COMMERCIALIZATION

Final product based on the technology is not selling into the market.

4.2 AGRICULTURE, NUTRITION & BIOTECHNOLOGY (ANB)

TENTATIVE COST OF DEVELOPMENT

₹ 17.0 Lakhs

INDUSTRIAL PARTNERS

No

IPR STATUS DETAILS (PATENTS/COPYRIGHT/TRADEMARK SECURITY IN INDIA/ABROAD)

NA

PLANT SET UP FOR FINAL PRODUCT

No

POTENTIAL MARKET/TECHNO-ECONOMICS

The product has excellent market potential since product contains sufficient quantity of carbohydrate, protein and mineral content, etc. Unavailability of such a convenience snack product in the present market ensures that these products would be a potential money earner and would satisfy the needs of fast food joints, housewives and restaurants.

ENVIRONMENTAL SAFETY CERTIFICATION

Environmental safety aspects not addressed and documented.

NODAL SCIENTIST DETAILS

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39. SHELF-STABLE EGG CRUNCHY BITES

UID: TECH-THEME_2_CFTRI-027

LABORATORY OF ORIGIN | CSIR-CFTRI, MYSORE

EXECUTIVE SUMMARY

Egg crunchy bite is a novel product made by using egg liquid (albumin and yolk), binders and permitted additives. The mix was processed under optimized conditions and made in to pieces. The pieces were dried under optimum conditions. The roasted product was coated with optimized level of spices and packed under metalized pouches and shelf stable for 6 month at room temperature. Nutritionally rich with quality protein and highly acceptable ready to use crunchy snack food. No chemical/synthetic preservative, shelf stable for 6 months.



KEYWORDS

Egg crunchy cube, Nutritionally rich with quality protein, Ready to use shelf stable, No chemical/synthetic preservative.

SALIENT FEATURES

- No chemical/synthetic preservative
- Shelf stable for 6 months.

APPLICATIONS

Nutritionally rich with quality protein and highly acceptable ready to use crunchy snack food.

TECHNOLOGY BENCHMARKING

Yes, Technology benchmarked with similar technologies and appropriate standards.

TECHNOLOGY READINESS LEVEL ASSESSMENT

TRL - 6

SCALE OF DEVELOPMENT

No pilot scale demonstration and technology prototype. Critical scale up issues not resolved.

STATUS OF COMMERCIALIZATION

Final product based on the technology is not selling into the market.

TENTATIVE COST OF DEVELOPMENT

₹ 14.0 Lakhs

INDUSTRIAL PARTNERS

No

PLANT SET UP FOR FINAL PRODUCT

No

IPR STATUS DETAILS (PATENTS/COPYRIGHT/TRADEMARK SECURITY IN INDIA/ABROAD)

NA

POTENTIAL MARKET/TECHNO-ECONOMICS

Egg crunchy bite is a novel ready to use snack product and nutritionally rich with quality protein. It has potential market due to unavailability such product in the present market.

ENVIRONMENTAL SAFETY CERTIFICATION

Environmental safety aspects not addressed and documented.

NODAL SCIENTIST DETAILS

Director

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40. SHELF-STABLE CHICKEN TIT BITS

UID: TECH-THEME_2_CFTRI-032

LABORATORY OF ORIGIN | CSIR-CFTRI, MYSORE

EXECUTIVE SUMMARY

Chicken meat in the desired shape is prepared and marinated with the minimal spice mix and salt. Separate batter with the standardized composition is made ready and the marinated pieces are fried after battering. The product is spiced to the required level and then packed after cooling in the suggested type of packaging material. As a ready-to-eat product of convenience to be eaten after warming along with the meal as a side dish or to be eaten as such along with drinks and beverages. Nutritionally balanced and are highly palatable No chemical/synthetic preservative added. Product may be packed in flexible metallized pouches of low moisture and low oxygen transmission.



KEYWORDS

Shelf stable side dish product, Nutritionally balanced, Ready to eat, No chemical/synthetic preservative.

SALIENT FEATURES

- Prepared and marinated with the minimal spice mix and salt.
- Nutritionally balanced and are highly palatable.

APPLICATIONS

As a ready-to-eat product of convenience to be eaten after warming along with the meal as a side dish or to be eaten as such along with drinks and beverages. Nutritionally balanced and are highly palatable.

TECHNOLOGY BENCHMARKING

Yes, Technology benchmarked with similar technologies and appropriate standards.

TECHNOLOGY READINESS LEVEL ASSESSMENT

TRL - 6

SCALE OF DEVELOPMENT

No pilot scale demonstration and technology prototype. Critical scale up issues not resolved.

STATUS OF COMMERCIALIZATION

Final product based on the technology is not selling into the market.

TENTATIVE COST OF DEVELOPMENT

₹ 12.0 Lakhs

4.2 AGRICULTURE, NUTRITION & BIOTECHNOLOGY (ANB)

INDUSTRIAL PARTNERS

No

PLANT SET UP FOR FINAL PRODUCT

No

IPR STATUS DETAILS (PATENTS/COPYRIGHT/TRADEMARK SECURITY IN INDIA/ABROAD)

NA

POTENTIAL MARKET/TECHNO-ECONOMICS

Chicken tit bit is a novel ready to use side dish product and nutritionally rich with quality protein. It has potential market due to unavailability such product in the present market.

ENVIRONMENTAL SAFETY CERTIFICATION

Environmental safety aspects not addressed and documented.

NODAL SCIENTIST DETAILS

Director

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41. VIRGIN COCONUT OIL (VCO)

UID: TECH-THEME_2_CFTRI-040

LABORATORY OF ORIGIN | CSIR-CFTRI, MYSORE

EXECUTIVE SUMMARY

Virgin Coconut Oil (VCO) has been used as both food and medicinal purpose. Recently, modern medical research confirmed that it has many health benefits and also useful in cosmetics. At present, VCO is processed by traditional fermentation process and by heat treatment. The present work is aimed at the production of virgin coconut oil by wet process (without any heat treatment). During this process, the freshly matured coconuts are deshelled, pared and disintegrated by passing through rotary wedge coconut cutter. The obtained coconut gratings are pressed in a screw/hydraulic press to extract coconut milk, which is the raw material for production of VCO. Coconut milk is treated with an enzyme protease of 0.15% concentration to break the emulsion, further it was centrifuged to separate coconut cream and aqueous layer. The coconut cream is subjected to freezing and thawing followed by centrifugation to get a clear VCO. In order to increase the yield and clarity of the product, it was subjected to field assisted microwave and adsorption column. Physico-chemical properties and free fatty acid profile was evaluated according to AOCS standard method. The sensory evaluation is also studied to ensure the product acceptability.

KEYWORDS

Virgin coconut oil, Coconut milk, Freezing.

SALIENT FEATURES

- VCO is processed by traditional fermentation process and by heat treatment.
- Physico-chemical properties and free fatty acid profile was evaluated according to AOCS standard method. The sensory evaluation is also studied to ensure the product acceptability.

APPLICATIONS

- Food and medicinal purpose.
- Useful in cosmetics.

TECHNOLOGY BENCHMARKING

Yes, Technology benchmarked with similar technologies and appropriate standards.

TECHNOLOGY READINESS LEVEL ASSESSMENT

TRL - 6

SCALE OF DEVELOPMENT

No pilot scale demonstration and technology prototype. Critical scale up issues not resolved.

STATUS OF COMMERCIALIZATION

Final product based on the technology is not selling into the market.

TENTATIVE COST OF DEVELOPMENT

₹ 10.0 Lakhs

4.2 AGRICULTURE, NUTRITION & BIOTECHNOLOGY (ANB)

INDUSTRIAL PARTNERS

No

PLANT SET UP FOR FINAL PRODUCT

No

IPR STATUS DETAILS (PATENTS/COPYRIGHT/TRADEMARK SECURITY IN INDIA/ABROAD)

NA

POTENTIAL MARKET/TECHNO-ECONOMICS

The India is third dominant leader of coconut producers in globally. In 2016, global market for organic virgin coconut oil was valued approximately \$ 685 million. It is expected to increase at the rate of CAGR of around 11% over the next few years.

ENVIRONMENTAL SAFETY CERTIFICATION

Environmental safety aspects not addressed and documented.

NODAL SCIENTIST DETAILS

Director

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42. PROCESS FOR THE PRODUCTION OF SPRAY DRIED COCONUT MILK POWDER

UID: TECH-THEME_2_CFTRI-041

LABORATORY OF ORIGIN | CSIR-CFTRI, MYSORE

EXECUTIVE SUMMARY

Coconut whey is one of the by-products during virgin coconut oil process. Whey proteins as functional and nutritional ingredients in food, pharmaceutical and cosmetic industries. It has high digestibility and therefore have high biological value, which is a measurement of high nitrogen availability and utilization. In addition, it has an excellent amino acid balance, including both essential and sulphur containing amino acids. These properties highlight the nutritional quality and effectiveness of whey proteins both as a direct dietary supplement and can be formulated as a skimmed milk powder. The process will involve shelling, paring, grating and squeezing to obtain coconut milk. The coconut fat will be separated from the milk and the remaining skim milk will be formulated with or without cow milk along with other ingredients followed by spray drying to obtain coconut milk powder. Storage and sensory analysis will be done for the developed product along with packaging requirements for achieving the expected shelf life.



KEYWORDS

Shelling, Paring, Grating, Spray drying

SALIENT FEATURES

- By-products during virgin coconut oil process.
- It has high digestibility and therefore have high biological value, which is a measurement of high nitrogen availability and utilization.

APPLICATIONS

Nutritional quality and effectiveness of whey proteins both as a direct dietary supplement and can be formulated as a skimmed milk powder.

TECHNOLOGY BENCHMARKING

Yes, Technology benchmarked with similar technologies and appropriate standards.

TECHNOLOGY READINESS LEVEL ASSESSMENT

TRL - 6

SCALE OF DEVELOPMENT

No pilot scale demonstration and technology prototype. Critical scale up issues not resolved.

4.2 AGRICULTURE, NUTRITION & BIOTECHNOLOGY (ANB)

STATUS OF COMMERCIALIZATION

Final product based on the technology is not selling into the market.

TENTATIVE COST OF DEVELOPMENT

₹ 10.0 Lakhs

INDUSTRIAL PARTNERS

No

PLANT SET UP FOR FINAL PRODUCT

No

IPR STATUS DETAILS (PATENTS/COPYRIGHT/TRADEMARK SECURITY IN INDIA/ABROAD)

NA

POTENTIAL MARKET/TECHNO-ECONOMICS

It is the base for all Asian curries, gravies and can be used in the preparation of different sweets where coconut flavour is suitable and it is estimated that the industry will usher in a stable growth space. The global market for coconut milk powder was valued at 800 Mn USD in 2018 and is expected to grow at a CAGR of 4.7% during 2019-2025.

ENVIRONMENTAL SAFETY CERTIFICATION

Environmental safety aspects not addressed and documented.

NODAL SCIENTIST DETAILS

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43. QUICK COOKING GERMINATED DEHYDRATED PULSES

UID: TECH-THEME_2_CFTRI-042

LABORATORY OF ORIGIN | CSIR-CFTRI, MYSORE

EXECUTIVE SUMMARY

Pulses are germinated, processed after the specific treatments and dehydrated to obtain the dried pulses. These can be used as cooked pulses or used in the traditional manner. They just need to be boiled in water for a short time. After cooking they can be salted and seasoned or further added into sambar, which can be used as food adjuncts along with roti, chapati or cooked rice as is traditionally practiced. The new products cook within 10-12 minutes saving thereby time, energy and drudgery to the housewives. Moreover, they are shelf stable (6 months) unlike the fresh germinated pulsed whose shelf is very short (less than a day or two).

KEYWORDS

Pulses, Cooking, Germinated, Convenience food.

SALIENT FEATURES

- Pulses are germinated, processed after the specific treatments and dehydrated to obtain the dried pulses.
- This product is protein rich, nutritious, time saving, shelf stable and convenient to prepare.

APPLICATIONS

These can be used as cooked pulses or used in the traditional manner. They just need to be boiled in water for a short time. The new products cook within 10-12 minutes saving thereby time, energy and drudgery to the housewives.

TECHNOLOGY BENCHMARKING

Yes, Technology benchmarked with similar technologies and appropriate standards.

TECHNOLOGY READINESS LEVEL ASSESSMENT

TRL - 6

SCALE OF DEVELOPMENT

No pilot scale demonstration and technology prototype. Critical scale up issues not resolved.

STATUS OF COMMERCIALIZATION

Final product based on the technology is not selling into the market.

TENTATIVE COST OF DEVELOPMENT

₹ 2.0 Lakhs

INDUSTRIAL PARTNERS

No

4.2 AGRICULTURE, NUTRITION & BIOTECHNOLOGY (ANB)

PLANT SET UP FOR FINAL PRODUCT

No

IPR STATUS DETAILS (PATENTS/COPYRIGHT/TRADEMARK SECURITY IN INDIA/ABROAD)
NA

POTENTIAL MARKET/TECHNO-ECONOMICS

This product is protein rich, nutritious, time saving, shelf stable and convenient to prepare.

ENVIRONMENTAL SAFETY CERTIFICATION

Environmental safety aspects not addressed and documented.

NODAL SCIENTIST DETAILS

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44. EXPANDED HORSE GRAM

UID: TECH-THEME_2_CFTRI-044

LABORATORY OF ORIGIN | CSIR-CFTRI, MYSORE

EXECUTIVE SUMMARY

Pulses like Bengal gram and Peas are available in puffed/expanded form but not Horse Gram because raw Horse gram does not give puffed or expanded product at normal moisture content and conventional puffing conditions. Studies have indicated that suitable pretreatment is necessary for expansion of Horse gram, which is followed by HTST to give an acceptable expanded product, which can be a RTE snack as such or offer appropriate spice coating. The product has less anti-nutritional factors and have good digestibility.

KEYWORDS

Horse gram, Pulses, Puffed/Expanded

SALIENT FEATURES

- Product at normal moisture content and conventional puffing conditions.
- This protein rich processed horse gram can be used as RTE snack after suitable spice coating and also in preparation of products like snacks bars.

APPLICATIONS

The product has less anti-nutritional factors and have good digestibility.

TECHNOLOGY BENCHMARKING

Yes, Technology benchmarked with similar technologies and appropriate standards.

TECHNOLOGY READINESS LEVEL ASSESSMENT

TRL - 6

SCALE OF DEVELOPMENT

No pilot scale demonstration and technology prototype, Critical scale up issues not resolved.

STATUS OF COMMERCIALIZATION

Final product based on the technology is not selling into the market.

TENTATIVE COST OF DEVELOPMENT

₹ 4.0 Lakhs

INDUSTRIAL PARTNERS

No

PLANT SET UP FOR FINAL PRODUCT

No

IPR STATUS DETAILS (PATENTS/COPYRIGHT/TRADEMARK SECURITY IN INDIA/ABROAD)

NA

4.2 AGRICULTURE, NUTRITION & BIOTECHNOLOGY (ANB)

POTENTIAL MARKET/TECHNO-ECONOMICS

This protein rich processed horse gram can be used as RTE snack after suitable spice coating and also in preparation of products like snacks bars.

ENVIRONMENTAL SAFETY CERTIFICATION

Environmental safety aspects not addressed and documented.

NODAL SCIENTIST DETAILS

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45. TURMERIC POWDER FROM FRESH TURMERIC RHIZOME

UID: TECH-THEME_2_CFTRI-048

LABORATORY OF ORIGIN | CSIR-CFTRI, MYSORE

EXECUTIVE SUMMARY

Turmeric is an important tropical spice primarily valued for its color, aroma, antioxidant property and powder could be used in food, perfumery and pharmaceutical industries. This ground spice is used as a condiment. It is an essential ingredient of curry powders and is extensively used in traditional medicines. Traditional Indian medicine claims the use of its powder against biliary disorders, anorexia, cough etc. The process developed by CSIR-CFTRI reduces processing time and losses. The heat treatment of rhizomes enhances the extractability of high colour and flavor of constituents. Essentially, the process involves cleaning and washing of rhizomes, slicing, drying (in a mechanical dryer) and pulverizing. The process time reduced to about 24 hours.

KEYWORDS

Turmeric, Fresh rhizome, Nutraceutical

SALIENT FEATURES

- Reduces processing time and losses.
- Essentially, the process involves cleaning and washing of rhizomes, slicing, drying (in a mechanical dryer) and pulverizing. The process time reduced to about 24 hours.

APPLICATIONS

It is an essential ingredient of curry powders and is extensively used in traditional medicines. Traditional Indian medicine claims the use of its powder against biliary disorders, anorexia, cough etc.

TECHNOLOGY BENCHMARKING

Yes, Technology benchmarked with similar technologies and appropriate standards.

TECHNOLOGY READINESS LEVEL ASSESSMENT

TRL - 7

SCALE OF DEVELOPMENT

Yes, pilot scale demonstration, technology prototype and critical scale up issues resolved.

STATUS OF COMMERCIALIZATION

Final product based on the technology is not selling into the market.

TENTATIVE COST OF DEVELOPMENT

₹ 10.0 Lakhs

INDUSTRIAL PARTNERS

No

4.2 AGRICULTURE, NUTRITION & BIOTECHNOLOGY (ANB)

PLANT SET UP FOR FINAL PRODUCT

No

IPR STATUS DETAILS (PATENTS/COPYRIGHT/TRADEMARK SECURITY IN INDIA/ABROAD)
NA

POTENTIAL MARKET/TECHNO-ECONOMICS

Indian market is considered to have a monopoly in the trade as it is the largest producer of turmeric in the world. India exports 43% dry, 4% fresh, 42% powder, and 12% other types of turmeric. The product has excellent market potential considering the increase in its production, availability and growing popularity. The forecast for turmeric market in India suggests a growth with a CAGR of 1% in terms of consumption.

ENVIRONMENTAL SAFETY CERTIFICATION

Environmental safety aspects not addressed and documented.

NODAL SCIENTIST DETAILS

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46. RAGI MALT-ENZYME RICH

UID: TECH-THEME_2_CFTRI-049

LABORATORY OF ORIGIN | CSIR-CFTRI, MYSORE

EXECUTIVE SUMMARY

Finger millet is a good source of dietary carbohydrates, calcium and micronutrients and hence, its malt is also a good source of protein, carbohydrates and many other nutrients besides the hydrolytic enzymes. Malted ragi flour can be used in preparation of weaning food, infant food, geriatric food, and also in milk based as well as alcoholic beverage formulations. It can be used as amylase rich food (ARF) and such other supplementary foods. Finger millet is widely grown in India. Has an Amylase activity in the rate of 300-400 maltose units. The product rich in amylase is useful in reducing the dietary bulk. Bio accessibility of calcium is about 70%. Can complements with other legume proteins and can be used in nutritional supplementation products.

KEYWORDS

Finger millet, Malt, Infant food

SALIENT FEATURES

The product rich in amylase is useful in reducing the dietary bulk.

APPLICATIONS

Bio accessibility of calcium is about 70%. Can complements with other legume proteins and can be used in nutritional supplementation products.

TECHNOLOGY BENCHMARKING

Yes, Technology benchmarked with similar technologies and appropriate standards.

TECHNOLOGY READINESS LEVEL ASSESSMENT

TRL - 6

SCALE OF DEVELOPMENT

No pilot scale demonstration and technology prototype. Critical scale up issues not resolved.

STATUS OF COMMERCIALIZATION

Final product based on the technology is not selling into the market.

TENTATIVE COST OF DEVELOPMENT

₹ 2.0 Lakhs

INDUSTRIAL PARTNERS

No

PLANT SET UP FOR FINAL PRODUCT

No

4.2 AGRICULTURE, NUTRITION & BIOTECHNOLOGY (ANB)

IPR STATUS DETAILS (PATENTS/COPYRIGHT/TRADEMARK SECURITY IN INDIA/ABROAD)
NA

POTENTIAL MARKET/TECHNO-ECONOMICS

This mix can find a ready market with the specialty foods including baby foods. Baby food market in India is valued at ₹ 150 billion and more than 25% is of baby cereals. The market is expected to grow at a CAGR of over 11%. Cost of malted ragi flour being less, it can also aid in better market penetration and expand the market.

ENVIRONMENTAL SAFETY CERTIFICATION

Environmental safety aspects not addressed and documented.

NODAL SCIENTIST DETAILS

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47. RTE LOW FAT FLAKED JOWAR SNACKS (SWEET AND SAVOURY)

UID: TECH-THEME_2_CFTRI-050

LABORATORY OF ORIGIN | CSIR-CFTRI, MYSORE

EXECUTIVE SUMMARY

Jowar is one of the important cereal crops of the country and its consumption is limited to traditional consumers. The major bottleneck is the non-availability of convenient/shelf stable/new generation products. Jowar or sorghum snack is a Ready-To-Eat (RTE) product with either sweet or salt spicy taste. It is suitable as a low-fat snack because frying in oil has been omitted to provide a good shelf life without sacrificing the attractive taste and texture of eating a crispy snack. The product can be considered as a health food and low in cost. The product can be stored for 4 months at ambient conditions with good shelf stability.

KEYWORDS

Jowar, Snacks, Healthy food

SALIENT FEATURES

It is suitable as a low-fat snack because frying in oil has been omitted to provide a good shelf life without sacrificing the attractive taste and texture of eating a crispy snack.

APPLICATIONS

The product can be considered as a health food and low in cost. The product can be stored for 4 months at ambient conditions with good shelf stability.

TECHNOLOGY BENCHMARKING

Yes, Technology benchmarked with similar technologies and appropriate standards.

TECHNOLOGY READINESS LEVEL ASSESSMENT

TRL - 6

SCALE OF DEVELOPMENT

No pilot scale demonstration and technology prototype. Critical scale up issues not resolved.

STATUS OF COMMERCIALIZATION

Final product based on the technology is not selling into the market.

TENTATIVE COST OF DEVELOPMENT

₹ 2.0 Lakhs

INDUSTRIAL PARTNERS

No

PLANT SET UP FOR FINAL PRODUCT

No

4.2 AGRICULTURE, NUTRITION & BIOTECHNOLOGY (ANB)

IPR STATUS DETAILS (PATENTS/COPYRIGHT/TRADEMARK SECURITY IN INDIA/ABROAD)
NA

POTENTIAL MARKET/TECHNO-ECONOMICS

Healthy snacks market in India is witnessing greater demand and variety/alternate grains are finding better acceptance. Packaged snack food market segment in India is valued over 5000 Mn USD and is growing annually by 7.5%. Fat free Jowar flakes, the healthy alternative is estimated to have a huge market potential both with traditional and non-traditional consumers.

ENVIRONMENTAL SAFETY CERTIFICATION

Environmental safety aspects not addressed and documented.

NODAL SCIENTIST DETAILS

Director

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48. NEERA BOTTLING

UID: TECH-THEME_2_CFTRI-058

LABORATORY OF ORIGIN | CSIR-CFTRI, MYSORE

EXECUTIVE SUMMARY

The major problem facing the coconut plantations in India is the 'mite' disease. The state governments are taking necessary steps to contain/eliminate this problem by various means. However, the coconut farmers are putting up with a lot of hardship by way of loss of yield of the produce. To sustain the loss of revenue, the farmers have resorted to tapping the trees for collection of neera and selling it to realize some revenue for their livelihood. Freshly tapped neera ferments very quickly and gets converted to 'toddy'. A thermally process has been developed to preserve neera in glass bottles.

KEYWORDS

Neera, Preservation, Bottling, Packing.

SALIENT FEATURES

A thermally process has been developed to preserve neera in glass bottles.

APPLICATIONS

Preserve neera in glass bottles.

TECHNOLOGY BENCHMARKING

Yes, Technology benchmarked with similar technologies and appropriate standards.

TECHNOLOGY READINESS LEVEL ASSESSMENT

TRL - 6

SCALE OF DEVELOPMENT

No pilot scale demonstration and technology prototype. Critical scale up issues not resolved.

STATUS OF COMMERCIALIZATION

Final product based on the technology is not selling into the market.

TENTATIVE COST OF DEVELOPMENT

₹ 2.0 Lakhs

INDUSTRIAL PARTNERS

No

PLANT SET UP FOR FINAL PRODUCT

No

IPR STATUS DETAILS (PATENTS/COPYRIGHT/TRADEMARK SECURITY IN INDIA/ABROAD)

NA

4.2 AGRICULTURE, NUTRITION & BIOTECHNOLOGY (ANB)

POTENTIAL MARKET/TECHNO-ECONOMICS

Neera has low glycaemic index and possesses essential minerals, making it a health drink. It could be positioned as healthy alternative to soft drinks. Coconut neera can also be aimed in the market for the targeted section like health conscious people, diabetic patients, kids and youngsters as a natural nutritive product to replace soft drinks, also sugar and honey after value addition.

ENVIRONMENTAL SAFETY CERTIFICATION

Environmental safety aspects not addressed and documented.

NODAL SCIENTIST DETAILS

Director

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49. CONTINUOUS VIBRO FLUIDIZED BED ROASTER USING FLUE GAS

UID: TECH-THEME_2_CFTRI-060

LABORATORY OF ORIGIN | CSIR-CFTRI, MYSORE

EXECUTIVE SUMMARY

Roasters are generally of batch-type. There are a few fluidized bed roasters which are electrically heated. However, because of the high volume of air required for fluidization the process is too slow to reach and maintain roasting temperatures and thus uneconomical. CSIR-CFTRI's design adapts Vibro-fluidization method wherein vibration assists in fluidization (and hence uniformity), needs less air and LPG heating makes it almost instantaneous in reaching roasting temperatures.

KEYWORDS

NA

SALIENT FEATURES

Vibro- fluidization method wherein vibration assists in fluidization (and hence uniformity).

APPLICATIONS

Needs less air and LPG heating makes it almost instantaneous, in reaching roasting temperature.

TECHNOLOGY BENCHMARKING

Yes, Technology benchmarked with similar technologies and appropriate standards.

TECHNOLOGY READINESS LEVEL ASSESSMENT

TRL - 6

SCALE OF DEVELOPMENT

No pilot scale demonstration and technology prototype. Critical scale up issues not resolved.

STATUS OF COMMERCIALIZATION

Final product based on the technology is not selling into the market.

TENTATIVE COST OF DEVELOPMENT

₹ 2.0 Lakhs

INDUSTRIAL PARTNERS

No

PLANT SET UP FOR FINAL PRODUCT

No

IPR STATUS DETAILS (PATENTS/COPYRIGHT/TRADEMARK SECURITY IN INDIA/ABROAD)

NA

4.2 AGRICULTURE, NUTRITION & BIOTECHNOLOGY (ANB)

POTENTIAL MARKET/TECHNO-ECONOMICS

Roasting is one of the major operations in food processing which decides the overall quality of food. Roasting is also highly energy intensive and time consuming. Uniformity of roasting also being a critical parameter, the vibro fluidized bed roaster offers a good solution. In view of the versatility of the units and advantages it can offer, it is estimated that the industrial requirement for such roasters would be about 100 nos per year.

ENVIRONMENTAL SAFETY CERTIFICATION

Environmental safety aspects not addressed and documented.

NODAL SCIENTIST DETAILS

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50. MAIZE DRY MILLING SYSTEM

UID: TECH-THEME_2_CFTRI-061

LABORATORY OF ORIGIN | CSIR-CFTRI, MYSORE

EXECUTIVE SUMMARY

Maize dry milling is done to get the anatomical parts of the grain viz., germ, bran and endosperm. The process involves multi – stage conditioning of the grains with water, sequentially milling them in four stages, aspiration, size and gravity separation of the products of milling to get germ, grits (3 sizes), bran and meal (powder of entire grain). The system employs indigenous machinery. Modifications have been made to the rice polisher to make it suitable for maize milling and the said modifications are covered by a patent. The ToT involves giving the details of the patent on payment of license fees. The yield of products and co – products are comparable to that obtained in large capacity imported machinery. The minimum economic capacity of the plant is 1TPH based on maize input.

KEYWORDS

Maize dry milling, Degerming, Debranning, Hominy grits, Maize grits

SALIENT FEATURES

Involves multi – stage conditioning of the grains with water, sequentially milling them in four stages, aspiration, size and gravity separation of the products of milling to get germ, grits (3 sizes), bran and meal (powder of entire grain).

APPLICATIONS

Maize dry milling is done to get the anatomical parts of the grain viz., germ, bran and endosperm.

TECHNOLOGY BENCHMARKING

Yes, Technology benchmarked with similar technologies and appropriate standards.

TECHNOLOGY READINESS LEVEL ASSESSMENT

TRL - 6

SCALE OF DEVELOPMENT

No pilot scale demonstration and technology prototype. Critical scale up issues not resolved.

STATUS OF COMMERCIALIZATION

Final product based on the technology is not selling into the market.

TENTATIVE COST OF DEVELOPMENT

₹ 70.0 Lakhs

INDUSTRIAL PARTNERS

No

PLANT SET UP FOR FINAL PRODUCT

No

4.2 AGRICULTURE, NUTRITION & BIOTECHNOLOGY (ANB)

IPR STATUS DETAILS (PATENTS/COPYRIGHT/TRADEMARK SECURITY IN INDIA/ABROAD)
N/A

POTENTIAL MARKET/TECHNO-ECONOMICS

Since the machinery are available indigenously, all rice mill machinery manufacturers can be licensees. The market for such mills is pan India and in other developing countries, where maize is grown and consumed predominantly.

ENVIRONMENTAL SAFETY CERTIFICATION

Environmental safety aspects not addressed and documented.

NODAL SCIENTIST DETAILS

Director

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51. INTEGRATED RUBBER ROLL SHELLER HULLER

UID: TECH-THEME_2_CFTRI-062

LABORATORY OF ORIGIN | CSIR-CFTRI, MYSORE

EXECUTIVE SUMMARY

Almost 30% of the paddy grown is milled in small capacity Engelberg huller in a single stage. However, during this process, the by – products viz., husk and bran are obtained as a mixture and hence no further value addition is possible. In addition, due to higher milling pressures, the yield of rice is lower. To obviate these disadvantages, an Integrated rubber roll sheller huller system was designed. In this system, to the existing huller, a rubber roll sheller with cascading aspirator is added. The dehusking and polishing systems are separate and thus value of husk and bran is increased. The bran from these mills are suitable for solvent extraction of oil. All components are available indigenously in the country. The capacity of the system is around 300 – 500 kg/h.

KEYWORDS

Maize dry milling, Degerming, Debranning, Hominy grits, Maize grits

SALIENT FEATURES

- Integrated rubber roll sheller huller system was designed.
- A rubber roll sheller with cascading aspirator is added.
- Separate dehusking and polishing system.
- Increases the value of husk and bran.

APPLICATIONS

The bran from these mills are suitable for solvent extraction of oil.

TECHNOLOGY BENCHMARKING

Yes, Technology benchmarked with similar technologies and appropriate standards.

TECHNOLOGY READINESS LEVEL ASSESSMENT

TRL - 6

SCALE OF DEVELOPMENT

No pilot scale demonstration and technology prototype. Critical scale up issues not resolved.

STATUS OF COMMERCIALIZATION

Final product based on the technology is not selling into the market.

TENTATIVE COST OF DEVELOPMENT

₹ 0.50 Lakhs

INDUSTRIAL PARTNERS

No

PLANT SET UP FOR FINAL PRODUCT

No

4.2 AGRICULTURE, NUTRITION & BIOTECHNOLOGY (ANB)

IPR STATUS DETAILS (PATENTS/COPYRIGHT/TRADEMARK SECURITY IN INDIA/ABROAD)
N/A

POTENTIAL MARKET/TECHNO-ECONOMICS

The Engelberg hullers are not used predominantly nowadays, even in rural areas. Thus, the potential for such systems is virtually non-existent. Hence, it is suggested that this technology may be put up under “Free Technologies” of the Institute.

ENVIRONMENTAL SAFETY CERTIFICATION

Environmental safety aspects not addressed and documented.

NODAL SCIENTIST DETAILS

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52. TINY RICE MILL

UID: TECH-THEME_2_CFTRI-067

LABORATORY OF ORIGIN | CSIR-CFTRI, MYSORE

EXECUTIVE SUMMARY

Nutrition of rice is a function of the amount of bran retained on the kernel. But, rice with low amount of polish (with higher nutrition) does not have a longer shelf life. In order to deliver rice with better nutrition and taste, a Tiny Rice Mill having a capacity of 10 – 12 kg/h, was designed. This system uses only ½ HP (~370 W) single phase motor and thus has lesser power consumption than a domestic mixer – grinder. The system has a rubber roll sheller which dehusks the paddy. From the milled material, husk is aspirated and collected separately through a cyclone. The rice is then polished to the desired level by the customer. The system can be used as and when required depending on the need, thus delivering rice with higher nutrition content as compared to commercially available rice.

KEYWORDS

Tiny rice mill, Domestic rice mill, Lab rice mill, Nutritious rice

SALIENT FEATURES

Deliver rice with better nutrition and taste, a Tiny Rice Mill having a capacity of 10 – 12 kg/h, was designed.

APPLICATIONS

The system has a rubber roll sheller which dehusks the paddy.

TECHNOLOGY BENCHMARKING

Yes, Technology benchmarked with similar technologies and appropriate standards.

TECHNOLOGY READINESS LEVEL ASSESSMENT

TRL - 6

SCALE OF DEVELOPMENT

No, pilot scale demonstration and technology prototype. Critical scale up issues not resolved.

STATUS OF COMMERCIALIZATION

Final product based on the technology is not selling into the market.

TENTATIVE COST OF DEVELOPMENT

₹ 2.50 Lakhs

INDUSTRIAL PARTNERS

No

PLANT SET UP FOR FINAL PRODUCT

No

IPR STATUS DETAILS (PATENTS/COPYRIGHT/TRADEMARK SECURITY IN INDIA/ABROAD)

N/A

4.2 AGRICULTURE, NUTRITION & BIOTECHNOLOGY (ANB)

POTENTIAL MARKET/TECHNO-ECONOMICS

This system has excellent potential since rice with a better nutritional profile is made available to the customer. This system also finds use in rice mills, research institutes, and educational institutes apart from domestic market.

ENVIRONMENTAL SAFETY CERTIFICATION

Environmental safety aspects not addressed and documented.

NODAL SCIENTIST DETAILS

Director

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53. PARBOILING AND DRYING PLANT (2 & 4 TPH)

UID: TECH-THEME_2_CFTRI-069

LABORATORY OF ORIGIN | CSIR-CFTRI, MYSORE

EXECUTIVE SUMMARY

Out of the total paddy grown in the country, almost 50% of it is parboiled prior to milling. The Institute's highly popular method is known as CFTRI's hot soaking and steaming method in industry circles. In order to encourage indigenous manufacture of these plants, the design drawings of the 2 & 4 TPH parboiling and drying plant was undertaken and completed successfully. The drawings of the soaking tanks, steaming tanks, LSU dryer along with structures for the entire plant are included in the technology PACKAGE.

KEYWORDS

Parboiling of paddy, Drying of paddy, Paddy, Parboiled rice

SALIENT FEATURES

Hot soaking and steaming method in industry circles.

APPLICATIONS

The Institute's highly popular method is known as CFTRI's hot soaking and steaming method in industry circles.

TECHNOLOGY BENCHMARKING

Yes, Technology benchmarked with similar technologies and appropriate standards.

TECHNOLOGY READINESS LEVEL ASSESSMENT

TRL - 6

SCALE OF DEVELOPMENT

No pilot scale demonstration and technology prototype. Critical scale up issues not resolved.

STATUS OF COMMERCIALIZATION

Final product based on the technology is not selling into the market.

TENTATIVE COST OF DEVELOPMENT

₹ 1.0 Lakhs

INDUSTRIAL PARTNERS

No

PLANT SET UP FOR FINAL PRODUCT

No

IPR STATUS DETAILS (PATENTS/COPYRIGHT/TRADEMARK SECURITY IN INDIA/ABROAD)

N/A

4.2 AGRICULTURE, NUTRITION & BIOTECHNOLOGY (ANB)

POTENTIAL MARKET/TECHNO-ECONOMICS

Presently, the machinery for parboiling and drying have undergone a lot of changes with IoT and AI technologies dictating a major chunk. In addition, with major advances in the material of construction, the demand for better and hygienic materials has rendered this technology (although it was the star during its period of development) redundant.

ENVIRONMENTAL SAFETY CERTIFICATION

Environmental safety aspects not addressed and documented.

NODAL SCIENTIST DETAILS

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54. CONTINUOUS RAGI MUDDE MAKING MACHINE

UID: TECH-THEME_2_CFTRI-070

LABORATORY OF ORIGIN | CSIR-CFTRI, MYSORE

EXECUTIVE SUMMARY

Traditionally, Ragi mudde (finger millet ball) is being consumed since many centuries in India, particularly in south India. Due to the low glycemic index of ragi and the rich nutrients like calcium, iron and dietary fiber, it is considered as wonder food. This is one of the best foods for all cross sections of the society from small children to old age people, hardworking labourers to the executives working in offices, from poor people to the rich. It is also good for the diabetics. There was a long felt need to develop the ragi mudde making process and mechanize the same. Though several organizations attempted only CSIR-CFTRI succeeded in making continuous ragi mudde machine.

KEYWORDS

Ragi Mudde, Glycemic index, Dietary fiber, Diabetics

SALIENT FEATURES

Ragi mudde making process and mechanize by making continuous ragi mudde machine.

APPLICATIONS

This is one of the best foods for all cross sections of the society from small children to old age people, hardworking labourers to the executives working in offices, from poor people to the rich. It is also good for the diabetics. There was a long felt need to develop the ragi mudde making process and mechanize the same.

TECHNOLOGY BENCHMARKING

Yes, Technology benchmarked with similar technologies and appropriate standards.

TECHNOLOGY READINESS LEVEL ASSESSMENT

TRL - 6

SCALE OF DEVELOPMENT

No pilot scale demonstration and technology prototype. Critical scale up issues not resolved.

STATUS OF COMMERCIALIZATION

Final product based on the technology is not selling into the market.

TENTATIVE COST OF DEVELOPMENT

₹ 20.0 Lakhs

INDUSTRIAL PARTNERS

No

PLANT SET UP FOR FINAL PRODUCT

No

4.2 AGRICULTURE, NUTRITION & BIOTECHNOLOGY (ANB)

IPR STATUS DETAILS (PATENTS/COPYRIGHT/TRADEMARK SECURITY IN INDIA/ABROAD)
N/A

POTENTIAL MARKET/TECHNO-ECONOMICS

India accounts for 85% of world production of Ragi. Ragi mudde is one of the most popular traditional healthy foods, prepared even on large scale. But making ragi mudde is a very tedious and skilful art. Nearly 60 to 70% of ragi flour produced in Karnataka is utilized for the preparation of ragi mudde. The mudde making unit is useful for schools (mid meal program), hostels, departmental and industrial canteens, ashrams, central service canteens including railways and jails. The requirement per annum is estimated at 10-15 numbers.

ENVIRONMENTAL SAFETY CERTIFICATION

Environmental safety aspects not addressed and documented.

NODAL SCIENTIST DETAILS

Director

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55. CRACKNIL – HERBAL ANTI-CRACK CREAM

UID: TECH-THEME_2_CIMAP-071

LABORATORY OF ORIGIN | CSIR-CIMAP, LUCKNOW

EXECUTIVE SUMMARY

Cracknil is an effective anti-cracks cream to cure cracks in heels, chapped hands, dry skin and eczema etc. It is a purely herbal formulation derived from age-old traditional skin recipe containing turmeric (haldi). The cream is non-toxic and makes the skin soft and glowing. Cracknil also exhibits significant anti-fungal effect against the most commonly occurring fungal pathogens.

KEYWORDS

Herbal, Anti-crack, Heels

SALIENT FEATURES

Purely herbal formulation derived from age-old traditional skin recipe containing turmeric.

APPLICATIONS

- Anti-fungal activity against commonly occurring fungal pathogens.
- Softening and moisturizing agent for dry skin with plant based active ingredients.
- Safe to use with no-side effect and suitable for all the age groups.

TECHNOLOGY BENCHMARKING

Yes, Technology benchmarked with similar technologies and appropriate standards.

TECHNOLOGY READINESS LEVEL ASSESSMENT

TRL - 8

SCALE OF DEVELOPMENT

YES, pilot scale demonstration, technology prototype and critical scaling issues resolved.

STATUS OF COMMERCIALIZATION

YES, Final product based on the technology is selling into the market.

TENTATIVE COST OF DEVELOPMENT

₹ 2.0 Lakhs (Approximate)

INDUSTRIAL PARTNERS

No

PLANT SET UP FOR FINAL PRODUCT

Industrial partner manufacturer setup the plant for final product using the technology.



4.2 AGRICULTURE, NUTRITION & BIOTECHNOLOGY (ANB)

IPR STATUS DETAILS (PATENTS/COPYRIGHT/TRADEMARK SECURITY IN INDIA/ABROAD)

Yes

POTENTIAL MARKET/TECHNO-ECONOMICS

Pharma Industries, Herbal companies and MSME start-ups.

ENVIRONMENTAL SAFETY CERTIFICATION

No. Environmental safety aspects not addressed and documented.

NODAL SCIENTIST DETAILS

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56. LIP BALM- LIP CARE FORMULATION

UID: TECH-THEME_2_CIMAP-072

LABORATORY OF ORIGIN | CSIR-CIMAP, LUCKNOW

EXECUTIVE SUMMARY

Lip balm jointly developed by CSIR-CIMAP and CSIR-NBRI with natural color and without petroleum jelly is mainly used to protect the lips from dryness by forming a moisture resistant film on lips. Herbal extract and essential oils are main active ingredients, used for moisture retention and prevent from bacterial infections. Fruity strawberry flavor gives the feel of mental comfort. USP of the Product. Vitamin-E enriched formulation, keeps the lips hydrated and nourished Protects from bacterial infection. Imparts natural pinkish tint to the lips.



KEYWORDS

Lip balm, Natural lip care, Petroleum jelly free and Herbal colour

SALIENT FEATURES

- Vitamin-E enriched formulation, keeps the lips hydrated and nourished.
- Protects from bacterial infection.
- Imparts natural pinkish tint to the lips.

APPLICATIONS

Natural colour and without petroleum jelly is mainly used to protect the lips from dryness by forming a moisture resistant film on lips.

TECHNOLOGY BENCHMARKING

Yes, Technology benchmarked with similar technologies and appropriate standards.

TECHNOLOGY READINESS LEVEL ASSESSMENT

TRL - 6

SCALE OF DEVELOPMENT

Yes, pilot scale demonstration, technology prototype and critical scaling issues resolved.

STATUS OF COMMERCIALIZATION

Final product based on the technology is not selling into the market.

TENTATIVE COST OF DEVELOPMENT

₹ 5.0 Lakhs

INDUSTRIAL PARTNERS

Yes

4.2 AGRICULTURE, NUTRITION & BIOTECHNOLOGY (ANB)

PLANT SET UP FOR FINAL PRODUCT

Industrial partner manufacturer setup the plant for final product using the technology.

IPR STATUS DETAILS (PATENTS/COPYRIGHT/TRADEMARK SECURITY IN INDIA/ABROAD)
CSIR-CIMAP and CSIR-NBRI Know-how.

POTENTIAL MARKET/TECHNO-ECONOMICS

Pharma Industries, Herbal companies and MSME start-ups.

ENVIRONMENTAL SAFETY CERTIFICATION

Yes. Environmental safety aspects are addressed and documented.

NODAL SCIENTIST DETAILS

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57. ACNE PREVENTIVE FACE WASH- ANTI ACNE HERBAL FORMULATION

UID: TECH-THEME_2_CIMAP-073

LABORATORY OF ORIGIN | CSIR-CIMAP, LUCKNOW

EXECUTIVE SUMMARY

Acne preventive face wash is an aloe vera based herbal formulation, to control the acne and pimples. Besides cleanser, it also works as skin conditioner. The combination of plant derived compounds and essential oils stimulate the senses which provide freshness and relaxation from skin related problems.

KEYWORDS

Herbal acne face wash, Aloe vera, Pimples

SALIENT FEATURES

- Aloe vera based and a unique combination of plant extracts and essential oils.
- Controls pimples and acne.
- Acts as a cleanser, removes impurities and purifies pores.

APPLICATIONS

Aloe vera based herbal formulation, to control the acne and pimples.

TECHNOLOGY BENCHMARKING

Yes, Similar technology already available and with appropriate standards.

TECHNOLOGY READINESS LEVEL ASSESSMENT

TRL - 8

SCALE OF DEVELOPMENT

Pilot scale demonstration and technology prototype developed. Critical scaling issues resolved.

STATUS OF COMMERCIALIZATION

Final product based on the technology is not selling into the market.

TENTATIVE COST OF DEVELOPMENT

₹ 5.0 Lakhs

INDUSTRIAL PARTNERS

No

PLANT SET UP FOR FINAL PRODUCT

No



4.2 AGRICULTURE, NUTRITION & BIOTECHNOLOGY (ANB)

IPR STATUS DETAILS (PATENTS/COPYRIGHT/TRADEMARK SECURITY IN INDIA/ABROAD)
CSIR-CIMAP Know-how.

POTENTIAL MARKET/TECHNO-ECONOMICS

Pharma Industries, Herbal companies and MSME start-ups.

ENVIRONMENTAL SAFETY CERTIFICATION

Yes. Environmental safety aspects are addressed and documented.

NODAL SCIENTIST DETAILS

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58. FLOMOP- HERBAL INSECT REPELLENT FLOOR MOPPING FORMULATION

UID: TECH-THEME_2_CIMAP-074

LABORATORY OF ORIGIN | CSIR-CIMAP, LUCKNOW

EXECUTIVE SUMMARY

Flomop is a bio-safe scented insect repellent herbal floor mopping formulation based on essential oils. It repels most of the household insects and leave lemon fresh smell. Phenol based floor mopping solutions available in the market are unsafe for skin and eyes and also toxic to human being.

KEYWORDS

Insect repellent, Floor moping, Essential oil



SALIENT FEATURES

- Essential oils based natural insect repellent floor moping formulation.
- Pleasant long lasting aroma.
- Safe to use, non toxic, environmental friendly.

APPLICATIONS

It repels most of the household insects and leave lemon fresh smell.

TECHNOLOGY BENCHMARKING

No

TECHNOLOGY READINESS LEVEL ASSESSMENT

TRL - 9

SCALE OF DEVELOPMENT

Pilot scale demonstration and technology prototype developed. Critical scaling issues resolve.

STATUS OF COMMERCIALIZATION

Final product based on the technology is selling into the market.

TENTATIVE COST OF DEVELOPMENT

₹ 1.0 Lakhs

INDUSTRIAL PARTNERS

No

PLANT SET UP FOR FINAL PRODUCT

Yes, Industrial partner/manufacturer setup the plant for final product using the technology.

IPR STATUS DETAILS (PATENTS/COPYRIGHT/TRADEMARK SECURITY IN INDIA/ABROAD)

Yes

4.2 AGRICULTURE, NUTRITION & BIOTECHNOLOGY (ANB)

POTENTIAL MARKET/TECHNO-ECONOMICS

Pharma Industries, Herbal companies and MSME start-ups.

ENVIRONMENTAL SAFETY CERTIFICATION

Yes. Environmental safety aspects are addressed and documented.

NODAL SCIENTIST DETAILS

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59. SWABEE- NATURAL SURFACE DISINFECTANT

UID: TECH-THEME_2_CIMAP-075

LABORATORY OF ORIGIN | CSIR-CIMAP, LUCKNOW

EXECUTIVE SUMMARY

Swabee is an essential oil based powerful disinfectant which kills most of the disease causing germs. It is non-corrective, bio-safe and can be used on surfaces like kitchen platform, cabinets, floor, ceramic tiles, bathrooms etc. It gives a healthy environment to all researchers and health professionals.

KEYWORDS

Broad spectrum, Anti-microbial, Surface disinfectant

SALIENT FEATURES

- Broad spectrum anti-microbial formulation.
- Contain herbal bio-actives.
- Safe to use, nontoxic, non-irritant to skin.

APPLICATIONS

Cleaning, Surface disinfectant

TECHNOLOGY BENCHMARKING

Yes, Technology benchmarked with similar technologies and appropriate standards.

TECHNOLOGY READINESS LEVEL ASSESSMENT

TRL - 8

SCALE OF DEVELOPMENT

- Relevant firm contacted for scale up.
- Prototype tested in actual field conditions/production/manufacturing/operational environment.
- Prototype addressed all scaling issues.

STATUS OF COMMERCIALIZATION

Final Product based on the technology has not started selling into the market.

TENTATIVE COST OF DEVELOPMENT

₹ 2.0 Lakhs (Approximate)

INDUSTRIAL PARTNERS

No

PLANT SET UP FOR FINAL PRODUCT

No



4.2 AGRICULTURE, NUTRITION & BIOTECHNOLOGY (ANB)

IPR STATUS DETAILS (PATENTS/COPYRIGHT/TRADEMARK SECURITY IN INDIA/ABROAD)

Patented in US, Bangladesh, Malaysia, Indonesia, Japan, Canada and India.

POTENTIAL MARKET/TECHNO-ECONOMICS

Pharma Industries, Herbal companies and MSME start-ups.

ENVIRONMENTAL SAFETY CERTIFICATION

No. Environmental safety aspects not addressed and documented.

NODAL SCIENTIST DETAILS

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60. CLEANGERM- NATURAL AROMATIC FLOOR CLEANER

UID: TECH-THEME_2_CIMAP-076

LABORATORY OF ORIGIN | CSIR-CIMAP, LUCKNOW

EXECUTIVE SUMMARY

The wide range of floor disinfectants and cleaner products are flooded in the market but most of them are contained harmful chemicals such as sodium hypochlorite, hydrogen peroxide, alkylbenzyl dimethyl ammonium chlorides and potassium hydroxide and also based on phenol or acid, which gives adverse effects on human health as well as on environment. CSIR-CIMAP has scientifically developed a unique formulation of natural aromatic floor cleaner that contains active molecules from plant sources. Lemon fresh natural floor disinfectant is intended to remove the harmful germs from the floors and providing healthy environment.

KEYWORDS

Anti-bacterial, Aromatic, Floor cleaner

SALIENT FEATURES

- Essential oils based formulation to kill the micro-organism from the floor.
- Long lasting lemon fresh aroma provide pleasant atmosphere.
- Acid and phenol free floor cleaner.

APPLICATIONS

Floor cleaner

TECHNOLOGY BENCHMARKING

Yes, Technology benchmarked with similar technologies and appropriate standards.

TECHNOLOGY READINESS LEVEL ASSESSMENT

TRL - 8

SCALE OF DEVELOPMENT

- Relevant firm contacted for scale up.
- Prototype tested in actual field conditions/production/manufacturing/operational environment.
- Prototype addressed all scaling issues.

STATUS OF COMMERCIALIZATION

Final Product based on the technology has started selling into the market.

TENTATIVE COST OF DEVELOPMENT

₹ 3.0 Lakhs (Approximate)



4.2 AGRICULTURE, NUTRITION & BIOTECHNOLOGY (ANB)

INDUSTRIAL PARTNERS

No

PLANT SET UP FOR FINAL PRODUCT

No

IPR STATUS DETAILS (PATENTS/COPYRIGHT/TRADEMARK SECURITY IN INDIA/ABROAD)
CSIR-CIMAP Know-how.

POTENTIAL MARKET/TECHNO-ECONOMICS

Herbal companies, Soap industries and MSME start-ups.

ENVIRONMENTAL SAFETY CERTIFICATION

Yes. Environmental safety aspects are addressed and documented.

NODAL SCIENTIST DETAILS

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61. MOSPRAY- HERBAL MOSQUITO REPELLENT SPRAY

UID: TECH-THEME_2_CIMAP-077

LABORATORY OF ORIGIN | CSIR-CIMAP, LUCKNOW

EXECUTIVE SUMMARY

Mospray is natural plant extracts and essential oil based mosquito repellent formulation, which repels the mosquitoes as well as house flies. Mospray is a safe, eco-friendly and very effective herbal formulation. It is easy in use and also can be used as room freshener.

KEYWORDS

Mosquito repellent, Herbal, Room spray

SALIENT FEATURES

- Essential oils based natural mosquito repellent room spray.
- Doesn't contain DEET.
- Bio-degradable, Eco-friendly, Safe in use.

APPLICATIONS

Mosquito repellent, Room spray.

TECHNOLOGY BENCHMARKING

Yes, Technology benchmarked with similar technologies and appropriate standards.

TECHNOLOGY READINESS LEVEL ASSESSMENT

TRL - 8

SCALE OF DEVELOPMENT

Industrial Partner/manufacturer has setup the plant for final product.

STATUS OF COMMERCIALIZATION

Final Product based on the technology has started selling into the market.

TENTATIVE COST OF DEVELOPMENT

₹ 1.0 Lakhs (Approximate)

INDUSTRIAL PARTNERS

Yes

PLANT SET UP FOR FINAL PRODUCT

Yes

IPR STATUS DETAILS (PATENTS/COPYRIGHT/TRADEMARK SECURITY IN INDIA/ABROAD)

Indian Patent.



4.2 AGRICULTURE, NUTRITION & BIOTECHNOLOGY (ANB)

POTENTIAL MARKET/TECHNO-ECONOMICS

Herbal companies and MSME start-ups.

ENVIRONMENTAL SAFETY CERTIFICATION

Yes. Environmental safety aspects not addressed and documented.

NODAL SCIENTIST DETAILS

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62. MOSEX-HERBAL MOSQUITO REPELLENT BODY LOTION

UID: TECH-THEME_2_CIMAP-078

LABORATORY OF ORIGIN | CSIR-CIMAP, LUCKNOW

EXECUTIVE SUMMARY

MosEx is a unique lotion made from plant based ingredients. Product repels the mosquitoes and ensures safe, healthy and sound sleep. This body lotion is an eco-friendly herbal formulation which can be used during travelling, sitting outside the house, lawn and office etc.

KEYWORDS

Mosquito repellent, Herbal, Body lotion

SALIENT FEATURES

- Help in protecting from mosquitoes bites diseases.
- Doesn't content DEET.
- Plant based bio-degradable, eco-friendly, safe formulation.

APPLICATIONS

Mosquito repellent body lotion.

TECHNOLOGY BENCHMARKING

Yes, Technology benchmarked with similar technologies.

TECHNOLOGY READINESS LEVEL ASSESSMENT

TRL - 9

SCALE OF DEVELOPMENT

Industrial Partner/manufacturer has setup the plant for final product.

STATUS OF COMMERCIALIZATION

Final Product based on the technology has started selling into the market.

TENTATIVE COST OF DEVELOPMENT

₹ 1.0 Lakhs (Approximate).

INDUSTRIAL PARTNERS

Yes

PLANT SET UP FOR FINAL PRODUCT

Yes

IPR STATUS DETAILS (PATENTS/COPYRIGHT/TRADEMARK SECURITY IN INDIA/ABROAD)

Indian Patent.



4.2 AGRICULTURE, NUTRITION & BIOTECHNOLOGY (ANB)

POTENTIAL MARKET/TECHNO-ECONOMICS

Herbal companies and MSME start-ups.

ENVIRONMENTAL SAFETY CERTIFICATION

Yes. Environmental safety aspects are addressed and documented.

NODAL SCIENTIST DETAILS

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63. MOSREP- MOSQUITO REPELLENT AGARBATTI

UID: TECH-THEME_2_CIMAP-079

LABORATORY OF ORIGIN | CSIR-CIMAP, LUCKNOW

EXECUTIVE SUMMARY

Mosrep is an eco-friendly herbal mosquito repellent agarbatti. It is prepared by using distillation waste, plant extract and essential oils. Most of the mosquito repellent products available in market contain synthetic compound and very harmful to human being, whereas mosrep has no side effects, according to our feedback data.



KEYWORDS

Mosquito repellent, Agarbatti

SALIENT FEATURES

- Natural mosquito repellent agarbatti.
- Content distillation waste, plant extract and essential oils.
- Useful in the place having electricity problem.

APPLICATIONS

Mosquito repellent agarbatti.

TECHNOLOGY BENCHMARKING

Yes, Technology benchmarked with similar technologies.

TECHNOLOGY READINESS LEVEL ASSESSMENT

TRL - 8

SCALE OF DEVELOPMENT

Industrial Partner/manufacturer has setup the plant for final product.

STATUS OF COMMERCIALIZATION

Final Product based on the technology has started selling into the market.

TENTATIVE COST OF DEVELOPMENT

₹ 0.25 Lakhs (Approximate).

INDUSTRIAL PARTNERS

Yes

PLANT SET UP FOR FINAL PRODUCT

Yes

IPR STATUS DETAILS (PATENTS/COPYRIGHT/TRADEMARK SECURITY IN INDIA/ABROAD)

Patented in India, Bangladesh, Pakistan, Sri Lanka, Malaysia, Indonesia and China.

4.2 AGRICULTURE, NUTRITION & BIOTECHNOLOGY (ANB)

POTENTIAL MARKET/TECHNO-ECONOMICS

Herbal companies and MSME start-ups.

ENVIRONMENTAL SAFETY CERTIFICATION

Yes. Environmental safety aspects are addressed and documented.

NODAL SCIENTIST DETAILS

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64. PAIN CHHOO – HERBAL PAIN BALM

UID: TECH-THEME_2_CIMAP-080

LABORATORY OF ORIGIN | CSIR-CIMAP, LUCKNOW

EXECUTIVE SUMMARY

Herbal based Pain balm formulated using essential oils and isolates as ingredients is useful in headache, muscular pain, sprains and cold etc. Application of the balm to the affected area produces relief by creating counter irritations and burning sensation. The balm has a pleasant aroma and if used in minute quantity, will act as mood freshener / mood elevator and also provide relief from heaviness.



KEYWORDS

Herbal, Pain balm, Headache

SALIENT FEATURES

- Useful in headache, muscular pain, sprain and cold.
- Contains natural bio-actives.
- Safe to use with no-side effect and suitable for all the age groups above 5 years.

APPLICATIONS

Useful in headache, muscular pain, sprains and cold etc.

TECHNOLOGY BENCHMARKING

Yes, Technology benchmarked with similar technologies and appropriate standards.

TECHNOLOGY READINESS LEVEL ASSESSMENT

TRL - 8

SCALE OF DEVELOPMENT

- Relevant firm contacted for scale up.
- Prototype tested in actual field conditions/production/manufacturing/operational environment.
- Prototype addressed all scaling issues.

STATUS OF COMMERCIALIZATION

Final Product based on the technology is not selling into the market.

TENTATIVE COST OF DEVELOPMENT

₹ 1.0 Lakhs (Approximate)

INDUSTRIAL PARTNERS

No

4.2 AGRICULTURE, NUTRITION & BIOTECHNOLOGY (ANB)

PLANT SET UP FOR FINAL PRODUCT

No

IPR STATUS DETAILS (PATENTS/COPYRIGHT/TRADEMARK SECURITY IN INDIA/ABROAD)

Patented in India.

POTENTIAL MARKET/TECHNO-ECONOMICS

Pharma Industries, Herbal companies and MSME start-ups.

ENVIRONMENTAL SAFETY CERTIFICATION

No. Environmental safety aspects not addressed and documented.

NODAL SCIENTIST DETAILS

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65. RELAXOMAP-ANTI-INFLAMMATORY PAIN RELIEVING OIL

UID: TECH-THEME_2_CIMAP-081

LABORATORY OF ORIGIN | CSIR-CIMAP, LUCKNOW

EXECUTIVE SUMMARY

An aromatherapy based herbal formulation “Relaxomap” developed by CSIR-CIMAP, in the form of oil, is intended to provide soothing relief from pain, resulting from daily tiredness and fatigue. This anti-inflammatory pain relieving oil is non-irritant to skin and useful in all type of muscular pain.

KEYWORDS

Herbal, Anti-inflammatory, Pain reliever, Essential oil based



SALIENT FEATURES

- Aromatherapy based safe anti-inflammatory pain relieving formulation.
- Topical formulation for all kind of pains.
- Safe to use with no-side effect and suitable for all the age groups above 5 years.

APPLICATIONS

Useful in all type of muscular pain.

TECHNOLOGY BENCHMARKING

Yes, Technology benchmarked with similar technologies and appropriate standards.

TECHNOLOGY READINESS LEVEL ASSESSMENT

TRL - 9

SCALE OF DEVELOPMENT

Industrial Partner/manufacturer has setup the plant for final product.

STATUS OF COMMERCIALIZATION

Final Product based on the technology has started selling into the market.

TENTATIVE COST OF DEVELOPMENT

₹ 5.0 Lakhs (Approximate).

INDUSTRIAL PARTNERS

Yes

PLANT SET UP FOR FINAL PRODUCT

Yes

4.2 AGRICULTURE, NUTRITION & BIOTECHNOLOGY (ANB)

IPR STATUS DETAILS (PATENTS/COPYRIGHT/TRADEMARK SECURITY IN INDIA/ABROAD)
CSIR-CIMAP Know-how.

POTENTIAL MARKET/TECHNO-ECONOMICS

Pharma Industries, Herbal companies and MSME start-ups.

ENVIRONMENTAL SAFETY CERTIFICATION

Yes. Environmental safety aspects are addressed and documented.

NODAL SCIENTIST DETAILS

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66. PAINJAA- ANTI-INFLAMMATORY PAIN RELIEVING GEL

UID: TECH-THEME_2_CIMAP-082

LABORATORY OF ORIGIN | CSIR-CIMAP, LUCKNOW

EXECUTIVE SUMMARY

CSIR-CIMAP has scientifically developed a novel formulation which contains active ingredients from natural sources for relieving muscular strain and inflammation.

KEYWORDS

Herbal, Anti-inflammatory, Pain reliever, Essential oil based



SALIENT FEATURES

- A plants based natural anti-inflammatory pain relieving formulation.
- Easily absorbed by the skin, resulting fast action.
- Cool to warm sensation.
- Non-greasy and non-staining.
- Provides long time effect.
- Safe and non-irritant to the skin.

APPLICATIONS

For relieving muscular strain and inflammation.

TECHNOLOGY BENCHMARKING

Yes, Technology benchmarked with similar technologies and appropriate standards.

TECHNOLOGY READINESS LEVEL ASSESSMENT

TRL - 8

SCALE OF DEVELOPMENT

- Relevant firm contacted for scale up.
- Prototype tested in actual field conditions/production/manufacturing/operational environment.
- Prototype addressed all scaling issues.

STATUS OF COMMERCIALIZATION

Final Product based on the technology is not selling into the market.

TENTATIVE COST OF DEVELOPMENT

₹ 5.0 Lakhs (Approximate)

INDUSTRIAL PARTNERS

No

4.2 AGRICULTURE, NUTRITION & BIOTECHNOLOGY (ANB)

PLANT SET UP FOR FINAL PRODUCT

No

IPR STATUS DETAILS (PATENTS/COPYRIGHT/TRADEMARK SECURITY IN INDIA/ABROAD)
CSIR-CIMAP Know-how.

POTENTIAL MARKET/TECHNO-ECONOMICS

Pharma Industries, Herbal companies and MSME start-ups.

ENVIRONMENTAL SAFETY CERTIFICATION

N/A

NODAL SCIENTIST DETAILS

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67. NAARI- SKIN HYGIENIC MEDICATED SANITARY PAD

UID: TECH-THEME_2_CIMAP-083

LABORATORY OF ORIGIN | CSIR-CIMAP, LUCKNOW

EXECUTIVE SUMMARY

Low cost medicated sanitary napkin with natural aroma, prepared by using plant extracts, aloe vera and essentials oils. Napkin protects from bacterial infection, provides skin hygiene and also relief from unpleasant odour.

KEYWORDS

Low cost, Herb based, Sanitary pad, Medicated

SALIENT FEATURES

- Plant based anti-bacterial molecule that prevent infection.
- Natural aroma which minimizes the unpleasant odour during usage.
- Herbs used to increase absorbency and comfort feel.

APPLICATIONS

Sanitary Napkins, Protection from bacterial infection, Skin hygiene.

TECHNOLOGY BENCHMARKING

Yes, Technology benchmarked with similar technologies and appropriate standards.

TECHNOLOGY READINESS LEVEL ASSESSMENT

TRL - 8

SCALE OF DEVELOPMENT

- Relevant firm contacted for scale up.
- Prototype tested in actual field conditions/production/manufacturing/operational environment.
- Prototype addressed all scaling issues.

STATUS OF COMMERCIALIZATION

Final Product based on the technology is not selling into the market.

TENTATIVE COST OF DEVELOPMENT

₹ 7.0 Lakhs (Approximate)

INDUSTRIAL PARTNERS

No

PLANT SET UP FOR FINAL PRODUCT

No



4.2 AGRICULTURE, NUTRITION & BIOTECHNOLOGY (ANB)

IPR STATUS DETAILS (PATENTS/COPYRIGHT/TRADEMARK SECURITY IN INDIA/ABROAD)

Patent filed.

POTENTIAL MARKET/TECHNO-ECONOMICS

Pharma industries, Herbal companies and MSME start-ups.

ENVIRONMENTAL SAFETY CERTIFICATION

No. Environmental safety aspects not addressed and documented.

NODAL SCIENTIST DETAILS

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68. HERBICHEW- TOBACCO AND NICOTINE FREE HERBAL MIXER

UID: TECH-THEME_2_CIMAP-084

LABORATORY OF ORIGIN | CSIR-CIMAP, LUCKNOW

EXECUTIVE SUMMARY

CSIR-CIMAP and CSIR-NBRI has jointly developed a tobacco and nicotine free herbal formulation, which give the feeling in taste and aroma like Gutkha but doesn't have any side effect. Herbal mixture is a good mouth freshener with anti-oxidants, antibacterial and digestive properties. On the basis of feedback data product has shown good tobacco de-addiction property.



KEYWORDS

Tobacco-de-addiction property, Gutka, Nicotine and tobacco free

SALIENT FEATURES

- Herbal mouth freshener chewing compound.
- Anti-oxidant formulation.
- Tobacco de-addiction agent.

APPLICATIONS

Mouth freshener with anti-oxidants, antibacterial and digestive properties.

TECHNOLOGY BENCHMARKING

Yes, Technology benchmarked with similar technologies.

TECHNOLOGY READINESS LEVEL ASSESSMENT

TRL - 8

SCALE OF DEVELOPMENT

- Relevant firm contacted for scale up.
- Prototype tested in actual field conditions/production/manufacturing/operational environment.
- Prototype addressed all scaling issues.

STATUS OF COMMERCIALIZATION

Final Product based on the technology is not selling into the market.

TENTATIVE COST OF DEVELOPMENT

₹ 5.0 Lakhs (Approximate)

INDUSTRIAL PARTNERS

No

4.2 AGRICULTURE, NUTRITION & BIOTECHNOLOGY (ANB)

PLANT SET UP FOR FINAL PRODUCT

No

IPR STATUS DETAILS (PATENTS/COPYRIGHT/TRADEMARK SECURITY IN INDIA/ABROAD)

Patent filed jointly by CSIR-CIMAP and CSIR-NBRI.

POTENTIAL MARKET/TECHNO-ECONOMICS

Pan Masala companies, Herbal formulation and MSME start-ups.

ENVIRONMENTAL SAFETY CERTIFICATION

No. Environmental safety aspects not addressed and documented.

NODAL SCIENTIST DETAILS

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69. POLY HERBAL TOOTHPASTE-HERBAL TOOTH CARE FORMULATION

UID: TECH-THEME_2_CIMAP-085

LABORATORY OF ORIGIN | CSIR-CIMAP, LUCKNOW

EXECUTIVE SUMMARY

CSIR-CIMAP and CSIR-NBRI, Lucknow has scientifically developed a novel formula to prepare an herbal toothpaste, which contains plants extracts and aromatic oils to treat periodontal problems. Gentle formula functions as a cleanser, tightens the gums, protects from tooth decay, and freshens the breath in natural way.



KEYWORDS

Poly herbal, Toothpaste, Decay

SALIENT FEATURES

- A unique combination of plant derived compounds and aromatic oils for sensitive and problematic teeth.
- Keeps gums strong and healthy.
- Freshens the breath in a natural way.
- Free from toxic and harsh chemicals.

APPLICATIONS

Cleans & tightens the gums, protects from tooth decay, and freshens the breath in natural way.

TECHNOLOGY BENCHMARKING

Yes, Technology benchmarked with similar technologies and appropriate standards.

TECHNOLOGY READINESS LEVEL ASSESSMENT

TRL - 9

SCALE OF DEVELOPMENT

Industrial Partner/manufacturer has setup the plant for final product.

STATUS OF COMMERCIALIZATION

Final Product based on the technology has started selling into the market.

TENTATIVE COST OF DEVELOPMENT

₹ 5.0 Lakhs (Approximate)

INDUSTRIAL PARTNERS

Yes

4.2 AGRICULTURE, NUTRITION & BIOTECHNOLOGY (ANB)

PLANT SET UP FOR FINAL PRODUCT

Yes

IPR STATUS DETAILS (PATENTS/COPYRIGHT/TRADEMARK SECURITY IN INDIA/ABROAD)

Patent filed jointly by CSIR-CIMAP and CSIR-NBRI.

POTENTIAL MARKET/TECHNO-ECONOMICS

Pharma Industries, Herbal formulation companies and MSME start-ups.

ENVIRONMENTAL SAFETY CERTIFICATION

Yes. Environmental safety aspects are addressed and documented.

NODAL SCIENTIST DETAILS

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70. MENTHOFRESH - HERBAL ORAL CLEANSER

UID: TECH-THEME_2_CIMAP-086

LABORATORY OF ORIGIN | CSIR-CIMAP, LUCKNOW

EXECUTIVE SUMMARY

CSIR-CIMAP has scientifically developed a plant based formulation by combining unique essential oils, which is free from harmful chemicals and alcohol. The formulation is a transparent aqueous solution having good antimicrobial property and deodorizes the mouth for a long period, also leaving it fresh and clean.

KEYWORDS

Herbal, Mouth wash, Alcohol free

SALIENT FEATURES

- An herbal oral cleanser.
- Chemical & alcohol free formulation.
- Free from artificial sweeteners.
- Kills harmful bacteria naturally and provided fresh breath.



APPLICATIONS

Deodorizes the mouth for a long period, also leaving it fresh and clean.

TECHNOLOGY BENCHMARKING

Yes, Technology benchmarked with similar technologies and appropriate standards.

TECHNOLOGY READINESS LEVEL ASSESSMENT

TRL - 7

SCALE OF DEVELOPMENT

- Relevant firm contacted for scale up.
- Prototype tested in actual field conditions/production/manufacturing/operational environment.
- Prototype addressed all scaling issues.

STATUS OF COMMERCIALIZATION

Final Product based on the technology is not selling into the market.

TENTATIVE COST OF DEVELOPMENT

₹ 2.0 Lakhs (Approximate)

INDUSTRIAL PARTNERS

No

PLANT SET UP FOR FINAL PRODUCT

No

4.2 AGRICULTURE, NUTRITION & BIOTECHNOLOGY (ANB)

IPR STATUS DETAILS (PATENTS/COPYRIGHT/TRADEMARK SECURITY IN INDIA/ABROAD)
CSIR-CIMAP Know-how.

POTENTIAL MARKET/TECHNO-ECONOMICS

Pharma Industries, Herbal formulation companies and MSME start-ups.

ENVIRONMENTAL SAFETY CERTIFICATION

No. Environmental safety aspects not addressed and documented.

NODAL SCIENTIST DETAILS

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71. HANKOOL PULSE- HAND SANITIZING FORMULATION

UID: TECH-THEME_2_CIMAP-088

LABORATORY OF ORIGIN | CSIR-CIMAP, LUCKNOW

EXECUTIVE SUMMARY

CSIR-CIMAP has scientifically developed a very effective, safe, Broad spectrum anti-bacterial and anti-fungal formulation of hand sanitizing, which contains plant based active molecule and essential oils.

KEYWORDS

Herbal, Hand sanitizer, Broad spectrum

SALIENT FEATURES

- Broad spectrum anti-microbial hand sanitizer.
- Formulation is effective against maximum harmful pathogens.
- Sanitizer contains herbal bio-actives and 70% alcohol.
- Formulation is safe, eco-friendly and non-irritant to human skin.

APPLICATIONS

Anti-bacterial and Anti-fungal formulation of hand sanitizing.

TECHNOLOGY BENCHMARKING

Yes, Technology benchmarked with similar technologies and appropriate standards.

TECHNOLOGY READINESS LEVEL ASSESSMENT

TRL - 9

SCALE OF DEVELOPMENT

Industrial Partner/manufacturer has setup the plant for final product.

STATUS OF COMMERCIALIZATION

Final Product based on the technology is selling into the market.

TENTATIVE COST OF DEVELOPMENT

₹ 2.0 Lakhs (Approximate)

INDUSTRIAL PARTNERS

Yes

PLANT SET UP FOR FINAL PRODUCT

Yes

IPR STATUS DETAILS (PATENTS/COPYRIGHT/TRADEMARK SECURITY IN INDIA/ABROAD)

CSIR-CIMAP Know-how



4.2 AGRICULTURE, NUTRITION & BIOTECHNOLOGY (ANB)

POTENTIAL MARKET/TECHNO-ECONOMICS

Pharma Industries, Herbal formulation companies and MSME start-ups.

ENVIRONMENTAL SAFETY CERTIFICATION

Yes. Environmental safety aspects are addressed and documented.

NODAL SCIENTIST DETAILS

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72. CIM PAUSHAK

UID: TECH-THEME_2_CIMAP-089

LABORATORY OF ORIGIN | CSIR-CIMAP, LUCKNOW

EXECUTIVE SUMMARY

CIM Paushak, developed by CSIR-CIMAP, is a Chyawanprash-like formulation. It is a standardized and scientifically-validated Awleha (thick paste) preparation that strengthens the immune system and contains various nutrients. CIM Paushak is a unique amalgamation of traditional knowledge (Rasayana concept) and modern science. It is safe and effective formulation containing 12 well known powerful Ayurveda herbs (ingredients) such as *Vitis vinifera*, *Boerhavia diffusa*, *Moringa oleifera*, *Withania somnifera*, *Sida cordifolia*, *Glycyrrhiza glabra*, *Terminalia chebula*, *Asparagus racemosus*, *Tinospora cordifolia*, *Terminalia bellerica*, *Terminalia arjuna* with *Emblica officinalis* (Amla) as the base. The polyherbal formulation renders a harmonious synergy leading to improved metabolism and general immunity. Study also suggests that CIM Paushak was Immunomodulatory property proven by scientific data. Product has been compared with other available Ayurvedic products. The CIM Paushak is economically cheaper, safe and effective as per human subject study.

KEYWORDS

Nutraceutical, Rasayana therapy, CIM Paushak, Awleha, Immunomodulatory

SALIENT FEATURES

The CIM Paushak is economically cheaper, Safe and effective as per human subject study.

APPLICATIONS

Chyawanprash-like formulation, Safe and effective, Immunomodulatory property.

TECHNOLOGY BENCHMARKING

Yes, Technology benchmarked with similar technologies and appropriate standards.

TECHNOLOGY READINESS LEVEL ASSESSMENT

TRL - 9

SCALE OF DEVELOPMENT

- Pilot scale demonstration in field conditions.
- Prototype has been tested in actual field conditions/production/manufacturing/operational environment.
- Prototype addresses all scale up issues.

STATUS OF COMMERCIALIZATION

Final Product based on the technology is selling into the market.

TENTATIVE COST OF DEVELOPMENT

₹ 100 per 250 gm pack size.

INDUSTRIAL PARTNERS

No

4.2 AGRICULTURE, NUTRITION & BIOTECHNOLOGY (ANB)

PLANT SET UP FOR FINAL PRODUCT

No

IPR STATUS DETAILS (PATENTS/COPYRIGHT/TRADEMARK SECURITY IN INDIA/ABROAD)

NA

POTENTIAL MARKET/TECHNO-ECONOMICS

CIM Paushak is a traditional Chyawanprash-like preparation with huge market potential. Currently the total market potential is ₹ 500 crores.

ENVIRONMENTAL SAFETY CERTIFICATION

Yes. Environmental safety aspects are addressed and documented.

NODAL SCIENTIST DETAILS

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73. CIM PHAL-SE

UID: TECH-THEME_2_CIMAP-090

LABORATORY OF ORIGIN | CSIR-CIMAP, LUCKNOW

EXECUTIVE SUMMARY

CIM Phal-Se is a fruit-based chewable granular nutraceutical preparation based on the traditional concept of Rasayana mentioned in Ayurveda. It is a nutritive formulation in granular form. It is a product of natural origin that has been developed using traditional knowledge of plants/fruits (consisting of Aegle marmelos and Emblica officinalis) and Excipients from Indian traditional system of medicine, known for their nutritive and medicinal properties. Immuno-stimulant activity of CIM Phal-Se presents evidence for its potential to reduce bad cholesterol (LDL and Triglycerides). CIM Phal-Se was found to exhibit gastro-intestinal improvement and immunomodulatory effect. The product is ready for commercialization.

KEYWORDS

Nutraceutical, Rasayana therapy, CIM Phal-Se, Granules, Immunomodulatory

SALIENT FEATURES

Fruit-based chewable.

APPLICATIONS

Fruit-based chewable granular nutraceutical preparation, Natural origin, Reduces bad cholesterol.

TECHNOLOGY BENCHMARKING

NA

TECHNOLOGY READINESS LEVEL ASSESSMENT

TRL - 9

SCALE OF DEVELOPMENT

- Relevant firm contacted for scale up.
- Prototype tested in actual field conditions/production/manufacturing/operational environment.
- Prototype addressed all scaling issues.

STATUS OF COMMERCIALIZATION

Final product based on the technology has started selling into the market.

TENTATIVE COST OF DEVELOPMENT

₹ 40 per 75gm pack size.

INDUSTRIAL PARTNERS

No

PLANT SET UP FOR FINAL PRODUCT

No

IPR STATUS DETAILS (PATENTS/COPYRIGHT/TRADEMARK SECURITY IN INDIA/ABROAD)

NA

4.2 AGRICULTURE, NUTRITION & BIOTECHNOLOGY (ANB)

POTENTIAL MARKET/TECHNO-ECONOMICS

CIM Phal-Se is a novel fruit-based granular nutraceutical preparation and similar preparations are not prevalent in the market presently. The formulation could be a replacement for people who want to get away from the addiction to pan masala or gutka. A number of people in India regularly chew panmasala or gutka, which can be replaced by CIM Phal-Se. The current market size of panmasala in India is about ₹ 35000 crore.

ENVIRONMENTAL SAFETY CERTIFICATION

Yes. Environmental safety aspects are addressed and documented.

NODAL SCIENTIST DETAILS

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74. ACNE CURE GEL

UID: TECH-THEME_2_CIMAP-091

LABORATORY OF ORIGIN | CSIR-CIMAP, LUCKNOW

EXECUTIVE SUMMARY

In the present formulation, the novel herbal lead in the form of pure phytomolecule with strong activity against *Propionibacterium acnes* has been used. Other available herbal products are not single molecule based formulations and also they are available in the form of cream, which is not preferred formulation particularly for acne problem being the oily in nature.

KEYWORDS

Acne cure gel, *P. acnes*, Phytomolecule, Gel

SALIENT FEATURES

Novel herbal formulation, Single molecule based formulation.

APPLICATIONS

Acne treatment, Cosmeceutical product

TECHNOLOGY BENCHMARKING

Yes, Technology benchmarked with similar technologies and appropriate standards.

TECHNOLOGY READINESS LEVEL ASSESSMENT

TRL - 6

SCALE OF DEVELOPMENT

- Pilot scale demonstration in field conditions.
- Prototype has been tested in actual field conditions.
- Prototype addressed all scaleup issues.

STATUS OF COMMERCIALIZATION

Final Product based on this technology is not selling in the market.

TENTATIVE COST OF DEVELOPMENT

₹ 10.0 Lakhs (Approximately)

INDUSTRIAL PARTNERS

No

PLANT SET UP FOR FINAL PRODUCT

No

IPR STATUS DETAILS (PATENTS/COPYRIGHT/TRADEMARK SECURITY IN INDIA/ABROAD)

NA



4.2 AGRICULTURE, NUTRITION & BIOTECHNOLOGY (ANB)

POTENTIAL MARKET/TECHNO-ECONOMICS

It is a cosmaceutical product, so it can be marketed under OTC product category. Male and female of the age group 15-25 can be potential customer for this product.

ENVIRONMENTAL SAFETY CERTIFICATION

No, Environmental safety aspects not addressed and documented.

NODAL SCIENTIST DETAILS

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75. AFTER SHAVE GEL

UID: TECH-THEME_2_CIMAP-092

LABORATORY OF ORIGIN | CSIR-CIMAP, LUCKNOW

EXECUTIVE SUMMARY

The present formulation should be used as after shave preparation. Apply gently on face and neck. Must avoid contact with eyes. After shave gel has been prepared from CIM1166 (US Patent No. 6660761 B2 owned by CSIR), which has a strong antimicrobial action against a wide range of harmful microorganisms. Combination of antimicrobial and cooling effect of CIM1166; moisturizing, skin nourishing, healing and rejuvenating effect of Aloe Vera and emollient effect of glycerin has been utilized for the development of herbal after shave gel formulation.

KEYWORDS

After shave gel, Aloe vera, CIM1166, Gel

SALIENT FEATURES

Strong antimicrobial action against a wide range of harmful microorganisms.

APPLICATIONS

After shave preparation.

TECHNOLOGY BENCHMARKING

Yes, Technology benchmarked with similar technologies and appropriate standards.

TECHNOLOGY READINESS LEVEL ASSESSMENT

TRL - 6

SCALE OF DEVELOPMENT

- Relevant firm contacted for scale up.
- Prototype tested in actual field conditions/production/manufacturing/operational environment.
- Prototype addressed all scaling issues.

STATUS OF COMMERCIALIZATION

Final Product based on this technology is not selling in the market.

TENTATIVE COST OF DEVELOPMENT

₹ 10.0 Lakhs (approximately)

INDUSTRIAL PARTNERS

No

PLANT SET UP FOR FINAL PRODUCT

No



4.2 AGRICULTURE, NUTRITION & BIOTECHNOLOGY (ANB)

IPR STATUS DETAILS (PATENTS/COPYRIGHT/TRADEMARK SECURITY IN INDIA/ABROAD)
US Patent No. 6660761 B2 owned by CSIR.

POTENTIAL MARKET/TECHNO-ECONOMICS

It is a cosmeceutical product, so it can be marketed under OTC product category. Adult male can be potential customer for this product.

ENVIRONMENTAL SAFETY CERTIFICATION

No, Environmental safety aspects not addressed and documented.

NODAL SCIENTIST DETAILS

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76. MOSQUITO REPELLENT CREAM

UID: TECH-THEME_2_CIMAP-094

LABORATORY OF ORIGIN | CSIR-CIMAP, LUCKNOW

EXECUTIVE SUMMARY

The cream is most suitable to repel mosquitoes at outdoor places where vaporizers and coils are ineffective, e.g. in travelling, in garden. Mosquito repellent cream has been prepared from an essential oil that is known for anti-insect activity. The oil that imparts the repellent activity is also known to be used for aromatherapy and induces a feeling of wellbeing and freshness.

KEYWORDS

Mosquito repellent, Cream, Essential oil

SALIENT FEATURES

Anti-insect activity.

APPLICATIONS

Mosquito repellent.

TECHNOLOGY BENCHMARKING

Yes, the technology is benchmarked with similar technologies and appropriate standards.

TECHNOLOGY READINESS LEVEL ASSESSMENT

TRL - 7

SCALE OF DEVELOPMENT

Industrial partner/manufacturer has set up the plant for final product using this technology.

STATUS OF COMMERCIALIZATION

Final Product using this technology started selling into the market.

TENTATIVE COST OF DEVELOPMENT

₹ 5 Lakhs (approximately)

INDUSTRIAL PARTNERS

Yes

PLANT SET UP FOR FINAL PRODUCT

Yes

IPR STATUS DETAILS (PATENTS/COPYRIGHT/TRADEMARK SECURITY IN INDIA/ABROAD)

NA



4.2 AGRICULTURE, NUTRITION & BIOTECHNOLOGY (ANB)

POTENTIAL MARKET/TECHNO-ECONOMICS

It is an OTC product, so it can be marketed under FMCG product category. Male and female of all age groups except children below five years can be potential customer for this product.

ENVIRONMENTAL SAFETY CERTIFICATION

Yes, Environmental safety aspects is addressed and documented.

NODAL SCIENTIST DETAILS

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77. PSORIA CIM CREAM

UID: TECH-THEME_2_CIMAP-095

LABORATORY OF ORIGIN | CSIR-CIMAP, LUCKNOW

EXECUTIVE SUMMARY

The formulation is effective against imiquimod induced psoriasis in mice. The present lead is a non-steroidal drug with plant origin and is effective topically at the conc. of 2% in cream formulation.

The phytomolecules combination has a strong anti-psoriatic action against imiquimod induced psoriasis. Combining anti-psoriatic effect of the phytomolecules along with emollient effect of cream is proved to be a good approach in the management of psoriasis. This formulation is effective in psoriasis like skin inflammation by alleviating PASI score and the level of psoriasis specific cytokines along with common inflammatory cytokines.



KEYWORDS

Anti-psoriatic cream, Psoriasis, Essential oil, Cream

SALIENT FEATURES

Non-steroidal drug with plant origin.

APPLICATIONS

Anti-psoriatic action.

TECHNOLOGY BENCHMARKING

Yes

TECHNOLOGY READINESS LEVEL ASSESSMENT

TRL - 7

SCALE OF DEVELOPMENT

- Pilot scale demonstration in field conditions.
- Prototype has been tested in actual field conditions/production/manufacturing/operational environment.
- Prototype addresses all scale up issues.

STATUS OF COMMERCIALIZATION

Final product based on this technology is not selling in the market.

TENTATIVE COST OF DEVELOPMENT

₹ 12 Lakhs (approximately)

4.2 AGRICULTURE, NUTRITION & BIOTECHNOLOGY (ANB)

INDUSTRIAL PARTNERS

No

PLANT SET UP FOR FINAL PRODUCT

No

IPR STATUS DETAILS (PATENTS/COPYRIGHT/TRADEMARK SECURITY IN INDIA/ABROAD)

NA

POTENTIAL MARKET/TECHNO-ECONOMICS

It is a therapeutic product, so it can be marketed in national and international market because psoriasis is a global problem. Male and female of the age group can be potential customer for this product.

ENVIRONMENTAL SAFETY CERTIFICATION

No, Environmental safety aspects not addressed and documented.

NODAL SCIENTIST DETAILS

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78. ADVANCED ELECTROSTATIC SPRAYER

UID: TECH-THEME_2_CSIO-96

LABORATORY OF ORIGIN | CSIR-CSIO, CHANDIGARH

EXECUTIVE SUMMARY

Electrostatic spraying is one of the most promising methods to spray the liquid based agrochemicals to protect the crops and orchards from many dreadful diseases and insects. Electrostatic force field has been exploited in the design and development of an air-assisted electrostatic sprayer for agricultural applications to increase the mass transfer efficiency and bio-efficacy. Electrostatic sprayer provides a uniform deposition onto the directly exposed as well as obscured surface of the crops and orchards and reaches to hidden areas of target canopy. It reduces the drift of active ingredients of agrochemicals from the target and increases the deposition efficiency. It provides a means for efficient use of agrochemicals and natural resources. This nozzle is light weight, highly efficient, reduces pesticide use and human health risks. Electrostatic spraying has revolutionized the industrial spraying.

KEYWORDS

Wraparound effective, Bio-efficacy, Mass-transfer efficiency

SALIENT FEATURES

Light weight, Highly efficient, Reduces pesticide use and human health risks.

APPLICATIONS

Sprays the liquid based agrochemicals to protect crops from many dreadful diseases and insects.

TECHNOLOGY BENCHMARKING

Yes, the technology is benchmarked with similar technologies and appropriate standards.

TECHNOLOGY READINESS LEVEL ASSESSMENT

TRL - 8

SCALE OF DEVELOPMENT

Industrial Partner/manufacturer has setup the plant for final product using this technology.

STATUS OF COMMERCIALIZATION

The final product based on the technology started selling into the market.

TENTATIVE COST OF DEVELOPMENT

₹ 0.8 to 0.9 Lakhs

INDUSTRIAL PARTNERS

Yes

PLANT SET UP FOR FINAL PRODUCT

Yes

4.2 AGRICULTURE, NUTRITION & BIOTECHNOLOGY (ANB)

IPR STATUS DETAILS (PATENTS/COPYRIGHT/TRADEMARK SECURITY IN INDIA/ABROAD)
NA

POTENTIAL MARKET/TECHNO-ECONOMICS

Agriculture, Forestry Disease Control, Agrochemical Industry.

ENVIRONMENTAL SAFETY CERTIFICATION

In Process.

NODAL SCIENTIST DETAILS

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79. CRISPY FRUITS AND VEGETABLES FOR AVOIDING POST HARVEST LOSSES

UID: TECH-THEME_2_IHBT-99

LABORATORY OF ORIGIN | CSIR-IHBT, PALAMPUR

EXECUTIVE SUMMARY

Retains near to original nutrition, texture, taste, aroma and color. Preservative free, no refrigeration required. Excellent reconstitution capacity.

Target crops: Any perishable fruit.

Major crops: Mango, Apple, Guava, Strawberry, Banana, Pineapple, Apricot, Turmeric, Ginger, Bel, Karonda, Timla, Mallu, Khatai etc.

Potential products – Whole dehydrated fruits, dehydrated fruit powders etc..

KEYWORDS

Fruits, Vegetables, Drying, Nutrition, Post-Harvest

SALIENT FEATURES

Preservative free, No refrigeration required. Excellent reconstitution capacity.

APPLICATIONS

Hotel and service industry, Food processing industries, Open market and online food aggregators.

TECHNOLOGY BENCHMARKING

Yes, the technology is benchmarked with similar technologies and appropriate standards.

TECHNOLOGY READINESS LEVEL ASSESSMENT

TRL - 7

SCALE OF DEVELOPMENT

- Pilot scale demonstration in field conditions.
- Prototype has been tested in actual field conditions/production/manufacturing/operational environment.
- Prototype addresses all scale up issues.

STATUS OF COMMERCIALIZATION

NA

TENTATIVE COST OF DEVELOPMENT

Rs. 25.0 Lakhs

INDUSTRIAL PARTNERS

NA

PLANT SET UP FOR FINAL PRODUCT

NA

4.2 AGRICULTURE, NUTRITION & BIOTECHNOLOGY (ANB)

IPR STATUS DETAILS (PATENTS/COPYRIGHT/TRADEMARK SECURITY IN INDIA/ABROAD)
NA

POTENTIAL MARKET/TECHNO-ECONOMICS

Global freeze-dried product market is expected to grow at a CAGR of 7.23% and during the forecast period of 2016-2021, and reach \$66.53 billion by 2021.

ENVIRONMENTAL SAFETY CERTIFICATION

NA

NODAL SCIENTIST DETAILS

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80. READY TO EAT FOODS FOR ETHNIC CUISINES; HIMACHALI CUISINES, PUNJABI FOODS & SOUTH INDIAN FOODS

UID: TECH-THEME_2_IHBT-100

LABORATORY OF ORIGIN | CSIR-IHBT, PALAMPUR

EXECUTIVE SUMMARY

Chemicals and Preservatives free. Food preserved for 12 months. Retains aroma and taste of the packaged food. Healthy benefits with prebiotic attribute. These RTE food products are in line with the changing consumer preference for healthy, convenient and on the go foods. The technology was used for successful revival of traditional and ethnic foods.

KEYWORDS

Ethnic, Canning, Cuisine, Ready to Eat

SALIENT FEATURES

Chemicals and Preservatives free.

APPLICATIONS

Hotel and service industry, Food processing industries, Open market and online food aggregators.

TECHNOLOGY BENCHMARKING

Yes, the technology is benchmarked with similar technologies and appropriate standards.

TECHNOLOGY READINESS LEVEL ASSESSMENT

TRL - 8

SCALE OF DEVELOPMENT

Relevant firm contacted for design and development of plant for up scaling.

STATUS OF COMMERCIALIZATION

Final product based on this technology is not selling in the market.

TENTATIVE COST OF DEVELOPMENT

₹ 32.00 Lakhs

INDUSTRIAL PARTNERS

NA

PLANT SET UP FOR FINAL PRODUCT

NA

IPR STATUS DETAILS (PATENTS/COPYRIGHT/TRADEMARK SECURITY IN INDIA/ABROAD)

NA

4.2 AGRICULTURE, NUTRITION & BIOTECHNOLOGY (ANB)

POTENTIAL MARKET/TECHNO-ECONOMICS

It is expected that the ready meals market in India would continue to grow at a CAGR of approximately 12.36% during the period 2016-21 and reach INR 2,901.53 million by 2020.

ENVIRONMENTAL SAFETY CERTIFICATION

NA

NODAL SCIENTIST DETAILS

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81. FOOD PRODUCTS FROM SEABUCKTHORN (HIPPOPHAE RHAMNOIDES)

UID: TECH-THEME_2_IHBT-102

LABORATORY OF ORIGIN | CSIR-IHBT, PALAMPUR

EXECUTIVE SUMMARY

CSIR-IHBT has developed several cost-effective food products and their technologies based on seabuckthorn fruits which are ready to commercial-stage CSIR-IHBT also providing trainings on food processing and postharvest technology to farmers, Shelf helping groups, NGO and technical cluster.

KEYWORDS

Sea buckthorn, Shelf life, Low chemical based products

SALIENT FEATURES

- Low or no chemical based products.
- Several products can make under one roof.
- Low cost investment with high profit.
- Shelf life of the developed product is more than 6 months.

APPLICATIONS

Hotel and service industry, Food processing industries.

TECHNOLOGY BENCHMARKING

Yes, the developed products are totally different from existing product available in the market. Benchmarked with appropriate standards.

TECHNOLOGY READINESS LEVEL ASSESSMENT

TRL - 6

SCALE OF DEVELOPMENT

- Pilot scale demonstration in field conditions.
- Prototype has been tested in actual field conditions/production/manufacturing/operational environment.

STATUS OF COMMERCIALIZATION

NA

TENTATIVE COST OF DEVELOPMENT

₹ 2.0 Lakhs

INDUSTRIAL PARTNERS

NA

PLANT SET UP FOR FINAL PRODUCT

NA

4.2 AGRICULTURE, NUTRITION & BIOTECHNOLOGY (ANB)

IPR STATUS DETAILS (PATENTS/COPYRIGHT/TRADEMARK SECURITY IN INDIA/ABROAD)

Patent Filled

POTENTIAL MARKET/TECHNO-ECONOMICS

The fruit and vegetable processing industry in India is likely to expand at a compound annual growth rate (CAGR) of ~7.62% between FY 2018 and to reach a value of INR 256.4 Bn in FY 2023.

ENVIRONMENTAL SAFETY CERTIFICATION

NA

NODAL SCIENTIST DETAILS

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82. NOVEL FOOD PRODUCTS FROM SOHIONG (PRUNUS NEPALENSIS)

UID: TECH-THEME_2_IHBT-103

LABORATORY OF ORIGIN | CSIR-IHBT, PALAMPUR

EXECUTIVE SUMMARY

CSIR-IHBT has developed several cost-effective food products and their technologies based on Sohiong (*Prunus nepalensis*) fruits which are ready to commercial stage CSIR-IHBT also providing trainings on food processing and postharvest technology to farmers, Shelf helping groups, NGO and technical cluster.

KEYWORDS

Sohiong fruits, No chemical based products, Shelf life, Post-harvest technology

SALIENT FEATURES

- Refrigeration is not required for storage.
- Low or no chemical based products.
- Several products can make under one roof.
- Low cost investment with high profit.
- Shelf life of the developed product is more than 6 months.

APPLICATIONS

Hotel and service industry, Food processing industries.

TECHNOLOGY BENCHMARKING

Yes, the technology benchmarked with similar technologies and appropriate standards.

TECHNOLOGY READINESS LEVEL ASSESSMENT

TRL - 6

SCALE OF DEVELOPMENT

- Pilot scale demonstration in field conditions.
- Prototype has been tested in actual field conditions/production/manufacturing/operational environment.

STATUS OF COMMERCIALIZATION

NA

TENTATIVE COST OF DEVELOPMENT

₹ 2.50 Lakhs

INDUSTRIAL PARTNERS

NA

PLANT SET UP FOR FINAL PRODUCT

NA

4.2 AGRICULTURE, NUTRITION & BIOTECHNOLOGY (ANB)

IPR STATUS DETAILS (PATENTS/COPYRIGHT/TRADEMARK SECURITY IN INDIA/ABROAD)
NA

POTENTIAL MARKET/TECHNO-ECONOMICS

The fruit and vegetable processing industry in India is likely to expand at a compound annual growth rate (CAGR) of ~7.62% between FY 2018 and to reach a value of INR 256.4 Bn in FY 2023.
INR 256.4 Bn in FY 2023.

ENVIRONMENTAL SAFETY CERTIFICATION

NA

NODAL SCIENTIST DETAILS

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83. PROTEIN AND FIBER ENRICHED CEREAL BARS (VARIANTS: GRANOLA BARS, PROTEIN BARS, LOW CALORIE BARS)

UID: TECH-THEME_2_IHBT-106

LABORATORY OF ORIGIN | CSIR-IHBT, PALAMPUR

EXECUTIVE SUMMARY

- 100% Natural, Preservative free.
- Multi grain- rich in millets and pulses.
- Natural fruit and honey based.
- 4 to 5 g protein/ serving.
- 3 g complex dietary fiber per serving.
- Less than 6 g sugar/ serving.
- Saturated fat content less than 2.5g/ serving.

KEYWORDS

Granola bars, Protein bars, Low calorie bars

SALIENT FEATURES

Preservative free, low saturated fat content.

APPLICATIONS

Food processing industries, Nutrition rich food, Ready to eat.

TECHNOLOGY BENCHMARKING

Yes, Existing brands available in market were taken as reference. The technology benchmarked with similar technologies and appropriate standards.

TECHNOLOGY READINESS LEVEL ASSESSMENT

TRL - 8

SCALE OF DEVELOPMENT

Industrial Partner/manufacturer has setup the plant for final product.

STATUS OF COMMERCIALIZATION

Final Product based on the technology has started selling into the market.

TENTATIVE COST OF DEVELOPMENT

₹ 2.0 Lakhs

INDUSTRIAL PARTNERS

Yes

PLANT SET UP FOR FINAL PRODUCT

Yes

4.2 AGRICULTURE, NUTRITION & BIOTECHNOLOGY (ANB)

IPR STATUS DETAILS (PATENTS/COPYRIGHT/TRADEMARK SECURITY IN INDIA/ABROAD)
NA

POTENTIAL MARKET/TECHNO-ECONOMICS

India energy bars market is projected to grow at a CAGR of over 28%, in value terms, during 2017-2022.

ENVIRONMENTAL SAFETY CERTIFICATION

Not Applicable. There are no any known environmental risks.

NODAL SCIENTIST DETAILS

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84. IRON AND ZINC ENRICHED SPIRULINA BASED FOOD PRODUCTS (NUT AND CHOCOLATE BARS, INSTANT SOUP MIXES, BEVERAGE MIXES)

UID: TECH-THEME_2_IHBT-107

LABORATORY OF ORIGIN | CSIR-IHBT, PALAMPUR

EXECUTIVE SUMMARY

- 100% Natural, preservative free.
- Up to 2 g Spirulina per serving.
- 25% RDA levels of Iron and Zinc per serving (25 g).
- Beta-carotene content – 122 µg/serving (25 g).
- 4 g protein/serving (25 g).
- Source of omega-6 Gamma Linolenic Acid.

KEYWORDS

Iron and zinc enriched spirulina (nut and chocolate bars)

SALIENT FEATURES

Preservative free, Natural, Nutritious food.

APPLICATIONS

Food processing industries, Nutrition rich food, Ready to eat.

TECHNOLOGY BENCHMARKING

Existing brands available in the market were taken as reference. The technology benchmarked with similar technologies and appropriate standards.

TECHNOLOGY READINESS LEVEL ASSESSMENT

TRL - 8

SCALE OF DEVELOPMENT

Industrial Partner/manufacturer has setup the plant for final product.

STATUS OF COMMERCIALIZATION

Final Product based on the technology has started selling into the market.

TENTATIVE COST OF DEVELOPMENT

₹ 3.0 Lakhs

INDUSTRIAL PARTNERS

Yes

PLANT SET UP FOR FINAL PRODUCT

Yes

4.2 AGRICULTURE, NUTRITION & BIOTECHNOLOGY (ANB)

IPR STATUS DETAILS (PATENTS/COPYRIGHT/TRADEMARK SECURITY IN INDIA/ABROAD)
NA

POTENTIAL MARKET/TECHNO-ECONOMICS

Global spirulina market is expected to register a CAGR of 10% during the forecast period, and is estimated to be valued at nearly US\$ 2,000 Mn by 2026, from more than US\$ 700 Mn in 2016.

ENVIRONMENTAL SAFETY CERTIFICATION

There are no any known environmental risks.

NODAL SCIENTIST DETAILS

Dr. Vidyashankar Srivatsan

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85. VITAMIN D2 ENRICHED SHIITAKE MUSHROOM PRODUCTS; READY TO RECONSTITUTE PRODUCTS - INSTANT SOUP MIXES, BEVERAGE MIXES & READY TO EAT ENERGY BARS

UID: TECH-THEME_2_IHBT-108

LABORATORY OF ORIGIN | CSIR-IHBT, PALAMPUR

EXECUTIVE SUMMARY

- 30 gram serving size of Instant Shiitake soup mix.
- 40 gram serving size Shiitake energy bars.
- 30 gram serving size of Shiitake beverage mixes.
- Food formulations meet 100% RDA of Vitamin D2.
- Products free from preservatives and artificial additive.
- Shelf life greater than 6 months.

KEYWORDS

Vitamin D2 enriched, Healthy Food, Mushroom

SALIENT FEATURES

100% RDA of Vitamin D2, Products free from preservatives and artificial additive.

APPLICATIONS

Food processing industries, Nutrition rich food, Ready to eat.

TECHNOLOGY BENCHMARKING

Yes, No reference product with Shiitake fortification. However, products fortified with other mushrooms are available.

TECHNOLOGY READINESS LEVEL ASSESSMENT

TRL - 6

SCALE OF DEVELOPMENT

Technology successfully demonstrated to the intended end user.

STATUS OF COMMERCIALIZATION

Final product based on this technology is not selling in the market.

TENTATIVE COST OF DEVELOPMENT

₹ 3.0 Lakhs

INDUSTRIAL PARTNERS

No

PLANT SET UP FOR FINAL PRODUCT

No

4.2 AGRICULTURE, NUTRITION & BIOTECHNOLOGY (ANB)

IPR STATUS DETAILS (PATENTS/COPYRIGHT/TRADEMARK SECURITY IN INDIA/ABROAD)
NA

POTENTIAL MARKET/TECHNO-ECONOMICS

The global demand for Shiitake mushroom is expected to reach approximately 4500 tonnes by 2025 with an estimated market of USD 35.4 billion and the international demand for vitamin D is estimated to reach USD 140 million by 2025 growing annually at 1.2%.

ENVIRONMENTAL SAFETY CERTIFICATION

There are no any known environmental risks.
FSSAI Certification obtained by industry partner.

NODAL SCIENTIST DETAILS

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86. IRON ENRICHED FRUIT BARS AND CANDIES

UID: TECH-THEME_2_IHBT-109

LABORATORY OF ORIGIN | CSIR-IHBT, PALAMPUR

EXECUTIVE SUMMARY

FRUIT BARS: Products provides 25- 30% RDA of bio- available iron per 30 g serving. Utilizes natural bio resources. Free from additives and preservatives.

CANDIES: Products provides 25-30% RDA of bio available iron per 30g serving and 4-6 candies by utilizes natural bio-resources such as crop residues and spice mixes, free from additives and preservatives and shelf life of the products up to 6 months.

KEYWORDS

Iron deficiency, Fruit Bars, Candies

SALIENT FEATURES

RDA of bio- available iron, Utilizes natural bio resources, Free from additives and preservatives.

APPLICATIONS

Instant energy, Ready to eat food.

TECHNOLOGY BENCHMARKING

Yes, the technology benchmarked with similar technologies and appropriate standards.

TECHNOLOGY READINESS LEVEL ASSESSMENT

TRL - 6

SCALE OF DEVELOPMENT

NA

STATUS OF COMMERCIALIZATION

NA

TENTATIVE COST OF DEVELOPMENT

₹ 25.0 Lakhs

INDUSTRIAL PARTNERS

NA

PLANT SET UP FOR FINAL PRODUCT

NA

IPR STATUS DETAILS (PATENTS/COPYRIGHT/TRADEMARK SECURITY IN INDIA/ABROAD)

NA

4.2 AGRICULTURE, NUTRITION & BIOTECHNOLOGY (ANB)

POTENTIAL MARKET/TECHNO-ECONOMICS

India energy bars market is projected to grow at a CAGR of over 28%, in value terms, during 2017-2022.

ENVIRONMENTAL SAFETY CERTIFICATION

NA

NODAL SCIENTIST DETAILS

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87. BUCKWHEAT BARS AND NOODLES

UID: TECH-THEME_2_IHBT-110

LABORATORY OF ORIGIN | CSIR-IHBT, PALAMPUR

EXECUTIVE SUMMARY

Buckwheat flour and puffs as gluten free ingredients in RTE foods, standardized processes for production of instant products (noodles, pasta and extruded snacks), and products are free from additives and chemical preservatives, buckwheat products contain beneficial polyphenol-utin upto 0.4% and average shelf life of buckwheat products is upto 6 months. Estimate cost of the Machinery: 45 lakhs. Production capacity – 200 kg per day for raw buckwheat processing.

KEYWORDS

Buckwheat bar, Noodles

SALIENT FEATURES

Free from additives and chemical preservatives.

APPLICATIONS

Fast food, Easy to cook noodles.

TECHNOLOGY BENCHMARKING

Yes, The technology benchmarked with similar technologies and appropriate standards.

TECHNOLOGY READINESS LEVEL ASSESSMENT

TRL - 6

SCALE OF DEVELOPMENT

NA

STATUS OF COMMERCIALIZATION

NA

TENTATIVE COST OF DEVELOPMENT

₹ 20.0 Lakhs

INDUSTRIAL PARTNERS

NA

PLANT SET UP FOR FINAL PRODUCT

NA

POTENTIAL MARKET/TECHNO-ECONOMICS

The global market for gluten-free products market was valued at USD 4.63 Billion in 2015 and is projected to reach USD 7.59 Billion by 2020, at a CAGR of 10.4% from 2015 to 2020.

ENVIRONMENTAL SAFETY CERTIFICATION

NA

NODAL SCIENTIST DETAILS

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88. PROTEIN MIX FOR BEVERAGES

UID: TECH-THEME_2_IHBT-111

LABORATORY OF ORIGIN | CSIR-IHBT, PALAMPUR

EXECUTIVE SUMMARY

- Serving Size: 30 g.
- 100% Natural high energy drink.
- No maltodextrins & malt powders.
- Multigrain based.
- High energy >100 Kcal/ serving.
- 7g protein/serving.
- 4g dietary fiber/serving.
- Meets 15% RDA of Calcium and Iron Preservative free.
- Non-hygroscopic – easy to store.
- Shelf life 1 year.

KEYWORDS

Protein mix for beverages

SALIENT FEATURES

100% Natural high energy drink.

APPLICATIONS

Non-hygroscopic – easy to store.

TECHNOLOGY BENCHMARKING

Yes. Existing brands available in the market were taken as reference.

TECHNOLOGY READINESS LEVEL ASSESSMENT

TRL - 8

SCALE OF DEVELOPMENT

Yes. Pilot scale demonstration done, prototype tested in actual field conditions & critical scaling issues such as shelf life of the product, machinery capacity etc. have been addressed.

STATUS OF COMMERCIALIZATION

Yes. Product based on the technology started selling in the market.

TENTATIVE COST OF DEVELOPMENT

₹ 3.0 lakhs

INDUSTRIAL PARTNERS

NA

PLANT SET UP FOR FINAL PRODUCT

Yes

4.2 AGRICULTURE, NUTRITION & BIOTECHNOLOGY (ANB)

IPR STATUS DETAILS (PATENTS/COPYRIGHT/TRADEMARK SECURITY IN INDIA/ABROAD)
NA

POTENTIAL MARKET/TECHNO-ECONOMICS

The global protein fortified foods and beverage market is estimated to reach USD 59.3 billion with a compound annual growth rate of 5.9% by 2022 of which one fifth to be contributed by Indian market at USD 12 billion.

ENVIRONMENTAL SAFETY CERTIFICATION

Not applicable. There are no any known environmental risks.

NODAL SCIENTIST DETAILS

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89. TEA CATECHINS

UID: TECH-THEME_2_IHBT-113

LABORATORY OF ORIGIN | CSIR-IHBT, PALAMPUR

EXECUTIVE SUMMARY

Catechins account for 75-80% of total polyphenols in fresh tea leaves. These are high value antioxidants responsible for numerous health benefits of tea. A simple, green and economical process for obtaining green tea antioxidants.

KEYWORDS

Catechins, Polyphenols, Tea leaves.

SALIENT FEATURES

Catechins account for 75-80% of total polyphenols in fresh tea leaves. These are high value antioxidants responsible for numerous health benefits of tea.

APPLICATIONS

These are high value antioxidants responsible for numerous health benefits of tea.

TECHNOLOGY BENCHMARKING

Yes. All product/technology already available.

TECHNOLOGY READINESS LEVEL ASSESSMENT

TRL -7

SCALE OF DEVELOPMENT

Yes. Pilot scale demonstration done, prototype tested in actual field conditions & all critical scaling issues addressed.

STATUS OF COMMERCIALIZATION

NA

TENTATIVE COST OF DEVELOPMENT

₹ 3.0 Lakh

INDUSTRIAL PARTNERS

NA

PLANT SET UP FOR FINAL PRODUCT

Yes

IPR STATUS DETAILS (PATENTS/COPYRIGHT/TRADEMARK SECURITY IN INDIA/ABROAD)

NA

4.2 AGRICULTURE, NUTRITION & BIOTECHNOLOGY (ANB)

POTENTIAL MARKET/TECHNO-ECONOMICS

Global market demand for the tea polyphenols was approximated at 4870 tons in year 2012 and it is predicted to grow at a CAGR rate of 8.5% during the forecasted period from year 2013 to year 2022.

ENVIRONMENTAL SAFETY CERTIFICATION

NA

NODAL SCIENTIST DETAILS

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90. TEA WINE

UID: TECH-THEME_2_IHBT-114

LABORATORY OF ORIGIN | CSIR-IHBT, PALAMPUR

EXECUTIVE SUMMARY

An un-distilled fermented tea-based wine has been prepared to harness the health benefits of tea. Tea wine is a good source of antioxidants. It is a unique product that can be prepared from premium as well as low grade teas. Wine can be made sweet and dry on demand with varying alcohol content ranging between 9% and 15%.

KEYWORDS

Un-distilled fermented tea-based wine, Trolox equivalent antioxidants, Sweet or dry

SALIENT FEATURES

Each ml of wine contains 400-600 µg of trolox equivalent antioxidants & low alcoholic beverage with high quality, either sweet or dry antioxidants.

APPLICATIONS

An un-distilled fermented tea-based wine has been prepared to harness the health benefits of tea. Tea wine is a good source of antioxidants.

TECHNOLOGY BENCHMARKING

Yes. All product/technology already available.

TECHNOLOGY READINESS LEVEL ASSESSMENT

TRL - 6

SCALE OF DEVELOPMENT

Yes. Pilot scale demonstration done, prototype tested in not actual field conditions & all critical scaling issues not addressed.

STATUS OF COMMERCIALIZATION

N/A

TENTATIVE COST OF DEVELOPMENT

₹ 3.0 Lakh

INDUSTRIAL PARTNERS

N/A

PLANT SET UP FOR FINAL PRODUCT

N/A

IPR STATUS DETAILS (PATENTS/COPYRIGHT/TRADEMARK SECURITY IN INDIA/ABROAD)

N/A

4.2 AGRICULTURE, NUTRITION & BIOTECHNOLOGY (ANB)

POTENTIAL MARKET/TECHNO-ECONOMICS

Global wine market was valued at approximately USD 302.02 billion in 2017 and is expected to generate revenue of around USD, 423.59 billion by the end of 2023, growing at a CAGR of around 5.8% between 2017 and 2023.

ENVIRONMENTAL SAFETY CERTIFICATION

N/A

NODAL SCIENTIST DETAILS

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91. TECHNOLOGY FOR PREPARATION OF TEA VINEGAR

UID: TECH-THEME_2_IHBT-115

LABORATORY OF ORIGIN | CSIR-IHBT, PALAMPUR

EXECUTIVE SUMMARY

Vinegar is a fermented beverage renowned for various health benefits. For diversification of tea, CSIR-IHBT has developed tea vinegar with goodness of tea. This beverage contains natural antioxidants and organic acids solely produced during fermentation. This beverage is very refreshing with incredible taste.

- Each ml of tea vinegar contains 350-500 µg of trolox equivalent antioxidants,
- Contains no added chemicals and preservatives,
- Shelf preserving herbal health product.

KEYWORDS

Vinegar, Tea, Tea vinegar, Natural antioxidants

SALIENT FEATURES

This beverage contains natural antioxidants and organic acids solely produced during fermentation.

APPLICATIONS

Vinegar is a fermented beverage renowned for various health benefits. For diversification of tea, CSIR-IHBT has developed tea vinegar with goodness of tea.

TECHNOLOGY BENCHMARKING

Yes. All product/technology already available.

TECHNOLOGY READINESS LEVEL ASSESSMENT

TRL - 6

SCALE OF DEVELOPMENT

Yes. Pilot scale demonstration done, prototype tested in actual field conditions & all critical scaling issues not addressed.

STATUS OF COMMERCIALIZATION

N/A

TENTATIVE COST OF DEVELOPMENT

₹ 2.0 Lakhs

INDUSTRIAL PARTNERS

N/A

PLANT SET UP FOR FINAL PRODUCT

N/A

4.2 AGRICULTURE, NUTRITION & BIOTECHNOLOGY (ANB)

IPR STATUS DETAILS (PATENTS/COPYRIGHT/TRADEMARK SECURITY IN INDIA/ABROAD)
N/A

POTENTIAL MARKET/TECHNO-ECONOMICS

According to a new report by EMR titled, 'Global Vinegar Market Report and Forecast 2020-2025', the global vinegar market reached USD 1.30 billion in 2019. It is further expected to grow in the forecast period of 2020-2025 at a CAGR of 1.8% to attain USD 1.45 billion in 2025.

ENVIRONMENTAL SAFETY CERTIFICATION

N/A

NODAL SCIENTIST DETAILS

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92. STEVIA POWDER AND STEVIA LIQUID DROPS (LOW CALORIE SWEETENER)

UID: TECH-THEME_2_IHBT-116

LABORATORY OF ORIGIN | CSIR-IHBT, PALAMPUR

EXECUTIVE SUMMARY

Green technology, Low calorie natural sweetener: have number of applications in food and beverage products.

KEYWORDS

Sweetener, Low calorie sweetener, Stevia liquid drops

SALIENT FEATURES

- Green technology & have number of applications in food and beverage products.
- Green technology, Low calorie natural sweetener: have number of applications in food and beverage products.

APPLICATIONS

Low calorie natural sweetener.

TECHNOLOGY BENCHMARKING

Yes. There is no similar technology available to our knowledge.

TECHNOLOGY READINESS LEVEL ASSESSMENT

TRL - 6

SCALE OF DEVELOPMENT

Yes. Pilot scale demonstration done, prototype tested in actual field conditions & all critical scaling issues not yet addressed.

STATUS OF COMMERCIALIZATION

Yes. Product based on the technology started selling in the market.

TENTATIVE COST OF DEVELOPMENT

₹ 42.0 Lakhs

INDUSTRIAL PARTNERS

No

PLANT SET UP FOR FINAL PRODUCT

No

IPR STATUS DETAILS (PATENTS/COPYRIGHT/TRADEMARK SECURITY IN INDIA/ABROAD)

N/A

4.2 AGRICULTURE, NUTRITION & BIOTECHNOLOGY (ANB)

POTENTIAL MARKET/TECHNO-ECONOMICS

Stevia market is expected to reach US\$ 565.2 million by 2020, reflecting a CAGR of 8.5% during the forecast period.

ENVIRONMENTAL SAFETY CERTIFICATION

Not yet

NODAL SCIENTIST DETAILS

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93. EARLY FLOWERING IN LILIUM AND TULIP THROUGH HYDROPONIC CULTIVATION

UID: TECH-THEME_2_IHBT-121

LABORATORY OF ORIGIN | CSIR-IHBT, PALAMPUR

EXECUTIVE SUMMARY

Early flowering in Lilium (55 days) and in Tulip (30 days).

- Developed nutrient recipe for flower crops.
- Disease and pest free quality biomass production.
- 12% increase in plant density than conventional farming.
- Significant reduction in crop cycle.
- 20% labour saving year round crop production.

KEYWORDS

Flower, Floriculture, Cut flower, Ornamental flower

SALIENT FEATURES

Developed nutrient recipe for flower crops.

APPLICATIONS

Significant reduction in crop cycle.

TECHNOLOGY BENCHMARKING

Yes. Hydroponic nutrient recipe was developed for early flowering & year round flower production for the first time.

TECHNOLOGY READINESS LEVEL ASSESSMENT

TRL - 6

SCALE OF DEVELOPMENT

No. Pilot scale demonstration not done, prototype tested in not actual field conditions & all critical scaling issues not addressed.

STATUS OF COMMERCIALIZATION

N/A

TENTATIVE COST OF DEVELOPMENT

₹ 15.67 Lakhs

INDUSTRIAL PARTNERS

N/A

PLANT SET UP FOR FINAL PRODUCT

N/A

4.2 AGRICULTURE, NUTRITION & BIOTECHNOLOGY (ANB)

IPR STATUS DETAILS (PATENTS/COPYRIGHT/TRADEMARK SECURITY IN INDIA/ABROAD)
N/A

POTENTIAL MARKET/TECHNO-ECONOMICS

Trade in international market is estimated at ₹ 1269 crores (Lilium) and ₹ 2362 crores (Tulips) with an annual growth rate of 15%. Annual demand of bulbs 1328 metric tonne.

ENVIRONMENTAL SAFETY CERTIFICATION

N/A

NODAL SCIENTIST DETAILS

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94. CAPTIVE CULTIVATION OF SHIITAKE MUSHROOM AND ITS ENRICHMENT WITH VITAMIN D2 CULTIVATION

UID: TECH-THEME_2_IHBT-131

LABORATORY OF ORIGIN | CSIR-IHBT, PALAMPUR

EXECUTIVE SUMMARY

- Captive cultivation of shiitake mushroom utilizing the timber waste available in Himalayan states in record 1.5-2 months' duration as compared to 8-12 month in natural conditions. The yield of fresh mushroom is 0.5-0.6 kg per 1 kg dry weight of sawdust substrate.
- Process of Vitamin D2 enrichment in Shiitake mushroom.
- Proposed Products: High Vitamin D2 fresh Shiitake; High Vitamin D2 dried Shiitake.
- High Vitamin D2 Shiitake powder (for nutraceuticals and food processing).

KEYWORDS

Mushroom, Shiitake, Healthy, and Vitamin D2 enriched

SALIENT FEATURES

Proposed Products: High Vitamin D2 Fresh Shiitake; High Vitamin D2 dried Shiitake.

APPLICATIONS

Process of Vitamin D2/enrichment in Shiitake mushroom.

TECHNOLOGY BENCHMARKING

Yes. No such mushroom products with High Vit-D in Indian market.

TECHNOLOGY READINESS LEVEL ASSESSMENT

TRL - 6

SCALE OF DEVELOPMENT

N/A

STATUS OF COMMERCIALIZATION

No

TENTATIVE COST OF DEVELOPMENT

₹ 66.50 Lakhs

INDUSTRIAL PARTNERS

N/A

PLANT SET UP FOR FINAL PRODUCT

N/A

4.2 AGRICULTURE, NUTRITION & BIOTECHNOLOGY (ANB)

IPR STATUS DETAILS (PATENTS/COPYRIGHT/TRADEMARK SECURITY IN INDIA/ABROAD)
N/A

POTENTIAL MARKET/TECHNO-ECONOMICS

The global demand for Shiitake mushroom is expected to reach approximately 4500 tonnes by 2025 with an estimated market of USD 35.4 billion and the international demand for vitamin D is estimated to reach USD 140 million by 2025 growing annually at 1.2%.

ENVIRONMENTAL SAFETY CERTIFICATION

N/A

NODAL SCIENTIST DETAILS

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95. IMPROVED BEE HIVE FOR QUALITY AND HYGEINIC EXTRACTION OF HONEY

UID: TECH-THEME_2_IHBT-134

LABORATORY OF ORIGIN | CSIR-IHBT, PALAMPUR

EXECUTIVE SUMMARY

Farmers/bee keepers at present using traditional method of bee hive and extraction of honey through honey extractor. The honey production and its quality in India are up to the mark as per the global standard. Traditional method of harvesting of honey is time consuming, labour intensive, mortality of bees during harvesting, non-hygienic and poor quality which get low price in the market. In India, there is no improved bee hive and honey extractor is available in the market. Therefore, CSIR-CSIO, Chandigarh and CSIR-IHBT, Palampur developed improved bee hive and evaluated successfully in the field which had the following features.

- Extraction and harvesting of honey without disturbing the frames and honey bees.
- No mortality of honey bees during harvesting as compared to traditional method by honey extractor.
- The harvested honey is hygiene and high quality which fetches good price in the market.
- The hive is more helpful for the farmers/bee keepers.

KEYWORDS

Improved bee hive, Quality honey, Hygienic extraction

SALIENT FEATURES

The honey production and its quality in India are up to the mark as per the global standard.

APPLICATIONS

The harvested honey is hygiene and high quality which fetches good price in the market.

TECHNOLOGY BENCHMARKING

Yes. Similar technology is not yet available in India.

TECHNOLOGY READINESS LEVEL ASSESSMENT

TRL - 7

SCALE OF DEVELOPMENT

Yes. Pilot scale demonstration done, prototype tested in actual field conditions & all critical scaling issues addressed.

STATUS OF COMMERCIALIZATION

Final Product based on the technology has not yet started selling into the market.

TENTATIVE COST OF DEVELOPMENT

₹ 20.0 Lakhs

INDUSTRIAL PARTNERS

N/A

4.2 AGRICULTURE, NUTRITION & BIOTECHNOLOGY (ANB)

PLANT SET UP FOR FINAL PRODUCT

Not yet

IPR STATUS DETAILS (PATENTS/COPYRIGHT/TRADEMARK SECURITY IN INDIA/ABROAD)

N/A

POTENTIAL MARKET/TECHNO-ECONOMICS

India is 8th largest producer of honey. Honey market in India is estimated to reach a value of INR 28,057 Million by 2024 at a CAGR of 10.2% during 2019-2024. The improved bee hive has lot of demand in the industry, farmers, beekeepers, state departments, KVIC etc., due to easy extraction of good quality hygienic honey without mortality of bees.

ENVIRONMENTAL SAFETY CERTIFICATION

Yes. Environmental safety aspects are addressed and documented.

NODAL SCIENTIST DETAILS

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96. AO KIT (ARGEMONE OIL DETECTION KIT)

UID: TECH-THEME_2_IITR-138

LABORATORY OF ORIGIN | CSIR-IITR, LUCKNOW

EXECUTIVE SUMMARY

Consumption of mustard oil adulterated with argemone Mexicana oil is known to cause an epidemic popularly referred to as dropsy. Several outbreaks have been reported in the past. The dropsy incidence at Delhi in August 1998 appears to be largest reported in the country involving over 2500 victims with more than 60 deaths. To detect Argemone oil adulteration in edible oils, a simple & quick field level kit has been developed by CSIR-IITR.

KEYWORDS

- Easy to perform, takes only a few minutes.
- Requires only visual observation of fluorescence in the instrument provided.
- Sensitive (Minimum detection limit of 0.01% (100 ppm).
- Cost effective (< 10 ₹ per test).
- Serves as a handy tool for consumers.

SALIENT FEATURES

Consumption of mustard oil adulterated with argemone Mexicana oil is known to cause an epidemic popularly referred to as dropsy.

APPLICATIONS

To detect Argemone oil adulteration in edible oil.

TECHNOLOGY BENCHMARKING

Yes. All product/technology already available.

TECHNOLOGY READINESS LEVEL ASSESSMENT

TRL - 7

SCALE OF DEVELOPMENT

Yes. Pilot scale demonstration done, prototype tested in actual field conditions & all critical scaling issues addressed.

STATUS OF COMMERCIALIZATION

Final Product based on the technology has not started selling into the market.

TENTATIVE COST OF DEVELOPMENT

₹ 20.0 Lakhs

INDUSTRIAL PARTNERS

No

PLANT SET UP FOR FINAL PRODUCT

No

4.2 AGRICULTURE, NUTRITION & BIOTECHNOLOGY (ANB)

IPR STATUS DETAILS (PATENTS/COPYRIGHT/TRADEMARK SECURITY IN INDIA/ABROAD)
N/A

POTENTIAL MARKET/TECHNO-ECONOMICS

- Mandi oil seed dealers.
- Edible oil expeller unit's retailers.
- Consumers themselves.
- Consumer Guidance Organizations.

ENVIRONMENTAL SAFETY CERTIFICATION

No. Environmental safety aspects not addressed and documented.

NODAL SCIENTIST DETAILS

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97. MO CHECK (MUSTARD OIL CHECK)

UID: TECH-THEME_2_IITR-139

LABORATORY OF ORIGIN | CSIR-IITR, LUCKNOW

EXECUTIVE SUMMARY

The MO check strips are useful for the detection of an artificial color, Butter Yellow in mustard/edible oils. This can be employed as a handy tool at the retail outlet by cautious dealers, consumers/housewives themselves; consumer guidance organization/societies and for random preliminary checks by food inspectors and health authorities even at the remotest areas. Butter yellow is a known carcinogenic dye therefore the test becomes extremely crucial to ensure safety of edible oils.

KEYWORDS

Easy to perform, takes only a few minutes.

- Requires only visual observation.
- Sensitive (Minimum detection limit of 0.001% (10 ppm).
- Cost effective (< 10 ₹ per test).

SALIENT FEATURES

The MO check strips are useful for the detection of an artificial color, Butter Yellow in mustard/edible oils.

APPLICATIONS

Extremely crucial to ensure safety of edible oil.

TECHNOLOGY BENCHMARKING

Yes. All product/technology already available.

TECHNOLOGY READINESS LEVEL ASSESSMENT

TRL- 7

SCALE OF DEVELOPMENT

Yes. Pilot scale demonstration done, prototype tested in actual field conditions & all critical scaling issues addressed.

STATUS OF COMMERCIALIZATION

Final Product based on the technology has not started selling into the market.

TENTATIVE COST OF DEVELOPMENT

₹ 7 Lakhs

INDUSTRIAL PARTNERS

No

PLANT SET UP FOR FINAL PRODUCT

No

4.2 AGRICULTURE, NUTRITION & BIOTECHNOLOGY (ANB)

IPR STATUS DETAILS (PATENTS/COPYRIGHT/TRADEMARK SECURITY IN INDIA/ABROAD)
N/A

POTENTIAL MARKET/TECHNO-ECONOMICS

- Mandi oil seed dealers.
- Edible oil expeller unit's retailers.
- Consumers themselves.
- Consumer Guidance Organizations.

ENVIRONMENTAL SAFETY CERTIFICATION

No. Environmental safety aspects not addressed and documented.

NODAL SCIENTIST DETAILS

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98. HERBAL TOOTHACHE GEL

UID: TECH-THEME_2_NBRI-140

LABORATORY OF ORIGIN | CSIR-NBRI, LUCKNOW

EXECUTIVE SUMMARY

Toothache is a pain or inflammation in or around the teeth and jaws, often caused by tooth decay or bacterial infection, tooth fracture and damaged filling. According to the National Health and Nutrition Examination Survey, more than 90% of adults have had toothache problem. Numerous pain relieving medications such as Ibuprofen or Naproxen Sodium, Benzocaine and Acetaminophen are most commonly used for temporary pain relief. Moreover, they cause several side effects including headache, nausea, vomiting, and nervousness and itching etc. To overcome these hurdles, Institute has developed an innovative Triple Medicated Herbal Hydrogel for providing instant relief from chronic toothache.

KEYWORDS

Health, Nutrition, Inflammation, Relief, Pain

SALIENT FEATURES

Toothache is a pain or inflammation in or around the teeth and jaws, often caused by tooth decay or bacterial infection, tooth fracture and damaged filling.

APPLICATIONS

Providing instant relief from chronic toothache.

TECHNOLOGY BENCHMARKING

Yes. Repute brands of market.

TECHNOLOGY READINESS LEVEL ASSESSMENT

TRL - 9

SCALE OF DEVELOPMENT

No. Pilot scale demonstration not done, prototype tested in not actual field conditions & all critical scaling issues not addressed.

STATUS OF COMMERCIALIZATION

No

TENTATIVE COST OF DEVELOPMENT

₹ 2.0 Lakh

INDUSTRIAL PARTNERS

N/A

PLANT SET UP FOR FINAL PRODUCT

The company has started to setup the plant for final product.

4.2 AGRICULTURE, NUTRITION & BIOTECHNOLOGY (ANB)

IPR STATUS DETAILS (PATENTS/COPYRIGHT/TRADEMARK SECURITY IN INDIA/ABROAD)
N/A

POTENTIAL MARKET/TECHNO-ECONOMICS

Tooth pain is one of the most common dental problem. As a result oral care market has shown significant growth in terms of both value & volume in last few years. Present market is motivated by change in life style and demand of herb based products. In 2019, the Global Oral Care market size was USD 34670 Million, and it is expected to reach USD 41010 Million by the end of 2026, with a CAGR of 2.4% during 2021-2026.”

ENVIRONMENTAL SAFETY CERTIFICATION

Yes. Environmental safety aspects are addressed and documented.

NODAL SCIENTIST DETAILS

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99. HERBAL FLOOR CLEANER

UID: TECH-THEME_2_NBRI-141

LABORATORY OF ORIGIN | CSIR-NBRI, LUCKNOW

EXECUTIVE SUMMARY

Most of the floor cleaners in Indian market are chemicals-based which contain laurel sulphate, acetic acid and other chemical preservatives. They cause irritation (sulphate), allergy (preservatives), respiratory irritation, and headache (synthetic aroma). Plant derived antimicrobials have great potential but their lipophilic nature is the biggest limitation. Thus, Institute has developed water soluble plant-based “Floor Disinfectant & Cleaner” under CSIR-Aroma Mission. The product contains plant-derived Nano-antimicrobials and completely soluble in water with natural aroma. It is free-from sulphate which act as an irritant. More importantly, it is biodegradable and eco-friendly.

KEYWORDS

Cleaner, Irritation, Headache, Disinfectant, Aroma

SALIENT FEATURES

It is free-from sulphate which is act as an irritant. More importantly, it is biodegradable and eco-friendly.

APPLICATIONS

Biodegradable & eco-friendly.

TECHNOLOGY BENCHMARKING

Yes. Repute brands of market.

TECHNOLOGY READINESS LEVEL ASSESSMENT

TRL- 9

SCALE OF DEVELOPMENT

No. Pilot scale demonstration not done, prototype tested in not actual field conditions & all critical scaling issues not addressed.

STATUS OF COMMERCIALIZATION

No

TENTATIVE COST OF DEVELOPMENT

₹ 50,000/-

INDUSTRIAL PARTNERS

No

PLANT SET UP FOR FINAL PRODUCT

The company has started to setup the plant for final product.

IPR STATUS DETAILS (PATENTS/COPYRIGHT/TRADEMARK SECURITY IN INDIA/ABROAD)

N/A

4.2 AGRICULTURE, NUTRITION & BIOTECHNOLOGY (ANB)

POTENTIAL MARKET/TECHNO-ECONOMICS

Floor cleaner basically come under house hold cleaning products. In past surface cleaning was usually done with plain water in India but from last few decades' people started using detergents, phenyl or soap-water to clean the surface. Now the consumers are shifting towards popular and branded surface cleaners for better hygiene. According to India Household Cleaning Market Outlook, 2021, the overall market for household cleaning is anticipated to grow with a CAGR of 15% in the next five years. India market stood at \$ 2,388 million in 2016, and is projected to grow in terms of value to reach \$ 9,655 million by the end of 2026.

ENVIRONMENTAL SAFETY CERTIFICATION

Yes. Environmental safety aspects are addressed and documented.

NODAL SCIENTIST DETAILS

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100. HERBAL TOOTHPASTE (ZENTHODENT)

UID: TECH-THEME_2_NBRI-142

LABORATORY OF ORIGIN | CSIR-NBRI, LUCKNOW

EXECUTIVE SUMMARY

Institute has scientifically developed a novel formula to develop a herbal toothpaste, which contains minimum number of herbal ingredients to treat periodontal problem and yellowing/staining of teeth. It is very effective to prevent cavity formation. It does not contain triclosan (carcinogen) and synthetic chemical preservatives. It is safe to use without any adverse effects.

KEYWORDS

Carcinogen, Preservative, Synthetic, Formula, Toothpaste

SALIENT FEATURES

- No triclosan (a carcinogenic agent).
- No chemical preservative.
- Most effective against cavity forming bacteria.
- Cleansing property.
- It is safe to use without any adverse effects.

APPLICATIONS

It is very effective to prevent cavity formation. It does not contain triclosan (carcinogen) and synthetic chemical preservatives

TECHNOLOGY BENCHMARKING

Yes. Repute brands of market.

TECHNOLOGY READINESS LEVEL ASSESSMENT

TRL - 9

SCALE OF DEVELOPMENT

No. Pilot scale demonstration not done, prototype tested in not actual field conditions & all critical scaling issues not addressed.

STATUS OF COMMERCIALIZATION

Final Product based on the technology has not started selling into the market.

TENTATIVE COST OF DEVELOPMENT

₹ 2.5 Lakh

INDUSTRIAL PARTNERS

N/A

PLANT SET UP FOR FINAL PRODUCT

The company has started to setup the plant for final product.

4.2 AGRICULTURE, NUTRITION & BIOTECHNOLOGY (ANB)

IPR STATUS DETAILS (PATENTS/COPYRIGHT/TRADEMARK SECURITY IN INDIA/ABROAD)
N/A

POTENTIAL MARKET/TECHNO-ECONOMICS

Consumer preference is shifting is from regular toothpaste to herbal/ ayurvedic variants where as in the rural markets, the same shift is taking place from either powder or other plant-based homegrown dental care solutions. Therefore, it is expected a positive impact on herbal toothpaste market growth from 2019 to 2025. The toothpaste market was valued at USD 26.09 billion in 2018, and it is projected to reach USD 36.98 billion by 2024, registering a CAGR of 6.1%.

ENVIRONMENTAL SAFETY CERTIFICATION

Yes. Environmental safety aspects are addressed and documented.

NODAL SCIENTIST DETAILS

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101. HIGH THROUGHPUT MASS SPECTROMETRY METHOD FOR THE DETECTION OF PESTICIDE RESIDUES AND CONTAMINANTS FROM FOOD AND PRODUCE

UID: TECH-THEME_2_NCL-146

LABORATORY OF ORIGIN | CSIR-NCL, PUNE

EXECUTIVE SUMMARY

Validated method allows accurate, sensitive, high throughput and quantitative analysis of trace agrochemical residues (ppb) from food using regulatory accepted mass spectrometry as a back end. High throughput front-end allows a 10-20 fold sample throughput per day compared with existing LC-MS methods along with significantly lowered operational costs. Validated field studies completed on pesticide and veterinary drugs detection.

KEYWORDS

Mass spectrometry, MALDI, Food safety analysis, Food authenticity, Pesticides, Antibiotics, Contaminants

SALIENT FEATURES

Validated field studies completed on pesticide and veterinary drugs detection.

APPLICATIONS

Detection of pesticide residues and contaminants in foods.

TECHNOLOGY BENCHMARKING

Yes. All product/technology already available.

TECHNOLOGY READINESS LEVEL ASSESSMENT

TRL - 7

SCALE OF DEVELOPMENT

Yes. Pilot scale demonstration done, prototype tested in actual field conditions & all critical scaling issues addressed.

STATUS OF COMMERCIALIZATION

Final Product based on the technology has not started selling into the market.

TENTATIVE COST OF DEVELOPMENT

N/A

INDUSTRIAL PARTNERS

No

PLANT SET UP FOR FINAL PRODUCT

No

4.2 AGRICULTURE, NUTRITION & BIOTECHNOLOGY (ANB)

IPR STATUS DETAILS (PATENTS/COPYRIGHT/TRADEMARK SECURITY IN INDIA/ABROAD)
N/A

POTENTIAL MARKET/TECHNO-ECONOMICS

Agrochemical testing industry, food testing laboratories, food retailers, supply chain firms, exporters and importers, supermarket chains, FMCG companies including organic food producers, mass spectrometry and chromatography products market.

ENVIRONMENTAL SAFETY CERTIFICATION

No. Environmental safety aspects not addressed and documented.

NODAL SCIENTIST DETAILS

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102. TP-16 BIOFERTILIZER

UID: TECH-THEME_2_NEIST-147

LABORATORY OF ORIGIN | CSIR-NEIST, JORHAT, ASSAM

EXECUTIVE SUMMARY

The continuous use of chemical fertilizers and manures to enhance soil fertility and crop productivity causes unexpected environmental degradation, including leaching of nitrate into ground water, surface runoff of phosphorus and nitrogen, and eutrophication of aquatic ecosystems. Microbial inoculants which flourish as beneficial free living soil bacteria and as rhizosphere bacteria in plants; which grow in and around plant tissues improve soil quality and stimulate plant growth and also help in nutrient use efficiency by plants. Based on beneficial characters of bacteria, a free living soil microbe designated as TP-16 was evaluated to be used as bio-fertilizer. The application of bio-fertilizer based on TP-16 also fortifies the soil quality. The present technology know-how describes the use of TP-16 in sustainable crop production and soil fertility improvement. CSIR-NEIST has developed both liquid and carrier based formulations from a plant growth promoting TP-16 microbial strain. The bio-fertilizer is suitable for recovery of degraded soil; improves soil biological properties; promotes yield in plantation crops (tea) and agronomically important crops as desired.

KEYWORDS

Multiple plant growth promoting characters, Improves nutrient uptake, Recovery of degraded soil, Environment friendly product

SALIENT FEATURES

The bio-fertilizer is suitable for recovery of degraded soil; improves soil biological properties.

APPLICATIONS

The bio-fertilizer is suitable for recovery of degraded soil; improves soil biological properties; promotes yield in plantation crops (tea) and agronomically important crops as desired.

TECHNOLOGY BENCHMARKING

Yes. All product/technology already available.

TECHNOLOGY READINESS LEVEL ASSESSMENT

TRL - 7

SCALE OF DEVELOPMENT

Yes. Pilot scale demonstration done, prototype tested in actual field conditions & all critical scaling issues addressed.

STATUS OF COMMERCIALIZATION

Final Product based on the technology is selling into the market.

TENTATIVE COST OF DEVELOPMENT

₹ 15.5 Lakhs

INDUSTRIAL PARTNERS

Yes

4.2 AGRICULTURE, NUTRITION & BIOTECHNOLOGY (ANB)

PLANT SET UP FOR FINAL PRODUCT

Yes

IPR STATUS DETAILS (PATENTS/COPYRIGHT/TRADEMARK SECURITY IN INDIA/ABROAD)
N/A

POTENTIAL MARKET/TECHNO-ECONOMICS

Bio-fertilizer industries, small & medium enterprises and other interested companies.

ENVIRONMENTAL SAFETY CERTIFICATION

No. Environmental safety aspects not addressed and documented.

NODAL SCIENTIST DETAILS

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103. OP-12 BIOFERTILIZER

UID: TECH-THEME_2_NEIST-148

LABORATORY OF ORIGIN | CSIR-NEIST, JORHAT, ASSAM

EXECUTIVE SUMMARY

Owing to over dependence and excess use of chemical fertilizer resulted in diminution of soil microbes. Moreover, cost of chemical fertilizers is increased and made it unaffordable to cultivators. Consequently, recent year's bio-fertilizer is proven idea and cost effective approach. Therefore CSIR-NEIST has developed OP-12 biofertilizer which is based on selected bacterial strain. Due to its distinctive plant growth-promoting (PGP) traits like nitrogen fixation, phosphate solubilization, production of indole-3-acetic acid (IAA) like molecules, ammonia, hydrogen cyanide (HCN), siderophore etc., it is used as an effective biofertilizer for plant growth promotion in various crops of different agro-climatic regions.

KEYWORDS

Useful in normal and water deficit conditions, Effective in various crops in different agro-climatic conditions, Cost-effective, Simple production technique environment friendly

SALIENT FEATURES

It is used as an effective biofertilizer for plant growth promotion in various crops of different agro-climatic regions.

APPLICATIONS

The bio-fertilizer is suitable for recovery of degraded soil; improves soil biological properties; promotes yield.

TECHNOLOGY BENCHMARKING

Yes. All product / technology already available.

TECHNOLOGY READINESS LEVEL ASSESSMENT

TRL - 6

SCALE OF DEVELOPMENT

Yes. Pilot scale demonstration done, prototype tested in actual field conditions & all critical scaling issues not addressed.

STATUS OF COMMERCIALIZATION

Final Product based on the technology has not started selling into the market.

TENTATIVE COST OF DEVELOPMENT

₹ 35.0 Lakhs

INDUSTRIAL PARTNERS

No

PLANT SET UP FOR FINAL PRODUCT

No

4.2 AGRICULTURE, NUTRITION & BIOTECHNOLOGY (ANB)

IPR STATUS DETAILS (PATENTS/COPYRIGHT/TRADEMARK SECURITY IN INDIA/ABROAD)
N/A

POTENTIAL MARKET/TECHNO-ECONOMICS

Bio-fertilizer industries, small & medium enterprises and other interested companies

ENVIRONMENTAL SAFETY CERTIFICATION

No. Environmental safety aspects not addressed and documented.

NODAL SCIENTIST DETAILS

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104. CITRONELLA JOR LAB C-5

UID: TECH-THEME_2_NEIST-149

LABORATORY OF ORIGIN | CSIR-NEIST, JORHAT, ASSAM

EXECUTIVE SUMMARY

Citronella or Java Citronella (*Cymbopogon winterianus*, Jowitt) is a perennial grass belonging to the family Poaceae. The plants are 2-2.5 m in height, perennial herbs with fibrous root system. The Citronella oil is used extensively as a source of perfumery chemicals such as citronellal, citronellol and geraniol. These chemicals find extensive use in soap, candles and incense, perfumery, cosmetic and flavouring industries throughout the world. CSIR-NEIST has developed an improved variety named, Jor Lab C-5 has been developed through EMS (Ethyl Methane Sulfonate) mutant progeny which has higher Citronellal content.

KEYWORDS

High citronellal content, High herbage yield

SALIENT FEATURES

Citronella oil is used extensively as a source of perfumery chemicals such as citronellal, Citronellal and geraniol.

APPLICATIONS

These chemicals find extensive use in soap, Candles and incense, Perfumery, Cosmetic and flavouring industries throughout the world.

TECHNOLOGY BENCHMARKING

Yes. All product / technology already available.

TECHNOLOGY READINESS LEVEL ASSESSMENT

TRL - 6

SCALE OF DEVELOPMENT

No. Pilot scale demonstration not done, prototype tested in not actual field conditions & all critical scaling issues not addressed.

STATUS OF COMMERCIALIZATION

Final Product based on the technology has not started selling into the market.

TENTATIVE COST OF DEVELOPMENT

₹ 0.43 Lakhs

INDUSTRIAL PARTNERS

No

PLANT SET UP FOR FINAL PRODUCT

No

4.2 AGRICULTURE, NUTRITION & BIOTECHNOLOGY (ANB)

IPR STATUS DETAILS (PATENTS/COPYRIGHT/TRADEMARK SECURITY IN INDIA/ABROAD)
N/A

POTENTIAL MARKET/TECHNO-ECONOMICS

Fragrance & Flavor industry, small enterprises, farmers, women entrepreneurs, NGOs and SHGs.

ENVIRONMENTAL SAFETY CERTIFICATION

No. Environmental safety aspects not addressed and documented.

NODAL SCIENTIST DETAILS

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105. LEMONGRASS JOR LAB L-8

UID: TECH-THEME_2_NEIST-150

LABORATORY OF ORIGIN | CSIR-NEIST, JORHAT, ASSAM

EXECUTIVE SUMMARY

Lemongrass (*Cymbopogon flexuosus*) is one of the traditional essential oil bearing plant belonging to the family poaceae. The oil is obtained from certain species of grasses of the genus *Cymbopogon*. The genus consists of about 80 species, 10 to 12 of which are known to occur in India. The value of Lemongrass oil depends entirely upon its citral content. Lemongrass is a plant of the humid tropics. Lemongrass oil is one of the important essential oils used in fragrance and flavour industries. The oil has high market demand in India and abroad. CSIR-NEIST has developed an improved variety named, Jor Lab L-8 with high herbage yield and high Citral content.

KEYWORDS

High citronellal content, High herbage yield

SALIENT FEATURES

Lemongrass oil is one of the important essential oils used in fragrance and flavour industries.

APPLICATIONS

Fragrance and flavour industries.

TECHNOLOGY BENCHMARKING

Yes. All product/technology already available.

TECHNOLOGY READINESS LEVEL ASSESSMENT

TRL - 6

SCALE OF DEVELOPMENT

No. Pilot scale demonstration not done, prototype tested in not actual field conditions & all critical scaling issues not addressed.

STATUS OF COMMERCIALIZATION

Final Product based on the technology has not started selling into the market.

TENTATIVE COST OF DEVELOPMENT

₹ 0.43 Lakhs

INDUSTRIAL PARTNERS

N/A

PLANT SET UP FOR FINAL PRODUCT

No

IPR STATUS DETAILS (PATENTS/COPYRIGHT/TRADEMARK SECURITY IN INDIA/ABROAD)

N/A

4.2 AGRICULTURE, NUTRITION & BIOTECHNOLOGY (ANB)

POTENTIAL MARKET/TECHNO-ECONOMICS

Fragrance & Flavor industry, small enterprises, farmers, women entrepreneurs, NGOs and SHGs

ENVIRONMENTAL SAFETY CERTIFICATION

No. Environmental safety aspects not addressed and documented.

NODAL SCIENTIST DETAILS

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106. FRESH GINGER PROCESSING TECHNOLOGY

UID: TECH-THEME_2_NIIST-151

LABORATORY OF ORIGIN | CSIR-NIIST, THIRUVANANTHAPURAM

EXECUTIVE SUMMARY

- Processing right from harvesting which is ideal for climatic conditions of North East States.
- Fresh spice processing has advantage of high quality products with fresh aroma and better yield.
- Mechanical drying of spices operations offers processing during rainy seasons.
- Employment opportunities for rural population and income generation to farmers.
- The process is green and no usage of toxic chemicals.



KEYWORDS

Fresh ginger, Size reduction, Mechanical dewatering, Distillation, ginger oil, Ginger

SALIENT FEATURES

The process is green and no usage of toxic chemicals.

APPLICATIONS

Ideal for regions where sun drying is not possible.

TECHNOLOGY BENCHMARKING

Yes. All product/technology already available.

TECHNOLOGY READINESS LEVEL ASSESSMENT

TRL - 9

SCALE OF DEVELOPMENT

Yes. Pilot scale demonstration done, prototype tested in actual field conditions & all critical scaling issues addressed.

STATUS OF COMMERCIALIZATION

Final Product based on the technology is selling into the market.

TENTATIVE COST OF DEVELOPMENT

N/A

INDUSTRIAL PARTNERS

Setup 3 plant in North East & 1 in Wayanadu Kerala

PLANT SET UP FOR FINAL PRODUCT

Yes

4.2 AGRICULTURE, NUTRITION & BIOTECHNOLOGY (ANB)

IPR STATUS DETAILS (PATENTS/COPYRIGHT/TRADEMARK SECURITY IN INDIA/ABROAD)
N/A

POTENTIAL MARKET/TECHNO-ECONOMICS

Scope for value addition for a variety of products: ginger powder, oil, juice etc. Better market & less competition from primary processing like cleaning, drying powdering.

ENVIRONMENTAL SAFETY CERTIFICATION

Yes. Industry address the safety/environment aspects.

NODAL SCIENTIST DETAILS

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107. DEHUMIDIFIED DRIER FOR FOOD /AGRI PRODUCTS

UID: TECH-THEME_2_NIIST-152

LABORATORY OF ORIGIN | CSIR-NIIST, THIRUVANANTHAPURAM

EXECUTIVE SUMMARY

CSIR NIIST had developed and commercialized dehumidification drying for dehydration of food & agri products. This technology involves drying the material under controlled temperature and uniform distribution of air to retain the functional properties and micronutrients & flavour. The multipurpose application of the model involves the processing of heat sensitive exotic spices, fruits & vegetables, flowers etc. for drying under adverse climatic conditions when it is harvested.



KEYWORDS

Refrigerated adsorption and dehumidification, Multipurpose application

SALIENT FEATURES

This technology involves drying the material under controlled temperature and uniform distribution of air to retain the functional properties and micronutrients & flavour.

APPLICATIONS

For drying of heat sensitive exotic spices, fruits & vegetables, flowers etc. under adverse climatic conditions when it is harvested.

TECHNOLOGY BENCHMARKING

Yes. All product/technology already available.

TECHNOLOGY READINESS LEVEL ASSESSMENT

TRL - 9

SCALE OF DEVELOPMENT

Yes. Pilot scale demonstration done, prototype tested in actual field conditions & all critical scaling issues addressed.

STATUS OF COMMERCIALIZATION

Final Product based on the technology is selling into the market.

TENTATIVE COST OF DEVELOPMENT

N/A

INDUSTRIAL PARTNERS

Setup driers in Kerala for nutmeg & ginger.

4.2 AGRICULTURE, NUTRITION & BIOTECHNOLOGY (ANB)

PLANT SET UP FOR FINAL PRODUCT

Yes

IPR STATUS DETAILS (PATENTS/COPYRIGHT/TRADEMARK SECURITY IN INDIA/ABROAD)
N/A

POTENTIAL MARKET/TECHNO-ECONOMICS

Scope for value addition, shelf life enhancement and export market for a variety of dehydrated produces from fruits & vegetables, spices & herbs, onion, mushroom, flowers and leaves with superior quality.

ENVIRONMENTAL SAFETY CERTIFICATION

Yes industry address the safety/environment aspects.

NODAL SCIENTIST DETAILS

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108. VALUE ADDED SYRUPS FROM PALM NEERA AND COCONUT NEERA

UID: TECH-THEME_2_NIIST-153

LABORATORY OF ORIGIN | CSIR-NIIST, THIRUVANANTHAPURAM

EXECUTIVE SUMMARY

Syrups prepared from saps of coconut and palmyra palm can be used for sweetening coffee, as toppings and can be a healthy substitute for ghur prepared from the sap of the palm and coconut tree. The same process can be adopted for making syrup from sugar cane juice and the syrup made so can be a substitute for cane juice jaggery which is prepared by adding various additives for clarification and solidification. Our products are prepared with no preservatives.

KEYWORDS

Syrups, Palm neera, Coconut neera, Trikatu syrup, Ajwain syrappowder

SALIENT FEATURES

Syrups prepared from saps of coconut and palmyra palm can be used for sweetening coffee, as toppings and can be a healthy substitute for ghur prepared from the sap of the palm and coconut tree.

APPLICATIONS

Our products are prepared with no preservatives.

TECHNOLOGY BENCHMARKING

Yes. Products are benchmarked with honey.

TECHNOLOGY READINESS LEVEL ASSESSMENT

TRL - 6

SCALE OF DEVELOPMENT

Demonstrated to MSME's involved in Jaggery processing.

STATUS OF COMMERCIALIZATION

N/A

TENTATIVE COST OF DEVELOPMENT

N/A

INDUSTRIAL PARTNERS

N/A

PLANT SET UP FOR FINAL PRODUCT

N/A

IPR STATUS DETAILS (PATENTS/COPYRIGHT/TRADEMARK SECURITY IN INDIA/ABROAD)

N/A

4.2 AGRICULTURE, NUTRITION & BIOTECHNOLOGY (ANB)

POTENTIAL MARKET/TECHNO-ECONOMICS

Products can be positioned under Natural sweeteners market and health and wellness market.

ENVIRONMENTAL SAFETY CERTIFICATION

N/A

NODAL SCIENTIST DETAILS

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109. PROCESS FOR PREPARATION OF WHITE PEPPER

UID: TECH-THEME_2_NIIST-155

LABORATORY OF ORIGIN | CSIR-NIIST, THIRUVANANTHAPURAM

EXECUTIVE SUMMARY

“White pepper”, the de-skinned black or fresh pepper is the most valued form of pepper (almost double value of black pepper). Common method for making white pepper is traditional retting, which affects the product quality significantly. The innovative clean bioprocess from CSIR-NIIST helps in fast and bulk production of white pepper without losing its spicy principles. The process is designed to cleave the pectin molecular bonding between the skin and oil glands of the pepper kernel by the action of enzymes produced in-situ. This is facilitated in tanks by circulating liquid from a reservoir of microbial culture grown on degraded pepper skin medium. This bioprocess completes skin removal in 2 days for green and 4 days for black pepper under designed conditions.



KEYWORDS

White Pepper, Value-addition, Bioprocess

SALIENT FEATURES

The process is designed to cleave the pectin molecular bonding between the skin and oil glands of the pepper kernel by the action of enzymes produced in-situ.

APPLICATIONS

This bioprocess completes skin removal in 2 days for green and 4 days for black pepper under designed conditions.

TECHNOLOGY BENCHMARKING

Yes. Yields & quality benchmarked classical retting methods of production.

TECHNOLOGY READINESS LEVEL ASSESSMENT

TRL - 7

SCALE OF DEVELOPMENT

Yes. Pilot scale demonstration done, prototype tested in actual field conditions & all critical scaling issues addressed.

STATUS OF COMMERCIALIZATION

Final Product based on the technology has not started selling into the market.

TENTATIVE COST OF DEVELOPMENT

₹ 1.5 Cr. (Est.)

4.2 AGRICULTURE, NUTRITION & BIOTECHNOLOGY (ANB)

INDUSTRIAL PARTNERS

No

PLANT SET UP FOR FINAL PRODUCT

Yes

IPR STATUS DETAILS (PATENTS/COPYRIGHT/TRADEMARK SECURITY IN INDIA/ABROAD)

N/A

POTENTIAL MARKET/TECHNO-ECONOMICS

Process is completed in 2 days for green and 4 days for black pepper under designed conditions against several days for traditional process. It generates biogas and organic fertilizer as by-products.

ENVIRONMENTAL SAFETY CERTIFICATION

No. No systematic study performed on this aspect.

NODAL SCIENTIST DETAILS

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110. ORGANISM AND PROCESS FOR PRODUCTION OF BETA GLUCOSIDASE (BGL)

UID: TECH-THEME_2_NIIST-156

LABORATORY OF ORIGIN | CSIR-NIIST, THIRUVANANTHAPURAM

EXECUTIVE SUMMARY

Beta-glucosidase is an important component in the enzyme (cellulase) cocktail for hydrolysis of biomass to generate sugars for biofuels and other applications, as this is the rate limiting enzyme. Availability of enzymes for biomass hydrolysis is important for the future energy security indigenous technologies for enzyme production are warranted. CSIR– NIIST has a solid state fermentation (SSF) technology for production of BGL using the fungus *Aspergillus niger* demonstrated successfully at semi-pilot scale (up-to 10 kg level). The technology would help to produce BGL at a cheaper rate than existing processes, and would help in development of efficient biomass hydrolyzing enzyme cocktails for biorefinery applications.



KEYWORDS

Beta-glucosidase

SALIENT FEATURES

- Enzyme producing organism is a novel *Aspergillus niger* strain, proprietary to CSIR.
- BGL is unique in having a moderate glucose tolerance ($K_i = 200\text{mM}$).
- Cost effective solid state fermentation process for enzyme production which gives 240 IU/gDS (24 IU/ml) of BGL activity.
- Process demonstrated at Pilot scale (upto 20 kg batch) in conditions very similar to commercial SSF production of enzymes.
- Addition of NIIST-BGL can enhance the activity of commercial cellulases upto 30%.
- Potential of enzyme validated by relevant stakeholders (eg Praj industries, Pune).
- Competing enzyme in Indian market has a price of ₹ 1300/kg whereas the estimated production cost of NIIST BGL is ₹ ~215/kg (Activities are similar for both).

APPLICATIONS

The technology would help to produce BGL at a cheaper rate than existing processes, and would help in development of efficient biomass hydrolyzing enzyme cocktails for biorefinery applications.

TECHNOLOGY BENCHMARKING

Yes. Yields & quality benchmarked with available patent information.

TECHNOLOGY READINESS LEVEL ASSESSMENT

TRL - 6

4.2 AGRICULTURE, NUTRITION & BIOTECHNOLOGY (ANB)

SCALE OF DEVELOPMENT

Yes. Pilot scale demonstration done, prototype tested in not actual field conditions & all critical scaling issues not addressed.

STATUS OF COMMERCIALIZATION

Final Product based on the technology has not started selling into the market.

TENTATIVE COST OF DEVELOPMENT

Operation cost –Current estimate ₹ 215/kg (240000 IUs); Target = ≤ ₹ 100/kg (240000 IUs).

INDUSTRIAL PARTNERS

No

PLANT SET UP FOR FINAL PRODUCT

No

IPR STATUS DETAILS (PATENTS/COPYRIGHT/TRADEMARK SECURITY IN INDIA/ABROAD)

N/A

POTENTIAL MARKET/TECHNO-ECONOMICS

Competing enzyme in Indian market has a price of ₹ 1300/kg whereas the estimated production cost of NIIST BGL is ₹ ~215/kg (Activities are similar for both)

ENVIRONMENTAL SAFETY CERTIFICATION

No. Environmental safety aspects not addressed and documented.

NODAL SCIENTIST DETAILS

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111. RICE GRAIN ANALYSIS SOFTWARE, VER 1.0

UID: TECH-THEME_2_CSIO-158

LABORATORY OF ORIGIN | CSIR - CSIO, CHANDIGARH

EXECUTIVE SUMMARY

Dimensional analysis of rice grains is an important part of quality estimation of rice grains. Rice Grain Analysis Software is an image processing based software for performing dimensional analysis of rice grains in a quick, efficient manner. Rice grain samples are placed on a flat-bed scanner and the scanned images are analysed by the developed software in few seconds. The analysis results are then provided to the user in tabular and graphical displays. The accuracy of dimensional measurements of rice grains using the developed software is comparable to the operator-based methods involving length measuring tools such as Vernier callipers. The developed software provides a fast, inexpensive, efficient, repeatable and robust method for dimensional analysis of rice grains in comparison to the manual method which is tedious, subjective, error-prone and expensive in nature.

KEYWORDS

Rice grains, Dimensional analysis, Image processing, Quality estimation, Flat-bed

SALIENT FEATURES

The accuracy of dimensional measurements of rice grains using the developed software is comparable to the operator-based methods involving length measuring tools such as Vernier callipers.

APPLICATIONS

The developed software provides a fast, inexpensive, efficient, repeatable and robust method for dimensional analysis of rice grains in comparison to the manual method.

TECHNOLOGY BENCHMARKING

Yes with standard vernier calipers.

TECHNOLOGY READINESS LEVEL ASSESSMENT

TRL - 7

SCALE OF DEVELOPMENT

Yes. Pilot scale demonstration done, prototype tested in actual field conditions & all critical scaling issues addressed.

STATUS OF COMMERCIALIZATION

NA

TENTATIVE COST OF DEVELOPMENT

₹ 5.50 Lakhs

INDUSTRIAL PARTNERS

N/A

4.2 AGRICULTURE, NUTRITION & BIOTECHNOLOGY (ANB)

PLANT SET UP FOR FINAL PRODUCT

N/A

IPR STATUS DETAILS (PATENTS/COPYRIGHT/TRADEMARK SECURITY IN INDIA/ABROAD)

N/A

POTENTIAL MARKET/TECHNO-ECONOMICS

200-300 licenses required in the domestic market.

ENVIRONMENTAL SAFETY CERTIFICATION

N/A

NODAL SCIENTIST DETAILS

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112. ENDOPHYTIC BACTERIAL FORMULATION – PLANT TONIC

UID: TECH-THEME_2_NIIST-159

LABORATORY OF ORIGIN | CSIR-NIIST, THIRUVANANTHAPURAM

EXECUTIVE SUMMARY

This is a technology developed by CSIR-NIIST and commercialized. The use this technology is for enhanced seed/sapling germination, plant biomass and yield besides the suppression of fungal and bacterial diseases. This was developed through a consortium of three endophytic bacterial strains isolated from agricultural crops. The studies were confirmed that this formulation is effective against all the crops tested like cereals, pluses, vegetables including leafy types, plantation crops, and floriculture plants. Production capacity of 10,000 liter per batch is developed with three months shelf life period under preserved condition.

KEYWORDS

Endophytes, Bacteria, Bioformulation, Crop improvement and disease management

SALIENT FEATURES

The use of this technology is for enhanced seed/sapling germination, plant biomass and yield besides the suppression of fungal and bacterial diseases.

APPLICATIONS

Production capacity of 10,000 liter per batch is developed with three months shelf life period under preserved condition which is tedious, subjective, error-prone and expensive in nature.

TECHNOLOGY BENCHMARKING

Yes. We compared the product with available related products in the market besides ones our earlier related commercialized technology product.

TECHNOLOGY READINESS LEVEL ASSESSMENT

TRL - 8

SCALE OF DEVELOPMENT

Yes. Pilot scale demonstration done, prototype tested in actual field conditions & all critical scaling issues addressed.

STATUS OF COMMERCIALIZATION

Yes. At present the party is using the product at their own family.

TENTATIVE COST OF DEVELOPMENT

N/A

INDUSTRIAL PARTNERS

N/A

4.2 AGRICULTURE, NUTRITION & BIOTECHNOLOGY (ANB)

PLANT SET UP FOR FINAL PRODUCT

Yes, 1000 litre capacity.

IPR STATUS DETAILS (PATENTS/COPYRIGHT/TRADEMARK SECURITY IN INDIA/ABROAD)
N/A

POTENTIAL MARKET/TECHNO-ECONOMICS

The product developed is eco-friendly, cost effective and easy to handle will have a high potential in agriculture sector particularly among the farming community, who want to minimize the use of toxic synthetic chemicals in their fields. Ideal for small scale farmers to medium level entrepreneurs. Efficacy of the product was proved under field condition with consistency. The product is superior in quality and cheaper than the related products available in the market.

ENVIRONMENTAL SAFETY CERTIFICATION

Yes. Eco-friendly product.

NODAL SCIENTIST DETAILS

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113. READY TO COOK DEHYDRATED VEGETABLES/ VEGETABLE MIXES

UID: TECH-THEME_2_NIIST-160

LABORATORY OF ORIGIN | CSIR-NIIST, THIRUVANANTHAPURAM

EXECUTIVE SUMMARY

Dehydrated ready to use vegetables/vegetable mixes for various culinary applications were developed. The focus is to process maximum quantity of the raw material during the peak harvest period and keep available stock in a safe processed condition for the whole year. Vegetables can be used directly by soaking in hot water for 2-3 minutes, could be used as vegetables and as ingredients for other food products.

KEYWORDS

RTC vegetables, Convenient foods

SALIENT FEATURES

Vegetables can be used directly by soaking in hot water for 2-3 minutes, could be used as vegetables and as ingredients for other food products.

APPLICATIONS

Production capacity of 10,000 liter per batch is developed with three months shelf life period under preserved condition which is tedious, subjective, error-prone and expensive in nature.

TECHNOLOGY BENCHMARKING

Yes. All product/technology already available.

TECHNOLOGY READINESS LEVEL ASSESSMENT

TRL - 8

SCALE OF DEVELOPMENT

Yes. Pilot scale demonstration done, prototype tested in actual field conditions & all critical scaling issues addressed.

STATUS OF COMMERCIALIZATION

N/A

TENTATIVE COST OF DEVELOPMENT

N/A

INDUSTRIAL PARTNERS

N/A

PLANT SET UP FOR FINAL PRODUCT

N/A

4.2 AGRICULTURE, NUTRITION & BIOTECHNOLOGY (ANB)

IPR STATUS DETAILS (PATENTS/COPYRIGHT/TRADEMARK SECURITY IN INDIA/ABROAD)
N/A

POTENTIAL MARKET/TECHNO-ECONOMICS

Convenient food market; Shelf life enhancement and export market for a variety of dehydrated produces from vegetables, with superior quality. Under commercialization for HORTICORP, Kerala. The technology developed aims in extending the shelf life of vegetables/fruits which are highly perishable and also helps to reduce the loss of material and thus improving the agriculture economy.

ENVIRONMENTAL SAFETY CERTIFICATION

N/A

NODAL SCIENTIST DETAILS

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114. DEHYDRATE FRUITS AND FRUIT PRESERVE IN HONEY

UID: TECH-THEME_2_NIIST-161

LABORATORY OF ORIGIN | CSIR-NIIST, THIRUVANANTHAPURAM

EXECUTIVE SUMMARY

Ripe fruits are dehydrated using novel drying methods to the optimum water activity so as to retain the fresh and natural flavors. The product has a shelf stability for one year under room temperature without any added preservatives, under vacuum package in standalone polyethylene bags. The fruits are partially osmotic dehydrated in honey followed by dehydration at mild conditions. Dehydrated fruits without any additives, can be consumed as healthy snacks/dessert/ingredient for other preparations

KEYWORDS

Fruit snacks, Preserves, Fruit based health snacks

SALIENT FEATURES

Ripe fruits are dehydrated using novel drying methods to the optimum water activity so as to retain the fresh and natural flavors.

APPLICATIONS

Dehydrated fruits without any additives, can be consumed as healthy snacks/dessert/ingredient for other preparations.

TECHNOLOGY BENCHMARKING

Yes. All product/technology already available.

TECHNOLOGY READINESS LEVEL ASSESSMENT

TRL - 7

SCALE OF DEVELOPMENT

Yes. Pilot scale demonstration done, prototype tested in actual field conditions & all critical scaling issues addressed.

STATUS OF COMMERCIALIZATION

N/A

TENTATIVE COST OF DEVELOPMENT

N/A

INDUSTRIAL PARTNERS

N/A

PLANT SET UP FOR FINAL PRODUCT

N/A

4.2 AGRICULTURE, NUTRITION & BIOTECHNOLOGY (ANB)

IPR STATUS DETAILS (PATENTS/COPYRIGHT/TRADEMARK SECURITY IN INDIA/ABROAD)
N/A

POTENTIAL MARKET/TECHNO-ECONOMICS

- Health food market; export market for a variety of regional fruits with superior quality; Preservation of seasonal fruits; functional food.
- Under commercialization for HORTICORP, Kerala.
- Value addition of seasonal fruits; Revival of agriculture economics by shelf life enhancement of seasonal crops.
- Can be implemented in consultancy mode, through process know how, equipment design and project implementation.

ENVIRONMENTAL SAFETY CERTIFICATION

N/A

NODAL SCIENTIST DETAILS

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115. FUNCTIONAL VEGETABLE OILS BASED ON RED PALM OLEIN (RPO) FOR CULINARY USE WITH ENRICHED CAROTENOIDS

UID: TECH-THEME_2_NIIST-162

LABORATORY OF ORIGIN | CSIR-NIIST, THIRUVANANTHAPURAM

EXECUTIVE SUMMARY

Healthy cooking oil with optimum fatty acid content enriched with carotenoids and tocopherols- Vitamin A deficiency (VAD) is an important nutritional problem in India, resulting in an increased risk of severe morbidity and mortality. Blended vegetable oils with optimum fatty acid profile enriched with beta carotene was developed to combat malnutrition due to vitamin A deficiency. Field level acceptability studies for dietary application of the blends were successfully carried out.

KEYWORDS

Functional vegetable oil, Carotenoids, Vitamin A.

SALIENT FEATURES

Field level acceptability studies for dietary application of the blends were successfully carried out.

APPLICATIONS

Correction of malnutrition due to Vitamin A deficiency in vegetable cooking oils.

TECHNOLOGY BENCHMARKING

Yes. All product/technology already available.

TECHNOLOGY READINESS LEVEL ASSESSMENT

TRL - 7

SCALE OF DEVELOPMENT

Yes. Pilot scale demonstration done, prototype tested in actual field conditions & all critical scaling issues addressed.

STATUS OF COMMERCIALIZATION

N/A

TENTATIVE COST OF DEVELOPMENT

N/A

INDUSTRIAL PARTNERS

N/A

PLANT SET UP FOR FINAL PRODUCT

N/A

4.2 AGRICULTURE, NUTRITION & BIOTECHNOLOGY (ANB)

IPR STATUS DETAILS (PATENTS/COPYRIGHT/TRADEMARK SECURITY IN INDIA/ABROAD)
N/A

POTENTIAL MARKET/TECHNO-ECONOMICS

- Consumer demand for healthy oil blends enriched with essential nutrients is on rise. RPO blend with optimum fatty acid profile enriched with carotenoids meet the consumers demand for healthy cooking oil.
- The global market for edible oil is going to exceed by 275 million metric tonne by 2024, driven by consumer demand for more healthy oils.

ENVIRONMENTAL SAFETY CERTIFICATION

N/A

NODAL SCIENTIST DETAILS

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116. TECHNOLOGY FOR RED PALM OLEIN (RPO) BASED SOFT GEL AS VITAMIN A SUPPLEMENT FOR COMBATING VITAMIN A DEFICIENCY

UID: TECH-THEME_2_NIIST-166

LABORATORY OF ORIGIN | CSIR-NIIST, THIRUVANANTHAPURAM

EXECUTIVE SUMMARY

Red Palm Olein (RPO) processed by NIIST technology has a higher bioavailability of full spectrum carotenoid nutritional supplement. Richest natural source of carotenoids with concentrations of 700-1000 ppm. Red palmolein based soft gel capsules were developed as a supplement to meet the vegan requirement of vitamin-A based on RDA requirements.

KEYWORDS

RPO, Vitamin A

SALIENT FEATURES

Richest natural source of carotenoids with concentrations of 700-1000 ppm.

APPLICATIONS

Supplement rich in Beta-carotene and Vit-E for combating Vit-A deficiency.

TECHNOLOGY BENCHMARKING

Yes. All product/technology already available.

TECHNOLOGY READINESS LEVEL ASSESSMENT

TRL – 7

SCALE OF DEVELOPMENT

Yes. Pilot scale demonstration done, prototype tested in actual field conditions & all critical scaling issues addressed.

STATUS OF COMMERCIALIZATION

N/A

TENTATIVE COST OF DEVELOPMENT

N/A

INDUSTRIAL PARTNERS

N/A

PLANT SET UP FOR FINAL PRODUCT

N/A

4.2 AGRICULTURE, NUTRITION & BIOTECHNOLOGY (ANB)

IPR STATUS DETAILS (PATENTS/COPYRIGHT/TRADEMARK SECURITY IN INDIA/ABROAD)
N/A

POTENTIAL MARKET/TECHNO-ECONOMICS

A growing demand for natural supplements of vitamin-A in order to prevent the Vitamin A Deficiency.
Vegan option as a vitamin A supplement.

ENVIRONMENTAL SAFETY CERTIFICATION

N/A

NODAL SCIENTIST DETAILS

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Chapter-4 4.3 Chemical (Including Leather) and Petroleum (CLP)

Introduction

The total number of technologies for TRL evaluation under this theme were 47 out of which 20 were selected as TRL 6 and above. TRL level for 12 technologies under this theme will be further evaluated by the experts. Seven technologies were related to the COVID-19 and kept for CSIR Covid Compendium and hence were not evaluated during the validation process. The contributing laboratories for the technologies were from CSIR-AMPRI, CSIR-CECRI, CSIR-CLRI, CSIR-CIMFR, CSIR-IHBT, CSIR-IICT, CSIR-IIP, and CSIR-NCL.

The seven prominent technologies at TRL 9 were from CSIR- IIP, CSIR-IICT and CSIR-CLRI.

Assessment of Technology Readiness Level

Figure 1 indicates the selected technologies at TRL6 and above in this theme. The total selected technologies at TRL 6, TRL 7, TRL 8 and TRL 9 are 7, 3, 3 and 7 respectively. TRL 6 and TRL 9 contributes 7 technologies each which is 70% of total technologies selected in this theme.

Figure 2 shows the average cost and number of technologies at TRL6 and above which indicates that the average cost of TRL 9 is the maximum about 6000 Lakhs. While the average cost of technologies at TRL 6, TRL 7 and TRL 8, respectively, are ₹ 527 lakhs, ₹ 29 lakhs and ₹ 37 Lakhs.

CSIR Laboratory-wise contribution of the technologies at TRL6 and above has shown in figure 3. CSIR-AMPRI, CSIR-CIMFR, CSIR-CLRI, CSIR-IHBT, CSIR-IICT, CSIR-IIP and CSIR-NCL are major contributors in this theme.

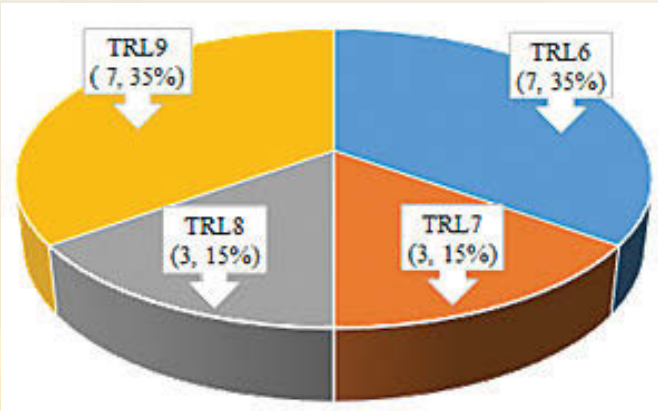


Figure 1. Distribution of Technology at TRL6 and above.

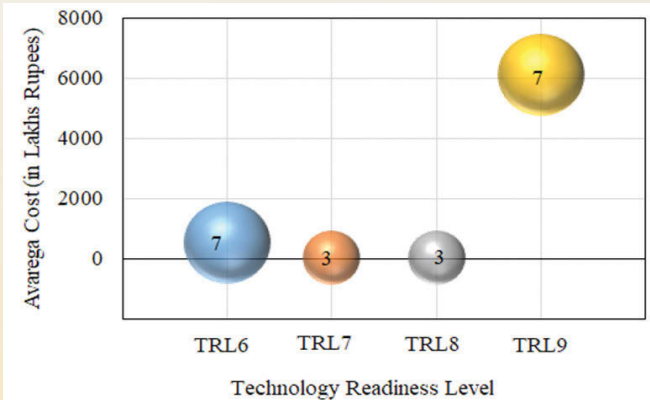


Figure 2. Average cost and number of technology of the technologies at TRL6 and above.

4.3 CHEMICAL (INCLUDING LEATHER) AND PETROLEUM (CLP)

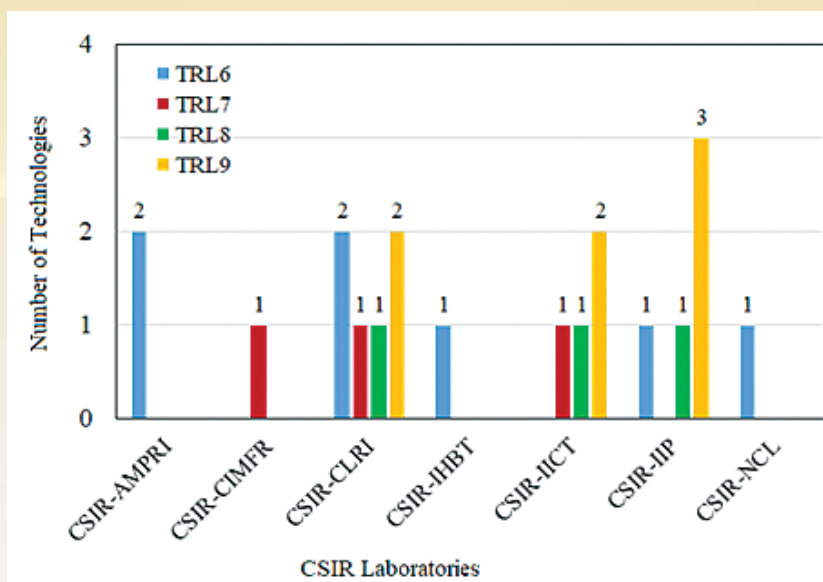


Figure 3. Lab-wise distribution of selected technologies at TRL6 and above.

Major highlights

The most promising/emerging technologies based on expert committee evaluation, developer's feedbacks and commercial status included basic design for a continuous commercial plant of 4000 MTA capacity for Para Tert Butyl Toluene (PTBT), Process development, scale-up studies and basic design for a commercial plant of 3000 TPA capacity for Para Tert Butyl Benzoic Acid (PTBBA), Process development, scale-up studies and basic design for a commercial plant of 3000 TPA capacity for Para Tert Butyl Methyl Benzoate (PTBMB), Simultaneous Production of US Grade Gasoline and High Purity Benzene from FCC C6 Heart Cut Naphtha, Visbreaking of Petroleum Residual Fractions (Soaker with internals), Sweetening catalyst – Thoxcat ESTM, technology for Waste plastics to Fuel and Petrochemicals, Wax De-oiling Technology for Production of Paraffin and Microcrystalline Waxes, Waterless Chrome Tanning Technology etc.

117. FLY ASH BASED ADVANCED (CEMENT FREE) GEOPOLYMER CONCRETE FOR RIGID PAVEMENT ROADS

UID: TECH-THEME_3_AMPRI-002

LABORATORY OF ORIGIN | CSIR-AMPRI, BHOPAL

EXECUTIVE SUMMARY

Salient Technical Features including Competing Features & Environmental Consideration:

- Bulk Utilization of Industrial Waste i.e Fly Ash.
- Eco-Friendly Process with around 80% less CO₂ emissions as compared to Conventional Cement Concrete thus solves global warming problem.
- Obviates the need of water curing.
- Energy efficient process as compared to conventional Cement Concrete.
- Energy efficient - can be made at ambient temperature (35-400C approximately).
- Can be made by using conventional machineries. Increased productivity as strength is achieved in seven days only compared to twenty eight days required for conventional cement concrete system.
- The increased productivity and superior engineering properties also saves on project cost and duration.

KEYWORDS

Fly ash based, Cement free, Eco friendly geopolymer concrete, Rigid pavement road.

SALIENT FEATURES

- 80% less CO₂ emissions.
- Usage of industrial waste-Fly ash.
- Energy efficient-can be made at ambient temperature.

TECHNOLOGY BENCHMARKING

The technology is benchmarked with similar technologies.

TECHNOLOGY READINESS LEVEL ASSESSMENT

TRL assessment is 6

SCALE OF DEVELOPMENT

Technology Demonstration in Operational Environment has been done.

STATUS OF COMMERCIALIZATION

Commercialization has not been started yet.

TENTATIVE COST OF DEVELOPMENT

₹ 10.00 lakhs

INDUSTRIAL PARTNERS

Not yet

PLANT SET UP FOR FINAL PRODUCT

Not yet

4.3 CHEMICAL (INCLUDING LEATHER) AND PETROLEUM (CLP)

IPR STATUS DETAILS (PATENTS/COPYRIGHT/TRADEMARK SECURITY IN INDIA/ABROAD)

Not

POTENTIAL MARKET/TECHNO-ECONOMICS

Infrastructure developers, Construction Industries, Fly Ash generating Industries

ENVIRONMENTAL SAFETY CERTIFICATION

No

NODAL SCIENTIST DETAILS

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118. ADVANCED PAVERS BLOCK FROM COPPER TAILINGS

UID: TECH-THEME_3_AMPRI-003

LABORATORY OF ORIGIN | CSIR-AMPRI, BHOPAL

EXECUTIVE SUMMARY

This project was awarded to CSIR-AMPRI, Bhopal by M/s Hindustan Copper Limited, Malanjkhand Copper Project, Malanjkhand, District Balaghat (M.P.) for utilization of copper tailings. The copper tailings (new and old) were used as 100% replacement of conventional river sand for the preparation of paver blocks along with other conventional ingredients like cement and coarse aggregates. The tailings mainly contain around 85-88% of silica as quartz. The process leads to saving of precious river sand and is environment friendly. During the preparation of paver blocks, it was observed that around 25-30% of copper tailings were used in the mix preparation.

KEYWORDS

Copper ore tailing, Pavers block, river sand, Coarse aggregates, Cement

SALIENT FEATURES

- The technology is developed for utilization of copper tailings instead of river sand.
- Preparation of paver blocks along with other conventional ingredients like cement and coarse aggregates.
- Applications-Civil infrastructure, pavements, city beautification & aesthetics.

TECHNOLOGY BENCHMARKING

The technology is benchmarked with similar technologies.

TECHNOLOGY READINESS LEVEL ASSESSMENT

TRL assessment is 6

SCALE OF DEVELOPMENT

Technology Demonstration in Operational Environment has not been done.

STATUS OF COMMERCIALIZATION

Yes

TENTATIVE COST OF DEVELOPMENT

₹ 13/- 14/- per Paver Block (approx.)

INDUSTRIAL PARTNERS

Hindustan Copper Limited

PLANT SET UP FOR FINAL PRODUCT

Not yet

IPR STATUS DETAILS (PATENTS/COPYRIGHT/TRADEMARK SECURITY IN INDIA/ABROAD)

N/A

4.3 CHEMICAL (INCLUDING LEATHER) AND PETROLEUM (CLP)

POTENTIAL MARKET/TECHNO-ECONOMICS

Civil infrastructure, pavements, city beautification & aesthetics.

ENVIRONMENTAL SAFETY CERTIFICATION

No

NODAL SCIENTIST DETAILS

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119. ODOR ABATEMENT FOR TANNERIES

UID: TECH-THEME_3_CLRI-009

LABORATORY OF ORIGIN | CSIR-CLRI, CHENNAI

EXECUTIVE SUMMARY

This technology provides clean atmosphere & occupational health through cleaner & sustainable production. It can be implemented in Leather manufacturing, Dairy, Tobacco, Food processing & waste treatment. This provides innovative technology using microbial bio-filters-thereby providing green, cleaner & sustainable technology. Bad odors in the processing industries will be removed.

KEYWORDS

Odor abatement system, Leather tannery

SALIENT FEATURES

- Bad odor is removed by using microbial bio-filter.
- Green, clean and sustainable technology.

TECHNOLOGY BENCHMARKING

The technology is benchmarked with similar technologies.

TECHNOLOGY READINESS LEVEL ASSESSMENT

TRL assessment is 6

SCALE OF DEVELOPMENT

Technology Demonstration in Operational Environment has been done.

STATUS OF COMMERCIALIZATION

Commercialization has not been started yet.

TENTATIVE COST OF DEVELOPMENT

₹ 20 Lakhs

INDUSTRIAL PARTNERS

Not yet

PLANT SET UP FOR FINAL PRODUCT

Not yet

IPR STATUS DETAILS (PATENTS/COPYRIGHT/TRADEMARK SECURITY IN INDIA/ABROAD)

Not

POTENTIAL MARKET/TECHNO-ECONOMICS

Tanneries & Product Units. It may have application in other industries as Well.

ENVIRONMENTAL SAFETY CERTIFICATION

No

NODAL SCIENTIST DETAILS

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120. CO-DIGESTION OF TANNERY SOLID WASTES FOR BIOGAS GENERATION

UID: TECH-THEME_3_CLRI-010

LABORATORY OF ORIGIN | CSIR-CLRI, CHENNAI

EXECUTIVE SUMMARY

Solid waste generation from tanning industry is inevitable and is a major concern from the environmental pollution point of view. Co-digestion of tannery solid waste (i.e., fleshings and Waste Activated Sludge (WAS) generated from effluent treatment plant) is taken as substrates for biogas generation. The quantity of mixed waste to be digested in the pilot plant is 750 kg per day on wet weight basis. After size reduction of fleshing, the fleshings and sludge will be mixed in an optimized mix ratio and will be fed into the anaerobic digester fitted with gas collection system. Digestate will be withdrawn in regular intervals of time and will be dewatered with the help of mechanical dewatering system. Mechanically Dewatered digestate is further dried and can be used as manure.

KEYWORDS

Tannery solid waste, Biogas

SALIENT FEATURES

- Environmental friendly.
- Waste from tannery is used as input to produce bio-gas.

TECHNOLOGY BENCHMARKING

The technology is benchmarked with similar technologies.

TECHNOLOGY READINESS LEVEL ASSESSMENT

TRL assessment is 7

SCALE OF DEVELOPMENT

Technology Demonstration in Operational Environment has been done.

STATUS OF COMMERCIALIZATION

Commercialization has been started.

TENTATIVE COST OF DEVELOPMENT

₹ 20 Lakhs

INDUSTRIAL PARTNERS

Not yet

PLANT SET UP FOR FINAL PRODUCT

Yes

IPR STATUS DETAILS (PATENTS/COPYRIGHT/TRADEMARK SECURITY IN INDIA/ABROAD)

Not

4.3 CHEMICAL (INCLUDING LEATHER) AND PETROLEUM (CLP)

POTENTIAL MARKET/TECHNO-ECONOMICS

CETP's & ETP's

ENVIRONMENTAL SAFETY CERTIFICATION

Yes

NODAL SCIENTIST DETAILS

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121. CHEMO AUTOTROPHIC ACTIVATED CARBON (CAACO) TECHNOLOGY FOR WASTE WATER TREATMENT

UID: TECH-THEME_3_CLRI-013

LABORATORY OF ORIGIN | CSIR-CLRI, CHENNAI

EXECUTIVE SUMMARY

This technology is used for the treatment of wastewater discharged from Industrial and domestic sectors without generation of sludge.

- Low foot print requirement.
- Low electrical energy consumption.
- No odour emission.
- Low operation cost.
- Minimum sludge production.
- CAACO technology can be integrated with membrane separation.
- Implemented in leather, textile, chemical, and pharmaceutical industries.

KEYWORDS

Zero water, Waste streams, Post-tanning

SALIENT FEATURES

- Waste water treatment from industrial and domestic sector without generation of sludge.
- Ind.-leather, textiles, chemical and pharma.

TECHNOLOGY BENCHMARKING

The technology is benchmarked with similar technologies.

TECHNOLOGY READINESS LEVEL ASSESSMENT

TRL assessment is 9

SCALE OF DEVELOPMENT

Technology Demonstration in Operational Environment has been done.

STATUS OF COMMERCIALIZATION

Commercialization has not been started

TENTATIVE COST OF DEVELOPMENT

₹ 3 Lakhs

INDUSTRIAL PARTNERS

Not yet

PLANT SET UP FOR FINAL PRODUCT

Yes

IPR STATUS DETAILS (PATENTS/COPYRIGHT/TRADEMARK SECURITY IN INDIA/ABROAD)

Not

4.3 CHEMICAL (INCLUDING LEATHER) AND PETROLEUM (CLP)

POTENTIAL MARKET/TECHNO-ECONOMICS

Tanneries, Textile Industries, Pharmaceuticals and Chemical Industries.

ENVIRONMENTAL SAFETY CERTIFICATION

N/A

NODAL SCIENTIST DETAILS

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122. FENTON ACTIVATED CARBON CATALYTIC OXIDATION (FACCO) PROCESS FOR THE TREATMENT OF HIGH STRENGTH WASTEWATER

UID: TECH-THEME_3_CLRI-015

LABORATORY OF ORIGIN | CSIR-CLRI, CHENNAI

EXECUTIVE SUMMARY

Treatment of wastewater discharged from Industrial and domestic sectors without generation of sludge.

- Low foot print requirement.
- Low electrical energy consumption.
- No odour emission.
- Low operation cost.
- Minimum sludge production.

KEYWORDS

Fenton, Waste water

SALIENT FEATURES

- Waste treatment with reduced sludge.
- Reduction in water pollution.

TECHNOLOGY BENCHMARKING

The technology is benchmarked with similar technologies.

TECHNOLOGY READINESS LEVEL ASSESSMENT

TRL assessment is 9

SCALE OF DEVELOPMENT

Technology Demonstration in Operational Environment has been done.

STATUS OF COMMERCIALIZATION

Commercialization has not been started.

TENTATIVE COST OF DEVELOPMENT

₹ 5 Lakhs

INDUSTRIAL PARTNERS

Not yet

PLANT SET UP FOR FINAL PRODUCT

Yes

IPR STATUS DETAILS (PATENTS/COPYRIGHT/TRADEMARK SECURITY IN INDIA/ABROAD)

No

4.3 CHEMICAL (INCLUDING LEATHER) AND PETROLEUM (CLP)

POTENTIAL MARKET/TECHNO-ECONOMICS

Chemical Industries, Pesticide Manufacturing Industries & dye intermediate manufacturing industries.

ENVIRONMENTAL SAFETY CERTIFICATION

N/A

NODAL SCIENTIST DETAILS

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123. SEQUENTIAL OXIC-ANOXIC BIOREACTOR (SOABR) FOR PRIMARY TREATMENT OF WASTEWATER

UID: TECH-THEME_3_CLRI-017

LABORATORY OF ORIGIN | CSIR-CLRI, CHENNAI

EXECUTIVE SUMMARY

The reactor can able to simultaneously remove colloidal and suspended particles with very minimum sludge production. The reactor comprises of oxic and anoxic zones the oxic zone removes the suspended particles by interception method and anoxic zone digest the solids scavenged by the oxic zone. The salient feature of this technology are Low foot print requirement, Low electrical energy consumption, Low operation cost, Minimum sludge production compared to primary chemical sludge.

KEYWORDS

Oxic-anoxic bioreactor, Wastewater

SALIENT FEATURES

Low operation cost, low electrical energy use and minimum sludge.

TECHNOLOGY BENCHMARKING

The technology is benchmarked with similar technologies.

TECHNOLOGY READINESS LEVEL ASSESSMENT

TRL assessment is 6

SCALE OF DEVELOPMENT

Technology Demonstration in Operational Environment has not been done.

STATUS OF COMMERCIALIZATION

Commercialization has not been started.

TENTATIVE COST OF DEVELOPMENT

₹ 5 Lakhs

INDUSTRIAL PARTNERS

Not yet

PLANT SET UP FOR FINAL PRODUCT

No

IPR STATUS DETAILS (PATENTS/COPYRIGHT/TRADEMARK SECURITY IN INDIA/ABROAD)

No

POTENTIAL MARKET/TECHNO-ECONOMICS

Leather Industries

ENVIRONMENTAL SAFETY CERTIFICATION

No

NODAL SCIENTIST DETAILS

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124. WATERLESS CHROME TANNING TECHNOLOGY (WCTT)

UID: TECH-THEME_3_CLRI-018

LABORATORY OF ORIGIN | CSIR-CLRI, CHENNAI

EXECUTIVE SUMMARY

This present Technology provides near zero waste in chrome tanning and avoids pickling and basification operations thereby enabling reduction in TDS from identified streams. This technology helps in reducing the usage of water for about 30% in the Tanneries. This technology was transferred to more than 100 tanneries within India. We are in the final stage of negotiation with LIDI, Ethiopia for transferring this technology to tanneries located in Ethiopia. This technology won many Awards including the CSIR Diamond Jubilee Technology Award for the year 2018.

KEYWORDS

Waterless chrome tanning, Basification

SALIENT FEATURES

- Use about 30% less water in tanneries.
- Transferred to Ethiopia.

TECHNOLOGY BENCHMARKING

The technology is benchmarked with similar technologies.

TECHNOLOGY READINESS LEVEL ASSESSMENT

TRL assessment is 8

SCALE OF DEVELOPMENT

Technology Demonstration in Operational Environment has been done.

STATUS OF COMMERCIALIZATION

Commercialization has not been started.

TENTATIVE COST OF DEVELOPMENT

₹ 50 Lakhs

INDUSTRIAL PARTNERS

Not yet

PLANT SET UP FOR FINAL PRODUCT

Yes

IPR STATUS DETAILS (PATENTS/COPYRIGHT/TRADEMARK SECURITY IN INDIA/ABROAD)

Not

POTENTIAL MARKET/TECHNO-ECONOMICS

Tanneries

ENVIRONMENTAL SAFETY CERTIFICATION

No

NODAL SCIENTIST DETAILS

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125. PROCESS FOR 5-HYDROXYMETHYLFURFURAL (5-HMF) PRODUCTION FROM BIOMASS

UID: TECH-THEME_3_IHBT-026

LABORATORY OF ORIGIN | CSIR-IHBT, PALAMPUR

EXECUTIVE SUMMARY

5-Hydroxymethylfurfural is considered as a highly demanding future feedstock chemical for biopolymer (FDCA), bio-fuel (DMF) and biochemical synthesis. Recently, we have developed a new process for low cost scalable production of HMF using different carbohydrates (rice straw derived cellulose, raw waste potato, sugarcane bagasse, cellulose, starch, glucose and fructose) with high purity and no need of tedious purification.

KEYWORDS

5-Hydroxymethylfurfural, Future feedstock chemical for biopolymer (FDCA), Biofuel (DMF)

SALIENT FEATURES

- Production of HMF using different carbohydrates (such as rice straw, waste potatoes and sugarcane bagasse).
- Useful for feedstock.

TECHNOLOGY BENCHMARKING

The technology is benchmarked with similar technologies.

TECHNOLOGY READINESS LEVEL ASSESSMENT

TRL assessment is 6

SCALE OF DEVELOPMENT

Technology Demonstration in Operational Environment has been done.

STATUS OF COMMERCIALIZATION

Commercialization has not been started.

TENTATIVE COST OF DEVELOPMENT

₹ 30 Lakhs

INDUSTRIAL PARTNERS

Not yet

PLANT SET UP FOR FINAL PRODUCT

No

IPR STATUS DETAILS (PATENTS/COPYRIGHT/TRADEMARK SECURITY IN INDIA/ABROAD)

Not

4.3 CHEMICAL (INCLUDING LEATHER) AND PETROLEUM (CLP)

POTENTIAL MARKET/TECHNO-ECONOMICS

The global market for 5-HMF is expected to reach about 123.279 billion USD by 2022 from 116.750 billion USD in 2016.

ENVIRONMENTAL SAFETY CERTIFICATION

No

NODAL SCIENTIST DETAILS

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126. HYDRAZINE HYDRATE TECHNOLOGY (HH), FOR M/S GUJARAT ALKALIES & CHEMICALS LIMITED, VADODARA

UID: TECH-THEME_3_IICT-028

LABORATORY OF ORIGIN | CSIR-IICT, HYDERABAD

EXECUTIVE SUMMARY

Sector wise data is presented in table below

Make-in India & Swashakth Bharath initiative

SEGMENT	PERCENTAGE
1. Polymerization and Blowing Agents	35%
2. Agro Chemicals	20%
3. Water Treatment	25%
4. Pharmaceuticals	8%
5. Others	12%

The process developed is innovative, novel and patentable; Commercially viable; Import Substitution; Foreign Exchange Savings; Energy Efficient; More than 90% Recoveries & Recycled Clean & Green Process; HH technology is produced first time in India by peroxide route; Improvement of Quality of Life. Impact of the technological innovation including the method of determination on: (i) India's competitiveness (ii) Society (iii) Employment and (iv) Environment. The steady growth in demand of hydrazine hydrate, gradually, makes it an important global consumer market. Hence, the development of newer and innovative methods of production of hydrazine hydrate with advanced technology has enormous economic and far-reaching social benefits.

KEYWORDS

Hydrazine Hydrate, Green process, Ketazine, Peroxide route

SALIENT FEATURES

- Innovative and commercial viable.
- Import substitution-saving foreign exchange.
- Energy efficient.
- The process developed at bench is novel via the peroxide-ketazine as ketazine avoids.
- Decomposition of hydrazine; yields are high; energy consumption is low; less consumption of ammonia.
- More than 85% of recoveries of chemicals, ammonia and solvent are recycled back making the process viable.
- A pressure reactive distillation for carrying out the hydrolysis reaction for production of 40% HH; high purity product with yield of around 85%.
- Concentration of 40% HH to 80% HH by means of simple vacuum distillation.
- A Green process with effluents treatable unlike other routes and so making the process environmentally benign.
- The process was proved at a pilot scale (12 kg/h) with continuous runs of all the steps and produced more than 800 kg of ketazine and 200 kg of HH at any given point of time.

4.3 CHEMICAL (INCLUDING LEATHER) AND PETROLEUM (CLP)

- Impurities in the product are within the specified international norms and making the product saleable in export market.

TECHNOLOGY BENCHMARKING

The technology is benchmarked with similar technologies.

TECHNOLOGY READINESS LEVEL ASSESSMENT

TRL- 7

SCALE OF DEVELOPMENT

Yes

STATUS OF COMMERCIALIZATION

Yes

TENTATIVE COST OF DEVELOPMENT

N/A

INDUSTRIAL PARTNERS

Not yet

PLANT SET UP FOR FINAL PRODUCT

In progress

IPR STATUS DETAILS (PATENTS/COPYRIGHT/TRADEMARK SECURITY IN INDIA/ABROAD)

Not

POTENTIAL MARKET/TECHNO-ECONOMICS

ROI is around 4-5 years

ENVIRONMENTAL SAFETY CERTIFICATION

Yes

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127. PROCESS DEVELOPMENT, SCALE-UP STUDIES AND BASIC DESIGN FOR A CONTINUOUS COMMERCIAL PLANT OF 4000 MTA CAPACITY FOR PARA TERT BUTYL TOLUENE (PTBT)

UID: TECH-THEME_3_IICT-029

LABORATORY OF ORIGIN | CSIR-IICT, HYDERABAD

EXECUTIVE SUMMARY

- para-tert-butyl toluene is of commercial importance as a raw material for production of para-tert-butyl benzoic acid.
- Used as modifiers in alkylated resins, in production of fragrances, pharmaceuticals and polymerisation regulators for polyesters.
- The product is not manufactured at large scale by any Indian industry and requirement is solely met through imports (IMPORT SUBSTITUTE).
- The continuous process was developed with exclusive selectivity towards para isomer.
- The basic design report for commercial plant of 4000 MTA was prepared by CSIR-IICT. The commercial plant of 4000 MTA was commissioned by CSIR-IICT and the plant is now operating continuously.

KEYWORDS

Para tert butyl toluene, Benzoic acid, Para isomer

SALIENT FEATURES

Used as modifiers in alkylated resins, in fragrances, pharmaceuticals and polymerisation regulators for polyesters

TECHNOLOGY BENCHMARKING

Yes

TECHNOLOGY READINESS LEVEL ASSESSMENT

TRL assessment is 9

SCALE OF DEVELOPMENT

Yes

STATUS OF COMMERCIALIZATION

Commercialization has not been started.

TENTATIVE COST OF DEVELOPMENT

N/A

INDUSTRIAL PARTNERS

No

PLANT SET UP FOR FINAL PRODUCT

Yes

4.3 CHEMICAL (INCLUDING LEATHER) AND PETROLEUM (CLP)

IPR STATUS DETAILS (PATENTS/COPYRIGHT/TRADEMARK SECURITY IN INDIA/ABROAD)

No

POTENTIAL MARKET/TECHNO-ECONOMICS

It's highly valuable technology for fine chemicals sector generation and it can make huge revenue for our government.

ENVIRONMENTAL SAFETY CERTIFICATION

Yes

NODAL SCIENTIST DETAILS

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128. PROCESS DEVELOPMENT, SCALE-UP STUDIES AND BASIC DESIGN FOR A COMMERCIAL PLANT OF 3000 TPA CAPACITY FOR PARA TERT BUTYL BENZOIC ACID (PTBBA)

UID: TECH-THEME_3_IICT-030

LABORATORY OF ORIGIN | CSIR-IICT, HYDERABAD

EXECUTIVE SUMMARY

- Para-tert-butyl benzoic acid is a substituted benzoic acid. It is a white crystal to yellow flakes and is used as a process regulator in polymer industry for producing alkyd and polyester resin.
- Para-tert-butyl benzoic acid is a speciality chemical for which China is the largest supplier with 25000 TPA and seven manufacturing units.
- At present there is no dedicated capacity for production of para-tert-butyl benzoic acid in India.
- Indian demand is 1000 TPA for personal care segment only.
- The product para-tert-butyl benzoic acid is a speciality chemical and the current demand of it in the Indian market is solely met through imports.
- The raw material para tert butyl toluene is produced by CSIR-IICT's patented process.
- The process was developed with air as the oxidizing agent and a recyclable commercial catalyst.
- The basic design report for commercial plant of 3000 TPA was prepared by CSIR-IICT.
- The commercial plant of 3000 TPA was commissioned by CSIR-IICT and the plant is now operating continuously.

KEYWORDS

Para tert butyl, Benzoic acid, Toluene

SALIENT FEATURES

Polymer industry for producing alkyd and polyester resin.

TECHNOLOGY BENCHMARKING

Yes

TECHNOLOGY READINESS LEVEL ASSESSMENT

TRL assessment is 9

SCALE OF DEVELOPMENT

Yes

STATUS OF COMMERCIALIZATION

Commercialization has not been started.

TENTATIVE COST OF DEVELOPMENT

N/A

INDUSTRIAL PARTNERS

No

4.3 CHEMICAL (INCLUDING LEATHER) AND PETROLEUM (CLP)

PLANT SET UP FOR FINAL PRODUCT

Yes

IPR STATUS DETAILS (PATENTS/COPYRIGHT/TRADEMARK SECURITY IN INDIA/ABROAD)

No

POTENTIAL MARKET/TECHNO-ECONOMICS

It's highly valuable technology for fine chemicals sector and it can make huge revenue for our government

ENVIRONMENTAL SAFETY CERTIFICATION

Yes

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129. PROCESS DEVELOPMENT, SCALE-UP STUDIES AND BASIC DESIGN FOR A COMMERCIAL PLANT OF CLP000 TPA CAPACITY FOR PARA TERT BUTYL METHYL BENOATE (PTBMB)

UID: TECH-THEME_3_IICT-031

LABORATORY OF ORIGIN | CSIR-IICT, HYDERABAD

EXECUTIVE SUMMARY

Para-tert-butyl methyl benzoate is a very important intermediate widely used in organic synthesis, pharmaceutical industry, cosmetics, flavours and fragrance industries. The Annual demand is approximately 20,000 TPA in India alone and the entire demand is met through import from china.

The product is not manufactured at large scale by any Indian industry and requirement is solely met through imports

- The raw material para tert butyl benzoic acid is produced by CSIR-IICT's technology.
- The process was developed with exclusive selectivity towards para isomer.
- The basic design report for commercial plant of 3000 TPA was prepared by CSIR-IICT.
- The commercial plant of 3000 TPA is ready for commissioning by CSIR-IICT.

KEYWORDS

Para tert butyl methyl benzoate, Para isomer

SALIENT FEATURES

Used in organic synthesis, pharmaceutical industry, cosmetics, flavours and fragrance industries.

TECHNOLOGY BENCHMARKING

Yes

TECHNOLOGY READINESS LEVEL ASSESSMENT

TRL assessment is 8

SCALE OF DEVELOPMENT

Yes

STATUS OF COMMERCIALIZATION

Not

TENTATIVE COST OF DEVELOPMENT

N/A

INDUSTRIAL PARTNERS

No

PLANT SET UP FOR FINAL PRODUCT

No

4.3 CHEMICAL (INCLUDING LEATHER) AND PETROLEUM (CLP)

IPR STATUS DETAILS (PATENTS/COPYRIGHT/TRADEMARK SECURITY IN INDIA/ABROAD)

No

POTENTIAL MARKET/TECHNO-ECONOMICS

It's highly valuable technology for fine chemicals sector and it can make huge revenue for our government

ENVIRONMENTAL SAFETY CERTIFICATION

Yes

NODAL SCIENTIST DETAILS

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130. SIMULTANEOUS PRODUCTION OF US GRADE GASOLINE AND HIGH PURITY BENZENE FROM FCC C6 HEART CUT NAPHTHA

UID: TECH-THEME_3_IIP-032

LABORATORY OF ORIGIN | CSIR-IIP, DEHRADUN

EXECUTIVE SUMMARY

Due to the strict environmental regulation, worldwide, there is a demand for lowbenzene gasoline, e.g. benzene < 0.62 vol % in the USA. FCC Naphtha is mainly responsible for high benzene concentration in the gasoline pool. CSIR-IIP and RIL developed extractive distillation based novel technology overcome the challenges of existing process and unavailability of a commercial process for reducing the benzene concentration in unprocessed FCC Gasoline. This Technology serves a dual role of recovering high purity benzene (>97 wt. % pure) and producing environmental friendly gasoline (Bz. < 0.4 wt. %) from FCC C6 heart cut stream containing benzene in the range of 11-19% without the requirement of any pre-processing step to saturate di-olefins and reduce reactive impurities (chlorides, peroxides etc.) impurities in the feedstock. Successful commercialization of the Technology with design capacity 0.7 MMTPA (17.4 KBPSD) at RIL Jamnagar in May 2016 has given due credence to its novelty and deliverables not only in India but in abroad as well. The estimated payback for the Technology based on the benefits realized by the RIL Jamnagar is ~1.1 year. Technology has been granted patents in several countries including, Russia, China, Japan, European Union, Spain, India and the USA. The Technology has received the prestigious CSIR Technology Award for Innovation, MoPNG (Ministry of Petroleum and Natural Gas, Govt. of India) Best Innovation Award, and ICC Award for Excellence in Process Design, TDB award.

KEYWORDS

FCC gasoline, Benzene recovery, Benzene lean gasoline, Minimize solvent loss and maximize product recoveries and CSIR-IIP-RIL Technology.

SALIENT FEATURES

This Technology is first of its kind in the world. Some of its salient features are as follows:

- Simple, energy-efficient, and low cost.
- Fully indigenous Technology developed jointly by Indian corporations located in India.
- Technology does neither require any prior hydrogenation step to saturate di-olefins nor requires Expensive types of equipment, which makes it simple, energy-efficient, and low cost.
- Technology is based on thermally and oxidative stable solvent system with unique process configuration to minimize solvent loss and maximize product recoveries.
- Fully indigenous Technology developed jointly by Indian corporations located in India.
- Technology has proved its mettle and has surpassed the uninterrupted run the length of 4+ years.

TECHNOLOGY BENCHMARKING

Yes

TECHNOLOGY READINESS LEVEL ASSESSMENT

TRL assessment is 9

SCALE OF DEVELOPMENT

Yes

4.3 CHEMICAL (INCLUDING LEATHER) AND PETROLEUM (CLP)

STATUS OF COMMERCIALIZATION

Yes

TENTATIVE COST OF DEVELOPMENT

About 300 crore

INDUSTRIAL PARTNERS

RIL, Jamnagar

PLANT SET UP FOR FINAL PRODUCT

Yes

IPR STATUS DETAILS (PATENTS/COPYRIGHT/TRADEMARK SECURITY IN INDIA/ABROAD)

No

POTENTIAL MARKET/TECHNO-ECONOMICS

With the increase in Propylene demand, FCCU severity is increasing, which results in more benzene in FCC gasoline. Thus, Technology will soon become the need of the hour, given not only producing clean benzene lean gasoline but also for efficient recovery of high-value aromatics (like benzene) from alternative feedstocks such as FCC Gasoline. Indian and international refineries who want to make quality gasoline & recover benzene as a product are potential customers for Technology.

ENVIRONMENTAL SAFETY CERTIFICATION

Yes

NODAL SCIENTIST DETAILS

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131. VISBREAKING OF PETROLEUM RESIDUAL FRACTIONS (SOAKER WITH INTERNALS)

UID: TECH-THEME_3_IIP-033

LABORATORY OF ORIGIN | CSIR-IIP, DEHRADUN

EXECUTIVE SUMMARY

This technology is for the revamping of the existing visbreaker unit in refinery. No major equipment is required. Only perforated plates have to be fabricated.

KEYWORDS

Major innovation is the design of the soaker internals and its arrangement inside the reactor.

- The fuel oil produced is of better quality in terms of stability.
- Lighter transportation fuels are produced in higher quantity. Refinery will save substantial amount of cutter stock.
- Energy is saved as the same conversion is achievable at lower temperature.
- Better temperature profile is maintained.
- Handling the plant is safe and easy due to less coking.
- Longer time-on-stream is achieved.
- Low cost and very easy to implement without any major change in the hardware of the existing unit.

KEYWORDS

Soaker internals, Fuel oil, Cutter stock, Less coking and temperature profile

SALIENT FEATURES

This technology is for the revamping of the existing visbreaker unit in refinery. No major equipment is required.

TECHNOLOGY BENCHMARKING

Yes

TECHNOLOGY READINESS LEVEL ASSESSMENT

TRL assessment is 9

SCALE OF DEVELOPMENT

Yes

STATUS OF COMMERCIALIZATION

Yes

TENTATIVE COST OF DEVELOPMENT

₹ 1.5 Crore

INDUSTRIAL PARTNERS

3 Numbers of Refineries.

4.3 CHEMICAL (INCLUDING LEATHER) AND PETROLEUM (CLP)

PLANT SET UP FOR FINAL PRODUCT

Yes

IPR STATUS DETAILS (PATENTS/COPYRIGHT/TRADEMARK SECURITY IN INDIA/ABROAD)

No

POTENTIAL MARKET/TECHNO-ECONOMICS

Refinery having visbreaking process.

ENVIRONMENTAL SAFETY CERTIFICATION

Yes

NODAL SCIENTIST DETAILS

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132. SWEETENING CATALYST – THOXCAT ESTM

UID: TECH-THEME_3_IIP-034

LABORATORY OF ORIGIN | CSIR-IIP, DEHRADUN

EXECUTIVE SUMMARY

Sweetening helps to make LPG more environmentally friendly by extracting mercaptans from LPG and catalytically converting them to disulphides.

KEYWORDS

Sweetening, Catalyst, Mercaptans, Disulphides and competitive

SALIENT FEATURES

- It helps to make LPG more environmentally friendly by extracting mercaptans from LPG.
- Drop in Catalyst - No changes in existing LPG Sweetening plant required.
- Higher activity, comparable stability with leading international sweetening catalysts.
- Lower catalyst consumption due to higher activity.
- Competitively priced, cost effective in use.
- Reformulation available for handling LPG containing mercaptans greater than 750 ppm.

TECHNOLOGY BENCHMARKING

Yes

TECHNOLOGY READINESS LEVEL ASSESSMENT

TRL assessment is 8

SCALE OF DEVELOPMENT

Yes

STATUS OF COMMERCIALIZATION

Yes

TENTATIVE COST OF DEVELOPMENT

₹ 20 Lakh

INDUSTRIAL PARTNERS

BPCL CRDC, Noida

PLANT SET UP FOR FINAL PRODUCT

No

IPR STATUS DETAILS (PATENTS/COPYRIGHT/TRADEMARK SECURITY IN INDIA/ABROAD)

No

POTENTIAL MARKET/TECHNO-ECONOMICS

- The total demand of Sweetening catalyst in India is 4 T/Annum.
- The total worldwide demand is 120 T/Annum.

4.3 CHEMICAL (INCLUDING LEATHER) AND PETROLEUM (CLP)

- CSIR-IIP plans to capture at least 10% of the global market in the next 3 years.
- Royalty – 10% of sale by LONA Industries, Mumbai equally shared by CSIR-IIP and BPCL.
- Commercialized in 10 Indian Refineries.
- Successfully Tried at ORPIC Oman (2016) and Saudi Aramco (2018) and accepted for regular use.

ENVIRONMENTAL SAFETY CERTIFICATION

No

NODAL SCIENTIST DETAILS

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133. WASTE PLASTICS TO FUEL AND PETROCHEMICALS

UID: TECH-THEME_3_IIP-035

LABORATORY OF ORIGIN | CSIR-IIP, DEHRADUN

EXECUTIVE SUMMARY

This technology is for the conversion of waste plastics (polyethylene and polypropylene) to exclusively any one of the products viz. gasoline, diesel or aromatics. The gasoline and diesel meet most of the BS IV/VI specifications while the petrochemicals are rich in toluene and xylenes. Conversion of waste plastics to exclusively either automotive grade gasoline or diesel or petrochemicals; 1 Kg of clean plastics can produce either 800 ml of diesel or 700 ml of gasoline or 500 ml of petrochemical; Process is environment friendly as no toxic gases are evolved.

KEYWORDS

Waste plastics, Diesel, gasoline, Automotive grade and environment friendly

SALIENT FEATURES

- It converts waste plastics (polyethylene and polypropylene) to exclusively any one of the products viz. gasoline, diesel or aromatics of the BS IV/VI specifications.
- Urban local bodies, Indian railways, shrine board etc. - The waste plastics being collected by these can be converted into diesel.

TECHNOLOGY BENCHMARKING

Yes

TECHNOLOGY READINESS LEVEL ASSESSMENT

TRL assessment is 6

SCALE OF DEVELOPMENT

Yes

STATUS OF COMMERCIALIZATION

No

TENTATIVE COST OF DEVELOPMENT

₹ 11 Crore

INDUSTRIAL PARTNERS

No

PLANT SET UP FOR FINAL PRODUCT

No

IPR STATUS DETAILS (PATENTS/COPYRIGHT/TRADEMARK SECURITY IN INDIA/ABROAD)

No

4.3 CHEMICAL (INCLUDING LEATHER) AND PETROLEUM (CLP)

POTENTIAL MARKET/TECHNO-ECONOMICS

Urban local bodies, Indian railways, shrine board etc. - The waste plastics being collected by these can be converted into diesel, to be used for running vehicles, gensets, tractors etc.

ENVIRONMENTAL SAFETY CERTIFICATION

No

NODAL SCIENTIST DETAILS

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134. WAX DE-OILING TECHNOLOGY FOR PRODUCTION OF PARAFFIN AND MICROCRYSTAL LINE WAXES

UID: TECH-THEME_3_IIP-036

LABORATORY OF ORIGIN | CSIR-IIP, DEHRADUN

EXECUTIVE SUMMARY

CSIR-IIP has developed a Wax De-oiling Technology for Production of Paraffin and Microcrystalline Waxes (MCW) from Petroleum Streams. Technology has been commercialized at Numaligarh Refinery Limited (NRL) Assam.

KEYWORDS

Solvent-to-feed ratio, Carbon foot print, Crystallization, Pinch analysis and energy efficient

SALIENT FEATURES

Wax De-oiling Technology has a number of distinctive features. Some salient features of Wax De-oiling Technology are :

- Lower solvent-to-feed ratio with prudent filtrate recycle.
- Optimum solvent dilution scheme combining delayed dilution.
- Controlled crystallization for producing larger wax crystals with narrow crystal size Distribution.
- In this process, furnace was eliminated from solvent recovery system by applying pinch analysis which helped NRL to reduce carbon foot print considerably.
- Lower cost in comparison to foreign technologies and energy efficient process.
- Lower solvent-to-feed ratio with prudent filtrate recycle.
- Lower cost and energy efficient in comparison to foreign technologies.

TECHNOLOGY BENCHMARKING

Yes

TECHNOLOGY READINESS LEVEL ASSESSMENT

TRL assessment is 9

SCALE OF DEVELOPMENT

Yes

STATUS OF COMMERCIALIZATION

Yes

TENTATIVE COST OF DEVELOPMENT

₹ 89.90 Lakhs

INDUSTRIAL PARTNERS

Numaligarh Refinery Limited, Assam.

PLANT SET UP FOR FINAL PRODUCT

No

4.3 CHEMICAL (INCLUDING LEATHER) AND PETROLEUM (CLP)

IPR STATUS DETAILS (PATENTS/COPYRIGHT/TRADEMARK SECURITY IN INDIA/ABROAD)

No

POTENTIAL MARKET/TECHNO-ECONOMICS

Paraffin Wax is used for wide variety of applications such as for making candles, polishes, medicines, food packaging, paints, tyres, leather etc. and is in great demand. The potential market of Wax de-oiling Technology is Petroleum Refineries in India and in Asia-Pacific region.

ENVIRONMENTAL SAFETY CERTIFICATION

Yes

NODAL SCIENTIST DETAILS

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135. PROCESS DEVELOPMENT FOR THE SYNTHESIS OF DIALKYL ETHERS BY DEHYDRATION OF ALCOHOLS USING MIX METAL OXIDE CATALYST

UID: TECH-THEME_3_NCL-040

LABORATORY OF ORIGIN | CSIR-NCL, PUNE

EXECUTIVE SUMMARY

- New modified and scaled up pilot-scale reactor is designed and fabricated at vendor site where 1 kg catalyst is loaded and 25 lit/day (1 L/h) DME can be produced by sending methanol 1-1.3 kgh-1. At the same time, DME filling/bottling plant procurement is also initiated.
- Spent deactivated catalyst recycling process also developed and recycled catalyst tested for its activity where shows almost the same activity after recycling.
- Three possible reactor design for the 100 kg catalyst loading has been worked out best possible plan will be finalized soon based on 1kg loading data and simulation data.
- Catalyst synthesis process also altered to get the cost-effective and high throughput DME synthesis process.

KEYWORDS

Ultra-clean fuel, Dimethyl ether, Cost-effective process technology

SALIENT FEATURES

- DME is a highly needed ultra-clean fuel for a country like India as it can cut down the imports.
- The simplest ether from C1 -DME can be blended with LPG to fulfil the energy requirement of our nation.

TECHNOLOGY BENCHMARKING

The technology is benchmarked with similar technologies.

TECHNOLOGY READINESS LEVEL ASSESSMENT

TRL assessment is 6

SCALE OF DEVELOPMENT

Technology Demonstration in Operational Environment has been done.

STATUS OF COMMERCIALIZATION

Commercialization has not been started.

TENTATIVE COST OF DEVELOPMENT

₹ 20 Cr for 2TPD unit

INDUSTRIAL PARTNERS

Praj Industries

PLANT SET UP FOR FINAL PRODUCT

No

4.3 CHEMICAL (INCLUDING LEATHER) AND PETROLEUM (CLP)

IPR STATUS DETAILS (PATENTS/COPYRIGHT/TRADEMARK SECURITY IN INDIA/ABROAD)

Not

POTENTIAL MARKET/TECHNO-ECONOMICS

- C2 ethers are very good solvent.
- C4 ethers are very much essential for perfumery industries.
- Targeted industry are SME (small and medium enterprises).
- In case of DME it is considered as energy security of our nation.
- DME is a highly needed ultra-clean fuel for a country like India as it can cut down the imports and help the nation to fulfill the need for fuel.
- This fuel can also bring down the level of air pollution across the country. CSIR can get royalty after the commercialization of this technology.
- This technology will help to create employment opportunities in the country.
- The simplest ether from C1 -DME can be blended with LPG to fulfil the energy requirement of our nation.

ENVIRONMENTAL SAFETY CERTIFICATION

No

NODAL SCIENTIST DETAILS

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136. THERMO-GRAVIMETRIC REACTOR (TGR)

UID: TECH-THEME_3_CIMFR-049

LABORATORY OF ORIGIN | CSIR-CIMFR, DHANBAD

EXECUTIVE SUMMARY

CSIR-CIMFR has designed, developed and installed Thermogravimetric Reactor to determine overall reactivity and kinetic parameters of processes like gasification, combustion, reduction, catalytic gasification, catalytic reactions, etc. with solid materials like coal, biomass or blends or any other solid materials, catalysts in presence of gaseous reactants like CO₂, oxygen, steam, or other several inert or reactive gases individually as well as in the form of mixture in any desired proportion using feed sample in the lump form, granular size or powder form, so that reactivity will reflect overall (apparent) reactivity of samples in its original size to depict the actual phenomena inside the commercial reactor like gasifier, combustor, or any other reactor where gas-solid or gas-gas catalytic reactions take place. Simultaneously, attached online gas analyzer system will give generated product gas composition also. Data generated can be utilized for design and up-scaling of several processes, mathematical modelling purpose for R&D and academic institutions. After getting accreditation from authorized agency, Thermo-gravimetric Reactor is ready to commercialize as an analytical product for overall reactivity and kinetic parameters of several thermochemical processes with features as discussed above. Further, TGR is having sample holding capacity for lump form, granular size or powder form up to 25 gm and conduct gravimetric analysis of several thermo-chemical reactions with solid materials like coal, biomass, petcoke or their blends or any other solid materials, catalysts, etc with above listed gaseous reactants.

KEYWORDS

Thermo-gravimetry, Gas-solid reactions, Catalytic gas-gas reactions, High temperature, Test facility

SALIENT FEATURES

Thermo-gravimetric is an analytical product useful as a test facility to determine overall reactivity and kinetic parameters of high temperature processes like gasification, combustion, reduction, catalytic gasification, catalytic reactions, etc.

TECHNOLOGY BENCHMARKING

Yes

TECHNOLOGY READINESS LEVEL ASSESSMENT

TRL 7

SCALE OF DEVELOPMENT

Yes

STATUS OF COMMERCIALIZATION

Ready for commercialization as an Analytical Test Facility.

TENTATIVE COST OF DEVELOPMENT

₹ 38 Lakh (Capital Cost)

4.3 CHEMICAL (INCLUDING LEATHER) AND PETROLEUM (CLP)

INDUSTRIAL PARTNERS

No

PLANT SET UP FOR FINAL PRODUCT

N/A

IPR STATUS DETAILS (PATENTS/COPYRIGHT/TRADEMARK SECURITY IN INDIA/ABROAD)

No

POTENTIAL MARKET/TECHNO-ECONOMICS

After getting accreditation from authorized agency, Thermo-gravimetric Reactor is ready to commercialize as an analytical product is useful as a test facility to determine overall reactivity and kinetic parameters of high temperature processes like gasification, combustion, reduction, catalytic gasification, catalytic reactions, etc. with solid materials like coal, biomass or blends or any other solid materials, catalysts in presence of gaseous reactants like CO₂, oxygen, steam, or other several inert or reactive gases individually as well as in the form of mixture in any desired proportion using feed sample in the lump form, granular size of powder form, so that reactivity will reflect overall (apparent) reactivity of samples in its original size. Bench scale or Pilot scale chemical R&D plant fabricators can be approached for licensing the developed product for its commercial exploitation.

ENVIRONMENTAL SAFETY CERTIFICATION

Yes

NODAL SCIENTIST DETAILS

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Chapter-4 4.4 Civil Infrastructure and Engineering (CIE)

Introduction

Nineteen CSIR labs are covered under this theme. And five labs, viz., CSIR-AMPRI, CSIR-CBRI, CSIR-CRRI, CSIR-NEIST and CSIR-SERC contributed a total of 34 CSIR technologies in this assessment. Finally, 27 were selected for the compendium.

All together nine technologies have been scaled up from the claimed TRL. “Fire Retardant Water Based Clear /Transparent Coating for Wood and Wood Based Interiors” from CSIR-CBRI was scaled up from TRL 6 to TRL 8 as the technology has been transferred to the industry and fulfilling all standards of TRL 8. Another technology “Building Product from Kota Stone Waste from CSIR-CBRI has been scaled up from TRL 7 to TRL 8. Technologies titled as “Kisan Sabha Mobile App”, “Car Driving Simulator with Driver Diagnostic and Training Method and Extended Products”, “Rejuvenator For Recycling of Asphalt Pavement Material For Hot in Plant and Hot in Situ Recycling of Bituminous Pavement (With Trade Name of REJUPAVE)”, “Customized Bitumen Emulsion for Mix Seal Surfacing Based on Aggregates of U.P. State” from CSIR-CRRI have been scaled up from TRL 7 to TRL 8. Another technology from CSIR-CRRI titled “ArogyaPath” National Healthcare Supply Chain Management Platform” has been scaled up from TRL 7 to TRL 9. One technology from CSIR-NEIST.

Titled as Modular Bricks from Brahmaputra River Bed Sand has been scaled up from TRL 6 to TRL 9. The technology “Eco-friendly Geopolymer Concrete Blocks” from CSIR-SERC has been scaled up from TRL 7 to TRL 8.

On the other hand, six technologies have been scaled down from the claimed TRL. Technology titled as C-Brick Machine–Capacity 5000 Bricks per 8 Hrs. Shift, from CSIR-CBRI has been scaled down to TRL 7 from the claimed TRL 8. Three more technologies from CSIR-CBRI viz. Process Know-how For Manufacturing of Nano-Lime, Process Know-how for Manufacturing of Silica Nano Particles (SNPs), and Fire Retardant Water Repellent Canvas have been scaled down from the claimed TRL 8 to TRL 6, TRL 6, and TRL 7, respectively. One technology from CSIR-CRRI titled as Design of Noise Barrier Based on Different Frequencies (a) Frequency Noise Barrier Configuration (b) Middle Frequency Noise Barrier Configuration and (c) High Frequency Noise Barrier Configuration has been scaled down from TRL 9 to TRL 8. Finally, one technology from CSIR-SERC, titled as Innovation Disaster Resistant Lightweight Prefabricated Building Systems Using EPS Panels, has been scaled down from TRL 8 to TRL 7.

Figure 1 shown below indicates the average cost of developing the technologies. Six technologies at TRL 6 have an average cost of ₹ 12.5 Lakhs; eight technologies at TRL 7 ₹ 7.315 Lakhs; nine technologies at TRL 8 ₹ 15.611 Lakhs and four technologies at TRL 9 have an average cost of ₹ 54.705 Lakhs.

4.4 CIVIL INFRASTRUCTURE AND ENGINEERING (CIE)

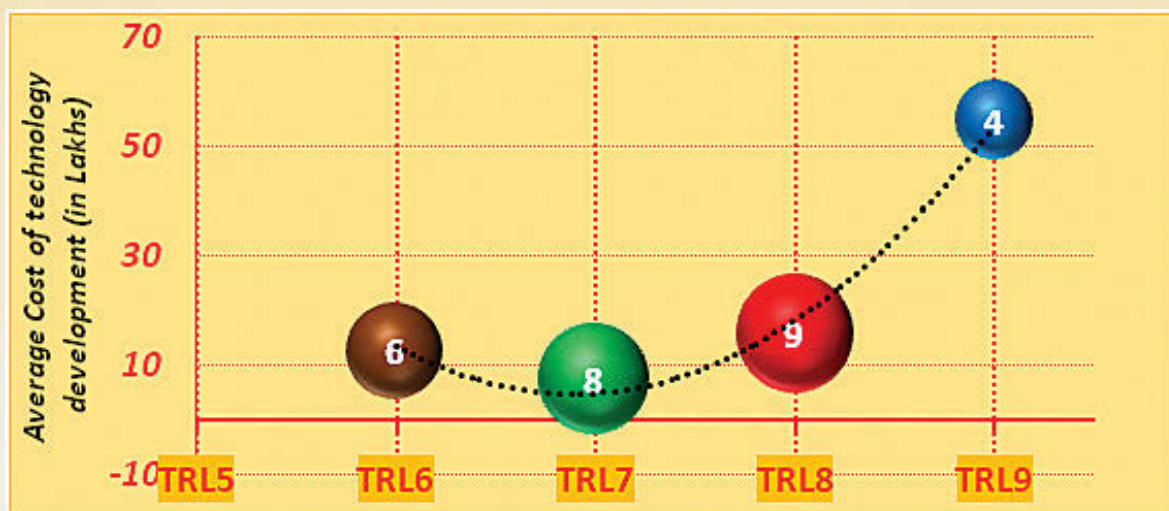


Figure 1. A bubble chart representing average cost of the technologies vs the TRL. Centre of the bubble represents the abscissa and ordinate while size of the bubble represents the number of technologies. Dotted line suggest a polynomial trend in average cost vs TRL of order 2.

Assessment of Technology Readiness Level

In all, twenty seven technologies have been assessed at TRL 6 or above and are included in the Compendium. There are a total of six, eight, nine and four technologies assessed at TRL 6, TRL 7, TRL 8 and TRL 9, respectively. A lab-wise contribution to TRL levels is shown in Fig. 2 in a multiple bar chart. As shown in the figure in blue, there is one technology from CSIR-AMPRI, four technologies from CSIR-CBRI, and one from CSIR-CRRI at TRL 6. Similarly there are four technologies each from CSIR-CBRI and CSIR-SERC at TRL 7, three from CSIR-CBRI, five from CSIR-CRRI and one from CSIR-SERC at TRL 8, and three from CSIR-CRRI, one from CSIR-NEIST at TRL 9.

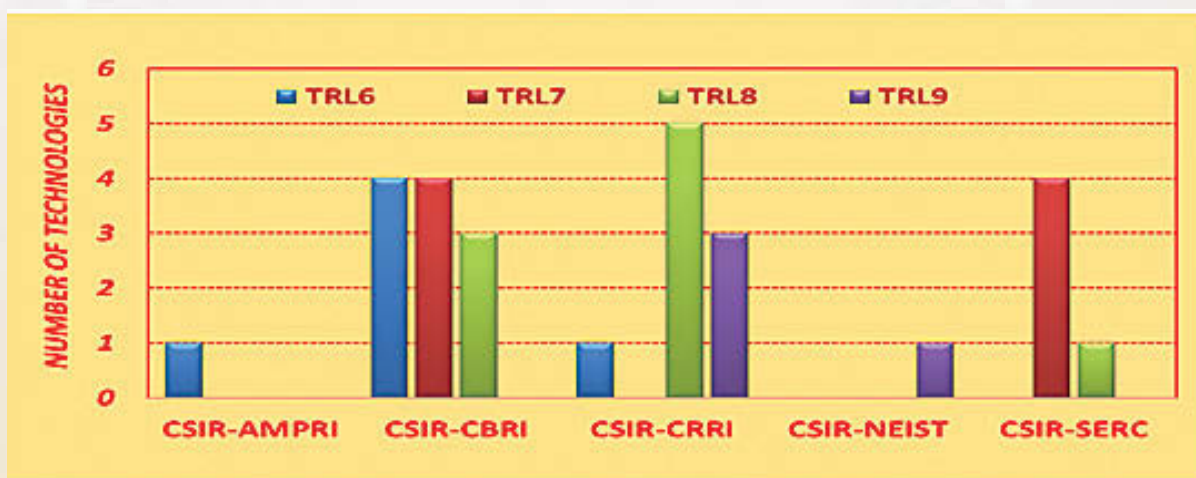


Figure 2. A bar-chart representation of the lab-wise contribution for TRL 6, TRL 7, TRL 8 and TRL 9 shown with blue, red, green and violet colour bars respectively. The ordinate represents the number of the technologies shown by the height of the bar for the respective labs shown on the abscissa.

Major highlights

Four technologies may be considered as the major highlights of this theme, as described below.

Kisan sabha mobile app: This technology has been developed to empower farmers and to provide them adequate choices to sell their produce at attractive prices. The app was launched on 1st of May 2020. Since then there has been more than 60000 downloads by different stakeholders including more than 20000 farmers, nearly 30000 transporters, more than 1000 Mandi dealers, more than 5000 service providers and more than 4000 consumers. This technology has been assessed at TRL 8.

“Arogyapath” national healthcare supply chain management platform: This technology has been developed with a vision of “Providing path which lead to one on a journey towards Arogya (healthy life)”. The idea of the development of such platform emerged from the health emergency scenario of COVID19 pandemic to provide single point availability of healthcare goods. This public platform provides a connection between the customers with healthcare needs and the suppliers who can supply products to fulfil those needs. The platform has been designed to address problems related to shortage of raw materials required for manufacturing these goods, locally or internationally, and logistics challenges, hoarding and import dependence and geopolitical considerations. This technology has been assessed at TRL 9.

Modular bricks from brahmaputra river bed sand: This technology is a modular brick production technology using Brahmaputra river bed sand, which is considered as waste material, as raw material. It is a bases on an energy efficient and environment friendly process conserving valuable agricultural soil. Already 300000 brick were produced in the manufacturing unit of CSIR-NIEST by the technology licensee M/s P.S. Enterprises, Jorhat, Assam. The final product in terms of modular bricks is now commercially available and being sold in the market. This technology has been assessed at TRL 9.

Mobile bridge inspection unit (mbu): Developed by CSIR-CRRI & CSIR-CMERI, this technology is an electro-mechanical truck mounted device which provides access to hidden parts of bridges or similar infrastructures for proper inspection. The present version is the truck mounted system with an aim to provide an economic solution for carrying out visual inspection of bridges on State and National Highways and can be operated by semi-skilled manpower at the site with minimal maintenance. MBIU can be designed to suit a particular need such as for railways. It is adept for market oriented modifications and already been licensed to two industrial partners in India. Moreover, more than 4 units of the final product costing approximately ₹ 180 Lakhs has already been sold. This technology has been assessed at TRL 9.

137. ADVANCED HYBRID COMPOSITE WOOD AND WOOD SUBSTITUTE (AC-WOOD)

UID: TECH-THEME_4_AMPRI-003

LABORATORY OF ORIGIN | CSIR-AMPRI, BHOPAL

EXECUTIVE SUMMARY

CSIR- AMPRI Bhopal, India has developed process know-how and optimised the parameters for manufacturing Advanced hybrid composite wood and wood substitute (AC-wood) products including screen printing. This technology was developed with multiple objectives for multifunctional application. The performance of AC-wood varies depending on the raw materials quantity, quality, particulate- fibre ratio, particulate/fibres – binder ratio, type of polymeric system and processing and manufacturing conditions. Realization of this technology is expected to results a new class of advanced composites to the society with a focus to “Make in India, Advanced Manufacturing and Clean India Mission Programmes”.



KEYWORDS

Screen printed composites, Multifunctional applications, Recycling technology

SALIENT FEATURES

NA

APPLICATIONS

Doors, Partition, Furniture, Roof & false ceilings, Floor & wall tiles, Electrical and Architectural cladding panels.

TECHNOLOGY BENCHMARKING

The technology is benchmarked with similar technology already available and all technology specifications benchmarked with appropriate standards.

TECHNOLOGY READINESS LEVEL ASSESSMENT

TRL 6

SCALE OF DEVELOPMENT

Pilot scale demonstration in field conditions done incorporating the feedback from TRL 6. Contact have been established with relevant firms to design and develop the plant for upscaling.

STATUS OF COMMERCIALIZATION

N/A

TENTATIVE COST OF DEVELOPMENT

₹ 3.5 lakhs

4.4 CIVIL INFRASTRUCTURE AND ENGINEERING (CIE)

INDUSTRIAL PARTNERS

N/A

IPR STATUS DETAILS (PATENTS/COPYRIGHT/TRADEMARK SECURITY IN INDIA/ABROAD)

N/A

PLANT SET UP FOR FINAL PRODUCT

Not yet

POTENTIAL MARKET/TECHNO-ECONOMICS

Civil Infrastructure.

ENVIRONMENTAL SAFETY CERTIFICATION

No

NODAL SCIENTIST DETAILS

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138. C-BRICK MACHINE – CAPACITY 5000 BRICKS PER 8 HRS. SHIFT (UPGRADED VERSION)

UID: TECH-THEME_4_CBRI-005

LABORATORY OF ORIGIN | CSIR-CBRI, ROORKEE

EXECUTIVE SUMMARY

This machine has been developed on vibro-compaction principle to produce about 5,000 bricks per shift. Mould box of the machine having four cavities of brick dimensions is placed on a wooden pallet. The pallet in turn is placed on the table of the machine. All the cavities of the mould box are filled up with a prepared wet mix of raw materials. Four plungers which swivel through 360 degrees are now shifted over the mould box and lowered down over to rest over the filled up cavities. The moulds are vibrated for about 5 seconds. Mould box is raised by operating a hand-operated lever so that the plungers remain over the shaped bricks. The plungers are raised by operating second lever, which leaves four well-shaped bricks on the pallet. The pallet is now removed manually and placed in the sun for drying prior to steam/wet curing. The machine produces bricks of size 230 x 110 x 75 mm with frog on it with excellent quality and good dimensional stability. This machine is simple in operation.

C-Brick Machine



KEYWORDS

Vibro compaction, Sand cement bricks, Water curing

SALIENT FEATURES

NA

APPLICATIONS

To produce sand cement bricks & building components.

TECHNOLOGY BENCHMARKING

The technology is benchmarked and there is an existing C-Brick Machine in CSIR-CBRI.

TECHNOLOGY READINESS LEVEL ASSESSMENT

TRL 7

SCALE OF DEVELOPMENT

The Pilot plant demonstration held. The technology prototype has been tested in the actual field conditions and addressed all the critical scaling issues. The technology is available for licensing. Discussion is going on with the relevant firms to design and develop the plant for upscaling.

STATUS OF COMMERCIALIZATION

Not Available

4.4 CIVIL INFRASTRUCTURE AND ENGINEERING (CIE)**TENTATIVE COST OF DEVELOPMENT**

₹ 2 Lakhs

INDUSTRIAL PARTNERS

Not Available

PLANT SET UP FOR FINAL PRODUCT

Fabrication plant setup.

IPR STATUS DETAILS (PATENTS/COPYRIGHT/TRADEMARK SECURITY IN INDIA/ABROAD)

Not Available

POTENTIAL MARKET/TECHNO-ECONOMICS

The machine can produce sand cement bricks with waste materials like fly ash/stone dust etc. There is a huge demand of use of waste materials in building components.

ENVIRONMENTAL SAFETY CERTIFICATION

Not Available

NODAL SCIENTIST DETAILS

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139. FIRE RETARDANT WATER BASED CLEAR/TRANSPARENT COATING FOR WOOD AND WOOD BASED INTERIORS

UID: TECH-THEME_4_CBRI-006

LABORATORY OF ORIGIN | CSIR-CBRI, ROORKEE

EXECUTIVE SUMMARY

Wood and wood based materials are in combustible in nature, when exposed to fire they ignite easily, spread flames; contribute to heat, generate dense smoke and toxic combustion products. Most of Indian wood when exposed to Surface spread of flame experiments, they fall in Class - 3 or Class - 4 i.e. they provide medium or rapid flame spread, also their Fire propagation index is in range of 30 - 38. Fire Retardant Water Based Transparent Coating developed by CSIR-CBRI when applied on existing or new wooden structures, i.e. doors, windows, false ceilings, partitions etc. the fire performance will be enhanced to next level as its comes to Class-0 fire behaviour ratings. The Fire propagation index is determined as $i \leq 6$ and $I \leq 12$ as per BS 476: Part 6 and Class-1 (very low/nil) on Surface Spread of Flame Classification as per BS 476: Part 7. This coating can be made available to common man or any other official, industrialist for affordable price at par with normal emulsion paint. The spread rate of normal paint is approximately 5 m²/lt, while Fire Retardant Water Based Transparent Coating developed by us gives 10 m²/lt. Hence cost-effective also. Application: for interior only.

KEYWORDS

Fire retardant, Class 0, Flame spread, Fire propagation index, Ignitability

SALIENT FEATURES

Not Available

APPLICATIONS

The existing arms, Ammunition depot, Ancient buildings, Monuments and all other buildings wooden interiors.

TECHNOLOGY BENCHMARKING

The water based fire retardant clear coating was not available indigenously for comparison, it is benchmarked as per BS 476: PART 6 (Fire Propagation Index) & BS 476: PART 7 (Surface Spread of Flame Classification).

TECHNOLOGY READINESS LEVEL ASSESSMENT

TRL 8

SCALE OF DEVELOPMENT

The Pilot plant demonstration held, 300 kg/day demonstration given. The prototype addressed all critical scaling issues from lab to pilot scale. This technology has been transferred to M/s Paramount Intercontinental Pvt. Ltd., Sonapat.

STATUS OF COMMERCIALIZATION

Commercialized

4.4 CIVIL INFRASTRUCTURE AND ENGINEERING (CIE)

TENTATIVE COST OF DEVELOPMENT

₹ 1 Lakh

INDUSTRIAL PARTNERS

M/s Paramount Intercontinental Pvt. Ltd., Sonapat started selling this product.

PLANT SET UP FOR FINAL PRODUCT

First batch of production at the industry.

IPR STATUS DETAILS (PATENTS/COPYRIGHT/TRADEMARK SECURITY IN INDIA/ABROAD)

Not Available

POTENTIAL MARKET/TECHNO-ECONOMICS

The existing arms and ammunition depot where only wooden doors and windows are available. Another one is the ancient buildings and monuments and all other buildings wooden interior where our developed technology have potential market.

ENVIRONMENTAL SAFETY CERTIFICATION

Yes. M/s Paramount Intercontinental Pvt. Ltd., Sonapat informed that all the No Objection Certificates from fire safety, environment departments obtained to run the plant.

NODAL SCIENTIST DETAILS

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140. MANUFACTURE OF PAVER BLOCK AND OTHER BUILDING COMPONENTS I.E. TILES/BRICKS FROM C&D WASTE

UID: TECH-THEME_4_CBRI-007

LABORATORY OF ORIGIN | CSIR-CBRI, ROORKEE

EXECUTIVE SUMMARY

Manufacturing of paver block and other building components i.e. Tiles/brick etc. from construction and demolition waste was done. From the test results obtained it was clear that these paver block can be recommended for medium traffic purpose as these are satisfying the minimum strength requirements as per IS:15658.

KEYWORDS

Paver Block, Brick, Tile, C&D Waste, Waste utilization

SALIENT FEATURES

Not Available

APPLICATIONS

Paver blocks for construction activities, pavement and sidewalks in traffic area.

TECHNOLOGY BENCHMARKING

C&D waste has been utilized by M/S IL&FS Environment, Burari, Delhi, without optimizing the C&D waste percentage – only 50% waste was utilized. This technology utilizes 100 % C&D waste. Results were compared with Indian Standards IS 15658:2006.

TECHNOLOGY READINESS LEVEL ASSESSMENT

TRL 7

SCALE OF DEVELOPMENT

Pilot scale demonstration in field conditions done, prototype been tested in actual field, and all scaling issues such as water adsorption, abrasion were taken care of in the final products.

STATUS OF COMMERCIALIZATION

Commercialized

TENTATIVE COST OF DEVELOPMENT

₹ 5 Lakhs

INDUSTRIAL PARTNERS

M/s DishaEcoloc Pavers, Nagpur.

PLANT SET UP FOR FINAL PRODUCT

M/s DishaEcoloc Pavers, Nagpur manufactured and is selling the products commercially.

4.4 CIVIL INFRASTRUCTURE AND ENGINEERING (CIE)

IPR STATUS DETAILS (PATENTS/COPYRIGHT/TRADEMARK SECURITY IN INDIA/ABROAD)

Not Available

POTENTIAL MARKET/TECHNO-ECONOMICS

The use of recycle C&D waste materials in construction activities helps not only to reduce the demand of non-renewable natural products but also to reduce the amount of waste land filled without extracting any value from it. From the results obtained it was found that these paver block can be used for medium traffic purpose as these are satisfying the minimum strength requirements as per IS:15658.

ENVIRONMENTAL SAFETY CERTIFICATION

Yes. No environmental issues like leaching, toxicity etc. are associated with products as C&D waste does not have toxic elements.

NODAL SCIENTIST DETAILS

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141. HYBRID REBAR COUPLER

UID: TECH-THEME_4_CBRI-008

LABORATORY OF ORIGIN | CSIR-CBRI, ROORKEE

EXECUTIVE SUMMARY

A rebar coupler is used to connect two adjacent rebars in new construction and in retrofitting works. This can be used to connect the new rebar with extended rebars in the existing concrete elements. However, in several cases the performance of conventional rebar couplers was not found satisfactory during the earthquake. To improve the performance of spliced region, hybrid rebar coupler has been developed and upgraded. This coupler consists of a cylindrical steel sleeve with internal threads to offer frictional resistance between the rebar and sleeve. The cylindrical sleeve has provisions for vertical and inclined bolts to apply lateral pressure. It can be used to connect precast structural elements at the potential hinge region of framed structures.



KEYWORDS

Rebar connector, Hybrid coupler, Seismic resistant, Coupler for Plastic hinge

SALIENT FEATURES

Not Available

APPLICATIONS

In construction industry as a replacement of conventional lap splice

TECHNOLOGY BENCHMARKING

The market available threaded coupler is tested and compared with the proposed. It is compared with conventional rebars. IS: 16172:2014 is followed to carryout Tensile and slip test.

TECHNOLOGY READINESS LEVEL ASSESSMENT

TRL 6

SCALE OF DEVELOPMENT

The plant is not yet fully established and hence it is not demonstrated in field conditions although the prototype addressed all critical scaling issues as it has been tested in different scale down models and in full scale model.

STATUS OF COMMERCIALIZATION

No

TENTATIVE COST OF DEVELOPMENT

₹ 5 Lakhs

INDUSTRIAL PARTNERS

Not Available

4.4 CIVIL INFRASTRUCTURE AND ENGINEERING (CIE)

PLANT SET UP FOR FINAL PRODUCT

No, under process.

IPR STATUS DETAILS (PATENTS/COPYRIGHT/TRADEMARK SECURITY IN INDIA/ABROAD)

Not Available

POTENTIAL MARKET/TECHNO-ECONOMICS

Currently many rebar couplers are widely used in construction industry instead of conventional lap splice. But many of them are tested as individual unit and very limited has been tested with RC elements under cyclic loading. This coupler has been tested under cyclic loading and examined at different potential hinge region of RC elements to validate its effectiveness in seismic resistance.

ENVIRONMENTAL SAFETY CERTIFICATION

No

NODAL SCIENTIST DETAILS

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142. PROCESS KNOW-HOW FOR MANUFACTURING OF NANO-LIME

UID: TECH-THEME_4_CBRI-009

LABORATORY OF ORIGIN | CSIR-CBRI, ROORKEE

EXECUTIVE SUMMARY

The nano-lime is a consistent quality material and high early stage strength. Compatibility with heritage materials. Nano-lime based systems are used for heritage structures e.g. repair mortar, micro-cracks filler, injection grout etc. The indigenously developed material is cost-effective and to replace imported nano-lime.

KEYWORDS

Lime, Heritage materials, Nanotechnology

SALIENT FEATURES

Not Available

APPLICATIONS

Building material for heritage structure.

TECHNOLOGY BENCHMARKING

The technology has been benchmarked with appropriate standards and with similar technology already available.

TECHNOLOGY READINESS LEVEL ASSESSMENT

TRL 6

SCALE OF DEVELOPMENT

Pilot plant demonstration done in actual field conditions incorporating feedbacks from TRL 6.

STATUS OF COMMERCIALIZATION

No

TENTATIVE COST OF DEVELOPMENT

₹ 10 Lakhs

INDUSTRIAL PARTNERS

Not Available

PLANT SET UP FOR FINAL PRODUCT

No, in process

IPR STATUS DETAILS (PATENTS/COPYRIGHT/TRADEMARK SECURITY IN INDIA/ABROAD)

Not Available

4.4 CIVIL INFRASTRUCTURE AND ENGINEERING (CIE)

POTENTIAL MARKET/TECHNO-ECONOMICS

All the heritage structures are built using Lime as building material and India has thousands of heritage structure. As only compatible material can be used for restoration work, this indigenously developed material has immense potential for cracking, grouting and stone consolidation applications.

ENVIRONMENTAL SAFETY CERTIFICATION

No

NODAL SCIENTIST DETAILS

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143. PROCESS KNOW-HOW FOR MANUFACTURING SILICA NANO-PARTICLES (SNPS)

UID: TECH-THEME_4_CBRI-010

LABORATORY OF ORIGIN | CSIR-CBRI, ROORKEE

EXECUTIVE SUMMARY

Nanotechnology in construction sector is gaining widespread attention as it provides a suitable alternative to fulfil the present need of sustainable construction without compromising the strength and cost of the concrete. Applications of Silica Nanoparticles (SNPs) in cementitious system results in three major advantages i.e. (1) Higher early stage strength, yielding to speedy construction; (2) Improvement in microstructure leading to higher performance against environmental constituents and (3) Modification in C-S-H structure, thereby exhibiting to enhanced durability. Therefore keep this in mind, CSIR-CBRI has developed an improved, cost-effective and facile process for the preparation of silica nanoparticles for use in cement based materials.



KEYWORDS

Cement/concrete, Nanotechnology, Nano-silica, Performance, Durability

SALIENT FEATURES

Not Available

APPLICATIONS

Replacement of the silica fume for cement/concrete based material.

TECHNOLOGY BENCHMARKING

It is benchmarked with appropriate standards and with similar technology already available.

TECHNOLOGY READINESS LEVEL ASSESSMENT

TRL 6

SCALE OF DEVELOPMENT

The Pilot scale plant demonstration done and prototype has been tested in actual field conditions incorporating feedbacks from TRL 6.

STATUS OF COMMERCIALIZATION

No

TENTATIVE COST OF DEVELOPMENT

₹ 25 Lakhs

4.4 CIVIL INFRASTRUCTURE AND ENGINEERING (CIE)

INDUSTRIAL PARTNERS

Not Available

PLANT SET UP FOR FINAL PRODUCT

No

IPR STATUS DETAILS (PATENTS/COPYRIGHT/TRADEMARK SECURITY IN INDIA/ABROAD)

Not Available

POTENTIAL MARKET/TECHNO-ECONOMICS

Performance and durability of cement/ concrete based material is the key in order to attain sustainability. Presently, silica fume is used for high performance concrete. However, this indigenously developed nano-silica is expected to replace the silica fume, an imported material owing to its higher performance and enhance durability.

ENVIRONMENTAL SAFETY CERTIFICATION

No

NODAL SCIENTIST DETAILS

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144. DEVELOPMENT OF THERMAL INSULATED VERMICULITE TILES

UID: TECH-THEME_4_CBRI-011

LABORATORY OF ORIGIN | CSIR-CBRI, ROORKEE

EXECUTIVE SUMMARY

Thermal insulation in buildings is an important factor for achieving thermal comfort for its occupants. Vermiculite due to its high thermal insulation parameters is used for manufacturing different kinds of fireproofing materials, insulating boards etc. Salient Features of Vermiculite Tiles

- Utilizes vermiculite waste.
- Adaptable technology for large, medium and small level industries.
- Better Thermal insulating properties.
- Low water absorption.
- Better mechanical strength.
- Aesthetic appearance.
- Environment friendly.



KEYWORDS

Roofing tiles, Vermiculite, Energy efficient, Thermal insulation, Light weight

SALIENT FEATURES

Vermiculite Tiles; utilizes vermiculite waste, adaptable technology for large, medium and small level industries, better thermal insulating properties, low water absorption, better mechanical strength, aesthetic appearance, environment friendly.

APPLICATIONS

Vermiculite tiles

TECHNOLOGY BENCHMARKING

The developed products have been compared with the commercial products. The test results matched with the appropriate standards.

TECHNOLOGY READINESS LEVEL ASSESSMENT

TRL 8

SCALE OF DEVELOPMENT

The Pilot scale demonstration have been given to industry persons after the transfer of the technology. All the products have been tested in lab as well as in the field conditions. All critical scaling issues have been addressed.

STATUS OF COMMERCIALIZATION

Commercialized

4.4 CIVIL INFRASTRUCTURE AND ENGINEERING (CIE)

TENTATIVE COST OF DEVELOPMENT

₹ 15-20 Lakhs

INDUSTRIAL PARTNERS

Pashan Welfare Association, Kota.

PLANT SET UP FOR FINAL PRODUCT

Pashan welfare association, Kota, has setup the plant for production.

IPR STATUS DETAILS (PATENTS/COPYRIGHT/TRADEMARK SECURITY IN INDIA/ABROAD)

Not Available

POTENTIAL MARKET/TECHNO-ECONOMICS

- Utilizes vermiculite waste.
- Adaptable technology for large, medium and small level industries.
- Better Thermal insulating properties.
- Low water absorption.
- Better mechanical strength.
- Aesthetic appearance.
- Environment friendly.

ENVIRONMENTAL SAFETY CERTIFICATION

All the safety aspects including environmental safety have been addressed and documented.

NODAL SCIENTIST DETAILS

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145. FIRE RETARDANT WATER REPELLENT CANVAS

UID: TECH-THEME_4_CBRI-012

LABORATORY OF ORIGIN | CSIR-CBRI, ROORKEE

EXECUTIVE SUMMARY

Most of the functions, public meetings are generally held inside the shamiyanas, pandals, temporary shelters and tents made of canvas. Canvas is a thick cotton fabric, which is generally used to fabricate the temporary shelter. The canvas cloth is generally used for erecting of tents and temporary shelters. Temporary shelters are erected in the open and directly exposed to the formidable weathering conditions. Canvas is chemically made of cellulose fibers that are flammable and ignite very rapidly and water can percolate through it very easily. Therefore, fire and water are the main problems of the temporary shelter made of canvas. Many fire incidents occur in temporary shelters made of cotton canvas every year all over the world which resulted into large number of casualties and loss of properties. CSIR-CBRI, Roorkee has developed a technology to render cotton canvas fire retardant with enhanced water repellency and tear strength through surface coating. Coating was prepared by reacting fire retardant additives and plasticizers with co-polymers and organic hydrocarbon compounds.



- The fire performance of coated cotton canvas was evaluated for flame proofing and flammability requirements for fire protection as per BS: 3119 and method for determination of flammability and flame resistance of textile fabrics as per IS: 11871 -1986. Cotton canvas cloth has been coated properly on both sides with the prepared fire-retardant chemical composition.
- Fire test results showed that fire retardancy of coated canvas cloth is enhanced significantly.
- Water repellent test results showed that there is negligible effect on coated canvas cloth.
- Tensile strength test results showed that there is about 16% increase in the tensile strength of coated canvas cloth.

KEYWORDS

Fire retardant, Water repellent, Cotton canvas, Flammability, Fire protection

SALIENT FEATURES

Not Available

APPLICATIONS

Temporary shelters, Pandals, Railway vestibules, Military hangers, Cotton canvas manufacturers and suppliers, Fire resistant movable curtain wall construction.

4.4 CIVIL INFRASTRUCTURE AND ENGINEERING (CIE)

TECHNOLOGY BENCHMARKING

It is benchmarked with respect to fire retardancy. Standard testing have been done for benchmarking.

TECHNOLOGY READINESS LEVEL ASSESSMENT

TRL 7

SCALE OF DEVELOPMENT

The Pilot plant demonstration held, 400 meters FRWR canvas produced, and the prototype has been tested for 10 years in actual field conditions. All critical scaling issues have been addressed.

STATUS OF COMMERCIALIZATION

No

TENTATIVE COST OF DEVELOPMENT

₹ 12 Lakhs

INDUSTRIAL PARTNERS

Not Available

PLANT SET UP FOR FINAL PRODUCT

Party is in process of set-up a plant.

IPR STATUS DETAILS (PATENTS/COPYRIGHT/TRADEMARK SECURITY IN INDIA/ABROAD)

Not Available

POTENTIAL MARKET/TECHNO-ECONOMICS

Temporary shelters, Pandals, Railway vestibules, Military hangers, Cotton canvas manufacturers and suppliers, Fire resistant movable curtain wall construction

ENVIRONMENTAL SAFETY CERTIFICATION

Environment safety aspects have been addressed.

NODAL SCIENTIST DETAILS

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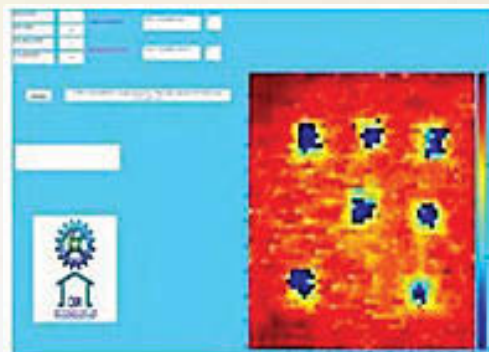
146. IMAGING OF HIDDEN ANOMALIES IN CONCRETE AND STONE MASONRY STRUCTURES USING ULTRASONIC PULSE VELOCITY

UID: TECH-THEME_4_CBRI-013

LABORATORY OF ORIGIN | CSIR-CBRI, ROORKEE

EXECUTIVE SUMMARY

A standalone software and data acquisition schemes for imaging of masonry and concrete structure. The software can be used for concrete, stone masonry types of samples to identify defected regions, variation in strengths of samples, identification of shape and size of the defects, guessing type of defects, localization of weakness in the structures and quality assurance and certification.



KEYWORDS

Concrete, Stone masonry, Ultrasound, Damage identification, Imaging

SALIENT FEATURES

Not Available

APPLICATIONS

Ultrasonic pulse velocity measurements.

TECHNOLOGY BENCHMARKING

The technology have been benchmarked with the existing available technology. It is a non-destructive evaluation technique which has been validated using destructive tests.

TECHNOLOGY READINESS LEVEL ASSESSMENT

TRL 7

SCALE OF DEVELOPMENT

Technology have been demonstrated and validated in actual field conditions. Prototype tested in actual field conditions. It's a software and technique, therefore addressed all the scaling issues.

STATUS OF COMMERCIALIZATION

Not yet commercialised.

TENTATIVE COST OF DEVELOPMENT

₹ 2.5 Lakhs

INDUSTRIAL PARTNERS

Not Available

PLANT SET UP FOR FINAL PRODUCT

No

4.4 CIVIL INFRASTRUCTURE AND ENGINEERING (CIE)

IPR STATUS DETAILS (PATENTS/COPYRIGHT/TRADEMARK SECURITY IN INDIA/ABROAD)

Not Available

POTENTIAL MARKET/TECHNO-ECONOMICS

- Equipment manufacturers related to ultrasonic pulse velocity measurements in concrete, wood and stones.
- Non-Destructive Evaluation and Testing (NDT&E) company.
- Software solution provider for NDE.
- Heritage and conventional repair and rehabilitation contractor and companies.
- Quality assurance company.
- Civil and Structural contractor.

ENVIRONMENTAL SAFETY CERTIFICATION

No

NODAL SCIENTIST DETAILS

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147. BUILDING PRODUCTS FROM KOTASTONE WASTE

UID: TECH-THEME_4_CBRI-014

LABORATORY OF ORIGIN | CSIR-CBRI, ROORKEE

EXECUTIVE SUMMARY

Every year about 10 to 12 Million Ton of Kotastone waste is discharged into local convenient places which poses major environmental and ecological problems which affects the human health such as –
 - Ground water contamination caused due to land filling - Air pollution due to increased level of suspended particulate in atmosphere - Choking of drain in rainy season due to unorganized disposal etc. Initiative taken towards resolving the problem of Kota stone waste disposal in Rajasthan is under the Government mission, "Swachh Bharat". This technology is helpful to stone Industry in disposing off the huge generated solid and slurry wastes economically without effecting the environment. There is tremendous scope for setting up secondary industries for recycling and using such solid wastes in construction materials. The developed technology is ~35-45% cost-effective as compared to the conventional tiles/blocks.

KEYWORDS

Floor tiles, Paver blocks, CFC blocks, Kotastone waste

SALIENT FEATURE

Not Available

APPLICATIONS

In view of huge quantity of wastes as minerals or resources, there is a tremendous scope and need for recycling and using such stone wastes to develop sustainable building materials.

TECHNOLOGY BENCHMARKING

The technology has been benchmarked with similar technology already available and all technology specifications have been benchmarked with appropriate standards.

TECHNOLOGY READINESS LEVEL ASSESSMENT

TRL 8

SCALE OF DEVELOPMENT

Pilot scale demonstration in field conditions done, technology prototype tested in actual field conditions/production/manufacturing/operational environment done and all scaling issues at prototype level addressed.

STATUS OF COMMERCIALIZATION

Commercialised; Pashan Welfare Association, Kota, has setup the plant for production. The product based on this technology has started selling in the market.

TENTATIVE COST OF DEVELOPMENT

₹ 2.5 Lakhs

INDUSTRIAL PARTNERS

Pashan Welfare Association, Kota.

4.4 CIVIL INFRASTRUCTURE AND ENGINEERING (CIE)

PLANT SET UP FOR FINAL PRODUCT

Established the contact with firm to develop the plant for upscaling.

IPR STATUS DETAILS (PATENTS/COPYRIGHT/TRADEMARK SECURITY IN INDIA/ABROAD)

Not Available

ENVIRONMENTAL SAFETY CERTIFICATION

Safety aspects (including environmental safety) addressed and documented.

POTENTIAL MARKET/TECHNO-ECONOMIC

The amount of wastes generated during cutting, quarrying, sawing and polishing processes from flaggy limestone industries easily reaches up to 10-12 MT per year. Flaggy limestone slurry consist of 85% water and 15% flaggy limestone powder. Thus, total solid waste generation easily reaches about 4.5-5 MT annually i.e. approx. 75-80% of total mined out reserves. It contains around 38% lime, 15-18% silica, 3-4% alumina and around 1- 2% iron as FeO and Fe₂O₃. Thus, looking to such huge quantity of wastes as minerals or resources, there is a tremendous scope and need for recycling and using such stone wastes to develop sustainable building materials.

NODAL SCIENTIST DETAILS

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148. HORIZONTAL BORING MACHINE FOR MAKING UNDERGROUND BORES

UID: TECH-THEME_4_CBRI-015

LABORATORY OF ORIGIN | CSIR-CBRI, ROORKEE

EXECUTIVE SUMMARY

The machine is capable of making 180 mm dia holes upto 17 m under the buildings/roads for laying underground services like sewer pipelines, conduits, water pipelines etc. without disturbing the surface structures. The machine is environment friendly and reduces the traffic jam and the dust due to underground boring. Being the low price product, it is best suitable for small to medium contractors engaged in building and allied construction activities.

KEYWORDS

Boring, Underground, Pipeline, Horizontal

SALIENT FEATURE

Not Available

APPLICATIONS

For laying underground services (sewer pipelines, conduits, water pipelines etc.) under the ground without disturbing the surface structures.

TECHNOLOGY BENCHMARKING

The technology has been benchmarked with similar technology already available and all technology specifications have been benchmarked with appropriate standards.

TECHNOLOGY READINESS LEVEL ASSESSMENT

TRL 6

SCALE OF DEVELOPMENT

Pilot scale demonstration in field conditions done, technology prototype tested in actual field conditions/production/manufacturing/operational environment done and all scaling issues at prototype level not addressed.

STATUS OF COMMERCIALIZATION

Not Available

TENTATIVE COST OF DEVELOPMENT

₹ 1.5 Lakhs

INDUSTRIAL PARTNERS

Not Available

PLANT SET UP FOR FINAL PRODUCT

Industrial partner has setup a plant in Uttarakhand.

4.4 CIVIL INFRASTRUCTURE AND ENGINEERING (CIE)

IPR STATUS DETAILS (PATENTS/COPYRIGHT/TRADEMARK SECURITY IN INDIA/ABROAD)

Not Available

POTENTIAL MARKET/TECHNO-ECONOMIC

- Usable by small to medium contractors engaged in building and allied construction activities.
- Boring Diameter – upto 180 mm
- Boring Length – upto 17 m
- Capable of making underground horizontal bores in Dry State using open flight auger and in wet state using combination of cutter and water jet.

ENVIRONMENTAL SAFETY CERTIFICATION

Not Required

NODAL SCIENTIST DETAILS

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149. DESIGN OF NOISE BARRIER BASED ON DIFFERENT FREQUENCIES (A) LOW FREQUENCY NOISE BARRIER CONFIGURATION (B) MIDDLE FREQUENCY NOISE BARRIER CONFIGURATION

UID: TECH-THEME_4_CRRI-016

LABORATORY OF ORIGIN | CSIR-CRRI, NEW DELHI

EXECUTIVE SUMMARY

At global level, Noise Barriers are not designed based on the disturbing frequency generated from transport sector. In this study, noise barriers have been designed based on three types of frequency classes for maximum reduction of noise i.e. Low frequency (<200Hz), (Middle frequency (200-1k Hz) and High frequency (1k-20k Hz).

KEYWORDS

Noise barrier, Frequency

SALIENT FEATURE

Not Available

APPLICATIONS

Not Available

TECHNOLOGY BENCHMARKING

The technology has been benchmarked with similar technologies already available and all product specifications have been benchmarked with appropriate standards.

TECHNOLOGY READINESS LEVEL ASSESSMENT

TRL 8

SCALE OF DEVELOPMENT

The technology has been demonstrated in field conditions and technology prototype has been tested in actual field conditions, and all critical scaling issues addressed.

STATUS OF COMMERCIALIZATION

Tender has been floated for commercialization.

TENTATIVE COST OF DEVELOPMENT

₹ Lakhs 50

INDUSTRIAL PARTNERS

Not Available

PLANT SET UP FOR FINAL PRODUCT

Manufacturer has set up the plant for final product using technology.

4.4 CIVIL INFRASTRUCTURE AND ENGINEERING (CIE)

IPR STATUS DETAILS (PATENTS/COPYRIGHT/TRADEMARK SECURITY IN INDIA/ABROAD)

Not Available

ENVIRONMENTAL SAFETY CERTIFICATION

Safety aspects (including environmental safety) addressed and documented

POTENTIAL MARKET/TECHNO-ECONOMIC

Construction agencies, NHAI, PWDs.

NODAL SCIENTIST DETAILS

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150. POTHOLE REPAIR MACHINE

UID: TECH-THEME_4_CRRI-017

LABORATORY OF ORIGIN | CSIR-CRRI, NEW DELHI

EXECUTIVE SUMMARY

Potholes have always been a problem for highway maintenance agencies because their treatment is skilful, complex, costly and time-consuming. The problem aggravates much during the rainy season, when pothole repair becomes more difficult because of adverse weather conditions and the large number of potholes that tend to develop at faster rate. To effectively address this cumbersome time consuming act for repair of potholes, CSIR-CRRI has developed a cold mix based Pothole Repair Machine in collaboration with industry partner. On site demonstration of developed prototype was done before the stakeholders. Soon, the prototype of machine is going to be launched in market.

KEYWORDS

Pathole, Patch fill, Road repair

SALIENT FEATURE

Not Available

APPLICATIONS

Pothole parch fill and road repair.

TECHNOLOGY BENCHMARKING

The technology has been benchmarked with similar technologies already available and all product specifications have been benchmarked with appropriate standards.

TECHNOLOGY READINESS LEVEL ASSESSMENT

TRL 6

SCALE OF DEVELOPMENT

Pilot scale demonstration in field conditions is in process. Technology prototype not tested in actual field conditions. All critical scaling issues addressed.

STATUS OF COMMERCIALIZATION

Through EOI, industry partner has been finalised for upscaling and modification. Discussion with the industrial partner is going on and prototype has been developed.

TENTATIVE COST OF DEVELOPMENT

₹ 30 Lakh

INDUSTRIAL PARTNERS

Not Available

IPR STATUS DETAILS (PATENTS/COPYRIGHT/TRADEMARK SECURITY IN INDIA/ABROAD)

Not Available

4.4 CIVIL INFRASTRUCTURE AND ENGINEERING (CIE)

ENVIRONMENTAL SAFETY CERTIFICATION

No

POTENTIAL MARKET/TECHNO-ECONOMIC

Construction agencies, NHAI, PWDs.

NODAL SCIENTIST DETAILS

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151. KISANSABHA MOBILE APP

UID: TECH-THEME_4_CRRI-019

LABORATORY OF ORIGIN | CSIR-CRRI, NEW DELHI

EXECUTIVE SUMMARY

In light of the latest announcement of 1.6 Lakh crores package by the Finance Minister wherein the key focus is to empower the farmer and initiatives like providing adequate choices to farmers to sell produce at attractive prices, Better framework for e-trading of produce, Agriculture marketing reforms to give farmers marketing choices and many such other step that will help the farmers. CSIR-CRRI in partnership with Sarvodaya Infotech Private Limited launched the application “Kisan Sabha”, for the benefits of farmers keeping in mind their key challenges like low incomes, unavailability transport seeds/fertilizers, etc. Kisan Sabah is a one stop portal designed to provide all such facilities to farmers, transporters and other entities engaged in the agriculture Industry. It has 6 major modules taking care of Farmers/Mandi Dealers/Transporters/Mandi Board Members/Service Providers/Consumers. Since its launch, it has shown a great momentum in the market with over 41000 downloads in a month and Alexa Rating much ahead of other big agri apps in the market.

KEYWORDS

Freight, Farmers, Mandi, Truck operators

SALIENT FEATURE

Kisan Sabah is a one stop portal designed to provide all such facilities to farmers, transporters and other entities engaged in the agriculture Industry. It has 6 major modules taking care of Farmers/Mandi Dealers/Transporters/Mandi Board Members/Service Providers/Consumers.

APPLICATIONS

Agri-mobile App

TECHNOLOGY BENCHMARKING

Benchmarked the technology with 60 similar technology already available. All loopholes have been addressed in the App.

TECHNOLOGY READINESS LEVEL ASSESSMENT

TRL 8

SCALE OF DEVELOPMENT

Pilot scale demonstration in Azadpur Mandi, Delhi. Prototype tested in actual field conditions with different stakeholders involved. All critical scaling issues addressed.

STATUS OF COMMERCIALIZATION

Commercialized.

TENTATIVE COST OF DEVELOPMENT

₹ 34 Lakh

INDUSTRIAL PARTNERS

Not Available

4.4 CIVIL INFRASTRUCTURE AND ENGINEERING (CIE)

PLANT SET UP FOR FINAL PRODUCTION

Yes, dedicated team from industrial partner working on it.

IPR STATUS DETAILS (PATENTS/COPYRIGHT/TRADEMARK SECURITY IN INDIA/ABROAD)

Trademark filled

ENVIRONMENTAL SAFETY CERTIFICATION

Yes. MoU signed with industry partner.

POTENTIAL MARKET/TECHNO-ECONOMIC

Mandi Boards, Agriculture Producing agencies, fertiliser companies

NODAL SCIENTIST DETAILS

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152. CAR DRIVING SIMULATOR WITH DRIVER DIAGNOSTIC AND TRAINING METHOD AND EXTENDED PRODUCTS

UID: TECH-THEME_4_CRRI-020

LABORATORY OF ORIGIN | CSIR-CRRI, NEW DELHI

EXECUTIVE SUMMARY

CSIR-CRRI and its industry partner have created a simulator to standardize the driver testing and assessment in India. This simulator software is unique as it has the vehicle dynamics of the same have been validated by various CSIR labs including CSIR-CRRI, CSIR-NAL and CSIR-CSIO. Along with this, the assessment modules have been customised and created to replicate real life tests conducted by RTOs on test tracks. The simulator also contains a learning module for training and a psychometric test for driver diagnostic. The technology is extendable into smaller portable products as can be seen in the photo with our industry partner.

KEYWORDS

Simulator, Driving simulator

SALIENT FEATURE

Not Available

APPLICATIONS

Driver testing and assessment in India.

TECHNOLOGY BENCHMARKING

The technology has been benchmarked with similar technologies already available and all product specifications have been benchmarked with appropriate standards.

TECHNOLOGY READINESS LEVEL ASSESSMENT

TRL 8

SCALE OF DEVELOPMENT

Pilot scale demonstration in lab done, prototype tested in actual environment. All critical issues addressed.

STATUS OF COMMERCIALIZATION

Manufacturer setup the plant for final product using the technology. Final product not yet sold in the market.

TENTATIVE COST OF DEVELOPMENT

₹ 5 Lakh

INDUSTRIAL PARTNERS

Not Available

PLANT SET UP FOR FINAL PRODUCTION

Industrial partner has been finalised for upscaling and modifications.

4.4 CIVIL INFRASTRUCTURE AND ENGINEERING (CIE)

IPR STATUS DETAILS (PATENTS/COPYRIGHT/TRADEMARK SECURITY IN INDIA/ABROAD)

Not Available

ENVIRONMENTAL SAFETY CERTIFICATION

Safety aspects (including environmental safety) addressed and documented.

POTENTIAL MARKET/TECHNO-ECONOMIC

Driver Training institutes, RTAs

NODAL SCIENTIST DETAILS

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153. REJUVENATOR FOR RECYCLING OF ASPHALT PAVEMENT MATERIAL FOR HOT IN PLANT AND HOT IN SITU RECYCLING OF BITUMINOUS PAVEMENT (WITH THE TRADE NAME OF REJUPAVE)

UID: TECH-THEME_4_CRRI-021

LABORATORY OF ORIGIN | CSIR-CRRI, NEW DELHI

EXECUTIVE SUMMARY

REJUPAVE is a liquid bio-based asphalt modifier cum rejuvenator used for bituminous road recycling. It facilitate the replenishment/restoration of the constituents of the oxidized bitumen binder (lost due to short and long term aging of bitumen). Besides restoring viscoelastic characteristics of oxidized binder for Hot Mix Recycling of road it facilitate the use of high RAP content for pavement recycling, hence conserve the virgin aggregates and bitumen required for road construction. Pavement recycling using Rejupave can ease the problem of ever increasing road levels due to successive bituminous overlays

KEYWORDS

Rejuvenator, Binder, Asphalt

SALIENT FEATURE

It facilitate the replenishment/restoration of the constituents of the oxidized bitumen binder (lost due to short and long term aging of bitumen).

APPLICATIONS

Road recycling

TECHNOLOGY BENCHMARKING

The technology has been benchmarked with similar technologies already available and all product specifications have been benchmarked with appropriate standards.

TECHNOLOGY READINESS LEVEL ASSESSMENT

TRL 8

SCALE OF DEVELOPMENT

Pilot scale demonstration in field conditions done, prototype tested in actual field conditions. All critical scaling issues not yet addressed.

STATUS OF COMMERCIALIZATION

No

TENTATIVE COST OF DEVELOPMENT

₹ 13 Lakh

INDUSTRIAL PARTNERS

Not Available

4.4 CIVIL INFRASTRUCTURE AND ENGINEERING (CIE)

PLANT SET UP FOR FINAL PRODUCTION

Yes, at pilot level

IPR STATUS DETAILS (PATENTS/COPYRIGHT/TRADEMARK SECURITY IN INDIA/ABROAD)

Not Available

ENVIRONMENTAL SAFETY CERTIFICATION

MSDS is under preparation.

POTENTIAL MARKET/TECHNO-ECONOMIC

Road construction agencies, NHAI, PWDs.

NODAL SCIENTIST DETAILS

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154. CUSTOMIZED BITUMEN EMULSION FOR MIX SEAL SURFACING BASED ON AGGREGATES OF U.P. STATE

UID: TECH-THEME_4_CRRI-022

LABORATORY OF ORIGIN | CSIR-CRRI, NEW DELHI

EXECUTIVE SUMMARY

Mix Seal Surfacing (MSS+) is a customized bitumen emulsion based dense graded surfacing for utilization as wearing course for low and medium volume roads. MSS+ is laid in a single layer at ambient atmospheric temperature and does not require any heating as the case with hot mix based bitumen surfacing. It eliminates the requirement of two stage construction as the case with cold mix premix carpet technology, hence can offer durable and dense surfacing. As no heating is involved hence it conserve the energy compare to hot mix construction. Dense graded MSS+ mix offer impermeable surface as the case with hot bituminous mix based surfacing.

KEYWORDS

Mix seal, MSS+, Emulsion

SALIENT FEATURE

Not Available

APPLICATIONS

Not Available

TECHNOLOGY BENCHMARKING

The technology has been benchmarked with similar technologies already available and all product specifications have been benchmarked with appropriate standards.

TECHNOLOGY READINESS LEVEL ASSESSMENT

TRL 8

SCALE OF DEVELOPMENT

Pilot scale demonstration in field conditions done, prototype tested in actual field conditions. All critical scaling issues not yet addressed.

STATUS OF COMMERCIALIZATION

No

TENTATIVE COST OF DEVELOPMENT

₹ 13 Lakh

INDUSTRIAL PARTNERS

Not Available

PLANT SET UP FOR FINAL PRODUCTION

At pilot level

4.4 CIVIL INFRASTRUCTURE AND ENGINEERING (CIE)

IPR STATUS DETAILS (PATENTS/COPYRIGHT/TRADEMARK SECURITY IN INDIA/ABROAD)

Not Available

ENVIRONMENTAL SAFETY CERTIFICATION

MSDS is under preparation.

POTENTIAL MARKET/TECHNO-ECONOMIC

Road construction agencies, NHAI, PWDs.

NODAL SCIENTIST DETAILS

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155. “AAROGYAPATH” NATIONAL HEALTHCARE SUPPLY CHAIN MANAGEMENT PLATFORM

UID: TECH-THEME_4_CRRI-023

LABORATORY OF ORIGIN | CSIR-CRRI, NEW DELHI

EXECUTIVE SUMMARY

The vision of this initiative is to set up an information management and forecasting databases platform at national level to capture demand and supply scenarios for key items that are required to address the national healthcare needs in the current pandemic scenario as well as future normal and epidemic scenarios. It provides a connection between the customers with healthcare needs and the suppliers who can supply products to fulfil those needs. The platform will also address problems related to shortage of raw materials required for manufacturing these goods, locally or internationally; Logistics challenges (e.g. non-availability of loaders at ports, transit restrictions on trucks across district borders); Hoarding and Import dependence and geopolitical considerations.

KEYWORDS

Health care, Supply chain

SALIENT FEATURES

NA

APPLICATIONS

It can be used in logistics & supply chains of health care systems.

TECHNOLOGY BENCHMARKING

The technology is benchmarked with similar technologies.

TECHNOLOGY READINESS LEVEL ASSESSMENT

TRL 9

SCALE OF DEVELOPMENT

Pilot scale demonstration in field conditions done, technology prototype tested in actual field conditions/ production/manufacturing/operational environment done and all scaling issues at prototype level addressed.

STATUS OF COMMERCIALIZATION

Yes. Product based on the technology started selling into the market.

TENTATIVE COST OF DEVELOPMENT

₹ 17 Lakhs

INDUSTRIAL PARTNERS

Not Available

PLANT SET UP FOR FINAL PRODUCT

Not Available

4.4 CIVIL INFRASTRUCTURE AND ENGINEERING (CIE)

IPR STATUS DETAILS (PATENTS/COPYRIGHT/TRADEMARK SECURITY IN INDIA/ABROAD)

Not Available

POTENTIAL MARKET/TECHNO-ECONOMICS

Health Care devices manufacturers, Suppliers, Logistic providers for supply chain.

ENVIRONMENTAL SAFETY CERTIFICATION

Yes

NODAL SCIENTIST DETAILS

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156. MOBILE BRIDGE INSPECTION UNIT (MBIU)

UID: TECH-THEME_4_CRRI-024

LABORATORY OF ORIGIN | CSIR-CRRI & CSIR-CMERI

EXECUTIVE SUMMARY

The MBIU is an electro-mechanical device mounted on a truck which provides access to hidden parts of bridges or similar infrastructures for proper inspection. The present version is the truck mounted system with an aim to provide an economical solution for carrying out visual inspection of bridges on state and national highways and can be operated by semi-skilled manpower at the site with minimal maintenance. MBIU can be designed to suit a particular need such as for railways. A video is available on YouTube: <http://www.youtube.com/watch?v=Ka3RyXYwClo>.

KEYWORDS

Bridge inspection, Visual bridge inspection

SALIENT FEATURES

MBIU increases the accessibility for inspection of the underside of high level bridge decks and helps in continuous inspection of throughout the span of the bridge.

APPLICATIONS

MBIU can be used for bridge inspection in railways, NHAI, PWDs etc.

TECHNOLOGY BENCHMARKING

The technology has been benchmarked with similar technologies already available and all product specifications.

TECHNOLOGY READINESS LEVEL ASSESSMENT

TRL 9

SCALE OF DEVELOPMENT

The technology has been demonstrated in field conditions and technology prototype has been tested in actual field conditions including all scaling issues at the prototype level. The prototype addressed all the critical scaling issues.

STATUS OF COMMERCIALIZATION

Commercialised; sold more than four units at approx. 180 lakhs

TENTATIVE COST OF DEVELOPMENT

₹ 170 Lakhs

INDUSTRIAL PARTNERS

Not Available

PLANT SET UP FOR FINAL PRODUCT

Yes. Two licences in India.

4.4 CIVIL INFRASTRUCTURE AND ENGINEERING (CIE)

IPR STATUS DETAILS (PATENTS/COPYRIGHT/TRADEMARK SECURITY IN INDIA/ABROAD)

Not Available

POTENTIAL MARKET/TECHNO-ECONOMICS

Road Construction agencies, NHAI, PWDs.

ENVIRONMENTAL SAFETY CERTIFICATION

Yes

NODAL SCIENTIST DETAILS

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157. PROCESS FOR LAYING ROADS USING COLD MIX TECHNOLOGY

UID: TECH-THEME_4_CRRI-028

LABORATORY OF ORIGIN | CSIR-CRRI, NEW DELHI

EXECUTIVE SUMMARY

Bitumen emulsion based cold mix technologies are alternative to traditional hot mix to serve the intended purpose. Indian Roads Congress with the support of CSIR-CRRI has made vital efforts for increased usage of bitumen emulsion and cold mixes. Practically, all road construction and maintenance requirement now can be met with emulsion based cold mix technologies.

KEYWORDS

Coldmix, Emulsion, Road construction

SALIENT FEATURES

Not Available

APPLICATIONS

It can be used in road construction and maintenance.

TECHNOLOGY BENCHMARKING

The technology has been benchmarked with similar technologies already available and all product specifications have been benchmarked with appropriate standards.

TECHNOLOGY READINESS LEVEL ASSESSMENT

TRL 9

SCALE OF DEVELOPMENT

Pilot scale demonstration done, prototype has been tested in actual field conditions, all critical scaling issues addressed.

STATUS OF COMMERCIALIZATION

Commercialised; approx. 8000 kms of road has been laid with the technology.

TENTATIVE COST OF DEVELOPMENT

₹ 10 Lakhs

INDUSTRIAL PARTNERS

N/A

PLANT SET UP FOR FINAL PRODUCT

Yes

IPR STATUS DETAILS (PATENTS/COPYRIGHT/TRADEMARK SECURITY IN INDIA/ABROAD)

N/A

4.4 CIVIL INFRASTRUCTURE AND ENGINEERING (CIE)

POTENTIAL MARKET/TECHNO-ECONOMICS

Road construction agencies, NHAI, PWDs.

ENVIRONMENTAL SAFETY CERTIFICATION

Yes

NODAL SCIENTIST DETAILS

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158. MODULAR BRICK FROM BRAHMAPUTRA RIVER BED SAND

UID: TECH-THEME_4_NEIST-029

LABORATORY OF ORIGIN | CSIR-NEIST, JORHAT, ASSAM

EXECUTIVE SUMMARY

Modular bricks are generally used in construction of building structures, boundary wall and foundations, etc. They can be used as an alternative building material in place of traditional burnt clay bricks. CSIR-NEIST has developed a unique process for production of modular bricks using Brahmaputra River bed sand. The process utilizes Brahmaputra River bed sand as main constituent and Ordinary Portland Cement (OPC) as binding material.

KEYWORDS

Cold eco-friendly, High compressive strength, Heat resistant, Fuel saving, Light weight

SALIENT FEATURES

The technology is based on an energy efficient and environment friendly process. The abundantly available Brahmaputra river bed sand which is considered as waste material has been used as raw material for manufacturing the modular brick.

APPLICATIONS

It can be used as an alternative to burnt clay bricks.

TECHNOLOGY BENCHMARKING

The technology has been benchmarked with similar technologies already available and all product specifications have been benchmarked with appropriate standards.

TECHNOLOGY READINESS LEVEL ASSESSMENT

TRL 9

SCALE OF DEVELOPMENT

The technology has been demonstrated in field conditions and technology prototype has been tested in actual field conditions. All critical scaling issues addressed.

STATUS OF COMMERCIALIZATION

The final product based on the technology commercially available and started selling in the market.

TENTATIVE COST OF DEVELOPMENT

₹ 21.82 Lakhs

INDUSTRIAL PARTNERS

M/s P. S. Enterprise, Jorhat, Assam.

PLANT SET UP FOR FINAL PRODUCT

Yes, an automatic mini plant (capacity 5000 bricks per 8 hrs) for scale up set up.

4.4 CIVIL INFRASTRUCTURE AND ENGINEERING (CIE)

IPR STATUS DETAILS (PATENTS/COPYRIGHT/TRADEMARK SECURITY IN INDIA/ABROAD)

Not Available

POTENTIAL MARKET/TECHNO-ECONOMICS

Brick manufacturing companies, construction companies and other interested companies

ENVIRONMENTAL SAFETY CERTIFICATION

Yes

NODAL SCIENTIST DETAILS

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159. ECO-FRIENDLY GEOPOLYMER CONCRETE BLOCKS

UID: TECH-THEME_4_SERC-030

LABORATORY OF ORIGIN | CSIR-SERC, CHENNAI

EXECUTIVE SUMMARY

Ambient temperature cured concrete blocks using geo-polymer technology is developed. These blocks are of different types - building blocks, paver blocks, hollow blocks and lightweight blocks. This technology offers a speedy, cost-effective and environment-friendly alternative to conventional Portland cement based blocks. The production of GPC blocks lead to a scientific, systematic and eco-friendly utilization of industrial wastes.

KEYWORDS

Geopolymer, Ambient curing, Paver blocks, Eco-friendly blocks, Cement free blocks

SALIENT FEATURES

Not Available

APPLICATIONS

It can be extensively used in buildings, landscaping, in container yards, foot paths, parking lots etc.

TECHNOLOGY BENCHMARKING

The technology has been benchmarked with similar technologies already available and all product specifications have been benchmarked with appropriate standards.

TECHNOLOGY READINESS LEVEL ASSESSMENT

TRL 8

SCALE OF DEVELOPMENT

Pilot scale demonstration, prototype testing done in factory conditions. All the critical scaling issues addressed.

STATUS OF COMMERCIALIZATION

No

TENTATIVE COST OF DEVELOPMENT

₹ 4.50 Lakhs

INDUSTRIAL PARTNERS

- M/s Kiran Global Geocements Limited, Chennai.
- M/s KPS Bricks, Erode, Tamil Nadu.

PLANT SET UP FOR FINAL PRODUCT

Yes

IPR STATUS DETAILS (PATENTS/COPYRIGHT/TRADEMARK SECURITY IN INDIA/ABROAD)

Not Available

4.4 CIVIL INFRASTRUCTURE AND ENGINEERING (CIE)

POTENTIAL MARKET/TECHNO-ECONOMICS

Bricks and blocks are important units for construction of civil infrastructure. The production of Geopolymer concrete (GPC) blocks lead to a scientific, systematic and eco-friendly utilization of industrial wastes. The new eco-friendly blocks will lead to a drastic reduction in the carbon footprint, embodied energy. Due to faster rate of development of strength at early ages, faster rate of construction and overall saving in life cycle cost. GPC building block technology offers a speedier and cost effective environmentally sound alternative to conventional walling materials. It can be easily adapted to suit special needs of users by modifying design parameters and is a highly profitable business for micro and small scale building material producers and construction companies. The global geopolymer market is expected to register an impressive growth in the forthcoming years. The rising number of applications of geopolymer and the growing demand for geopolymer across diverse industries are the key factors expected to encourage the growth of the global polymer market in the next few years.

ENVIRONMENTAL SAFETY CERTIFICATION

No

NODAL SCIENTIST DETAILS

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160. COST EFFECTIVE DURABLE WATER TANKS USING FLOWABLE CEMENT MORTAR

UID: TECH-THEME_4_SERC-031

LABORATORY OF ORIGIN | CSIR-SERC, CHENNAI

EXECUTIVE SUMMARY

A novel technology to construct cost-effective, easy-to-build and durable water tanks for domestic needs. The tanks can be easily constructed with flowable cement mortar, without the need of skilled artisans. The tanks can also be built using thin precast concrete panels that do not require any lifting mechanism for placing on the roof.

KEYWORDS

Water Tank, Thin precast concrete panel

SALIENT FEATURES

Cost-effective compared to commercially available tanks, easy-to-build, durable and safe in storing water, weight of the tank is relatively less when compared to RCC and masonry tanks, viable alternate to plastic tanks, water tank can be constructed using thin precast concrete panels and can be assembled in 30 minutes.

APPLICATIONS

It can be used for storage of portable water in rural housing sector and in all urban residential applications.

TECHNOLOGY BENCHMARKING

The technology has been benchmarked with similar technologies already available and all product specifications have been benchmarked with appropriate standards.

TECHNOLOGY READINESS LEVEL ASSESSMENT

TRL 7

SCALE OF DEVELOPMENT

The technology has been demonstrated in field conditions and technology prototype has been tested in actual field conditions. All critical scaling issues addressed.

STATUS OF COMMERCIALIZATION

No

TENTATIVE COST OF DEVELOPMENT

₹ 7.50 Lakhs

INDUSTRIAL PARTNERS

M/s Lakshmi Srinivas Engineers, Hyderabad.

PLANT SET UP FOR FINAL PRODUCT

No

4.4 CIVIL INFRASTRUCTURE AND ENGINEERING (CIE)

IPR STATUS DETAILS (PATENTS/COPYRIGHT/TRADEMARK SECURITY IN INDIA/ABROAD)

Not Available

POTENTIAL MARKET/TECHNO-ECONOMICS

The technology is useful for storage of portable water in rural housing sector and also for all residential applications.

ENVIRONMENTAL SAFETY CERTIFICATION

No

NODAL SCIENTIST DETAILS

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161. TOILET UNIT USING THIN PRECAST CONCRETE SEGMENTAL PANELS

UID: TECH-THEME_4_SERC-032

LABORATORY OF ORIGIN | CSIR-SERC, CHENNAI

EXECUTIVE SUMMARY

A novel technology to construct cost effective, durable and ecologically safe toilets using thin precast concrete segmental panels. The panels can be joined one above the other with perfect bonding and through connecting rods. The septic tank can also be built using thin precast panels. Assembling of panels and erection of toilet can be completed in three hours' time without any special equipment. This technology is also suitable for mass production through industrialisation.

KEYWORDS

Thin concrete panel, Toilet, Precast

SALIENT FEATURES

Provide cost effective durable toilet units for rural sectors, thin precast concrete segmental panels are used, ease assembling of panels, durable, user-friendly and economical, sustainable construction using industrial wastes, feasible for all climatic conditions and in remote area, mass production is possible through industrialization.

APPLICATIONS

It can be used to set up cost effective toilets in rural and urban areas.

TECHNOLOGY BENCHMARKING

The technology has been benchmarked with similar technologies already available and all product specifications.

TECHNOLOGY READINESS LEVEL ASSESSMENT

TRL 7

SCALE OF DEVELOPMENT

The technology has been demonstrated in field conditions and technology prototype has been tested in actual field conditions. All critical scaling issues addressed.

STATUS OF COMMERCIALIZATION

No

TENTATIVE COST OF DEVELOPMENT

₹ 7.5 Lakhs

INDUSTRIAL PARTNERS

- M/s Lakshmi Srinivas Engineers, Hyderabad.
- M/s Fractal Enterprise, Vishakhapatnam.
- M/s Natural Waste Management Technologies Pvt. Ltd., Krishna (Dt.), A.P.

4.4 CIVIL INFRASTRUCTURE AND ENGINEERING (CIE)

PLANT SET UP FOR FINAL PRODUCT

No

IPR STATUS DETAILS (PATENTS/COPYRIGHT/TRADEMARK SECURITY IN INDIA/ABROAD)

Not Available

POTENTIAL MARKET/TECHNO-ECONOMICS

Construction Industry can make use of this technology for mass production of toilet core panels.

ENVIRONMENTAL SAFETY CERTIFICATION

No

NODAL SCIENTIST DETAILS

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162. TEXTILE REINFORCED CONCRETE PROTOTYPING TECHNOLOGY (TRCPT)

UID: TECH-THEME_4_SERC-033

LABORATORY OF ORIGIN | CSIR-SERC, CHENNAI

EXECUTIVE SUMMARY

Today's infrastructure construction practices predominantly revolve around mould-based and concrete prefabrication techniques. Though a proven approach, it is also associated with logistics and environment sustainability challenges. In this context, Textile Reinforced Concrete Prototyping Technology (TRCPT) brings in green and innovative construction practices that can be deployed to make products without using moulds. TRC consist of fine grained cementitious binder and non-metallic textile reinforcement. Using TRCPT, the mechanical properties of the product is realized in a rectangular textile reinforced concrete sheet, which is prototyped at a later stage of fabrication for producing a variety of structural components. Using this method, the point to point variability in properties can be better controlled irrespective of the complexity arising in various geometrical configurations. TRCPT replicates the multi-vitamin concept in the construction sector, by facilitating production of both structural and non-structural precast products.

KEYWORDS

Textile reinforced concrete, Liner, Panels, Glass textile

SALIENT FEATURES

Not Available

APPLICATIONS

It can be used in construction industry (roofing sheets, tiles, etc.), in temporary construction, permanent and temporary toilets, water ponds and thermal panels.

TECHNOLOGY BENCHMARKING

The technology has been benchmarked with similar technologies already available and all product specifications have been benchmarked with appropriate standards.

TECHNOLOGY READINESS LEVEL ASSESSMENT

TRL 7

SCALE OF DEVELOPMENT

The technology has been demonstrated in field conditions and technology prototype has been tested in actual field conditions. All critical scaling issues addressed.

STATUS OF COMMERCIALIZATION

No

TENTATIVE COST OF DEVELOPMENT

₹ 12 Lakhs

4.4 CIVIL INFRASTRUCTURE AND ENGINEERING (CIE)

INDUSTRIAL PARTNERS

- M/s Smart Build Prefab Limited, Hyderabad – for making Textile Reinforced Concrete (TRC) Toilet Units.
- M/s Sapphire Consultants, Thane – for making TRC liner for water ponds and industrial wastewater ponds.

PLANT SET UP FOR FINAL PRODUCT

No

IPR STATUS DETAILS (PATENTS/COPYRIGHT/TRADEMARK SECURITY IN INDIA/ABROAD)

Not Available

POTENTIAL MARKET/TECHNO-ECONOMICS

The products can find a host of applications in infrastructure engineering including stand- alone and in structural strengthening application.

- TRC panels has a huge market in various applications such as roofing sheets, tiles, partition walls, panel for temporary construction etc.
- Permanent and relocatable TRC toilets can be constructed in a fast track mode.
- TRC liners can be used in water conservation projects such as water pond lining, canal lining etc.
- In addition, industrial wastewater pond lining with TRC can enhance the durability in aggressive environments.
- TRC is ideal material for concrete and masonry strengthening.
- TRC panels can be used for providing thermal comfort in buildings.

ENVIRONMENTAL SAFETY CERTIFICATION

No

NODAL SCIENTIST DETAILS

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163. INNOVATIVE DISASTER RESISTANT LIGHTWEIGHT PREFABRICATED BUILDING SYSTEMS USING EPS PANELS

UID: TECH-THEME_4_SERC-034

LABORATORY OF ORIGIN | CSIR-SERC, CHENNAI

EXECUTIVE SUMMARY

The technology is pre-engineered precast lightweight large wall and roof panels for mass housing that will contribute immensely towards urban infrastructure development in India. The light weight panels have a sandwich construction with expanded polystyrene as core and self-compacting concrete skins. The performance of these light weight panels as well as G+1 building assembled using these panels were evaluated for flexural, axial and seismic actions. The technology can be used for mass housing and affordable buildings, for quality and speedy constructions, for constructions in earthquake prone areas, for light weight buildings in poor soil conditions and for all types of single and multi-storeyed buildings. With the Government initiatives like “Housing-for-all” and “Smart Cities”, the Indian construction industry needs rapid and economical methods of construction in order to meet the huge demand for housing in both rural and urban environments. With better quality at affordable levels and speedy execution, this know-how/technology can be customized to the needs and it allows for affordable, stronger and faster mode of construction of houses, which enables mass production of houses.

KEYWORDS

Light weight sandwich panel, Precast concrete, EPS panel, Large wall and Roof panels

SALIENT FEATURES

Not Available

APPLICATIONS

It can be used for mass housing and other construction in disaster prone areas.

TECHNOLOGY BENCHMARKING

The technology has been benchmarked with similar technologies already available and all product specifications.

TECHNOLOGY READINESS LEVEL ASSESSMENT

TRL 7

SCALE OF DEVELOPMENT

The technology has been demonstrated in field conditions and technology prototype has been tested in actual field conditions. All critical scaling issues addressed.

STATUS OF COMMERCIALIZATION

No

TENTATIVE COST OF DEVELOPMENT

₹ 10 Lakhs

4.4 CIVIL INFRASTRUCTURE AND ENGINEERING (CIE)

INDUSTRIAL PARTNERS

- M/s Synergy Thrislington, Mohali.
- M/s Consortium Transmission Systems Private Limited (CTSPL), Hyderabad.
- M/s Level 9 Biz Pvt. Ltd., Punjab.

PLANT SET UP FOR FINAL PRODUCT

No

IPR STATUS DETAILS (PATENTS/COPYRIGHT/TRADEMARK SECURITY IN INDIA/ABROAD)

Not Available

POTENTIAL MARKET/TECHNO-ECONOMICS

The technology can be used for mass housing and affordable buildings, for quality and speedy constructions, for constructions in earthquake prone areas, for light weight buildings in poor soil conditions and for all types of single and multi-storeyed buildings. With the Government initiatives like “Housing-for-all” and “Smart Cities”, the Indian construction industry needs rapid and economical methods of construction in order to meet the huge demand for housing in both rural and urban environments. With better quality at affordable levels and speedy execution, this know-how/technology can be customized to the needs and it allows for affordable, stronger and faster mode of construction of houses, which enables mass production of houses.

ENVIRONMENTAL SAFETY CERTIFICATION

No

NODAL SCIENTIST DETAILS

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Chapter-4 4.5 Ecology, Environment, Earth and Ocean Sciences and Water (E3OW)

Introduction

A total of 45 technologies were evaluated and selected among the 13 CSIR labs under the theme of Ecology, Environment, Earth and Ocean Sciences and Water (E3OW). The labs at TRL level 6 are CSIR-CSIO, CSIR-IICT, CSIR-NCL, CSIR-NEIST, and CSIR-NIIST majority of which are working on technologies related to environmental remediation such as Compact Membrane Unit for Fluoride Removal from groundwater, Nanofiltration (NF) process for separation of corrosive chloride ions from steel industrial wastewater, and Process for development of weather resistant coir geotextile etc. The labs at TRL level 7 are CSIR-AMPRI, CSIR-CGCRI, CSIR-CSIO, CSIR-NCL, CSIR-NIIST, CSIR-NPL, CSIR-NIO. Similarly, at level 8 and level 9 are the labs CSIR-CSIO, CSIR-NEERI, CSIR-NIIST, CSIR-NIO and CSIR-CCMB, CSIR-IICT, CSIR-NCL, CSIR-NEERI, CSIR-NIIST, CSIR-NIO, and CSIR-NPL respectively.

From the Below Figure 1, it is evident that CSIR-NPL, CSIR-IICT, CSIR-NCL, CSIR-NIIST, and CSIR-NEERI are the major players in terms of % share, number of technologies, and technology readiness level.

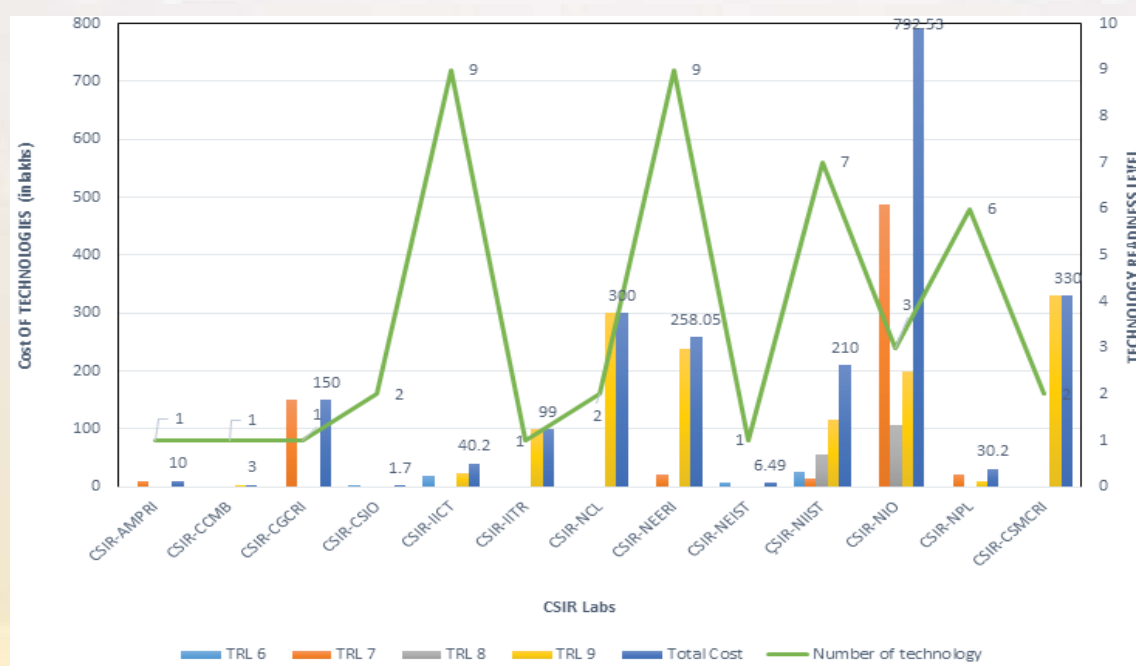


Figure 1. Comprehensive overview of Lab wise technologies in terms of technologies

Assessment of Technology readiness Level

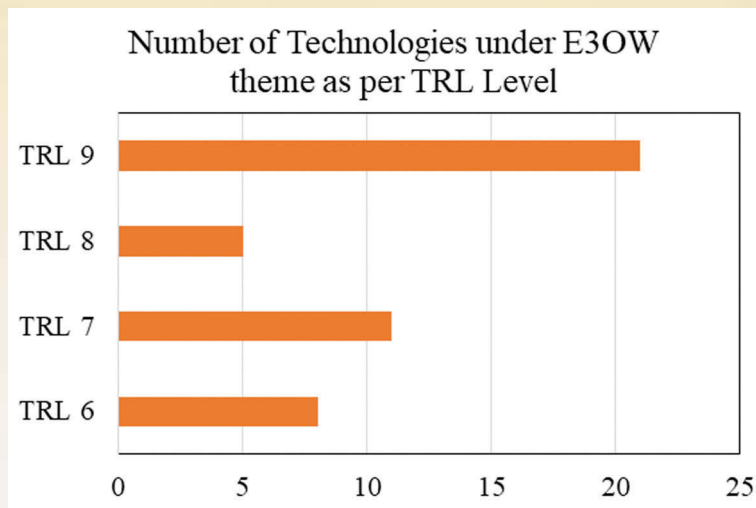


Figure 2. Number of Technologies under E3OW theme as per TRL Level

Major highlights

Water purification technologies: Several water purification technologies keeping in view contamination problem has been developed by CSIR labs. It is better to use terminology water contamination removal technologies instead to make it Universal water purification technology.

Expert appreciate most of the technologies and see great potential, however they emphasized their wider dissemination to industry on different geographical location. They also mentioned it has been noticed especially in case of water purification system.

164. NANO ALUMINA ADSORBENT BASED WATER FILTERED FOR ARSENIC AND FLUORIDE REMOVAL

UID: TECH-THEME_5_AMPRI-001

LABORATORY OF ORIGIN | CSIR-AMPRI, BHOPAL

EXECUTIVE SUMMARY

Long term drinking of water containing excessive fluoride (>1.5 mg/l) cause fluorosis problems to human being that affects teeth, bones, joints and ultimately leads to crippling of the body. Similarly drinking of excessive, arsenic (>10 $\mu\text{g/l}$) contaminated water causes Arsenicosis problem that affect skin and ultimately leads cancerous problem. Due to contamination of ground water more than seventy million people in nineteen states in India are suffering from fluorosis problem. Similarly, more than twenty million people in seven states in India are suffering from the Arsenicosis problem. Though numbers of technologies are developed for the arsenic and fluoride removal of water but none of found suitable for providing safe drinking water particularly at household level. Present developed technology is easily understandable, cost effective and easy for operation. The developed filter works under gravity. So, no electricity require for the treatment of water. The filtration rate of the water depends on the height of overhead tank from where water comes in to the filter. pH range 6.5-8.5 and total dissolved solid within 500 mg/l of raw water is more suitable for obtaining maximum arsenic or fluoride removal efficiency of the developed filter. The developed filter can also remove toxic contaminants like chromium, lead etc. of the contaminated water. Nano adsorbent used in filter for arsenic or fluoride removal, is of low cost and can be synthesized in bulk without any waste generation. There are no mineral losses as total dissolved solid of the treated water is almost same after treatment. Treated water follows the drinking water standard as per BIS.

KEYWORDS

Nanomaterial, Fluoride, Arsenic, Adsorption, Surface area



SALIENT FEATURES

Nano adsorbent used in filter for arsenic or fluoride removal, is of low cost and can be synthesized in bulk without any waste generation. There are no mineral losses as total dissolved solid of the treated water is almost same after treatment. Treated water follows the drinking water standard as per BIS.

APPLICATIONS

Nano adsorbent used in filter for arsenic or fluoride removal, is of low cost and can be synthesized in bulk without any waste generation. There are no mineral losses as total dissolved Solid of the treated water is almost same after treatment. Treated water follows the drinking water standard as per BIS

TECHNOLOGY BENCHMARKING

Yes

TECHNOLOGY READINESS LEVEL ASSESSMENT

TRL assessment is 6

SCALE OF DEVELOPMENT

pH range 6.5-8.5 and total dissolved solid within 500 mg/l of raw water is more suitable for obtaining maximum arsenic or fluoride removal efficiency of the developed filter. The developed technology demonstrated to the intended end user satisfactorily. The developed device was installed in the real affected areas for fluoride, it was installed in the Ashta District of Madhya Pradesh, and for arsenic the filter was installed and tested in the Karkatpur Village of the Gorakhpur district. The device worked well as observed in the lab.

STATUS OF COMMERCIALIZATION

- MWS Social Enterprises Pvt. Ltd. Indore, M.P., India.
- Marcus Projects Pvt. Ltd., Lucknow, U.P., India.

TENTATIVE COST OF DEVELOPMENT

₹ 10 Lakhs

INDUSTRIAL PARTNERS

- MWS Social Enterprises Pvt. Ltd. Indore, M.P., India.
- Marcus Projects Pvt. Ltd., Lucknow, U.P., India.

PLANT SET UP FOR FINAL PRODUCT

The developed device was installed in the real affected areas for fluoride, it was installed in the Ashta District of Madhya Pradesh, and for arsenic the filter was installed and tested in the Karkatpur Village of the Gorakhpur district. The device worked well as observed in the lab.

IPR STATUS DETAILS (PATENTS/COPYRIGHT/TRADEMARK SECURITY IN INDIA/ABROAD)

No

POTENTIAL MARKET/TECHNO-ECONOMICS

The technology has huge potential market for the industries working in the water treatment area. Particularly in the current scenario, where reverse osmosis based membranes are suffering adverse effect of wastage of lots of water, industries are looking for the adsorbent based technologies.

ENVIRONMENTAL SAFETY CERTIFICATION

The safety aspects including environmental safety addressed and documented.

NODAL SCIENTIST DETAILS

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165. UNIVERSAL PRIMER TECHNOLOGY FOR IDENTIFICATION OF ANIMAL SPECIES

UID: TECH-THEME_5_CCMB-002

LABORATORY OF ORIGIN | CSIR-CCMB, HYDERABAD

EXECUTIVE SUMMARY

This was the technology that was invented by CSIR-CCMB in the year 2000. The first patent was filed in March 2001. Till date, it is the only approach which is still being used to provide species identification service to the nation even after 20 years, there is no alternative to it. The technique is accepted world-wide and also by legal justice system in India.

KEYWORDS

DNA barcoding, Species identification, Wildlife forensics



SALIENT FEATURES

Till date, it is the only approach which is still being used to provide species identification service to the nation even after 20 years, there is no alternative to it.

APPLICATIONS

The technique is accepted world-wide and also by legal justice system in India.

TECHNOLOGY BENCHMARKING

Similar technologies not available in this segment. The novel primer sequences designed in this invention offer a unique proposition to this technology.

TECHNOLOGY READINESS LEVEL ASSESSMENT

TRL assessment is 9

SCALE OF DEVELOPMENT

UPT is extensively used for offering Species identification in wildlife forensics and Judiciary.

STATUS OF COMMERCIALIZATION

The technique is accepted world-wide and also by legal justice system in India.

TENTATIVE COST OF DEVELOPMENT

₹ 3 Lakhs

INDUSTRIAL PARTNERS

Innobate Technologies, New Delhi.

4.5 ECOLOGY, ENVIRONMENT, EARTH AND OCEAN SCIENCES AND WATER (E3OW)**PLANT SET UP FOR FINAL PRODUCT**

Not Available

IPR STATUS DETAILS (PATENTS/COPYRIGHT/TRADEMARK SECURITY IN INDIA/ABROAD)

Yes, WO2002077278A1 under PCT, 2003/7489, 1373558.

POTENTIAL MARKET/TECHNO-ECONOMICS

Technology is routinely being used to provide wildlife forensics services to the Nation, especially in the cases pertaining to wildlife crime. This technology is being used extensively by Forest departments & Judiciary.

NODAL SCIENTIST DETAILS

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Inventor

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166. WATER PURIFICATION THROUGH CERAMIC FILTERS

UID: TECH-THEME_5_CGCRI-003

LABORATORY OF ORIGIN | CSIR-CGCRI, KOLKATA

EXECUTIVE SUMMARY

CSIR-CGCRI has developed and offers ceramic membranes modules technology which can be used to replace the sand filter and disposable cartridge filters for feed pretreatment of brackish water, ground and sea water. These are useful for removal of arsenic (including the process for media preparation) and Iron from ground water. Ceramic membrane based high capacity modules can be used for pre-treatment of turbid water for polishing of iron and arsenic contaminated water using micro filtration technique; and pre-treatment of river water for turbidity and suspended particulate removal. The process technology has been transferred to M/s Entech Metals Pvt. Ltd., Kolkata to manufacture Arsenic and Iron Removal Plants of 500-20,000 LPD capacity. Eleven entrepreneurs purchased the plants and set up industries under SSI sector with self/bank financing for regular production of bottled (5 & 20 liter) drinking water.

KEYWORDS

Ceramic membrane, Water purification, Arsenic

SALIENT FEATURES

These are useful for removal of arsenic (including the process for media preparation) and Iron from ground water. Ceramic membrane based high capacity modules can be used for pre-treatment of turbid water for polishing of iron and arsenic contaminated water using micro filtration technique; and pre-treatment of river water for turbidity and suspended particulate removal.

APPLICATIONS

The technique is accepted world-wide and also by legal justice system in India.

TECHNOLOGY BENCHMARKING

Yes

TECHNOLOGY READINESS LEVEL ASSESSMENT

TRL assessment is 7

SCALE OF DEVELOPMENT

Manufacture Arsenic and Iron Removal Plants of 500-20,000 LPD capacity. Eleven entrepreneurs purchased the plants and set up industries under SSI sector with self/bank financing for regular production of bottled (5 & 20 liter) drinking water.

STATUS OF COMMERCIALIZATION

Commercialized

TENTATIVE COST OF DEVELOPMENT

₹ 150 Lakhs

4.5 ECOLOGY, ENVIRONMENT, EARTH AND OCEAN SCIENCES AND WATER (E3OW)

INDUSTRIAL PARTNERS

Technology has been transferred to M/s Entech Metals Pvt. Ltd., Kolkata.

PLANT SET UP FOR FINAL PRODUCT

Yes

IPR STATUS DETAILS (PATENTS/COPYRIGHT/TRADEMARK SECURITY IN INDIA/ABROAD)

No

POTENTIAL MARKET/TECHNO-ECONOMICS

Societal benefit, Industrial affluent treatment.

ENVIRONMENTAL SAFETY CERTIFICATION

The environment safety aspects addressed and documented.

NODAL SCIENTIST DETAILS

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167. PROCESS TECHNOLOGY FOR SEPARATION OF PHOSPHOR MATERIAL FROM CFL WASTE/ RECYCLING OF WASTE CFLS AND TUBELIGHTS

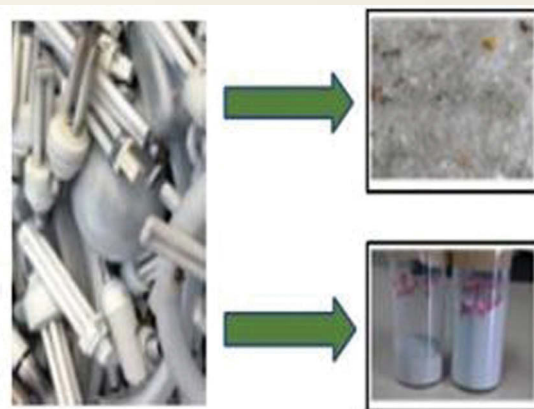
UID: TECH-THEME_5_CSIO-005

LABORATORY OF ORIGIN | CSIR-CSIO, CHANDIGARH

EXECUTIVE SUMMARY

Compact Fluorescent Lamps (CFLs) and Tube Lights are still widely used for domestic as well as outdoor lighting. After their life span, the CFLs and Tube lightswaste needs to be appropriately addressed. CFLs, like all fluore scent lamps, contain mercury as a vapor. Therefore, it is very important to develop suitable closed loop technologies to address complete recycling of CFL and Tube Light wastes. The present process, after safely breaking the waste in a bulb-eater, allows convenient separation of waste in to phosphor and glass products. Unlike other acid treatment-based technologies, the present process involves safer and more environmentally friendly steps.

Recovered products can be mixed with virgin material or used as such for different applications. Thus, overall burden of producing fresh phosphor and glass can be minimized. Hence, the technology offer both economic and environmental benefits.



KEYWORDS

E-waste, Waste tube lights, Waste CFLs, Recycling, Glass, Phosphor, Recovery

SALIENT FEATURES

Unlike other acid treatment-based technologies, the present process involves safer and more environmentally friendly steps. Recovered products can be mixed with virgin material or used as such for different applications. Thus, overall burden of producing fresh phosphor and glass can be minimized. Hence, the technology offers both economic and environmental benefits.

APPLICATIONS

Recovered products can be mixed with virgin material or used as such for different applications. Thus, overall burden of producing fresh phosphor and glass can be minimized. Hence, the technology offer both economic and environmental benefits.

TECHNOLOGY BENCHMARKING

Yes

TECHNOLOGY READINESS LEVEL ASSESSMENT

TRL assessment is 6

SCALE OF DEVELOPMENT

All the performance parameters are optimized and engineered prototype was transferred to industry.

STATUS OF COMMERCIALIZATION

Transfer to one industry

TENTATIVE COST OF DEVELOPMENT

₹ 0.5 Lakhs

INDUSTRIAL PARTNERS

M/s Cloud Tech Pvt. Ltd. Yamuna Nagar, Haryana.

PLANT SET UP FOR FINAL PRODUCT

No

IPR STATUS DETAILS (PATENTS/COPYRIGHT/TRADEMARK SECURITY IN INDIA/ABROAD)

No

POTENTIAL MARKET/TECHNO-ECONOMICS

Recyclers, Environmental agencies, Government institutes.

ENVIRONMENTAL SAFETY CERTIFICATION

In process with the firm, Certification will be taken by the industry for this particular product. (Not taken yet).

NODAL SCIENTIST DETAILS

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168. ELECTROSTATIC DUST MITIGATION AND SMOG CONTROL DEVICE

UID: TECH-THEME_5_CSIO-006

LABORATORY OF ORIGIN | CSIR-CSIO, CHANDIGARH

EXECUTIVE SUMMARY

Dust is a pervasive problem in handling bulk materials such as coal, cement, construction, demolition of buildings, thermal power plants etc. interfering with all aspects of operation. Dust suppression systems help to control the dust while improving efficiency. Electrostatic dust mitigation device is highly useful in suppressing the dust particles entrained in the air and protect the environment in an efficient way. It produces uniform and fine spray particles that are nearly equal in proportion of dust size particles. The present invention and utility model discloses a multipurpose air-induced air-assisted high-range electrostatic spraying system based on induction charging principle for dust mitigation and environment protection. An induction charging based high-range electrostatic spraying system has been designed and developed at CSIR-CSIO, Chandigarh.



KEYWORDS

Aerodynamics, Charged particulate matter, Naturally occurring ions, Charge neutralization

SALIENT FEATURES

The present invention and utility model discloses a multipurpose air-induced air-assisted high-range electrostatic spraying system based on induction charging principle for dust mitigation and environment protection. An induction charging based high-range electrostatic spraying system has been designed and developed at CSIR- CSIO, Chandigarh.

APPLICATIONS

Dust mitigation and environment protection

TECHNOLOGY BENCHMARKING

Yes

TECHNOLOGY READINESS LEVEL ASSESSMENT

TRL assessment is 6

SCALE OF DEVELOPMENT

All the performance parameters are optimized and engineered prototype was transferred to industry.

STATUS OF COMMERCIALIZATION

Transfer to one industry M/s Cloud Tech Pvt. Ltd., Yamuna Nagar, Haryana.

TENTATIVE COST OF DEVELOPMENT

₹ 1.2-1.5 Lakhs

INDUSTRIAL PARTNERS

No

PLANT SET UP FOR FINAL PRODUCT

Yes

IPR STATUS DETAILS (PATENTS/COPYRIGHT/TRADEMARK SECURITY IN INDIA/ABROAD)**POTENTIAL MARKET/TECHNO-ECONOMICS**

Real state, Coal mines, Thermal power plants, Cement enterprises, Pollution control board.

ENVIRONMENTAL SAFETY CERTIFICATION

Certificate on environment safety is under process.

NODAL SCIENTIST DETAILS

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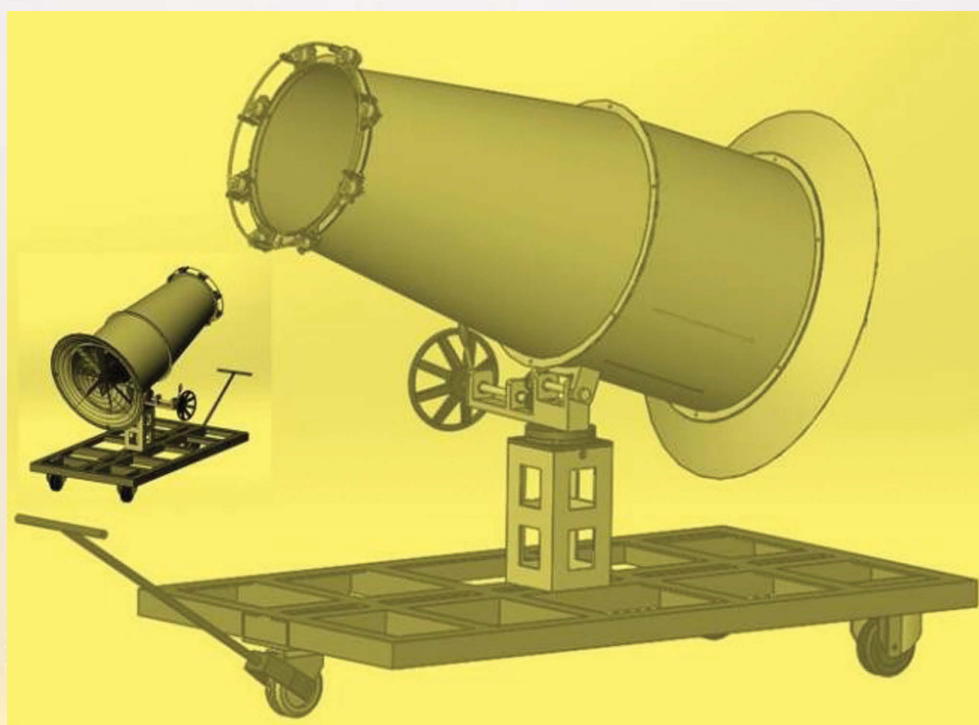
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169. ANAEROBIC GAS LIFT REACTOR (AGR): A HIGH RATE BIOMETHANATION TECHNOLOGY TO TREAT ORGANIC SOLID WASTE FOR THE GENERATION OF BIOGAS AND BIO MANURE

UID: TECH-THEME_5_IICT-007

LABORATORY OF ORIGIN | CSIR-IICT, HYDERABAD

EXECUTIVE SUMMARY

Treatment of organic solid waste for the generation of biogas and bio manure; Scale operation: 500 kg to 10 tons per day; Low Hydraulic Residence Time (HRT); High Volatile Solids Loading Rate (VSLR); High methane yield; End to end solution for solid waste management; Incorporated with best features of high rate anaerobic digester.; Could be designed for the treatment of 500 kg to 10 tons of organic solid waste per day; Encompasses novel pre- and post-processing mechanisms. Advanced digester design: higher biogas production, nutrient rich organic fertilizer generation, low foot print area, semi-automatic plant operation.

KEYWORDS

Anaerobic Gas lift Reactor, Biomethanation technology, Organic solid waste

SALIENT FEATURES

Encompasses novel pre- and post-processing mechanisms. Advanced digester design: higher biogas production, nutrient rich organic fertilizer generation, low foot print area, semi- automatic plant operation, Low Hydraulic Residence Time (HRT), High Volatile Solids Loading Rate (VSLR), High methane yield, End to end solution for solid waste management.

APPLICATIONS

Advanced digester design: higher biogas production, nutrient rich organic fertilizer generation, low foot print area, semi-automatic plant operation. Treatment of organic solid waste for the generation of biogas and bio manure. Scale operation: 500 kg to 10 tons per day.

TECHNOLOGY BENCHMARKING

The technology is benchmarked with similar technologies.

TECHNOLOGY READINESS LEVEL ASSESSMENT

TRL assessment is 9

SCALE OF DEVELOPMENT

Technology is currently at commercial scale. Four full scale plants based on this technology are working at Toofran for poultry litter; Bellary, Hubli in Karnataka and Ahmadabad in Gujarat for food waste in India for the generation of biogas and bio manure.

STATUS OF COMMERCIALIZATION

Technology is currently at commercial scale.

TENTATIVE COST OF DEVELOPMENT

INR 15 lakhs for 250 kg capacity per day, INR 40 lakhs for 1 TPD capacity and INR 300 lakhs for 10 TPD capacity.

INDUSTRIAL PARTNERS

No

TECHNOLOGY IS LICENSED

M/s Ahuja Engineering Services Private Limited (AESPL), Secunderabad. M/s AESPL executes projects on turnkey basis under the technical guidance of CSIR-IICT.

IPR STATUS DETAILS (PATENTS/COPYRIGHT/TRADEMARK SECURITY IN INDIA/ABROAD)
(Indian Patent No.307102).

PLANT SET UP FOR FINAL PRODUCT

Plants with the capacity of 1 ton per day and below: 22

Plants with the capacity of above 1 ton per day but below 10 ton per day: 4

Plants based on Substrates

- Food Waste: 15
- Market and vegetable waste: 7
- Poultry litter: 2
- Organic fraction of MSW and leachate: 1
- Mulberry waste: 1

Plants with biogas generation capacity <100 ncum/day: 15

Plants with biogas generation capacity 100-1000: 10

Plants with biogas generation capacity >1000 ncum/day): 1

POTENTIAL MARKET/TECHNO-ECONOMICS

Quantity of food waste: 1 ton/day; Biogas generation: 150 m³/day; Bio-manure generation: 150 kg/day; Land area requirement for the plant: 1200 m²; Manpower requirement (semi-skilled): 2 people; Biogas can be pipelined and used directly for cooking; For combined heat and power-part of biogas can be used for cooking and remaining can be used towards power; 150 m³ of Biogas can replace 3 LPG commercial cylinders (19 Kg each) @ INR 1800; Revenue/day: (3 cylinders × INR1800) = INR 5400/day; Revenue/day from Bio-Fertilizer: 150 Kg × INR 1.5 = INR 75/day; Total Revenue per day: INR 5400 + INR 75 = INR 5475 per day; Total Revenue per annum (considering 300 working days): INR 16,42,500 per annum; Total operating cost: INR 2,42,500 per annum; Net Revenue: INR 14,00,000 per annum; Capital cost: INR 40,00,000; Pay back of capital investment: about 3 years; Distributive biogas plants installed at or close to waste generation source with captive energy consumption will provide plant sustainability, easier scale-up, more scope for multiplication, generate employment.

ENVIRONMENTAL SAFETY CERTIFICATION

Yes

NODAL SCIENTIST DETAILS

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170. RENEWABLE BIOHYDROGEN (H₂) AND PLATFORM CHEMICAL FROM BIOGENIC (SOLID /LIQUID) WASTE

UID: TECH-THEME_5_IICT-008

LABORATORY OF ORIGIN | CSIR-IICT, HYDERABAD

EXECUTIVE SUMMARY

- Produce hydrogen and fatty acids from waste/wastewater apart from waste remediation.
- A standalone process for hydrogen production or as a unit operation in ETPs.
- Hydrogen can be used automobile (fuel), chemical industry and oil refining process.
- By-product can be used as platform chemicals after separation or as feedstock for production secondary bio-based products.
- Can be embedded with existing waste remediation units/ETPs.
- Sustainable and renewable technology.
- Simultaneous remediation with resource recovery.
- Support bio refinery, circular bio economy and hydrogen economy.



KEYWORDS

Renewable biohydrogen, Biogenic waste, Waste remediation.

SALIENT FEATURES

- Produce hydrogen and fatty acids from waste/wastewater apart from waste remediation.
- Standalone process for biohydrogen production or as an unit operation in ETPs.
- Can be embedded with existing ETPs in industry for captive production.
- Focal technology for production of Biobased products from waste.
- Simultaneous remediation with resource recovery.
- Sustainable and renewable technology.
- Supports circular bioeconomy and can efficiently embedded with waste biorefinery platform.
- Ideal for SMES, MMES, Ventura Capitals, etc.

APPLICATIONS

- Support bio refinery, circular bio economy and hydrogen economy.
- Technology is intended to produce Biohydrogen from waste/wastewater through acidogenic fermentation apart from its remediation that can be used in.
- Energy carrier for automobile sector.

4.5 ECOLOGY, ENVIRONMENT, EARTH AND OCEAN SCIENCES AND WATER (E3OW)

- Raw material and process ingredients in various industries viz., chemical, pharmaceutical, petroleum, fertilizer, food, etc.
- Supplemented as additive in CNG to increase the efficiency.

TECHNOLOGY BENCHMARKING

Yes

TECHNOLOGY READINESS LEVEL ASSESSMENT

TRL assessment is 7

SCALE OF DEVELOPMENT

The prototype developed and demonstrated successfully to the intended end user and address all critical scaling issues.

STATUS OF COMMERCIALIZATION

Not yet

TENTATIVE COST OF DEVELOPMENT

Process design to required scale.

INDUSTRIAL PARTNERS

Not yet

PLANT SET UP FOR FINAL PRODUCT

No

IPR STATUS DETAILS (PATENTS/COPYRIGHT/TRADEMARK SECURITY IN INDIA/ABROAD)

No

POTENTIAL MARKET/TECHNO-ECONOMICS

The process is technically feasible, commercially viable and environmentally sustainable.

ENVIRONMENTAL SAFETY CERTIFICATION

No

NODAL SCIENTIST DETAILS

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171. RAPID AND GREEN COMPOSTER

UID: TECH-THEME_5_IICT-009

LABORATORY OF ORIGIN | CSIR-IICT, HYDERABAD

EXECUTIVE SUMMARY

ALSO KNOWN AS ACCELERATED ANAEROBIC COMPOSTING TECHNOLOGY (AAC)

- Can be used to rapidly compost solid waste viz., kitchen/domestic waste, vegetable waste, organic fraction of municipal waste, agricultural biomass, garden waste, wood waste, etc.
- The compost can be used as soil conditioner, and augment beneficial organisms to the soil. Compost offers a natural alternative to chemical fertilizers and promotes organic farming.
- Reduces landfill waste.
- Recycles kitchen and yard waste.
- Rapid composting and high Productivity.
- Domestic household waste.
- Customized design based on nature and quantity of waste (household to commercial).
- Solar energy for heating (~60°C).
- Natural Mixing.
- Design synthetic consortia.
- Enrichment of the soil.
- Organic Healthy Yields and Environmental Well Being.

KEYWORDS

Composter, Rapid composting, Domestic waste

SALIENT FEATURES

Customized design based on nature and quantity of waste (household to commercial). Can be used to rapidly compost solid waste viz., kitchen/domestic waste, vegetable waste, organic fraction of municipal waste, agricultural biomass, garden waste, wood waste, etc.

APPLICATIONS

Customized design based on nature and quantity of waste (household to commercial).

TECHNOLOGY BENCHMARKING

Yes

TECHNOLOGY READINESS LEVEL ASSESSMENT

TRL assessment is 6

SCALE OF DEVELOPMENT

The technology has demonstrated successfully to the intended end user.

STATUS OF COMMERCIALIZATION

No

4.5 ECOLOGY, ENVIRONMENT, EARTH AND OCEAN SCIENCES AND WATER (E3OW)**TENTATIVE COST OF DEVELOPMENT**

Rapid Green Composter for urban and rural application.

INDUSTRIAL PARTNERS

No

PLANT SET UP FOR FINAL PRODUCT

No

IPR STATUS DETAILS (PATENTS/COPYRIGHT/TRADEMARK SECURITY IN INDIA/ABROAD)

No

POTENTIAL MARKET/TECHNO-ECONOMICS

Rapidity of the composting especially using the solar energy will improve the cost effectiveness of the composter.

ENVIRONMENTAL SAFETY CERTIFICATION

No

NODAL SCIENTIST DETAILS

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172. COMPACT AND LOW COST VERTICAL MODULAR RO/NF/UF SYSTEMS FOR DEFLUORIDATION OF GROUND WATER AND PURIFICATION OF SURFACE WATER

UID: TECH-THEME_5_IICT-010

LABORATORY OF ORIGIN | CSIR-IICT, HYDERABAD

EXECUTIVE SUMMARY

The cost-effective moderate capacity RO/NF/UF plant is useful for the treatment of water containing high TDS, fluoride, suspended solids, hardness, turbidity and disease-causing microbes in a single step.

- The plant is very useful in the small hamlets and fluoride affected remote places.
- Highly compact, moderate systems of 100 to 1000 L/h capacity.
- The unit is flexible and is inter convertible from reverse osmosis to nanofiltration membrane system.
- Easy to use, robust and requires very less maintenance and portable in nature.
- Longer membrane life and lower fouling by impurities.
- Greater water recovery (80%) with low rejects volume. The reject water can be reused for washing water, laundry and other purposes.
- This plant removes all impurities in a single step including excess Total Dissolved Solids (TDS), fluoride, salinity, hardness, turbidity, and microbial content.
- Retention of sufficient mineral content, Ca, Mg, P, Na, K essential for human consumption and health.
- The operating cost in these plants is about Paise 3-5 per L of purified water generated.
- The vertical modular assembly requires smaller footprint for installation and is easier transport.
- The design also has a feasibility to incorporate more than one membrane modules where in a single feed pump is sufficient to build the required feed pressure.
- The UV lamp incorporated disinfects the permeate water making the product water safe for human consumption.
- The taste of the water is enhanced by post treatment using granulated activated carbon filter whereas the provision made for TDS controller in permeate line remineralize the water by providing sufficient minerals.
- Provides purified water for small habitats of 10 to 20 hamlets such as schools, colleges and hospitals



Figure Indigenous RO/NF systems developed by CSIR-IICT for defluoridation of ground water and surface water purification. Source: S. Sridhar et al. (ed.) Membrane Processes, (1- 36) © 2019 Scrivener Publishing LLC



KEYWORDS

Reverse osmosis, Nanofiltration, Ultrafiltration, Water purification, Ground and Surface water

SALIENT FEATURES

- The operating cost in these plants is about Paise 3-5 per L of purified water generated.
- The vertical modular assembly requires smaller footprint for installation and is easier transport.
- This plant removes all impurities in a single step including excess Total Dissolved Solids (TDS), salinity, hardness, turbidity, heavy metals and microbial content.
- Greater water recovery (80%) with low rejects volume. The reject water can be reused for washing water, laundry and other purposes.
- Retention of sufficient mineral content, Ca, Mg, P, Na, K essential for human consumption and health. Longer membrane life and lower fouling by impurities.
- The design also has a feasibility to incorporate more than one membrane modules where in a single feed pump is sufficient to build the required feed pressure.

APPLICATIONS

The cost-effective moderate capacity RO/NF/UF plant is useful for the treatment of water containing high TDS, fluoride, suspended solids, hardness, turbidity and disease-causing microbes in a single step.

TECHNOLOGY BENCHMARKING

Yes

TECHNOLOGY READINESS LEVEL ASSESSMENT

TRL assessment is 7

SCALE OF DEVELOPMENT

Highly compact, moderate systems of 100 to 1000 L/h capacity.

STATUS OF COMMERCIALIZATION

Technology has been transferred to industry.

TENTATIVE COST OF DEVELOPMENT

₹ 5 Lakhs +GST

INDUSTRIAL PARTNERS

1. PMPL, Vadodara and Delta Ion Exchange, Hyderabad.
2. Non-commercial venture in Gandhi Hospital, Hyderabad Village, LIC premises Villages, in Telangana, Andhra Pradesh, Karnataka and Tamil Nadu and Free Water camps on Airport Road and Hyderabad Industrial Exhibition etc.

PLANT SET UP FOR FINAL PRODUCT:

Yes

IPR STATUS DETAILS (PATENTS/COPYRIGHT/TRADEMARK SECURITY IN INDIA/ABROAD)

No

POTENTIAL MARKET/TECHNO-ECONOMICS

Technically and economically viable. Techno Economic Comparison of the proposed CSIR- IICT Compact defluoridation membrane unit with market technologies.

ENVIRONMENTAL SAFETY CERTIFICATION

Yes

NODAL SCIENTIST DETAILS

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173. ATMOSPHERIC WATER GENERATOR (AWG) WITH REMINERALIZATION

UID: TECH-THEME_5_IICT-011

LABORATORY OF ORIGIN | CSIR-IICT, HYDERABAD

EXECUTIVE SUMMARY

- The device takes advantage of relative humidity ($RH > 25\%$) and temperature ($20\text{ }^{\circ}\text{C}$) to produce drinking water for remote villages, coastal regions, border areas.
- Developed a novel remineralisation technology using an automated system for dosing a proprietary salt mixture.
- Post treatment by novel indigenous.
- high flux polyether sulfone-based ultrafiltration membrane and ozonation/UV light produces clarified and disinfected water.
- Technology on water purification and remineralization has been transferred to Incubate Maithri Aquatech Pvt. Ltd., Hyderabad.
- Cost per Liter of potable water is ₹ 3.5/- which may reduce to ₹ 1.5/- using solar power.
- Design of Solar powered AWG unit reduces cost per liter production of potable water.



Atmospheric Water Generator Unit
(1000 LPD)

KEYWORDS

Condensation, AWG, Ultrafiltration, Disinfection, Water from air

SALIENT FEATURES

- Atmospheric Water Generator (AWG) is a clean and eco-friendly technology that uses heat exchange for condensing moisture from atmosphere.
- Technically and economically viable.

APPLICATIONS

- Technology on water purification and remineralization has been transferred to Incubate Maithri Aquatech Pvt. Ltd., Hyderabad.
- Cost per Liter of potable water is ₹ 3.5/- which may reduce to ₹ 1.5/- using solar power.
- Design of Solar powered AWG unit reduces cost per liter production of potable water.

TECHNOLOGY BENCHMARKING

Yes

TECHNOLOGY READINESS LEVEL ASSESSMENT

TRL assessment is 9

4.5 ECOLOGY, ENVIRONMENT, EARTH AND OCEAN SCIENCES AND WATER (E3OW)**SCALE OF DEVELOPMENT**

Cost of one 1000 LPD unit ₹ 10 Lakhs +GST (installation in collaboration with Maithri Aquatech).

STATUS OF COMMERCIALIZATION

Final System is already on railway station including Secunderabad.

INDUSTRIAL PARTNERS

Technology has been exclusively transferred to Maithri Aquatech Pvt. Ltd., Hyderabad.

PLANT SET UP FOR FINAL PRODUCT

Yes

IPR STATUS DETAILS (PATENTS/COPYRIGHT/TRADEMARK SECURITY IN INDIA/ABROAD)

No

POTENTIAL MARKET/TECHNO-ECONOMICS

Technically and economically viable. Technology has been exclusively transferred to Maithri Aquatech Pvt. Ltd., Hyderabad.

ENVIRONMENTAL SAFETY CERTIFICATION

Yes

NODAL SCIENTIST DETAILS

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174. TECHNOLOGY PACKAGE FOR PRODUCTION OF PACKAGED DRINKING WATER FACILITY

UID: TECH-THEME_5_IICT-012

LABORATORY OF ORIGIN | CSIR-IICT, HYDERABAD

EXECUTIVE SUMMARY

Innovative low-cost technology for conversion of commercial reverse osmosis membranes into nanofiltration membrane using a proprietary reagent.

- The system removes all impurities in a single step including excess total dissolved solids, salinity, hardness, turbidity, heavy metals & pathogens.
- The membrane allows passage of 80 to 120 ppm of TDS comprised of Ca, Mg, P, Na, K and other minerals essential for human health.
- The highly compact skid mounted Nano filtration system costs ₹ 3.5 Lakhs with water recovery of 70% in comparison to 40-50% wastage in conventional RO systems.

KEYWORDS

Reverse osmosis, Water, Nanofiltration, Reminero, TDS

SALIENT FEATURES

Low-cost technology for packaged drinking water that removes all impurities including TDS, Salinity, Hardness.

APPLICATIONS

Innovative low-cost technology for conversion of commercial reverse osmosis membranes into nanofiltration membrane using a proprietary reagent.

TECHNOLOGY READINESS LEVEL ASSESSMENT

TRL assessment is 7

SCALE OF DEVELOPMENT

This technology is in the market. HPCI has sold 1.5 lakh liter of 500 and 1000 ml bottle. Ph7 Aqua Pvt. Ltd. has sold 2 lakhs litres of 20 Litre cans.

TECHNOLOGY BENCHMARKING

Yes

STATUS OF COMMERCIALIZATION

This technology is in the market. HPCI has sold 1.5 lakh liter of 500 and 1000 ml bottle. Ph7 Aqua Pvt. Ltd. has sold 2 lakhs litres of 20 Litre cans.

TENTATIVE COST OF DEVELOPMENT

₹ 1.5 Lakhs +GST

INDUSTRIAL PARTNERS

- Aqua Pvt. Ltd.
- HPCL

4.5 ECOLOGY, ENVIRONMENT, EARTH AND OCEAN SCIENCES AND WATER (E3OW)**PLANT SET UP FOR FINAL PRODUCT**

Yes

IPR STATUS DETAILS (PATENTS/COPYRIGHT/TRADEMARK SECURITY IN INDIA/ABROAD)

No

POTENTIAL MARKET/TECHNO-ECONOMICS

Technically and economically viable.

ENVIRONMENTAL SAFETY CERTIFICATION

Yes

NODAL SCIENTIST DETAILS

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<http://www.thehindubusinessline.com/>

175. NOVEL INEXPENSIVE MEMBRANE SYSTEM AS IMPORT SUBSTITUTE FOR PRODUCTION OF DEMINERALIZED STERILE WATER

UID: TECH-THEME_5_IICT-013

LABORATORY OF ORIGIN | CSIR-IICT, HYDERABAD

EXECUTIVE SUMMARY

Demineralized water is used for preparation of saline water, dialysis water in hospitals, microbial culture preparation in biotech industries and laboratories, caustic soda plant etc.

- Compact system of 40 – 70 L/h capacity.
- The process is more economical and costs only ₹ 35000/-.
- It generates permeate of 0 to 2 ppm Total Dissolved Solids (TDS).
- Compared to conventional separation methods such as evaporation, distillation where the energy consumption and operating costs are very high or can replace even expensive membrane units supplied by multinational companies like Millipore which cost in lacs of rupees.
- The system can produce Type-2 water of conductivity <1 $\mu\text{S}/\text{cm}$ at an operating cost of 10 Paise per Liter.
- Demineralized water is used for preparation of saline water, dialysis water in hospitals.
- Maintenance free compared to multinational companies that charge ₹ 1 lakh per annum.

KEYWORDS

Membrane, Demineralized, Sterile water

SALIENT FEATURES

Demineralised water is used for preparation of saline water, dialysis water in hospitals, microbial culture preparation in biotech industries and laboratories, caustic soda plant etc.

- Compact system of 40 – 70 L/h capacity.
- The process is more economical and costs only Rs. 35000/-.
- It generates permeate of 0 to 2 ppm Total Dissolved Solids (TDS).

Compared to conventional separation methods such as evaporation, distillation where the energy consumption and operating costs are very high or can replace even expensive membrane units supplied by multinational companies like Millipore which cost in lacs of rupees.

APPLICATIONS

Demineralized water is used for preparation of saline water, dialysis water in hospitals.

TECHNOLOGY BENCHMARKING

Yes

TECHNOLOGY READINESS LEVEL ASSESSMENT

TRL assessment is 9

SCALE OF DEVELOPMENT

- The system can produce Type-2 water of conductivity <1 $\mu\text{S}/\text{cm}$ at an operating cost of 10 paisa per Litre.
- Compact system of 40 – 70 L/h capacity.

STATUS OF COMMERCIALIZATION

Commercialized, in the market.

TENTATIVE COST OF DEVELOPMENT

₹ 5 Lakhs +GST

INDUSTRIAL PARTNERS

1. Althion, Hyderabad.
2. Plantris, New Delhi.
3. Nephroplus hospitals chain.

The device is deployed at numerous places including CSIR-IICT, CSIR-CCMB, Care hospitals, Huwel Life Sciences, JNTU Kakinada, University of Hyderabad, Osmania University and JNTU Hyderabad and biotech laboratories.

PLANT SET UP FOR FINAL PRODUCT

Yes

IPR STATUS DETAILS (PATENTS/COPYRIGHT/TRADEMARK SECURITY IN INDIA/ABROAD)

Patented

POTENTIAL MARKET/TECHNO-ECONOMICS

Techno Economic Comparison of the proposed CSIR-IICT demineralizer with market technologies

ENVIRONMENTAL SAFETY CERTIFICATION

Yes

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176. NANOFILTRATION (NF) PROCESS FOR SEPARATION OF CORROSIVE CHLORIDE IONS FROM STEEL INDUSTRIAL WASTEWATER

UID: TECH-THEME_5_IICT-014

LABORATORY OF ORIGIN | CSIR-IICT, HYDERABAD

EXECUTIVE SUMMARY

- Removal of excess chloride and cyanide from industrial waste water.
- Designed, developed and commissioned NF system of 5.5 m³/h capacity for the removal of the cyanide and excess chloride.
- The process enables separation of chloride from 1500 mg/L in the effluent, to an acceptable level of < 400 mg/L with a water recovery of 75%.

The process is more economical when compared to reverse osmosis and other conventional processes.

KEYWORDS

Nanofiltration, Wastewater treatment, Corrosive chloride, Industrial wastewater

SALIENT FEATURES

The process enables separation of chloride from 1500 mg/L in the effluent, to an acceptable level of < 400 mg/L with a water recovery of 75%.

APPLICATIONS

Water purification

TECHNOLOGY BENCHMARKING

Yes

TECHNOLOGY READINESS LEVEL ASSESSMENT

TRL assessment is 7

SCALE OF DEVELOPMENT

Designed, developed and commissioned NF system of 5.5 m³/h capacity for the removal of the cyanide and excess chloride.

STATUS OF COMMERCIALIZATION

Yes

TENTATIVE COST OF DEVELOPMENT

Nanofiltration wastewater treatment unit starting from bench scale to commercial scale and tentative cost of Technology transfer ₹ 10.0 Lakhs +GST.

INDUSTRIAL PARTNERS

Tata Steel HMC division, Haldia.

4.5 ECOLOGY, ENVIRONMENT, EARTH AND OCEAN SCIENCES AND WATER (E3OW)

PLANT SET UP FOR FINAL PRODUCT

Yes

IPR STATUS DETAILS (PATENTS/COPYRIGHT/TRADEMARK SECURITY IN INDIA/ABROAD)

No

POTENTIAL MARKET/TECHNO-ECONOMICS

Technically and economically feasible process and is being used by TATA Steel HMC division, Haldia.

ENVIRONMENTAL SAFETY CERTIFICATION

Not yet

NODAL SCIENTIST DETAILS

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177. EXTRACTION OF IMPURITY-FREE SODIUM THIOCYANATE SOLVENT FROM AQUEOUS SOLUTIONS IN ACRYLIC FIBER INDUSTRY

UID: TECH-THEME_5_IICT-015

LABORATORY OF ORIGIN | CSIR-IICT, HYDERABAD

EXECUTIVE SUMMARY

- A five-stage NF operation of 4000-6000 L/day feed capacity has been designed and commissioned at CFCL.
- The process showed more than 90% impurity removal with > 99% NaSCN recovery.
- The operating cost per m³ of permeate generated was half of the conventional Gel Filtration Process.
- The process developed was eco-friendly, efficient and cost-effective.



10000 Lit/day

KEYWORDS

Sodium thiocyanate, Solvent, Nanofiltration, Fiber, Recovery

SALIENT FEATURES

- A five-stage NF operation of 4000-6000 L/day feed capacity has been designed and commissioned at CFCL.
- The process showed more than 90% impurity removal with > 99% NaSCN recovery.
- The operating cost per m³ of permeate generated was half of the conventional Gel Filtration Process.
- The process developed was eco-friendly, efficient and cost-effective.

APPLICATIONS

Acrylic fibre industry generating huge amounts of aqueous effluent stream containing 10-12% sodium thiocyanate (NaSCN) solvent along with color imparting ions, salts and organic compounds such as β -sulfo propionic acid, β -sulfo propionitrile. Membrane based nanofiltration (NF) technique for recovering NaSCN from the industrial process solution.

TECHNOLOGY BENCHMARKING

Yes

TECHNOLOGY READINESS LEVEL ASSESSMENT

TRL assessment is 6

SCALE OF DEVELOPMENT

A five-stage NF operation of 4000-6000 L/day feed capacity has been designed and commissioned at CFCL.

STATUS OF COMMERCIALIZATION

Technology transferred to industry.

4.5 ECOLOGY, ENVIRONMENT, EARTH AND OCEAN SCIENCES AND WATER (E3OW)**TENTATIVE COST OF DEVELOPMENT**

₹ 14 Lakhs +GST

INDUSTRIAL PARTNERS

Consolidated Fibres & Chemicals Ltd. (CFCL), Haldia, West Bengal.

PLANT SET UP FOR FINAL PRODUCT

Yes

IPR STATUS DETAILS (PATENTS/COPYRIGHT/TRADEMARK SECURITY IN INDIA/ABROAD)

1. US Patent 7,314,606 Granted on 1st Jan, 2008.
2. Morocco: MA Pat. No. 28551 Granted on 3rd April, 2007.
3. Indonesia: ID 0021889 Granted on 4th Sept, 2008.
4. Turkey TR200606229B Granted on 21st March, 2007.

POTENTIAL MARKET/TECHNO-ECONOMICS

Technically and economically feasible as it is being produced by industry.

ENVIRONMENTAL SAFETY CERTIFICATION

No environmental issues involved in the process.

NODAL SCIENTIST DETAILS

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178. ONEER- AN ELECTRONIC DEVICE FOR THE DISINFECTION OF DRINKING WATER

UID: TECH-THEME_5_IITR-016

LABORATORY OF ORIGIN | CSIR-IITR, LUCKNOW

EXECUTIVE SUMMARY

Oneer™ is useful for the continuous treatment of water. It is an innovative technology that eliminates all disease-causing pathogens such as virus, bacteria, fungi, protozoa, and cyst to provide safe drinking water to communities as per National and International standards prescribed for potable water (BIS, WHO and EPA).

KEYWORDS

- Low-cost water disinfection device that can even treat brackish or turbid water.
- High disinfection efficiency of > 8 Log reduction of bacteria viz. *Escherichia coli*, *Vibrio cholerae*, *Staphylococcus aureus*, *Salmonella typhimurium* and fungus (*Candida albicans*).
- Conforms to WHO safe limits for drinking water through innovative design of electrodes and controlled treatment energy for specific period.
- No exogenous chemicals added during decontamination process.
- Maintenance-free and long-life water-disinfection device for safe water.
- Domestic model can provide 10 L water per batch and community model can continuously supply ~400 L/hr treated water (5000 L/day) for schools, hospitals, restaurants and other public places.



Figure: Domestic model



Figure: Community model

SALIENT FEATURES

Modular design that can be tuned to suit the input water quality of a particular geographical area. Pre-filters for specific contaminants (As, Fe, F etc.) can be integrated to the device to provide local solution to local problem.

- Maintenance free as the device takes care of itself for self cleaning automatically, through an intelligent microprocessor controlled central unit.
- All the body parts of the device which are in water contact are made up of highest rated food grade stainless steel (306 and 316L).
- It can tackle both chemical and biological contaminants.
- Fully automatic to give 24×7 feedback for operational parameters and obviate the possibility of contamination through manual intervention.
- Due to modular design scalability is possible from 5000 LPD to 100000 LPD or higher.
- Power-normal electricity or solar. Especially, the domestic model (or for small business community) can be solar powered enabling even to the street side food vendors who use water to prepare their products not only get its benefit but also the consumers/clients get disinfected water as a confidence build up to consume the food products.
- Minimal water wastage: Minimal quantity of waste water discharge compared to any RO system currently available in the market.

4.5 ECOLOGY, ENVIRONMENT, EARTH AND OCEAN SCIENCES AND WATER (E3OW)

- Essential micronutrients are retained in the present technology unlike competitive technology in which post water treatment more than 90% of all the ions are eliminated which subsequently have to be enriched by mineral cartridges.
- Internet of Things (IoT) enabled to provide 24×7 real-time feedback of operational parameters.

APPLICATIONS

Water disinfection device

TECHNOLOGY BENCHMARKING

Yes

TECHNOLOGY READINESS LEVEL ASSESSMENT

TRL assessment is 9

SCALE OF DEVELOPMENT

Domestic model can provide 10 L water per batch and community model can continuously supply ~400 L/hr treated water (5000 L/day) for schools, hospitals, restaurants and other public places.

STATUS OF COMMERCIALIZATION

The technology has been already licensed to two private parties (M/s SS Maser Technology Private Limited, Lucknow and M/s Bluebird Pure Private Limited, New Delhi) on non-exclusive basis. The commercial model from Bluebird Pure Private Limited named “Vishuddhi” is available for procurement at Government e-Marketplace (GeM) and at online marketplace amazon.in. Following are the respective links:

- GeM link for Vishuddhi Domestic Potable water disinfection system as per CSIR.
- (BLUEBIRD PURE) (Bluebird Pure Vishuddhi 500 LPH).
<https://mkp.gem.gov.in/potable-water-disinfection-system-per-csir/vishuddhi-domestic-potable-water-disinfection-system-per-csir/p-5116877-33231477149-cat.html>
- GeM link for Vishuddhi Domestic Potable water disinfection system as per CSIR.
- (BLUEBIRD PURE) (Bluebird Pure Vishuddhi 100LPH (Solar Compatible)).
- Amazon link for Water Disinfection System Water Purifier- Technology by CSIR-IITR .
- India (Domestic Model).
<https://www.amazon.in/Bluebird-Pure-Vishuddhi-Disinfection-System/dp/B07Q6BGPL5>

The commercial model from SS Maser Technology Private Limited named “Puraneer” with capacity of 450 LPH and 500 LPH are available for procurement at Government e-Marketplace (GeM). Following are the respective links:

- GeM link for Potable Water Disinfection System - 450 LPH (MASER) (MASER & Puraneer 450).
<https://mkp.gem.gov.in/potable-water-disinfection-system-per-csir/potable-water-disinfection-system-450-lph/p-5116877-84012151292-cat.html>
- GeM link for Potable Water Disinfection System - 500 LPH (MASER) (MASER & Puraneer 500).
<https://mkp.gem.gov.in/potable-water-disinfection-system-per-csir/potable-water-disinfection-system-500-lph/p-5116877-82793534262-cat.html>

Further, a Confidential Disclosure Agreement (CDA) for technology transfer was signed with Eureka Forbes Ltd. through NRDC. Commercialized and in the market.

TENTATIVE COST OF DEVELOPMENT

₹ 99 Lakhs

INDUSTRIAL PARTNERS

- (a) Transfer of Technology to M/s Bluebird Pure Private Limited, New Delhi.
- (b) Transfer of Technology to M/s SS Maser Technology Private Limited, Lucknow.

PLANT SET UP FOR FINAL PRODUCT

Yes

IPR STATUS DETAILS (PATENTS/COPYRIGHT/TRADEMARK SECURITY IN INDIA/ABROAD)

No

POTENTIAL MARKET/TECHNO-ECONOMICS

Industries involved in water purification, Industries in manufacturing water purifiers for domestic and community purpose.

ENVIRONMENTAL SAFETY CERTIFICATION

Yes

NODAL SCIENTIST DETAILS

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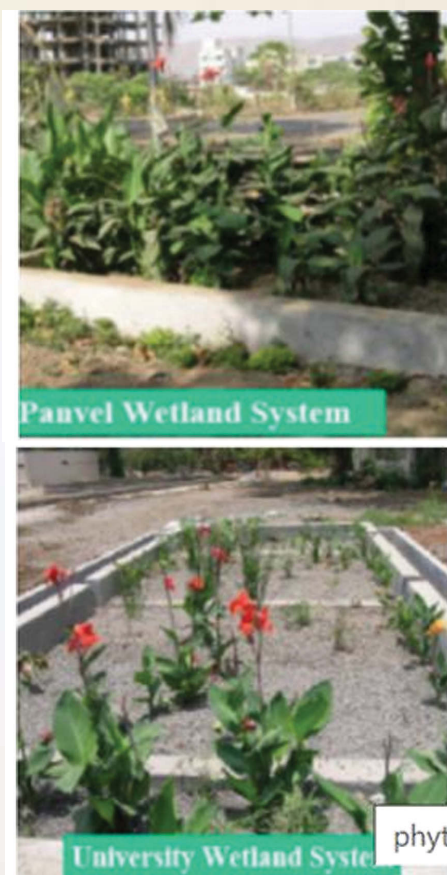
179. PHYTORID-WASTEWATER TREATMENT TECHNOLOGY

UID: TECH-THEME_5_NEERI-023

LABORATORY OF ORIGIN | CSIR-NEERI, NAGPUR

EXECUTIVE SUMMARY

- A cost effective engineered natural and sustainable treatment system for treatment of Municipal, Urban, Agricultural and Wastewater.
- Technology is based on constructed wetland, constructed in series and parallel modules/cells filled with porous media such as crushed bricks, gravel and stones.
- Use of specific plants species viz. Elephant grass, Cattails, Reeds, Cannas pp. and Yellow flag iris, normally found in natural wetlands with filtration and treatment capability. Some ornamental as well as flowering plants species such as Golden Dhuranda, Bamboo, Nerium, Colosia, etc. can also be used for treatment as well as landscaping purposes.
- The reduction in the treated effluent for the Total Suspended Solids (TSS) varied from 70% to 80%, BOD from 78% to 84%, nitrogen from 70% to 75%, phosphorus from 52% to 64% and fecal coliform from 90 % to 97%.
- The treated effluent is useful for municipal gardens, fountains and irrigation.
- Technology has Australian & European Patents (AU2003223110 A1, 2005 & WO2004/087584 A1, 2005).



KEYWORDS

Sewage treatment, Wastewater, Constructed wetland

SALIENT FEATURES

- Cost-effective.
- Negligible operation and maintenance expenses.
- Minimum electricity requirement.
- Smaller footprint.
- Facilitates recycle and reuse of water.
- No foul odour and No mosquito nuisance.
- Paradigm shift from conventional treatment.

APPLICATIONS

A cost effective engineered natural and sustainable treatment system for treatment of Municipal, Urban, Agricultural and Wastewater.

TECHNOLOGY BENCHMARKING

Yes

TECHNOLOGY READINESS LEVEL ASSESSMENT

TRL assessment is 9

SCALE OF DEVELOPMENT

Commercialized, Transfer the technology and available in the market.

STATUS OF COMMERCIALIZATION

Commercialized

TENTATIVE COST OF DEVELOPMENT

Not given

INDUSTRIAL PARTNERS

This technology has been transferred to General Techno Services, Techno green Environmental Solutions, Pune, M/s Ecologique Science Technik (India) Pvt. Ltd., Nagpur, Alaknanda Technologies Pvt. Ltd. Mumbai, M/s S.S. Engineering, U.P., M/s Ayyappa Infra projects Pvt. Ltd., Hyderabad, M/s Emergy Enviro Pvt. Ltd., Mumbai, Scientific Precision Pvt. Ltd., Mumbai.

PLANT SET UP FOR FINAL PRODUCT

Yes

IPR STATUS DETAILS (PATENTS/COPYRIGHT/TRADEMARK SECURITY IN INDIA/ABROAD)

Technology has Australian & European Patents (AU2003223110 A1, 2005 & WO2004/087584 A1, 2005).

POTENTIAL MARKET/TECHNO-ECONOMICS

Vast business potential is available in following sectors:

- Municipal sewage treatment (gram panchayat/council/ corporations).
- Nallah water treatment.
- Conservation of water bodies by avoiding wastewater disposal.
- Sewage treatment of Commercial or public utility spaces (airports, railway stations, complexes).

ENVIRONMENTAL SAFETY CERTIFICATION

Yes

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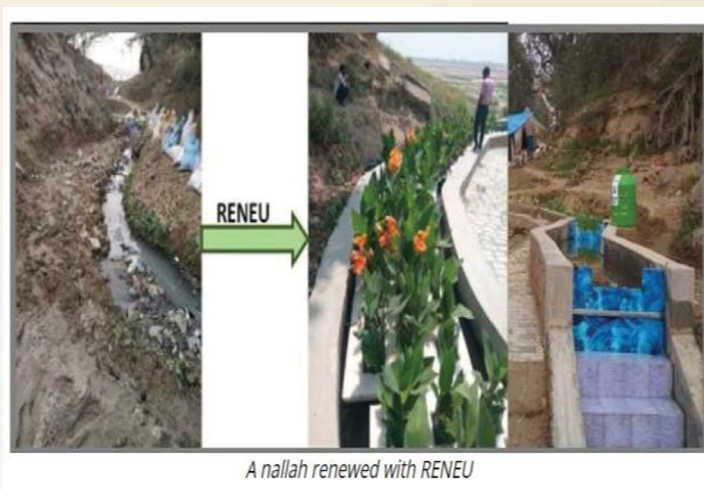
180. RESTORATION OF NALLAH WITH ECOLOGICAL UNITS

UID: TECH-THEME_5_NEERI-024

LABORATORY OF ORIGIN | CSIR-NEERI, NAGPUR

EXECUTIVE SUMMARY

- In-situ Drain treatment system developed by CSIR-NEERI.
- Based on natural attenuation principle with engineered tools to treat sewage drain water as it flows in the nallahs.
- The treatment system is called RENEU (Restoration of Nallahs Using Ecological Units) and Deals with the following points:
 - Dealing with Floating garbage.
 - Silt trap: Desilting.
 - Suspended solids and floating matter in sewage.
 - Biodegradation of organics in sewage by anoxic and aerobic methods.
 - Removal of excess nutrients using floating plants.
 - Geo-Tank with defined matrix.
 - Bacterial Load: A disinfection treatment at the end in the outlet making the water safe for reuse.



KEYWORDS

Nallahs, In-situ drain treatment, RENEU

SALIENT FEATURES

- A holistic and sustainable nallah/drain cleaning methodology based on natural ecosystem.
- Outlet parameters will have:
 - COD : Depending on the initial load, minimum 40% reduction of COD.
 - BOD : Reduction in 40% BOD from initial value or < 30 mg/L.

APPLICATIONS

- In-situ Nallah treatment by natural attention-based engineering treatment technology.
- Cost effective decentralized treatment for In-situ treatment of flowing drains ensures removal of floating garbage and suspended solids, bio-degradation of organics and removal of excessive nutrients like Nitrogen & Phosphorus.
- Works on: Screening cum silt trap, Sedimentation, Biomats and Phyto-trap, Solar Diffused Aerator, Phyto flo-raft.

TECHNOLOGY BENCHMARKING

Yes

TECHNOLOGY READINESS LEVEL ASSESSMENT

TRL assessment is 9

4.5 ECOLOGY, ENVIRONMENT, EARTH AND OCEAN SCIENCES AND WATER (E3OW)

SCALE OF DEVELOPMENT

Technology transferred and Implemented in villages.

STATUS OF COMMERCIALIZATION

Commercialized

TENTATIVE COST OF DEVELOPMENT

₹ 200 Lakhs

INDUSTRIAL PARTNERS

Emergy Enviro Pvt. Ltd.

PLANT SET UP FOR FINAL PRODUCT

Yes

IPR STATUS DETAILS (PATENTS/COPYRIGHT/TRADEMARK SECURITY IN INDIA/ABROAD)

No

POTENTIAL MARKET/TECHNO-ECONOMICS

Vast business potential is available in following sectors:

- Municipal sewage treatment (gram panchayat/council/corporations).
- Nallah water treatment.
- Conservation of water bodies by avoiding wastewater disposal.
- Sewage treatment of Commercial or public utility spaces (airports, railway stations, complexes).

ENVIRONMENTAL SAFETY CERTIFICATION

Yes

NODAL SCIENTIST DETAILS

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181. WIND AUGMENTATION PURIFYING UNIT (WAYU- II)

UID: TECH-THEME_5_NEERI-025

LABORATORY OF ORIGIN | CSIR-NEERI, NAGPUR

EXECUTIVE SUMMARY

- To combat the worsening air quality, CSIR-NEERI, has developed the WAYU (Wind Augmentation and Purification Units) device.
- The WAYU device works in two stages. The first stage uses a fan to suck in air around the device, which contains all kinds of pollutants like dust and particulate matter. These are separated using three blades of different dimensions.
- Post this, the air enters into a specially designed chamber where oxidation takes place using activated carbon coated with titanium oxide. The oxidation is supported by two ultraviolet lights. The purified air is then pumped out into the atmosphere.
- Filters were made of non-woven fabric and their removal efficiency for particulate matter was 80 to 90 percent and of the poisonous gases 40 to 50 percent. The device is 5.5 feet tall and one foot wide.
- Easy operation & maintenance.
- Can be easily modified to suit any scenario and volume of air.

KEYWORDS

Air quality, Pollutant, Particulate matter, UV light, Oxidation, WAYU-II

SALIENT FEATURES

- Relatively cheaper than most devices in market for similar purpose.
- Low power consumption facilitating the use of solar power.
- Easy operation and maintenance.
- Removes gaseous pollutants along with particulate matter unlike most of the devices which focus only on particulate matter.
- Can be easily modified to suit any scenario and volume of air.

APPLICATIONS

- Useful in the traffic inter junctions & cross roads.
- Crowded spaces in Market.
- Heavy traffic areas.
- High vehicle and traffic density prone zones.
- Deployed in 25 locations in Mumbai with IIT Bombay.
- Deployed in 54 locations in Delhi with CPCB.

TECHNOLOGY BENCHMARKING

Yes

TECHNOLOGY READINESS LEVEL ASSESSMENT

TRL assessment is 9

4.5 ECOLOGY, ENVIRONMENT, EARTH AND OCEAN SCIENCES AND WATER (E3OW)**SCALE OF DEVELOPMENT**

Commercialized, Deployed in several location in Delhi, Mumbai
status of commercialization.
Commercialized

TENTATIVE COST OF DEVELOPMENT

₹ 15 Lakhs

INDUSTRIAL PARTNERS

Yes, M/s ESS Environment Consultants Pvt. Ltd., New Delhi.

PLANT SET UP FOR FINAL PRODUCT

Yes

IPR STATUS DETAILS (PATENTS/COPYRIGHT/TRADEMARK SECURITY IN INDIA/ABROAD)

No

POTENTIAL MARKET/TECHNO-ECONOMICS

Market potential is available in following areas:

- Traffic inter junction.
- Municipal Corporation.
- Crowded spaces in Market.
- Heavy traffic areas.
- High vehicle and traffic density prone zones.

ENVIRONMENTAL SAFETY CERTIFICATION

Yes

NODAL SCIENTIST DETAILS

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Director

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182. PASSIVE AMBIENT AIR-POLLUTANT REMOVAL SYSTEM

UID: TECH-THEME_5_NEERI-026

LABORATORY OF ORIGIN | CSIR-NEERI, NAGPUR

EXECUTIVE SUMMARY

- PAARS is Passive Ambient Air-Pollutant Removal System based on Natural treatment.
- System comprises of a filtration unit of a soil/media bed with specific plants species capable of removing pollutants from surrounding polluted air.
- A plurality of axial fans at inlet and outlet are provided to facilitate flow of polluted air in and clean air out through the soil/media bed.
- A mesh facilitates passing air into the soil/media bed.
- A perforated plate is provided for collecting water receding from the soil/media bed through pipe in the water tank.
- The combination of the soil/media bed, plants and the axial fan constitutes filtration unit.
- Purifies indoor as households, offices, industries and outdoor (curbside, parks, divider).

KEYWORDS

Indoor air pollution

SALIENT FEATURES

- It addresses the problem of indoor air pollution which can be addressed by the device and its functional items.
- It can reduce PM, CO, SOX, NOX, VOCs emitted in the indoor air.
- It can also be used in an industrial area or premises or any other places where diffused air pollutants are common.
- It can be powered using solar energy, renewable energy sources such as wind, or any other suitable power source.

APPLICATIONS

Air purification (Purifies indoor as households, offices, industries and outdoor (curbside, parks, divider).

TECHNOLOGY BENCHMARKING

Yes

TECHNOLOGY READINESS LEVEL ASSESSMENT

TRL assessment is 9

SCALE OF DEVELOPMENT

Commercialized

STATUS OF COMMERCIALIZATION

Commercialized

4.5 ECOLOGY, ENVIRONMENT, EARTH AND OCEAN SCIENCES AND WATER (E3OW)**TENTATIVE COST OF DEVELOPMENT**

₹ 5 Lakhs

INDUSTRIAL PARTNERS

M/s Pristine Environmental Solutions.

PLANT SET UP FOR FINAL PRODUCT

Yes

IPR STATUS DETAILS (PATENTS/COPYRIGHT/TRADEMARK SECURITY IN INDIA/ABROAD)

No

POTENTIAL MARKET/TECHNO-ECONOMICS

Vast market is available in following sectors:

- Industrial area or premises.
- Places where diffused air pollutants are common.

ENVIRONMENTAL SAFETY CERTIFICATION

Yes

NODAL SCIENTIST DETAILS

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Director

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183. NEERDHUR

UID: TECH-THEME_5_NEERI-027

LABORATORY OF ORIGIN | CSIR-NEERI, NAGPUR

EXECUTIVE SUMMARY

- Improved adjustable fuel grate for multi-fuel applications.
- Supports top and front fuel loading.
- Works on Wood, Agro-residue, charcoal, biomass, etc.
- Improved combustion chamber designs.
- Improved thermal efficiency.
- Reduced cooking time and fuel consumption.
- Reduced emissions.
- Zero maintenance & easy to use.
- Better safety and portability.



Domestic Model	Community Model
▪ Power output - 1.7 KW ▪ Thermal efficiency: 33.33 %* ▪ TPM Emission - 340.10 mg/MJd* ▪ CO Emission - 3.78 g/MJd* ▪ Fuel/feed: 0.8 - 1 kg. ▪ Serving size: 4 - 5 person ▪ Estimated lifespan: 2-3 years ▪ Stove weight - 4.5 kg.	▪ Power output - 7.06 KW ▪ Thermal efficiency: 28.37 %* ▪ TPM Emission - 254.98 mg/MJd* ▪ CO Emission - 2.64 g/MJd* ▪ Fuel/feed: 3.5 - 4 kg. ▪ Serving size: 20 - 25 person ▪ Estimated lifespan: 2-3 years ▪ Stove weight - 10 kg.

* Test results are based on performance testing conducted by MNRE's Improved Cook-stove Test Centres as per BIS: IS-13152: 2013

KEYWORDS

Fiber laser, Optical fiber, Highpower laser, Optical amplifier, Laser surgery

SALIENT FEATURES

- High thermal efficiency and MNRE approval for improved cook-stove performance as per BIS: IS-13152: 2013.
- NEERDHUR is among the best cook stoves in terms of highest thermal efficiency under the 2KW domestic natural draft biomass stoves.
- NEERDHUR has been extensively demonstrated and tested in field for its performance and has shown a benefit to cost ratio between 4 to 6.

APPLICATIONS

Improved adjustable fuel grate for multi-fuel applications.

TECHNOLOGY BENCHMARKING

Yes

TECHNOLOGY READINESS LEVEL ASSESSMENT

TRL assessment is 9

SCALE OF DEVELOPMENT

Developed and Deployed in the market.

STATUS OF COMMERCIALIZATION

Commercialized

TENTATIVE COST OF DEVELOPMENT

Not given

INDUSTRIAL PARTNERS

Expression of Interest (EOI) is invited from potential entrepreneurs and start-ups for transfer of Know-how on NEERDHUR ICS with technical support from CSIR-NEERI.

PLANT SET UP FOR FINAL PRODUCT

Yes

IPR STATUS DETAILS (PATENTS/COPYRIGHT/TRADEMARK SECURITY IN INDIA/ABROAD)

Indian Patent Application Number 201611024651.

Design Registration Application number 282681, Journal Number 29/2017 and Journal Date 21/07/2017.

POTENTIAL MARKET/TECHNO-ECONOMICS

Market is available for:

- Rural women.
- Households slum dwellers.
- Street vendors.
- Small & Medium Enterprises (SMEs).
- Forest, Defence etc.
- other Government departments.
- Community kitchens.

Know-how of “NEERDHUR” Improved Cookstove technology has been successfully demonstrated in 25 villages across 4 states, namely Maharashtra, Madhya Pradesh, West Bengal and Gujarat. Field trials and IEC have also been done in the above states.

- Total number of States covered: 4 (25 villages).
- Total Households Benefitted: 2500+
- Total Beneficiaries: 10,000+

ENVIRONMENTAL SAFETY CERTIFICATION

Yes

NODAL SCIENTIST DETAILS

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184. HIGH-RATE TRANSPIRATION SYSTEM

UID: TECH-THEME_5_NEERI-029

LABORATORY OF ORIGIN | CSIR-NEERI, NAGPUR

EXECUTIVE SUMMARY

Ease of installation and simplicity of operations:

- Low land requirement for maximum wastewater treatment & disposal.
- Works on natural treatment processes and could thus be termed eco-friendly.
- Facilitates development of forests and green belts.
- Generates sink potential for air pollutants and green house gases.
- Low-energy and cost requirements compared to conventional effluent treatment systems.
- Biomass generation and revenue returns.
- Green belt development and carbon sequestration during the process of wastewater treatment.



KEYWORDS

Transpiration, Wastewater treatment, Carbon sequestration, Green belt, GHG, HRTS

SALIENT FEATURES

Reuse of effluent and its nutrient contents for biomass production:

- Prevention of ground and surface water pollution.
- Green belt development with concomitant advantages to the environment.
- Biomass generation and revenue returns.
- Fuel wood and timber wood production.
- Raw material for cottage industries.
- Generates sink potential for air pollutants and greenhouse gases.
- Works on natural treatment processes and could thus be term.

APPLICATIONS

Green belt development and carbon sequestration during the process of wastewater treatment.

TECHNOLOGY BENCHMARKING

Yes

TECHNOLOGY READINESS LEVEL ASSESSMENT

TRL assessment is 7

SCALE OF DEVELOPMENT

Deployed in campus.

STATUS OF COMMERCIALIZATION

Commercialized

TENTATIVE COST OF DEVELOPMENT

₹ 10 Lakhs

INDUSTRIAL PARTNERS

M/s SMS Envocare Limited, Nagpur.

PLANT SET UP FOR FINAL PRODUCT

Yes

IPR STATUS DETAILS (PATENTS/COPYRIGHT/TRADEMARK SECURITY IN INDIA/ABROAD)

No

POTENTIAL MARKET/TECHNO-ECONOMICS

Industries looking for zero waste discharge.

ENVIRONMENTAL SAFETY CERTIFICATION

Yes

NODAL SCIENTIST DETAILS

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185. GREENDISPO

UID: TECH-THEME_5_NEERI-030

LABORATORY OF ORIGIN | CSIR-NEERI, NAGPUR

EXECUTIVE SUMMARY

- An eco-friendly high-temperature sanitary napkin incinerator 'Green Dispo' is jointly developed technology by International Advanced Research Centre for Powder Metallurgy and New Materials (ARCI), Hyderabad, an autonomous institute under the Department of Science & Technology, Govt. of India in collaboration with M/s Sowbal Aerothermics, Hyderabad, and CSIR-National Environmental Engineering Research Institute (CSIR-NEERI), Nagpur.
- The technology has been extended to develop the high-temperature incinerators and patented and these are being installed in schools, colleges, government offices, and public places.

KEYWORDS

Sanitary pads, Incinerates, Disposal

SALIENT FEATURES

- Ensure instant disposal in a scientific & hygienic way.
- Energy efficient heaters and innovative design of combustion chamber (Single).
- Incinerates used sanitary pads at a temperature more than 850 °C.
- Optimized A/F ratio and heating cycles.
- Efficiently burn unbleached pads with high cellulose & Super Absorbent Polymers (SAP).
- Exhaust emissions comply to BMW Management Rules, 2016.
- Eliminates Dioxin & Furan during combustion.
- Ash collected in separate tray with < 5% ash generated per napkin.
- Auto power & thermal cut-off and automatic temperature control.
- Suitably insulated with safe device surface temperatures.
- Easy to operate and with low maintenance.

APPLICATIONS

High-temperature incinerators.

TECHNOLOGY BENCHMARKING

Yes

TECHNOLOGY READINESS LEVEL ASSESSMENT

TRL assessment is 9

SCALE OF DEVELOPMENT

Different model of different capacity is available.



STATUS OF COMMERCIALIZATION

The lab has also made multiple dealers through license to market the innovation country wide.

- The product is readily available at Amazon, Indiamart etc.
- A dedicated website is available for the product at <http://greendispo.com/about/>
- Product installation and details are readily available over Youtube.
- The product is also being market thorough GeM.

TENTATIVE COST OF DEVELOPMENT

No

INDUSTRIAL PARTNERS

- ARCI Hyderabad.
- Sowbel Aerothermics (SA), Secunderabad.
- Authorized dealer: Mayavati Trader and all forasmile Parvati, Pune.
- Available at Amazon and India Mart Through GEM portal.

PLANT SET UP FOR FINAL PRODUCT

Yes

IPR STATUS DETAILS (PATENTS/COPYRIGHT/TRADEMARK SECURITY IN INDIA/ABROAD)

Joint IP under tri-partite MoU among ARCI, CSIR-NEERI and SA.

Patent Application No: 201821021430.

POTENTIAL MARKET/TECHNO-ECONOMICS

Schools, colleges, government offices, and public places.

ENVIRONMENTAL SAFETY CERTIFICATION

Yes

NODAL SCIENTIST DETAILS

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Er. Ankit Gupta

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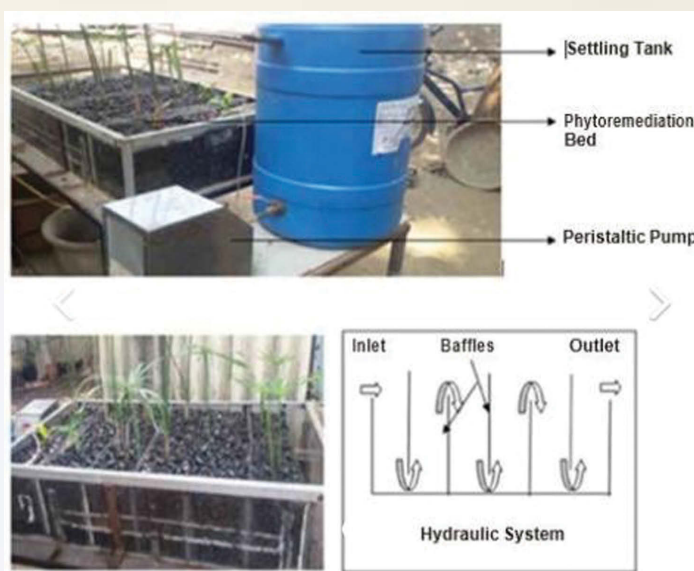
186. MUNICIPAL WASTEWATER TREATMENT USING IMMOBILIZED MICROBIAL CULTURE- BIO PHYTOREM SYSTEM

UID: TECH-THEME_5_NEERI-033

LABORATORY OF ORIGIN | CSIR-NEERI, NAGPUR

EXECUTIVE SUMMARY

- The technology uses the immobilized microbes for treatment of Municipal wastewater in more efficient manner.
- Bacterial cultures degrade organic matter after it forms biofilm on the inert material such as thermocol, non-woven fabric, gravels etc. for longer time interval.
- Isolating the efficient bacterial strain from an established engineered wetland system.
- The isolated bacterial strains are immobilized on various inert materials such as Ca- alginate.
- Unique aerobic microbial culture.



KEYWORDS

Municipal, Wastewater, Immobilized, Microbial culture, Bio phytorem, Ca-alginate, Bio-cluture

SALIENT FEATURES

- Reduces sewage treatment time at wetland.
- Improves efficiency of wetland treatment system.
- Reduce minimum space requirement for wetland construction.
- Use of culture in the form of biofilm protects the bacteria from toxic compounds in sewage and increases its survival during influx of toxic substances and shock loads.
- Eliminate requirement of frequent addition of microbial culture.

APPLICATIONS

Wastewater treatment

TECHNOLOGY BENCHMARKING

Yes

TECHNOLOGY READINESS LEVEL ASSESSMENT

TRL assessment is 7

SCALE OF DEVELOPMENT

The technology prototype has been tested in actual field conditions and addressed all critical scaling issues and deployed.

4.5 ECOLOGY, ENVIRONMENT, EARTH AND OCEAN SCIENCES AND WATER (E3OW)

STATUS OF COMMERCIALIZATION

Commercialized

TENTATIVE COST OF DEVELOPMENT

Not mentioned

INDUSTRIAL PARTNERS

Know how given to WOTASTIC Pvt. Ltd.

PLANT SET UP FOR FINAL PRODUCT

Used the technology in Phyto remediation system.

IPR STATUS DETAILS (PATENTS/COPYRIGHT/TRADEMARK SECURITY IN INDIA/ABROAD)

No

POTENTIAL MARKET/TECHNO-ECONOMICS

For treatment of Municipal wastewater.

ENVIRONMENTAL SAFETY CERTIFICATION

Yes

NODAL SCIENTIST DETAILS

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187. NEERFLUSH

UID: TECH-THEME_5_NEERI-034

LABORATORY OF ORIGIN | CSIR-NEERI, NAGPUR

EXECUTIVE SUMMARY

- Low Cost & Affordable patented innovation for Improving the Sanitation & Hygiene “NEERFLUSH” offers a cheaper solution for rural and urban areas.
- Needs ‘NO’, electronic or electrical operation.
- Hands free, that is without hand contact, unintentional that is automatic and effortless flushing.
- Uses minimum requisite quantity of water per flush, as uses 75% less water than standard facility.
- Leads to assured, regular and compulsory flushing and cleaning of urinals-toilets.
- Low cost compared with the existing systems.
- Can be customized and retrofitted, to new as well as existing urinals-toilets.
- Easy and low maintenance. Reduces, associated health risk.



KEYWORDS

Low cost, Affordable, Toilet flusher, Mechanical urinal, NEERFLUSH

SALIENT FEATURES

- Low Cost & Affordable patented innovation for Improving the Sanitation & Hygiene “NEERFLUSH” offers a cheaper solution for rural and urban areas.
- Needs ‘NO’, electronic or electrical operation.
- Hands free, that is without hand contact, unintentional that is automatic and effortless flushing.
- Uses minimum requisite quantity of water per flush, as uses 75% less water than standard facility.
- Leads to assured, regular and compulsory flushing and cleaning of urinals-toilets.
- Low cost compared with the existing systems.
- Can be customized and retrofitted, to new as well as existing urinals-toilets.
- Easy and low maintenance. Reduces, associated health risk.

APPLICATIONS

Sanitation

TECHNOLOGY BENCHMARKING

Yes

TECHNOLOGY READINESS LEVEL ASSESSMENT

TRL assessment is 7

SCALE OF DEVELOPMENT

The prototype has demonstrated in actual field successfully and available for licensing.

STATUS OF COMMERCIALIZATION

Ready for licensing.

TENTATIVE COST OF DEVELOPMENT

Not mentioned

INDUSTRIAL PARTNERS

No

PLANT SET UP FOR FINAL PRODUCT

No

IPR STATUS DETAILS (PATENTS/COPYRIGHT/TRADEMARK SECURITY IN INDIA/ABROAD)

India: 194DEL2013, United States : 14/890273 (Granted), South Africa : 2016/00020 (Granted), European Union: 14736464.0 PCT: IN2014/000329.

POTENTIAL MARKET/TECHNO-ECONOMICS

Sulabh Shauchalaya, Municipalities' Toilets, Urban Public Toilets, Village Panchayat, Commercial Complexes, Office/Residences, Academic Institutions, Tourist Places.

ENVIRONMENTAL SAFETY CERTIFICATION

No

NODAL SCIENTIST DETAILS

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188. WOOD CARE FORMULATION

UID: TECH-THEME_5_NEIST-037

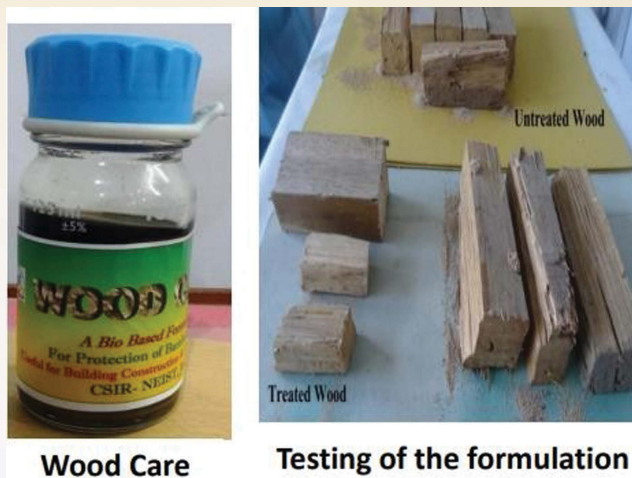
LABORATORY OF ORIGIN | CSIR-NEIST, JORHAT, ASSAM

EXECUTIVE SUMMARY

Wood and bamboo are two important forest resources used extensively as building and furnishing materials. CSIR-NEIST has developed Wood Care Formulation which has been found potential to prevent the damage of wood and bamboo from fungal and insect attack enhancing the durability and strength. The product is developed from easily available raw materials and involves a simple process for production.

KEYWORDS

Insect & fungal resistant properties.



SALIENT FEATURES

- Use of eco- friendly raw materials & chemicals.
- Low-cost technology and can be adopted as cottage scale level in rural areas.
- No sophisticated equipment's and machineries involved.
- No highly skilled labours required.
- No bye products generate during manufacturing process.

APPLICATIONS

Insect & fungal resistant herbal formulation and Enhance the durability and strength of bamboo and wood & wood/bamboo products.

TECHNOLOGY BENCHMARKING

The technology is benchmarked with similar technologies.

TECHNOLOGY READINESS LEVEL ASSESSMENT

TRL assessment is 6

SCALE OF DEVELOPMENT

The Pilot scale demonstration in the field conditions is successfully done and the technology prototype has been tested in the actual field conditions and addressed all the critical scaling issues and available for licensing.

STATUS OF COMMERCIALIZATION

Ready for commercialization

TENTATIVE COST OF DEVELOPMENT

₹ 6.49 Lakhs

4.5 ECOLOGY, ENVIRONMENT, EARTH AND OCEAN SCIENCES AND WATER (E3OW)**INDUSTRIAL PARTNERS**

M/s Food and Chemical Industries Bhubaneswar.

PLANT SET UP FOR FINAL PRODUCT

No

IPR STATUS DETAILS (PATENTS/COPYRIGHT/TRADEMARK SECURITY IN INDIA/ABROAD)

No

POTENTIAL MARKET/TECHNO-ECONOMICS

Wood care products manufacturing companies, MSME and other interested companies.

ENVIRONMENTAL SAFETY CERTIFICATION

No

NODAL SCIENTIST DETAILS

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189. PROCESS FOR DEVELOPMENT OF WEATHER RESISTANT COIR GEOTEXTILE

UID: TECH-THEME_5_NIIST-038

LABORATORY OF ORIGIN | CSIR-NIIST, THIRUVANANTHAPURAM

EXECUTIVE SUMMARY

This material can be used for construction of roads, protection of sea/river shores with improved strength and without frequent replacements in soil erosion prevention. The cost of treatment is only 10% of the cost of the geotextile.

KEYWORDS

Coir geotextile, Erosion control, Road construction, Green materials, Rot resistant.

SALIENT FEATURES

Weather resistant and soil erosion prevention.

APPLICATIONS

This material can be used for the construction of roads, protection of sea/river shores with improved strength, and without frequent replacements in soil erosion prevention.

TECHNOLOGY BENCHMARKING

Yes

TECHNOLOGY READINESS LEVEL ASSESSMENT

TRL assessment is 7

SCALE OF DEVELOPMENT

The technology is demonstrated to COIR board successfully.

STATUS OF COMMERCIALIZATION

No

TENTATIVE COST OF DEVELOPMENT

₹ 25 Lakhs

INDUSTRIAL PARTNERS

No

PLANT SET UP FOR FINAL PRODUCT

No

IPR STATUS DETAILS (PATENTS/COPYRIGHT/TRADEMARK SECURITY IN INDIA/ABROAD)

No

POTENTIAL MARKET/TECHNO-ECONOMICS

Construction, sea erosion control, river bank protection.

ENVIRONMENTAL SAFETY CERTIFICATION

No

NODAL SCIENTIST DETAILS

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190. BIODEGRADABLE CUTLERIES, CUPS, GLASS AND PLATES FROM AGRI WASTES (WHEAT BARN, SUGAR CANE BAGASSE, RICE HUSK, FRUIT PEELS AND PINEAPPLE LEAVES)

UID: TECH-THEME_5_NIIST-039

LABORATORY OF ORIGIN | CSIR-NIIST, THIRUVANANTHAPURAM

EXECUTIVE SUMMARY

The developed product is shelf stable up to the period of 10 to 12 months and heat resistant up to the temperature of 100 °C. It is found to be ideal for replacing the single use plastics and also the above said technology have been licensed and transferred two MSME's for commercial production. It can be used in classic ovens/ microwave oven.

KEYWORDS

Wheat bran, Sugarcane bagasse, Fruit peels, Biodegradable cutleries, Biodegradable plates



SALIENT FEATURES

It is found to be ideal for replacing the single use plastics and also the above said technology have been licensed and transferred two MSME's for commercial production. It can be used in classic ovens/ microwave oven.

APPLICATIONS

Disposable Biodegradable cutleries.

TECHNOLOGY BENCHMARKING

Yes

TECHNOLOGY READINESS LEVEL ASSESSMENT

TRL assessment is 8

SCALE OF DEVELOPMENT

Aura Axim established wheat barn based edible cutleries robotic based plant at Ernakulum.

STATUS OF COMMERCIALIZATION

Commercialized

TENTATIVE COST OF DEVELOPMENT

₹ 25 Lakhs

4.5 ECOLOGY, ENVIRONMENT, EARTH AND OCEAN SCIENCES AND WATER (E3OW)

INDUSTRIAL PARTNERS

Aura Axim Industry, Ernakulum.

PLANT SET UP FOR FINAL PRODUCT

Yes

IPR STATUS DETAILS (PATENTS/COPYRIGHT/TRADEMARK SECURITY IN INDIA/ABROAD)

No

POTENTIAL MARKET/TECHNO-ECONOMICS

The developed product Eco friendly, bio degradable, micro wave friendly, can hold water content for some time, not smelly, aesthetic looking, eatable if required, edible flavours to be added to get different tastes and colours. It is having huge potential especially Indian railways(IRCTC), Airlines, Temples, Gurdwaras, where ever hot and cold meals are served. It can be used in classic ovens/microwave oven. The initial expensive is very less lost so its affordable to MSME and other small scale industries.

ENVIRONMENTAL SAFETY CERTIFICATION

The safety aspects including environmental safety addressed and documented.

NODAL SCIENTIST DETAILS

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191. MODULAR ONSITE WASTEWATER TREATMENT CUM RESOURCE RECOVERY UNIT

UID: TECH-THEME_5_NIIST-041

LABORATORY OF ORIGIN | CSIR-NIIST, THIRUVANANTHAPURAM

EXECUTIVE SUMMARY

This is a modular unit that can treat organic rich wastewater from small establishments and recover reuse quality water and bioenergy. A patent is already filed for this technology. Field units are working. Technology already licensed to one MSME for field implementation.

KEYWORDS

Onsite wastewater treatment, Modular treatment system, High strength wastewater, Bioenergy

SALIENT FEATURES

This is a modular unit that can treat organic rich wastewater from small establishments and recover reuse quality water and bioenergy.



NOWA unit (2000L/day) installed in NIIST campus recovering biogas and reuse quality water from high strength wastewater discharged from NIIST canteen

APPLICATIONS

Wastewater treatment

TECHNOLOGY BENCHMARKING

Yes

TECHNOLOGY READINESS LEVEL ASSESSMENT

TRL assessment is 8

SCALE OF DEVELOPMENT

Technology successfully demonstrated to the intended end user (two units are working in the field) and tested in the actual field and the prototype addressed all the critical scaling issues.

STATUS OF COMMERCIALIZATION

Yes

TENTATIVE COST OF DEVELOPMENT

₹ 15 Lakhs

INDUSTRIAL PARTNERS

Satyam Enviro Pvt. Ltd.

PLANT SET UP FOR FINAL PRODUCT

No

4.5 ECOLOGY, ENVIRONMENT, EARTH AND OCEAN SCIENCES AND WATER (E3OW)**IPR STATUS DETAILS (PATENTS/COPYRIGHT/TRADEMARK SECURITY IN INDIA/ABROAD)**

Yes

POTENTIAL MARKET/TECHNO-ECONOMICS

Small establishments like canteens, restaurants, agro based MSMEs, community halls, etc.

ENVIRONMENTAL SAFETY CERTIFICATION

Environmental safety aspect address and documented.

NODAL SCIENTIST DETAILS

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192. BIOPROCESS FOR TREATING PERCHLORATE (ROCKET FUEL) CONTAMINATED WATER AND SOIL

UID: TECH-THEME_5_NIIST-042

LABORATORY OF ORIGIN | CSIR-NIIST, THIRUVANANTHAPURAM

EXECUTIVE SUMMARY

Perchlorate (rocket fuel) is an emerging endocrine disrupting contaminant. CSIR-NIIST has developed a microbial process for decontaminating perchlorate in discharges and soil (ex-situ remediation). The process is tested and validated up to pilot scale.

KEYWORDS

Perchlorate, Bioremediation, Ex-situ soil remediation

SALIENT FEATURES

Perchlorate (rocket fuel) is an emerging endocrine disrupting contaminant. CSIR-NIIST has developed a microbial process for decontaminating perchlorate in discharges and soil (ex-situ remediation).

APPLICATIONS

Soil remediation from rocket fuel.

TECHNOLOGY BENCHMARKING

Yes

TECHNOLOGY READINESS LEVEL ASSESSMENT

TRL assessment is 7

SCALE OF DEVELOPMENT

The prototype demonstrated to the intended end user successfully, treatment of real effluent and contaminated soil is done.

STATUS OF COMMERCIALIZATION

No

TENTATIVE COST OF DEVELOPMENT

₹ 15 Lakhs

INDUSTRIAL PARTNERS

No

PLANT SET UP FOR FINAL PRODUCT

Not yet



A perchlorate contaminated community well closed by health department in Keezhmad panchayat, Aluva.



Pilot scale bio-physical unit for treating perchlorate contaminated ground water.

4.5 ECOLOGY, ENVIRONMENT, EARTH AND OCEAN SCIENCES AND WATER (E3OW)

IPR STATUS DETAILS (PATENTS/COPYRIGHT/TRADEMARK SECURITY IN INDIA/ABROAD)
WO2017/125943 AL

POTENTIAL MARKET/TECHNO-ECONOMICS

Mainly for space R&D units (ISRO, VSSC), and industries handling perchlorate in bulk.

ENVIRONMENTAL SAFETY CERTIFICATION

Environment safety aspect addressed and documented.

NODAL SCIENTIST DETAILS

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193. COMPACT FOOD WASTE BIOGAS PLANT

UID: TECH-THEME_5_NIIST-043

LABORATORY OF ORIGIN | CSIR-NIIST, THIRUVANANTHAPURAM

EXECUTIVE SUMMARY

This is a compact system for treating food waste. Compared with conventional biogas plants, this unit has many advantages. May field installations (up to 500 kg/d) technology licensed to four agencies.

KEYWORDS

Bioenergy, Food waste, Biomethanation, High rate biomethanation

SALIENT FEATURES

This is a compact system for treating food waste. Compared with conventional biogas plants, this unit has many advantages. May field installations (up to 500 kg/d) Technology.

APPLICATIONS

Production of biogas from food waste.

TECHNOLOGY BENCHMARKING

Yes

TECHNOLOGY READINESS LEVEL ASSESSMENT

TRL assessment is 8

SCALE OF DEVELOPMENT

Field installations (up to 500 kg/d) at Trivandrum International Airport.

STATUS OF COMMERCIALIZATION

Commercialized

TENTATIVE COST OF DEVELOPMENT

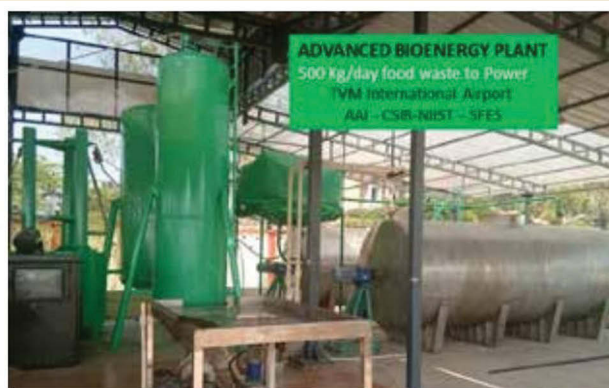
₹ 15 Lakhs

INDUSTRIAL PARTNERS

Tranferred to four agencies, Swatch Future Energy Solution, Mailhem Ikos Environment, Airport Authority of India (AAI).

PLANT SET UP FOR FINAL PRODUCT

Yes



Large capacity (500 kg/day) food waste biogas plant installed at Trivandrum International airport.

IPR STATUS DETAILS (PATENTS/COPYRIGHT/TRADEMARK SECURITY IN INDIA/ABROAD)

No

POTENTIAL MARKET/TECHNO-ECONOMICS

General organic waste treatment.

ENVIRONMENTAL SAFETY CERTIFICATION

Environmental safety aspect addressed and documented.

NODAL SCIENTIST DETAILS

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Mobile: +91 9447386706

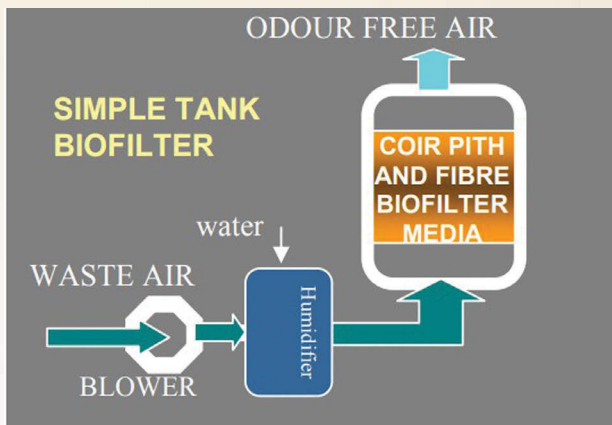
194. BIOFILTER: TECHNOLOGY FOR INDUSTRIAL ODOUR CONTROL

UID: TECH-THEME_5_NIIST-045

LABORATORY OF ORIGIN | CSIR-NIIST, THIRUVANANTHAPURAM

EXECUTIVE SUMMARY

Biofilter technology developed by CSIR-NIIST is unique for treatment of odorous gaseous stream. CSIR-NIIST undertakes careful study of customer requirements before design of the odour control system. NIIST Biofilter technology has been implemented in various industries i.e., shrimp feed plants, fish meal plants, gelatine factory, bone meal factory, composting plant etc. NIIST high-performance, low-cost BIOFILTER MEDIA (US Pat. 6,696,284) has special characteristics like provides moisture, provides support of growth, provides nutrients, provides neutralising agents, low pressure drop, high water holding capacity, enables mass transfer of contaminants from air to microbes, green and eco-friendly material, long life.



KEYWORDS

Odorous emissions, Odor nuisance, Deodorization, Biofiltration, Gaseous emissions

SALIENT FEATURES

High-performance.
Low-cost BIOFILTER MEDIA.
Very low pressure drop.
Quick start-up of activity.
High water holding capacity.
Long life and green eco-friendly material.

APPLICATIONS

Biofilter technology, Industrial water odour control system.

TECHNOLOGY BENCHMARKING

Yes

TECHNOLOGY READINESS LEVEL ASSESSMENT

TRL assessment is 9

SCALE OF DEVELOPMENT

Deployed

STATUS OF COMMERCIALIZATION

Yes

TENTATIVE COST OF DEVELOPMENT

₹ 45 Lakhs

INDUSTRIAL PARTNERS

M/s Elixir Enviro Systems Pvt. Ltd., Alappuzha.

A.P. Engineers, Plot no. C2, SIPCOT Perundurai, Erode, 638052, Tamil Nadu.

IPR STATUS DETAILS (PATENTS/COPYRIGHT/TRADEMARK SECURITY IN INDIA/ABROAD)

Yes, Patent No:US6696284B2.

PLANT SET UP FOR FINAL PRODUCT

Yes

POTENTIAL MARKET/TECHNO-ECONOMICS

Chemical manufacture, food processing, animal farms, sewage treatment, waste oil recycling, pharmaceutical, composting unit, Flavours and fragrances, polyester production, asphalt manufacture, printing.

ENVIRONMENTAL SAFETY CERTIFICATION

Environment safety aspect addressed and documented.

NODAL SCIENTIST DETAILS

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195. BFBR: A HIGH-RATE ANAEROBIC REACTOR FOR COMPLEX WASTEWATER TREATMENT

UID: TECH-THEME_5_NIIST-046

LABORATORY OF ORIGIN | CSIR-NIIST, THIRUVANANTHAPURAM

EXECUTIVE SUMMARY

The Buoyant Filter Bioreactor (BFBR) has designed for treatment of high strength complex wastewater. BFBR converts wastewater containing a high ratio of suspended COD to total COD. Suspended organic materials that contribute to an aerobically degradable COD include starches and complex carbohydrates, proteins, fats and oils. Conventional high-rate anaerobic reactors are not efficient at retaining suspended COD. Unlike in conventional high-rate UASB, the BFBR has a high efficiency retention mechanism with forced cleaning system to retain both suspended solids and biomass, and thus achieve high efficiency for wastewaters with suspended COD.

The high velocity backflow is created by periodic release of gas accumulated in the reactor (US Pat. 6592751), thereby avoiding extra pumping systems and power consumption. BFBR system has been customised and installed in different rice mill and ice-cream factories as per the effluent capacity.

KEYWORDS

Activated Sludge Process (ASP), BFBR, COD, Complex wastewater, Hydraulic Retention Time (HRT).

SALIENT FEATURES

Unlike in conventional high-rate UASB, the BFBR has a high efficiency retention mechanism with forced cleaning system to retain both suspended solids and biomass, and thus achieve high efficiency for wastewaters with suspended COD. The high velocity backflow is created by periodic release of gas accumulated in the reactor. thereby avoiding extra pumping systems and power consumption. BFBR system has been customised and installed in different rice mill and ice-cream factories as per the effluent capacity.

APPLICATIONS

Wastewater treatment

TECHNOLOGY BENCHMARKING

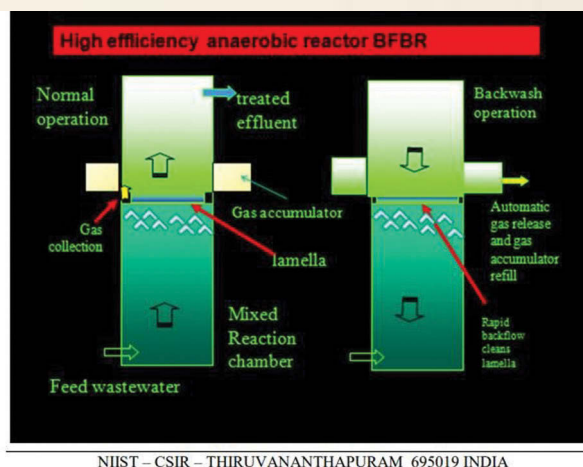
Yes

TECHNOLOGY READINESS LEVEL ASSESSMENT

TRL assessment is 9

SCALE OF DEVELOPMENT

Deployed in rice mill, 14 has installed.



STATUS OF COMMERCIALIZATION

Commercialized

TENTATIVE COST OF DEVELOPMENT

₹ 70 Lakhs

INDUSTRIAL PARTNERS

Galaxy Environ. Pvt. Ltd.

POTENTIAL MARKET/TECHNO-ECONOMICS

Ice cream factory, Rice mil, dairy industries, coconut processing industries, hotel, hospital, etc.

IPR STATUS DETAILS (PATENTS/COPYRIGHT/TRADEMARK SECURITY IN INDIA/ABROAD)

US PAT. 6592751.

ENVIRONMENTAL SAFETY CERTIFICATION

Environmental safety aspects address and documented.

PLANT SET UP FOR FINAL PRODUCT:

Yes

NODAL SCIENTIST DETAILS

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Sr. Scientist

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BFBR under construction for rice-mill effluent. Licensee: Galaxy Environ. Pvt. Ltd.



BF BR installed in ice-cream factory



BFBR with double membrane gas holder. Licensee: Galaxy Environ Pvt. Ltd.

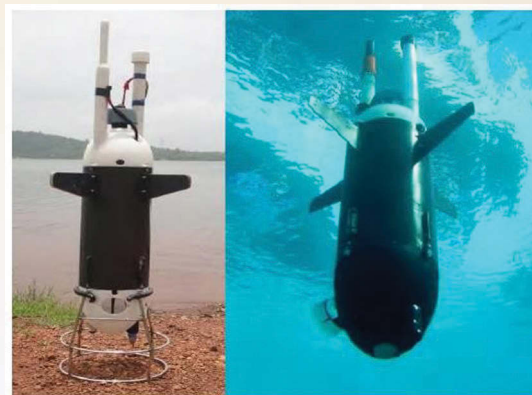
196. AUTONOMOUS VERTICAL PROFILER (AVP) FOR PROFILING COASTAL WATERS

UID: TECH-THEME_5_NIO-047

LABORATORY OF ORIGIN | CSIR-NIO, GOA

EXECUTIVE SUMMARY

Observing technology for coastal spaces is an important component of the Ocean observing system. The product 'Autonomous Vertical Profiler' (AVP) was developed at CSIR-NIO, Goa. This invention obviates the drawbacks experienced in most profiling system by incorporating constant velocity control in profiler motion by a user set value. This new feature will result in clean non-corrupted data records at the surface and through the entire transect of the profiler motion. This is shown to be achieved here by an on-board controller system that receives a reference input from a speed sensor on the profiler, and automatically adjusts the revolutions per minute (rpm) to a small thruster motor riding piggy-back on one end-cap of the present profiler.



'Autonomous Vertical Profiler' (AVP)

KEYWORDS

Vertical profiler, Environmental monitoring, Water parameters

SALIENT FEATURES

This invention obviates the drawbacks experienced in most profiling system by incorporating constant velocity control in profiler motion by a user set value.

APPLICATIONS

Ocean observation system, Satellite validation, Fisheries research, Oceanography etc.

TECHNOLOGY BENCHMARKING

Yes

TECHNOLOGY READINESS LEVEL ASSESSMENT

TRL assessment is 9

SCALE OF DEVELOPMENT

Developed and tested in all aspects.

STATUS OF COMMERCIALIZATION

Yes

TENTATIVE COST OF DEVELOPMENT

₹ 198.54 Lakhs

4.5 ECOLOGY, ENVIRONMENT, EARTH AND OCEAN SCIENCES AND WATER (E3OW)**INDUSTRIAL PARTNERS**

Yes, Technology has been transferred to M/s Control Technologies, engaluru.

PLANT SET UP FOR FINAL PRODUCT

Yes, commission 2 units of industrial grade hybrid Radiation Monitors- Autonomous Vertical Profiler (ERM- AVP) by CT control Technology (India Pvt. Ltd., Bengluru, using expertise available BARC, Mumbai).

IPR STATUS DETAILS (PATENTS/COPYRIGHT/TRADEMARK SECURITY IN INDIA/ABROAD)

US Patent No.US 6,786,087 B2, dated: Sep.7, 2004.

POTENTIAL MARKET/TECHNO-ECONOMICS

Yes, defense

ENVIRONMENTAL SAFETY CERTIFICATION

Runs on rechargeable batteries. Eco- friendly material used for construction.

NODAL SCIENTIST DETAILS

Shri R. Madhan

Sr. Principal Scientist & Head Marine Instrumentation Division

CSIR-National Institute of Oceanography

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197. CONTROLLED THRUSTER DRIVEN AUTONOMOUS UNDER WATER VEHICLES (AUV) FOR OCEANOGRAPHIC EXPLORATION AND PROFILING

UID: TECH-THEME_5_NIO-048

LABORATORY OF ORIGIN | CSIR-NIO, GOA

EXECUTIVE SUMMARY

This under water vehicle issued for Oceanographic in-situ data collection. It is fully autonomous, pre-programme dimension, easy to operate through a user friendly GUI. Length 1.8 m, diameter 0.23 m, depth range 200 m, nominal speed 1.5 m/s, endurance ~6 hrs. Science payloads: CTD sensor, Chlorophyll sensor, Oxygen sensor, radiometers. Runs on rechargeable batteries. Environment friendly material used for construction.

KEYWORDS

Under water vehicle, Oceanographic data, Water parameters

SALIENT FEATURES

Fully autonomous, pre-programmed missions, easy to operate through a user friendly GUI. Length 1.8 m, diameter 0.23 m, depth range 200 m, nominal speed 1.5 m/s, endurance ~6 hrs. Science payloads: CTD sensor, Chlorophyll sensor, Oxygen.

APPLICATIONS

Oceanographic in-situ data collection.

TECHNOLOGY BENCHMARKING

Yes

TECHNOLOGY READINESS LEVEL ASSESSMENT

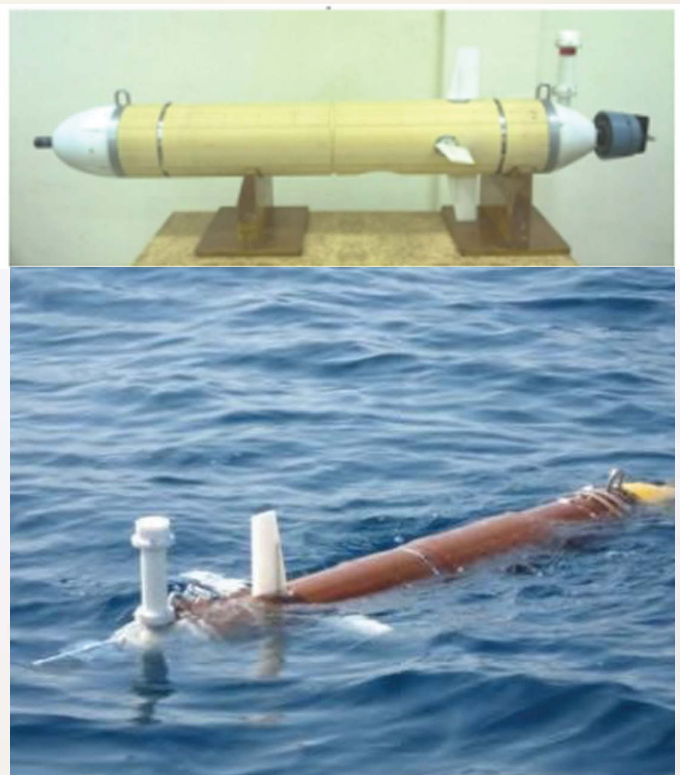
TRL assessment is 8

SCALE OF DEVELOPMENT

Prototype has developed and tested successfully in all aspects in actual field.

STATUS OF COMMERCIALIZATION

Commercialized



TENTATIVE COST OF DEVELOPMENT

₹ 106.09 Lakhs

INDUSTRIAL PARTNERS

Technology Transferred to M/s VEA Coimbatore and M/s L&T Mumbai.

PLANT SET UP FOR FINAL PRODUCT

No

IPR STATUS DETAILS (PATENTS/COPYRIGHT/TRADEMARK SECURITY IN INDIA/ABROAD)

No

POTENTIAL MARKET/TECHNO-ECONOMICS

This technology is useful for Oceanographic in-situ data collection.

ENVIRONMENTAL SAFETY CERTIFICATION

Environmental Safety Aspect addressed.

NODAL SCIENTIST DETAILS

Shri R. Madhan

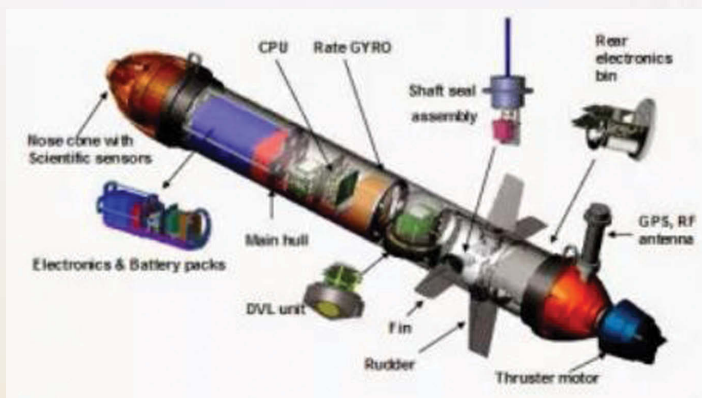
Sr. Principal Scientist & Head Marine Instrumentation Division

CSIR-National Institute of Oceanography

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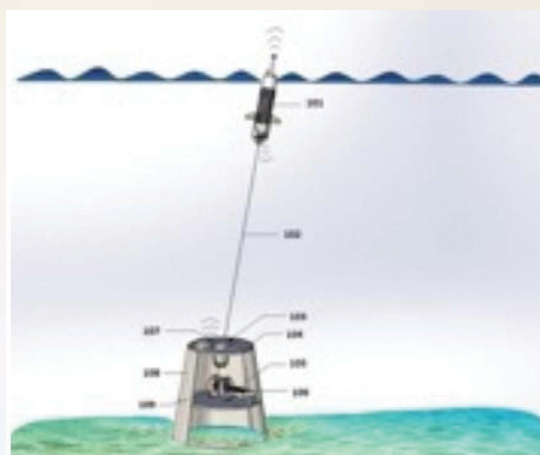
198. A SEABED RESIDENT EVENT DRIVEN PROFILING SYSTEM FOR USE IN COASTAL WATERS

UID: TECH-THEME_5_NIO-049

LABORATORY OF ORIGIN | CSIR-NIO, GOA

EXECUTIVE SUMMARY

The present invention on ‘A Seabed Resident Event-driven Profiling System for use in Coastal Waters’ describes an autonomous robotic system that is located on the seabed of the coast. The movable component of this system consists of a re-configured inverted version of the thruster driven profiler (AVP) that was described in US Patent 6,786,087. The present thruster driven inverted profiler (named iAVP) like the AVP is positively buoyant but carries an acoustic transponder and standard oceanographic sensors on its hull to measure water column properties in its upward ascent from the seabed to the sea surface. The fixed component of the system is a sea winch ensconced within an anchored truncated conical framework residing on the seabed, and connected to the iAVP by an neutrally buoyant monofilament line. The framework accommodates a winch, winch control electronics, pressure, temperature, tilt sensors, sea batteries and an acoustic transponder that is used to acoustically communicate with the inverted profiler.



Source: Mascarenhas et al. IEEE, 2016

KEYWORDS

Seabed, Coastal water, Robotic system

SALIENT FEATURES

The present invention on ‘A Seabed Resident Event-driven Profiling System for use in Coastal Waters’ describes an autonomous robotic system that is located on the seabed of the coast. The movable component of this system consists of a re-configured inverted version of the thruster driven profiler (AVP).

APPLICATIONS

Robotic system

TECHNOLOGY BENCHMARKING

Yes

TECHNOLOGY READINESS LEVEL ASSESSMENT

TRL assessment is 7

SCALE OF DEVELOPMENT

The prototype has demonstrated successfully in the actual field conditions and addressed all critical scaling issues.

STATUS OF COMMERCIALIZATION

Yes

Off Goa from 10th April to 15th May 2017.

Off Gujarat 5th Feb to 4th March 2018.

Off Goa from 15th June to 29th July 2018.

TENTATIVE COST OF DEVELOPMENT

₹ 487 Lakhs

INDUSTRIAL PARTNERS

Yes

IPR STATUS DETAILS (PATENTS/COPYRIGHT/TRADEMARK SECURITY IN INDIA/ABROAD)

Yes

POTENTIAL MARKET/TECHNO-ECONOMICS

The invention opens novel applications in environmental monitoring of monsoon processes, and also the strategic long-term surveillance of coastal waters.

ENVIRONMENTAL SAFETY CERTIFICATION

Environmental Safety aspects addressed.

NODAL SCIENTIST DETAILS

Shri R. Madhan

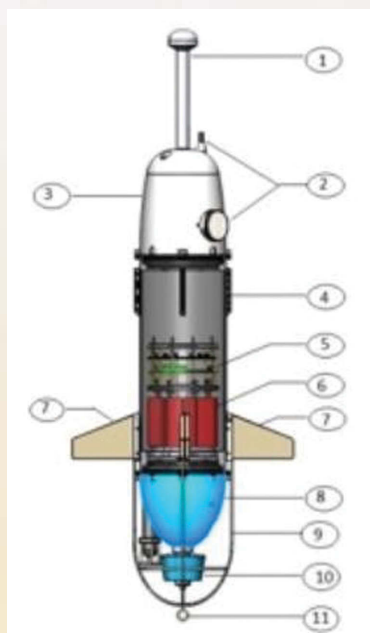
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Source: Mascarenhas et al. IEEE, 2016

199. ACOUSTICAL LIGHTWEIGHT INTERIOR DRY WALL PANEL FOR HIGH SOUND INSULATION (KNOW-HOW)

UID: TECH-THEME_5_NPL-050

LABORATORY OF ORIGIN | CSIR-NPL, NEW DELHI

EXECUTIVE SUMMARY

The main objective of this development is to develop a new partition panel with higher insulating value and higher STC rating value by involving new design & combinations and employing novel processing techniques. The acoustical characteristics of partition panel in theory are capable for providing extremely better values of sound transmission loss but these better values are not usually obtained in practice due to the presence of necessary sound bridges which often form a direct mechanical connection between the two panels that constitute the partition panel. By using CSIR-NPL developed panel it is possible to obtain transmission loss to provide an Sound Transmission Class (STC) rating of > 55 (by minimizing sound bridges and providing adequate cavity absorption), adequately high STC for an inter dwelling partition panel which is approx. 10 rating points higher than the standard staggered stud panel with little increase in total mass.

KEYWORDS

Noise pollution, Noise control, STC rating, Sound transmission loss, Sound pressure level

SALIENT FEATURES

New partition panel with higher insulating value and higher STC rating value by involving new design & combinations and employing novel processing techniques.

APPLICATIONS

Noise pollution control Device.

TECHNOLOGY BENCHMARKING

Yes

TECHNOLOGY READINESS LEVEL ASSESSMENT

TRL assessment is 9

SCALE OF DEVELOPMENT

Transferred to industry.

STATUS OF COMMERCIALIZATION

Transferred

TENTATIVE COST OF DEVELOPMENT

₹ 5 Lakhs

INDUSTRIAL PARTNERS

Yes

PLANT SET UP FOR FINAL PRODUCT

Not mentioned

IPR STATUS DETAILS (PATENTS/COPYRIGHT/TRADEMARK SECURITY IN INDIA/ABROAD)

No

POTENTIAL MARKET/TECHNO-ECONOMICS

- Residential and Commercial Buildings' owners in India.
- PVR halls and multiplexes' owners, etc.
- Wide range of users like architects, noise control engineers, builders, regulators, manufactures and consumers.
- Used for internal walls, and ceiling in hotels, restaurants, factory, shopping malls, cinemas, theatres, hospitals, airports, and school, universities constructions.

ENVIRONMENTAL SAFETY CERTIFICATION

Environmental Safety aspect addressed.

NODAL SCIENTIST DETAILS

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Dr. (Ms.) Kirti Soni
Principal Scientist
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CSIR-National Physical Laboratory (CSIR-NPL) has signed a Technology Licensing Agreement with "M/s Sehgal Doors, New Delhi" for commercialization of technology "Acoustical Lightweight Interior Dry Wall Panel for High Sound Insulation" on 05th November 2018, at CSIR-NPL, New Delhi.

200. NOISE ABSORPTIVE BARRIER (FOR METRO ABATEMENT) (KNOW-HOW)

UID: TECH-THEME_5_NPL-051

LABORATORY OF ORIGIN | CSIR-NPL, NEW DELHI

EXECUTIVE SUMMARY

The problem of sound in buildings and residential area through Metro, Railways, Highways, and Airports is growing nowadays. Noise barriers are the most effective method of the mitigating roadway, railway, metro, airport, and industrial noise sources – other than cessation of the source activity or use of source controls. The use of high-performance noise barriers is a growing requirement. CSIR-NPL has created a noise barrier that is easy to install, cost-effective to retrofit to existing facilities and reduces the noise substantially. Noise absorbing panels best meet these complex noise-control needs because it is absorbed rather than reflected into another area.

KEYWORDS

Noise pollution, Noise control, STC rating, Sound transmission loss, Sound pressure level

SALIENT FEATURES

Noise absorbing panel's best meet these complex noise-control needs because it is absorbed rather than reflected into another area.

APPLICATIONS

Noise barrier

TECHNOLOGY BENCHMARKING

Yes

TECHNOLOGY READINESS LEVEL ASSESSMENT

TRL assessment is 9

SCALE OF DEVELOPMENT

Transferred to industry

STATUS OF COMMERCIALIZATION

Transferred to industry

TENTATIVE COST OF DEVELOPMENT

₹ 5 Lakhs

INDUSTRIAL PARTNERS

Yes

PLANT SET UP FOR FINAL PRODUCT

No

4.5 ECOLOGY, ENVIRONMENT, EARTH AND OCEAN SCIENCES AND WATER (E3OW)

IPR STATUS DETAILS (PATENTS/COPYRIGHT/TRADEMARK SECURITY IN INDIA/ABROAD)

No

POTENTIAL MARKET/TECHNO-ECONOMICS

- Wide range of users like Architects, Noise Control Engineers etc.
- Residents, users of road, metro, railway infrastructures industries, regulators, manufactures and consumers etc.

ENVIRONMENTAL SAFETY CERTIFICATION

Environmental safety concern addressed and documented.

NODAL SCIENTIST DETAILS

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 Mobile: +91 9711154513



CSIR-National Physical Laboratory (CSIR-NPL) has signed a Technology Licensing Agreement with "M/s Reliable Diesel Engineers (P) Ltd. Faridabad – 121 003, Haryana" for commercialization of technology "Noise Absorptive barrier for Metro/ Railway/Highway/Airport Noise Abatement" on 4th September 2019, at CSIR-NPL, New Delhi.

201. PROCESS FOR THE PREPARATION OF ZINC PEROXIDE NANO-PARTICLES AND AN ANTIMICROBIAL AGENT AND PREPARATION THEREOF

UID: TECH-THEME_5_NPL-052

LABORATORY OF ORIGIN | CSIR-NPL, NEW DELHI

EXECUTIVE SUMMARY

Synthesis of nano material of desired size and indifferent medium is a very challenging task. The proposed material of desired size has been synthesized in solvent and water based matrix. We have utilized this material for water purification especially for arsenic, chromium, cyanide, pesticides and microbes removal from contaminated water. The material can be synthesized as per the requirement of industry. The synthesis process is low cost, eco friendly.

KEYWORDS

Antimicrobial agent for water purification industries, Paint, Cement, Wall putty, Agriculture

SALIENT FEATURES

Material for water purification especially for arsenic, chromium, cyanide, pesticides and microbes removal from contaminated water.

APPLICATIONS

Water Purification

TECHNOLOGY BENCHMARKING

Yes

TECHNOLOGY READINESS LEVEL ASSESSMENT

TRL assessment is 7

SCALE OF DEVELOPMENT

Material developed

STATUS OF COMMERCIALIZATION

Yes

TENTATIVE COST OF DEVELOPMENT

₹ 5 Lakhs

INDUSTRIAL PARTNERS

Yes

PLANT SET UP FOR FINAL PRODUCT

No

4.5 ECOLOGY, ENVIRONMENT, EARTH AND OCEAN SCIENCES AND WATER (E3OW)

IPR STATUS DETAILS (PATENTS/COPYRIGHT/TRADEMARK SECURITY IN INDIA/ABROAD)

Patented (PATENTNO.US8,715,612:2013), (PATENTNO.IN1338 DEL2014)

POTENTIAL MARKET/TECHNO-ECONOMICS

Industries related to water purification for decontaminated of arsenic, chromium, cyanide, pesticides and microbes, agriculture production (to control spore germination in wheat: *Bipolaris sorokiniana*).

ENVIRONMENTAL SAFETY CERTIFICATION

Environmental safety concern addressed.

NODAL SCIENTIST DETAILS

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202. ENVIRONMENTAL CONDITIONS MONITORING DEVICE

UID: TECH-THEME_5_NPL-053

LABORATORY OF ORIGIN | CSIR-NPL, NEW DELHI

EXECUTIVE SUMMARY

Environmental conditions play vital role in the metrological and calibration laboratories. These conditions have direct impact on the sensors, transducers and other metrological standards. Recently CSIR-National Physical Laboratory, India has indigenously developed, high precision environment monitoring device. The environment monitoring device has the capability to continuously monitor and record the ambient temperature, barometric pressure, relative humidity and air density.

KEYWORDS

Environmental conditions, Humidity, Barometric pressure, Temperature, Metrology, Calibration

SALIENT FEATURES

Indigenously developed, high precision environment monitoring device. The environment monitoring device has the capability to continuously monitor and record the ambient temperature, barometric pressure, relative humidity and air density.

APPLICATIONS

Environmental condition monitoring device.

TECHNOLOGY BENCHMARKING

Yes

TECHNOLOGY READINESS LEVEL ASSESSMENT

TRL assessment is 7

SCALE OF DEVELOPMENT

Yes

STATUS OF COMMERCIALIZATION

Yes

TENTATIVE COST OF DEVELOPMENT

₹ 0.2 Lakhs

INDUSTRIAL PARTNERS

No

PLANT SET UP FOR FINAL PRODUCT

No

IPR STATUS DETAILS (PATENTS/COPYRIGHT/TRADEMARK SECURITY IN INDIA/ABROAD)

No

4.5 ECOLOGY, ENVIRONMENT, EARTH AND OCEAN SCIENCES AND WATER (E3OW)

POTENTIAL MARKET/TECHNO-ECONOMICS

Required in each calibration laboratory.

ENVIRONMENTAL SAFETY CERTIFICATION

Environmental safety concern addressed and documented.

NODAL SCIENTIST DETAILS

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Sr. Principal Scientist

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203. PM2.5 SAMPLER PATENT/KNOW-HOW UPDATE)

UID: TECH-THEME_5_NPL-054

LABORATORY OF ORIGIN | CSIR-NPL, NEW DELHI

EXECUTIVE SUMMARY

A high volume PM2.5 impactor sampler is developed. This impactor can segregate particulate matter >2.5 micron size and facilitate to collect ≤ 2.5 micron size particles suspended in ambient air on filter size (8 × 10) inch. The impactor is designed for sampling air with a high flow rate (1.13m³/min, i.e. 40 CFM). Also, the design of this impactor is made such as a retrofit on the filter holder of conventional high-volume total suspended particulate matter (TSPM) sampler to make it high-volume PM2.5 sampler.

KEYWORDS

PM2.5, High-volume sampler, Impactor, Air monitoring

SALIENT FEATURES

A high volume PM2.5 impactor sampler is developed. This impactor can segregate particulate matter >2.5 micron size and facilitate to collect ≤ 2.5 micron size particles suspended in ambient air on filter size (8 × 10) inch. The impactor is designed for sampling air with a high flow rate (1.13m³/min, i.e. 40 CFM). Also, the design of this impactor is made such as a retro fit on the filter holder of conventional high-volume Total Suspended Particulate Matter (TSPM) sampler to make it high-volume PM2.5 sampler.

APPLICATIONS

Air pollution

TECHNOLOGY BENCHMARKING

Yes

TECHNOLOGY READINESS LEVEL ASSESSMENT

TRL assessment is 9

SCALE OF DEVELOPMENT

Developed. After prototype, a full scale sampler was developed for its performance evaluation.

STATUS OF COMMERCIALIZATION

YES, It is commercially available at <http://envsolutions.in/>

TENTATIVE COST OF DEVELOPMENT

₹ 10 Lakhs

INDUSTRIAL PARTNERS

Yes



4.5 ECOLOGY, ENVIRONMENT, EARTH AND OCEAN SCIENCES AND WATER (E3OW)

PLANT SET UP FOR FINAL PRODUCT

No

IPR STATUS DETAILS (PATENTS/COPYRIGHT/TRADEMARK SECURITY IN INDIA/ABROAD)

Patented, Patent 2179US329.

POTENTIAL MARKET/TECHNO-ECONOMICS

Apart from regulatory sampling with high accuracy of data, this PM2.5 sampler is very useful especially where the extensive offline chemical analysis of filter samples is needed for source apportionment studies or analysis of bioassay, diurnal studies, and air sampling where the mass concentration of particles is very low, e.g. marine, polar regions, most of the rural sites, etc. Therefore, it has wide potential starting from stakeholders such as academia, regulatory agencies, research institutes, hospitals to remote monitoring regions.

ENVIRONMENTAL SAFETY CERTIFICATION

Environment safety aspects addressed.

NODAL SCIENTIST DETAILS

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204. RECYCLING OF PLASTIC WASTE INTO TILES FOR SOCIETAL USAGE

UID: TECH-THEME_5_NPL-055

LABORATORY OF ORIGIN | CSIR-NPL, NEW DELHI

EXECUTIVE SUMMARY

Disposal of Plastic Waste is a big problem. It is non-biodegradable and it mainly consists of polyethylene bags (LDPE), plastic bottles and other plastic scrap. Burning of these plastics causes environmental pollution. The main objective of present technology is to utilize waste plastic scrap consisting of LDPE, HDPE and PP and fabricate paver tiles, roof tiles and interlock floor tiles and design structure which can be used in making structures.

KEYWORDS

Waste Plastic Management, Pavertiles, LDPE, PP, HDPE

SALIENT FEATURES

Utilize waste plastic scrap consisting of LDPE, HDPE and PP and fabricate paver tiles, roof tiles and interlock floor tiles and design structure which can be used in making structures.

APPLICATIONS

Tilesmaking

TECHNOLOGY BENCHMARKING

Yes

TECHNOLOGY READINESS LEVEL ASSESSMENT

TRL assessment is 7

SCALE OF DEVELOPMENT

7 industries have taken our technology in India.

STATUS OF COMMERCIALIZATION

Yes

TENTATIVE COST OF DEVELOPMENT

₹ 5 Lakhs

INDUSTRIAL PARTNERS

Yes

PLANT SET UP FOR FINAL PRODUCT

No

IPR STATUS DETAILS (PATENTS/COPYRIGHT/TRADE MARK SECURITY IN INDIA/ABROAD)

Patented

4.5 ECOLOGY, ENVIRONMENT, EARTH AND OCEAN SCIENCES AND WATER (E3OW)

POTENTIAL MARKET/TECHNO-ECONOMICS

7 industries have taken our technology in India. Organisation is in negotiations with more industries in India and abroad for transferring the technology. Technology was selected in Smart Fifty innovations by DST & IIM Kolkata.

ENVIRONMENTAL SAFETY CERTIFICATION

Environmental Safety Aspect addressed.

NODAL SCIENTIST DETAILS

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205. HOLLOW FIBER ULTRAFILTRATION MEMBRANE MANUFACTURING TECHNOLOGY

UID: TECH-THEME_5_CSMCRI-056

LABORATORY OF ORIGIN | CSIR-CSMCRI, BHAVNAGAR

EXECUTIVE SUMMARY

CSIR-CSMCRI has successfully developed technology for manufacturing hollow fiber ultrafiltration membranes having discrete Molecular Weight Cut Off (MWCO) values from polymers like polysulphone, poly(acrylonitrile-co-methacrylic acid), polysulphone – polyacrylonitrile blend and polysulfone-sulfonated polystyrene-divinylbenzene copolymer.

KEYWORDS

Hollow Fibre spinning process, Module fabrication, Characterization and Performance evaluation, Water purification

SALIENT FEATURES

CSIR-CSMCRI has successfully developed technology for manufacturing hollow fiber ultrafiltration membranes having discrete Molecular Weight Cut Off (MWCO) values from polymers like polysulphone, poly(acrylonitrile-co-methacrylic acid), polysulphone – polyacrylonitrile blend and polysulfone-sulfonated polystyrene-divinylbenzene copolymer.

APPLICATIONS

Water Purification membrane technology.

TECHNOLOGY BENCHMARKING

Yes

TECHNOLOGY READINESS LEVEL ASSESSMENT

TRL assessment is 9

SCALE OF DEVELOPMENT

It is indigenously developed IPR protected technology.

STATUS OF COMMERCIALIZATION

Commercial product available in the market. Technology has been licensed to M/s Uniqflux Membranes LLP, Pune and commercialized.

TENTATIVE COST OF DEVELOPMENT

₹ 30 Lakhs

INDUSTRIAL PARTNERS

Yes

PLANT SET UP FOR FINAL PRODUCT

No

4.5 ECOLOGY, ENVIRONMENT, EARTH AND OCEAN SCIENCES AND WATER (E3OW)

IPR STATUS DETAILS (PATENTS/COPYRIGHT/TRADEMARK SECURITY IN INDIA/ABROAD)

Patented. (US9364797, IN2178DEL2010, EP2616168 (A1), JP5933557 (B2), WO2012035402).

POTENTIAL MARKET/TECHNO-ECONOMICS

It is indigenously developed IPR protected technology, (US9364797, IN2178DEL2010, EP2616168 (A1), JP5933557 (B2), WO2012035402) which is much cheaper than the commercial product available in the market. Technology has been licensed to M/s Uniqflux Membranes LLP, Pune and commercialized.

ENVIRONMENTAL SAFETY CERTIFICATION

Environmental safety aspect addressed.

NODAL SCIENTIST DETAILS

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206. TECHNOLOGY FOR THE MANUFACTURING OF THIN FILM COMPOSITE REVERSE OSMOSIS MEMBRANE FOR DESALINATION AND WATER PURIFICATION

UID: TECH-THEME_5_CSMCRI-057

LABORATORY OF ORIGIN | CSIR-CSMCRI, BHAVNAGAR

EXECUTIVE SUMMARY

Technology for the preparation of flat sheet ultrafiltration membrane and antifouling, high flux and high salt rejecting Thin Film Composite (TFC) Reverse Osmosis (RO) membrane for brackish water and seawater desalination has been developed. The ultrafiltration membrane is used as the base for TFC membrane and can also be used for water purification and disinfection purpose where desalination is not required. This technology relates to the indigenous development of process for converting brackish- and seawater into potable water by membrane desalination. The developed process describes the stepwise conversion of raw materials into final products, i.e., thin film composite brackish water and seawater desalination membranes, and modules. Membrane performance, stability, antifouling property and rejection efficiency are similar to the standard commercial membranes. The technology for brackish water desalination has been commercialized and the products are already in the market. The IP of the technology is protected (US10384171, EP2922617 (A1), WO2014080426, DEL201911023080).

KEYWORDS

Thin film composite reverse osmosis membrane, Water desalination, Modules, Antifouling property, Drinking

SALIENT FEATURES

The technology for brackish water desalination has been commercialized and the products are already in the market.

APPLICATIONS

Water Purification

TECHNOLOGY BENCHMARKING

Yes

TECHNOLOGY READINESS LEVEL ASSESSMENT

TRL assessment is 9

SCALE OF DEVELOPMENT

Brackish water modules of different sizes are available in the market

STATUS OF COMMERCIALIZATION

Yes

TENTATIVE COST OF DEVELOPMENT

₹ 300 Lakhs

4.5 ECOLOGY, ENVIRONMENT, EARTH AND OCEAN SCIENCES AND WATER (E3OW)

INDUSTRIAL PARTNERS

Yes, Uniq flux, Pune Rinzei Hydrotech, Ahmedabad and Omtech, Rajkot.

PLANT SET UP FOR FINAL PRODUCT

Technology was demonstrated at 100 square meter batch, membrane modules were tested in field condition.

IPR STATUS DETAILS (PATENTS/COPYRIGHT/TRADEMARK SECURITY IN INDIA/ABROAD)

Patented

POTENTIAL MARKET/TECHNO-ECONOMICS

Use of water from unconventional source such as high saline water, and contaminated water is essential due to crisis of fresh and drinking water. All the desalination plant including seawater desalination uses thin film composite reverse osmosis membrane based filtration modules. The reverse osmosis membrane technology has huge market potential in India and over the world. The projected India's desalination plant market is 2.83 billion US\$ in 2021. Few international companies like, Dow Filmtech, Nittodinko, and Hydranautics dominate the water desalination and purification market.

ENVIRONMENTAL SAFETY CERTIFICATION

Environmental safety aspect has been addressed.

NODAL SCIENTIST DETAILS

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Chapter-4 4.6 Energy (Conventional and non-conventional) and energy devices (EED)

Introduction

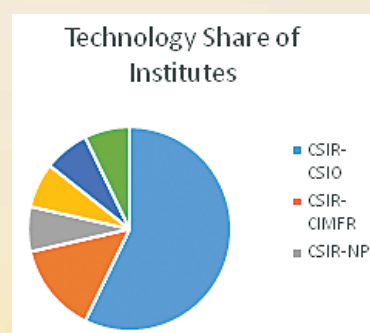
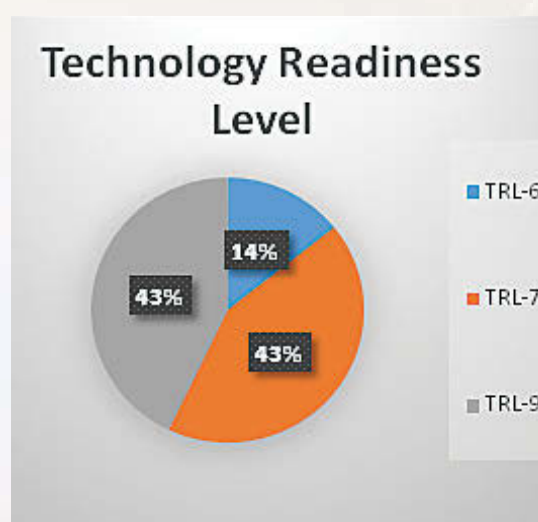
The theme “Energy- Conventional and non-conventional and energy devices” for the CSIR Technology compendium had fifteen technologies which were received for evaluation. As many as fourteen technologies were selected after evaluation for the compendium. Two technologies submitted at TRL-8 by technology developers were upscaled to TRL-9 as it fulfilled all the criteria for TRL-9. One technology which was initially self-assessed by technology Developer as TRL-7 was later self-assessed at TRL 4 and thus removed from the compendium.

Most technologies in the ENERGY theme, as many as eight in number, are from CSIR-Central Scientific Instruments Organisation (CSIR-CSIO) Chandigarh. This theme has two technologies from CSIR-Central Institute of Mining and Fuel Research (CSIR-CIMFR) Dhanbad while one technology each are from CSIR-National Physical Laboratory (CSIR-NPL), CSIR- National Institute for Interdisciplinary Science and Technology (CSIR-NIIST), CSIR-Indian Institute of Petroleum (CSIR-IIP) and CSIR-Central Glass and Ceramic Research Institute (CSIR-CGCRI).

The two scaled up technologies are both from CSIR-CSIO as both the products have been commercialised. As mentioned above, the technology which was scaled down by the Technology Developer and hence was not taken up for assessment of the TRL of the technology.

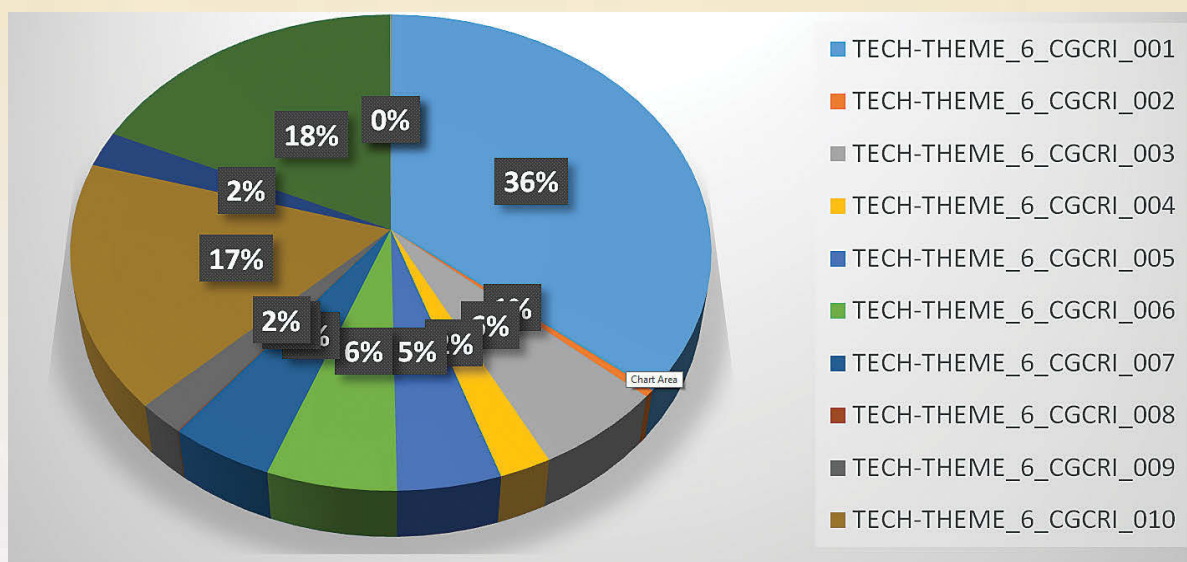
Assessment of technology readiness level:

The technologies were assessed at various levels based on various criteria followed at each level. A questionnaire was designed and circulated to the technology developers for their self-assessment based on the questionnaire. After a thorough evaluation at CSIR-NISTADS level, clarification from the technology developers was sought where-ever required. Experts in the field were invited to have a discussion of the TRL and finally assessed for the



4.6 ENERGY (CONVENTIONAL AND NON-CONVENTIONAL) AND ENERGY DEVICES (EED))

various readiness levels of the technologies. The Compendium includes the technologies from TRL 6 onwards only.



Major highlights

The two most promising technologies with-in the theme “Energy- Conventional and non-conventional and energy devices” based on expert committee evaluation were the Induction Motor Efficiency Monitoring System (IMEMS) by CSIR-CSIO, Chandigarh which has received Gold-Plate certificate and demonstrated in the Indian Navy and “Finger Gesture Based Control Module For Intelligent Patient Vehicle” also of CSIR-CSIO, Chandigarh which could be registered for “Aarogya Path” (a web-based solution for the healthcare supply chain that provides real-time availability of critical supplies launched). The two commercialised technologies CSIR-CIMFR were also very promising since they are already into production.

“An Improved Domestic Cooking Burner for PNG” developed by CSIR-IIP has market acceptance and hence a validation of the technology.

The “Air Conditioner Efficiency Meter (ACEMETER)” developed by CSIR-CSIO has a potential to extend the product to ‘Version 2’ by not limiting to window AC and developing for other similar products as suggested by experts.

As explained by the technology developer, the “Building Energy Management Software (BEMS)” by CSIR-CSIO has better features compared to other similar products available.

The CSIR-NIIST technology “Semi-Automatic Equipment’s For Large Area Dye-Sensitized Solar Module Fabrication” is promising from industry perspective since the solar power sector is a fast developing industry with lots of scope for improvement and innovations.

207. SPECIALTY OPTICAL FIBERS

UID: TECH-THEME_6_CGCRI-001

LABORATORY OF ORIGIN | CSIR-CGCRI, KOLKATA

EXECUTIVE SUMMARY

Now-a-days, specialty optical fibers are the driving force for development of different varieties of fiber optics based optical components and devices ranging from communications, oil and gas exploration to laser surgery, high power lasers, automotive and aerospace. Specialty optical fibers serve as a heart of any kind of fiber optic based devices such as fiber laser, optical fiber amplifier, broad band light source etc. In India, CSIR-CGCRI is only R & D Lab involved towards development of different specialty optical fibers for optical amplifier, fiber laser, broad-band sources etc. CGCRI has developed erbium doped single mode fiber for low power optical amplifier, Er/Yb codoped double clad fiber for high power optical amplifier, Non-linear Photonic Crystal fiber for broad-band sources, Double clad Ytterbium doped fiber for high power fiber laser at 1064nm as per International standard. CSIR-CGCRI sold more than 15.0 km of erbium doped fiber to its industrial partner M/s. SFO Technologies Pvt. Ltd. Cochin, Kerala for development of EDFA module and ready to make any kind of custom designed based specialty optical fibers.



KEYWORDS

Fiber laser, Optical fiber, Highpower laser, Optical amplifier, Laser surgery

SALIENT FEATURES

High power fiber lasers at operating wavelength of 1064nm; for PCF, supercontinuum generation in visible and mid-IR regions; high power beam delivery by hollow core PCFs.

APPLICATIONS

Optical communication, Lasers for strategic applications, Supercontinuum light sources.

TECHNOLOGY BENCHMARKING

The technology is benchmarked with similar technologies

TECHNOLOGY READINESS LEVEL ASSESSMENT

TRL assessment is 7

SCALE OF DEVELOPMENT

The Pilot scale demonstration in the field conditions is successfully done and the technology prototype has been tested in the actual field conditions and addressed all the critical scaling issues and available for licensing.

STATUS OF COMMERCIALIZATION

Under commercialization in partnership with industry (Specify about the sales etc.)

4.6 ENERGY (CONVENTIONAL AND NON-CONVENTIONAL) AND ENERGY DEVICES (EED))

TENTATIVE COST OF DEVELOPMENT

₹ 150 Lakhs

INDUSTRIAL PARTNERS

M/s SFO Technologies Pvt. Ltd. Cochin, Kerala

PLANT SET UP FOR FINAL PRODUCT

Not yet

IPR STATUS DETAILS (PATENTS/COPYRIGHT/TRADEMARK SECURITY IN INDIA/ABROAD)

Patented.

POTENTIAL MARKET/TECHNO-ECONOMICS

Aerospace, Medical devices, Automotive, Communication.

ENVIRONMENTAL SAFETY CERTIFICATION

The safety aspects including environmental safety addressed and documented.

NODAL SCIENTIST DETAILS

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208. VEERA: VIRTUAL INTELLIGENCE TECHNIQUES FOR REHABILITATION

UID: TECH-THEME_6_CSIO-002

LABORATORY OF ORIGIN | CSIR-CSIO, CHANDIGARH

EXECUTIVE SUMMARY

VEERA is a virtual intelligent platform for motor rehabilitation of persons with disabilities. It combines experience from virtual reality and knowledge from machine intelligence to enhance neural reorganization that optimizes the physical rehabilitation outcomes in individuals with disability. It provides stimulating sensory feedback to promote motor learning and encompasses tools that help to understand the biology of disability. The degree of interaction during physiotherapy is maximized using virtual rehabilitation resulting better recovery & efficacy. The developed system consists of an in-house developed force platform, indigenous sensor and copyrighted software that help to improve balance and neuromuscular functions of persons undergoing physiotherapy. It also quantifies motor disability by presenting the individuals with situations/tasks that require use of groups of muscles and body parts as in conventional Function Reach Test in physiotherapy. The system is useful for the patients with condition ranging from musculoskeletal problems, stroke induced paralysis to cognitive deficits.

KEYWORDS

Virtual Rehabilitation, Cognitive, Neuro-muscular rehabilitation

SALIENT FEATURES

It combines experience from virtual reality and knowledge from machine intelligence to enhance neural reorganization that optimizes the physical rehabilitation outcomes in individuals with disability.

APPLICATIONS

The system is useful for the patients with condition ranging from musculoskeletal problems, stroke induced paralysis to cognitive deficits.

TECHNOLOGY BENCHMARKING

The technology is benchmarked with similar technologies.

TECHNOLOGY READINESS LEVEL ASSESSMENT

TRL assessment is 7

SCALE OF DEVELOPMENT

The Pilot scale demonstration in the field conditions is successfully done and the technology prototype has been tested in the actual field conditions and addressed all the critical scaling issues and available for licensing.

STATUS OF COMMERCIALIZATION

No

TENTATIVE COST OF DEVELOPMENT

₹ 2.0 Lakhs

4.6 ENERGY (CONVENTIONAL AND NON-CONVENTIONAL) AND ENERGY DEVICES (EED))

INDUSTRIAL PARTNERS

No

PLANT SET UP FOR FINAL PRODUCT

No

IPR STATUS DETAILS (PATENTS/COPYRIGHT/TRADEMARK SECURITY IN INDIA/ABROAD)

No

POTENTIAL MARKET/TECHNO-ECONOMICS

100 System in 05 years

ENVIRONMENTAL SAFETY CERTIFICATION

No

NODAL SCIENTIST DETAILS

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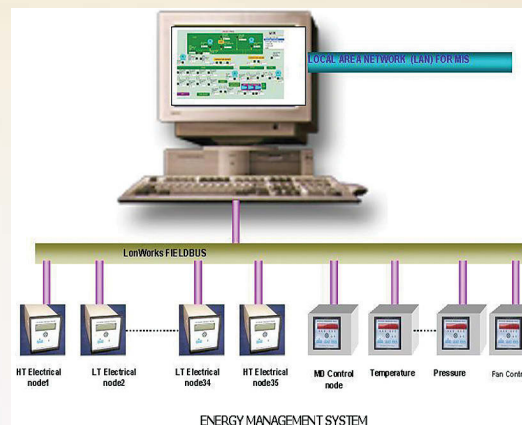
209. INDUSTRIAL ENERGY MANAGEMENT SYSTEM BASED ON LONWORKS TECHNOLOGY

UID: TECH-THEME_6_CSIO-003

LABORATORY OF ORIGIN | CSIR-CSIO, CHANDIGARH

EXECUTIVE SUMMARY

Developed Industrial Energy Management System based on LONWorks Technology monitors energy and other parameters (Nodes) in real time, stores the data, analyses the data for alarms, generates control and reports. This system is very useful for medium and large-scale industries and big Commercial establishments such as IT parks where the number of nodes are up to 4096. The WEB enabled system with user friendly GUI and can be easily upgraded to Industry 4.0. The developed system is a useful tool for maintenance and service people for evaluating the utilities by monitoring the energy data which gives an indication of health of the system. By proper maintenance and control, it has potential to save energy and avoids break downs by generating alarms in case of any abnormalities. The networking protocol is widely used for building automation systems.



KEYWORDS

Energy Management, Energy Saving, WEB Enabled System, Real Time Monitoring

SALIENT FEATURES

The WEB enabled system with user friendly GUI and can be easily upgraded to Industry 4.0.

APPLICATIONS

This system is very useful for medium and large-scale industries and big Commercial establishments such as IT parks where the number of nodes are up to 4096.

TECHNOLOGY BENCHMARKING

The technology is benchmarked with similar technologies.

TECHNOLOGY READINESS LEVEL ASSESSMENT

TRL assessment is 9

SCALE OF DEVELOPMENT

The industrial partner setup the plant for final product and the final product started selling into the market with the safety aspects addressed and documented.

STATUS OF COMMERCIALIZATION

Technology transferred two firms and it is under commercialization in partnership with industry.

TENTATIVE COST OF DEVELOPMENT

₹ 25 Lakhs

4.6 ENERGY (CONVENTIONAL AND NON-CONVENTIONAL) AND ENERGY DEVICES (EED))

INDUSTRIAL PARTNERS

M/s Vantedge IT Solutions, Bengaluru.

PLANT SET UP FOR FINAL PRODUCT

Not yet

IPR STATUS DETAILS (PATENTS/COPYRIGHT/TRADEMARK SECURITY IN INDIA/ABROAD)

No

POTENTIAL MARKET/TECHNO-ECONOMICS

200 system/year

ENVIRONMENTAL SAFETY CERTIFICATION

Nil

NODAL SCIENTIST DETAILS

Mr. G. S. Ayyappan

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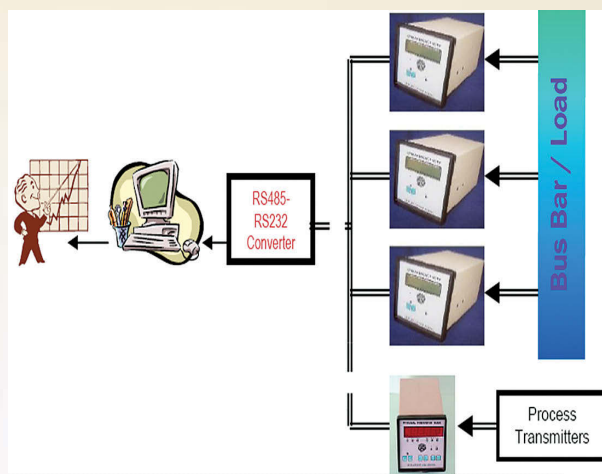
210. INDUSTRIAL ENERGY MANAGEMENT SYSTEM BASED ON MODBUS TECHNOLOGY

UID: TECH-THEME_6_CSIO-004

LABORATORY OF ORIGIN | CSIR-CSIO, CHANDIGARH

EXECUTIVE SUMMARY

Developed Industrial Energy Management System based on MODBUS Technology monitors energy and other parameters (Nodes) in real time, stores the data, analyses the data for alarms, generates control and reports. This system is very useful for small and medium scale industries and Commercial establishments as the number of nodes can be around 32. The data can be viewed online in the WEB portal with friendly GUI. The developed system is a useful tool for maintenance and service people for evaluating the utilities by monitoring the energy data which gives an indication of health of the system. By proper maintenance and control, it has potential to save energy and avoids breakdowns by generating alarms in case of any abnormalities.



KEYWORDS

Energy management, Energy saving, WEB enabled system, Real time monitoring

SALIENT FEATURES

The data can be viewed online in the WEB portal with friendly GUI

APPLICATIONS

The developed system is a useful tool for maintenance and service people for evaluating the utilities by monitoring the energy data which gives an indication of health of the system.

TECHNOLOGY BENCHMARKING

The technology is benchmarked with similar tech.

TECHNOLOGY READINESS LEVEL ASSESSMENT

TRL assessment is 9

SCALE OF DEVELOPMENT

The industrial partner setup the plant for final product and the final product started selling into the market with the safety aspects addressed and documented.

STATUS OF COMMERCIALIZATION

Under commercialization in partnership with industry.

TENTATIVE COST OF DEVELOPMENT

₹ 10 lakh

4.6 ENERGY (CONVENTIONAL AND NON-CONVENTIONAL) AND ENERGY DEVICES (EED))

INDUSTRIAL PARTNERS

M/s Industrial Controls & Drives (India) Pvt. Ltd., Chennai.

IPR STATUS DETAILS (PATENTS/COPYRIGHT/TRADEMARK SECURITY IN INDIA/ABROAD)
No

PLANT SET UP FOR FINAL PRODUCT

Not yet

POTENTIAL MARKET/TECHNO-ECONOMICS

200 system/year

ENVIRONMENTAL SAFETY CERTIFICATION

To be taken by the industry

NODAL SCIENTIST DETAILS

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211. INDUCTION MOTOR EFFICIENCY MONITORING SYSTEM (IMEMS)

UID: TECH-THEME_6_CSIO-005

LABORATORY OF ORIGIN | CSIR-CSIO, CHANDIGARH

EXECUTIVE SUMMARY

Induction motors are considered to be the largest users of electrical energy among all motors. Developed IMEMS uses current signature techniques to estimate efficiency of existing three phase induction motors in the field without removing the motors from the location. The developed system is a useful tool for maintenance persons to identify the motor's Best Operating Point (BOP) in order to conserve energy. Also helps in identifying the motors energy efficiency for refurbishment, replacement, rewinding etc. This helps to operate the motor around its best efficiency and also helps in preventive maintenance. The developed system has energy saving potential upto 5%.

KEYWORDS

Motor efficiency, Energy savings, Temperature, Power, Signal processing

SALIENT FEATURES

- Developed IMEMS uses current signature techniques to estimate efficiency of existing three phase induction motors in the field without removing the motors from the location.
- The developed system is a useful tool for maintenance persons to identify the motor's Best Operating Point (BOP) in order to conserve energy.
- Helps in identifying the motors energy efficiency for refurbishment, replacement, rewinding etc.

APPLICATIONS

Tool for maintenance persons to identify the motor's Best Operating Point (BOP) in order to conserve energy.

TECHNOLOGY BENCHMARKING

The technology is benchmarked with similar technologies.

TECHNOLOGY READINESS LEVEL ASSESSMENT

TRL assessment is 9

SCALE OF DEVELOPMENT

The industrial partner setup the plant for final product and the final product started selling into the market with the safety aspects addressed and documented.



4.6 ENERGY (CONVENTIONAL AND NON-CONVENTIONAL) AND ENERGY DEVICES (EED))**STATUS OF COMMERCIALIZATION**

Under commercialization in partnership with industry

TENTATIVE COST OF DEVELOPMENT

₹ 20 Lakhs

INDUSTRIAL PARTNERS

M/s Industrial Controls & Drives (India) Pvt. Ltd., Chennai, M/s Beta Technologies India Pvt. Ltd., Coimbatore.

PLANT SET UP FOR FINAL PRODUCT

Yes

IPR STATUS DETAILS (PATENTS/COPYRIGHT/TRADEMARK SECURITY IN INDIA/ABROAD)

No

POTENTIAL MARKET/TECHNO-ECONOMICS

100 units/year

ENVIRONMENTAL SAFETY CERTIFICATION

Yes

NODAL SCIENTIST DETAILS

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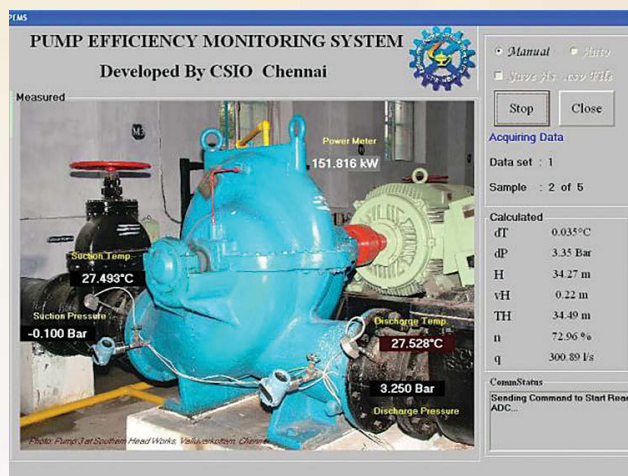
212. PUMP EFFICIENCY MONITORING SYSTEM (PEMS)

UID: TECH-THEME_6_CSIO-006

LABORATORY OF ORIGIN | CSIR-CSIO, CHANDIGARH

EXECUTIVE SUMMARY

CSIR-CSIO, Chennai Centre developed Pump Efficiency Monitoring System (PEMS) based on the thermodynamic principle using the latest state-of-art instrumentation. Onsite constraints often make it difficult to accurately measure pump efficiency under installed conditions by the same method that pump manufacturers traditionally use for works tests. This method does not use flow as a parameter and without detaching the pump from line with MODBUS Protocol for digital communication. The developed system has the potential to saves time and costs assessment of pumps in comparison with conventional methods. Online monitoring optimizes maintenance intervals and reduced plant shutdown periods etc.



Online monitoring optimizes maintenance intervals and reduced plant shutdown periods etc.

KEYWORDS

Pump efficiency, Power, Temperature, Pressure

SALIENT FEATURES

- The developed system has the potential to saves time and costs assessment of pumps in comparison with conventional methods.
- Online monitoring optimizes maintenance intervals and reduces plant shutdown periods etc

APPLICATIONS

All kind of water work

TECHNOLOGY BENCHMARKING

The technology is benchmarked with similar technologies.

TECHNOLOGY READINESS LEVEL ASSESSMENT

TRL assessment is 7

SCALE OF DEVELOPMENT

The Pilot scale demonstration in the field conditions is successfully done and the technology prototype has been tested in the actual field conditions and addressed all the critical scaling issues and available for licensing.

STATUS OF COMMERCIALIZATION

Technology has been transferred to industry.

TENTATIVE COST OF DEVELOPMENT

₹ 25 Lakhs

INDUSTRIAL PARTNERS

Names not available

PLANT SET UP FOR FINAL PRODUCT

Yes

IPR STATUS DETAILS (PATENTS/COPYRIGHT/TRADEMARK SECURITY IN INDIA/ABROAD)

No

POTENTIAL MARKET/TECHNO-ECONOMICS

Municipalities, Drinking water mission, Navy

ENVIRONMENTAL SAFETY CERTIFICATION

No

NODAL SCIENTIST DETAILS

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213. FINGER GESTURE BASED CONTROL MODULE FOR INTELLIGENT PATIENT VEHICLE

UID: TECH-THEME_6_CSIO-007

LABORATORY OF ORIGIN | CSIR-CSIO, CHANDIGARH

EXECUTIVE SUMMARY

In the modern world, due to lifestyle disorders, certain diseases and accidents, there are millions of disabled people worldwide who are suffering from partial to full body disabilities, which include motor-disability, due to which such people are unable to drive mobility aids without caregivers. The available solutions that Indian powered wheelchair manufactures are using are all imported joysticks based, very costly and not suitable for such persons. Finger gesture based alternative drive solution has been developed to address the needs of providing independent assistance to paraplegic people having weak upper limb due to which they are unable to drive a wheelchair. The developed alternate drive controller is an industry ready solution based upon finger gestures on the capacitive touch screen for manoeuvring the motorized wheelchair. It consists of an indigenous motion drive and controller incorporated with rear collision detection. It is an affordable drive solution in comparison of the imported version of general purpose drive controllers and it will significantly reduce cost of powered wheelchair manufacturing in India.



KEYWORDS

Mobility assistive devices

SALIENT FEATURES

Affordable and significantly reduces cost of powered wheelchair manufacturing in India.

APPLICATIONS

Medical devices

TECHNOLOGY BENCHMARKING

The technology is benchmarked with similar technologies.

TECHNOLOGY READINESS LEVEL ASSESSMENT

TRL assessment is 6

SCALE OF DEVELOPMENT

The product specification benchmarked with appropriate standards, successfully demonstrated to the intended user and the user satisfied with performance.

STATUS OF COMMERCIALIZATION

Under commercialization in partnership with industry.

4.6 ENERGY (CONVENTIONAL AND NON-CONVENTIONAL) AND ENERGY DEVICES (EED))

TENTATIVE COST OF DEVELOPMENT

₹ 20 Lakhs Approx.

INDUSTRIAL PARTNERS

M/s Pentagon Rugged Systems (India) Pvt. Ltd., Hyderabad.

PLANT SET UP FOR FINAL PRODUCT

Not yet

IPR STATUS DETAILS (PATENTS/COPYRIGHT/TRADEMARK SECURITY IN INDIA/ABROAD)

No details available

POTENTIAL MARKET/TECHNO-ECONOMICS

1000 Pcs per Year (projection)

ENVIRONMENTAL SAFETY CERTIFICATION

No yet

NODAL SCIENTIST DETAILS

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214. BUILDING ENERGY MANAGEMENT SOFTWARE (BEMS)

UID: TECH-THEME_6_CSIO-008

LABORATORY OF ORIGIN | CSIR-CSIO, CHANDIGARH

EXECUTIVE SUMMARY

Development BEMS can help to understand the energy consumption by maintaining the human comfort level at office or house. Development system is plug and play type and easily interface to residential, commercial and industrial sectors to monitor energy, analyses and control the loads as per the feedback.

KEYWORDS

Software, Building energy management, Energy monitoring

SALIENT FEATURES

Development system is plug and play type and easily interfaced to residential, commercial and industrial sectors to monitor energy, analyses and control the loads as per the feedback. Technology validated in the target environment and test results compared with expected results. The technology successfully demonstrated to the intended end user (Demonstrated and Installed in Intelligence building CSIR-CBRI). The intended user satisfied with the performance.

APPLICATIONS

Residential, Commercial and industrial

TECHNOLOGY BENCHMARKING

The technology is benchmarked with similar technologies and results compared with available product.

TECHNOLOGY READINESS LEVEL ASSESSMENT

TRL assessment is 6

SCALE OF DEVELOPMENT

The product specification benchmarked with appropriate standards, successfully demonstrated to the intended user and the user satisfied with performance.

STATUS OF COMMERCIALIZATION

No

TENTATIVE COST OF DEVELOPMENT

₹ 20,000/- for 2bhk, ₹ 30,000/- for 3bhk

INDUSTRIAL PARTNERS

N/A

PLANT SET UP FOR FINAL PRODUCT

Not yet

IPR STATUS DETAILS (PATENTS/COPYRIGHT/TRADEMARK SECURITY IN INDIA/ABROAD)

No

POTENTIAL MARKET/TECHNO-ECONOMICS

50,000 devices/year

ENVIRONMENTAL SAFETY CERTIFICATION

Not yet

NODAL SCIENTIST DETAILS

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215. AN IMPROVED DOMESTIC COOKING BURNER FOR PNG

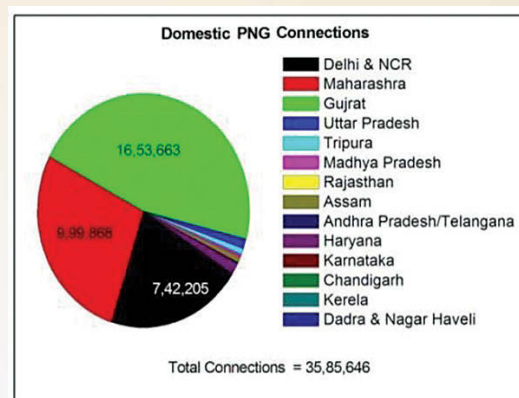
UID: TECH-THEME_6_IIP-009

LABORATORY OF ORIGIN | CSIR-IIP, DEHRADUN

EXECUTIVE SUMMARY

An energy efficient domestic cooking burner has been designed for Piped Natural Gas by CSIR-IIP, Dehradun with the financial support of PCRA, New Delhi. The designed burner has following salient features;

- 25% Improved Thermal Efficiency.
- Ensures safety against possible flame lift and flash back
- Avoids loss of fuel to atmosphere; unnecessary incremental GHG emissions.
- The burner is designed in capacities to cover the entire range of cooking burners prevailing in India.
- A non-exclusive license given to forty (40) stove/burner manufacturing companies in India.
- PNG stoves are available in all types and models (Glass-top, Steel Body, Three Burner, Four Burner etc.).
- Indian Patent Application No. 201711046975, 28 Dec, 2017 (Filed).
- PCT Patent Application No. PCT/IN2019/050482, 26 June, 2019 (Filed).
- Bangladesh Application No. 166/2019, 27 June, 2019 (Filed).
- Design Registration No. 303178, 5 March, 2018 (Granted).
- Exceeding the Specification of IS: 17153.



KEYWORDS

Energy efficiency, Domestic cooking burner, Piped natural gas, City gas distribution

SALIENT FEATURES

25% Improved Thermal Efficiency and Ensures safety against possible flame lift and flash back. Avoids loss of fuel to atmosphere; unnecessary incremental GHG emissions.

APPLICATIONS

Stove burner manufacturing companies.

TECHNOLOGY BENCHMARKING

The technology is benchmarked with similar technologies.

TECHNOLOGY READINESS LEVEL ASSESSMENT

TRL assessment is 9

SCALE OF DEVELOPMENT

The industrial partner setup the plant for final product and the final product started selling into the market with the safety aspects addressed and documented.

STATUS OF COMMERCIALIZATION

Non-exclusive license given to forty (40) stove/burner manufacturing companies in India.

4.6 ENERGY (CONVENTIONAL AND NON-CONVENTIONAL) AND ENERGY DEVICES (EED))

TENTATIVE COST OF DEVELOPMENT

₹ 9.0 Lakhs

INDUSTRIAL PARTNERS

Non-exclusive license given to forty (40) stove/burner manufacturing companies in India, list not available.

PLANT SET UP FOR FINAL PRODUCT

05 of manufacturing companies have started manufacturing the product and selling through online marketing platform.

IPR STATUS DETAILS (PATENTS/COPYRIGHT/TRADEMARK SECURITY IN INDIA/ABROAD)

All the safety measures as per IS 17153 have been addressed and documented (Application Ptent number 201711046975).

POTENTIAL MARKET/TECHNO-ECONOMICS

There are more than 50 lakh registered domestic PNG users in India under the City Gas Distribution (CDG) network of the country. There is an estimate of ₹ 4 Crores of new domestic PNG connection in coming 3 - 4 years. Besides this, there are many countries where Natural Gas is used as domestic cooking fuel e.g. Bangladesh, Middle East and African Countries. Therefore, it has a potential to be deployed in foreign countries also.

ENVIRONMENTAL SAFETY CERTIFICATION

All the safety measures as per IS 17153 have been addressed and documented.

NODAL SCIENTIST DETAILS

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216. SEMI-AUTOMATIC EQUIPMENT'S FOR LARGE AREA DYE-SENSITIZED SOLAR MODULE FABRICATION

UID: TECH-THEME_6_NIIST-010

LABORATORY OF ORIGIN | CSIR-NIIST, THIRUVANANTHAPURAM

EXECUTIVE SUMMARY

For the first time in the country, NIIST researchers and their industrial partner, M/s Elixir Technologies, Bangalore, succeeded in establishing an indigenous semi-automatic fabrication unit for manufacturing dye sensitized solar cell (DSC) based modules. CSIR-NIIST successfully indigenously developed the entire equipment's and optimized the fabrication process thereby developing international competency in this photovoltaic sector. Building integrated photovoltaics (BIPVs) can theoretically produce electricity at attractive costs by assuming both the function of energy generators and of construction materials. Of all the existing PV technologies Dye-sensitized Solar Cells/Modules (DSSC/DSMs) stand out to be the best technology that meet the above mentioned requirements to be used in BIPV sector.

Important parameters unique to this development:

- Indigenization of the process - Semi-automatic production line indigenously manufactured for the first time in the country in association with the industrial partner Elixir Technologies, Bangalore.
- 60-70% Cost reduction in module fabrication equipment in comparison with the imported ones by indigenization of technology.
- Capable of producing DSSC modules in 5×5, 10×10, 15×15 and 30×30 cm² sizes.
- Successfully licensed the knowhow to Elixir Technologies, Bangalore in October 2019.
- Presently Elixir is involved in commercialization of these equipment's in national and international markets.

KEYWORDS

Dye sensitized solar modules, Semi-automatic equipment, Indoor photovoltaics, Self-powered IoTs, Building Integrated Photovoltaics (BIPV)

SALIENT FEATURES

Indigenization of the process, 60-70% Cost reduction in module fabrication equipment, Capable of producing DSSC modules.

APPLICATIONS

Solar cell Industry

TECHNOLOGY BENCHMARKING

No similar technology and equipment available.

TECHNOLOGY READINESS LEVEL ASSESSMENT

TRL assessment is 7

SCALE OF DEVELOPMENT

The Pilot scale demonstration in the field conditions is successfully done and the technology prototype has been tested in the actual field conditions and addressed all the critical scaling issues and available for licensing.

4.6 ENERGY (CONVENTIONAL AND NON-CONVENTIONAL) AND ENERGY DEVICES (EED))**STATUS OF COMMERCIALIZATION**

Under commercialization in partnership with industry.

TENTATIVE COST OF DEVELOPMENT

₹ 70 Lakhs – 1 Crore

INDUSTRIAL PARTNERS

M/s. Elixir Technologies, Bangalore.

PLANT SET UP FOR FINAL PRODUCT

Not yet

IPR STATUS DETAILS (PATENTS/COPYRIGHT/TRADEMARK SECURITY IN INDIA/ABROAD)

N/A

POTENTIAL MARKET/TECHNO-ECONOMICS

Major applications

- Powering IoT smart devices [battery less/achieving extended battery life].
 - Smart meters and management (water management & energy management).
 - Smart Parking (Urban mobility).
 - Self-powered sensors (Temperature, humidity, CO₂, CO, IR etc.).
- Portable devices [integrated in phones, tablets, mobile charging stations, backpack, in clothes etc.].
- Solar Power Windows [aesthetically beautiful power producing glass windows].

ENVIRONMENTAL SAFETY CERTIFICATION

No

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217. CARBON COMPOSITES BIPOLAR PLATES FOR HYDROGEN BASED FUEL CELL APPLICATIONS

UID: TECH-THEME_6_NPL-011

LABORATORY OF ORIGIN | CSIR-NPL, DELHI

EXECUTIVE SUMMARY

Fuel cell is electrochemical device that convert chemical energy of the reactants (H_2 and O_2) directly into electricity & heat with high efficiency. The main components of PEM fuel cell are composite bipolar plate, porous carbon paper electrode, polymer electrolyte membrane and platinum catalyst. Carbon composites bipolar plate is a multi-functional component within the PEM fuel cell stack. It connects and separates the individual fuel cells in series to form a fuel cell stack with required voltage, its main function is uniform distribution of fuel gas and oxygen over the whole active surface area of the membrane-electrode assemblies (MEA), conducts electrical current from the anode of one cell to the cathode of the next, facilitates water management within the cell, supports thin membrane and electrodes and clamping forces for the stack assembly, among other things. Essentially the composites bipolar plates are light weight and the electrically-conducting plates which join together the anode of one cell to the cathode of another. NPL has developed the graphite and expanded graphite based composites bipolar plates.



KEYWORDS

Carbon composites bipolar plates, Fuel cell

SALIENT FEATURES

The device converts chemical energy of the reactants directly into electricity & heat with high efficiency.

APPLICATIONS

Fuel cell, Phosphoric acid, Solid state batteries.

TECHNOLOGY BENCHMARKING

The technology is benchmarked with similar technologies.

TECHNOLOGY READINESS LEVEL ASSESSMENT

TRL assessment is 7

4.6 ENERGY (CONVENTIONAL AND NON-CONVENTIONAL) AND ENERGY DEVICES (EED))**SCALE OF DEVELOPMENT**

The Pilot scale demonstration in the field conditions is successfully done and the technology prototype has been tested in the actual field conditions and addressed all the critical scaling issues and available for licensing.

STATUS OF COMMERCIALIZATION

Not yet

TENTATIVE COST OF DEVELOPMENT

₹ 10 Lakhs

INDUSTRIAL PARTNERS

N/A

IPR STATUS DETAILS (PATENTS/COPYRIGHT/TRADEMARK SECURITY IN INDIA/ABROAD)

Patented (766/DEL/2010)

PLANT SET UP FOR FINAL PRODUCT

Not yet

POTENTIAL MARKET/TECHNO-ECONOMICS

Fuel cell (PEM, DMFC, Phosphoric acid), Solid state batteries.

ENVIRONMENTAL SAFETY CERTIFICATION

Yes

NODAL SCIENTIST DETAILS

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218. TECHNOLOGY FOR PRODUCTION OF SOFT COKE

UID: TECH-THEME_6_CIMFR-013

LABORATORY OF ORIGIN | CSIR-CIMFR, DHANBAD

EXECUTIVE SUMMARY

Coal Carbonization Division, CSIR-CIMFR developed ovens for soft coke production which is energy efficient, environment friendly and of low capital investment and has successfully. Numbers of such oven have been erected and commissioned for a capacity of 1.5 to 2.01 t coal throughput per oven for 16 hrs. Carbonization and one hour charging and discharging. These are connected with a single common chimney of minimum 40 ft height. The ovens, made of standard refractory bricks, are arch shaped having a single door which can be removed during discharge. Coal is charged in the previously heated oven and the door is placed and sealed with mud. The volatiles coming out of the coal is partly burnt and the heat generated during combustion of the volatiles help to maintain the temperature of the oven. The flue gas generated is typically channelized into the sole of the oven with hindrance created by special design resulting higher sole temperature which helps to burn out the remaining volatile matters and eliminate the tarry matter in the gas before being drained through the chimney. The circulation of the flue gas generated during low/medium temperature carbonization of coal achieves the following benefits:

- Higher temperature of sole which reduces the cooking time and thus increase productivity.
- Allows the tarry matters coming out during carbonization, to be completely burnt/partly settled with the help of secondary air injected through the holes selectively placed inside the oven. Entry of secondary air can be regulated through the side holes as well as dampers and if necessary can be utilized to dilute the emitted gas from the chimney.
- Reduces pollution.

KEYWORDS

Soft, Coke, Domestic, Pollution

SALIENT FEATURES

The ovens for soft coke production are energy efficient, environment friendly and of low capital investment. Higher temperature of sole reduces the cooking time and thus increase productivity.

APPLICATIONS

Soft coke production

TECHNOLOGY BENCHMARKING

Yes

TECHNOLOGY READINESS LEVEL ASSESSMENT

TRL assessment is 9

SCALE OF DEVELOPMENT

The industrial partner setup the plant for final product and the final product started selling into the market with the safety aspects addressed and documented.

STATUS OF COMMERCIALIZATION

Under commercialization in partnership with industry.

4.6 ENERGY (CONVENTIONAL AND NON-CONVENTIONAL) AND ENERGY DEVICES (EED))**TENTATIVE COST OF DEVELOPMENT**

₹ 75 Lakhs Approx.

INDUSTRIAL PARTNERS

- M/s Shardapunj Fuel Coke Pvt. Ltd., Chandauli – 232 101, U.P.
- M/s Kahkasha Enterprises, Hazaribag – 825301
- M/s Ganpati Enterprises, Bhabua, Bihar, Eastern Fuels Pvt. Ltd., Chandauli, U.P.
- Sidhgiri Holdings Pvt. Ltd. Chandauli, U.P.

PLANT SET UP FOR FINAL PRODUCT

Yes

IPR STATUS DETAILS (PATENTS/COPYRIGHT/TRADEMARK SECURITY IN INDIA/ABROAD)

Patented (199849; 30.9.1997)

POTENTIAL MARKET/TECHNO-ECONOMICS

Developed technology provides an alternative domestic fuels, soft coke, in place of wood, cow dung cakes and agriculture waste etc. Soft coke has got very lucrative market potential for cooking purposes.

ENVIRONMENTAL SAFETY CERTIFICATION

No (Not required)

NODAL SCIENTIST DETAILS

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219. TECHNOLOGY FOR NON-RECOVERY TYPE COKE OVEN, DRAG TYPE COKE OVEN WITH STAMP CHARGING AND COKE QUENCHING

UID: TECH-THEME_6_CIMFR-014

LABORATORY OF ORIGIN | CSIR-CIMFR, DHANBAD

EXECUTIVE SUMMARY

In the initial days attention on Coal Carbonization Division CSIR-CIMFR was for the utilization of inferior grade coking coal for coke making as the coke making technology were mostly imported and of by-product recovery type. Subsequently the objectives were diverted towards beehive coke ovens of smaller sizes for making flexibility in coke making. Coal Carbonization Division CSIR-CIMFR, further developed sole heated beehive ovens of multi chimney and in later stages that of single chimney. To make the technology more Energy efficient, suitable heating and insulating systems were developed in the non-recovery coke oven. Coal is converted into hard coke broadly in two types of ovens viz oven without by product recovery i.e., non-recovery and those with recovery of by products. Non recovery ovens are also known as beehive ovens. Non-recovery ovens are generally preferred due to less capital investment and flexibility in operation compared to product ovens. Non-recovery ovens can be easily started up or closed down as they are made of firebricks. Further it was required to increase productivity, quality of coke and use of inferior coal for coke making. In view of the requirement the stamp charging system with coke quenching system was developed.

KEYWORDS

Hard, Coke, Carbonisation, Stamp charging

SALIENT FEATURES

Less capital investment and flexibility in operation compared to product ovens.

APPLICATIONS

Non recovery coke oven plant.

TECHNOLOGY BENCHMARKING

The technology is benchmarked with similar technologies.

TECHNOLOGY READINESS LEVEL ASSESSMENT

TRL assessment is 9

SCALE OF DEVELOPMENT

The industrial partner setup the plant for final product and the final product started selling into the market with the safety aspects addressed and documented.

STATUS OF COMMERCIALIZATION

Under commercialization in partnership with industry.

TENTATIVE COST OF DEVELOPMENT

Size dependent.

INDUSTRIAL PARTNERS

N/A

PLANT SET UP FOR FINAL PRODUCT

Yes

IPR STATUS DETAILS (PATENTS/COPYRIGHT/TRADEMARK SECURITY IN INDIA/ABROAD)

N/A

POTENTIAL MARKET/TECHNO-ECONOMICS

Good quality coking coal is carbonized in coke ovens for making coke. In steel making coke is used as reducing agent and source of heat in blast furnace. The technology has huge market potential for merchant cokerries and integrated steel plant.

ENVIRONMENTAL SAFETY CERTIFICATION

No (Not required)

NODAL SCIENTIST DETAILS

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220. AIR CONDITIONER EFFICIENCY METER (ACE METER)

UID: TECH-THEME_6_CSIO-015

LABORATORY OF ORIGIN | CSIR-CSIO, CHANDIGARH

EXECUTIVE SUMMARY

It is a dedicated instrument designed to evaluate the performance of window Air conditioners with the following features:

- Identification of the performance indicators of Air Conditioners for determining the probable cause of deterioration.
- Generation of report with a figure of merit/efficiency to indicate the current state of the Air-conditioning unit under test.
- Analysing the performance and suggesting necessary actions for conserving the energy, ultimately.

KEYWORDS

Hand-held, Non-destructive instrument, Energy conservation tool

SALIENT FEATURES

- Identification of the performance indicators of Air Conditioners for determining the probable cause of deterioration.
- Generation of report with a figure of merit/efficiency to indicate the current state of the Air-conditioning unit under test.
- Analysing the performance and suggesting necessary actions for conserving the energy, ultimately.

APPLICATIONS

Monitoring of efficiency of window air conditioner.

TECHNOLOGY BENCHMARKING

Yes (Similar technology instrument not available in market).

TECHNOLOGY READINESS LEVEL ASSESSMENT

TRL assessment is 7

SCALE OF DEVELOPMENT

The Pilot scale demonstration in the field conditions is successfully done and the technology prototype has been tested in the actual field conditions and addressed all the critical scaling issues and available for licensing.

STATUS OF COMMERCIALIZATION

No

TENTATIVE COST OF DEVELOPMENT

₹ 0.15 Lakhs



4.6 ENERGY (CONVENTIONAL AND NON-CONVENTIONAL) AND ENERGY DEVICES (EED))

INDUSTRIAL PARTNERS

N/A

PLANT SET UP FOR FINAL PRODUCT

Not yet

IPR STATUS DETAILS (PATENTS/COPYRIGHT/TRADEMARK SECURITY IN INDIA/ABROAD)

No

POTENTIAL MARKET/TECHNO-ECONOMICS

Energy Auditors, HVAC Technicians and Engineers.

ENVIRONMENTAL SAFETY CERTIFICATION

Yes

NODAL SCIENTIST DETAILS

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Chapter-4 4.7 Healthcare NCE, Biologics, Diagnostic, Genomics (HTC)

Introduction

Affordability and accessibility of healthcare is one of the major challenges faced by any country in the world. Infusion of Technology in Healthcare forms a process of improvement in contesting these challenges. India's capacity towards developing ideas for accessing affordable healthcare services will help in socio-economic progress and better standard of care. Healthcare NCE, Biologics, Diagnostic, Genomics have been the main focus as per the current scenario in the country. CSIR has been working towards achieving this goal. During the year 2020, in total 41 CSIR technologies were evaluated out of which 18 technologies emerged promising for market based on expert committee evaluation, developer's feedbacks, commercial status, importance and Technology Readiness Level (TRL) assessment for these technologies was ≥ 6 . Technologies from CSIR laboratories such as CSIO, IGIB, IICB, IICT, IIIM, NCL, NEIST are included.

Technologies with TRL 6 are Development of Patient Specific Orthopaedic & Maxillofacial Implants, Respiration Assistive Intervention Device-Respi AID, Glucocorticoid receptor (GR)-targeted liposomal platform for aggressive and drug-resistant cancer, Novel cationic 17-Estradiol-substituted-estradiol derivatives with anti-cancer activity, Selective detection and analysis of small molecules, Herbal Anti-Fungal Formulation, IIIM-141 (CROCUS SATIVUS) Capsule Formulation: Saffron Based Nutraceutical Product, Bacterial Cellulose Patches;

Technologies with TRL 7 are Exoskeleton Device (ExoD) for Rehabilitation of Mobility Impaired Patients, ORGAN-Biomechatronic Rehabilitative Solutions for Children with Congenital Hemi-paresis, Rapid Diagnostic Kit for Detection of Kala-azar from Serum and Urine Samples, Know-How for "Continuous Process for Production of Paracetamol";

Technologies with TRL 8 are Postural Stability Assessment System, FnCas9 Editor Linked Uniform Detection Assay (FELUDA), Fermentation Process for Docosahexaenoic Acid (DHA);

4.7 HEALTHCARE, NCE, BIOLOGICS, DIAGNOSTIC, GENOMICS (HTC)

Technologies with TRL 9 are Electrostatic Disinfection Machine, RT PCR kit for COVID19 testing, Gluconate Salts: Production of Metal -Gluconates.

CSIR has been contributing to India’s scientific temperament towards self-reliance.

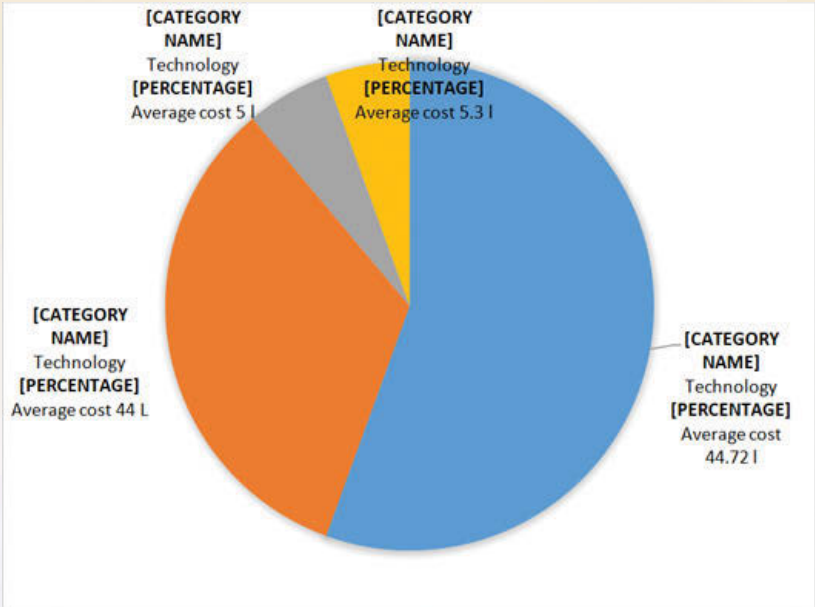


Fig 1. Percentage of Technologies and Average cost under a TRL

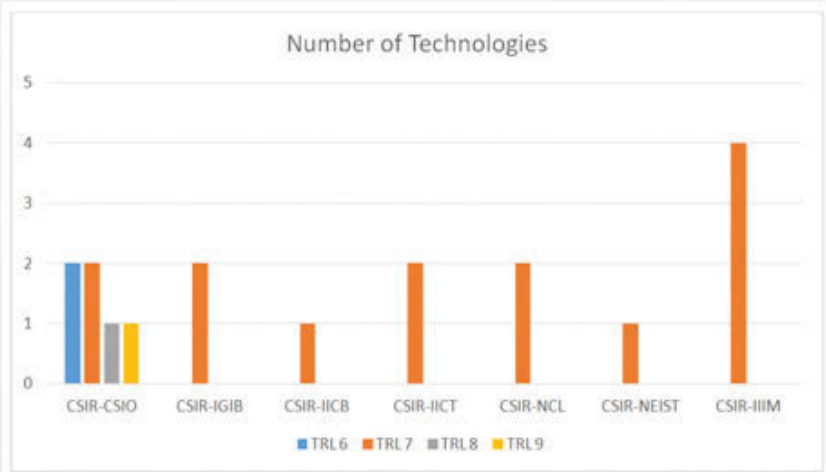


Fig 2. Number of Technologies under a TRL

221. EXOSKELETON DEVICE (EXOD) FOR REHABILITATION OF MOBILITY IMPAIRED PATIENTS

UID: TECH-THEME_7_CSIO-005

LABORATORY OF ORIGIN | CSIR-CSIO, CHANDIGARH

EXECUTIVE SUMMARY

Exoskeletons are the devices that come in the category of wearable robots. The developed exoskeleton system consists of a wearable exoskeleton suit, powered by actuators and a closed loop control system to drive the mechanism depending on the desired pattern for movement of the limbs.

KEYWORDS

Robotic rehabilitation, Gait assistance, Wearable orthotic device

SALIENT FEATURES

Exoskeleton is an external structural mechanism with joints and links corresponding to those of the human body. It has the functionality for exercise of the individual joints of the lower limb.

APPLICATIONS

Exoskeleton with their applications in rehabilitation medicine and virtual reality simulation, offer benefits for both disabled and healthy populations. Exoskeleton device can be used as a capability magnifier or as assisting device for spinal cord injury patients, stroke patients, and the elderly. The device is meant for therapeutic use under the supervision of a therapist or clinician.

TECHNOLOGY BENCHMARKING

Yes

TECHNOLOGY READINESS LEVEL ASSESSMENT

TRL assessment is 7

SCALE OF DEVELOPMENT

NA

STATUS OF COMMERCIALIZATION

Technology transfer

TENTATIVE COST OF DEVELOPMENT

₹ 10.00 Lakhs

INDUSTRIAL PARTNERS

M/s Pentagon Rugged Systems (India) Pvt.



PLANT SET UP FOR FINAL PRODUCT

NA

IPR STATUS DETAILS

NA

POTENTIAL MARKET/TECHNO-ECONOMICS

50 System in 05 years.

ENVIRONMENTAL SAFETY CERTIFICATION

NA

NODAL SCIENTIST DETAILS

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222. POSTURAL STABILITY ASSESSMENT SYSTEM

UID: TECH-THEME_7_CSIO-006

LABORATORY OF ORIGIN | CSIR-CSIO, CHANDIGARH

EXECUTIVE SUMMARY

Postural stability system assesses the standing balance of a person. Postural stability is achieved by maintaining an upright body alignment against gravitational force and preserving the equilibrium of the centre of mass (CoM) in an individual's base of support. It requires proper coordination of our sensory system comprising visual, somatosensory, and vestibular modalities as well as motor control systems. Assessment of standing balance is essential to the treatment of instability in the neurologic patient.



KEYWORDS

Balance assessment, Biofeedback

SALIENT FEATURES

The developed system assesses pressure fluctuations produced by the heels and toes of the subject standing on a platform having force sensors placed at the specific locations for each foot. Calculated parameters help in assessing interactions of the neurophysiological and neuro-anatomic subsystems involved in balance control and further treatment for instability. It gives the projection of body's center of mass on the ground by estimation of center of foot pressure.

APPLICATIONS

The developed system helps in assessing interactions of the neurophysiological and neuro-anatomic subsystems involved in balance control and further treatment for instability. It can also be used to estimate gait events like balance stability and lateral fall and thus can be used as a training tool for sit-to-stand, stand-to-sit, joint movements for stance and gait analysis during rehabilitation therapy for muscle spasticity.

TECHNOLOGY BENCHMARKING

NA

TECHNOLOGY READINESS LEVEL ASSESSMENT

TRL assessment is 8.

SCALE OF DEVELOPMENT

Established contact with relevant firms to design and develop the plant for upscaling.

STATUS OF COMMERCIALIZATION

End to end testing of the system from the start till the obtaining of final product been done in the target production/operational environment.

TENTATIVE COST OF DEVELOPMENT

₹ 2.00 Lakhs

INDUSTRIAL PARTNERS

M/s Oceanic Fitness, Chandigarh.

PLANT SET UP FOR FINAL PRODUCT

NA

IPR STATUS DETAILS

NA

POTENTIAL MARKET/TECHNO-ECONOMICS

50 System in 05 years.

ENVIRONMENTAL SAFETY CERTIFICATION

NA

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223. ORGAN- BIOMECHATRONIC REHABILITATIVE SOLUTIONS FOR CHILDREN WITH CONGENITAL HEMI-PARESIS

UID: TECH-THEME_7_CSIO-007

LABORATORY OF ORIGIN | CSIR-CSIO, CHANDIGARH

EXECUTIVE SUMMARY

ORGAN-portable hand orthotic device is designed and fabricated using additive manufacturing platform. This 3D printed hand orthotic device is a substitute to the traditionally available hand orthoses and hand splints to treat the paediatric patients. Apart from being light weight, adjustable, easy to use and comfortable, proposed device is low cost and require reduced fabrication time and delivery time. The traditionally available orthosis devices require highly skilled manufacturers and are available only in standard sizes. But 3D printing technique and developed mechanism offers a high degree of customization.



KEYWORDS

B3D Orthotic, Hand function rehabilitation

SALIENT FEATURES

It is light weight, adjustable, easy to use and comfortable, proposed device is low cost and require reduced fabrication time and delivery time. These are more resistant to stress and strain as the structure of orthotic device did not get change even after repetitive use. The structure could be easily modified according to user's requirement and comfort with the help of dedicated CAD software. In addition to several advantages of the product this technology offers ease in the fabrication process as well.

APPLICATIONS

To treat paediatric patients with congenital hemi-paresis.

TECHNOLOGY BENCHMARKING

Yes

TECHNOLOGY READINESS LEVEL ASSESSMENT

TRL assessment is 7

SCALE OF DEVELOPMENT

Established contact with relevant firms to design and develop the plant for upscaling.

STATUS OF COMMERCIALIZATION

End to end testing of the system from the start till the obtaining of final product been done in the target production/operational environment.

4.7 HEALTHCARE, NCE, BIOLOGICS, DIAGNOSTIC, GENOMICS (HTC)

TENTATIVE COST OF DEVELOPMENT

₹ 1.00 Lakh

INDUSTRIAL PARTNERS

NA

PLANT SET UP FOR FINAL PRODUCT

NA

IPR STATUS DETAILS

NA

POTENTIAL MARKET/TECHNO-ECONOMICS

50 System in 03 years.

ENVIRONMENTAL SAFETY CERTIFICATION

NA

NODAL SCIENTIST DETAILS

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224. ELECTROSTATIC DISINFECTION MACHINE

UID: TECH-THEME_7_CSIO-008

LABORATORY OF ORIGIN | CSIR-CSIO, CHANDIGARH

EXECUTIVE SUMMARY

The Electrostatic Disinfection Machine, based on the electrostatic principle, produces uniform and fine spray droplets of disinfection material in the range of 10-20 μm . Charged droplets cover the directly exposed and obscured surfaces uniformly with increased efficiency and efficacy.

KEYWORDS

Aerosol, Charged mist, Surface decontamination, Effective sanitization

SALIENT FEATURES

Due to the small size of droplets, the surface area of spray droplets increases which enhances the interaction with the harmful microorganisms. The machine uses very less disinfection material as compared to conventional methods, which helps to save natural resources and negligible increase of chemical waste in the environment.

APPLICATIONS

It kills or inhibits the growth of pathogens.

TECHNOLOGY BENCHMARKING

Yes

TECHNOLOGY READINESS LEVEL ASSESSMENT

TRL assessment is 9

SCALE OF DEVELOPMENT

NA

STATUS OF COMMERCIALIZATION

Established contact with 3 firms to design and develop the plant for upscaling.

TENTATIVE COST OF DEVELOPMENT

₹ 60,000/- to 70,000/-

INDUSTRIAL PARTNERS

NA

PLANT SET UP FOR FINAL PRODUCT

NA



IPR STATUS DETAILS

NA

POTENTIAL MARKET/TECHNO-ECONOMICS

Healthcare, Hospitals, Poultry, Animal and Husbandry, Public transport, Airports, Railways, Hotels, Industry, Automobiles industry, Education, Research institutes, Any common small shops.

ENVIRONMENTAL SAFETY CERTIFICATION

One certification on safety is in process.

NODAL SCIENTIST DETAILS

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225. DEVELOPMENT OF PATIENT SPECIFIC ORTHOPAEDIC & MAXILLOFACIAL IMPLANTS

UID: TECH-THEME_7_CSIO-009

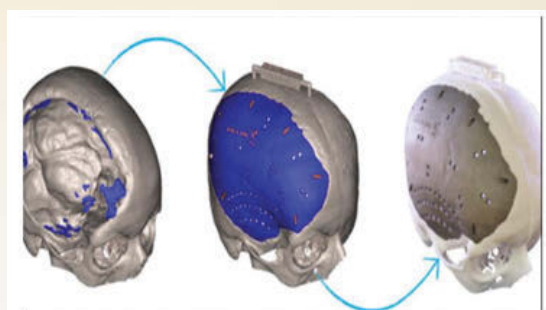
LABORATORY OF ORIGIN | CSIR-CSIO, CHANDIGARH

EXECUTIVE SUMMARY

Patient Specific Implants (PSI) also known as custom Implants are developed on “One Implant One Patient Philosophy. Design to manufacturing expertise for PSI at one place is only available at CSIR-CSIO in India.

KEYWORDS

Patient specific implants



SALIENT FEATURES

PSI are developed using patient's own CT-Scan data, converting the scan data to 3D model than developing the implant specifically according to once anatomy. Designed implant is then 3D printed in biocompatible Ti6Al4V ELI Titanium alloy. Expertise of the laboratory made possible economic availability of PSI in India at almost 50% of cost as compared to Foreign Service providers.

APPLICATIONS

It is required when available implants are not able to provide solution optimally or altogether implants are not available for specific requirement, due to which the patient can be crippled or bed ridden for life.

TECHNOLOGY BENCHMARKING

Customised for individual use, Standard not available.

TECHNOLOGY READINESS LEVEL ASSESSMENT

TRL assessment is 6

SCALE OF DEVELOPMENT

NA

STATUS OF COMMERCIALIZATION

Launch delayed due to COVID.

TENTATIVE COST OF DEVELOPMENT

₹ 5 Lakhs

INDUSTRIAL PARTNERS

M/s Forbes & Co.

PLANT SET UP FOR FINAL PRODUCT

In Progress.

IPR STATUS DETAILS

NA

POTENTIAL MARKET/TECHNO-ECONOMICS

Around 50-100 Implants/year.

ENVIRONMENTAL SAFETY CERTIFICATION

Yes

NODAL SCIENTIST DETAILS

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226. RESPIRATION ASSISTIVE INTERVENTION DEVICE - RESPI AID

UID: TECH-THEME_7_CSIO-010

LABORATORY OF ORIGIN | CSIR-CSIO, CHANDIGARH

EXECUTIVE SUMMARY

The Respiration Assistance Intervention Device (Portable Ventilator) is based on the operation of Ambu Bag, which is used conventionally for manual respiration.

KEYWORDS

Portable ventilator, Respi-Aid

SALIENT FEATURES

Automated Ambu bag operation is based on double flap motorised mechanism. Provision to set the following input parameters for functioning of the device:

- Volume of gas to be delivered to the patient (Tidal Volume).
- Rate at which the gas is to be delivered to the patient (Respiration Rate).
- Inspiration to Expiration ratio (I:E Ratio).

APPLICATIONS

NA

TECHNOLOGY BENCHMARKING

Testing done by Certified 3rd party.

TECHNOLOGY READINESS LEVEL ASSESSMENT

TRL assessment is 6

SCALE OF DEVELOPMENT

NA

STATUS OF COMMERCIALIZATION

Technology transfer

TENTATIVE COST OF DEVELOPMENT

₹ 5 Lakhs

INDUSTRIAL PARTNERS

Sivapriya exim, Chennai.

PLANT SET UP FOR FINAL PRODUCT

NA



IPR STATUS DETAILS

NA

POTENTIAL MARKET/TECHNO-ECONOMICS

Around 500 units/year.

ENVIRONMENTAL SAFETY CERTIFICATION

No

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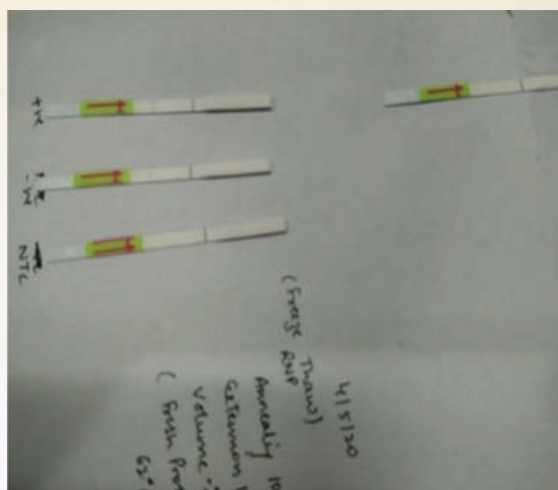
227. FNCAS9 EDITOR LINKED UNIFORM DETECTION ASSAY (FELUDA)

UID: TECH-THEME_7_IGIB-011

LABORATORY OF ORIGIN | CSIR-IGIB, NEW DELHI

EXECUTIVE SUMMARY

Detection of pathogenic sequences or variants in DNA and RNA through a point-of-care diagnostic approach is valuable for rapid clinical prognosis. In recent times, CRISPR based detection of nucleic acids have provided an economical and quicker alternative to sequencing-based platforms which are often difficult to implement in the field. Here, we present FnCas9 Editor Linked Uniform Detection Assay (FELUDA) that employs a highly accurate enzymatic readout for detecting nucleotide sequences, identifying nucleobase identity and inferring zygosity with precision. The knowledgebase encompasses a comprehensive pipeline including protein expression, sgRNA design, preparation of RNA complexes, detection methods that are dependent on applications, SOPs for pathogen detections, SNP detections.



KEYWORDS

CRISPR, COVID19, SARS nCoV2, Rapid diagnosis

SALIENT FEATURES

FELUDA output can be adapted to multiple signal detection platforms and can be quickly designed and deployed for versatile applications including rapid diagnosis during infectious diseases.

APPLICATIONS

This technology has application in fast diagnosis nucleic acid-based detection including genomic variations, diseases associated with the variations, pathogens, food contaminants, fish, poultry, cattle qualities.

TECHNOLOGY BENCHMARKING

Yes

TECHNOLOGY READINESS LEVEL ASSESSMENT

TRL assessment is 8 (Validation of system in pilot scale).

SCALE OF DEVELOPMENT

NA

STATUS OF COMMERCIALIZATION

Technology transfer.

4.7 HEALTHCARE, NCE, BIOLOGICS, DIAGNOSTIC, GENOMICS (HTC)**TENTATIVE COST OF DEVELOPMENT**

₹ 45 Lakhs

INDUSTRIAL PARTNERS

NA

PLANT SET UP FOR FINAL PRODUCT

NA

IPR STATUS DETAILS

NA

POTENTIAL MARKET/TECHNO-ECONOMICS

This technology has application in fast diagnosis nucleic acid-based detection including genomic variations, diseases associated with the variations, pathogens, food contaminants, fish, poultry, cattle qualities.

ENVIRONMENTAL SAFETY CERTIFICATION

No

NODAL SCIENTIST DETAILS

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228. RT PCR KIT FOR COVID19 TESTING

UID: TECH-THEME_7_IGIB-012

LABORATORY OF ORIGIN | CSIR-IGIB, NEW DELHI

EXECUTIVE SUMMARY

There is an urgent nation-wide need for indigenous development of molecular tests for COVID19. The ICMR approved test for COVID19 is a RT-PCR based assay.

KEYWORDS

RTPCR, COVID19, SARS nCoV2

SALIENT FEATURES

Indigenous development of RTPCR kits for diagnosis of COVID19.

APPLICATIONS

NA

TECHNOLOGY BENCHMARKING

Yes

TECHNOLOGY READINESS LEVEL ASSESSMENT

TRL assessment is 9 (Validation of system in pilot scale).

SCALE OF DEVELOPMENT

NA

STATUS OF COMMERCIALIZATION

Yes to technology transfer.

TENTATIVE COST OF DEVELOPMENT

₹ 12 Lakhs

INDUSTRIAL PARTNERS

M/s Trivitron Healthcare Pvt. Ltd.

PLANT SET UP FOR FINAL PRODUCT

NA

IPR STATUS DETAILS

NA

POTENTIAL MARKET/TECHNO-ECONOMICS

The ICMR/WHO approved molecular test for COVID19 is a RT-PCR based assay. The RTPCR is expected to be the main stay for molecular diagnosis of COVID19 for the foreseeable future. Given the increasing number of individuals with COVID19 the RTPCR is expected to be in demand for molecular diagnosis of COVID19.

ENVIRONMENTAL SAFETY CERTIFICATION

NA

NODAL SCIENTIST DETAILS

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229. RAPID DIAGNOSTIC KIT FOR DETECTION OF KALA-AZAR FROM SERUM AND URINE SAMPLES

UID: TECH-THEME_7_IICB-017

LABORATORY OF ORIGIN | CSIR-IICB, KOLKATA

EXECUTIVE SUMMARY

Dipstick transformed into colloidal Gold Based Lateral Flow Technology for field Adaptable, Easy and non-invasive diagnosis of Kala-azar.

KEYWORDS

Lateral Flow, Diagnostics, Leishmania, Urine, Dipstick

SALIENT FEATURES

Result can be seen by naked eyes in two minutes without the use of any sophisticated instruments.

APPLICATIONS

Capable of detecting anti leishmanial IgG antibodies in Kala-azar serum and urine, could be useful for test of cure, equally effective for PKDL diagnostics.

TECHNOLOGY BENCHMARKING

Yes

TECHNOLOGY READINESS LEVEL ASSESSMENT

TRL assessment is 7

SCALE OF DEVELOPMENT

NA

STATUS OF COMMERCIALIZATION

Ready to transfer.

TENTATIVE COST OF DEVELOPMENT

NA

INDUSTRIAL PARTNERS

NA

PLANT SET UP FOR FINAL PRODUCT

NA

IPR STATUS DETAILS

NA

POTENTIAL MARKET/TECHNO-ECONOMICS

NA

ENVIRONMENTAL SAFETY CERTIFICATION

No

NODAL SCIENTIST DETAILS

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230. GLUCOCORTICOID RECEPTOR (GR)- TARGETED LIPOSOMAL PLATFORM FOR AGGRESSIVE AND DRUG-RESISTANT CANCER

UID: TECH-THEME_7_IICT-022

LABORATORY OF ORIGIN | CSIR-IICT, HYDERABAD

EXECUTIVE SUMMARY

Therapeutics – multiple cancer types; A platform technology: carries multiple drugs & induces targeted drug sensitization, EMT-reversal and kills drug-resistant cancer cells and cancer stem cells (CSCs); hence, suited to also treat cancer relapse. The technology repurposes a typical cancer drugs against multiple cancers.

KEYWORDS

Glucocorticoid, Liposomal platform, Drug-resistant cancer

SALIENT FEATURES

NA

APPLICATIONS

Liposomal Platform technology for delivering cancer drugs.

TECHNOLOGY BENCHMARKING

Unique system; similar technology not available.

TECHNOLOGY READINESS LEVEL ASSESSMENT

TRL assessment is 6

SCALE OF DEVELOPMENT

NA

STATUS OF COMMERCIALIZATION

Ready to transfer.

TENTATIVE COST OF DEVELOPMENT

NA

INDUSTRIAL PARTNERS

NA

PLANT SET UP FOR FINAL PRODUCT

NA

IPR STATUS DETAILS

Patent license transferred to NDT.

POTENTIAL MARKET/TECHNO-ECONOMICS

NCE with IND qualified.

ENVIRONMENTAL SAFETY CERTIFICATION

No

NODAL SCIENTIST DETAILS

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231. NOVEL CATIONIC 17-ESTRADIOL-SUBSTITUTED-ESTRADIOL DERIVATIVES WITH ANTI-CANCER ACTIVITY

UID: TECH-THEME_7_IICT-024

LABORATORY OF ORIGIN | CSIR-IICT, HYDERABAD

EXECUTIVE SUMMARY

Estradiol derivatives useful as anti-cancer agents against gynecological and breast cancers

- These Estrogen-structure based molecules have the ability to kill cancer cells of all stages of breast cancer. Other existing estrogen-based or estrogenic anticancer molecule acts against estrogen receptor (ER)-expressing breast cancer cells only. So, this molecule is 'fit-for-all' breast cancer phenotypes.
- These molecules have anticancer effect against other ER-expressing cancer cells, such as ovarian carcinoma, melanoma, pancreatic cancer.
- It is orally administrable (whereas estrogenic, anti-breast cancer drug FaslodexTM is intramuscularly injectable only). Hence, it holds the promise to become the first oral breast cancer drug developed from India.

KEYWORDS

Anti-cancer, Estradiol derivatives, Estrogen-structure

SALIENT FEATURES

NA

APPLICATIONS

NA

TECHNOLOGY BENCHMARKING

Yes

TECHNOLOGY READINESS LEVEL ASSESSMENT

TRL assessment is 6

SCALE OF DEVELOPMENT

NA

STATUS OF COMMERCIALIZATION

Ready to transfer.

TENTATIVE COST OF DEVELOPMENT

Molecule is ready as a package.

INDUSTRIAL PARTNERS

NA

PLANT SET UP FOR FINAL PRODUCT

NA

IPR STATUS DETAILS

Patent license transferred to NDT.

POTENTIAL MARKET/TECHNO-ECONOMICS

Commercially viable, as the synthesis involves industrially inexpensive chemicals.

ENVIRONMENTAL SAFETY CERTIFICATION

No

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232. SELECTIVE DETECTION AND ANALYSIS OF SMALL MOLECULES

UID: TECH-THEME_7_NCL-029

LABORATORY OF ORIGIN | CSIR-NCL, PUNE

EXECUTIVE SUMMARY

This patented materials' technology and process knowhow for mass spectrometry (granted patents US (US 10,613,098 B2) and EU (EP 2676287 B1)) enables sensitive and selective analysis of low m/z (<1000) analytes in the presence of peptides, protein and other larger molecules. The technology uses mesoporous silica subjected to a charge modification process and laser desorption ionization. Platform technology suitable for 'on plate' separation-detection and Mass Spectrometry Imaging (MSI) kits.

KEYWORDS

Mass spectrometry, Peptides, Protein isolation and enrichment, Laser desorption ionization

SALIENT FEATURES

APPLICATIONS

TECHNOLOGY BENCHMARKING

Yes

TECHNOLOGY READINESS LEVEL ASSESSMENT

TRL assessment is 6

SCALE OF DEVELOPMENT

NA

STATUS OF COMMERCIALIZATION

NA

TENTATIVE COST OF DEVELOPMENT

NA

INDUSTRIAL PARTNERS

NA

PLANT SET UP FOR FINAL PRODUCT

NA

IPR STATUS DETAILS

NA

POTENTIAL MARKET/TECHNO-ECONOMICS

Mass spectrometry and chromatography products market. These include life and analytical sciences industry marketing Solid-Phase Extraction (SPE) kits, assays, reagents and methods for the clinical diagnostics, biopharma, bioprocess and microbiological analysis. This technology will be a value addition to the emerging mass spectral imaging toolkit for clinical analysis.

ENVIRONMENTAL SAFETY CERTIFICATION

No

NODAL SCIENTIST DETAILS

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233. KNOW-HOW FOR “CONTINUOUS PROCESS FOR PRODUCTION OF PARACETAMOL”

UID: TECH-THEME_7_NCL-031

LABORATORY OF ORIGIN | CSIR-NCL, PUNE

EXECUTIVE SUMMARY

CSIR-NCL has developed a superior and cheaper process for the manufacture of the widely used drug, paracetamol. This process has been developed under CSIR Mission Mode Project “Innovative Processes and Technologies for Indian Pharmaceuticals and Agrochemical Sector Industries (INPROTICS)”. The project aims to develop cost effective, eco-friendly processes for key drugs and agrochemicals. In case of pharmaceuticals, new or non-infringing processes that are free to operate shall be developed. Thus, this project aims to serve the country with its contributions to ‘Make in India’ program and also toward better health and food security for all Indians. This process could help Indian drug manufacturers compete more effectively against their Chinese counterparts who dominate the global production of paracetamol.

Conventional process employs acetic anhydride as an acylating agent; to get 100% conversion of p-aminophenol (PAP). Conventional process has following drawbacks. i) The usage of acetic anhydride comes under narcotics and excise duty control also acetic anhydride is expensive. ii) Acetic acid form azeotrope with water hence reaction rate diminished. iii) High raw material consumption per kg of the product & generation of aqueous effluents. iv) The process is in batch mode of operation which adds problems such as inconsistent in quality, high footprint of the plant. v) Downstream processing paracetamol is expensive and many steps are involved.

CSIR-NCL has developed cost efficient continuous pilot scale process for the production of paracetamol. The unique advantage of developed process are, i) free from usage of acetic anhydride, ii) continuous process, iii) zero effluent discharge, iv) cost effective process, v) small footprint.

KEYWORDS

Paracetamol pain relief drug, Sustainable continuous process, Pilot scale process, Active pharmaceuticals ingredient (API), Import substitute

SALIENT FEATURES

NA



Inauguration of paracetamol pilot plant by Director NCL, Prof. A. K. Nangia on 16 July 2019



Honourable Union Minister for Science & Technology, Earth Sciences and Environment, Forest and Climate Change Dr. Harsh Vardhan visit to Paracetamol pilot plant (9th September 2019)

APPLICATIONS

NA

TECHNOLOGY BENCHMARKING

Yes

TECHNOLOGY READINESS LEVEL ASSESSMENT

Sustainable continuous pilot scale process for production of paracetamol using multifunctional reactor (TRL-7).

SCALE OF DEVELOPMENT

NA

STATUS OF COMMERCIALIZATION

National Utility.

TENTATIVE COST OF DEVELOPMENT

₹ 2 cr.

INDUSTRIAL PARTNERS

Pilot plant by CSIR-NCL. Thus, this project aims to serve the country with its contributions to 'Make in India' program and also toward better health and food security for all Indians.

PLANT SET UP FOR FINAL PRODUCT

NA

IPR STATUS DETAILS

NA

POTENTIAL MARKET/TECHNO-ECONOMICS

- The global market for paracetamol is rising at an average growth rate of 5-6% per year. Growing demand for Paracetamol all across the world is mainly attributed to its distinguishing to provide immediate relief from fever. The demand of paracetamol in USA and Japan is enormous because of combination of paracetamol in cough and cold drug formulations. However, paracetamol is facing tough competition from latest drugs.
- Paracetamol manufacturers are looking for strong support from research organizations with outstanding innovative technologies to meet varying requirements of global consumers in efficient manner.
- Global paracetamol (PARA) market expected to reach USD 999.4 million in 2020 & in India PARA demand is approximately 25000 TPA.

ENVIRONMENTAL SAFETY CERTIFICATION

No

NODAL SCIENTIST DETAILS

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234. HERBAL ANTI-FUNGAL FORMULATION

UID: TECH-THEME_7_NEIST-034

LABORATORY OF ORIGIN | CSIR-NEIST, ASSAM

EXECUTIVE SUMMARY

The herbal Anti-Fungal formulation developed by CSIR-NEIST, named as 'Fungi-Destruct' is a broad-spectrum Anti-Fungal formulation and effective against wide array of human pathogenic fungi. Made from plant sources of NE India, the formulation eliminates fungal infections after few applications.



KEYWORDS

Potential for killing various fungi, No adverse side effects, Active ingredients derived from plant sources, Eco-friendly process

SALIENT FEATURES

NA

APPLICATIONS

NA

TECHNOLOGY BENCHMARKING

Yes

TECHNOLOGY READINESS LEVEL ASSESSMENT

TRL assessment is 6

SCALE OF DEVELOPMENT

NA

STATUS OF COMMERCIALIZATION

Technology transfer.

TENTATIVE COST OF DEVELOPMENT

₹ 14.96 Lakhs

INDUSTRIAL PARTNERS

NA

PLANT SET UP FOR FINAL PRODUCT

NA

IPR STATUS DETAILS

NA

POTENTIAL MARKET/TECHNO-ECONOMICS

Pharmaceutical companies and Small/Medium enterprises.

ENVIRONMENTAL SAFETY CERTIFICATION

Yes, Acute Dermal Toxicity.

NODAL SCIENTIST DETAILS

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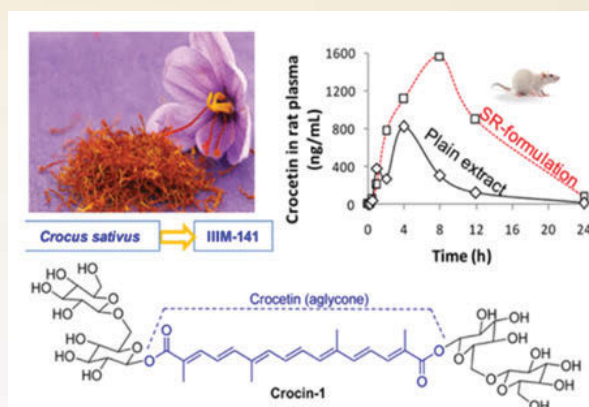
235. (CROCUS SATIVUS) CAPSULE FORMULATION: SAFFRON BASED NUTRACEUTICAL PRODUCT

UID: TECH-THEME_7_IIM-041

LABORATORY OF ORIGIN | CSIR-IIIM, JAMMU

EXECUTIVE SUMMARY

IIIM-141-SR is a capsule formulation of the hydroalcoholic extract of *Crocus sativus* (Saffron). CSIR-IIIM has performed a systematic study on a crocin-rich extract of the stigma of this plant for its protective as well as therapeutic role in Alzheimer disease. The extract has been standardized using four chemical markers, and performed its CMC-quality control (microbial load, aflatoxin content). Through our studies, the mechanism behind its protective and therapeutic role in Alzheimer's disease has been unravelled. The crocin-rich extract display multiple pharmacological activities for Alzheimer's disease including ability to enhance amyloid- β clearance from brain (via induction of P-gp/ LRP-1 proteins), provides protection against amyloid- β induced toxicity to neuronal cells, inhibit NLRP3 inflammasome and display antioxidant activity. It up-regulated synaptic proteins and reduced neuroinflammation associated with A β pathology in the brains of 5XFAD mice (genetic mice model of the disease) (ACS Chem. Neurosci. 2017, 8, 1756-1766).



The in-vivo anti-dementia effect of the crocin-rich extract was also studied using two behavioral models viz. STZ-induced Morris water maze and scopolamine-induced passive avoidance test. The treatment with crocin-rich extract decreased the STZ-induced memory impairment in rats in Morris water maze test. In passive avoidance test, the administration of crocin-rich extract at 100 mpk for 7 days significantly recovered the scopolamine induced memory-deficit. Furthermore, it was found to be highly safe both in in-vitro and in-vivo models. The new 'sustained release (SR) oral formulation' of the extract was developed, which led to 3.3-fold enhancement in the plasma exposure of the bioactive constituent 'crocetin' in comparison to the plain extract in SD rats. With this new SR formulation, a hard-gelatin capsule formulation has been prepared, and IP has been filed (IN201711036084, WO2019077621A1). The preclinical pharmacology of the lead has been published in ACS Omega (ACS Omega, 2018, 3, 9572–9585).

KEYWORDS

Crocus sativus, Capsule formulation, Nutraceuticals

SALIENT FEATURES

N/A

APPLICATIONS

NA

TECHNOLOGY BENCHMARKING

Yes

4.7 HEALTHCARE, NCE, BIOLOGICS, DIAGNOSTIC, GENOMICS (HTC)**TECHNOLOGY READINESS LEVEL ASSESSMENT**

TRL assessment is 6

SCALE OF DEVELOPMENT

NA

STATUS OF COMMERCIALIZATION

Yes to Technology transfer.

TENTATIVE COST OF DEVELOPMENT

₹ 20 Lakhs

INDUSTRIAL PARTNERS

M/s Pharmaza, Gujarat.

PLANT SET UP FOR FINAL PRODUCT

NA

IPR STATUS DETAILS

NA

POTENTIAL MARKET/TECHNO-ECONOMICS

Nutraceuticals:

This product has been out-licensed to the M/s Pharmanza Herbal Pvt. Ltd. (Gujarat) in July 2018, for launching it in the US and Indian Market as a nutraceutical product for brain health on exclusivity basis.

ENVIRONMENTAL SAFETY CERTIFICATION

Yes

NODAL SCIENTIST DETAILS

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236. GLUCONATE SALTS: PRODUCTION OF METAL GLUCONATES

UID: TECH-THEME_7_IIM-045

LABORATORY OF ORIGIN | CSIR-IIIM, JAMMU

EXECUTIVE SUMMARY

TCSIR-IIIM Jammu has developed a technology to convert glucose to gluconates using a fungal strain i.e., *Aspergillus niger* under certain specifically defined physico-chemical conditions. A final product recovery of 90-95% can be achieved during short fermentation cycle.

Gluconates have several established pharmaceutical, agricultural and other industrial applications. Calcium, copper, ferrous and zinc salts find use in oral metal supplements for humans, animals and agricultural applications. Various metal gluconates can serve as micronutrients for improvement of soil fertility. Sodium gluconate being an excellent sequestrant, finds application as metal or bottle cleaning agent. For its ability to slow the process of polymerization of cement at highly reduced moisture conditions, very large quantity of sodium gluconate is used as an additive by cement industries.

Salient features:

- The strain of *Aspergillus niger* selected is a GRAS organism, highly stable under vegetative state and tolerates high concentration of ionic salts.
- Green and indigenous technology wherein chemically defined synthetic medium is used for fermentation.
- The product is isolated directly from fermentation broth.
- No by product or effluent is generated in the process and is Green Technology.
- Very short fermentation batch cycle for calcium D- gluconate and high product yields makes the process very attractive for strategic economic reasons.
- Barium gluconate has also been produced by the fermentation process using the above fungal strain for the preparation of other salts like Zinc, copper, ferrous, magnesium, manganese.

KEYWORDS

Aspergillus niger, Fermentation technology, metal-Gluconate



SALIENT FEATURES

NA

APPLICATIONS

NA

TECHNOLOGY BENCHMARKING

Yes

TECHNOLOGY READINESS LEVEL ASSESSMENT

TRL assessment is 9

SCALE OF DEVELOPMENT

NA

STATUS OF COMMERCIALIZATION

Yes to technology transfer.

TENTATIVE COST OF DEVELOPMENT

₹ 15 Lakhs

INDUSTRIAL PARTNERS

NA

PLANT SET UP FOR FINAL PRODUCT

NA

IPR STATUS DETAILS

Indian patent application: IN193, 293DT23/12/02/006/1096/DEL/2001.

POTENTIAL MARKET/TECHNO-ECONOMICS

Health care/Industries/Agriculture.

ENVIRONMENTAL SAFETY CERTIFICATION

Yes

NODAL SCIENTIST DETAILS

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237. FERMENTATION PROCESS FOR DOCOSAHEXAENOIC ACID (DHA) PRODUCTION

UID: TECH-THEME_7_IIM-046

LABORATORY OF ORIGIN | CSIR-IIIM, JAMMU

EXECUTIVE SUMMARY

Docosahexaenoic acid (DHA) is polyunsaturated omega-3 fatty acid that is a primary structural component of the human brain, cerebral cortex, skin, sperm, testicles and retina. It can be synthesized from alpha-linolenic acid or obtained directly from maternal milk (breast milk), fish oil or algae oil. It is known to have beneficial nutrient properties including development of brain function in infants. It forms as an essential component of infant food formulas. DHA is also being used as food additives and animal feed.

KEYWORDS

Docosahexaenoic acid, Poly unsaturated fatty acids, Omega-3 fatty acid, Health supplement

SALIENT FEATURES

- CSIR-IIIM has developed microbial fermentation process for DHA production using natural marine microorganism isolated at CSIR-NIO under NMITLI program of CSIR.
- Technology has been developed upto 300L scale at CSIR-IIIM, Jammu.
- Microbial strain used in the process is a marine isolate, Schizochytrium sp.
- The strain is GRAS microorganism isolated from marine source.
- Starting material for production of DHA is glucose and proteins.
- The strain under optimized conditions produces about 8-10 g/L oil containing about 35-40% DHA.

APPLICATIONS

N/A

TECHNOLOGY BENCHMARKING

Yes

TECHNOLOGY READINESS LEVEL ASSESSMENT

TRL assessment is 8

SCALE OF DEVELOPMENT

N/A

STATUS OF COMMERCIALIZATION

Technology transferred.

TENTATIVE COST OF DEVELOPMENT

₹ 25 Lakhs

INDUSTRIAL PARTNERS

NA

PLANT SET UP FOR FINAL PRODUCT

NA

IPR STATUS DETAILS

NA

POTENTIAL MARKET/TECHNO-ECONOMICS

Health care.

ENVIRONMENTAL SAFETY CERTIFICATION

Yes

NODAL SCIENTIST DETAILS

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238. BACTERIAL CELLULOSE PATCHES

UID: TECH-THEME_7_IIM-048

LABORATORY OF ORIGIN | CSIR-IIIM, JAMMU

EXECUTIVE SUMMARY

Bacterial cellulose has emerged as an important biopolymer having multifarious applications in various fields. It has proven to be the most viable alternative to plant cellulose. It is very advantageous to use bacterial cellulose instead of plant cellulose for many reasons as it has no hemicelluloses and lignin. It has better properties as compared to plant cellulose and the products manufactured from bacterial cellulose are of superior quality having more durability and efficiency. Also, using bacterial cellulose is more eco-friendly, as the need for plant cellulose results in depletion of forest resources which in return increases the danger of pollution.

Bacterial cellulose (BC), is a highly pure cellulose (devoid of hemicelluloses and lignin) produced by bacteria. It has a high degree of crystallinity, polymerization, tensile strength and tear resistance, and hydrophobicity. These unique properties confer upon it the ability to be used for a multitude of applications in many industries particularly in the biomedical area. It can be used as wound dressing or bandage for healing wounds, making artificial skin, artificial vessels etc. Bacterial cellulose membrane can heal the wound much faster and efficiently than conventionally used wound dressings. The unique physical and mechanical properties of BC, arising from its tridimensionality and branched nano and micro-fibrillar structure, as well as biocompatibility triggered the interest to produce BC membranes that can be used for drug loading and controlled release by making Trans dermal patches. Transdermal patches comprise a method of delivering medication through the skin in a non-invasive manner. The patch contains the desired medication (i.e., topical antibiotics like antibacterial, antifungal etc.) and is designed in such a way that the medication permeates the skin in a controlled fashion thus attaining more steady levels of the drug in the body.

Realizing the importance of bacterial cellulose and its industrial impact, this project has been envisaged. We are successfully able to produce bacterial cellulose from after an intensive screening. The production of bacterial cellulose was optimized in a cost-effective manner. The production will also focus on the development of bio cellulose membranes with desired thinness. Process engineering including downstream processing, harvesting, purification of bio cellulose membrane and subsequent impregnation of topical antibiotics in the bio cellulose membranes was carried out for the development of dermal patches. Stability Studies of the antibiotic's impregnation bio cellulose membranes, It transdermal PK and Drug release studies on the dermal patches was carried out to check the efficacy of the produced bio membranes. In-vivo efficacy of the dermal patches containing topical antibiotics will also be attempted for to achieve and develop a commercially viable process of BC based transdermal patches.

KEYWORDS

Transdermal patch, Eco-friendly & bacterial cellulose

SALIENT FEATURES

NA

APPLICATIONS

NA

TECHNOLOGY BENCHMARKING

Yes

TECHNOLOGY READINESS LEVEL ASSESSMENT

TRL assessment is 6

SCALE OF DEVELOPMENT

NA

STATUS OF COMMERCIALIZATION

NA

TENTATIVE COST OF DEVELOPMENT

₹ 10 Lakhs

INDUSTRIAL PARTNERS

NA

PLANT SET UP FOR FINAL PRODUCT

NA

IPR STATUS DETAILS

NA

POTENTIAL MARKET/TECHNO-ECONOMICS

Agriculture/Nutraceutical.

ENVIRONMENTAL SAFETY CERTIFICATION

No

NODAL SCIENTIST DETAILS

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Chapter-4 4.8 Mining, Minerals, Metals and Materials (4M)

Introduction

Includes the following in this section:

- i. Number of technologies evaluated and selected.
Number of technologies evaluated: 88
Number of technologies selected: 75
- ii. Name of the contributing Labs
 - CSIR-National Metallurgical Laboratory, Jamshedpur, Jharkhand.
 - CSIR-Central Glass and Ceramic Research Institute, Kolkata, West Bengal.
 - CSIR-Institute of Minerals & Materials Technology, Bhubaneswar, Odisha.
 - CSIR-Central Institute of Mining and Fuel Research, Dhanbad, Jharkhand.
 - CSIR-Central Scientific Instruments Organisation, Chandigarh.
 - CSIR–National Institute for Interdisciplinary Science and Technology, Thiruvananthapuram, Kerala.
 - CSIR-National Physical Laboratory, New Delhi.
 - CSIR-Advanced Materials and Process Research, Bhopal, Madhya Pradesh.
- iii. Discussion about the technologies scaled up and Scaled down with explicit number of scaled up and Scaled down technologies.

The TRL level was assessed and evaluated based on the information provided by laboratories for respective technology to be evaluated. Main information were provided namely (i) executive summary of the technology (ii) potential market (iii) key words (iv) cost of technology developed (v) self-assessment filled in questionnaire and (vi) claimed TRL level of the respective technology. The questionnaire was divided into 9 sections comprising queries of 9 TRL levels. All the parameters were reviewed and evaluated by the committee comprising expert of each theme/area of the technology. On the basis of the recommendations of the committee TRL level was assigned to the respective committee. However, TRL level of some selected technologies was scaled up or scaled down, as claimed by the laboratory, as follows:

<i>No. of TRL level Scaled up Technologies</i>	<i>05</i>
<i>No. of TRL level Scaled down Technologies</i>	<i>17</i>

- iv. Figures bar graphs/pie chart with TRL number and cost of Technology Development (% share of the all labs).

4.8 MINING, MINERALS, METALS AND MATERIALS (4M)

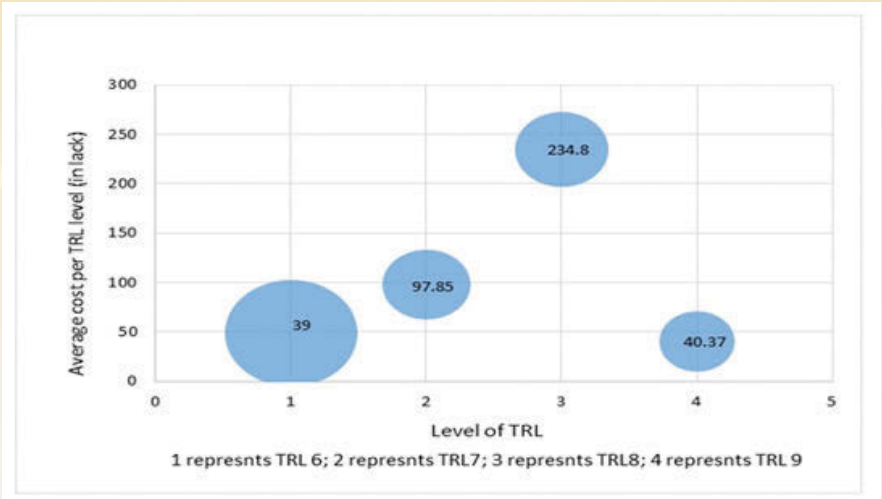


Figure 1: Associated average cost of attaining TRL level

Assessment of Technology readiness Level

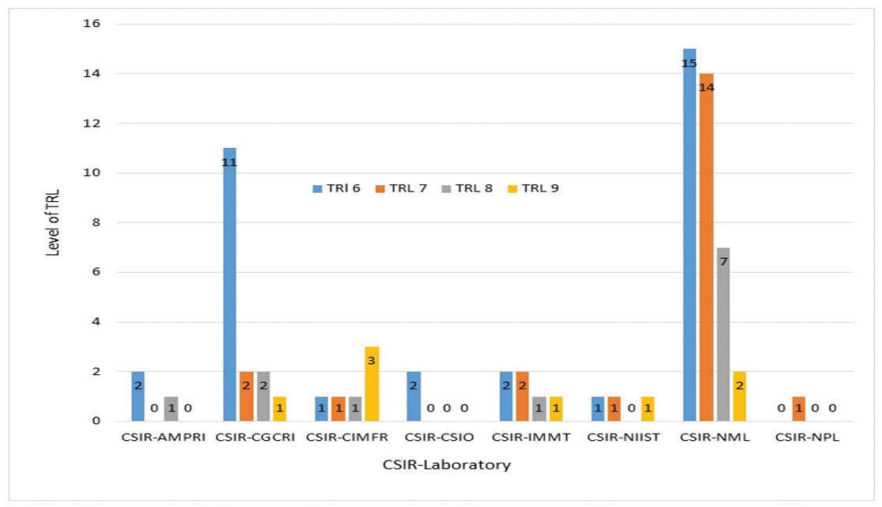


Figure 2: Laboratory-wise No. of technology and TRL level

Major highlights

Include most promising/emerging technologies based on expert committee evaluation, developer's feedbacks, commercial status, Importance etc.

CSIR has undertaken initiative to translate laboratory leads to marketable/value-added technologies/products and thereby enhance interactions and connect to stakeholders and industry for enabling ease of doing technology licensing. One of the initiatives is a “Thematic approach” to harness multidisciplinary talent and infrastructure for solving specific challenges in identified sectors. Mining, Minerals, Metals and Materials (4M) is one of the important themes in the manufacturing sectors. Under this theme CSIR identified technologies developed by the CSIR laboratories in the field of 4M which are about or ready to go to the market; 75 such technologies are identified with Technology Readiness Level (TRL) 6 and above. This will help stake holders to identify technology for setting up plant for commercialization. Under this theme technologies developed by NML, CGCRI, IIMT, CIMFR, CSIO, NPL, AMPRI and NIEST are provided with detailed information. The expert committee argued that CSIR must encourage scientists to develop technology which have direct intervention to solve the real problems to meet the objectives of Atmanirbhar Bharat. Respective laboratories must reach the stake holders or invite potential stakeholders for commercialization of the technology which are above TRL level 8 and encourage scientists to enhance TRL level for those technologies which are below TRL 6. In the opinion of committee some technologies i.e. Specialty Borosilicate Glass Bead: An Innovative Material for Nuclear Safety are promising, Ash filling in Opencast mines, Paste backfilling in underground metal mines, Truck Mounted Mobile Coal Sampler for Instant Coal Ash & Moisture Analyser at Site from Railway Wagon/Truck, Alum from Aluminium Dross Residue, VIRTUAL CASTING – Affordable State-of-the-Art Software for Casting Process Design. Commercial name: FLOW+ module in AutoCAST X1, Column Flotation Technology for Processing of Fine Minerals and Ores and Anti-Tarnishing Lacquer for Silver and Copper-based Alloys are promising technologies.

239. DIAGNOSTIC LEAD FREE X-RAY SHIELDING TILES FOR X-RAY, CT- SCANNER ROOM AND CATH LAB

UID: TECH-THEME_8_ AMPRI-001

LABORATORY OF ORIGIN | CSIR-AMPRI, BHOPAL

EXECUTIVE SUMMARY

X-ray shielding materials are the inevitable part of civil construction in X-ray diagnosis, Computerized Tomography (CT) scanner and cath labs to protect common public, patients and environment from hazardous X-rays. Currently 2 mm thick toxic lead sheet is used to shield until 150 kVp X-rays. CSIR-AMPRI, has developed a radiation shielding tiles that is capable of shielding until 150 kVp X-rays using red mud, which is an alumina industrial waste. The X-ray shielding tiles were fabricated by adding barium compound together with iron rich red mud in a green and economically viable manner. In addition, binder was used to increase the strength of the tiles as well as to decrease the sintering temperature. The tiles were fabricated by mixing equal amount of barium compound and red mud in a ball mill. The red mud: barium compound mixture was wet grinded with binder solution and then green tiles were made by applying 72 MPa pressure. The developed tiles were dried in hot air oven at 90°C and then sintered between 900-1150°C in ambient condition. During sintering, boehmite, goethite, gibbsite and calcite was found to decompose and form new phases like sodalite, cancrinite, nepheline, pseudobrookite, gehlenite and perovskite. Barium compound remains intact. The developed tile possesses the impact strength of 22.5 J/m and modulus of rupture 21 N/mm². The 7 mm thick tile possesses the attenuation characteristics of 1 mm lead at 140 kVp X-rays. No leaching of heavy elements was found from the tiles. The developed tiles are three times cheaper than the lead sheet. It has been approved by Atomic Energy Regulatory Board (AERB) of India. These tiles can be used to build radiation shielding structures in diagnostic X-rays, CT-scanner room, Cath labs, etc., to shield X-rays instead of toxic lead sheet. Know How of developed joint free diagnostic X-ray shielding tiles has been transferred to Prism Johnson Ltd. Hyderabad at CSIR Headquarter in presence of DG-CSIR. Developed tiles are used in X-ray, CT-scanner rooms and Cath Lab of M/s Saideep Healthcare Pvt. Ltd. Ahmednagar, Maharashtra in 2500 Sq Feet area. One patent has been granted in USA in 2009 (US 7, 524, 452 B2) and two provisional patent application have been filed (201911033448 IN and 0214NF2019 IN, US, CN, AU, BR, EU, GN).

KEYWORDS

X-ray shielding tiles, Red mud, Toxic lead, X-ray diagnosis, CT-scanner rooms, Cath Labs

SALIENT FEATURES

This radiation shielding tiles that is capable of shielding until 150 kVp X-rays using red mud, which is an alumina industrial waste. The developed tile possesses the impact strength of 22.5 J/m and modulus of rupture 21 N/mm². The 7 mm thick tile possesses the attenuation characteristics of 1 mm lead at 140.

APPLICATIONS

X-ray shielding materials are the inevitable part of civil construction in X-ray diagnosis, Computerized Tomography (CT) scanner and cath labs to protect common public, patients and environment from hazardous X- rays.

4.8 MINING, MINERALS, METALS AND MATERIALS (4M)**TECHNOLOGY BENCHMARKING**

Yes

TECHNOLOGY READINESS LEVEL ASSESSMENT

TRL 8

SCALE OF DEVELOPMENT

Developed tiles are used in X-ray, CT-scanner rooms and Cath Lab of M/s Saideep Healthcare Pvt. Ltd. Ahmednagar, Maharashtra in 2500 Sq Feet area. It is approved by AERB.

STATUS OF COMMERCIALIZATION

Developed joint free diagnostic X-ray shielding tiles has been transferred to Prism Johnson Ltd. Hyderabad.

TENTATIVE COST OF DEVELOPMENT

₹ 1.635 Lakhs to cover one X-ray diagnosis room of having area 17 m².

INDUSTRIAL PARTNERS

M/s Prism Johnson Ltd. Hyderabad.

PLANT SET UP FOR FINAL PRODUCT

Yes

IPR STATUS DETAILS (PATENTS/COPYRIGHT/TRADEMARK SECURITY IN INDIA/ABROAD)

One patent has been granted in USA in 2009 (US 7,524,452 B2) and two provisional patent application have been filed (201911033448 IN and 0214NF2019 IN, US, CN, AU, BR, EU, GN).

POTENTIAL MARKET/TECHNO-ECONOMICS

Radiation shielding material for CT-scanner room, X-ray diagnostic room.

ENVIRONMENTAL SAFETY CERTIFICATION

Yes

NODAL SCIENTIST DETAILS

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240. CLOSED CELL ALUMINIUM COMPOSITES FOAMS

UID: TECH-THEME_8_ AMPRI-003

LABORATORY OF ORIGIN | CSIR-AMPRI, BHOPAL

EXECUTIVE SUMMARY

Closed cell Al-Composite foams are ultralight weight materials with significant extent of interfacial areas between cell and cell wall making it suitable for energy absorption, blast resistance, lightweight structural applications especially in automobile and defence. Hybrid composite increased the strength vis-à-vis energy absorption due to interaction of two kinds of reinforcement with the matrix. These porous materials resist the impulse wave transmission, and under blast it fragmented into very light particles and minimize secondary damage.

Process Developed

- Tailor made Aluminium and Aluminium composite foams with fairly uniform cell size distribution is developed.
- Liquid metallurgy stir casting process is utilised and can be adopted by any aluminium foundry.
- Cell size can be varied between 1 mm to 5 mm and porosity fraction can be varied between 60 to 90%. Density: 0.2 – 1.0 g/cc.
- Plateau strength: 5 MPa to 80 MPa, Energy absorption: 5 to 30 MJ/m³, Modulus: 5 to 10 GPa.
- Easily sliced like wood, it could be machinable and weldable. Thus by adopting these techniques, Al-hybrid composite foam sheets, plates, enclosure boxes etc could be made for various applications.
- Reinforcing agent are CNT, graphene and SiC particles.

KEYWORDS

Hard ceramic particle, Aluminium alloys, Aluminium composite foam, Stir casting, Blast resistance, Crashworthiness, Sound and vibration attenuation, Rural climatizer

SALIENT FEATURES

Closed cell Al-Composite foams are ultralight weight materials with significant extent of interfacial areas between cell and cell wall making it suitable for energy absorption, blast resistance, lightweight structural applications especially in automobile and defence.

APPLICATIONS

Suitable for energy absorption, blast resistance, lightweight structural applications especially in automobile and defence.

TECHNOLOGY BENCHMARKING

Yes

TECHNOLOGY READINESS LEVEL ASSESSMENT

TRL 6

SCALE OF DEVELOPMENT

Aluminium foam at a scale of 250 kg/day established at laboratory. Prototypes made and being tested Results showed to the end users.

4.8 MINING, MINERALS, METALS AND MATERIALS (4M)

STATUS OF COMMERCIALIZATION

A few products have been designed and made. The products as per end users are being designed. Satisfied with prototype test results. Performance to be evaluated in operational condition. (Industry partner is working with us).

TENTATIVE COST OF DEVELOPMENT

₹ 50.00 Lakhs

INDUSTRIAL PARTNERS

N/A

PLANT SET UP FOR FINAL PRODUCT

Not yet

IPR STATUS DETAILS (PATENTS/COPYRIGHT/TRADEMARK SECURITY IN INDIA/ABROAD)

N/A

POTENTIAL MARKET/TECHNO-ECONOMICS

- Automobile crash worthiness (crash box, bumper), Insert of doors and door panels, inverter bracket, filler of chassis and pillars for light weight high safety structure.
- Ship Building: Doors, partition panels in the cabin, hulls in ships and boats, light weight structure (use of Al-foam in place of steel, can reduce the weight of ship by 100 to 1500 tons. flooring of jetties.
- Defence: When the hybrid composite foam is attached with the steel plates, it will absorb the energy and minimum force is transmitted to the steel back plate causing protection of explosives, armaments. Antimine boots, bunkers, light weight combat vehicles.
- Construction sectors: flooring, wall mounting tiles, door panels and partition panels, lightweight partition walls for high rise building.
- Rural Sectors: Rural climatizer which maintain chamber temperature below 26°C even when atmospheric temperature is 45 to 48°C. This works without any power. It would be useful for vegetable and food storage by farmers, vegetable vendor. Even rural people can keep it in their home for domestic purpose. Energy saving is around ₹ 5000/- per year for a capacity of 1 m³.
- Rail: crash components, partition panels and flooring, sound and vibration arrester, considering its multifunctional application, these materials have huge market particularly if government impose strict vehicle safety requirement as well as indigenization of defence technology.

ENVIRONMENTAL SAFETY CERTIFICATION

N/A

NODAL SCIENTIST DETAILS

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241. ALUMINIUM METAL MATRIX COMPOSITES AND HYBRID COMPOSITES

UID: TECH-THEME_8_ AMPRI-004

LABORATORY OF ORIGIN | CSIR-AMPRI, BHOPAL

EXECUTIVE SUMMARY

To improve wear resistance, strength, modulus and high temperature strength, hard ceramics (SiC, Al₂O₃, Fly ash, mullite, TiC, TiB₂ graphite, CNT, Graphene etc.) are mixed into the cleaned and degassed liquid aluminium alloy at controlled temperature. These particles may be ultrafine, (100 nm to 10 micron) and coarse (10-80 micron) individually or in combinations are mixed into the liquid melt through mechanical stirring (at controlled rpm) using specially designed stirrer. Before mixing these particles are pre-treated. During mixing of these particles a surface modifier is added to improve the wettability between melt and the particle. Uniform distribution and strong interface bonding is achieved. These are easy to cast using conventional sand casting, die casting, pressure die casting and investment casting. Yield Strength 180 to 350 MPa (in cast condition) depending on the matrix and reinforcement and reinforcement content is achieved. After extrusion, rolling/forging it is 350 to 500 MPa Corrosion resistance and wear resistance comparable to cast iron 100 kg composite/heat. At same level Al-non particle composite is also developed. One License given to M/s Exclusive Magnesia, Hyderabad. Auto-industries are exploring to develop light weight auto components to replace steel and cast iron.



KEYWORDS

Hard ceramic particle, Aluminium alloys, Aluminium metal matrix composite, Stir, Casting, Sand-casting, Pressure die casting

SALIENT FEATURES

To improve wear resistance, strength, modulus and high temperature strength. After extrusion, rolling/forging it is 350 to 500 MPa Corrosion resistance and wear resistance comparable to cast iron 100 kg composite/heat. Environmental friendly materials.

APPLICATIONS

Automobiles, Defence, Engineering.

TECHNOLOGY BENCHMARKING

Yes

TECHNOLOGY READINESS LEVEL ASSESSMENT

TRL 6

4.8 MINING, MINERALS, METALS AND MATERIALS (4M)

SCALE OF DEVELOPMENT

Demonstrated in pilot scale in laboratory and outside laboratory, Components supplied to the end users for trials in operating conditions after completion of our self-trail.

STATUS OF COMMERCIALIZATION

Up to 4000 Km trial of brake drum made in automobile. Brake tests have performed at VRDE Ahmednagar. Operational level trials to be made.

TENTATIVE COST OF DEVELOPMENT

₹ 50.00 Lakhs

INDUSTRIAL PARTNERS

One License given to M/s Exclusive Magnesia, Hyderabad.

PLANT SET UP FOR FINAL PRODUCT

Not yet

IPR STATUS DETAILS (PATENTS/COPYRIGHT/TRADEMARK SECURITY IN INDIA/ABROAD)

N/A

POTENTIAL MARKET/TECHNO-ECONOMICS

- Automobile (brake drums, discs, piston, cylinder liner, engine blocks, connecting rods, crank case, clutch plates etc to replace cast iron and steel (weight saving by 65 to 70%).
- Defence: Nose cone for torpedo, radar, EMI shielding, light weight composite armour, space vehicles.
- Engineering: Manhole cover (to replace cast iron cover).
- Improve energy efficiency, increase load carrying capacity or pay off load.
- Environmental friendly materials.
- In India every year around 35 lakhs of new car is made and sale. More than 50 lakhs of motor bikes are sold. In addition, there are heavy vehicles like busses, trucks, defence vehicles. Thus these materials would have huge market in recent future.

ENVIRONMENTAL SAFETY CERTIFICATION

Yes

NODAL SCIENTIST DETAILS

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242. SPECIALTY BOROSILICATE GLASS BEAD: AN INNOVATIVE MATERIAL FOR NUCLEAR SAFETY

UID: TECH-THEME_8_CGCRI-005

LABORATORY OF ORIGIN | CSIR-CGCRI, KOLKATA

EXECUTIVE SUMMARY

High level radio-active liquid waste produced in nuclear plant contains undesirable long life radio isotopes. The preeminent way to immobilize such isotopes for safe disposal is to use material with unique molecular structures and physical shapes. CSIR-CGCRI has developed, implemented, and commercialized specialty materials that has become ultimate choice for management of radioactive waste in a closed nuclear fuel cycle. These are of preferred sizes with stringent physical, chemical and mechanical specifications. The innovative technology enables remote control of the entire operation of immobilization process at nuclear plants. It also assists in recovery and recycles of valuables during nuclear waste immobilization and is of significant importance for nuclear power programs. The entire process is non-hazardous to the operating personal. CSIR-CGCRI has also evaluated the productivity of the materials in terms of desired material performance, resulting from large scale bulk manufacturing.



KEYWORDS

Nuclear waste, Nuclear plants

SALIENT FEATURES

Developed, implemented, and commercialized specialty materials that has become ultimate choice for management of radioactive waste in a closed nuclear fuel cycle. These are of preferred sizes with stringent physical, chemical and mechanical specifications.

APPLICATIONS

Nuclear waste management.

TECHNOLOGY BENCHMARKING

Yes

TECHNOLOGY READINESS LEVEL ASSESSMENT

TRL 9

SCALE OF DEVELOPMENT

Commercialised

STATUS OF COMMERCIALIZATION

Commercialised

4.8 MINING, MINERALS, METALS AND MATERIALS (4M)

TENTATIVE COST OF DEVELOPMENT

₹ 250.00 Lakhs

INDUSTRIAL PARTNERS

N/A

PLANT SET UP FOR FINAL PRODUCT

Yes

IPR STATUS DETAILS (PATENTS/COPYRIGHT/TRADEMARK SECURITY IN INDIA/ABROAD)

N/A

POTENTIAL MARKET/TECHNO-ECONOMICS

Nuclear waste disposal.

ENVIRONMENTAL SAFETY CERTIFICATION

Yes

NODAL SCIENTIST DETAILS

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243. HIGH DENSITY RADIATION SHIELDING WINDOW GLASS FOR NUCLEAR HOT CELL APPLICATION

UID: TECH-THEME_8_ CGCRI-006

LABORATORY OF ORIGIN | CSIR-CGCRI, KOLKATA

EXECUTIVE SUMMARY

Radiation Shielding Window Glass (RSW) are used in nuclear reactors and nuclear processing units. CSIR-CGCRI has developed a technology for producing homogeneous and defect free high density RSW glass blocks (ceria stabilized as well as un-stabilized) of varying sizes. The laboratory has ventured into establishing pilot scale facility of 180 kg melt size per batch for technology demonstration and producing the materials to meet the indigenous demand.

KEYWORDS

Radiation shielding, Nuclear reactor, Nuclear processing unit

SALIENT FEATURES

Developed a technology for producing homogeneous and defect free high density RSW glass blocks (ceria stabilized as well as un-stabilized) of varying sizes.

APPLICATIONS

Nuclear stations, facilities.

TECHNOLOGY BENCHMARKING

Yes

TECHNOLOGY READINESS LEVEL ASSESSMENT

TRL 8

SCALE OF DEVELOPMENT

Established pilot scale facility of 180 kg melt size per batch for technology demonstration and producing the materials. The technology prototype been tested in actual field conditions/production/manufacturing/operational environment.

STATUS OF COMMERCIALIZATION

Comercialized

TENTATIVE COST OF DEVELOPMENT

₹ 300.00 Lakhs

INDUSTRIAL PARTNERS

N/A

PLANT SET UP FOR FINAL PRODUCT

Yes

4.8 MINING, MINERALS, METALS AND MATERIALS (4M)

IPR STATUS DETAILS (PATENTS/COPYRIGHT/TRADEMARK SECURITY IN INDIA/ABROAD)
N/A

POTENTIAL MARKET/TECHNO-ECONOMICS

Defence sector, highly strategic and import substitution material.

ENVIRONMENTAL SAFETY CERTIFICATION

Not Certified

NODAL SCIENTIST DETAILS

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244. LOW MOISTURE CASTABLE (45-75% Al_2O_3)

UID: TECH-THEME_8_ CGCRI-007

LABORATORY OF ORIGIN | CSIR-CGCRI, KOLKATA

EXECUTIVE SUMMARY

Conventional shaped refractory requires high shutdown/installation time, suffer limitation of geometry and has lower energy efficiency. Developed low moisture castable (45-75% Al_2O_3) is prepared from different high alumina aggregates, high alumina cement and reactive aluminas. These can be installed with low cement/water resulting high hot strength, flexibility on-site installation of difficult shapes. Compared to conventional shaped refractory, these castables can be manufactured without special mixing instruments and less inventory. The technology has been transferred to several industries.

KEYWORDS

Alumina aggregate, Castable, Refractory material

SALIENT FEATURES

Developed low moisture castable (45-75% Al_2O_3) is prepared from different high alumina aggregates, high alumina cement and reactive aluminas. These can be installed with low cement/water resulting high hot strength, flexibility on-site installation of difficult shapes.

APPLICATIONS

Uses in refractory castables.

TECHNOLOGY BENCHMARKING

Yes

TECHNOLOGY READINESS LEVEL ASSESSMENT

TRL 6

SCALE OF DEVELOPMENT

Technology successfully demonstrated to the intended end user.

STATUS OF COMMERCIALIZATION

The technology has been transferred to several industries & commercialized.

TENTATIVE COST OF DEVELOPMENT

₹ 50.00 Lakhs

INDUSTRIAL PARTNERS

N/A

PLANT SET UP FOR FINAL PRODUCT

Yes

IPR STATUS DETAILS (PATENTS/COPYRIGHT/TRADEMARK SECURITY IN INDIA/ABROAD)

Patented

4.8 MINING, MINERALS, METALS AND MATERIALS (4M)

POTENTIAL MARKET/TECHNO-ECONOMICS

Uses in refractory castables with cost minimization.

ENVIRONMENTAL SAFETY CERTIFICATION

N/A

NODAL SCIENTIST DETAILS

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245. MAG-CHROME REFRACTORY AGGREGATES FROM FRIABLE CHROME ORE

UID: TECH-THEME_8_CGCRI-008

LABORATORY OF ORIGIN | CSIR-CGCRI, KOLKATA

EXECUTIVE SUMMARY

Mag-chrome refractories exhibit exceptional resistance to high temperature corrosion. This spinel refractory is generally produced from calcined magnesite and chrome ore. However, the Indian chrome ores are not dense-its friable nature poses major difficulty in ceramic processing. Thus it is challenging to prepare dense Mag-chrome aggregates using friable chrome ore. The patented technology however, overcomes this challenge. This technology can convert sintered MgO and friable chrome ore into dense mag-chrome refractory aggregate through single step heat treatment with the judicious use of oxide additive. The dense aggregates derived from this method can be used to prepare shaped refractory blocks for different critical applications like steel ladle, copper smelter and cement rotary kiln. The technology has been transferred and commercialized.



KEYWORDS

MgO, Friable chrome ore, Cement rotary kiln

SALIENT FEATURES

This technology can convert sintered MgO and friable chrome ore into dense mag-chrome refractory aggregate through single step heat treatment with the judicious use of oxide additive. The dense aggregates derived from this method can be used to prepare shaped refractory blocks for different critical applications like steel ladle, copper smelter and cement rotary kiln.

APPLICATIONS

Uses in steel ladle, copper smelter and cement rotary kiln.

TECHNOLOGY BENCHMARKING

Yes

TECHNOLOGY READINESS LEVEL ASSESSMENT

TRL 6

SCALE OF DEVELOPMENT

Technology successfully demonstrated to the intended end user.

STATUS OF COMMERCIALIZATION

N/A

4.8 MINING, MINERALS, METALS AND MATERIALS (4M)

TENTATIVE COST OF DEVELOPMENT

₹ 50.00 Lakhs

INDUSTRIAL PARTNERS

N/A

PLANT SET UP FOR FINAL PRODUCT

N/A

IPR STATUS DETAILS (PATENTS/COPYRIGHT/TRADEMARK SECURITY IN INDIA/ABROAD)

N/A

POTENTIAL MARKET/TECHNO-ECONOMICS

Refractory Industry.

ENVIRONMENTAL SAFETY CERTIFICATION

NA

NODAL SCIENTIST DETAILS

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246. MULLITE REFRACTORY AGGREGATES FROM BAUXITE

UID: TECH-THEME_8_ CGCRI-009

LABORATORY OF ORIGIN | CSIR-CGCRI, KOLKATA

EXECUTIVE SUMMARY

Indian Bauxite is not suitable for high temperature application as it contains detrimental impurities like CaO , Fe_2O_3 , SiO_2 and TiO_2 . Conversion of these low grade natural bauxites through structural modification to high alumina aggregates has been realised through judicious formation of mullite phase before the development of low melting phases from bauxite. The detrimental effect of impurity oxides in raw bauxite is sequestered by converting them into high temperature solid solution by judicious incorporation of additives. This improves the RUL value by almost 100°C . The ultimate high alumina aggregates thus developed is much superior compared to directly calcined bauxite in terms of physical, micro-structural and thermo-mechanical properties. The final product is characterized by compact and homogeneous microstructure with an average grain size of 3 micron and refractoriness under load value of 1600°C . The technology is ready for transfer.

KEYWORDS

Bauxite, Mining

SALIENT FEATURES

The ultimate high alumina aggregates thus developed is much superior compared to directly calcined bauxite in terms of physical, micro-structural and thermo-mechanical properties.

APPLICATIONS

Uses in mining.

TECHNOLOGY BENCHMARKING

Yes

TECHNOLOGY READINESS LEVEL ASSESSMENT

TRL 6

SCALE OF DEVELOPMENT

Technology successfully demonstrated to the intended end User & plant trial completed.

STATUS OF COMMERCIALIZATION

N/A

TENTATIVE COST OF DEVELOPMENT

₹ 50.00 Lakhs

INDUSTRIAL PARTNERS

N/A

4.8 MINING, MINERALS, METALS AND MATERIALS (4M)

PLANT SET UP FOR FINAL PRODUCT

N/A

IPR STATUS DETAILS (PATENTS/COPYRIGHT/TRADEMARK SECURITY IN INDIA/ABROAD)

N/A

POTENTIAL MARKET/TECHNO-ECONOMICS

Mining Industry.

ENVIRONMENTAL SAFETY CERTIFICATION

N/A

NODAL SCIENTIST DETAILS

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247. MAG-AL SPINEL REFRACTORY AGGREGATES

UID: TECH-THEME_8_CGCRI-010

LABORATORY OF ORIGIN | CSIR-CGCRI, KOLKATA

EXECUTIVE SUMMARY

Mag-Al spinel refractories offer high temperature strength and excellent high temperature corrosion resistance along with low thermal expansion. This refractory is an eco-friendly alternative to Mag-chrome refractory. However, formation of dense spinel aggregates is challenging due to high thermal expansion associated with spinelisation reaction from magnesia and alumina. The developed technology utilises formation of dense spinel aggregates through a single stage thermal treatment using a novel additive to facilitate the formation of dense spinel. These dense spinel aggregates find use in different areas of high temperature processing industries such as clinkering zone of cement rotary kiln, steel convertors etc. The technology has been validated in several industries.

KEYWORDS

Cement industry, Mag-Al

SALIENT FEATURES

Mag-Al spinel refractories offer high temperature strength and excellent high temperature corrosion resistance along with low thermal expansion. The developed technology utilises formation of dense spinel aggregates through a single stage thermal treatment using a novel additive to facilitate the formation of dense spinel.

APPLICATIONS

Clinkering zone of cement rotary kiln, Steel convertors.

TECHNOLOGY BENCHMARKING

Yes

TECHNOLOGY READINESS LEVEL ASSESSMENT

TRL 6

SCALE OF DEVELOPMENT

Technology successfully demonstrated to the intended end user.

STATUS OF COMMERCIALIZATION

N/A

TENTATIVE COST OF DEVELOPMENT

₹ 50.00 Lakhs

INDUSTRIAL PARTNERS

N/A

PLANT SET UP FOR FINAL PRODUCT

Not yet

4.8 MINING, MINERALS, METALS AND MATERIALS (4M)

IPR STATUS DETAILS (PATENTS/COPYRIGHT/TRADEMARK SECURITY IN INDIA/ABROAD)
N/A

POTENTIAL MARKET/TECHNO-ECONOMICS
Cement industry, Steel industry.

ENVIRONMENTAL SAFETY CERTIFICATION
N/A

NODAL SCIENTIST DETAILS
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248. 70-90% ALUMINA CEMENT FREE DENSE SELF FLOWING CASTABLE

UID: TECH-THEME_8_ CGCRI-012

LABORATORY OF ORIGIN | CSIR-CGCRI, KOLKATA

EXECUTIVE SUMMARY

Dense self-flowing castables are the most important unshaped refractory used in cement, petroleum, steel and thermal power plants. The developed castable is composed of various grades of sintered/fused alumina aggregates of different purity level, calcined bauxite and clays along with reactive alumina. This requires no vibration for its flow, less inventory and offer quick and controlled cold setting property. It has been already transferred to several industries.

KEYWORDS

Calcined bauxite, Alumina aggregate

SALIENT FEATURES

The developed castable is composed of various grades of sintered/fused alumina aggregates of different purity level, calcined bauxite and clays along with reactive alumina. This requires no vibration for its flow, less inventory and offer quick and controlled cold setting property.

APPLICATIONS

Cement, petroleum, steel and thermal power plants.

TECHNOLOGY BENCHMARKING

Yes

TECHNOLOGY READINESS LEVEL ASSESSMENT

TRL 6

SCALE OF DEVELOPMENT

Already transferred to industry.

STATUS OF COMMERCIALIZATION

N/A

TENTATIVE COST OF DEVELOPMENT

₹ 50.00 Lakhs

INDUSTRIAL PARTNERS

Yes

PLANT SET UP FOR FINAL PRODUCT

Not yet

IPR STATUS DETAILS (PATENTS/COPYRIGHT/TRADEMARK SECURITY IN INDIA/ABROAD)

N/A

4.8 MINING, MINERALS, METALS AND MATERIALS (4M)

POTENTIAL MARKET/TECHNO-ECONOMICS

Refractory industries

ENVIRONMENTAL SAFETY CERTIFICATION

N/A

NODAL SCIENTIST DETAILS

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249. ORBITAL EYE BALL IMPLANT

UID: TECH-THEME_8_CGCRI-013

LABORATORY OF ORIGIN | CSIR-CGCRI, KOLKATA

EXECUTIVE SUMMARY

CSIR-CGCRI has developed Orbital eye ball implant for functional and cosmetic rehabilitation (in which implanted artificial eye can almost exactly mimic that of healthy eye) of huge numbers of ailing single-eyed patients in India. It is light weight, highly porous orbital implants made using bioactive material hydroxyapatite. The implant comes in different sizes to suit different patients. Implants are made using innovative and economical process. The high porosity of the implant enables tissue in-growth thereby provides natural eye movement that is synchronized with other normal eye.

KEYWORDS

Implant, Bioceramic implant

SALIENT FEATURES

It is light weight, highly porous orbital implants made using bioactive material hydroxyapatite. The implant comes in different sizes to suit different patients. Implants are made using innovative and economical process. The high porosity of the implant enables tissue in-growth thereby provides natural eye movement that is synchronized with other normal eye.

APPLICATIONS

Orbital eye ball implant for functional and cosmetic rehabilitation.

TECHNOLOGY BENCHMARKING

Yes

TECHNOLOGY READINESS LEVEL ASSESSMENT

TRL 6

SCALE OF DEVELOPMENT

Technology successfully demonstrated to the intended end user.

STATUS OF COMMERCIALIZATION

N/A

TENTATIVE COST OF DEVELOPMENT

₹ 60.00 Lakhs

INDUSTRIAL PARTNERS

N/A

PLANT SET UP FOR FINAL PRODUCT

N/A

IPR STATUS DETAILS (PATENTS/COPYRIGHT/TRADEMARK SECURITY IN INDIA/ABROAD)

N/A

4.8 MINING, MINERALS, METALS AND MATERIALS (4M)

POTENTIAL MARKET/TECHNO-ECONOMICS

Functional and cosmetic rehabilitation.

ENVIRONMENTAL SAFETY CERTIFICATION

N/A

NODAL SCIENTIST DETAILS

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250. CERAMIC BIOMEDICAL IMPLANTS (HIP JOINT-PROSTHESIS)

UID: TECH-THEME_8_ CGCRI-015

LABORATORY OF ORIGIN | CSIR-CGCRI, KOLKATA

EXECUTIVE SUMMARY

CSIR-CGCRI has developed ceramic biomedical implants (hip joint prosthesis) for total hip replacement (THR) based on ceramic head and polymer acetabular cup. Dense alumina based modular femoral head of different diameters to suit are available for total hip replacement. The products have been clinically tested and is as per ISO spec., low wear, suits Indian patients. The technology has been launched in market. Equivalent metallic implants have been discarded world-wide, ceramic THR is gaining importance, thus huge market potential exist for the technology and the products.

KEYWORDS

Implant, Bio ceramic implant

SALIENT FEATURES

Developed ceramic biomedical implants (hip joint prosthesis) for Total Hip Replacement (THR) based on ceramic head and polymer acetabular cup.

APPLICATIONS

Dense alumina based modular femoral head of different diameters to suit are available for total hip replacement. The products have been clinically tested and is as per ISO spec., low wear, suits Indian patients.

TECHNOLOGY BENCHMARKING

Yes

TECHNOLOGY READINESS LEVEL ASSESSMENT

TRL 6

SCALE OF DEVELOPMENT

Technology successfully demonstrated to the intended end User.

STATUS OF COMMERCIALIZATION

N/A

TENTATIVE COST OF DEVELOPMENT

₹ 60.00 Lakhs

INDUSTRIAL PARTNERS

NA

PLANT SET UP FOR FINAL PRODUCT

NA

4.8 MINING, MINERALS, METALS AND MATERIALS (4M)

IPR STATUS DETAILS (PATENTS/COPYRIGHT/TRADEMARK SECURITY IN INDIA/ABROAD)

N/A

POTENTIAL MARKET/TECHNO-ECONOMICS

Functional and cosmetic rehabilitation.

ENVIRONMENTAL SAFETY CERTIFICATION

N/A

NODAL SCIENTIST DETAILS

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251. BIOACTIVE GLASS COATING FOR DENTAL APPLICATION

UID: TECH-THEME_8_ CGCRI-016

LABORATORY OF ORIGIN | CSIR-CGCRI, KOLKATA

EXECUTIVE SUMMARY

CSIR-CGCRI has developed bioactive glass/hydroxyapatite coating on metallic tooth root part (total dental implant). Cement-less fixation compared to the polymer cement fixation of bare metallic dental implants, gives rise to many advantages that include absence of heat generation during implantation, non-requirement of secondary surgery to remove the bone cement after some time, faster bone resorption, etc. It is mechanically strong, adherent bioactive coating on metallic implant substrates including titanium and its alloys. It can be used on surgical grade stain.

KEYWORDS

Implant, Bioceramic implant

SALIENT FEATURES

Cement-less fixation compared to the polymer cement fixation of bare metallic dental implants, gives rise to many advantages that include absence of heat generation during implantation, non-requirement of secondary surgery to remove the bone cement after some time, faster bone resorption, etc.

APPLICATIONS

Total dental implant.

TECHNOLOGY BENCHMARKING

Yes

TECHNOLOGY READINESS LEVEL ASSESSMENT

TRL 6

SCALE OF DEVELOPMENT

Technology successfully demonstrated to the intended end user.

STATUS OF COMMERCIALIZATION

N/A

TENTATIVE COST OF DEVELOPMENT

₹ 60.00 Lakhs

INDUSTRIAL PARTNERS

N/A

PLANT SET UP FOR FINAL PRODUCT

N/A

4.8 MINING, MINERALS, METALS AND MATERIALS (4M)

IPR STATUS DETAILS (PATENTS/COPYRIGHT/TRADEMARK SECURITY IN INDIA/ABROAD)
N/A

POTENTIAL MARKET/TECHNO-ECONOMICS
Functional and cosmetic rehabilitation.

ENVIRONMENTAL SAFETY CERTIFICATION
N/A

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252. SYNTHETIC BONE GRAFT MATERIAL

UID: TECH-THEME_8_CGCRI-017

LABORATORY OF ORIGIN | CSIR-CGCRI, KOLKATA

EXECUTIVE SUMMARY

Synthetic bone graft material technology of CSIR-CGCRI find application in making porous scaffolds, granules, powders for bone development/faster augmentation, dental filler, periodontic applications while having superior osteo-conductive/inductive properties. The material can be used with pharmaceutical drugs or growth-factors, freely flowable granules can also be used for plasma spray purposes. It is effective for intra-medullary bone development.

KEYWORDS

Implant, Bioceramic implant

SALIENT FEATURES

Synthetic bone graft material technology find application in making porous scaffolds, granules, powders for bone development/faster augmentation, dental filler, periodontic applications while having superior osteo-conductive/inductive properties.

APPLICATIONS

In making porous scaffolds, granules, powders for bone development/faster augmentation, dental filler, periodontic applications while having superior osteo-conductive/inductive properties. It can also be used for plasma spray.

TECHNOLOGY BENCHMARKING

Yes

TECHNOLOGY READINESS LEVEL ASSESSMENT

TRL 6

SCALE OF DEVELOPMENT

Technology successfully demonstrated to the intended end user.

STATUS OF COMMERCIALIZATION

N/A

TENTATIVE COST OF DEVELOPMENT

₹ 60.00 Lakhs

INDUSTRIAL PARTNERS

N/A

PLANT SET UP FOR FINAL PRODUCT

N/A

IPR STATUS DETAILS (PATENTS/COPYRIGHT/TRADEMARK SECURITY IN INDIA/ABROAD)

N/A

4.8 MINING, MINERALS, METALS AND MATERIALS (4M)

POTENTIAL MARKET/TECHNO-ECONOMICS

Functional and cosmetic rehabilitation.

ENVIRONMENTAL SAFETY CERTIFICATION

N/A

NODAL SCIENTIST DETAILS

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253. OPTICAL FIBER BRAGG GRATING (FBG) BASED SENSORS FOR SMART INFRASTRUCTURE AND INDUSTRIAL PROCESS MONITORING

UID: TECH-THEME_8_CGCRI-018

LABORATORY OF ORIGIN | CSIR-CGCRI, KOLKATA

EXECUTIVE SUMMARY

FBG sensors are optical fiber based sensing devices that can measure strain, temperature, pressure and vibration and many more parameters depending on its configuration and design. These optical sensors are generally used for process control and health monitoring applications. These sensors are free from electromagnetic interference. These are operable in harsh environments where conventional sensors are unusable and can be used in distributed form i.e., over hundreds of sensors in a single optical fiber. These sensors are easily embeddable in structures during fabrication leading to development of intelligent infrastructure. Few systems have been developed using FBG sensor technology with direct industry participation.

KEYWORDS

FBG, Temperature sensor

SALIENT FEATURES

FBG sensors are optical fiber based sensing devices that can measure strain, temperature, pressure and vibration and many more parameters depending on its configuration and design. These optical sensors are generally used for process control and health monitoring applications. These sensors are free from electromagnetic interference.

APPLICATIONS

To development of intelligent infrastructure.

TECHNOLOGY BENCHMARKING

Yes

TECHNOLOGY READINESS LEVEL ASSESSMENT

TRL 8

SCALE OF DEVELOPMENT

Technology successfully demonstrated to the intended end user, Technology prototype been tested in actual field conditions/production/manufacturing/operational environment.

STATUS OF COMMERCIALIZATION

N/A

TENTATIVE COST OF DEVELOPMENT

₹ 200.00 Lakhs

INDUSTRIAL PARTNERS

N/A

PLANT SET UP FOR FINAL PRODUCT

N/A

IPR STATUS DETAILS (PATENTS/COPYRIGHT/TRADEMARK SECURITY IN INDIA/ABROAD)

N/A

POTENTIAL MARKET/TECHNO-ECONOMICS

Railways, Power plants etc.

ENVIRONMENTAL SAFETY CERTIFICATION

N/A

NODAL SCIENTIST DETAILS

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254. MOISTURE SENSOR (5-95% RH) MOISTURE METER (5-100 PPM MOISTURE)

UID: TECH-THEME_8_ CGCRI-019

LABORATORY OF ORIGIN | CSIR-CGCRI, KOLKATA

EXECUTIVE SUMMARY

Sol-gel derived microporous as well as nonporous alumina thin film based capacitive moisture sensors (humidity meter with sensor head and trace moisture analyser with sensor head) with fast response and recovery have been developed indigenously by CSIR-CGCRI. The weight is about 200 g to 300 g. The power requirement is 220V/50Hz or 9V DC, <10mA. The display is digital/LCD as per the customer requirements.

KEYWORDS

Moisture sensor, Moisture meter

APPLICATIONS

Humidity meter with sensor head and trace moisture analyser with sensor head.

TECHNOLOGY BENCHMARKING

Yes

TECHNOLOGY READINESS LEVEL ASSESSMENT

TRL 6

SCALE OF DEVELOPMENT

Technology successfully demonstrated to the intended end user.

STATUS OF COMMERCIALIZATION

NA

TENTATIVE COST OF DEVELOPMENT

₹ 30.00 Lakhs

INDUSTRIAL PARTNERS

N/A

PLANT SET UP FOR FINAL PRODUCT

N/A

IPR STATUS DETAILS (PATENTS/COPYRIGHT/TRADEMARK SECURITY IN INDIA/ABROAD)

N/A

POTENTIAL MARKET/TECHNO-ECONOMICS

Agriculture

ENVIRONMENTAL SAFETY CERTIFICATION

N/A

NODAL SCIENTIST DETAILS

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255. POTTERY AND LOW COST EARTHEN WARES

UID: TECH-THEME_8_ CGCRI-020

LABORATORY OF ORIGIN | CSIR-CGCRI, KOLKATA

EXECUTIVE SUMMARY

Pottery is commonly used by all class of people. Pottery process which is being made generally at 1250°C has been converted to energy efficient processed earthen ware at 1080-1100°C. These wares are cheaper than normal pottery. It has opened a new door to new comers generating employment. Almost 20-30 units in Khurja are manufacturing this pottery after our T&D programs. It has scope to get spread to other clusters.

KEYWORDS

Pottery and low cost earthen ware

SALIENT FEATURES

Energy efficient process; reduce the energy demand as this technology process the earthen ware at 1080-1100°C.

APPLICATIONS

Pottery

TECHNOLOGY BENCHMARKING

Yes

TECHNOLOGY READINESS LEVEL ASSESSMENT

TRL 6

SCALE OF DEVELOPMENT

Technology successfully demonstrated to the intended end user.

STATUS OF COMMERCIALIZATION

N/A

TENTATIVE COST OF DEVELOPMENT

₹ 150.00 Lakhs

INDUSTRIAL PARTNERS

Yes

PLANT SET UP FOR FINAL PRODUCT

Almost 20-30 units in Khurja are manufacturing this pottery.

IPR STATUS DETAILS (PATENTS/COPYRIGHT/TRADEMARK SECURITY IN INDIA/ABROAD)

N/A

4.8 MINING, MINERALS, METALS AND MATERIALS (4M)

POTENTIAL MARKET/TECHNO-ECONOMICS

Rural entrepreneurship in the area of pottery.

ENVIRONMENTAL SAFETY CERTIFICATION

N/A

NODAL SCIENTIST DETAILS

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256. FABRICATION OF SPECIALTY REFRACTORY POT AND MANUFACTURING OF HIGH DENSITY SPECIALTY GLASS CULLET FOR RADIATION SHIELDING APPLICATIONS

UID: TECH-THEME_8_ CGCRI-022

LABORATORY OF ORIGIN | CSIR-CGCRI, KOLKATA

EXECUTIVE SUMMARY

Pottery is commonly used by all class of people. Pottery process which is being made generally at the present offer comprises of a Process/Product Technology for fabrication of Specialty Refractory Pot and manufacturing of High Density Specialty Glass Cullet (D=5.2g/cc) leading to transfer of technology, demonstration of the technology and commercialization of the technology.

KEYWORDS

Radiation shielding, Nuclear reactor, Nuclear processing unit

SALIENT FEATURES

Combination of Process/Product Technology for fabrication of Specialty Refractory Pot and manufacturing of High Density Specialty Glass Cullet.

APPLICATIONS

Radiation shielding, nuclear reactor.

TECHNOLOGY BENCHMARKING

Yes

TECHNOLOGY READINESS LEVEL ASSESSMENT

TRL 7

SCALE OF DEVELOPMENT

Technology successfully demonstrated to the intended end User, Technology prototype been tested in actual field conditions/production/manufacturing/operational environment.

STATUS OF COMMERCIALIZATION

NA

TENTATIVE COST OF DEVELOPMENT

₹ 150.00 Lakhs

INDUSTRIAL PARTNERS

NA

PLANT SET UP FOR FINAL PRODUCT

NA

4.8 MINING, MINERALS, METALS AND MATERIALS (4M)

IPR STATUS DETAILS (PATENTS/COPYRIGHT/TRADEMARK SECURITY IN INDIA/ABROAD)
NA

POTENTIAL MARKET/TECHNO-ECONOMICS
Defence sector, highly strategic and affordable material.

ENVIRONMENTAL SAFETY CERTIFICATION
NA

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257. TECHNOLOGY OF PACKAGED FIBER LASER

UID: TECH-THEME_8_CGCRI-024

LABORATORY OF ORIGIN | CSIR-CGCRI, KOLKATA

EXECUTIVE SUMMARY

- i) 100 W Continuous wave (CW) Ytterbium fiber laser at 1.11 μ m.
 - ii) 20 W Pulsed Ytterbium fiber laser at 1.11 μ m.
 - Type I (Pulse Energy 0.5 mJ, Pulse width within 90-120 ns).
 - Type 2 (Pulse Energy 1 mJ, Pulse width within 80-110 ns).
 - iii) 30 W Continuous Wave (CW) Thulium fiber laser at 1.94 μ m and 2.11 μ m
- Description of Technology:
The offer comprises of three technologies consisting of fabrication and packaging technique of-
- (a) 100 W CW Ytterbium laser for stent cutting, marking on plastic and PCB surface
 - (b) 20 W Pulsed Ytterbium laser for marking and engraving applications and
 - (c) 30 W CW Thulium laser for surgical application in medicine.

KEYWORDS

Fiber laser, Thulium fiber laser

SALIENT FEATURES

Combination of three technologies consisting of fabrication and packaging technique for:

- Stent cutting, marking on plastic and PCB surface.
- Marking and engraving applications.
- Surgical application in medicine.

APPLICATIONS

Technologies of fabrication and packaging technique.

TECHNOLOGY BENCHMARKING

Yes

TECHNOLOGY READINESS LEVEL ASSESSMENT

TRL 7

SCALE OF DEVELOPMENT

Technology successfully demonstrated to the intended end user.

STATUS OF COMMERCIALIZATION

N/A

TENTATIVE COST OF DEVELOPMENT

₹ 200.00 Lakhs

INDUSTRIAL PARTNERS

N/A

PLANT SET UP FOR FINAL PRODUCT

N/A

IPR STATUS DETAILS (PATENTS/COPYRIGHT/TRADEMARK SECURITY IN INDIA/ABROAD)

N/A

POTENTIAL MARKET/TECHNO-ECONOMICS

Metal cutting, marking and surgical applications.

ENVIRONMENTAL SAFETY CERTIFICATION

N/A

NODAL SCIENTIST DETAILS

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258. ASH FILLING IN OPENCAST MINES

UID: TECH-THEME_8_CIMFR-025

LABORATORY OF ORIGIN | CSIR-CIMFR, DHANBAD

EXECUTIVE SUMMARY

Disposal of coal ash generated by thermal power plants is a challenge now-a-days under rigid environmental norms. The conventional method of disposing it in ash ponds leads to requirement of huge amount of valuable land for its construction which can have adverse effect on air, ground water and soil. Hence, the need of the hour is to utilize this ash in an environment friendly manner. The technology throws a light on the scheme for utilizing coal ash in combination with overburden (O/B) material as a filling material in abandoned and active portion of the mine. The filling work is carried out by design of embankment to contain it against the high wall.

KEYWORDS

Opencast mine, Overburden (O/B), Fly ash, Waste disposal.

SALIENT FEATURES

This technology throws a light on the scheme for utilizing coal ash in combination with overburden (O/B) material as a filling material in abandoned and active portion of the mine. The filling work is carried out by design of embankment to contain it against the high wall.

APPLICATIONS

Disposal of coal ash generated by thermal power plants.

TECHNOLOGY BENCHMARKING

Yes

TECHNOLOGY READINESS LEVEL ASSESSMENT

TRL 9

SCALE OF DEVELOPMENT

Already successful field implementation is done at the different opencast mines.

STATUS OF COMMERCIALIZATION

Yes

TENTATIVE COST OF DEVELOPMENT

₹ 20.00 Lakhs

INDUSTRIAL PARTNERS

JSPL, NTPC, CIL, SCCL, CSPGCL, LANCO, ICML etc.

PLANT SET UP FOR FINAL PRODUCT

Yes

4.8 MINING, MINERALS, METALS AND MATERIALS (4M)

IPR STATUS DETAILS (PATENTS/COPYRIGHT/TRADEMARK SECURITY IN INDIA/ABROAD)
N/A

POTENTIAL MARKET/TECHNO-ECONOMICS

Already successfully field implementation was done at the different opencast mines. Different companies who have funded the projects in this area includes JSPL, NTPC, CIL, SCCL, CSPGCL, LANCO, ICML etc.

ENVIRONMENTAL SAFETY CERTIFICATION

Yes

NODAL SCIENTIST DETAILS

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259. PASTE BACKFILLING IN UNDERGROUND METAL MINES

UID: TECH-THEME_8_ CIMFR-026

LABORATORY OF ORIGIN | CSIR-CIMFR, DHANBAD

EXECUTIVE SUMMARY

Surface disposal of mill tailings generated as a by-product of processing of ore is challenging task due to adverse socio- environmental impacts. A possible alternate solution is to use the mill tailings as a backfill material for underground metal mines. Conventional hydraulic filling requires recirculation of additional water, whereas paste filling requires comparatively less water, facilitates possibility of maximum recovery of ore from the stope, enhances stability, minimizes subsidence and provides many more advantages. The term “Paste” refers to a class of backfill that has an appearance akin to “Toothpaste” and have low water content such that the mixture has a consistency as measured by ASTM slump cone test from slightly greater than zero up to nearly 305 mm (12 inches), high densities (> 75% solids by weight) low permeability, generally consisting about 15% minus 20 μ fine content.

KEYWORDS

Underground metal mine, Paste backfill, Mill tailings, Fly ash, Waste disposal

SALIENT FEATURES

A possible alternate solution is to use the mill tailings as a backfill material for underground metal mines. Conventional hydraulic filling requires recirculation of additional water, whereas paste filling requires comparatively less water, facilitates possibility of maximum recovery of ore from the stope, enhances stability, minimizes subsidence and provides many more advantages.

APPLICATIONS

Backfill material for underground metal mines.

TECHNOLOGY BENCHMARKING

Yes

TECHNOLOGY READINESS LEVEL ASSESSMENT

TRL 9

SCALE OF DEVELOPMENT

Already successful field implementation is done at the underground mines of HZL.

STATUS OF COMMERCIALIZATION

Different companies who have funded the projects in this area includes HZL, IMFA, and MOIL etc.

TENTATIVE COST OF DEVELOPMENT

₹ 40.00 Lakhs

INDUSTRIAL PARTNERS

HZL, IMFA, and MOIL etc.

4.8 MINING, MINERALS, METALS AND MATERIALS (4M)

PLANT SET UP FOR FINAL PRODUCT

Yes

IPR STATUS DETAILS (PATENTS/COPYRIGHT/TRADEMARK SECURITY IN INDIA/ABROAD)
N/A

POTENTIAL MARKET/TECHNO-ECONOMICS

Already successful field implementation is done at the underground mines of HZL. Different companies who have funded the projects in this area includes HZL, IMFA, and MOIL etc.

ENVIRONMENTAL SAFETY CERTIFICATION

Yes

NODAL SCIENTIST DETAILS

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260. PASTE BACKFILLING IN UNDERGROUND COAL MINES

UID: TECH-THEME_8_CIMFR-027

LABORATORY OF ORIGIN | CSIR-CIMFR, DHANBAD

EXECUTIVE SUMMARY

Surface disposal of coal ash is a challenging task due to adverse socio-environmental impacts. A possible alternate solution is to use the coal ash as a paste backfill material for underground coal mines. Development of Paste backfill technology and its application in the few coal mines of the world marked the dawn of new era in backfill technology for coal mines. This has sparked an urge to develop this technology into Indian mining scenario. Conventional hydraulic filling requires recirculation of additional water, whereas paste filling requires comparatively less water, facilitates possibility of maximum recovery of coal from pillars, enhances stability, minimizes subsidence and provides many more advantages.

KEYWORDS

Underground coal mine, Paste backfill, Fly ash, Coal pillar, Waste disposal.

SALIENT FEATURES

Coal ash is used as a paste backfill material for underground coal mines. This technology use less water in comparison to the conventional hydraulic filling technologies.

APPLICATIONS

Backfill material for underground coal mines.

TECHNOLOGY BENCHMARKING

Yes

TECHNOLOGY READINESS LEVEL ASSESSMENT

TRL 6

SCALE OF DEVELOPMENT

Field implementation is in process at Sarni mine, Patharkhera Area, WCL.

STATUS OF COMMERCIALIZATION

N/A

TENTATIVE COST OF DEVELOPMENT

₹ 73.48 Lakhs

INDUSTRIAL PARTNERS

Contacted to WCL, TATA STEEL and ECL.

PLANT SET UP FOR FINAL PRODUCT

N/A

IPR STATUS DETAILS (PATENTS/COPYRIGHT/TRADEMARK SECURITY IN INDIA/ABROAD)

N/A

4.8 MINING, MINERALS, METALS AND MATERIALS (4M)

POTENTIAL MARKET/TECHNO-ECONOMICS

Field implementation is in process at Sarni mine, Patharkhera Area, WCL. We have contacted several industries like; WCL, TATA STEEL and ECL for getting external cash flow in the form of Industry sponsored projects.

ENVIRONMENTAL SAFETY CERTIFICATION

N/A

NODAL SCIENTIST DETAILS

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261. TRUCK MOUNTED MOBILE COAL SAMPLER FOR INSTANT COAL ASH & MOISTURE ANALYSER AT SITE FROM RAILWAY WAGON / TRUCK

UID: TECH-THEME_8_CIMFR-028

LABORATORY OF ORIGIN | CSIR-CIMFR, DHANBAD

EXECUTIVE SUMMARY

This Truck Mounted Mobile Coal Sampler (TMMCS) with Instant Ash & Moisture Analyser as shown in figure 1 (a, b, c) is for collecting an unbiased coal sample from open railway Wagon/Truck. The coal collected from the loaded Wagon/Truck will provide a true random representative sample (up to 6 feet depth) which would be analysed for quality determination for Ash & Moisture to get GCV value. The objective of the project has been successfully fulfilled and the feasibility of the nuclear technique method with Dual-gamma-ray Transmission for analysis of coal ash and moisture content has established resulting a fruitful outcome. The developed technology has given satisfactory output values of coal ash and moisture content within the permissible range to get instant GCV. In this sampler a modified drill mechanism was developed to collect the required coal from the truck/railway wagon for online analysis of ash and moisture content in the truck itself. This system will help coal producers as well as coal purchasers to get instant results of GCV within marginal variations and within the limits in no time. Patent filing is in progress.

KEYWORDS

Truck mounted mobile coal sampler, Instant ash, Moisture and GCV, Modified drill mechanism, Nuclear technique, Dual-gamma-ray transmission

SALIENT FEATURES

Mobile Instant Ash & Moisture Analyser for collecting an unbiased coal sample from open railway Wagon/Truck. The coal collected from the loaded Wagon/Truck will provide a true random representative sample (up to 6 feet depth) which would be analysed for quality determination for Ash & Moisture to get GCV value.

APPLICATIONS

Analysis of coal ash and moisture content.

TECHNOLOGY BENCHMARKING

Yes

TECHNOLOGY READINESS LEVEL ASSESSMENT

TRL 9

SCALE OF DEVELOPMENT

An integrated Truck Mounted Mobile Coal Sampler was designed and developed by CSIR-CIMFR, Dhanbad & M/s Pranay Enterprises, Hyderabad and field trial was successfully conducted at The Singareni Collieries Company Limited (SCCL) (A government Company) mines.

4.8 MINING, MINERALS, METALS AND MATERIALS (4M)**STATUS OF COMMERCIALIZATION**

Field trial was successfully conducted at The Singareni Collieries Company Limited (SCCL) (A government Company) mines.

TENTATIVE COST OF DEVELOPMENT

₹ 100.00 Lakhs

INDUSTRIAL PARTNERS

M/s Pranay Enterprises, Hyderabad.

PLANT SET UP FOR FINAL PRODUCT

Yes

IPR STATUS DETAILS (PATENTS/COPYRIGHT/TRADEMARK SECURITY IN INDIA/ABROAD)
N/A

POTENTIAL MARKET/TECHNO-ECONOMICS

An integrated Truck Mounted Mobile Coal Sampler was designed and developed by CSIR-CIMFR, Dhanbad & M/s Pranay Enterprises, Hyderabad and field trial was successfully conducted at The Singareni Collieries Company Limited (SCCL) (A government Company) mines. This system will help coal producers as well as coal purchasers to get instant results of GCV within marginal variations and within the limits in no time. This cost effective developed equipment/product would be helpful at large to reduce the cost of electricity, thus in turn beneficial to the society. The potential market for this device/product may be in the following coal, coal based power sector and steel making industries.

- Coal India
- NTPC
- DVC
- SAIL, VSP and other steel making industries.
- Other private coal company, coal based power sector.

ENVIRONMENTAL SAFETY CERTIFICATION

Certified

NODAL SCIENTIST DETAILS

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262. YIELDING STEEL PROP

UID: TECH-THEME_8_CIMFR-029

LABORATORY OF ORIGIN | CSIR-CIMFR, DHANBAD

EXECUTIVE SUMMARY

This product relates to a device for roof support of underground mine/tunnel. It particularly relates to a mine support device which additionally providing unique yielding mechanism, continuous monitoring of roof load of underground mine/tunnels/roadways with simple, easy and safe remote release mechanism. In general, underground mine/tunnels/roadways are supported, especially in India, by using wooden cogs/props and roof bolts. Though in most of the mines roof bolting culture has started, but passive support systems cannot be avoided. In board & pillar mining and longwall mining operation these types of supports are used extensively in addition to the roof bolting. But as wood is becoming scarce, there is need for suitable alternative supports to replace timbers in mines. Further, in deeper mines roof load decreases, thus to run the blasting gallery method of mining slow loading yielding props are required in addition to other support systems. Keeping in mind the Indian mining condition the support should be of greater longevity, light enough for easy portability and requiring less maintenance. Further, it should have facilities for height variation, sufficient yielding, continues load monitoring and releasing remotely as the coal seam thickness varies widely in Indian mines. Then, it should have ease in operation by even an unskilled worker. Additionally, the device must be economically viable and acceptable to the miners.

KEYWORDS

Slow loading prop, Yielding characteristics, Detachable parts, Disc spring, Setting load

SALIENT FEATURES

Method of mining slow loading yielding props are required in addition to other support systems. This product relates to a device for roof support of underground mine/tunnel. It particularly relates to a mine support device which additionally providing unique yielding mechanism, continuous monitoring of roof load of underground mine/tunnels/roadways with simple, easy and safe remote release mechanism. In general, underground mine/tunnels/roadways are supported, especially in India, by using wooden cogs/props and roof bolts.

APPLICATIONS

This product relates to roof support of underground mine/tunnel.

TECHNOLOGY BENCHMARKING

Yes

TECHNOLOGY READINESS LEVEL ASSESSMENT

TRL 8

SCALE OF DEVELOPMENT

Technology prototype been tested in actual field, industrial partner/manufacturer setup the plant for final product using the technology.

STATUS OF COMMERCIALIZATION

N/A

TENTATIVE COST OF DEVELOPMENT

₹ 1.50 Lakhs

INDUSTRIAL PARTNERS

N/A

PLANT SET UP FOR FINAL PRODUCT

N/A

IPR STATUS DETAILS (PATENTS/COPYRIGHT/TRADEMARK SECURITY IN INDIA/ABROAD)

Yes

POTENTIAL MARKET/TECHNO-ECONOMICS

- Coal India.
- SCCL, Kothagudem.
- Other state government & private coal companies.

ENVIRONMENTAL SAFETY CERTIFICATION

Yes

NODAL SCIENTIST DETAILS

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263. CIMFR BLAST GUIDE

UID: TECH-THEME_8_ CIMFR-031

LABORATORY OF ORIGIN | CSIR-CIMFR, DHANBAD

EXECUTIVE SUMMARY

An android application capable of performing many calculations during blasting for estimation of design parameters. It can also generate blast layout designs for visualizing the blasting pattern and timings. It also has many blasting regulatory compliances and guidelines which can be used by the user as reference.

KEYWORDS

Blast guide, Blast design parameters, Explosive products, Blast layout design, Regulatory compliance & guidelines.

SALIENT FEATURES

An android based application for calculations for estimation of design parameters during blasting. It can also generate blast layout designs for visualizing the blasting pattern and timings.

APPLICATIONS

Mine blast guide.

TECHNOLOGY BENCHMARKING

Yes

TECHNOLOGY READINESS LEVEL ASSESSMENT

TRL 7

SCALE OF DEVELOPMENT

Technology successfully demonstrated to the intended end user & technology prototype been tested in actual field conditions/production/manufacturing/operational environment.

STATUS OF COMMERCIALIZATION

N/A

TENTATIVE COST OF DEVELOPMENT

Nil

INDUSTRIAL PARTNERS

N/A

PLANT SET UP FOR FINAL PRODUCT

N/A

IPR STATUS DETAILS (PATENTS/COPYRIGHT/TRADEMARK SECURITY IN INDIA/ABROAD)

N/A

4.8 MINING, MINERALS, METALS AND MATERIALS (4M)

POTENTIAL MARKET/TECHNO-ECONOMICS

Various open cast metal or non-metal mines owners such as Coal India Limited, NMDC Limited, Singareni Collieries Company Limited, Tata Steel Limited, Vedanta Limited, L&T Construction, Ambuja Cement, ACC Cement, and Jaiprakash Associated Limited, etc.

ENVIRONMENTAL SAFETY CERTIFICATION

Yes

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264. ECONOMICAL PRODUCTION OF HIGHLY POROUS METAL ORGANIC FRAMEWORKS (MOF) FROM ZINC SCRAP

UID: TECH-THEME_8_CSIO-032

LABORATORY OF ORIGIN | CSIR-CSIO, CHANDIGARH

EXECUTIVE SUMMARY

Conversion of metal scraps in to economically attractive products is a key to drive the growth of Recycling sector. From this perspective, the present technology aims to convert the waste electrode powder of spent alkaline batteries in to an expensive Metal Organic Framework (MOF) end product. MOF have tremendous potential as adsorption material in different industrial applications such as gas separation, gas storage and catalysis. About 80% of annual battery waste is contributed by Zn-Alkaline primary batteries utilized in various household devices. Due to inefficient recycling processes, most of these batteries end up in land-fill sites. The process developed at CSIO can recover a high cost MOF (specifically Zinc-imidazolate framework or ZIF-8) from the waste electrode powder of spent alkaline batteries. After chemical leaching, the recovered zinc is converted in to ZIF-8 utilizing simple steps at ambient conditions. The recovered product is more than 99% pure as verified by several instrumental techniques. It may be highlighted here the ZIF-8 is a high cost chemical (about ₹ 6-8 Lakhs per kg).

KEYWORDS

Metal-organic framework, Advanced materials, Porous, Recovery from waste, Adsorbents

SALIENT FEATURES

It aims to convert the waste electrode powder of spent alkaline batteries in to an expensive Metal Organic Framework (MOF) end product. MOF have tremendous potential as adsorption material in different industrial applications such as gas separation, gas storage and catalysis.

APPLICATIONS

Industrial applications such as gas separation, gas storage and catalysis.

TECHNOLOGY BENCHMARKING

Yes

TECHNOLOGY READINESS LEVEL ASSESSMENT

TRL 6

SCALE OF DEVELOPMENT

Technology successfully demonstrated to the intended end user.

STATUS OF COMMERCIALIZATION

N/A

TENTATIVE COST OF DEVELOPMENT

₹ 0.5 Lakhs

4.8 MINING, MINERALS, METALS AND MATERIALS (4M)

INDUSTRIAL PARTNERS

N/A

PLANT SET UP FOR FINAL PRODUCT

N/A

IPR STATUS DETAILS (PATENTS/COPYRIGHT/TRADEMARK SECURITY IN INDIA/ABROAD)

N/A

POTENTIAL MARKET/TECHNO-ECONOMICS

Materials, Speciality Chemicals, Adsorbents, Recyclers, Nano-products.

ENVIRONMENTAL SAFETY CERTIFICATION

N/A

NODAL SCIENTIST DETAILS

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265. MATERIALS FOR OPTICAL DETECTION OF SELENIUM IN WATER

UID: TECH-THEME_8_CSIO-033

LABORATORY OF ORIGIN | CSIR-CSIO, CHANDIGARH

EXECUTIVE SUMMARY

Selenium is an emerging water pollutant and is known to cause adverse health effects leading to selenosis in humans as well as animals. There is narrow range of its consumption in terms of deficiency (<40 ug/day) and toxicity (>400 ug/day) intake. The consumption of selenium (IV) above permissible limits of (10 ppb in drinking water by WHO and BIS) causes toxicity and oxidative stress leading to chronic diseases called Selenosis. It is thus important to develop some method for its screening in water bodies. We have developed optical materials and process for selenium detection in water through colorimetric and fluorescence change. A lab based reader device is also developed to read the fluorescence response.

KEYWORDS

Selenium, Material, Colorimetric, Fluorometric, Water

SALIENT FEATURES

Developed optical materials and process for selenium detection in water through colorimetric and fluorescence change. A lab based reader device is also developed to read the fluorescence response.

APPLICATIONS

To develop methods for screening in water bodies.

TECHNOLOGY BENCHMARKING

Yes

TECHNOLOGY READINESS LEVEL ASSESSMENT

TRL 6

SCALE OF DEVELOPMENT

Technology successfully demonstrated to the intended end user.

STATUS OF COMMERCIALIZATION

N/A

TENTATIVE COST OF DEVELOPMENT

₹ 0.12 Lakhs

INDUSTRIAL PARTNERS

N/A

PLANT SET UP FOR FINAL PRODUCT

N/A

4.8 MINING, MINERALS, METALS AND MATERIALS (4M)

IPR STATUS DETAILS (PATENTS/COPYRIGHT/TRADEMARK SECURITY IN INDIA/ABROAD)
N/A

POTENTIAL MARKET/TECHNO-ECONOMICS

Rural and Urban Water Supply and Sanitation Boards, Industries, Hospitals.

ENVIRONMENTAL SAFETY CERTIFICATION

N/A

NODAL SCIENTIST DETAILS

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266. COLUMN FLOTATION TECHNOLOGY FOR FLOTATION OF LOW GRADE FINES ORES AND MINERALS

UID: TECH-THEME_8_IMMT-034

LABORATORY OF ORIGIN | CSIR-IMMT, BHUBANESWAR

EXECUTIVE SUMMARY

Development of column flotation is the most significant achievement in the area of mineral processing in the last six decades for beneficiation of different fine size low grade ores and minerals. Column flotation technology developed by CSIR-IMMT is designed based on the counter-current and plug flow characteristics of flow of slurry and air bubbles that has many advantages like good process results, high selectivity of separation, simple process control to maintain constant aero-hydro-dynamics conditions, low energy consumption, low floor space requirements and simple design. Flotation column technology has unique features like combination of vertical and horizontal wash water system, introducing vertical and horizontal eddy breakers and online internal sparger replacement. CSIR-IMMT has carried out the studies in all levels like laboratory, pilot and commercial scale levels. Based on the metallurgical performance, the design aspects change in time to time. The test work has been carried out on various ores and minerals like coal, iron ore, chromite, phosphate barite, graphite, limestone, sulphide ores (galena, sphalerite, chalcopryite, molybdenite, stibnite) and sillimanite. It was scaled up and designed to 2 m diameter and 10 m height to handle 50 TPH feed of low grade iron ore for commercial application. The pilot scale set up has been designed of 0.5 m diameter and 10 m height having throughput capacity of 2-3 TPH for demonstration to the user industries at the beneficiation plant site. The demonstration at the plant site has been done for JSPL, Barbil, Essar Steel, Kirandul, Tata Steel, Joda for iron ore beneficiation and Tata Steel, Sukinda for chromite ore beneficiation. The commercial plant of 1m diameter and 7 m height has been set up for Utkal Graphite, Odisha for graphite beneficiation. The pilot plant having 1m diameter and 5 metre height has been set up, Tata Steel, West Bokaro coal washery and BCCL, Sudamundih coal washery for recovery of carbon values from the tailings of flotation cells. Chemico Chemicals, New Delhi has taken this technology for beneficiation of stibnite (antimony sulphide) in commercial level.

KEYWORDS

Column flotation, Online internal sparger replacement, Unique wash water system, Unique eddy breaker, Flotation of different minerals

SALIENT FEATURES

- Rotating combined horizontal and vertical wash water system to improve the quality of froth, improves the flowability of froth in the cleaning zone and allow to the system to operate in positive bias.
- Unique online maintenance of internal spargers replacement to maintain continuous operation without shutdown.
- Provision of internal spargers in different levels to maintain uniform bubble size in the flotation zone for better selectivity of attachment between hydrophobic particles and air bubbles.
- Counter current between slurry and air bubbles help to increase the relative velocity between air bubbles and hydrophobic solid particles.
- Plug flow patter operation helps to reduce the mixing and improve the attachment of air bubbles and hydrophobic particles.
- Horizontal and vertical baffles eliminate the eddy formation in the flotation zone.
- Interface level between flotation zone and cleaning zone can be maintained through PID control.
- The column is the vertical feature which reduces the floor space to install with same capacity with respect to flotation cell.
- There is no moving part inside; hence it reduces the maintenance cost.
- As it has cleaning zone, it reduces the number of cleaning steps in the beneficiation circuit.

4.8 MINING, MINERALS, METALS AND MATERIALS (4M)**APPLICATIONS**

Industries, Refineries.

TECHNOLOGY BENCHMARKING

Yes

TECHNOLOGY READINESS LEVEL ASSESSMENT

TRL 7

SCALE OF DEVELOPMENT

Technology successfully demonstrated to the intended end User, technology prototype been tested in actual field conditions/production/manufacturing/operational environment. The demonstration at the plant site has been done for JSPL, Barbil, Essar Steel, Kirandul, Tata Steel, Joda for iron ore.

STATUS OF COMMERCIALIZATION

Technology has been transferred to M/s Tega Industries Limited, Kolkata for commercial exploitation.

TENTATIVE COST OF DEVELOPMENT

₹ 1000 Lakhs

INDUSTRIAL PARTNERS

JSPL, Barbil, Essar Steel, Kirandul, Tata Steel, Joda, M/s Tega Industries Limited, Kolkata.

PLANT SET UP FOR FINAL PRODUCT

Yes

IPR STATUS DETAILS (PATENTS/COPYRIGHT/TRADEMARK SECURITY IN INDIA/ABROAD)

N/A

POTENTIAL MARKET/TECHNO-ECONOMICS

The technology has been transferred to M/s Tega Industries Limited, Kolkata for commercial exploitation. In the meantime, the technology has been transferred to small scale industries for flotation of graphite and stibnite (antimony sulphide). The pilot scale demonstration has been carried out for flotation of coal, iron ore, chromite ore, sillimanite and phosphate ore. As high grade is deteriorating in day-by-day, it has great potential for commercial application in the beneficiation of low grade ores and minerals like coal, iron ore, graphite, sulphide ores, barite, sillimanite and chromite ore.

ENVIRONMENTAL SAFETY CERTIFICATION

Yes

NODAL SCIENTIST DETAILS

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267. MAXIMISE THE IRON RECOVERY FROM LOW AND LEAN AND LOW GRADE IRON ORE RESOURCES

UID: TECH-THEME_8_IMMT-035

LABORATORY OF ORIGIN | CSIR-IMMT, BHUBANESWAR

EXECUTIVE SUMMARY

Iron ore is one of the basic raw materials for iron and steel industries. As per the recent National Steel Policy of Govt. of India, steel production will be enhanced to 300 MTPA in 2030. Indian hematitic iron ore deposits are associated with goethite, kaolinite, gibbsite and quartzite in different proportions. This ore is more soft and friable in nature due to the associated minerals. The generation of fine in comparison with hard lumpy ore is more. Many washing plants have been set up by NMDC, SAIL and Tata Steel to remove the slimes which contains the Fe value more than 55% Fe. Similarly the beneficiation plants have been set up by many organisation to beneficiate the low grade iron ores. When goethite and kaolinite percentage in the ore is more, it does not respond to the conventional beneficiation and also the reject contains more than threshold limit of 45% Fe. Thus, there is a need of hour to improve the iron value in ore at the stage of raw material preparation because high grade ore is depleting day-by-day. About 30-40% low-grade iron ore of total reserve is available for supply to contribute in the demand of Indian iron and steel industry. Apart from the low grade ores, iron ore tailings and slimes are accumulating day-by-day which contains more than 45% Fe. Similarly, India has high reserves of BHQ/BHJ/BGQ. These are to be addressed for their utilisation Hence reduction roasting process is an alternative process to utilise low and lean grade iron ore resources available in India. To counter the above problems CSIR-IMMT, Bhubaneswar has done lot of works to maximise the iron recovery from lean and low grade iron ore resources in India as well as samples from abroad in laboratory, pilot and semi commercial levels. In this process, kinetics and thermodynamics of the process should be monitored properly so that wustite formation should be minimised particularly. Otherwise, iron loss in the tailings will increase.

KEYWORDS

Low grade ores (45-58%), BHQ, BHJ, BGQ, Reduction roasting

SALIENT FEATURES

- Increases 15-20% extra yield.
- Increases grade of the concentrate.
- Reduces the grinding energy minimum 30%.
- Maximise the recovery of process water by filtration for both concentrate and tailings.
- Handling of the reject is easy and it does not require tailings pond.
- Productivity of the process will be high because there is no clay effect.
- Transportation through pipeline is easy.
- Ease to make pellet and reduced 20-30% energy consumption in the pelletisation process due to exothermic reaction for conversion from magnetite to hematite.
- Reduction roasting of BHQ/BHJ/BGQ to produce super grade concentrate with very less percentage of alumina to produce super grade pellet.
- It improves the conservation as well as environment of the surrounding the mines.

APPLICATIONS

Optical communication, lasers for strategic applications, supercontinuum light sources.

TECHNOLOGY BENCHMARKING

Yes

TECHNOLOGY READINESS LEVEL ASSESSMENT

TRL 8

SCALE OF DEVELOPMENT

Technology prototype been tested in actual field conditions/production/manufacturing/operational environment, final product based on the technology started selling into the market.

STATUS OF COMMERCIALIZATION

Test were carried out for Jindal SAW, Bhilwara, 40 TPD test was carried out for BGQ and BMM Ispat, Hospet, 20TPH test was carried out for BHQ, low grade iron ores and tailings.

TENTATIVE COST OF DEVELOPMENT

₹ 2000 Lakhs

INDUSTRIAL PARTNERS

Tata Steel, BMM Ispat, Arcelar Mittal Nipon Steel Ltd., JSPL, JSW, Jindal Saw Ltd., SMPL.

PLANT SET UP FOR FINAL PRODUCT

Yes

IPR STATUS DETAILS (PATENTS/COPYRIGHT/TRADEMARK SECURITY IN INDIA/ABROAD)

N/A

POTENTIAL MARKET/TECHNO-ECONOMICS

At present, India is producing in different iron ores. Market value of the iron ore of different quality in 2018 as per IBM information data at mine site:

65% Fe or more for lump ore (calibrated)	: ₹ 4307/- tonne
65% Fe or more for fines	: ₹ 2946/- tonne
Below 55% lump	: ₹ 1053/- tonne
55% fine	: ₹ 580/- tonne

As below 58% Fe content iron ore is not suitable for conventional beneficiation process with respect to yield as well as high Fe content in the reject, by reduction roasting process, the tentative production cost will be ₹ 2700/- per tonne at the Fe value of 64-65%. Similarly from BHQ/BHJ/BHQ, the cost of concentrate is ₹ 2800/- per tonne with Fe content of 65-66% with less alumina which is suitable for DRI pellet production. For commercial plant, the MOU was signed with FL Smidth to scale up the technology with auto control system of the process. The potential clients are Tata Steel, BMM Ispat, Arcelar Mittal Nipon Steel Ltd., JSPL, JSW, Jindal Saw Ltd., SMPL and other.

ENVIRONMENTAL SAFETY CERTIFICATION

N/A

NODAL SCIENTIST DETAILS

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268. MAXIMISE THE RECOVERY OF FLAKY GRAPHITE IN BENEFICIATION PROCESS OF NATURAL GRAPHITE ORE

UID: TECH-THEME_8_IMMT-036

LABORATORY OF ORIGIN | CSIR-IMMT, BHUBANESWAR

EXECUTIVE SUMMARY

Globally graphite is the most essential material in industrial application. Graphite is used as raw material for crucible, refractory, foundry, pencils, colloidal graphite, lubricants, batteries, graphene oxide, graphene, and expandable graphite. Grade, shape, size and purity are the determinant factors for each application. Each industry has its own specifications in regard to fixed carbon content and size distribution of graphite. The grade of graphite for its utilization varies from 80% to as high as 99.9% fixed carbon content. As graphite is the natural hydrophobic flaky nature and low density material, flotation technique is used to extract the graphite mineral. The mostly rejected materials in the graphite ore are clay minerals, quartzite and carbonate minerals. To make liberation of graphite mineral, the ore is crushed and ground before flotation. The flotation is done either using conventional flotation cell or column flotation. The purity of the product depends on the mineralogy as well as flaky/crystalline/amorphous nature of the ore. The unique technology has been developed to maximise the recovery of flaky particles (above 150 micron size) using scrubbing techniques. The combination scrubbing and classification were used using particular dosage of chemical additives to separate flaky particles before grinding. Flaky nature of the graphite ore responds well to the flotation process and easy to produce high quality product. It is possible to produce 94-96% fixed carbon concentrate product, which has high potential in application in different industries.

KEYWORDS

Graphite ore, Flaky graphite, Scrubbing process, Fixed carbon

SALIENT FEATURES

- The available flaky graphite in the more can be recovered more than 90%.
- The number of flotation steps in the cleaning can be reduced.
- The throughput capacity can be enhanced easily.
- The capital as well as operating cost will reduce drastically.

APPLICATIONS

Flaking industries, refineries etc.

TECHNOLOGY BENCHMARKING

Yes

TECHNOLOGY READINESS LEVEL ASSESSMENT

TRL 7

SCALE OF DEVELOPMENT

Technology prototype been tested in actual field conditions/production/manufacturing/operational environment.

4.8 MINING, MINERALS, METALS AND MATERIALS (4M)**STATUS OF COMMERCIALIZATION**

This process has been transferred to M/s Tirupati Graphite Plc. London to set up a plant at Madagascar.

TENTATIVE COST OF DEVELOPMENT

₹ 200 Lakhs

INDUSTRIAL PARTNERS

M/s Tirupati Graphite Plc.

PLANT SET UP FOR FINAL PRODUCT

This process has been transferred to M/s Tirupati Graphite Plc. London to set up a plant at Madagascar.

IPR STATUS DETAILS (PATENTS/COPYRIGHT/TRADEMARK SECURITY IN INDIA/ABROAD)
N/A

POTENTIAL MARKET/TECHNO-ECONOMICS

This process has been transferred to M/s Tirupati Graphite Plc. London to set up a plant at Madagascar. The plant has been set up and process has been successfully transferred. In all over the world, the demand of high purity graphite, graphene oxide and graphene are increasing exponential in day-by-day for different applications. Graphene is one layer of graphite. The natural graphite has high potential demand in near future.

ENVIRONMENTAL SAFETY CERTIFICATION

N/A

NODAL SCIENTIST DETAILS

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269. DESIGNED SCREW SCRUBBER EQUIPMENT FOR MINERAL PROCESSING

UID: TECH-THEME_8_IMMT-037

LABORATORY OF ORIGIN | CSIR-IMMT, BHUBANESWAR

EXECUTIVE SUMMARY

Iron ore, chromite ore and manganese ore contain good amount of clay particles. Because of clay mineral associated with oxide ores, the viscosity of pulp increases drastically due to its swelling properties. It affects the hydrodynamics of slurry during grinding of the ores and separation units in the beneficiation circuit. To improve the performance of grinding and separation process, the ore is to be scrubbed using different scrubbing equipment. Normally, the clay is associated either coating on the surface of the oxide minerals or sitting in the capillary of the particles. The size of the clay particles is below 45 micron. Before grinding, the ore (below 10 mm size) is scrubbed using screw scrubber to classify below 150 micron particles as overflow of the screw scrubber. The water flow rate varies depending on the particle size distribution and percentage of clay mineral associated. The screw scrubber is designed in such a manner, the scrubbing action is more in comparison with other scrubbing equipments used like screw scrubber, drum scrubber and log washer for below 10 mm size particles. The laboratory scale and pilot scale screw scrubbers were designed and fabricated and installed. The pilot scale capacity is 3 TPH for iron ores. Due to more scrubbing action the size reduction takes place more in comparison with other equipment. Number of tests were carried out for iron ore, chromite ore, manganese ore, barite, graphite etc. The process has been scaled up to treat up to 200 TPH of oxide ores.

KEYWORDS

Screw scrubber, Clay particles, Reduction of ultra-fine generation, Improvement of productivity and quality of the product

SALIENT FEATURES

- The clay and fine particles can be removed easily at the beginning so that the hydrodynamics of the slurry can be improved in the grinding and beneficiation circuit.
- Throughput capacity can be increased easily.
- It helped a lot to reduce the ultrafine particles.

APPLICATIONS

Refineries, Cement Industries etc.

TECHNOLOGY BENCHMARKING

Yes

TECHNOLOGY READINESS LEVEL ASSESSMENT

TRL 6

SCALE OF DEVELOPMENT

Technology successfully demonstrated to the intended end user.

4.8 MINING, MINERALS, METALS AND MATERIALS (4M)**TENTATIVE COST OF DEVELOPMENT**

₹ 20 Lakhs

STATUS OF COMMERCIALIZATION

The technology has been transferred to M/s Swagath Urathene Limited, Bhubaneswar for commercial utilization.

PLANT SET UP FOR FINAL PRODUCT

N/A

INDUSTRIAL PARTNERS

M/s Swagath Urathene Limited.

IPR STATUS DETAILS (PATENTS/COPYRIGHT/TRADEMARK SECURITY IN INDIA/ABROAD)

N/A

POTENTIAL MARKET/TECHNO-ECONOMICS

The technology has been transferred to M/s Swagath Urathene Limited, Bhubaneswar for commercial utilization. The following are the potential areas where the technology could be commercialized (a) feldspar beneficiation, (b) iron ore beneficiation, (c) chromite beneficiation, (d) graphite beneficiation and bauxite ore.

ENVIRONMENTAL SAFETY CERTIFICATION

N/A

NODAL SCIENTIST DETAILS

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270. MAXIMISATION OF IRON RECOVERY FROM LEAN/ LOW GRADE IRON ORE RESOURCES BY REDUCTION ROASTING TECHNIQUE

UID: TECH-THEME_8_IMMT-039

LABORATORY OF ORIGIN | CSIR-IMMT, BHUBANESWAR

EXECUTIVE SUMMARY

Low grade iron ore (< 55%Fe) and lean grade ore (BHQ/BHJ/BGQ) do not respond to the conventional physical beneficiation process. To recover iron values from these types of iron ore, reduction roasting has been done to change the iron phase minerals i.e., hematite and goethite to magnetite phase under specific thermodynamic conditions. Tests have been carried out in pilot scale at 70-80 TPH on various mineralogically different low-grade iron ores/slimes/tailings/BHQ/BHJ/BGQ.

KEYWORDS

Reduction roasting, Magnetic separation, Low grade iron ore, Goethetic iron ore

SALIENT FEATURES

- Increases 15-20% extra yield.
- Increases grade of the concentrate.
- Reduces the grinding energy by a minimum of 30% margin.
- Maximizes the recovery of process water by filtration for both concentrate and tailings.
- Handling of the reject is easy and it does not require tailing pond.
- Transportation through pipeline is easy.
- Easy to make pellet with 20-30% reduction of energy consumption in the pelletisation process due to exothermic reaction in the conversion from magnetite to hematite.
- Improves the pellet quality from magnetite concentrate.
- Reduces the consumption of ores per tonne of production of concentrate.
- Reduces the tailings generation.
- Improves ore conservation and reduces environmental impact.

APPLICATIONS

Iron and mineral industry.

TECHNOLOGY BENCHMARKING

Yes

TECHNOLOGY READINESS LEVEL ASSESSMENT

TRL 7

SCALE OF DEVELOPMENT

Technology prototype been tested in actual field conditions/production/manufacturing/operational environment.

STATUS OF COMMERCIALIZATION

MOU has been signed with M/s FLS mitdh, Chennai for commercialization of the technology.

4.8 MINING, MINERALS, METALS AND MATERIALS (4M)**TENTATIVE COST OF DEVELOPMENT**

₹ 700 Lakhs

INDUSTRIAL PARTNERS

M/s FLSmidth

PLANT SET UP FOR FINAL PRODUCT

N/A

IPR STATUS DETAILS (PATENTS/COPYRIGHT/TRADEMARK SECURITY IN INDIA/ABROAD)

N/A

POTENTIAL MARKET/TECHNO-ECONOMICS

As per the National Steel Policy 2017, India needs to produce 300 million tonnes which requires beneficiation of low grade iron ore. The present technology provides a pathway for maximizing the productivity of iron ore beneficiation wherein conserving the iron ore resources of India. MOU has been signed with M/s FLSmidth, Chennai for commercialization of the technology.

ENVIRONMENTAL SAFETY CERTIFICATION

N/A

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271. ALUM FROM ALUMINIUM DROSS RESIDUE

UID: TECH-THEME_8_IMMT-040

LABORATORY OF ORIGIN | CSIR-IMMT, BHUBANESWAR

EXECUTIVE SUMMARY

Aluminium dross is one of the major wastes generated from aluminium industries which contains a varied amount of aluminium values in the form of metals and metal oxide. Traditionally aluminium metal values are recovered and a tremendous amount of the rejects/residues containing 5-8% metal and 60-65% metal oxides are thus generated. A very small quantity of this dross residue is used for making crackers, impure chemicals, and low-quality refractory bricks. Disposal and recycling of the residue is a worldwide problem and most of which (about 95%) is landfilled due to the unavailability of suitable technologies for recycling. As the residue contains a lot of toxic substances such as nitrides, fluorides and in some cases also cyanides, it causes severe environmental pollution and contaminates the nearby water bodies destroying the local flora and fauna. This process is an environmentally benign process that will utilize this hazardous residue to produce a high valued and highly useful chemical alum. This will completely abolish the mishandling of dross residues that causes severe environmental hazards. The alum produced in this process has the potential to treat the effluents from industries like leather, paper and pharmaceuticals etc. In addition to this, an industry of this capacity generates employment opportunities for about 20-25 people including engineers and chemists.

KEYWORDS

Dross, Alum, Acid, Leaching, Crystallisation

SALIENT FEATURES

This process is an environmentally benign process that will utilize this hazardous residue to produce a high valued and highly useful chemical alum. This will completely abolish the mishandling of dross residues that causes severe environmental hazards. The alum produced in this process has the potential to treat the effluents from industries like leather, paper and pharmaceuticals etc.

APPLICATIONS

Industries like leather, paper and pharmaceuticals etc.

TECHNOLOGY BENCHMARKING

Yes

TECHNOLOGY READINESS LEVEL ASSESSMENT

TRL 9

SCALE OF DEVELOPMENT

Technology prototype been tested in actual field conditions/production/manufacturing/operational environment.

STATUS OF COMMERCIALIZATION

Final product based on the technology started selling into the market.

4.8 MINING, MINERALS, METALS AND MATERIALS (4M)**TENTATIVE COST OF DEVELOPMENT**

₹ 150–200 Lakhs for an Industry 15-20 Tons of alum per day.

INDUSTRIAL PARTNERS

Yes

PLANT SET UP FOR FINAL PRODUCT

N/A

IPR STATUS DETAILS (PATENTS/COPYRIGHT/TRADEMARK SECURITY IN INDIA/ABROAD)

N/A

POTENTIAL MARKET/TECHNO-ECONOMICS

To treat effluents from Pharma Industries, Leather Industries, and Paper and pulp Industries, Textile Industries, Urban sewage water treatment.

ENVIRONMENTAL SAFETY CERTIFICATION

Yes

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272. EYE-ON-PELLET-: ONLINE PELLET SIZE ANALYZER FOR PELLETIZATION INDUSTRIES

UID: TECH-THEME_8_IMMT-041

LABORATORY OF ORIGIN | CSIR-IMMT, BHUBANESWAR

EXECUTIVE SUMMARY

Preparation of iron ore fines/concentrates, as feed to blast furnace, involves production of spherical pellets of typically 8mm-18mm diameter is called pelletization. The productivity of a pelletization plant depends on a process which generates spherical pellets with a proper strength in a specific size range. Presently, in many pelletization plants in India the size monitoring and control is being carried out by human supervision leading to sub-optimal productivity. CSIR-IMMT's Instrument (named as EYE-ON-PELLET) is capable of online monitoring of the size of pellets during its production and provides a size distribution trend. The system also can give alarm if production size is too small or big. By viewing the size distribution trend the operator can control process parameters to enhance the productivity. There is scope for further customization in the technology depending on the requirement of the industry. System is field trialed and demonstrated at leading pelletization industries such as TATA, BRPL, JSW, ESSAR, MSPL, Minera etc. Technology is transferred to an Indian company for manufacturing and marketing of the instrument. The technology is adopted by JSW Steel Ltd., Vijayanagaram, Karnataka, India in 2019-2020 at its pellet plant 1 (7 equipments with networking) and pellet plant 2 (1 equipment).

KEYWORDS

Iron ore pelletization, Online pellet size analysis, Eye-on-Pellet, Camera based size analysis

SALIENT FEATURES

CSIR-IMMT's Instrument (named as EYE-ON-PELLET) is capable of online monitoring of the size of pellets during its production and provides a size distribution trend. The system also can give alarm if production size is too small or big. By viewing the size distribution trend the operator can control process parameters to enhance the productivity.

APPLICATIONS

Steel industry etc.

TECHNOLOGY BENCHMARKING

Yes

TECHNOLOGY READINESS LEVEL ASSESSMENT

TRL 6

SCALE OF DEVELOPMENT

Demonstrated at leading pelletization industries such as TATA, BRPL, JSW, ESSAR, MSPL, Minera etc, technology successfully demonstrated to the intended end user.

STATUS OF COMMERCIALIZATION

The technology is adopted by JSW Steel Ltd., Vijayanagaram, Karnataka, India in 2019-2020 at its pellet plant 1 (7 equipments with networking) and pellet plant 2 (1 equipment).

4.8 MINING, MINERALS, METALS AND MATERIALS (4M)**TENTATIVE COST OF DEVELOPMENT**

₹ 7-10 Lakhs per unit.

INDUSTRIAL PARTNERS

JSW Steel Ltd., Vijayanagaram, Karnataka.

PLANT SET UP FOR FINAL PRODUCT

Technology is transferred to an Indian company for manufacturing and marketing of the instrument. The technology is adopted by JSW Steel Ltd., Vijayanagaram, Karnataka, India in 2019-2020 at its pellet plant 1 (7 equipments with networking) and pellet plant 2 (1 equipment).

IPR STATUS DETAILS (PATENTS/COPYRIGHT/TRADEMARK SECURITY IN INDIA/ABROAD)

N/A

POTENTIAL MARKET/TECHNO-ECONOMICS

Pelletization plants and steel plants having pelletization process require such a technology for online size analysis to enhance the productivity.

ENVIRONMENTAL SAFETY CERTIFICATION

Yes

NODAL SCIENTIST DETAILS

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273. AN ENVIRONMENTALLY FRIENDLY PROCESS FOR THE PRODUCTION OF HIGH GRADE SYNTHETIC RUTILE FROM LOW GRADE ILMENITE

UID: TECH-THEME_8_NIIST-042

LABORATORY OF ORIGIN | CSIR-NIIST, THIRUVANANTHAPURAM

EXECUTIVE SUMMARY

Ilmenite (FeTiO_3) and rutile (TiO_2) are the natural minerals exploited worldwide for the production of pigment grade TiO_2 and titanium metal. CSIR-NIIST has developed an environment friendly process which is superior in terms of pollution abatement, technology and the grade of synthetic rutile. This technology has been successfully demonstrated for two private industries where around 700 metric tons of Ilmenite has been processed to obtain 570 metric tons of metallized ilmenite (83-85%) with two commercial Direct Reduced Iron (DRI) rotary kilns of capacity 50 TPD and 130 metric tons of synthetic rutile has been produced. The process conditions of individual operations have been tailor-made to suit the available various grade of Indian ilmenite. This metallization process part will be useful for titania slag technology where the energy consumption can be drastically reduced.

KEYWORDS

Ilmenite, Metallization, Rotary kiln, Synthetic rutile and Titanium dioxide

SALIENT FEATURES

Environment friendly process which is superior in terms of pollution abatement, technology and the grade of synthetic rutile.

APPLICATIONS

Iron, construction industry etc.

TECHNOLOGY BENCHMARKING

Yes

TECHNOLOGY READINESS LEVEL ASSESSMENT

TRL 7

SCALE OF DEVELOPMENT

Technology successfully demonstrated to the intended end User, technology prototype been tested in actual conditions/production manufacturing.

STATUS OF COMMERCIALIZATION

Successfully demonstrated for two private industries where around 700 metric tons of Ilmenite has been processed to obtain 570 metric tons of metallized ilmenite (83-85%) with two commercial Direct Reduced Iron (DRI) rotary kilns of capacity 50 TPD and 130 metric tons of synthetic rutile has been produced.

TENTATIVE COST OF DEVELOPMENT

- Current price of ilmenite (55% TiO_2) – ₹ 8,000-10,000/T.
- Cost of production for Synthetic rutile – ₹ 33,000/T.

4.8 MINING, MINERALS, METALS AND MATERIALS (4M)

- Selling price of synthetic rutile (92% TiO_2) – ₹ 48,000-50,000/T.
- Estimated secured profit – ₹ 15,000/T.

INDUSTRIAL PARTNERS

N/A

PLANT SET UP FOR FINAL PRODUCT

N/A

IPR STATUS DETAILS (PATENTS/COPYRIGHT/TRADEMARK SECURITY IN INDIA/ABROAD)

NA

POTENTIAL MARKET/TECHNO-ECONOMICS

Global TiO_2 market is 11 billion USD and expected to grow 2.7% per year. The demand for TiO_2 in India is 1,50,000 tonnes / year and India imports 70% of it. Though Indian has 375-400 million tonnes of ilmenite (21% of global deposits), India's installed capacity is 1% of world's capacity. In light of the huge market space in terms of internal demand as well as the export potential, upgradation of ilmenite to a product containing more than 90% TiO_2 assumes greater significance by the Indian industries by adopting suitable but environmental friendly technologies. Upgradation of ilmenite in terms of TiO_2 content also fetch significant value addition. For instance, ilmenite containing 50-55% TiO_2 is priced at ₹ 8,000-10,000 per tonne and the same gets enhanced to ₹ 48,000 to 50,000 per tonne when the TiO_2 content in the mineral is increased to 90% or more.

ENVIRONMENTAL SAFETY CERTIFICATION

Yes

NODAL SCIENTIST DETAILS

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274. VIRTUAL CASTING – AFFORDABLE STATE-OF-THE-ART SOFTWARE FOR CASTING PROCESS DESIGN. COMMERCIAL NAME: FLOW+ MODULE IN AUTOCAS-X1

UID: TECH-THEME_8_NIIST-043

LABORATORY OF ORIGIN | CSIR-NIIST, THIRUVANANTHAPURAM

EXECUTIVE SUMMARY

FLOW+ module in AutoCAST-X1 is a completely redesigned software code: developed by the computational modelling & simulation group of CSIR-NIIST based: on “VIRTUAL CASTING SOLVER” Technology of CSIR-NIIST. FLOW+ module is a physics based casting simulation software with efficient memory management and better shrinkage prediction algorithm and is seamlessly integrated into geometry based casting design software AutoCAST-X which is owned, maintained and marketed by 3D Foundry Tech Pvt. Ltd., (3DFT). The FLOW+ module takes as input the thermo physical properties of the metal and the mold along with the geometry of the casting from AutoCAST platform, calculates the flow pattern in the mold cavity during filling, temperature changes in the metal and predicts the defects that could occur in the solidified casting.

KEYWORDS

Casting design, Simulation, Defects, Shrinkage, Foundry

SALIENT FEATURES

FLOW+ module is a physics based casting simulation software with efficient memory management and better shrinkage prediction algorithm and is seamlessly integrated into geometry based casting design software AutoCAST-X which is owned, maintained and marketed by 3D Foundry Tech Pvt. Ltd., (3DFT).

APPLICATIONS

Computer programming, software development.

TECHNOLOGY BENCHMARKING

Yes

TECHNOLOGY READINESS LEVEL ASSESSMENT

TRL 9

SCALE OF DEVELOPMENT

Transferred 17 licenses by the scientists themselves to 1 industrial customer and 16 educational Institutions, gave them training, benchmarked their cases etc.

STATUS OF COMMERCIALIZATION

Software was transferred to a start-up M/s 3D Foundry Tech Pvt. Ltd., a company incubated at IIT-B which was marketing AutoCAST-X a software for casting design developed by IITB this technology was validated first by the experimental results generated at IIT-B.

TENTATIVE COST OF DEVELOPMENT

₹ 5.5 Lakhs

INDUSTRIAL PARTNERS

3D Foundry Tech Pvt. Ltd., (3DFT) & IITB.

PLANT SET UP FOR FINAL PRODUCT

Yes

IPR STATUS DETAILS (PATENTS/COPYRIGHT/TRADEMARK SECURITY IN INDIA/ABROAD)

N/A

POTENTIAL MARKET/TECHNO-ECONOMICS

AutoCAST-X1 with FLOW+ is one of the very few products entirely designed and developed in India. This product is positioned as an easy-to-use, world class, yet affordable simulation software to Indian foundries (which falls under Small and Medium scale) and gives them the competitive edge of simulation at an affordable cost (compared to imported products) to deliver defect free castings right first time and every time. Unlike existing (imported) software, it is truly user friendly – even diploma degree holders can get trained and start using the software within two days. This software product enables foundries to reduce the number of shop-floor trials for developing a new casting (typically from five to just one trial). The average saving is approximately ₹ 16 lakhs per year per foundry. Further, they are able to reduce rejections (typically by half), as well as improve yield (typically by 5%), which translates to net value addition of ₹ 20 lakhs per year per foundry. The current penetration of casting simulation technology in Indian foundries is estimated to be less than 10%, compared to over 50% in developed countries. The adaptation of this technology by even 20% of the 5000 foundries in India will lead to immense savings including energy and environment benefits.

ENVIRONMENTAL SAFETY CERTIFICATION

Yes

NODAL SCIENTIST DETAILS

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275. FUNCTIONALLY GRADED ALUMINIUM ALLOY AND COMPOSITE PRODUCTS AND PROCESS TECHNOLOGY

UID: TECH-THEME_8_NIIST-044

LABORATORY OF ORIGIN | CSIR-NIIST, THIRUVANANTHAPURAM

EXECUTIVE SUMMARY

A large number of components for engineering and structural applications demand location specific performance under service conditions. Functionally Graded Materials (FGM) are tailored materials with gradual transition in the composition or microstructure which motivates the changes in the properties, and performance of that location thereby meeting the functional needs of the component. In the present method, the FGM concepts are successfully adopted for the design and fabrication of lightweight aluminium composite - functionally graded material components for automotive applications with improved location specific mechanical and wear properties. The technique has been used to fabricate and demonstrate the automotive components of brake rotor disc, cylinder liners and gear housing piston rings in collaboration with user industries. The lightweight brake disc components can be used in automotive for enhanced braking performance, handling and driving performance of the vehicle. The Al- FGM cylinder liners can provide low coefficient of friction and enhanced wear behaviour which in turn improves fuel efficiency and controlled emission. The gear housing piston rings are developed and tested (in terms of radiographic quality, loading and wear properties) for combat vehicle applications of CVRDE.

KEYWORDS

Functionally graded materials, Aluminum alloy, Metal matrix composite, Lightweight, Automotive

SALIENT FEATURES

Functionally Graded Materials (FGM) are tailored materials with gradual transition in the composition or microstructure which motivates the changes in the properties, and performance of that location thereby meeting the functional needs of the component.

APPLICATIONS

Automobile, aerospace, and marine and related industry.

TECHNOLOGY BENCHMARKING

Yes

TECHNOLOGY READINESS LEVEL ASSESSMENT

TRL 6

SCALE OF DEVELOPMENT

Technology successfully demonstrated to the intended end User, technology prototype been tested in actual conditions/production/manufacturing.

STATUS OF COMMERCIALIZATION

N/A

TENTATIVE COST OF DEVELOPMENT

₹ 80 Lakhs

INDUSTRIAL PARTNERS

N/A

PLANT SET UP FOR FINAL PRODUCT

N/A

IPR STATUS DETAILS (PATENTS/COPYRIGHT/TRADEMARK SECURITY IN INDIA/ABROAD)

N/A

POTENTIAL MARKET/TECHNO-ECONOMICS

According to the latest report published by Market Research Future (MRFR), the automotive disc brake market is projected to garner a market share of \$15.6 billion, resulting in a thriving Compound Annual Growth Rate (CAGR) of 6.5% during the forecast period of 2019-2023. Similarly, the global automotive cylinder liner market was estimated to be valued at US\$ 3,922.4 Mn in 2017 and is projected to reach US\$ 5,627.9 Mn by the end of 2027, expanding at a CAGR of 3.7% over the forecast period (2017-2027). The global metal matrix composite market is expected to reach USD 433.3 million by 2022, according to a new report by Grand View Research, Inc. Increasing need for high-performance composite metals from automotive, aerospace, and marine industries is expected to fuel the product demand over the forecast period. Global metal matrix composites market was 6,174.0 kilo tons in 2014 and is expected to grow at a CAGR of 6.3% from 2015 to 2022.

ENVIRONMENTAL SAFETY CERTIFICATION

N/A

NODAL SCIENTIST DETAILS

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276. ECO-FRIENDLY FLOTATION REAGENTS FOR SILLIMANITE, LIMESTONE AND COAL

UID: TECH-THEME_8_NML-046

LABORATORY OF ORIGIN | CSIR-NML, JAMSHEDPUR

EXECUTIVE SUMMARY

Currently in mineral processing industry, reagents (collectors and frothers) used for flotation of minerals and coal is synthesized from organic/inorganic source materials, classified as cationic, anionic and non-ionic. Majority of reagents being used at present in the industry are not environmentally compatible and are non-biodegradable. The reagent developed by CSIR-NML is eco-friendly and bio-degradable for the flotation of various mineral such as sillimanite, limestone, iron ore fines and coal. The performance of new reagents is evaluated in comparison with existing reagent practices.

KEYWORDS

Flotation reagents, Sillimanite, Limestone and coal

SALIENT FEATURES

The reagent developed by CSIR-NML is eco-friendly and bio-degradable for the flotation of various mineral such as sillimanite, limestone, iron ore fines and coal. The performance of new reagents is evaluated in comparison with existing reagent practices.

APPLICATIONS

Coal industries etc.

TECHNOLOGY BENCHMARKING

Yes

TECHNOLOGY READINESS LEVEL ASSESSMENT

TRL 7

SCALE OF DEVELOPMENT

Technology prototype has been tested in actual field, conditions/production/manufacturing/operational environment, technology successfully demonstrated to the intended end user.

STATUS OF COMMERCIALIZATION

N/A

TENTATIVE COST OF DEVELOPMENT

₹ 30 Lakhs

INDUSTRIAL PARTNERS

N/A

PLANT SET UP FOR FINAL PRODUCT

N/A

4.8 MINING, MINERALS, METALS AND MATERIALS (4M)

IPR STATUS DETAILS (PATENTS/COPYRIGHT/TRADEMARK SECURITY IN INDIA/ABROAD)
N/A

POTENTIAL MARKET/TECHNO-ECONOMICS
All mineral commodities.

ENVIRONMENTAL SAFETY CERTIFICATION
N/A

NODAL SCIENTIST DETAILS

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277. COLUMN FLOTATION TECHNOLOGY FOR PROCESSING OF FINE MINERALS AND ORES

UID: TECH-THEME_8_NML-048

LABORATORY OF ORIGIN | CSIR-NML, JAMSHEDPUR

EXECUTIVE SUMMARY

CSIR-NML has advanced a column flotation technology, a new mineral beneficiation method developed on strong scientific principles for processing of fine minerals and ores. The merits of the technology include improved metallurgical performance in terms of grade and recovery, effective cleaning of froths, small foot print, low capital investment, less operation and maintenance costs with user friendly controls.

KEYWORDS

Column flotation, Minerals, Ores, Beneficiation

SALIENT FEATURES

It has improved metallurgical performance in terms of grade and recovery, effective cleaning of froths, small foot print, low capital investment, less operation and maintenance costs with user friendly controls.

APPLICATIONS

Minerals refineries

TECHNOLOGY BENCHMARKING

Yes

TECHNOLOGY READINESS LEVEL ASSESSMENT

TRL 9

SCALE OF DEVELOPMENT

Technology prototype been tested in actual field conditions/production/manufacturing/operational environment.

STATUS OF COMMERCIALIZATION

Industrial partner/manufacturer has been setup the plant for final product using the technology & the final product based on the technology started selling into the market.

TENTATIVE COST OF DEVELOPMENT

₹ 100 Lakhs

INDUSTRIAL PARTNERS

Yes

PLANT SET UP FOR FINAL PRODUCT

N/A

4.8 MINING, MINERALS, METALS AND MATERIALS (4M)

IPR STATUS DETAILS (PATENTS/COPYRIGHT/TRADEMARK SECURITY IN INDIA/ABROAD)

N/A

POTENTIAL MARKET/TECHNO-ECONOMICS

All mineral commodities.

ENVIRONMENTAL SAFETY CERTIFICATION

Yes

NODAL SCIENTIST DETAILS

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278. YELLOW TUNGSTEN OXIDE AND TUNGSTEN METAL POWDER FROM HEAVY ALLOY SCRAPS

UID: TECH-THEME_8_NML-049

LABORATORY OF ORIGIN | CSIR-NML, JAMSHEDPUR

EXECUTIVE SUMMARY

CSIR-NML has developed the process technology for recovery of high pure products (YTO, W-metal powders & other metal salts/powders) from waste/end-of-life WC-hard metal tool bits/drill bits/inserts etc. and heavy metal alloy scraps/swarf. Tungsten is a vital strategic metal, having low resources in India.



KEYWORDS

Yellow tungsten oxide, Tungsten metal, Alloy scraps

SALIENT FEATURES

CSIR-NML has developed the process technology for recovery of high pure products (YTO, W-metal powders & other metal salts/powders) from waste/end-of-life WC-hard metal tool bits/drill bits/inserts etc. and heavy metal alloy scraps/swarf.

APPLICATIONS

Metal industry.

TECHNOLOGY BENCHMARKING

Yes

TECHNOLOGY READINESS LEVEL ASSESSMENT

TRL 8

SCALE OF DEVELOPMENT

Technology prototype been tested in actual field conditions/production/manufacturing/operational environment.

STATUS OF COMMERCIALIZATION

Industrial partner/manufacturer setup the plant for final product using the technology.

TENTATIVE COST OF DEVELOPMENT

₹ 50 Lakhs

INDUSTRIAL PARTNERS

N/A

PLANT SET UP FOR FINAL PRODUCT

N/A

4.8 MINING, MINERALS, METALS AND MATERIALS (4M)

IPR STATUS DETAILS (PATENTS/COPYRIGHT/TRADEMARK SECURITY IN INDIA/ABROAD)
N/A

POTENTIAL MARKET/TECHNO-ECONOMICS
Strategic sector.

ENVIRONMENTAL SAFETY CERTIFICATION
No

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279. NANOSIZED HYDROXYAPETITE POWDER

UID: TECH-THEME_8_NML-050

LABORATORY OF ORIGIN | CSIR-NML, JAMSHEDPUR

EXECUTIVE SUMMARY

Hydroxyapatite is a bioceramic powder widely used as bone graft material in Orthopedic and Dental implants. Most of the available products are imported brands with prohibitive price in India. The novelty in process for the production of nanosized hydroxyapatite powder lies in the in-situ synthesis of hydroxyapatite particles in protein matrix revealing an optimum degree of crystallinity. The protein matrix controls the hydroxyapatite particle size, morphology and regulates the precipitation process. The inventive step of the present invention is the attraction of calcium ions to specific sites in the protein matrix. In Load bearing biphasic calcium phosphate nanocomposite blocks as bone grafts and scaffolds, the novelty lies in the usage of biomimetic hydroxyapatite nanoparticles as an injectable basic building block. Biomimetic hydroxyapatite nanoparticles are well established because of its bioactivities suitable for bone tissue engineering.

KEYWORDS

Hydroxyapatite, Biomimetic, Nanotechnology, Medical industry

SALIENT FEATURES

The novelty in process for the production of nanosized hydroxyapatite powder lies in the in-situ synthesis of hydroxyapatite particles in protein matrix revealing an optimum degree of crystallinity. The protein matrix controls the hydroxyapatite particle size, morphology and regulates the precipitation process. The inventive step of the present invention is the attraction of calcium ions to specific sites in the protein matrix.

APPLICATIONS

Chemical industry.

TECHNOLOGY BENCHMARKING

Yes

TECHNOLOGY READINESS LEVEL ASSESSMENT

TRL 8

SCALE OF DEVELOPMENT

Technology prototype been tested in actual field conditions/production/manufacturing/operational environment.

STATUS OF COMMERCIALIZATION

Industrial partner/manufacturer setup the plant for final product using the technology.

TENTATIVE COST OF DEVELOPMENT

₹ 20 Lakhs

INDUSTRIAL PARTNERS

N/A

PLANT SET UP FOR FINAL PRODUCT

N/A

IPR STATUS DETAILS (PATENTS/COPYRIGHT/TRADEMARK SECURITY IN INDIA/ABROAD)

N/A

POTENTIAL MARKET/TECHNO-ECONOMICS

Medical industry, chemical industry.

ENVIRONMENTAL SAFETY CERTIFICATION

The safety aspects including environmental safety addressed and documented.

NODAL SCIENTIST DETAILS

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280. GEO-POLYMER CEMENT

UID: TECH-THEME_8_NML-051

LABORATORY OF ORIGIN | CSIR-NML, JAMSHEDPUR

EXECUTIVE SUMMARY

Geo-polymer cement developed by CSIR-NML is a new type of alumino-silicate binder and considered as an alternative to Portland cement. During synthesis, the alumino-silicates present in feedstock undergo polymerization and polycondensation resulting into hard ceramic like material with good longevity.

KEYWORDS

Geo-polymer cement

SALIENT FEATURES

The alumino-silicates present in feedstock undergo polymerization and polycondensation resulting into hard ceramic like material with good longevity. A new type of alumino-silicate binder and considered as an alternative to Portland cement.

APPLICATIONS

The geopolymer cement is used as binder material, main ingredient in precast concrete blocks, fire resistant and insulated panels, decorative stone artefacts, building materials, cast ceramic tiles, and immobilization of toxic wastes.

TECHNOLOGY BENCHMARKING

Yes

TECHNOLOGY READINESS LEVEL ASSESSMENT

TRL 7

SCALE OF DEVELOPMENT

Technology prototype been tested in actual field conditions/production/manufacturing/operational environment.

STATUS OF COMMERCIALIZATION

N/A

TENTATIVE COST OF DEVELOPMENT

₹ 20 Lakhs

INDUSTRIAL PARTNERS

N/A

PLANT SET UP FOR FINAL PRODUCT

Not yet

IPR STATUS DETAILS (PATENTS/COPYRIGHT/TRADEMARK SECURITY IN INDIA/ABROAD)

N/A

4.8 MINING, MINERALS, METALS AND MATERIALS (4M)

POTENTIAL MARKET/TECHNO-ECONOMICS

The geopolymer cement is used as binder material, main ingredient in precast concrete blocks, fire resistant and insulated panels, decorative stone artefacts, building materials, cast ceramic tiles, and immobilization of toxic wastes.

ENVIRONMENTAL SAFETY CERTIFICATION

N/A

NODAL SCIENTIST DETAILS

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281. PAVING BLOCKS FROM FLY ASH, BLAST FURNACE SLAG, STEEL SLAG, AND OTHER INDUSTRIAL WASTES

UID: TECH-THEME_8_NML-052

LABORATORY OF ORIGIN | CSIR-NML, JAMSHEDPUR

EXECUTIVE SUMMARY

Geo-polymer cement developed by CSIR-NML is a new type of alumino-silicate binder and considered these paving blocks are produced by the geopolymerisation of industrial wastes such as fly ash, granulated blast furnace slag, steel slag, and red mud independently or in in different combinations.

KEYWORDS

Paving blocks, Fly ash, Blast furnace, Slag, Steel

SALIENT FEATURES

Paving blocks are produced by the geopolymerisation of industrial wastes such as fly ash, granulated blast furnace slag, steel slag, and red mud independently or in in different combinations.

APPLICATIONS

Paving blocks.

TECHNOLOGY BENCHMARKING

Yes

TECHNOLOGY READINESS LEVEL ASSESSMENT

TRL 7

SCALE OF DEVELOPMENT

Technology prototype been tested in actual field conditions/production/manufacturing/operational environment, technology prototype been tested in actual field conditions/production/manufacturing/operational environment.

STATUS OF COMMERCIALIZATION

N/A

TENTATIVE COST OF DEVELOPMENT

₹ 10 Lakhs

INDUSTRIAL PARTNERS

N/A

PLANT SET UP FOR FINAL PRODUCT

Not yet

IPR STATUS DETAILS (PATENTS/COPYRIGHT/TRADEMARK SECURITY IN INDIA/ABROAD)

N/A

POTENTIAL MARKET/TECHNO-ECONOMICS

Steel industry, Industrial waste recycling industries.

ENVIRONMENTAL SAFETY CERTIFICATION

N/A

NODAL SCIENTIST DETAILS

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282. ENERGY EFFICIENT COKE BRASS AND BELL METAL MELTING FURNACE

UID: TECH-THEME_8_NML-053

LABORATORY OF ORIGIN | CSIR-NML, JAMSHEDPUR

EXECUTIVE SUMMARY

The existing traditional brass melting furnaces are fuel inefficient. The operators are exposed to toxic flue gases; the flue contains high Suspended Particulate Matter (SPM) causing serious health hazards for the artisans. These also contribute to atmospheric pollution.

KEYWORDS

Coke, Brass, Bell metal, Melting furnace

SALIENT FEATURES

Fuel efficient and reduce atmospheric pollution which generally caused by traditional brass.

APPLICATIONS

Coke brass and bell metal melting furnace.

TECHNOLOGY BENCHMARKING

The technology is benchmarked with similar technologies.

TECHNOLOGY READINESS LEVEL ASSESSMENT

TRL 8

SCALE OF DEVELOPMENT

Technology prototype been tested in actual field conditions/production/manufacturing/operational environment.

STATUS OF COMMERCIALIZATION

Industrial partner/manufacturer setup the plant for final product using the technology.

TENTATIVE COST OF DEVELOPMENT

₹ 10 Lakhs

INDUSTRIAL PARTNERS

N/A

IPR STATUS DETAILS (PATENTS/COPYRIGHT/TRADEMARK SECURITY IN INDIA/ABROAD)

N/A

PLANT SET UP FOR FINAL PRODUCT

Not yet

4.8 MINING, MINERALS, METALS AND MATERIALS (4M)

POTENTIAL MARKET/TECHNO-ECONOMICS

All Brass & Broze handicrafts manufacturers.

ENVIRONMENTAL SAFETY CERTIFICATION

N/A

NODAL SCIENTIST DETAILS

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283. PRODUCTION OF FERRITE AND PIGMENT GRADE HIGH PURITY MONODISPERSED IRON OXIDE FROM WASTE CHLORIDE PICKLE

UID: TECH-THEME_8_NML-054

LABORATORY OF ORIGIN | CSIR-NML, JAMSHEDPUR

EXECUTIVE SUMMARY

A simple process is developed at CSIR-NML for production of highly dispersed red iron oxide of uniform size and shape from variety of waste sources including chloride pickle liquor. The major processing steps consist of oxidation of ferrous iron followed by conversion to desired grade iron oxide. The developed process takes care of the impurity present in the starting material and can produce high purity iron oxide suitable for various other high end applications in making soft ferrites, catalysts, sensors etc. The process produces very uniform size iron oxide in the range 100-2000 nm of different shapes and colour. Due to highly dispersed and very uniform nature of the particles, the produced iron oxide gives very high colour purity and matches with the colour of different standard grade high end iron oxide available in the market.

KEYWORDS

Ferrite, Pigment, Monodispersed, Iron oxide, Chloride pickle liquor

SALIENT FEATURES

This process produces very uniform size iron oxide in the range 100-2000 nm of different shapes and colour. Due to highly dispersed and very uniform nature of the particles, the produced iron oxide gives very high colour purity and matches with the colour of different standard grade high end iron oxide available in the market.

APPLICATIONS

Production of ferrite and pigment grade high purity monodispersed iron oxide, Chemical industry.

TECHNOLOGY BENCHMARKING

Yes

TECHNOLOGY READINESS LEVEL ASSESSMENT

TRL 7

SCALE OF DEVELOPMENT

Technology prototype been tested in actual field conditions/production/manufacturing/operational environment.

STATUS OF COMMERCIALIZATION

N/A

TENTATIVE COST OF DEVELOPMENT

₹ 70 Lakhs

INDUSTRIAL PARTNERS

N/A

PLANT SET UP FOR FINAL PRODUCT

Not yet

IPR STATUS DETAILS (PATENTS/COPYRIGHT/TRADEMARK SECURITY IN INDIA/ABROAD)

N/A

POTENTIAL MARKET/TECHNO-ECONOMICS

Pickling, pigment industry.

ENVIRONMENTAL SAFETY CERTIFICATION

N/A

NODAL SCIENTIST DETAILS

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284. MAGSTAR: A PORTABLE MAGNETIC HYSTERESIS AND BARKHAUSEN EMISSIONS BASED ELECTROMAGNETIC DEVICE FOR NON-DESTRUCTIVE EVALUATION OF STEEL STRUCTURE/COMPONENT

UID: TECH-THEME_8_NML-055

LABORATORY OF ORIGIN | CSIR-NML, JAMSHEDPUR

EXECUTIVE SUMMARY

The developed electromagnetic NDE device works by exciting the sensor by an alternating current source. The sensor is to be placed on test body to get signal corresponding to the characteristics of the test objects. The output signals from the sensor are the measure of the magnetization, coercivity and magnetic noise (Barkhausen emissions) which change with microstructure and stress state of the materials.

KEYWORDS

Magstar, Electromagnetic, Non-destructive evaluation, Magnetic, Barkhausen

SALIENT FEATURES

The developed device works by exciting the sensor by an alternating current source. These output signals from the sensor are the measure of the magnetization, coercivity and magnetic noise (Barkhausen emissions) which change with microstructure and stress state of the materials.

APPLICATIONS

Instrumentation industry, automobile sector, steel and thermal sector.

TECHNOLOGY BENCHMARKING

Yes

TECHNOLOGY READINESS LEVEL ASSESSMENT

TRL 8

SCALE OF DEVELOPMENT

Technology prototype been tested in actual field conditions/production/manufacturing/operational environment.

STATUS OF COMMERCIALIZATION

Licensed for manufacturing to M/s Technofour, Pune, on non-exclusive basis, produced by firm on demand, Fabricated at M/s Technofour.

TENTATIVE COST OF DEVELOPMENT

₹ 45 Lakhs

INDUSTRIAL PARTNERS

Fabricated at M/s Technofour.

4.8 MINING, MINERALS, METALS AND MATERIALS (4M)

PLANT SET UP FOR FINAL PRODUCT

Yes

IPR STATUS DETAILS (PATENTS/COPYRIGHT/TRADEMARK SECURITY IN INDIA/ABROAD)

N/A

POTENTIAL MARKET/TECHNO-ECONOMICS

Steel, thermal power, all NDT R & D institutes & automobile sector.

ENVIRONMENTAL SAFETY CERTIFICATION

N/A

NODAL SCIENTIST DETAILS

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285. ANTI-TARNISHING LACQUER FOR SILVER AND COPPER-BASED ALLOYS

UID: TECH-THEME_8_NML-056

LABORATORY OF ORIGIN | CSIR-NML, JAMSHEDPUR

EXECUTIVE SUMMARY

Anti-tarnishing lacquer developed at CSIR-NML is a one component fast drying interior lacquer for use on brass, copper, bronze and silver surfaces. It prevents tarnishing (blackening) and provides a durable finish resistant to water, acid and alkali environments. The formula contains active corrosion inhibitors chemically bonded to acrylic polymer backbone, hence prevents tarnishing of copper, brass, bronze and items for long durations of several years.

KEYWORDS

Anti-tarnishing, Lacquer, Silver, Copper, Brass, Bronze

SILENT FEATURES

Anti-tarnishing lacquer is a one component fast drying interior lacquer for use on brass, copper, bronze and silver surfaces. It prevents tarnishing (blackening) and provides a durable finish resistant to water, acid and alkali environments.

APPLICATIONS

Copper Industry, brass handicrafts manufactures.

TECHNOLOGY BENCHMARKING

Yes

TECHNOLOGY READINESS LEVEL ASSESSMENT/S

TRL 9

SCALE OF DEVELOPMENT

The pilot scale demonstration in the field conditions is successfully done and the technology prototype has been tested in the actual field conditions and addressed all the critical scaling issues.

STATUS OF COMMERCIALIZATION

Final product based on the technology started selling into the market.

TENTATIVE COST OF DEVELOPMENT

₹ 10 Lakhs

INDUSTRIAL PARTNERS

N/A

PLANT SET UP FOR FINAL PRODUCT

N/A

4.8 MINING, MINERALS, METALS AND MATERIALS (4M)

IPR STATUS DETAILS (PATENTS/COPYRIGHT/TRADEMARK SECURITY IN INDIA/ABROAD)
N/A

POTENTIAL MARKET/TECHNO-ECONOMICS
All Brass handicrafts manufacturers.

ENVIRONMENTAL SAFETY CERTIFICATION
Yes

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286. PABI: PORTABLE AUTOMATED BALL INDENTATION

UID: TECH-THEME_8_NML-057

LABORATORY OF ORIGIN | CSIR-NML, JAMSHEDPUR

EXECUTIVE SUMMARY

CSIR-NML has developed and offers a 'Portable Automated Ball Indentation (PABI) System' for in-situ evaluation of mechanical properties of metallic components. The device has the ability to estimate hardness, yield stress, yield ratio, tensile strength, strain hardening constant and fracture toughness-all in just one test.

KEYWORDS

Portable Automated Ball Indentation (PABI) hardness, Yield stress

SILENT FEATURES

The technology is for in-situ evaluation of mechanical properties of metallic components; the device has the ability to estimate hardness, yield stress, yield ratio, tensile strength, strain hardening constant and fracture toughness-all in just one test.

APPLICATIONS

Metal industries.

TECHNOLOGY BENCHMARKING

Yes

TECHNOLOGY READINESS LEVEL ASSESSMENT/S

TRL 7

SCALE OF DEVELOPMENT

Technology prototype been tested in actual field conditions/production/manufacturing/operational environment.

STATUS OF COMMERCIALIZATION

N/A

TENTATIVE COST OF DEVELOPMENT

₹ 25 Lakhs

INDUSTRIAL PARTNERS

N/A

PLANT SET UP FOR FINAL PRODUCT

N/A

IPR STATUS DETAILS (PATENTS/COPYRIGHT/TRADEMARK SECURITY IN INDIA/ABROAD)

N/A

4.8 MINING, MINERALS, METALS AND MATERIALS (4M)

POTENTIAL MARKET/TECHNO-ECONOMICS

All metal industries to evaluate key mechanical properties of metallic components/materials.

ENVIRONMENTAL SAFETY CERTIFICATION

N/A

NODAL SCIENTIST DETAILS

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287. FLAW GUARD: A COST EFFECTIVE DEVICE FOR DEFECT DETECTION IN WIRE DURING COLD DRAWING

UID: TECH-THEME_8_NML-058

LABORATORY OF ORIGIN | CSIR-NML, JAMSHEDPUR

EXECUTIVE SUMMARY

Presence of transverse cracks in wires leads to premature failure. This system 'Flaw guard' developed by CSIR-NML detects crack during fabrication of wires and works based on the principle of encircling coil differential probe eddy current. This is installed in the drawing line and wire passes through the core of the probe. Probe diameter can be changed based on the wire diameter. Real time data availability in ASCII format for defect type identification in high speed drawn wires and low cost makes it unique and viable for large scale implementations.

KEYWORDS

Flaw guard, Defect, Detection, Wire, Cold drawing

SALIENT FEATURES

This system detects crack during fabrication of wires and works based on the principle of encircling coil differential probe eddy current. Real time data availability in ASCII format for defect type identification in high speed drawn wires and low cost makes it unique and viable for large scale implementations.

APPLICATIONS

Fabrication industry.

TECHNOLOGY BENCHMARKING

Yes

TECHNOLOGY READINESS LEVEL ASSESSMENT

TRL 8

SCALE OF DEVELOPMENT

Technology prototype been tested in actual field conditions/production/manufacturing/operational environment.

STATUS OF COMMERCIALIZATION

N/A

TENTATIVE COST OF DEVELOPMENT

₹ 20 Lakhs

INDUSTRIAL PARTNERS

N/A

PLANT SET UP FOR FINAL PRODUCT

N/A

4.8 MINING, MINERALS, METALS AND MATERIALS (4M)

IPR STATUS DETAILS (PATENTS/COPYRIGHT/TRADEMARK SECURITY IN INDIA/ABROAD)

N/A

POTENTIAL MARKET/TECHNO-ECONOMICS

Online surface and subsurface defects viz. transverse cracks, weld joint, crack feet etc. detection in wires during cold drawing, structural integrity assessment in industries.

ENVIRONMENTAL SAFETY CERTIFICATION

N/A

NODAL SCIENTIST DETAILS

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288. RECOVERY OF LEAD FROM ZINC PLANT RESIDUE

UID: TECH-THEME_8_NML-059

LABORATORY OF ORIGIN | CSIR-NML, JAMSHEDPUR

EXECUTIVE SUMMARY

Subsequent to zinc extraction with sulphuric acid from various zinc secondaries, insoluble lead in the form of sulphate remained in the leached residue. The residue containing appreciable amount of lead is treated as hazardous waste and is presently being dumped inside the plant premise.

KEYWORDS

Recovery, Lead, Zinc, Plant, Residue

SALIENT FEATURES

No hazardous substrates.

APPLICATIONS

N/A

TECHNOLOGY BENCHMARKING

N/A

TECHNOLOGY READINESS LEVEL ASSESSMENT

TRL 6

SCALE OF DEVELOPMENT

N/A

STATUS OF COMMERCIALIZATION

Technology successfully demonstrated to the intended end user.

TENTATIVE COST OF DEVELOPMENT

₹ 40 Lakhs

INDUSTRIAL PARTNERS

N/A

PLANT SET UP FOR FINAL PRODUCT

N/A

IPR STATUS DETAILS (PATENTS/COPYRIGHT/TRADEMARK SECURITY IN INDIA/ABROAD)

N/A

POTENTIAL MARKET/TECHNO-ECONOMICS

Zinc, Chemical Industries

ENVIRONMENTAL SAFETY CERTIFICATION

N/A

NODAL SCIENTIST DETAILS

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289. DEVELOPMENT OF SYNTHETIC FLUX AND A PROCESS FOR DE-PHOSPHORIZATION OF STEEL IN INDUCTION FURNACE

UID: TECH-THEME_8_NML-060

LABORATORY OF ORIGIN | CSIR-NML, JAMSHEDPUR

EXECUTIVE SUMMARY

Approximately 90% of nearly 15 million tonnes of steel produced in Indian induction furnaces, using DRI as the major feed material and containing phosphorous in the range of 0.08 - 0.11 %, is used as structural material. Both BIS and ASTM standards stipulates P in the range of 0.03 - 0.06%, depending upon the application.

KEYWORDS

De-phosphorization, Steel, Induction Furnace, Flux

SILENT FEATURES

NA

APPLICATIONS

Steel and material sector.

TECHNOLOGY BENCHMARKING

Yes

TECHNOLOGY READINESS LEVEL ASSESSMENT/S

TRL 6

SCALE OF DEVELOPMENT

The pilot scale demonstration in the field conditions is successfully done and the technology prototype has been tested in the actual field conditions and addressed all the critical scaling issues, technology successfully demonstrated to the intended end user.

STATUS OF COMMERCIALIZATION

N/A

TENTATIVE COST OF DEVELOPMENT

₹ 40 Lakhs

INDUSTRIAL PARTNERS

N/A

PLANT SET UP FOR FINAL PRODUCT

N/A

4.8 MINING, MINERALS, METALS AND MATERIALS (4M)

IPR STATUS DETAILS (PATENTS/COPYRIGHT/TRADEMARK SECURITY IN INDIA/ABROAD)
N/A

POTENTIAL MARKET/TECHNO-ECONOMICS
Primary, secondary steel making sector.

ENVIRONMENTAL SAFETY CERTIFICATION
N/A

NODAL SCIENTIST DETAILS

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290. MAGSYS: A PORTABLE GIANT MAGNETO-IMPEDANCE (GMI) BASED MAGNETIC SENSING DEVICE FOR NDE APPLICATIONS

UID: TECH-THEME_8_NML-061

LABORATORY OF ORIGIN | CSIR-NML, JAMSHEDPUR

EXECUTIVE SUMMARY

MagSys is a portable magnetic sensing device where nanostructured Fe-Co based magnetic wires of diameter 80-120 micron prepared by in-rotating water quenching technique is used as a core material in the probe-head. The magnetic wire material exhibit Giant Magneto-Impedance (GMI) properties. The output signal of the sensor is proportional to the magnetic field generated by the test object. If there is change in composition, microstructure or residual stress of the test object due to in-service operation, the magnetic properties also change and hence the output signal of the sensor.

KEYWORDS

MagSys, Giant Magneto-Impedance (GMI), Magnetic, NDE

SILENT FEATURES

MagSys is a portable magnetic sensing device where nanostructured Fe-Co based magnetic wires of diameter 80-120 micron prepared by in-rotating water quenching technique is used as a core material in the probe-head. The magnetic wire material exhibit Giant Magneto-Impedance (GMI) properties.

APPLICATIONS

Metal wiring sector.

TECHNOLOGY BENCHMARKING

Yes

TECHNOLOGY READINESS LEVEL ASSESSMENT/S

TRL 7

SCALE OF DEVELOPMENT

The pilot scale demonstration in the field conditions is successfully to IOCL and the technology prototype has been tested in the actual field conditions and addressed all the critical scaling issues.

STATUS OF COMMERCIALIZATION

N/A

TENTATIVE COST OF DEVELOPMENT

₹ 25 Lakhs

INDUSTRIAL PARTNERS

IOCL

PLANT SET UP FOR FINAL PRODUCT

N/A

4.8 MINING, MINERALS, METALS AND MATERIALS (4M)

IPR STATUS DETAILS (PATENTS/COPYRIGHT/TRADEMARK SECURITY IN INDIA/ABROAD)
N/A

POTENTIAL MARKET/TECHNO-ECONOMICS
Oil & gas, thermal power industry sector.

ENVIRONMENTAL SAFETY CERTIFICATION
N/A

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291. ULTRASONIC FLOW GAUGE: A DEVICE FOR FLUID FLOW RATE MEASUREMENT THROUGH A NARROW TUBE

UID: TECH-THEME_8_NML-062

LABORATORY OF ORIGIN | CSIR-NML, JAMSHEDPUR

EXECUTIVE SUMMARY

CSIR-NML has developed a flow rate measurement device which is now used in Spacecraft propulsion systems, essential for orbit raising, station keeping, attitude correction/reaction control and de-orbiting. The conventional methods (like pVT and book keeping) are used to calculate the remaining propellant after orbit transfer whereas more than 80% of the propellant is consumed during apogee raising manoeuvres. As both pVT and bookkeeping methods are starting their evaluation at the beginning of satellite orbital life, the accuracy of the remaining propellant mass prediction is eventually driven and limited by the precision in the estimation on the quantity of propellant consumed during Liquid Apogee Motor firing. The developed ultrasonic flow gauge is integrated in the spacecraft for on-board propellant gauging. It can also be used as a gas and liquid flow meter for ground based applications.

KEYWORDS

Ultrasonic, Flow gauge, Fluid, Flow rate

SILENT FEATURES

It is a flow rate measurement device which is now used in Spacecraft propulsion systems, essential for orbit raising, station keeping, attitude correction/reaction control and de-orbiting.

APPLICATIONS

Aviation industry and strategic sector.

TECHNOLOGY BENCHMARKING

Yes

TECHNOLOGY READINESS LEVEL ASSESSMENT/S

TRL 7

SCALE OF DEVELOPMENT

Prototype for 4 devices is in process for Spacecraft, technology prototype been tested in actual field conditions/production/manufacturing/operational environment.

STATUS OF COMMERCIALIZATION

N/A

TENTATIVE COST OF DEVELOPMENT

₹ 40 Lakhs

INDUSTRIAL PARTNERS

N/A

PLANT SET UP FOR FINAL PRODUCT

N/A

IPR STATUS DETAILS (PATENTS/COPYRIGHT/TRADEMARK SECURITY IN INDIA/ABROAD)

N/A

POTENTIAL MARKET/TECHNO-ECONOMICS

On board propellant gauging of space craft as a gas flow meter & as a liquid flow meter. Aerospace, strategic.

ENVIRONMENTAL SAFETY CERTIFICATION

N/A

NODAL SCIENTIST DETAILS

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292. MICROWAVE – IR SORT: RAPID, RELIABLE, NON – INVASIVE TECHNOLOGY FOR IRON ORE COMPOSITIONAL ANALYSIS

UID: TECH-THEME_8_NML-063

LABORATORY OF ORIGIN | CSIR-NML, JAMSHEDPUR

EXECUTIVE SUMMARY

Fast, reliable non-invasive technique to detect alumina/Fe in iron ore. This technology relies on the conversion of microwave energy to heat energy based on the dielectric properties of the mineral constituents of iron ore. Thermal behaviour of the ore is imaged using Infra-red camera with high temperature sensitivity and the average temperature rise is related to the weight percentage of alumina/iron in iron ore.

KEYWORDS

Microwave, IR, Ironore, Compositional, Analysis

SALIENT FEATURES

It is a fast, reliable non-invasive technique to detect alumina/Fe in iron ore. This technology relies on the conversion of microwave energy to heat energy based on the dielectric properties of the mineral constituents of iron ore.

APPLICATIONS

Metal industry-iron/Aluminium industry.

TECHNOLOGY BENCHMARKING

Yes

TECHNOLOGY READINESS LEVEL ASSESSMENT/S

TRL 6

SCALE OF DEVELOPMENT

Technology successfully demonstrated to the intended end user.

STATUS OF COMMERCIALIZATION

NA

TENTATIVE COST OF DEVELOPMENT

₹ 20 Lakhs

INDUSTRIAL PARTNERS

N/A

PLANT SET UP FOR FINAL PRODUCT

N/A

4.8 MINING, MINERALS, METALS AND MATERIALS (4M)

IPR STATUS DETAILS (PATENTS/COPYRIGHT/TRADEMARK SECURITY IN INDIA/ABROAD)
N/A

POTENTIAL MARKET/TECHNO-ECONOMICS
Iron & steel industry.

ENVIRONMENTAL SAFETY CERTIFICATION
N/A

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293. RECOVERY OF COBALT FROM DISCARDED LI-ION BATTERIES OF MOBILE PHONE

UID: TECH-THEME_8_NML-064

LABORATORY OF ORIGIN | CSIR-NML, JAMSHEDPUR

EXECUTIVE SUMMARY

A process has been developed by CSIR-NML developed for the dissolution of metals from discarded Lithium Ion Batteries (LIBs) of mobile phone. Diluted sulfuric acid in the presence of an oxidant was used to leach out ~99.99% cobalt along with other metals in 60 min at elevated temperatures. Leach liquor generated was further processed through solvent extraction, precipitation, electro-winning techniques.

KEYWORDS

Cobalt, Li-ion, Batteries, Mobile phones

SALIENT FEATURES

The technology is developed for the dissolution of metals from discarded Lithium Ion Batteries (LIBs) of mobile phone. Diluted sulfuric acid in the presence of an oxidant was used to leach out ~99.99% cobalt along with other metals in 60 min at elevated temperatures.

APPLICATIONS

Electronic recycling industries.

TECHNOLOGY BENCHMARKING

Yes

TECHNOLOGY READINESS LEVEL ASSESSMENT/S

TRL 6

SCALE OF DEVELOPMENT

Technology successfully demonstrated to the intended end user.

STATUS OF COMMERCIALIZATION

N/A

TENTATIVE COST OF DEVELOPMENT

₹ 20 Lakhs

INDUSTRIAL PARTNERS

N/A

PLANT SET UP FOR FINAL PRODUCT

N/A

IPR STATUS DETAILS (PATENTS/COPYRIGHT/TRADEMARK SECURITY IN INDIA/ABROAD)

N/A

4.8 MINING, MINERALS, METALS AND MATERIALS (4M)

POTENTIAL MARKET/TECHNO-ECONOMICS

All electronic recycling industries.

ENVIRONMENTAL SAFETY CERTIFICATION

N/A

NODAL SCIENTIST DETAILS

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294. HIGHLY METALLISED LOW SULPHUR DIRECTLY REDUCED IRON (DRI) FROM IRON ORE SLIME AND REJECTED/MIDDLING COAL

UID: TECH-THEME_8_NML-066

LABORATORY OF ORIGIN | CSIR-NML, JAMSHEDPUR

EXECUTIVE SUMMARY

This innovation is useful for converting steel plant wastes such as iron ore slime/fines, middling and rejected coal containing more than 25% ash into a highly metallised (Metallisation > 96%) low Sulphur (0.006%S) DRI. The DRI produced from these waste raw materials is suitable as a substitute of scrap for induction furnace, electric arc furnace and basic oxygen furnace for steel making.

KEYWORDS

DRI, Sulphur, Iron ore slime, Middling coal

SALIENT FEATURES

The technology is about converting steel plant wastes such as iron ore slime/fines, middling and rejected coal containing more than 25 % ash into a highly metallised (Metallisation > 96%) low Sulphur (0.006%S) DRI.

APPLICATIONS

Steel industry.

TECHNOLOGY BENCHMARKING

Yes

TECHNOLOGY READINESS LEVEL ASSESSMENT/S

TRL 6

SCALE OF DEVELOPMENT

Technology successfully demonstrated to the intended end user.

STATUS OF COMMERCIALIZATION

N/A

TENTATIVE COST OF DEVELOPMENT

₹ 40 Lakhs

INDUSTRIAL PARTNERS

N/A

PLANT SET UP FOR FINAL PRODUCT

N/A

IPR STATUS DETAILS (PATENTS/COPYRIGHT/TRADEMARK SECURITY IN INDIA/ABROAD)

N/A

4.8 MINING, MINERALS, METALS AND MATERIALS (4M)

POTENTIAL MARKET/TECHNO-ECONOMICS

Secondary steel making sector.

ENVIRONMENTAL SAFETY CERTIFICATION

N/A

NODAL SCIENTIST DETAILS

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295. DIP CLEANER CUM BRIGHTENER FOR GOLD AND DIAMOND

UID: TECH-THEME_8_NML-067

LABORATORY OF ORIGIN | CSIR-NML, JAMSHEDPUR

EXECUTIVE SUMMARY

Gold and diamond jewellery dip cleaner developed at CSIR-NML can be used to clean, brighten and enhance glitter of used gold & diamond jewelleryes at home. The advanced formulation is free from harmful mineral acids and other harsh chemicals making it safe for domestic use.

KEYWORDS

Dip cleaner, Brightener, Gold, Diamond, Jewellery

SALIENT FEATURES

The technology can be used to clean, brighten and enhance glitter of used gold & diamond jewelleryes at home. The formulation is free from harmful mineral acids and other harsh chemicals making it safe for domestic use.

APPLICATIONS

Jewellery industry.

TECHNOLOGY BENCHMARKING

Yes

TECHNOLOGY READINESS LEVEL ASSESSMENT/S

TRL 7

SCALE OF DEVELOPMENT

The pilot scale demonstration in the field conditions is successfully done and the technology prototype has been tested in the actual field conditions and addressed all the critical scaling issues. Technology prototype been tested in actual field conditions/production/manufacturing/operational environment.

STATUS OF COMMERCIALIZATION

N/A

TENTATIVE COST OF DEVELOPMENT

₹ 10 Lakhs

INDUSTRIAL PARTNERS

N/A

PLANT SET UP FOR FINAL PRODUCT

N/A

4.8 MINING, MINERALS, METALS AND MATERIALS (4M)

IPR STATUS DETAILS (PATENTS/COPYRIGHT/TRADEMARK SECURITY IN INDIA/ABROAD)

N/A

POTENTIAL MARKET/TECHNO-ECONOMICS

Jewellery industry.

ENVIRONMENTAL SAFETY CERTIFICATION

N/A

NODAL SCIENTIST DETAILS

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296. BENEFICIATION OF LOW-GRADE IRON ORES

UID: TECH-THEME_8_NML-068

LABORATORY OF ORIGIN | CSIR-NML, JAMSHEDPUR

EXECUTIVE SUMMARY

The technology is based on processing of low-grade iron ores primarily involving washing, gravity and magnetic separation. The products are calibrated lumps, sinter and pellet-grade concentrates suitable for iron & steel making. The intermediate products are recycled towards maximization of iron recovery.

KEYWORDS

Beneficiation, Low-grade, Iron ores, Gravity, Magnetic separation

SALIENT FEATURES

The technology is based on processing of low-grade iron ores primarily involving washing, gravity and magnetic separation. The products are calibrated lumps, sinter and pellet-grade concentrates suitable for iron & steel making.

APPLICATIONS

Iron and steel industry.

TECHNOLOGY BENCHMARKING

Yes

TECHNOLOGY READINESS LEVEL ASSESSMENT/S

TRL 7

SCALE OF DEVELOPMENT

The pilot scale demonstration in the field conditions is successfully done and the technology prototype has been tested in the actual field conditions and addressed all the critical scaling issues. Technology prototype been tested in actual field conditions/production/manufacturing/operational environment.

STATUS OF COMMERCIALIZATION

N/A

TENTATIVE COST OF DEVELOPMENT

₹ 30 Lakhs

INDUSTRIAL PARTNERS

N/A

PLANT SET UP FOR FINAL PRODUCT

N/A

4.8 MINING, MINERALS, METALS AND MATERIALS (4M)

IPR STATUS DETAILS (PATENTS/COPYRIGHT/TRADEMARK SECURITY IN INDIA/ABROAD)

N/A

POTENTIAL MARKET/TECHNO-ECONOMICS

Primary, secondary steel making sector.

ENVIRONMENTAL SAFETY CERTIFICATION

N/A

NODAL SCIENTIST DETAILS

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297. HIGHLY METALLISED DIRECTLY REDUCED IRON (DRI) FROM MILL SCALE AND LEAN GRADE NON COKING COAL IN TUNNEL KILN

UID: TECH-THEME_8_NML-069

LABORATORY OF ORIGIN | CSIR-NML, JAMSHEDPUR

EXECUTIVE SUMMARY

The process utilizes mill scale and lean grade non-coking coal for production of highly metalized DRI through Tunnel Kiln. This invention is useful for converting mill scale generated in primary and secondary sector of iron and steel industries in to highly metalized DRI. Lean grade non-coking coal left in the mines head are utilized as a reductant for conversion of mill scale in to DRI. DRI produced from this process have very high degree of metallization (Metallisation > 92%) and are suitable as a feed for induction furnace, electric arc furnace and basic oxygen furnace for steel making.

KEYWORDS

Directly Reduced Iron (DRI), Mill scale, Non-coking coal, Tunnel kiln

SALIENT FEATURES

The process utilizes mill scale and lean grade non-coking coal for production of highly metalized DRI through Tunnel Kiln. Lean grade non-coking coal left in the mines head are utilized as a reductant for conversion of mill scale in to DRI. DRI produced from this process have very high degree of metallization (Metallisation > 92%).

APPLICATIONS

Iron and steel industry.

TECHNOLOGY BENCHMARKING

Yes

TECHNOLOGY READINESS LEVEL ASSESSMENT/S

TRL 8

SCALE OF DEVELOPMENT

The Pilot scale demonstration in the field conditions is successfully done and the technology prototype has been tested in the actual field conditions and addressed all the critical scaling issues. Technology prototype been tested in actual field conditions/production/manufacturing/operational environment conditions/production/manufacturing/operational environment.

STATUS OF COMMERCIALIZATION

N/A

TENTATIVE COST OF DEVELOPMENT

₹ 40 Lakhs

INDUSTRIAL PARTNERS

N/A

4.8 MINING, MINERALS, METALS AND MATERIALS (4M)

PLANT SET UP FOR FINAL PRODUCT

N/A

IPR STATUS DETAILS (PATENTS/COPYRIGHT/TRADEMARK SECURITY IN INDIA/ABROAD)

N/A

POTENTIAL MARKET/TECHNO-ECONOMICS

Primary, secondary steel making sector.

ENVIRONMENTAL SAFETY CERTIFICATION

N/A

NODAL SCIENTIST DETAILS

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298. DIP CLEANER/TARNISH REMOVER FOR SILVER

UID: TECH-THEME_8_NML-070

LABORATORY OF ORIGIN | CSIR-NML, JAMSHEDPUR

EXECUTIVE SUMMARY

Silver dip cleaner developed at CSIR-NML can be used to clean, brighten and enhance glitter of tarnished silver items at home. The advanced formulation is free from harmful mineral acids and other harsh chemicals making it safe for domestic use. Cleaning is performed by dipping tarnished silver in hot cleaning solution for 30 minutes followed by washing in water. Metal loss during cleaning is negligible even if silver items remain in solution for several hours. Silver items with embedded precious stones can be safely cleaned using the dip cleaner. Rubbing is not required for cleaning and hence difficult to access areas in silver statues and decorative items can be cleaned quickly and efficiently by simply dipping it into the hot cleaning solution. The cleaning solution can be used as the medium in ultrasonic cleaning bath to clean bulk quantity of silver in short time without affecting the embedded precious stones. Same cleaning solution can be used several times and can be safely disposed of without any environment pollution.

KEYWORDS

Dip cleaner/Tarnish, Silver, Chemical

SALIENT FEATURES

The formulation is can be used to clean, brighten and enhance glitter of tarnished silver items at home and is free harmful mineral acids and other harsh chemicals making it safe for domestic use. Cleaning is performed by dipping tarnished silver in hot cleaning solution for 30 minutes followed by washing in water.

APPLICATIONS

Jewellery industry.

TECHNOLOGY BENCHMARKING

Yes

TECHNOLOGY READINESS LEVEL ASSESSMENT/S

TRL 7

SCALE OF DEVELOPMENT

Technology successfully demonstrated to the intended end User. Technology prototype been tested in actual field conditions/production/manufacturing/operational environment.

STATUS OF COMMERCIALIZATION

N/A

TENTATIVE COST OF DEVELOPMENT

₹ 10 Lakhs

INDUSTRIAL PARTNERS

N/A

4.8 MINING, MINERALS, METALS AND MATERIALS (4M)

PLANT SET UP FOR FINAL PRODUCT

N/A

IPR STATUS DETAILS (PATENTS/COPYRIGHT/TRADEMARK SECURITY IN INDIA/ABROAD)

N/A

POTENTIAL MARKET/TECHNO-ECONOMICS

Jewellery industry.

ENVIRONMENTAL SAFETY CERTIFICATION

N/A

NODAL SCIENTIST DETAILS

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299. CERTIFIED REFERENCE MATERIALS

UID: TECH-THEME_8_NML-071

LABORATORY OF ORIGIN | CSIR-NML, JAMSHEDPUR

EXECUTIVE SUMMARY

Certified Reference Materials (CRM) of ores, minerals, refractories, ferro alloys and different grades of steel. CRMs are available as turnings, powders and solid discs. These CRMs have been prepared following ISO Guide 34, 35 and other allied standards. Each unit of CRM is accompanied with a composition certificate with uncertainty. The CRM is highly instrumental in validation of analytical data, standardization of analytical techniques, calibration of analytical instruments and checking proficiency of analytical chemists.

KEYWORDS

Certified, Reference, Materials

SALIENT FEATURES

Certified Reference Materials (CRM) of ores, minerals, refractories, ferro alloys and different grades of steel.

APPLICATIONS

Reference documents for validation of analytical data, standardization of analytical techniques, calibration of analytical instruments and checking proficiency of analytical chemists.

TECHNOLOGY BENCHMARKING

Yes

TECHNOLOGY READINESS LEVEL ASSESSMENT

TRL 8

SCALE OF DEVELOPMENT

Technology prototype has been tested in actual field conditions/production/manufacturing/operational environment.

STATUS OF COMMERCIALIZATION

N/A

TENTATIVE COST OF DEVELOPMENT

₹ 0.055 Lakhs

INDUSTRIAL PARTNERS

N/A

PLANT SET UP FOR FINAL PRODUCT

N/A

IPR STATUS DETAILS

N/A

4.8 MINING, MINERALS, METALS AND MATERIALS (4M)

POTENTIAL MARKET/TECHNO-ECONOMICS

Validation of analytical data, standardization of analytical techniques, calibration of analytical instruments, checking proficiency of analytical chemists.

ENVIRONMENTAL SAFETY CERTIFICATION

N/A

NODAL SCIENTIST DETAILS

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300. COPPER CONCENTRATE FROM COPPER ORES

UID: TECH-THEME_8_NML-072

LABORATORY OF ORIGIN | CSIR-NML, JAMSHEDPUR

EXECUTIVE SUMMARY

The process is based on forth flotation of copper bearing minerals from ore after milling. The concentrate is dewatered and used for extraction of metal by pyro-metallurgical route. The copper concentrate is used for extraction of metal by pyro-metallurgical route.

KEYWORDS

Copper, Concentrate, Copper ores, Forth flotation

SALIENT FEATURES

The process is based on forth flotation of copper bearing minerals from ore after milling.

APPLICATIONS

Chemical and copper industry.

TECHNOLOGY BENCHMARKING

Yes

TECHNOLOGY READINESS LEVEL ASSESSMENT

TRL 7

SCALE OF DEVELOPMENT

Technology prototype been tested in actual field conditions/production/manufacturing/operational environment.

STATUS OF COMMERCIALIZATION

N/A

TENTATIVE COST OF DEVELOPMENT

₹ 30 Lakhs

INDUSTRIAL PARTNERS

N/A

PLANT SET UP FOR FINAL PRODUCT

Not yet

IPR STATUS DETAILS

N/A

POTENTIAL MARKET/TECHNO-ECONOMICS

Copper industry.

ENVIRONMENTAL SAFETY CERTIFICATION

N/A

NODAL SCIENTIST DETAILS

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301. DRY BENEFICIATION OF NON-COKING COAL FOR APPLICATION IN THERMAL POWER AND DRI

UID: TECH-THEME_8_NML-073

LABORATORY OF ORIGIN | CSIR-NML, JAMSHEDPUR

EXECUTIVE SUMMARY

- Producing clean coal with 34% and 25% ash with high yield.
- No need of process water.
- Prevents generation of coal slime water.
- Requires relatively less floor area compared to conventional wet processing.
- Less power consumption per ton of coal compared to wet processing of coal.

KEYWORDS

Dry beneficiation, Non-coking coal, Thermal power, DRI

SALIENT FEATURES

Producing clean coal with 34% and 25% ash with high yield: No need of process water; Prevents generation of coal slime water.

APPLICATIONS

Coal mines and thermal power.

TECHNOLOGY BENCHMARKING

Yes

TECHNOLOGY READINESS LEVEL ASSESSMENT

TRL 6

SCALE OF DEVELOPMENT

Technology successfully demonstrated to the intended end user.

STATUS OF COMMERCIALIZATION

NA

TENTATIVE COST OF DEVELOPMENT

₹ 50 Lakhs

INDUSTRIAL PARTNERS

N/A

PLANT SET UP FOR FINAL PRODUCT

N/A

IPR STATUS DETAILS

N/A

4.8 MINING, MINERALS, METALS AND MATERIALS (4M)

POTENTIAL MARKET/TECHNO-ECONOMICS

Coal mineral commodities and Primary, secondary steel making sector.

ENVIRONMENTAL SAFETY CERTIFICATION

N/A

NODAL SCIENTIST DETAILS

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302. BENEFICIATION OF TUNGSTEN ORES SALIENT FEATURES

UID: TECH-THEME_8_NML-074

LABORATORY OF ORIGIN | CSIR-NML, JAMSHEDPUR

EXECUTIVE SUMMARY

The technology is based on the novel integrated process flow sheet involving beneficiation of low- and lean-grade ores and hydrometallurgical extraction of tungsten from wolframite concentrate. The concentration of the lean ore is achieved basically by gravity and magnetic separation techniques followed by hydrometallurgical extraction of tungsten from wolframite concentrate to obtain ammonium para-tungstate.

KEYWORDS

Beneficiation, Tungsten, Ores, Hydrometallurgy

SALIENT FEATURES

The technology is based on the novel integrated process flow sheet involving beneficiation of low- and lean-grade ores and hydrometallurgical extraction of tungsten from wolframite concentrate.

APPLICATIONS

Chemical and metallurgy.

TECHNOLOGY BENCHMARKING

Yes

TECHNOLOGY READINESS LEVEL ASSESSMENT

TRL 7

SCALE OF DEVELOPMENT

Technology successfully demonstrated to the intended end User. Technology prototype been tested in actual field conditions/production/manufacturing/operational environment.

STATUS OF COMMERCIALIZATION

NA

TENTATIVE COST OF DEVELOPMENT

₹ 50 Lakhs

INDUSTRIAL PARTNERS

N/A

PLANT SET UP FOR FINAL PRODUCT

N/A

IPR STATUS DETAILS

N/A

4.8 MINING, MINERALS, METALS AND MATERIALS (4M)

POTENTIAL MARKET/TECHNO-ECONOMICS

All Tungsten mineral commodities.

ENVIRONMENTAL SAFETY CERTIFICATION

N/A

NODAL SCIENTIST DETAILS

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303. ANTI-CORROSIVE CHEMICAL FOR STEEL SHEET, REBAR AND WIRE

UID: TECH-THEME_8_NML-075

LABORATORY OF ORIGIN | CSIR-NML, JAMSHEDPUR

EXECUTIVE SUMMARY

An anti-corrosive chemical has been developed for the corrosion prevention of steel sheet, rebar and wire. The developed chemical has the following salient features:

- Synthesis protocol consists of mixing of chemicals.
- Improves anti-corrosion properties of metals; > 200 h salt spray.
- Can be applied on a surface by dip coating followed by drying at room temperature for 1 h or by curing at 150°C for 5 min.
- Cured coated products at 250°C give golden and brown colors with 5 and 10 min curing time, respectively.
- Cured product gives good lustre.
- Coating forms a good adhesion on a surface.
- Can also be applied on a surface using brush and spray.
- Control, Display and Analysis: External laptop/notebook/PC.

KEYWORDS

Anti-corrosive, Chemical, Steel sheet, Rebar, Wire.

SALIENT FEATURES

Improves anti-corrosion properties of metals; > 200 h salt spray; Can be applied on a surface by dip coating followed by drying at room temperature for 1 h or by curing at 150°C for 5 min; Cured product gives good lustre.

APPLICATIONS

Chemical and steel industry.

TECHNOLOGY BENCHMARKING

Yes

TECHNOLOGY READINESS LEVEL ASSESSMENT

TRL 6

SCALE OF DEVELOPMENT

Technology successfully demonstrated to the intended end user.

STATUS OF COMMERCIALIZATION

N/A

TENTATIVE COST OF DEVELOPMENT

₹ 10 Lakhs

4.8 MINING, MINERALS, METALS AND MATERIALS (4M)

INDUSTRIAL PARTNERS

N/A

PLANT SET UP FOR FINAL PRODUCT

N/A

IPR STATUS DETAILS (PATENTS/COPYRIGHT/TRADEMARK SECURITY IN INDIA/ABROAD)

N/A

POTENTIAL MARKET/TECHNO-ECONOMICS

Mild steel component manufacturing clusters.

ENVIRONMENTAL SAFETY CERTIFICATION

N/A

NODAL SCIENTIST DETAILS

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304. ANNEALING SIMULATOR DEVICE

UID: TECH-THEME_8_NML-076

LABORATORY OF ORIGIN | CSIR-NML, JAMSHEDPUR

EXECUTIVE SUMMARY

A reactor chamber enables controlled process environment and controlled heating and cooling rates. The device parameters are as follows:

- Annealing Parameter.
- Temperature : 1000°C Maximum.
- Slowest heating rate : 100°C/hr.
- Highest heating rate : 500°C/min or higher.
- Annealing environment : H₂ & N₂ mixture, N₂, or any other gas.
- Cooling rate : 200°C/s with gases.
- Medium of cooling : Air, H₂ & N₂ mixture, N₂, Atomized water.
- Power requirement : 230V, 50Hz, 200VA.
- Control, display and analysis : External laptop/notebook/PC.

KEYWORDS

Annealing, Simulator, Heat treatment, Furnace

SALIENT FEATURES

A reactor chamber enables controlled process environment and controlled heating and cooling rates.

APPLICATIONS

Simulation, chemical and environment related.

TECHNOLOGY BENCHMARKING

Yes

TECHNOLOGY READINESS LEVEL ASSESSMENT

TRL 7

SCALE OF DEVELOPMENT

The pilot scale demonstration in the field conditions is successfully done and the technology prototype has been tested in the actual field conditions.

STATUS OF COMMERCIALIZATION

N/A

TENTATIVE COST OF DEVELOPMENT

₹ 80 Lakhs

INDUSTRIAL PARTNERS

N/A

PLANT SET UP FOR FINAL PRODUCT

Not yet

4.8 MINING, MINERALS, METALS AND MATERIALS (4M)

IPR STATUS DETAILS (PATENTS/COPYRIGHT/TRADEMARK SECURITY IN INDIA/ABROAD)

N/A

POTENTIAL MARKET/TECHNO-ECONOMICS

Steel industry, furnace manufactures.

ENVIRONMENTAL SAFETY CERTIFICATION

N/A

NODAL SCIENTIST DETAILS

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305. Ultra-β: A PORTABLE NONLINEAR ULTRASONIC DEVICE

UID: TECH-THEME_8_NML-077

LABORATORY OF ORIGIN | CSIR-NML, JAMSHEDPUR

EXECUTIVE SUMMARY

It is a portable, site worthy damage parameter measurement set-up based on higher harmonic analysis of ultrasonic signal. Moreover, the modification in the design of the commercially available system based on higher harmonic analysis of ultrasound wave makes it applicable to in-service components assessment for other structural damage evaluation like fatigue, creep etc. It assesses as well as quantifies the pitted area which could be useful to predict the crack initiation site in the structure in service.

KEYWORDS

Ultra-β, Ultrasonic, Device, NDE

SALIENT FEATURES

It assesses as well as quantifies the pitted area which could be useful to predict the crack initiation site in the structure in service.

APPLICATIONS

Instrumentation.

TECHNOLOGY BENCHMARKING

Yes

TECHNOLOGY READINESS LEVEL ASSESSMENT

TRL 6

SCALE OF DEVELOPMENT

Technology successfully demonstrated to the intended end user.

STATUS OF COMMERCIALIZATION

N/A

TENTATIVE COST OF DEVELOPMENT

₹ 20 Lakhs

INDUSTRIAL PARTNERS

N/A

PLANT SET UP FOR FINAL PRODUCT

N/A

IPR STATUS DETAILS

N/A

4.8 MINING, MINERALS, METALS AND MATERIALS (4M)

POTENTIAL MARKET/TECHNO-ECONOMICS

Damage assessment viz. fatigue, creep, corrosion pitting of industrial components, high power pulser for EMAT, guided wave ultrasonics.

ENVIRONMENTAL SAFETY CERTIFICATION

N/A

NODAL SCIENTIST DETAILS

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306. RECOVERY OF GOLD FROM WASTE MOBILE PHONES AND SCRAPS OF VARIOUS EQUIPMENT

UID: TECH-THEME_8_NML-079

LABORATORY OF ORIGIN | CSIR-NML, JAMSHEDPUR

EXECUTIVE SUMMARY

A process is developed for the dissolution of metal from the PCBs of waste mobile phone, small parts of various equipments containing gold on outer layer. Chemical leaching followed by adsorption/cementation with subsequent heat treatment was used to recover 99% gold.

KEYWORDS

Gold, Mobile phones, PCBs, Recovery, E-waste

SALIENT FEATURES

The technology of dissolution of metal from the PCBs of waste mobile phone, small parts of various equipments containing gold on outer layer.

APPLICATIONS

Mobile, jewellery, waste management etc.

TECHNOLOGY BENCHMARKING

Yes

TECHNOLOGY READINESS LEVEL ASSESSMENT

TRL 6

SCALE OF DEVELOPMENT

Technology successfully demonstrated to the intended end User.

STATUS OF COMMERCIALIZATION

N/A

TENTATIVE COST OF DEVELOPMENT

₹ 20 Lakhs

INDUSTRIAL PARTNERS

N/A

PLANT SET UP FOR FINAL PRODUCT

N/A

IPR STATUS DETAILS

N/A

4.8 MINING, MINERALS, METALS AND MATERIALS (4M)

POTENTIAL MARKET/TECHNO-ECONOMICS

All electronic recycling industries.

ENVIRONMENTAL SAFETY CERTIFICATION

N/A

NODAL SCIENTIST DETAILS

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307. PROCESS FOR PRODUCTION OF HIGHLY METALLISED DIRECTLY REDUCED IRON CYLINDERS (DRIC) FROM LEAN GRADE RAW MATERIALS

UID: TECH-THEME_8_NML-080

LABORATORY OF ORIGIN | CSIR-NML, JAMSHEDPUR

EXECUTIVE SUMMARY

The process utilizes ~100% waste/lean grade raw materials to produce value added product. This invention is useful for converting steel plant and mining waste such as iron ore fines/slime and lean grade coking or non-coking coal (>32% ash) into a highly metallised (metallization >96%) low Sulphur (0.008%S) DRI Cylinders suitable as a feed for induction furnace, electric arc furnace and basic oxygen furnace steelmaking.

KEYWORDS

Directly Reduced Iron (DRI), Steelmaking, Ironore, low grade raw materials

SALIENT FEATURES

The process utilizes ~100% waste/lean grade raw materials to produce value added product.

APPLICATIONS

Steel and iron industry.

TECHNOLOGY BENCHMARKING

Yes

TECHNOLOGY READINESS LEVEL ASSESSMENT

TRL 6

SCALE OF DEVELOPMENT

Technology successfully demonstrated to the intended end user.

STATUS OF COMMERCIALIZATION

NA

TENTATIVE COST OF DEVELOPMENT

₹ 50 Lakhs

INDUSTRIAL PARTNERS

N/A

PLANT SET UP FOR FINAL PRODUCT

N/A

IPR STATUS DETAILS

N/A

4.8 MINING, MINERALS, METALS AND MATERIALS (4M)

POTENTIAL MARKET/TECHNO-ECONOMICS

Steel and iron industry.

ENVIRONMENTAL SAFETY CERTIFICATION

N/A

NODAL SCIENTIST DETAILS

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308. PELLET-SINTER COMPOSITE AGGLOMERATE (PSCA) OF IRON OXIDE FINES FOR USE IN BLAST FURNACE

UID: TECH-THEME_8_NML-083

LABORATORY OF ORIGIN | CSIR-NML, JAMSHEDPUR

EXECUTIVE SUMMARY

In Pellet-Sinter Composite Agglomerate (P-SCA), iron oxide pellets are embedded in to the sinter mass. P-SCA for use in blast furnace has been developed with Indian iron ore to utilize the micro-fines in sintering. The salient features of the process are as follows:

- It also uses steel plant's waste materials viz. LD sludge, mill scale etc (5-10%) with iron oxide microfines.
- The process yields a very good quality sinter even at the lower basicity that is usable in blast furnace.
- It increases the fines acceptability (30% above normal) improving permeability and decreases energy consumption (~20%) and flux consumption.

KEYWORDS

Pellet-Sinter Composite Agglomerate (PSCA), Iron oxide, Blast furnace

SALIENT FEATURES

The technology uses steel plant's waste materials viz. LD sludge, mill scale etc (5-10%) with iron oxide microfines; The process yields a very good quality sinter even at the lower basicity that is usable in blast furnace and it increases the fines acceptability (30% above normal) improving permeability and decreases energy consumption (~20%) and flux consumption.

APPLICATIONS

Blast furnace.

TECHNOLOGY BENCHMARKING

Yes

TECHNOLOGY READINESS LEVEL ASSESSMENT

TRL 6

SCALE OF DEVELOPMENT

Technology successfully demonstrated to the intended end user.

STATUS OF COMMERCIALIZATION

N/A

TENTATIVE COST OF DEVELOPMENT

₹ 40 Lakhs

INDUSTRIAL PARTNERS

N/A

4.8 MINING, MINERALS, METALS AND MATERIALS (4M)

PLANT SET UP FOR FINAL PRODUCT

N/A

IPR STATUS DETAILS

N/A

POTENTIAL MARKET/TECHNO-ECONOMICS

Integrated steel plant.

ENVIRONMENTAL SAFETY CERTIFICATION

N/A

NODAL SCIENTIST DETAILS

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Principal Scientist & Group Leader Ferrous

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309. PRODUCTION OF DIRECTLY REDUCED IRON (DRI)

UID: TECH-THEME_8_NML-085

LABORATORY OF ORIGIN | CSIR-NML, JAMSHEDPUR

EXECUTIVE SUMMARY

The process utilizes ~100% waste raw materials. This invention is useful for converting steel plant/mining wastes such as iron ore fine/slimes and lean grade coal into a high quality value added product (DRI). The product is a suitable feed for electric arc furnace, BOF and induction furnace for steel making environmental consideration.

KEYWORDS

Iron, Steel, Directly Reduced Iron (DRI)

SALIENT FEATURES

The invention is useful for converting steel plant/mining wastes such as iron ore fine/slimes and lean grade coal into a high quality value added product (DRI).

APPLICATIONS

Steel industry.

TECHNOLOGY BENCHMARKING

Yes

TECHNOLOGY READINESS LEVEL ASSESSMENT

TRL 6

SCALE OF DEVELOPMENT

Technology successfully demonstrated to the intended end user.

STATUS OF COMMERCIALIZATION

NA

TENTATIVE COST OF DEVELOPMENT

₹ 50 Lakhs

INDUSTRIAL PARTNERS

N/A

PLANT SET UP FOR FINAL PRODUCT

N/A

IPR STATUS DETAILS

N/A

4.8 MINING, MINERALS, METALS AND MATERIALS (4M)

POTENTIAL MARKET/TECHNO-ECONOMICS

Primary, secondary steel making sector.

ENVIRONMENTAL SAFETY CERTIFICATION

No

NODAL SCIENTIST DETAILS

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310. WIDE METALLIC GLASS RIBBON PROCESSING UNIT

UID: TECH-THEME_8_NML-086

LABORATORY OF ORIGIN | CSIR-NML, JAMSHEDPUR

EXECUTIVE SUMMARY

25 mm wide 25-50 micron thick continuous glassy ribbon can be prepared by planar flow casting method using melt spinning system. It uses 1 kg (for ferrous alloy) capacity induction furnace. The liquid metal is poured on water cooled Cu-wheel which can rotate at a speed of 1000-3000 rpm. The system can be operated in normal and controlled atmospheres. The type of alloys that can be prepared through this melt-spinning system are:

- Glassy magnetic alloys: Fe-Si-B, Fe-Ni-B, Co-Si-B.
- Nanostructured magnetic alloys: Fe-Nb-Cu-Si-B, Fe-Co-Nb-Si-B.
- Brazing alloys: Cu-Ni-Mn, Ni-Fe-Cr-B-Si.
- Ferromagnetic shape memory alloy: Ni-Mn-Ga, Co-Ni-Al.

KEYWORDS

Metallic glass ribbon, Processing, Melt spinning

SALIENT FEATURES

25 mm wide 25-50 micron thick continuous glassy ribbon can be prepared by planar flow casting method using melt spinning system. The system can be operated in normal and controlled atmospheres.

APPLICATIONS

Metal, transformer and glass industry.

TECHNOLOGY BENCHMARKING

Yes

TECHNOLOGY READINESS LEVEL ASSESSMENT

TRL 6

SCALE OF DEVELOPMENT

Technology successfully demonstrated to the intended end User.

STATUS OF COMMERCIALIZATION

N/A

TENTATIVE COST OF DEVELOPMENT

₹ 80 Lakhs

INDUSTRIAL PARTNERS

N/A

PLANT SET UP FOR FINAL PRODUCT

Not yet

4.8 MINING, MINERALS, METALS AND MATERIALS (4M)

IPR STATUS DETAILS

N/A

POTENTIAL MARKET/TECHNO-ECONOMICS

Transformer industry.

ENVIRONMENTAL SAFETY CERTIFICATION

No

NODAL SCIENTIST DETAILS

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311. CYANIDE FREE ALKALINE ELECTROLYTE AND ELECTRO-CHEMICAL PROCESS FOR RUST REMOVAL FROM PLAIN CARBON STEEL COMPONENTS

UID: TECH-THEME_8_NML-087

LABORATORY OF ORIGIN | CSIR-NML, JAMSHEDPUR

EXECUTIVE SUMMARY

The process is fast electrochemical rust removal process (1-2 min). It's an alkaline cleaning process with no hydrogen embrittlement and cleaned surface is passivated to prevent immediate rusting. Electrolyte is free from toxic elements like cyanides which operates at room temperature. It can clean small components (screws) to big components. The technology is ready for commercial use in plant scale.

KEYWORDS

Cyanide, Alkaline, Electrolyte, Electrochemical, Rust, Steel

SALIENT FEATURES

It is a technology of fast electrochemical rust removal, prevent immediate rusting and can clean small components (screws) to big components.

APPLICATIONS

Useful in rust removal industry.

TECHNOLOGY BENCHMARKING

Yes

TECHNOLOGY READINESS LEVEL ASSESSMENT

TRL 6

SCALE OF DEVELOPMENT

Technology successfully demonstrated to the intended end user.

STATUS OF COMMERCIALIZATION

N/A

TENTATIVE COST OF DEVELOPMENT

₹ 10 Lakhs

INDUSTRIAL PARTNERS

N/A

PLANT SET UP FOR FINAL PRODUCT

Not yet

IPR STATUS DETAILS

N/A

4.8 MINING, MINERALS, METALS AND MATERIALS (4M)

POTENTIAL MARKET/TECHNO-ECONOMICS

Mild steel component manufacturing clusters.

ENVIRONMENTAL SAFETY CERTIFICATION

No

NODAL SCIENTIST DETAILS

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312. CYANIDE FREE PROCESS FOR LEACHING AND RECOVERY OF GOLD

UID: TECH-THEME_8_NML-088

LABORATORY OF ORIGIN | CSIR-NML, JAMSHEDPUR

EXECUTIVE SUMMARY

Cyanide free gold leaching process as fast as cyanide (2-5 min) and it's a close loop process of gold leaching and recovery which operated at room temperature. The Gold plated on any surface can be recovered without damaging the base material. The know-how is ready for commercial use in plant scale.

KEYWORDS

Cyanide, Leaching, Recovery, Gold

APPLICATIONS

Useful in gold recovery industry.

TECHNOLOGY BENCHMARKING

Yes

TECHNOLOGY READINESS LEVEL ASSESSMENT

TRL 6

SCALE OF DEVELOPMENT

Technology successfully demonstrated to the intended end user.

STATUS OF COMMERCIALIZATION

The know-how is ready for commercial use in plant scale.

TENTATIVE COST OF DEVELOPMENT

₹ 10 Lakhs

INDUSTRIAL PARTNERS

N/A

PLANT SET UP FOR FINAL PRODUCT

Not yet

IPR STATUS DETAILS

N/A

POTENTIAL MARKET/TECHNO-ECONOMICS

Gold recovery industry.

ENVIRONMENTAL SAFETY CERTIFICATION

No

NODAL SCIENTIST DETAILS

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313. COMMERCIAL PROCESS FOR THE RECOVERY OF HIGH PURITY GOLD AND SILVER (KNOW-HOW)

UID: TECH-THEME_8_NPL-089

LABORATORY OF ORIGIN | CSIR-NPL, NEW DELHI

EXECUTIVE SUMMARY

Gold and silver are precious metals. The recovery of gold and silver is a challenging task. There are several metals which may be present in gold and silver. The recovery of gold and silver in presence of such metals is very tough and may leach out during purification process. We have developed process for the recovery of high purity of gold and silver. Besides this nanoparticles of these metals can be prepared in water/solvent medium for desired applications.

KEYWORDS

High purity, Recovery from process waste, Nanoparticles preparation

SALIENT FEATURES

It is a process of recovery of high purity of gold and silver. Besides this, nanoparticles of these metals can be prepared in water/solvent medium for desired applications.

APPLICATIONS

Gold industry.

TECHNOLOGY BENCHMARKING

Yes

TECHNOLOGY READINESS LEVEL ASSESSMENT

TRL 7

SCALE OF DEVELOPMENT

The Pilot scale demonstration in the field conditions is successfully done and the technology prototype has been tested in the actual field conditions and addressed all the critical scaling issues.

STATUS OF COMMERCIALIZATION

NA

TENTATIVE COST OF DEVELOPMENT

N/A

INDUSTRIAL PARTNERS

N/A

PLANT SET UP FOR FINAL PRODUCT

Yes

IPR STATUS DETAILS

N/A

4.8 MINING, MINERALS, METALS AND MATERIALS (4M)

POTENTIAL MARKET/TECHNO-ECONOMICS

Industries related to jewellery, cosmetics, etc.

ENVIRONMENTAL SAFETY CERTIFICATION

N/A

NODAL SCIENTIST DETAILS

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Annexure I

Overall Coordination Team

Mentor

Prof. Ranjana Aggarwal, Director, CSIR-NIScPR

Mentor

Advisor

Dr. Sujit Bhattacharya, Chief Scientist, CSIR-NIScPR

Project Advisor

Overall Coordination

Dr. Vipin Kumar, Sr. Principal Scientist, CSIR-NIScPR

Nodal Scientist & Coordinator

Dr. Shiv Narayan Nishad, Scientist, CSIR-NIScPR

Member-Convenor

Dr. Vinayak, Senior Scientist, CSIR-NIScPR

Member

Theme Experts and Coordination Team

Aerospace, Electronics, and Instrumentation & Strategic Sectors (AEISS)

Dr. Shamim Ahmed, Director General, K. P. College of Engineering	Chairman
Mr. Lakshman A.A. Associate Vice President of Sales, Umlaut Pvt Ltd	External Expert
Dr. J Jadhav Director, NAL Bangalore	Theme Director
Head TMD or Nominee	CSIR HQ Representative
Head TMD-SeMI or Nominee	CSIR HQ Representative
Dr. Shiv Narayan Nishad, Scientist, CSIR-NIScPR	Theme Coordinator
Dr Vipin Kumar, Senior Principal Scientist, CSIR-NIScPR	Theme Coordinator
Shri Anil Sharma, Principal Technical Officer, CSIR-NIScPR	Theme Member

Agri, Nutrition & Biotech (ANB)

Dr. H. Purushotham, Former Chairman & Managing Director, National Research Development Corporation, New Delhi	Chairman
Dr. Mamta Dhawan, Independent Consultant	External Expert
Dr. Saroj Kanta Barik, Director, CSIR-NBRI	Theme Director
Head TMD or Nominee	CSIR HQ Representative
Head TMD-SeMI or Nominee	CSIR HQ Representative
Dr. M. Rais, Chief Scientist, CSIR-NIScPR	Theme Coordinator
Dr. L Pulamte, Senior Principal Scientist, CSIR-NIScPR	Theme Coordinator
Dr. Suman Ray, Senior Scientist, CSIR-NIScPR	Theme Member
Dr. Anil Kushwaha, Senior Technical Officer, CSIR-NIScPR	Theme Member

ANNEXURE I

Chemicals (Including Leather) and Petrochemicals (CLP)

Dr. RR Hirwani, Visiting Professor, IIT, Dharwad	Chairman
Dr. G S Kapur, Executive Director (Chemical Technology), Indian Oil Corporation Ltd	External Expert
Dr. Chandra Shekhar, Director, CSIR-IICT	Theme Director
Dr. Anjan Ray	Special Invitee
Head TMD or Nominee	Head TMD or Nominee
Head TMD-SeMI or Nominee	Head TMD-SeMI or Nominee
Dr. Kasturi Mandal, Principal Scientist, CSIR-NIScPR	Theme Coordinator
Dr. Madhulika Bhati, Principal Scientist, CSIR-NIScPR	Theme Coordinator
Shri Kashmiri Lal, Principal Technical Officer, CSIR-NIScPR	Theme Member

Civil Infrastructure & Engineering (CIE)

Dr. Anil Wali (MD, FITT, IIT-Delhi)	Chairperson
Prof. Santosh Karpuria, Director, CSIR-SERC	Nodal Director
Prof. Satish Chandra, Director, CSIR-CRRI	Special Invitee
Mr. Sailendra Meduri (L&T)	External Expert
Dr. Akanksha Tyagi (IIT-Roorkee)	External Expert
Head TMD or Nominee	Head TMD or Nominee
Head TMD-SeMI or Nominee	Head TMD-SeMI or Nominee
Dr. L. Pulamte, Sr. Principal Scientist, CSIR-NIScPR	Theme Coordinator
Dr. Vinayak, Senior Scientist, CSIR-NIScPR	Theme Coordinator
Mr. Chand Mohammad, Technical Assistant, CSIR-NIScPR	Theme Member

Ecology, Environment, Earth & Ocean Sciences and Water (E3OW)

Dr. L.S.Rathore, ESSO-India Meteorological Department	Chairman
Dr. Neeraj Dangi, TERI SAS	External Expert
Dr. VM Tiwari, CSIR-NGRI	Theme Director
Head TMD or Nominee	Head TMD or Nominee
Head TMD-SeMI or Nominee	Head TMD-SeMI or Nominee
Dr. Madhulika Bhati, Principal Scientist, CSIR-NIScPR	Theme Coordinator
Dr. Kasturi Mandal, Principal Scientist, CSIR-NIScPR	Theme Coordinator
Dr. Praveen Sharma, Principal Technical Officer, CSIR-NIScPR	Theme Member

Energy (Conventional and Non-Conventional) and Energy Devices (EED)

Prof. Unnat Pandit, JNU, CHAIRMAN	Chairman
Sh. Chandrasekhar Iyer, Meghraj Capital Advisors	External Expert
Dr. Kalaiselvi, Director, CSIR-CECRI, Karaikudi	Theme Director
Dr. S.K.Tiwari,	CSIR-HQ Representative
Dr. Devi Prasad Bhukya	CSIR-HQ Representative
Dr. Sandhya Wakdikar, Senior Principal Scientist, CSIR-NIScPR	Theme Coordinator
Dr. Yogesh Suman, Senior Principal Scientist, CSIR-NIScPR	Theme Coordinator
Shri A.K. Bhardwaj, Principal Technical Officer, CSIR-NIScPR	Theme Member

Healthcare (HTC)

Dr. Y. K. Gupta, President, AIIMS Bhopal	Chairman
Ms. Bindhya Cariappa, Vice-President, IQVIA, Bangalore	External expert
Dr. Anurag Aggarwal, Director, CSIR-IGIB	Theme Director
Head TMD or Nominee	Head TMD or Nominee
Head TMD-SeMI or Nominee	Head TMD-SeMI or Nominee
Dr. Y. Madhavi, Senior Principal Scientist, CSIR-NIScPR	Theme Coordinator
Dr. Sandhiya Lakshmanan, Scientist, CSIR-NIScPR	Theme Coordinator
Mrs Renu Jethi, Sr. Technical Officer, CSIR-NIScPR	Theme Member

Mining, Minerals, Metals and Materials (4M)

Professor B. B. Dhar, Former Director, CMRI, Dhanbad	Chairperson
Prof. Debasish Chakravarty, IIT, Kharagpur	External Expert
Dr. Indranil Chattoraj, Director, CSIR-NML, Jamshedpur	Theme Director
Dr. Kuttanellore Muraleedharan, Director, CSIR-CGCRI, Kolkata	Special Invitee
Dr. Monika J. Kulshreshtha, Principal Scientist	CSIR Representative
Dr. Radha Madhab Mohanty, Senior Scientist	CSIR Representative
Dr. Naresh Kumar, Chief Scientist, CSIR-NIScPR	Theme Coordinator
Sh. Avinash Kshitij, Principal Scientist, CSIR-NIScPR	Theme Coordinator
Dr. Suresh Kumar, Principal Technical Officer, CSIR-NIScPR	Theme Member

ANNEXURE II

Lab Level Self-Assessment Check List

Name of CSIR Laboratory :

Name of the Technology :

Unique Code (UID) :

Self Assessed TRL :

TRL 4	Technology validation at Lab Level	Yes/No	Remarks
1.	Has the Experimental Proof of Concept Demonstrated at Lab Level?		
2.	Have you Checked and Validated all the Technology Components at Lab Level?		
3.	Have you Benchmarked the Technology with Similar Technology Already Available?		
TRL 5	Technology Validation at Relevant Environment		
4.	Was Technology Validated in the Target Industrial/Production Environment?		
5.	Were the Suggestions/Modifications by Concerned Professionals Incorporated and System Modified?		
6.	Whether test results compared with expected results?		
TRL 6	Technology Demonstration in Operational Environment		
7.	Are all Product/Technology Apecifications Benchmarked with Appropriate Standards?		
8.	Was Technology Successfully Demonstrated to the Intended End User?		
9.	Was the Intended End User Satisfied with the Performance of the Technology?		
TRL 7	System Prototype in Operational Environment		
10.	Have you Taken Pilot Scale Demonstration in Field Conditions Incorporating the Feedback from TRL 6?		
11.	Has the Technology Prototype been Tested in Actual Field Conditions/ Production/Manufacturing/Operational Environment?		
12.	Has the Prototype Addressed All Critical Scaling Issues?		
TRL 8	System Complete and Qualified		
13.	Have you Established Contact with Relevant Firms to Design and Develop the Plant for Upscaling?		
14.	Has End to End Testing of the System from the Start Till the Obtaining Of Final Product, Been Done in the Target Production/Operational Environment?		
15.	Has Relevant Certifications Taken from Appropriate Agencies?		

ANNEXURE I I

TRL 9	System Proven in Actual Environment		
16.	Has the Industrial Partner/Manufacturer Setup the Plant for Final Product Using the Technology?		
17.	Has the Final Product Based on the Technology Started Selling Into the Market?		
18.	Have Safety Aspects (Including Environmental Safety) Addressed and Documented?		

Name & Signature of Nodal Scientist/BDG Head/Director

Stamp

ANNEXURE III

List of Technologies at TRL 6

Sr. No.	Technology Name	Themes	Lab	TRL Number	Page No.
1	Design and Development of 2.6 MW S-band Tunable Pulse	AEISS	CSIR-CEERI	6	53
2	Intelligent Seismic Sensing Node for Elephant Movement Detection	AEISS	CSIR-CSIO	6	59
3	Ligament Injury Assessment & Therapy Device for Motor-Rehabilitation of Soldiers “L-GEAR”	AEISS	CSIR-CSIO	6	65
4	Eco-Friendly Process for the Preparation of Corrosion Resistant Sealed Anodized Coatings on Aircraft Aluminium Alloy	AEISS	CSIR-NAL	6	91
5	Tapecasting Technology for Ceramic Substrates	AEISS	CSIR-NAL	6	93
6	SUCHAN mini UAV	AEISS	CSIR-NAL	6	101
7	Environment Friendly Multifunctional Bamboo Composite Material for Modern Housing and Structures	ANB	CSIR-AMPRI	6	117
8	Nutra Chikki with Added Spirulina	ANB	CSIR-CFTRI	6	121
9	A Process for Flavour Essence from Decalepis Hamiltonii/ Hemidesmus Indicus Roots	ANB	CSIR-CFTRI	6	123
10	A Process for the Preparation of β - carotene and Mineral Fortified Buns	ANB	CSIR-CFTRI	6	125
11	Edible Rice Bran	ANB	CSIR-CFTRI	6	127
12	Soy Protein Hydrolysate	ANB	CSIR-CFTRI	6	129
13	Sesame Dehulling – Dry Process	ANB	CSIR-CFTRI	6	131
14	Dehydrated Shelf Stable Egg Cube	ANB	CSIR-CFTRI	6	133
15	Shelf-Stable Egg Crunchy Bites	ANB	CSIR-CFTRI	6	135
16	Shelf-Stable Chicken Tit Bits	ANB	CSIR-CFTRI	6	137
17	Virgin Coconut Oil (VCO)	ANB	CSIR-CFTRI	6	139
18	Process for the Production of Spray Dried Coconut Milk Powder	ANB	CSIR-CFTRI	6	141
19	Quick Cooking Germinated Dehydrated Pulses	ANB	CSIR-CFTRI	6	143
20	Expanded Horse Gram	ANB	CSIR-CFTRI	6	145
21	Ragi malt-Enzyme Rich	ANB	CSIR-CFTRI	6	149
22	RTE Low Fat Flaked Jowar Snacks (Sweet and Savoury)	ANB	CSIR-CFTRI	6	151
23	Neera Bottling	ANB	CSIR-CFTRI	6	153
24	Continuous Vibro Fluidized Bed Roaster using Flue Gas	ANB	CSIR-CFTRI	6	155
25	Maize Dry Milling System	ANB	CSIR-CFTRI	6	157
26	Integrated Rubber Roll Sheller Hulle	ANB	CSIR-CFTRI	6	159
27	Tiny Rice Mill	ANB	CSIR-CFTRI	6	161

ANNEXURE III

28	Parboiling and Drying Plant (2 & 4 TPH)	ANB	CSIR-CFTRI	6	163
29	Continuous Ragi Mudde Making Machine	ANB	CSIR-CFTRI	6	165
30	Lip Balm- Lip Care Formulation	ANB	CSIR-CIMAP	6	169
31	Acne Cure Gel	ANB	CSIR-CIMAP	6	205
32	After Shave Gel	ANB	CSIR-CIMAP	6	207
33	Food Products from Seabuckthorn (<i>Hippophae Rhamnoides</i>)	ANB	CSIR-IHBT	6	219
34	Novel Food Products from Sohiong (<i>Prunus Nepalensis</i>)	ANB	CSIR-IHBT	6	221
35	Vitamin D ₂ Enriched Shiitake Mushroom Products: Ready to Reconstitute Products Instant Soup Mixesbeverage Mixes Ready to Eat Energy Bars	ANB	CSIR-IHBT	6	227
36	Iron Enriched Fruit Bars and Candies	ANB	CSIR-IHBT	6	229
37	Buckwheat Bars and Noodles	ANB	CSIR-IHBT	6	231
38	Tea Wine	ANB	CSIR-IHBT	6	237
39	Technology for Preparation of Tea Vinegar	ANB	CSIR-IHBT	6	239
40	Stevia Powder and Stevia Liquid Drops (Low Calorie Sweetener)	ANB	CSIR-IHBT	6	241
41	Early Flowering in Lilium and Tulip Through Hydroponic Cultivation	ANB	CSIR-IHBT	6	243
42	Captive Cultivation of Shiitake Mushroom and its Enrichment with Vitamin D ₂	ANB	CSIR-IHBT	6	245
43	OP-12 Biofertilizer	ANB	CSIR-NEIST	6	263
44	Citronella Jor Lab C-5	ANB	CSIR-NEIST	6	265
45	Lemongrass Jor Lab L-8	ANB	CSIR-NEIST	6	267
46	Value Added Syrups from Palm Neera and Coconut Neera	ANB	CSIR-NIIST	6	273
47	Organism and Process for Production of Beta Glucosidase (BGL)	ANB	CSIR-NIIST	6	277
48	Fly Ash based Advanced (Cement Free) Geopolymer Concrete for Rigid Pavement Roads	CLP	CSIR-AMPRI	6	293
49	Advanced Pavers Block from Copper Tailings	CLP	CSIR-AMPRI	6	295
50	Odor Abatement for Tanneries	CLP	CSIR-CLRI	6	297
51	Sequential Oxidic-anoxic Bioreactor (SOABR) for Primary Treatment of Wastewater	CLP	CSIR-CLRI	6	305
52	Process for 5-hydroxymethylfurfural (5-hmf) Production from Biomass	CLP	CSIR-IHBT	6	309
53	Waste Plastics to Fuel and Petrochemicals	CLP	CSIR-IIP	6	325
54	Process Development for the Synthesis of Dialkyl Ethers by Dehydration of Alcohols using Mix Metal Oxide Catalyst	CLP	CSIR-NCL	6	329
55	Advanced Hybrid Composite Wood and Wood Substitute (AC-wood)	CIE	CSIR-AMPRI	6	337
56	Hybrid Rebar Coupler	CIE	CSIR-CBRI	6	345
57	Process Know-How for Manufacturing of Nano-Lime	CIE	CSIR-CBRI	6	347
58	Process Know-How for Manufacturing of Silica Nano Particles (SNPs)	CIE	CSIR-CBRI	6	349
59	Horizontal Boring Machine for Making Underground Bores	CIE	CSIR-CBRI	6	359
60	Pothole Repair Machine	CIE	CSIR-CRRI	6	363

ANNEXURE III

61	Nano Alumina Adsorbent Based Water Filter for Arsenic and Fluoride Removal	E3OW	CSIR-AMPRI	6	393
62	Process Technology for Separation of Phosphor Material from CFL Waste/ Recycling of Waste CFLs and Tubelights	E3OW	CSIR-CSIO	6	401
63	Electrostatic Dust Mitigation and Smog Control Device	E3OW	CSIR-CSIO	6	403
64	Rapid and Green Composter	E3OW	CSIR-IICT	6	409
65	Extraction of Impurity-Free Sodium Thiocyanate Solvent from Aqueous Solutions in Acrylic Fiber Industry	E3OW	CSIR-IICT	6	423
66	Wood Care Formulation	E3OW	CSIR-NEIST	6	447
67	Finger Gesture based Control Module for Intelligent Patient Vehicle	EED	CSIR-CSIO	6	499
68	Building Energy Management Software (BEMS)	EED	CSIR-CSIO	6	501
69	Development of Patient Specific Orthopaedic & Maxillofacial Implants	HTC	CSIR-CSIO	6	525
70	Respiration Assistive Intervention Device - Respi AID	HTC	CSIR-CSIO	6	527
71	Glucocorticoid Receptor (GR)-Targeted Liposomal Platform for Aggressive and Drug-Resistant Cancer	HTC	CSIR-IICT	6	535
72	Novel Cationic 17-Estradiol-Substituted-Estradiol Derivatives with Anti-Cancer Activity	HTC	CSIR-IICT	6	537
73	Selective Detection and Analysis of Small Molecules	HTC	CSIR-NCL	6	539
74	Herbal Anti-Fungal Formulation	HTC	CSIR-NEIST	6	543
75	(Crocus sativus) Capsule Formulation: Saffron Based Nutraceutical Product	HTC	CSIR-IIIM	6	545
76	Bacterial Cellulose Patches	HTC	CSIR-IIIM	6	551
77	Closed Cell Aluminium Composites Foams	4M	CSIR-AMPRI	6	559
78	Aluminium Metal Matrix Composites and Hybrid Composites	4M	CSIR-AMPRI	6	561
79	Low Moisture Castable (45-75% Al ₂ O ₃)	4M	CSIR-CGCRI	6	567
80	Mag-Chrome Refractory Aggregates from Friable Chrome Ore	4M	CSIR-CGCRI	6	569
81	Mullite Refractory Aggregates from Bauxite	4M	CSIR-CGCRI	6	571
82	Mag-Al Spinel Refractory Aggregates	4M	CSIR-CGCRI	6	573
83	70-90% Alumina Cement Free Dense Self Flowing Castable	4M	CSIR-CGCRI	6	575
84	Orbital Eye Ball Implant	4M	CSIR-CGCRI	6	577
85	Ceramic Biomedical Implants (Hip Joint Prosthesis)	4M	CSIR-CGCRI	6	579
86	Bioactive Glass Coating for Dental Application	4M	CSIR-CGCRI	6	581
87	Synthetic Bone Graft Material	4M	CSIR-CGCRI	6	583
88	Moisture Sensor (5-95% RH) Moisture Meter (5-100 ppm Moisture)	4M	CSIR-CGCRI	6	587
89	Pottery and Low Cost Earthen Wares	4M	CSIR-CGCRI	6	589
90	Paste Backfilling in Underground Coal Mines	4M	CSIR-CIMFR	6	599
91	Economical Production of Highly Porous Metal Organic Frameworks (MOF) from Zinc Scrap	4M	CSIR-CSIO	6	607
92	Materials for Optical Detection of Selenium in Water	4M	CSIR-CSIO	6	609
93	Designed Screw Scrubber Equipment for Mineral Processing	4M	CSIR-IMMT	6	617
94	Eye-On-Pellet-: Online Pellet Size Analyzer for Pelletization Industries	4M	CSIR-IMMT	6	623

ANNEXURE III

95	Functionally Graded Aluminum Alloy and Composite Products and Process Technology	4M	CSIR-NIIST	6	629
96	Recovery of Lead from Zinc Plant Residue	4M	CSIR-NML	6	655
97	Development of Synthetic Flux and a Process for De-phosphorization of Steel in Induction Furnace	4M	CSIR-NML	6	657
98	Microwave – IR Sort: Rapid, Reliable, Non – invasive Technology for Iron Ore Compositional Analysis	4M	CSIR-NML	6	663
99	Recovery of Cobalt from Discarded Li-ion Batteries of Mobile Phone	4M	CSIR-NML	6	665
100	Highly Metallised Low Sulphur Directly Reduced Iron (DRI) from Iron Ore Slime and Rejected/Middling Coal	4M	CSIR-NML	6	667
101	Dry Beneficiation of Non Coking Coal for Application in Thermal Power and DRI	4M	CSIR-NML	6	681
102	Anti-Corrosive Chemical for Steel Sheet, Rebar and Wire	4M	CSIR-NML	6	685
103	Ultra-β: A Portable Nonlinear Ultrasonic Device	4M	CSIR-NML	6	689
104	Recovery of Gold from Waste Mobile Phones and Scraps of Various Equipment	4M	CSIR-NML	6	691
105	Process for Production of Highly Metallised Directly Reduced Iron Cylinders (DRIC) from Lean Grade Raw Materials	4M	CSIR-NML	6	693
106	Pellet-Sinter Composite Agglomerate (PSCA) of Iron Oxide Fines for Use in Blast Furnace	4M	CSIR-NML	6	695
107	Production of Directly Reduced Iron (DRI)	4M	CSIR-NML	6	697
108	Wide Metallic Glass Ribbon Processing Unit	4M	CSIR-NML	6	699
109	Cyanide Free Alkaline Electrolyte and Electrochemical Process for Rust Removal from Plain Carbon Steel Components	4M	CSIR-NML	6	701
110	Cyanide Free Process for Leaching and Recovery of Gold	4M	CSIR-NML	6	703

ANNEXURE IV

List of Technologies at TRL 7

Sr. No.	Technology Name	Theme Number	Lab	TRL Number	Page No.
1	Earthquake Warning System (EqWS)	AIESS	CSIR-CSIO	7	57
2	Divya Nayan: A Personal Reading Machine for Visually Impaired	AIESS	CSIR-CSIO	7	61
3	AutoCEPH: A Software for 2-D Computerized Cephalometric Analysis as a Web Service	AIESS	CSIR-CSIO	7	63
4	Bio-Aviation Fuels: Renewable Fuels for Strategic Sector	AIESS	CSIR-IIP	7	67
5	HANSA-NG Aircraft	AIESS	CSIR-NAL	7	71
6	Process Technology for Continuous preparation of Carbon Fiber	AIESS	CSIR-NAL	7	81
7	Bi Level Positive Airway Pressure System (Bi+AP V1)	AIESS	CSIR-NAL	7	103
8	Cross Floating Valve (Know-How)	AIESS	CSIR-NPL	7	109
9	Development of Free Standing and Flexible Carbon Nanotube Paper (Know-How)	AIESS	CSIR-NPL	7	111
10	Turmeric Powder from Fresh Turmeric Rhizome	ANB	CSIR-CFTRI	7	147
11	Menthofresh -HERBAL ORAL CLEANSER	ANB	CSIR-CIMAP	7	197
12	Mosquito Repellent Cream	ANB	CSIR-CIMAP	7	209
13	PsoriaCIM Cream	ANB	CSIR-CIMAP	7	211
14	Crispy Fruits and Vegetables for Avoiding Post Harvest Losses	ANB	CSIR-IHBT	7	215
15	Tea Catechins	ANB	CSIR-IHBT	7	235
16	Improved Bee Hive for Quality and Hygeinic Extraction of Honey	ANB	CSIR-IHBT	7	247
17	AO Kit (Argemone Oil Detection Kit)	ANB	CSIR-IITR	7	249
18	MO Check (Mustard Oil Check)	ANB	CSIR-IITR	7	251
19	High Throughput Mass Spectrometry Method for the Detection of Pesticide Residues and Contaminants from Food and Produce	ANB	CSIR-NCL	7	259
20	TP-16 Biofertilizer	ANB	CSIR-NEIST	7	261
21	Process for Preparation of White Pepper	ANB	CSIR-NIIST	7	275
22	Rice Grain Analysis Software, Ver 1.0	ANB	CSIR-CSIO	7	279
23	Dehydrate Fruits and Fruit Preserve in Honey	ANB	CSIR-NIIST	7	285
24	Functional Vegetable Oils Based on Red Palm Olein (RPO) for Culinary use with Enriched Carotenoids and Optimum Fatty Acid Profile	ANB	CSIR-NIIST	7	287
25	Technology for Red Palm Olein (RPO) Based Soft Gel as Vitamin A Supplement for Combating Vitamin A Deficiency	ANB	CSIR-NIIST	7	289
26	Co-Digestion of Tannery Solid Wastes for Biogas Generation	CLP	CSIR-CLRI	7	299
27	Hydrazine Hydrate Technology (HH), for M/s Gujarat Alkalies & Chemicals Limited, Vadodara	CLP	CSIR-IICT	7	311

ANNEXURE IV

28	Thermo-Gravimetric Reactor (TGR)	CLP	CSIR-CIMFR	7	331
29	C-Brick Machine – Capacity 5000 bricks per 8 hrs. shift (upgraded version)	CIE	CSIR-CBRI	7	339
30	Manufacture of Paver Block and Other Building Components i.e. Tiles/Bricks from C&D Waste	CIE	CSIR-CBRI	7	343
31	Fire Retardant Water Repellent Canvas	CIE	CSIR-CBRI	7	353
32	Imaging of Hidden Anomalies in Concrete and Stone Masonry Structures using Ultrasonic Pulse Velocity	CIE	CSIR-CBRI	7	355
33	Cost Effective Durable Water Tanks using Flowable Cement Mortar	CIE	CSIR-SERC	7	383
34	Toilet Unit Using Thin Precast Concrete Segmental Panels	CIE	CSIR-SERC	7	385
35	Textile Reinforced Concrete Prototyping Technology (TRCPT)	CIE	CSIR-SERC	7	387
36	Innovative Disaster Resistant Lightweight Prefabricated Building Systems using EPS Panels	CIE	CSIR-SERC	7	389
37	Water Purification through Ceramic Filters	E3OW	CSIR-CGCRI	7	399
38	Renewable Biohydrogen (H ₂) and Platform Chemical from Biogenic (solid /liquid) Waste	E3OW	CSIR-IICT	7	407
39	Compact and Low Cost Vertical Modular RO/NF/UF Systems for Defluoridation of Ground Water and Purification of Surface Water	E3OW	CSIR-IICT	7	411
40	Technology Package for Production of Packaged Drinking Water Facility	E3OW	CSIR-IICT	7	417
41	Nanofiltration (NF) Process for Separation of Corrosive Chloride ions from Steel Industrial Wastewater	E3OW	CSIR-IICT	7	421
42	High Rate Transpiration System	E3OW	CSIR-NEERI	7	439
43	Municipal Wastewater Treatment Using Immobilized Microbial Culture- Bio Phytorem System	E3OW	CSIR-NEERI	7	443
44	Neerflush (Automatic Mechanical Urinal Flusher)	E3OW	CSIR-NEERI	7	445
45	Process for Development of Weather Resistant Coir Geotextile	E3OW	CSIR-NIIST	7	449
46	Bioprocess for Treating Perchlorate (Rocket Fuel) Contaminated Water and Soil.	E3OW	CSIR-NIIST	7	455
47	A Sea bed Resident Event Driven Profiling System for Use in Coastal Waters	E3OW	CSIR-NIO	7	467
48	Process for the Preparation of Zinc Peroxide Nano-Particles (Patent No. US 8,715,612: 2013) and an Antimicrobial Agent and Preparation Thereof (Patent No. IN 1338 DEL2014)	E3OW	CSIR-NPL	7	473
49	Environmental Conditions Monitoring Device	E3OW	CSIR-NPL	7	475
50	Recycling of Plastic Waste into Tiles for Societal Usage	E3OW	CSIR-NPL	7	479
51	Specialty Optical Fibers	EED	CSIR-CGCRI	7	486
52	VEERA: Virtual Intelligence Techniques for Rehabilitation	EED	CSIR-CSIO	7	489
53	Pump Efficiency Monitoring System (PEMS)	EED	CSIR-CSIO	7	497
54	Semi-Automatic Equipment's for Large Area Dye-Sensitized Solar Module Fabrication	EED	CSIR-NIIST	7	505
55	Carbon Composites Bipolar Plates for Hydrogen Based Fuel Cell Applications (Patent No: 766/DEL/2010)	EED	CSIR-NPL	7	507
56	Air Conditioner Efficiency Meter (ACE Meter)	EED	CSIR-CSIO	7	513

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57	Exoskeleton Device (ExoD) for Rehabilitation of Mobility Impaired Patients	HTC	CSIR-CSIO	7	516
58	ORGAN- Biomechatronic Rehabilitative Solutions for Children with Congenital Hemi-paresis	HTC	CSIR-CSIO	7	521
59	Rapid Diagnostic Kit For Detection Of Kala- azar from Serum and Urine Samples	HTC	CSIR-IICB	7	533
60	Know-How for “Continuous Process for Production of Paracetamol”	HTC	CSIR-NCL	7	541
61	Fabrication Of Specialty Refractory Pot And Manufacturing Of High Density Specialty Glass Cullet For Radiation Shielding Applications	4M	CSIR-CGCRI	7	591
62	Technology of Packaged Fiber Laser	4M	CSIR-CGCRI	7	593
63	CSIR – CIMFR Blast Guide	4M	CSIR-CIMFR	7	605
64	Column Flotation Technology for Flotation of Low Grade Fines Ores and Mineral	4M	CSIR-IMMT	7	611
65	Maximise the Recovery of Flaky Graphite in Beneficiation Process of Natural Graphite Ore	4M	CSIR-IMMT	7	615
66	Maximisation of Iron Recovery from Lean/Low Grade Iron Ore Resources by Reduction Roasting Technique	4M	CSIR-IMMT	7	619
67	An Environmentally Friendly Process for the Production of High Grade Synthetic Rutile from Low Grade Ilmenite	4M	CSIR-NIIST	7	625
68	Eco-friendly Flotation Reagents for Sillimanite, Limestone and Coal	4M	CSIR-NML	7	631
69	Geo-polymer Cement	4M	CSIR-NML	7	639
70	Paving Blocks from Fly Ash, Blast Furnace Slag, Steel Slag, and other Industrial Wastes	4M	CSIR-NML	7	641
71	Production of Ferrite and Pigment Grade High Purity Monodispersed Iron Oxide from Waste Chloride Pickle Liquor and other Iron Rich Sources	4M	CSIR-NML	7	645
72	PABI: Portable Automated Ball Indentation System	4M	CSIR-NML	7	651
73	MagSys: A Portable Giant Magneto-Impedance (GMI) based Magnetic Sensing Device for NDE Applications	4M	CSIR-NML	7	659
74	Ultrasonic Flow Gauge: A Device for Fluid Flow Rate Measurement through a Narrow Tube	4M	CSIR-NML	7	661
75	Dip Cleaner cum Brightener for Gold and Diamond	4M	CSIR-NML	7	669
76	Beneficiation of Low-grade Iron Ores	4M	CSIR-NML	7	671
77	Dip Cleaner/Tarnish Remover for Silver	4M	CSIR-NML	7	675
78	Copper Concentrate from Copper Ores	4M	CSIR-NML	7	679
79	Beneficiation of Tungsten Ores Salient Features	4M	CSIR-NML	7	683
80	Annealing Simulator Device	4M	CSIR-NML	7	687
81	Commercial Process for the Recovery of High Purity Gold and Silver (Know-How)	4M	CSIR-NPL	7	705

ANNEXURE V

List of Technologies at TRL 8

Sr. No.	Technology Name	Theme Name	CSIR-Lab	TRL Number	Page No.
1	Er-Doped Fiber Amplifier (EDFA)	AEISS	CSIR-CGCRI	8	55
2	Technical Know-How for Processing of Nickel-Titanium (NiTi) Shape Memory Alloy (SMA) Products for Engineering and Biomedical Applications	AEISS	CSIR-NAL	8	89
3	NAL MRA 1426/1427 GMR Magnetic Sensor	AEISS	CSIR-NAL	8	95
4	Cracknil – Herbal Anti-Crack Cream	ANB	CSIR-CIMAP	8	167
5	Acne Preventive Face Wash- Anti Acne Herbal Formulation	ANB	CSIR-CIMAP	8	171
6	Swabee- Natural Surface Disinfectant	ANB	CSIR-CIMAP	8	175
7	Cleangerm- Natural Aromatic Floor Cleaner	ANB	CSIR-CIMAP	8	177
8	Mospray- Herbal Mosquito Repellent Spray	ANB	CSIR-CIMAP	8	179
9	MOSREP- Mosquito Repellent Agarbatti	ANB	CSIR-CIMAP	8	183
10	Pain Chhoo – Herbal Pain Balm	ANB	CSIR-CIMAP	8	185
11	Painjaa- Anti-Inflammatory Pain Relieving Gel	ANB	CSIR-CIMAP	8	189
12	NAARI- Skin Hygienic Medicated Sanitary Pad	ANB	CSIR-CIMAP	8	191
13	HerbiChew- Tobacco and Nicotine Free Herbal Mixer	ANB	CSIR-CIMAP	8	193
14	Advanced Electrostatic Sprayer	ANB	CSIR-CSIO	8	213
15	Ready to Eat Foods for Ethnic Cuisines Himachali Cuisines (Kangri Dham: Contains Four Separate Preparations i.e. Rajmah, Black Gram, Urad Dal, Sweet and Sour Flavoured Dry Fruits), Punjabi Foods, South Indian Foods	ANB	CSIR-IHBT	8	217
16	Protein and Fiber Enriched Cereal Bars (Variants: Granola Bars, Protein Bars, Low Calorie Bars)	ANB	CSIR-IHBT	8	223
17	Iron and Zinc Enriched Spirulina Based Food Products (Nut and Chocolate Bars, Instant Soup Mixes, Beverage Mixes)	ANB	CSIR-IHBT	8	225
18	Protein Mix for Beverages	ANB	CSIR-IHBT	8	233
19	Endophytic Bacterial Formulation – Plant Tonic	ANB	CSIR-NIIST	8	281
20	Ready to Cook Dehydrated Vegetables/Vegetable Mixes	ANB	CSIR-NIIST	8	283
21	Waterless Chrome Tanning Technology (WCTT)	CLP	CSIR-CLRI	8	307
22	Process Development, Scale-up Studies and Basic Design for a Commercial Plant of CLP000 TPA Capacity for Para Tert Butyl Methyl Benzoate (PTBMB)	CLP	CSIR-IICT	8	317
23	Sweetening Catalyst – Thoxcat ESTM	CLP	CSIR-IIP	8	323
24	Fire Retardant Water Based Clear/ Transparent Coating for Wood and Wood Based Interiors	CIE	CSIR-CBRI	8	341

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25	Development of Thermal Insulated Vermiculite Tiles	CIE	CSIR-CBRI	8	351
26	Building Products from Kotastone Waste	CIE	CSIR-CBRI	8	357
27	Design of Noise Barrier Based on Different Frequencies (a) Low Frequency Noise Barrier Configuration (b) Middle Frequency Noise Barrier Configuration and (c) High Frequency Noise Barrier Configuration	CIE	CSIR-CRRI	8	361
28	Kisan Sabha Mobile App	CIE	CSIR-CRRI	8	365
29	Car Driving Simulator with Driver Diagnostic and Training Method and Extended Products	CIE	CSIR-CRRI	8	367
30	Rejuvenator for Recycling of Asphalt Pavement Material for Hot in Plant and Hot in Situ Recycling of Bituminous Pavement (with the trade name of REJUPAVE)	CIE	CSIR-CRRI	8	369
31	Customized Bitumen Emulsion for Mix Seal Surfacing Based on Aggregates of U.P. State	CIE	CSIR-CRRI	8	371
32	Eco-friendly Geopolymer Concrete Blocks	CIE	CSIR-SERC	8	381
33	Biodegradable Cutleries, Cups, Glass and Plates from Agri Wastes (Wheat Barn, Sugar Cane Bagasse, Rice Husk, Fruit Peels and Pineapple Leaves)	E3OW	CSIR-NIIST	8	451
34	Modular Onsite Wastewater Treatment Cum Resource Recovery Unit	E3OW	CSIR-NIIST	8	453
35	Compact Food Waste Biogas Plant	E3OW	CSIR-NIIST	8	457
36	Controlled Thruster Driven Autonomous Underwater Vehicles (AUV) for Oceanographic Exploration and Profiling	E3OW	CSIR-NIO	8	465
37	Postural Stability Assessment System	HTC	CSIR-CSIO	8	519
38	Fncas9 Editor Linked Uniform Detection Assay (FELUDA).	HTC	CSIR-IGIB	8	529
39	Fermentation Process for Docosahexaenoic Acid (DHA) Production	HTC	CSIR-IIIM	8	549
40	Diagnostic Lead Free X-ray Shielding Tiles for X-ray, CT- Scanner Room and Cath Lab	4M	CSIR-AMPRI	8	557
41	High Density Radiation Shielding Window Glass for Nuclear Hot Cell Application	4M	CSIR-CGCRI	8	565
42	Optical Fiber Bragg Grating (FBG) Based Sensors for Smart Infrastructure and Industrial Process Monitoring	4M	CSIR-CGCRI	8	585
43	Yielding Steel Prop	4M	CSIR-CIMFR	8	603
44	Maximise the Iron Recovery from Low and Lean and Low Grade Iron Ore Resources	4M	CSIR-IMMT	8	613
45	Yellow Tungsten Oxide and Tungsten Metal Powder from Heavy Alloy Scraps	4M	CSIR-NML	8	635
46	Nanosized Hydroxyapatite Powder	4M	CSIR-NML	8	637
47	Energy Efficient Coke Brass and Bell Metal Melting Furnace	4M	CSIR-NML	8	643
48	Mag Star: A Portable Magnetic Hysteresis and Barkhausen Emissions based Electromagnetic Device for Non-Destructive Evaluation of Steel Structure/Component	4M	CSIR-NML	8	647
49	Flaw Guard.: A Cost Effective Device for Defect Detection in Wire during Cold Drawing	4M	CSIR-NML	8	653
50	Highly Metallised Directly Reduced Iron (DRI) from Mill Scale and Lean Grade non Coking Coal in Tunnel Kiln	4M	CSIR-NML	8	673
51	Certified Reference Materials	4M	CSIR-NML	8	677

ANNEXURE VI

List of Technologies at TRL 9

Sr. No	Technology Name	Theme Name	CSIR-Lab	TRL Number	Page No.
1	Location of Bullet on Target System Detection and Hit Visualization Using Acoustic 'N' - Wave Identification (DHVANI)	AEISS	CSIR-NAL	9	73
2	Location of Bullet on Target System Acoustic Based Hit Identification and Analysis System (ABHIAS)	AEISS	CSIR-NAL	9	75
3	Wankel Rotary Combustion Engine 55hp	AEISS	CSIR-NAL	9	77
4	Manufacturing of Cured Composite Structures for Aircraft with Autoclave Moulding Technology	AEISS	CSIR-NAL	9	79
5	Autoclave – Industry Grade, Lab Scale and Desktop	AEISS	CSIR-NAL	9	83
6	Radomes for Airborne and Weather Applications	AEISS	CSIR-NAL	9	85
7	Multi Zone Hot Bonder	AEISS	CSIR-NAL	9	87
8	NAL FOQA flight Data Analysis System	AEISS	CSIR-NAL	9	97
9	Drishti Transmissometer- A Runway Visibility Measuring System	AEISS	CSIR-NAL	9	99
10	Long Afterglow Phosphor Powders (Patent No: India 225682, JP2003292951)	AEISS	CSIR-NPL	9	105
11	Apparatus for Polarization vs Electric Field Measurement at Various Frequencies in Thin Film Samples (Patent No: 458DEL2015)	AEISS	CSIR-NPL	9	107
12	Improved Samba Mahsuri (RP BIO 226): a Bacterial Blight Disease Resistant and Low GI (Diabetic Friendly) Rice Variety	ANB	CSIR-CCMB	9	119
13	Flomop- Herbal Insect Repellent Floor Mopping Formulation	ANB	CSIR-CIMAP	9	173
14	Mos-Ex- Herbal Mosquito Repellent Body Lotion	ANB	CSIR-CIMAP	9	181
15	Relaxomap- Anti-inflammatory Pain Relieving Oil	ANB	CSIR-CIMAP	9	187
16	Poly Herbal Toothpaste-Herbal Tooth Care Formulation	ANB	CSIR-CIMAP	9	195
17	Hankool Pulse- Hand Sanitizing Formulation	ANB	CSIR-CIMAP	9	199
18	CIM Paushak	ANB	CSIR-CIMAP	9	201
19	CIM Phal-Se	ANB	CSIR-CIMAP	9	203
20	Herbal Toothache Gel	ANB	CSIR-NBRI	9	253
21	Herbal Floor Cleaner	ANB	CSIR-NBRI	9	255
22	Herbal Toothpaste (Zenthodent)	ANB	CSIR-NBRI	9	257
23	Fresh Ginger Processing Technology	ANB	CSIR-NIIST	9	269
24	Dehumidified Drier for Food / Agri Produces	ANB	CSIR-NIIST	9	271
25	Chemo Autotrophic Activated Carbon (CAACO) Technology for Wastewater Treatment	CLP	CSIR-CLRI	9	301

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26	Fenton Activated Carbon Catalytic Oxidation (FACCO) Process for the Treatment of High Strength Wastewater	CLP	CSIR-CLRI	9	303
27	Process Development, Scale-up Studies and Basic Design for a Continuous Commercial Plant of 4000 MTA Capacity for Para Tert Butyl Toluene (PTBT)	CLP	CSIR-IICT	9	313
28	Process Development, Scale-up Studies and Basic Design for a Commercial Plant of 3000 TPA Capacity for Para Tert Butyl Benzoic Acid (PTBBA)	CLP	CSIR-IICT	9	315
29	Simultaneous Production of US Grade Gasoline and High Purity Benzene from FCC C6 Heart Cut Naphtha	CLP	CSIR-IIP	9	319
30	Visbreaking of Petroleum Residual Fractions (Soaker with Internals)	CLP	CSIR-IIP	9	321
31	Wax De-oiling Technology for Production of Paraffin and Microcrystalline Waxes	CLP	CSIR-IIP	9	327
32	"AarogyaPath" National Healthcare Supply Chain Management Platform	CIE	CSIR-CRRI	9	373
33	Mobile Bridge Inspection Unit (MBIU)	CIE	CSIR-CRRI	9	375
34	Process for Laying Roads Using Cold Mix Technology	CIE	CSIR-CRRI	9	377
35	Modular Brick from Brahmaputra River Bed Sand	CIE	CSIR-NEIST	9	379
36	Universal Primer Technology for Identification of Animal Species	E3OW	CSIR-CCMB	9	397
37	Anaerobic Gas Lift Reactor (AGR): A High Rate Biomethanation Technology to Treat Organic Solid Waste for the Generation of Biogas and Bio Manure	E3OW	CSIR-IICT	9	405
38	Atmospheric Water Generator (AWG) with Remineralization	E3OW	CSIR-IICT	9	415
39	Novel Inexpensive Membrane System as Import Substitute for Production of Demineralized Sterile Water	E3OW	CSIR-IICT	9	419
40	Oneer- An Electronic Device for the Disinfection of Drinking Water	E3OW	CSIR-IITR	9	425
41	Phytoid-Wastewater Treatment Technology	E3OW	CSIR-NEERI	9	429
42	Restoration of Nallah with Ecological Units	E3OW	CSIR-NEERI	9	431
43	Wind Augmentation Purifying Unit (wayu-ii)	E3OW	CSIR-NEERI	9	433
44	Passive Ambient Air-Pollutant Removal System	E3OW	CSIR-NEERI	9	435
45	Neerdhur	E3OW	CSIR-NEERI	9	437
46	Greendispo	E3OW	CSIR-NEERI	9	441
47	Biofilter: Technology for Industrial Odour Control	E3OW	CSIR-NIIST	9	459
48	BFBR: A High-Rate Anaerobic Reactor for Complex Wastewater Treatment	E3OW	CSIR-NIIST	9	461
49	Autonomous Vertical Profiler (AVP) for Profiling Coastal Waters	E3OW	CSIR-NIO	9	463
50	Acoustical Lightweight Interior Dry Wall Panel for High Sound Insulation (Know-How)	E3OW	CSIR-NPL	9	469
51	Noise Absorptive Barrier (For Metro/Railway/Highway/Airport Noise Abatement) (Know-How)	E3OW	CSIR-NPL	9	471
52	PM2.5 sampler (Patent/Know-How Update)	E3OW	CSIR-NPL	9	477
53	Hollow Fiber Ultrafiltration Membrane Manufacturing Technology	E3OW	CSIR-CSMCRI	9	481

ANNEXURE VI

54	Technology for the Manufacturing of Thin Film Composite Reverse Osmosis Membrane for Desalination and Water Purification	E3OW	CSIR-CSMCRI	9	483
55	Industrial Energy Management System Based on LonWorks Technology	EED	CSIR-CSIO	9	491
56	Industrial Energy Management System Based on MODBUS Technology	EED	CSIR-CSIO	9	493
57	Induction Motor Efficiency Monitoring System (IMEMS)	EED	CSIR-CSIO	9	495
58	An Improved Domestic Cooking Burner for PNG	EED	CSIR-IIP	9	503
59	Technology for Production of Soft Coke	EED	CSIR-CIMFR	9	509
60	Technology for Non Recovery Type Coke Oven, Drag Type Coke Oven with Stamp Charging and Coke Quenching	EED	CSIR-CIMFR	9	511
61	Electrostatic Disinfection Machine	HTC	CSIR-CSIO	9	523
62	RT PCR Kit for COVID19 Testing	HTC	CSIR-IGIB	9	531
63	Gluconate Salts: Production of Metal -GLUCONATES	HTC	CSIR-IIIM	9	547
64	Specialty Borosilicate Glass Bead : An Innovative Material For Nuclear Safety	4M	CSIR-CGCRI	9	563
65	Ash filling in Opencast Mines	4M	CSIR-CIMFR	9	595
66	Paste Backfilling in Underground Metal Mines	4M	CSIR-CIMFR	9	597
67	Truck Mounted Mobile Coal Sampler for Instant Coal Ash & Moisture Analyser at Site from Railway Wagon / Truck	4M	CSIR-CIMFR	9	601
68	Alum from Aluminium Dross Residue	4M	CSIR-IMMT	9	621
69	VIRTUAL CASTING – Affordable State-of-the-Art Software for Casting Process Design. Commercial name: FLOW+ module in AutoCAST X1	4M	CSIR-NIIST	9	627
70	Column Flotation Technology for Processing of Fine Minerals and Ores	4M	CSIR-NML	9	633
71	Anti-Tarnishing Lacquer for Silver and Copper-based Alloys	4M	CSIR-NML	9	649

ANNEXURE VII

List of Technologies requiring further validation

Sr. No.	Technology ID	CSIR-Lab	Technology Name
1.	TECH-THEME_3_CLRI-011	CSIR-CLRI	A Process for Zero Water Discharge for Post Tanning Operations
2.	TECH-THEME_3_CLRI-012	CSIR-CLRI	Zero Wastewater Discharge Process For Pre-Tanning Operations in Leather Manufacture
3.	TECH-THEME_3_CLRI-014	CSIR-CLRI	Fluidized Immobilized Catalytic Carbon
4.	TECH-THEME_3_CLRI-016	CSIR-CLRI	Enzyme Immobilised Carbon Oxidation (ENICO) Process
5.	TECH-THEME_3_CLRI-019	CSIR-CLRI	Dry Tanning
6.	TECH-THEME_3_CSMCRI-022	CSIR-CSMCRI	Preparation of Molecular Biology Grade Agarose Directly from Cultivated Gracilaria Dura Seaweed
7.	TECH-THEME_3_IHBT-025	CSIR-IHBT	Process for Cyclohexane-1,3 – Dione Synthesis
8.	TECH-THEME_3_NCL-037	CSIR-NCL	Development of Penicillin V Acylase System for Industrial Production of Semi-Synthetic Antibiotics
9.	TECH-THEME_3_NCL-041	CSIR-NCL	Catalytic Process for Manufacturing Dimethyl Ether (DME) from Methanol
10.	TECH-THEME_3_NPL-046	CSIR-NPL	Metal Alloy Based Nono-Powders for EM Absorbing Paints (Know-How) and Associated Epoxy Based Paint Base
11.	TECH-THEME_3_NPL-047	CSIR-NPL	Smart Coatings of Conducting Polymers for Corrosion Protection (Patent No. 3813 DEL 2013; December 30, 2013; Country India & US; US Patent No. US 9683109 dt. June 20, 2017)
12.	TECH-THEME_3_CIMFR-48	CSIR-CIMFR	20 kg/h Pilot Scale Air Blown Fluidized Bed Gasification (PFBG) Test Facility

ANNEXURE VIII

List of Technologies Repeated

Sr. No.	Technology Name	Theme	CSIR Lab	TRL in Compendium		Change in TRL
				2021	2019	
1	Low Moisture Castable (45-75% Al ₂ O ₃)	4M	CSIR-CGCRI	6	9	-3
2	Mag-Chrome Refractory Aggregates from Friable Chrome Ore	4M	CSIR-CGCRI	6	9	-3
3	Pottery and Low Cost Earthen Wares	4M	CSIR-CGCRI	6	9	-3
4	Water Purification through Ceramic Filters	E3OW	CSIR-CGCRI	7	9	-2
5	Orbital Eye Ball Implant	4M	CSIR-CGCRI	6	8	-2
6	Ceramic Biomedical Implants (Hip Joint Prosthesis)	4M	CSIR-CGCRI	6	8	-2
7	Dip Cleaner cum Brightener for Gold and Diamond	4M	CSIR-NML	7	9	-2
8	Earthquake Warning System (EqWS)	AEISS	CSIR-CSIO	7	8	-1
9	Process Technology for Continuous Preparation of Carbon Fiber	AEISS	CSIR-NAL	7	8	-1
10	Eco-Friendly Process for the Preparation of Corrosion Resistant Sealed Anodized Coatings on Aircraft Aluminium Alloy	AEISS	CSIR-NAL	6	7	-1
11	NAL MRA 1426/1427 GMR Magnetic Sensor	AEISS	CSIR-NAL	8	9	-1
12	Nutra Chikki with Added Spirulina	ANB	CSIR-CFTRI	6	7	-1
13	TEA CATECHINS	ANB	CSIR-IHBT	7	8	-1
14	AO Kit (Argemone Oil Detection Kit)	ANB	CSIR-IITR	7	8	-1
15	MO Check (Mustard Oil Check)	ANB	CSIR-IITR	7	8	-1
16	Sweetening Catalyst – Thoxcat ESTM	CLP	CSIR-IIP	8	9	-1
17	Innovative Disaster Resistant Lightweight Prefabricated Building Systems using EPS Panels	CIE	CSIR-SERC	7	8	-1
18	Glucocorticoid Receptor (GR)-Targeted Liposomal Platform for Aggressive and Drug-Resistant Cancer	HTC	CSIR-IICT	6	7	-1
19	High Density Radiation Shielding Window Glass for Nuclear Hot Cell Application	4M	CSIR-CGCRI	8	9	-1
20	Mullite Refractory Aggregates from Bauxite	4M	CSIR-CGCRI	6	7	-1
21	Mag-Al Spinel Refractory Aggregates	4M	CSIR-CGCRI	6	7	-1
22	70-90% Alumina Cement Free Dense Self Flowing Castable	4M	CSIR-CGCRI	6	7	-1
23	Bioactive Glass Coating for Dental Application	4M	CSIR-CGCRI	6	7	-1
24	Synthetic Bone Graft Material	4M	CSIR-CGCRI	6	7	-1

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25	Designed Screw Scrubber Equipment for Mineral Processing	4M	CSIR-IMMT	6	7	-1
26	EYE-ON-PELLET-: Online Pellet Size Analyzer for Pelletization Industries	4M	CSIR-IMMT	6	7	-1
27	Paving Blocks from Fly Ash, Blast Furnace Slag, Steel Slag, and other Industrial Wastes	4M	CSIR-NML	7	8	-1
28	Energy Efficient Coke Brass and Bell Metal Melting Furnace	4M	CSIR-NML	8	9	-1
29	Microwave – IR Sort: Rapid, Reliable, Non – invasive Technology for Iron Ore Compositional Analysis	4M	CSIR-NML	6	7	-1
30	Highly Metallised Low Sulphur Directly Reduced Iron(DRI) from Iron Ore Slime and Rejected/Middling Coal	4M	CSIR-NML	6	7	-1
31	Er-Doped Fiber Amplifier (EDFA)	AEISS	CSIR-CGCRI	8	8	0
32	Intelligent Seismic Sensing Node for Elephant Movement Detection	AEISS	CSIR-CSIO	6	6	0
33	Divya Nayan: A Personal Reading Machine for Visually Impaired	AEISS	CSIR-CSIO	7	7	0
34	AutoCEPH: A Software for 2-D Computerized Cephalometric Analysis as a Web Service	AEISS	CSIR-CSIO	7	7	0
35	Wankel Rotary Combustion Engine 55hp	AEISS	CSIR-NAL	9	9	0
36	Manufacturing of Cocured Composite Structures for Aircraft with Autoclave Moulding Technology	AEISS	CSIR-NAL	9	9	0
37	NAL FOQA Flight Data Analysis System	AEISS	CSIR-NAL	9	9	0
38	Drishti Transmissometer- A Runway Visibility Measuring System	AEISS	CSIR-NAL	9	9	0
39	A Process for the Preparation of b-carotene and Mineral Fortified Buns	ANB	CSIR-CFTRI	6	6	0
40	Organism and Process for Production of Beta Glucosidase (BGL)	ANB	CSIR-NIIST	6	6	0
41	Hybrid Rebar Coupler	CIE	CSIR-CBRI	6	6	0
42	Process Know-How for Manufacturing of Silica Nano Particles (SNPs)	CIE	CSIR-CBRI	6	6	0
43	Horizontal Boring Machine for Making Underground Bores	CIE	CSIR-CBRI	6	6	0
44	Cost Effective Durable Water Tanks Using Flowable Cement Mortar	CIE	CSIR-SERC	7	7	0
45	Toilet Unit Using Thin Precast Concrete Segmental Panels	CIE	CSIR-SERC	7	7	0
46	Textile Reinforced Concrete Prototyping Technology (TRCPT)	CIE	CSIR-SERC	7	7	0
47	Anaerobic Gas Lift Reactor (AGR): A High Rate Biomethanation Technology to Treat Organic Solid Waste for the Generation of Biogas and Bio Manure	E3OW	CSIR-IICT	9	9	0
48	A Sea Bed Resident Event Driven Profiling System for Use in Coastal Waters	E3OW	CSIR-NIO	7	7	0
49	Finger Gesture Based Control Module for Intelligent Patient Vehicle	EED	CSIR-CSIO	6	6	0

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50	Technology for Non Recovery Type Coke Oven, Drag Type Coke Oven with Stamp Charging and Coke Quenching	EED	CSIR-CIMFR	9	9	0
51	Development of Patient Specific Orthopaedic & Maxillofacial Implants	HTC	CSIR-CSIO	6	6	0
52	Specialty Borosilicate Glass Bead : An Innovative Material For Nuclear Safety	4M	CSIR-CGCRI	9	9	0
53	Optical Fiber Bragg Grating (FBG) based Sensors for Smart Infrastructure and Industrial Process Monitoring	4M	CSIR-CGCRI	8	8	0
54	Moisture Sensor (5-95%RH) Moisture Meter (5-100 ppm Moisture)	4M	CSIR-CGCRI	6	6	0
55	Economical Production of Highly Porous Metal Organic Frameworks (MOF) from Zinc Scrap	4M	CSIR-CSIO	6	6	0
56	Maximisation of Iron Recovery from Lean/Low Grade Iron Ore Resources by Reduction Roasting Technique	4M	CSIR-IMMT	7	7	0
57	Functionally Graded Aluminum Alloy and Composite Products and Process Technology	4M	CSIR-NIIST	6	6	0
58	Column Flotation Technology for Processing of Fine Minerals and Ores	4M	CSIR-NML	9	9	0
59	Yellow Tungsten Oxide and Tungsten Metal Powder from Heavy Alloy Scraps	4M	CSIR-NML	8	8	0
60	Nanosized Hydroxyapatite Powder	4M	CSIR-NML	8	8	0
61	Geo-Polymer Cement	4M	CSIR-NML	7	7	0
62	Production of Ferrite and Pigment Grade High Purity Monodispersed Iron Oxide from Waste Chloride Pickle Liquor and other Iron Rich Sources	4M	CSIR-NML	7	7	0
63	MagStar: A Portable Magnetic Hysteresis and Barkhausen Emissions based Electromagnetic Device for Non-Destructive Evaluation of Steel Structure/Component	4M	CSIR-NML	8	8	0
64	Anti-Tarnishing Lacquer for Silver and Copper-based Alloys	4M	CSIR-NML	9	9	0
65	PABI: Portable Automated Ball Indentation System	4M	CSIR-NML	7	7	0
66	Recovery of Lead from Zinc Plant Residue	4M	CSIR-NML	6	6	0
67	Development of Synthetic Flux and a Process for De-phosphorization of Steel in Induction Furnace	4M	CSIR-NML	6	6	0
68	MagSys: A Portable Giant Magneto-Impedance (GMI) based Magnetic Sensing Device for NDE Applications	4M	CSIR-NML	7	7	0
69	Ultrasonic Flow Gauge: A Device for Fluid Flow Rate Measurement through a Narrow Tube	4M	CSIR-NML	7	7	0
70	Recovery of Cobalt from Discarded Li-ion Batteries of Mobile Phone	4M	CSIR-NML	6	6	0
71	Multi Zone Hot Bonder	AEISS	CSIR-NAL	9	8	1
72	Improved Samba Mahsuri (RP BIO 226): a Bacterial Blight Disease Resistant and Low GI (Diabetic Friendly) Rice Variety	ANB	CSIR-CCMB	9	8	1
73	Process for Preparation of White Pepper	ANB	CSIR-NIIST	7	6	1
74	Simultaneous Production of US Grade Gasoline and High Purity Benzene from FCC C6 Heart Cut Naphtha	CLP	CSIR-IIP	9	8	1

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75	Fire Retardant Water Based Clear/ Transparent Coating for Wood and Wood Based Interiors	CIE	CSIR-CBRI	8	7	1
76	Building Products from Kotastone Waste	CIE	CSIR-CBRI	8	7	1
77	NEERDHUR	E3OW	CSIR-NEERI	9	8	1
78	Specialty Optical Fibers	EED	CSIR-CGCRI	7	6	1
79	Industrial Energy Management System based on LonWorks Technology	EED	CSIR-CSIO	9	8	1
80	Industrial Energy Management System based on MODBUS Technology	EED	CSIR-CSIO	9	8	1
81	Induction Motor Efficiency Monitoring System (IMEMS)	EED	CSIR-CSIO	9	8	1
82	Pump Efficiency Monitoring System (PEMS)	EED	CSIR-CSIO	7	6	1
83	Exoskeleton Device (ExoD) for Rehabilitation of Mobility Impaired Patients	HTC	CSIR-CSIO	7	6	1
84	VIRTUAL CASTING – Affordable State-of-the-Art Software for Casting Process Design. Commercial name: FLOW+ module in AutoCAST X1	4M	CSIR-NIIST	9	8	1
85	Eco-friendly Flotation Reagents for Sillimanite, Limestone and Coal	4M	CSIR-NML	7	6	1
86	FlawGuard.: A Cost Effective Device for Defect Detection in Wire during Cold Drawing	4M	CSIR-NML	8	7	1
87	Painjaa- Anti-inflammatory Pain Relieving Gel	ANB	CSIR-CIMAP	8	6	2
88	Advanced Electrostatic Sprayer	ANB	CSIR-CSIO	8	6	2
89	Technology for Production of Soft Coke	EED	CSIR-CIMFR	9	7	2
90	Postural Stability Assessment System	HTC	CSIR-CSIO	8	6	2
91	Relaxomap- Anti-inflammatory Pain Relieving Oil	ANB	CSIR-CIMAP	9	6	3
92	Fresh Ginger processing Technology	ANB	CSIR-NIIST	9	6	3

