

## Recent Achievements of CSIR-CMERI Durgapur

### A. E-tractor for small and marginal farming lands

#### A.1. Introduction:

Tractors have been one of the most important tools associated with modern agriculture. Considering the need to further reduce the greenhouse gas emissions and the eventual scarce availability of fossil fuels shortly, electric tractors have been proposed as a possible solution in the context of more sustainable farming. However, all commercial equipment consists of high-power machines, which are only feasible to large area Farming.

However, it has been found that the Indian electric tractor many manufacturing companies were adopted the imported technologies in their product. As the working condition in India is quite challenging compare to other developed country, hence there is a need of development based on the Indian condition. CSIR CMERI has developed an Indigenous Compact Electric tractor (**CSIR PRIMA ET11**) for small marginal farmer.



The Specifications of the developed electric tractor is as follows:

<b>Power (Peak)</b>	<b>26hp</b>
<b>Power (Rated)</b>	<b>11hp</b>
<b>Wheel Base (mm)</b>	<b>~1510 mm</b>
<b>Battery Type</b>	<b>LiFePo<sub>4</sub>(Prismatic Cell)</b>
<b>Battery capacity</b>	<b>72V, 200AH</b>
<b>Lift capacity (Kg)</b>	<b>500</b>
<b>Max speed</b>	<b>25 (Kmph)</b>

<b>PTO</b>	<b>540rpm</b>
<b>Three point link</b>	<b>Category 1N</b>
<b>Weight</b>	<b>950Kg</b>
<b>Drive (2WD/4WD)</b>	<b>2WD</b>

In national market there is few potential manufacturers available in the range of low power like 10 to 12 hp. The comparative details of with other OEM developed e-tractors are mentioned below:

	<b>Cellestial</b>	<b>Sonalika</b>	<b>Escort Farmtrac</b>	<b>CSIR CMERI</b>
<b>Dimensions</b>	1500X1000X1000 mm <sup>3</sup>	1561X1058X1058 mm <sup>3</sup>	2730 (L) x 1090 (W) X 2170 (H)	1500 (L) x 1070 (W) X 1370 (H)
<b>Max power</b>	6 kW ( AC induction)	12kW (BLDC Imported)	18.4k (BLDC Imported)	8 kW (BLDC Indian)
<b>Transmission</b>	9 Forward and 3 Reverse Gear	Forward Gear 6 and Reverse Gear 3	9 Forward and 3 Reverse Gear	6 Forward and 3 Reverse Gear
<b>Max speed</b>	16 Kmph	25Kmph	20Kmph	25Kmph
<b>Battery</b>	72 V,200Ah	72V, 250AH	72V,300AH	72V,200AH
<b>Pulling capacity</b>	1.2 Tonne, Lifting capacity 450 kg	2 Tonne, Lifting capacity 450 kg	2 Tonne, Lifting capacity 750 kg	1.5 Tonne, Lifting capacity 500 kg
<b>PTO</b>	540-900 RPM	540 RPM	540RPM	540RPM
<b>Recharge</b>	Domestic Charging - 6 Hours	Domestic Charging - 10 Hours	Domestic Charging - 10 Hours	Domestic Charging - 8 Hours
	Fast Charging - 2 Hours			
<b>Cost</b>	5 Lakhs	6 lakhs	7-8 Lakhs	4-5* Lakhs
<b>Battery backup</b>	6 hours	6 hours	5-6 hours	5-6 hours
<b>Current Status</b>	Commercialised	Prototype ready	Prototype ready	Prototype ready

\*Mass production tentative cost.

## **A.2. Silent Features of CSIR CMERI Developed System:**

- 1) Robust and Semi Synchro-type mechanical drivetrain.

- 2) Modular Mainframe for maintainability and Serviceability.
- 3) Improved and efficient hydraulic System.
- 4) Improvised and optimized drivetrain for smooth transition of gears.
- 5) Optimized weight-to-power ratio.
- 6) Women-Friendly Ergonomics.
- 7) Intelligently controlled prime movers.
- 8) Customized instrument cluster Suited for e-tractor application.
- 9) Vehicle Health Monitoring Features.
- 10) Electric Vehicle to Load feature (V2L concept).
- 11) Indigenous and Cost Effective.

### **A.3. Technology Readiness Level :6**

### **A.4. Socio/Economic/Environmental Impact (brief) with mapping in SDGs :**

The proposed solution will contribute significantly to country's economic growth by providing an alternative to conventional diesel engine operated systems. This Technology will help MSME to get venture in the e- tractor segment.

*Livelihood diversification:* off-farm earning potential through providing hire services along with farm mechanization. This will ultimately improve the quality of life. In addition, pollution and noise level in the village will reduce which help to improve in quality of life.

The major aspect of the project is utilization of renewable energy sources which include energy from solar. This project has no environmental impact as:

- Green and cleaner environment through usage of renewable energy;
- Utilization of solar for energy generation.

### **Industry Partner:**

M/s K.N.Biosciences India Pvt.Ltd., Bachupally Road, Industrial Area, Ameenpur, Miyapur, Hyderabad-502325, Telangana

### **YouTubeLink:**

<https://www.youtube.com/watch?v=m78u9v8fGIU&pp=ygUOZXRYWNOB3IgY21lcmk%3D>

## **B. Vehicle Integrated Mechanized Drain Cleaning Machine**

### **B.1. Introduction:**

The oldest and cheapest method of drainage cleaning is by employing human beings. This has been often seen in the major Indian cities to clean the underground sewage channels by the humans. A group of three to four people are engaged in this work starting from cleaning the drainage to lifting the filth up and dumping the filth by another worker. There are several incidents reported in the recent times where the unfortunate workers died due to hazardous/ poisonous gasses released inside the drainage. Even if the workers survive, they will not have sound health due to continuous exposure to such hazardous gasses. Simultaneously, their average age decreases remarkably. As a result, the Govt. of India has banned such hazardous job several years ago by introducing “*The Prohibition of Employment as Manual Scavengers and their Rehabilitation Act, 2013*”.

Also the popular mechanical scavenging systems available internationally and commercially are mostly for the developed countries and are useful for typical type of sewerage system only. Besides, the type of sewerage depends on the demographical locations/ economical status of the society (such as Indian society uses huge plastic/ polythene bags/ materials etc.). For this purpose, scavenging system has been developed separately by Indian start-ups/ companies. But, these systems can operate only in the vertical channel or close-to the vertical channel connected to the manholes. These systems cannot be used for the horizontal channels/ pipes connecting to consecutive manholes. Furthermore, the developed systems are bulky and cannot be used in the sewage/ drainage systems with smaller dimensions

### **B.2. Novelty/Innovations/Interventions with market competitiveness**

Vehicle mounted mechanized drain cleaning machine which is thoroughly indigenously developed, integral and self powered in nature, developed with a noble intention to eradicate the manual scavenging process and also to provide one point solution for all sewer related problems like, sewer chocking, overflowing manholes, damaged sewer pipelines etc. The machine is equipped with many cutting edge technologies and innovative ideas that makes this machine to stand apart among the other similar equipments available in the market that includes: innovative mechanical slurry water filtration system, re-using of filtered slurry water for jetting process, three way gearbox unit to utilize the engine power for the system’s operation, automated hose reel guiding and disinfectant facility, inbuilt feedback system and underwater camera based post drain cleaning inspection system etc. makes the machine most effective and user friendly in negotiating many drain cleaning related challenges with ease and comfort.

This vehicle can serve for urban and local bodies with population density 10000. It can clean the chockage of upto 600mm sewer line. The System is equipped with slurry dispensing unit for sludge collection, a multistage mechanical filtration, high pressure jetting system, D silting mechanism and post cleaning inspection unit. The main features of the system are to collect the sludge (Grey) water, filtration of the sludge (grey) water for utilisation in the chockage cleaning, the high pressure multi jet

cleaning system to suit the tough Indian chockage conditions and the hydraulically operated D-silting mechanism with moveable type collection bucket to remove the slit from the manhole and collect in the collection bucket, which can be easily dumped in the relevant place. All the above sub systems are mounted in the BS-VI chassis very compactly and its gets operated pneumatically to make the operations easy and safe.



### **B.3. Key Feature of the vehicle:**

1. Completely **indigenously developed, vehicle mounted self powered and integral system.**
2. Innovative vehicle mounted **mechanical filtration unit for effective filtration of grey (slurry) water** to be utilized in high pressure jetting process.
3. High pressure jetting unit that **re-uses the filtered grey (slurry) water for jetting operation and saves a large amount of fresh water** being wasted for the jetting purpose, which is generally in practice among other machines.
4. **Un-interrupted execution of drain cleaning process** without any stoppage for re-filling of fresh water for jetting operation.
5. **Entire system gets power from the vehicle's engine** that makes the system a self adequate and independent of any external power sources for functioning and can be deployed anywhere at any time.
6. **Automated hose reel guiding mechanism with disinfectant unit** to provide safe & comfortable working environment for the operator.
7. **State of the art in-cabin on-time feedback display system** empowers the system controller from the vehicle's cabin to monitor the system's functioning and take effective decisions based on the situations.
8. **Underwater camera based post drain cleaning inspection system** provides complete evaluative report about the effectiveness of sewer cleaning

process including inside health analysis of underground sewer pipelines such as: any cracks / damages etc.

The vehicle-mounted drain cum sewer cleaning machine market in India is a growing segment of the sanitation equipment industry. With the increasing demand for sanitation and wastewater management solutions, coupled with the government's focus on improving sanitation infrastructure and promoting the use of advanced equipment and technologies, this market is expected to continue to grow in the coming years.

Following are the contribution toward society through this development:

- a. Efficient and quick: These machines can clear blockages in underground drainage systems quickly and efficiently, reducing downtime and costs.
- b. Saves labor costs: These machines require minimal labor, which reduces labor costs.
- c. Easy to operate: These machines are easy to operate and require minimal training.
- d. Compact: These machines are mounted on vehicles and are easy to transport to different locations, making them ideal for urban and rural areas.

#### **B.4. TRL – 6-7**

#### **B.5. Key achievements :**

- The technology was demonstrated to Ministry of Urban and Housing Affairs (MoHUA), Commissionerate of Delhi Municipalities, Delhi Jal Board Chief Engineer & many other dignitaries on October 28, 2021 at CSIR-NPL, Pusa, New Delhi.
- Having moved ahead with the commercialization plan, the institute has licensed the technology to two companies- M/s Maniar & Co, Ahmedabad and M/s KamAvida, Pune. It is also available of GeM portal.
- Continuous online Meeting has been organized by CSIR CMERI in presence of the beneficiary (Municipalities) and the Ministry of Urban and housing affairs for the deployment of the Developed technology.
- Lok Sabha Starred Questions regarding mechanized drain cleaning machines and CSIR CMERI attend the Lok Sabha Session for answering the questions.
- CSIR DG is helping is discussing to the Ministry of social justice and empowerment regarding the CSIR-developed Mechanised Drain cleaning system to be utilized in their NAMASTE scheme as well as in the various tenders of Municipalities.

#### **Industry Partners:**

- M/s KAM AVIDA ENVIRO ENGINEERS PVT.LTD., Plot No.2, Survey No.255/1, Hinjewadi, Tal: Mulshi, Dist.Pune-411057, Maharashtra
- MANIAR & CO., 110, NR Ajit Mill, Rakhial Road, Ahmedabad-380021, Gujarat



**No.15/1/2022-SBM-I (Pt.I) (e-9128500)**  
**Ministry of Housing and Urban Affairs**  
**Government of India**  
**(SBM-I Division)**

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Nirman Bhawan, New Delhi

Dated: 6<sup>th</sup> June, 2022

To

Dr Anjali Chatterjee  
Chief Scientist & Head  
Business, Innovation & Skills  
CSIR- Central Mechanical Engineering Research Institute  
Durgapur-713209

**Subject- Deployment of Mechanised Drain Cleaning Machine**

Dear Ma'am,

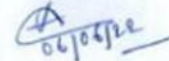
I am directed to refer to your letter dated 04 May 2022, vide which you have intimated development of a vehicle mounted drain jetting platform by CSIR- CMERI which also integrates add ons such as an inspection camera with monitor.

2. Such products have been readily identified to be very useful for maintaining and rehabilitating public sanitation infrastructure and this Ministry has been actively guiding and facilitating States and ULBs to rapidly mechanise their operation and maintenance through procurement or hire of such jetting apparatus. CSIR-CMERI needs to be complemented for their initiative.

3. I am to further state that since CSIR- CMERI has taken steps to commercialize manufacturing of the above mechanized platform through two private agencies, both of which are already registered on the Government e-Marketplace (GeM), the said machine can also be listed on GeM by these firms together with sale price and availability.

4. Once listed, the Ministry shall guide States and ULBs about the availability of the product for their procurement action.

Yours Faithfully



(AJIT KUMAR)

Under Secretary to Government of India

Tele: (011) 23062654

**YouTube Link:**

- <https://www.youtube.com/watch?v=QLeen7jiImc>
- <https://www.youtube.com/watch?v=tEj3w-3YS4s>

## C. Municipal Solid Waste Management Plant

### C.1. About the Technology with salient features

Scientific management of Municipal Solid Waste has been one of the major thrust areas in urban India under the national flagship Mission Swachh Bharat Mission-Urban. In India, an estimated 62 million tonnes of Municipal Solid Waste is generated annually by 377 million citizens residing in urban areas. India's urban population is expected to grow to 600 million by 2030 & to 814 million by 2050. Accordingly, India is set to generate 165 million tonnes of waste by 2030 and 436 million tonnes by 2050. As a result, the annual greenhouse gas emissions from Municipal Solid Waste is expected to go up to 41.09 million tonnes by 2030. This necessitates the importance of scientific solid waste management in today's context.

Waste-to-energy is an option for sustainable solid waste management and it is the need of the hour to realise its potential as one of the most significant future renewable energy sources, which is economically viable and environmentally sustainable. For the developing countries where landfilling is the most preferred option for management of solid waste, recycling of waste is seldom done and hence technological interventions for effective energy recovery from waste can be exploited to meet the increasing energy demands before all the fossil fuel reserves are depleted.

CSIR-CMERI has developed an integrated Municipal Solid Waste disposal system (i-MSWDS) for disposal of solid waste in a scientific way in-line with Solid Waste Management Rules (SWM) 2016 prescribed by Union Ministry of Environment, Forests and Climate Change (MoEF&CC), Govt. of India. The CSIR-CMERI developed Decentralised Solid Waste Management Technology (DSWMT) has a design comprising of the following modules for bulk waste generators i.e. Mechanized Segregation, Bio-Methanation, Composting, Briquetting, Pyrolysis and Plastic Agglomeration which tries and provides solution for the management of every aspect of Solid Wastes.

Segregation of Solid Wastes is a problem as segregation at source is at times not complied with. Thus, the Mechanized Segregation Unit plays a crucial role in segregating all the variants of Waste i.e. Bio-Degradable, Plastics, Metals and Inert Components. The segregation is an extremely important process to facilitate the process of reuse, recycling and recovery of waste. The segregated bio-degradable component of the waste is decomposed in an anaerobic environment popularly known as bio gasification. In this process biogas is liberated through conversion of organic matter. The biogas has a typical volumetric composition of 55 – 60% methane and 35 – 40% CO<sub>2</sub> with traces of moisture and other impurities such as hydrogen sulphide and it can be used as fuel for cooking purpose. The gas can also be utilized in gas engines for the generation of electricity. The residual slurry is a good organic manure and can be utilized as fertilizer. Alternatively, the organic waste can also be converted to compost in a natural process. The compost can also be utilized in organic farming. Biomass waste such as dry leaves, dead branches, dry grass etc. are disposed of by first shredding it to a suitable size followed by mixing with the liquid slurry coming out of the biogas digester. This mixture is feedstock for briquette. These briquettes are being utilized as fuel for cooking.



The polymer waste consisting of plastics, sanitary waste etc. is being disposed of through two main processes i.e., pyrolysis and agglomeration. In the pyrolysis process, the polymer waste is heated to a temperature of 500 – 600°C in an anaerobic environment in presence of suitable catalyst. The volatile matter from the polymer waste comes out as a result of heating which on condensation gives pyrolysis oil. The pyrolysis oil is termed as Petro Alternate Fuel (PAF). The crude pyrolysis oil after purification can be used in industrial boilers, generators etc. for heating / power generation purposes. The non-condensed syngas from the pyrolysis process can be fed to the gas engine for generation of electricity. The solid residue known as char can be used for the production of briquette. In agglomeration, the dried plastics are put in an Agglomeration machine to physically transform loose plastic material into chips. The chips are fed in the hopper of an extruder where it is melted to give strands/strings. These strings are put in grinding machine to obtain pellets of required size. The pellets are used as feedstock in hopper of injection moulding machines where it is re-processed to a range of useful items that we use every day in our everyday lives.

The Decentralised Waste Management system is aimed at efficiently managing the solid waste following the principles of circular economy – that integrates economic activity and environmental wellbeing in a sustainable way. A special emphasis is laid on ‘true recycling’ of materials i.e. converting the waste resource back to its original form, without sacrificing quality or integrity in the process.

### **C.2. Salient Features:**

- Complete disposal of solid waste in own premises and utilisation of value added products for circular economy,
- Discontinuation of transportation of waste to landfill sites thereby eliminating the chances of air, water and soil pollution,
- Mechanized segregation system to auto-segregate waste into bio-degradable waste, polymer waste, inert waste and metallic waste from mixed waste,
- Eco-friendly disposal of polymer waste through pyrolysis process,
- Re-processing of plastic waste to recycle used plastic scrap to produce plastic granules,
- Generation of biogas from organic waste and its utilization,
- Conversion of agro waste into briquette by mixing with the slurry of the biogas digester and utilization as fuel for cooking.

### **C.3. Novelty/Innovations/Interventions with market competitiveness**

- Decentralized Solid Waste Management plant: Disposal of solid waste within localized premises reducing the burden of handling large volumes of MSW at a centralized location, with corresponding reduction in costs of transportation and intermediate storage,
- Technology is in compliance with the latest Solid Waste Management Rules, 2016,
- Development of mechanized segregation and handling system for Municipal Solid Waste,
- Development of technology for production of bio-methane from segregated organic fraction of Municipal Solid Waste through technological interventions to make the biogas production process more mechanized and efficient,
- Conversion of agro waste into briquette by mixing with the slurry of the biogas digester and utilization as fuel for cooking,
- Eco-friendly disposal of plastic waste through pyrolysis process and recovery of pyrolysis oil and syngas,
- Re-processing of plastic waste and reconverting them to new and useful plastic products.

In India, emphasis is laid on waste segregation at source into three categories – wet, dry and hazardous waste – and handover the segregated waste to local bodies. Segregation at source requires multiple stakeholders to collaborate and align their initiatives. Many policies and regulatory initiatives have been notified by the government to support this. However, source segregation is yet to be implemented and achieved in majority of India. There is ample evidence from operations of recycling, composting and waste-to-energy projects that their viability critically hinges on availability of segregated waste. Hence, mechanized segregation system followed by waste-to-energy recovery in an efficient manner is expected to increase the demand for waste to energy plants.

Some of the opportunities that can be explored in the Waste to Energy Market through this technological intervention are:

- Growing demand for bio fertilizers in the global market,
- Increasing natural gas prices are increasing the demand for biogas,
- Make plastic less of an environmental burden,
- Rapid urban population growth and increasing population density resulting in increase in urban waste generation,
- A scarcity of land for waste landfills.

#### **C.4. echnology Readiness Level**

The technology has been demonstrated at full scale in relevant environment and hence estimated with a TRL 6.

#### **e) Socio/Economic/Environmental Impact (brief) with mapping in SDGs**

Improving solid waste management provides a cleaner and healthier environment; improves liveability for all city residents; and attracts new investment and tourism, which improves a city's economic competitiveness, creating jobs, and new business opportunities. SWM also contributes to new sources of energy thus tackling climate change challenges.

The waste sector accounts for 3.7% of India's total national-level GHG emissions. The GHG emissions per tonne of solid waste disposed have increased by 2.7 times, rising from 85 kg CO<sub>2</sub> per tonne of solid waste disposed during 1954-60 to 227 kg of CO<sub>2</sub> per tonne of solid waste disposed during 2005-2015. Hence scientific solid waste management can play an important role in mitigation of GHG emissions. Comprehensive waste management lies at the intersection of SDG 6 (Clean Water and Sanitation), SDG 11 (Sustainable Cities and Communities), SDG 12 (Responsible Consumption and Production), SDG 13 (Climate Action) and SDG 14 (Life Below Water).

#### **f) Opportunity to the MSME/Industries/ Entrepreneur under Make-In-India/Import Substitution etc. drive**

A majority of the components making a sub-system of the integrated Municipal Solid Waste Disposal System (i-MSWDS) are standard mechanical and electrical equipment items which can be manufactured in India. Hence, there is ample opportunity for MSME sector under Make-In-India initiative to explore new business avenues in the Waste Management industry and make the dream of Swachh Bharat a reality. The technology can also promote entrepreneurship amongst youth population and create employment opportunities in the waste management sector.

### **g) Policy Support/Govt. Initiatives**

The Govt. of India has identified Waste to Energy as a renewable (Clean Energy) technology and is supporting it with different subsidies and incentives. The Ministry of New and Renewable Energy (MNRE) is actively promoting all viable technologies for energy recovery from Municipal and Industrial wastes. The Waste to Energy initiatives will help minimize carbon emission and mitigate climate change actions and therefore financial incentives may be proposed by MNRE to encourage participation in waste-to-energy projects.



Integrated Solid Waste Management Plant at CSIR-CMERI Durgapur

#### **Industry Partners:**

##### **Complete:**

- M/s Ecosafe Zero Waste Solutions (P) Ltd., Panch Shiv Mandir, Housing Board Colony, Patna-800020, Bihar
- M/s Joint Enterprise Engg.Co., Durgapur Industrial Estate, JP Avenue, Durgapur-713212, West Bengal

##### **Partial:**

- M/s Akash Enterprise, Bhurkunda, PO.Samudrapur, PS.AshokNagar, North 24 Parganas-743272, WB
- M/s Siya Instruments, 19, Hastinapur Road, Mewar Industrial Area, Madri, Udaipur-313013, Rajasthan
- M/s SainathEnvirotech, 305-C ,Sevanthakulam Road, Tuticorin – 628 003, Tamilnadu

#### **YouTube Link:**

- [https://www.youtube.com/watch?v=UAscjVNNFOQ&ab\\_channel=CSIR-CMERI%2CDurgapurandLudhiana](https://www.youtube.com/watch?v=UAscjVNNFOQ&ab_channel=CSIR-CMERI%2CDurgapurandLudhiana)

- [https://www.youtube.com/watch?v=HUjf9eDPNmc&ab\\_channel=CSIR-CMERI%2CDurgapurandLudhiana](https://www.youtube.com/watch?v=HUjf9eDPNmc&ab_channel=CSIR-CMERI%2CDurgapurandLudhiana)

### **D. Riot/ Mob Control Vehicle (MCV)**

In a view to elevate modern technical support to paramilitary forces engaged in maintaining law and order situation and equip them with advanced options, need of advanced Mob Control Vehicle (MCV) were felt necessary. As per the direction of the Prime Minister's Office (PMO) to CSIR and preliminary specification formulated by the MHA (Ministry of Home Affairs) Committee, CSIR-CMERI developed 3- categories of MCVs; Heavy, Medium and Tractor based MCV in association with CRPF-RAF. CRPF-RAF officials had participated in mock trials at CSIR-CMERI Durgapur/Ludhiana and training sessions at 103Bn and 108Bn CRPF-RAF campus.

All 3-Categories of MCVs were demonstrated to the MHA Committee members twice at CRPF-campus Gurugram and 103 Bn CRPF-RAF campus. In March, 2022, DG-CRPF approved the QR/TD of all 3- categories of MCVs, shown below, based on recommendation of MHA committee.



#### **Medium Category MCV**

- 2.5 Ton Pay Load capacity
- Troop carrying Capacity : 8+2
- 7 Core technology Modules

#### **Heavy Category MCV**

- 7.5 Ton Pay Load capacity
- Troop carrying Capacity : 8+2
- 9 Core technology modules

#### **Tractor Based MCV**

- Built on a 90 Hp industrial tractor
- SS 304 wire mesh shield
- PTZ camera and LED flood light

CRPF-RAF, Delhi Police and Chandigarh Police , have shown interest in procurement of different categories of MCV from the Licensee of MCV technology. Accordingly CSIR-CMERI has executed the activities of Transfer Of Technology (TOT) to Indian Industries, against a total technology fee of INR 82.6 lakh, which will fulfil the users requirement through pilot batch production and subsequent commercialization.

CSIR-CMERI has transferred the technology of all the seven modules of Medium MCV, on non-exclusive basis, to M/s. Himatsingka Agencies Pvt. Ltd., Bhagalpur Road, Dumka, Jharkhand, who can now manufacture and sell the Medium Category MCV "as a complete package", as per specification of MHA Committee. The said licensee has also executed the TOT of Water Cannon Modules of Heavy MCV with CSIR-CMERI on non-exclusive basis. Hence they can manufacture and sell MCV with any no of modules (out of above eight modules) as per the customized requirement of users, in line with the specification of MHA Committee.

Also CSIR-CMERI Durgapur has executed TOT of two modules (Front Shovel and Retractable Multi Barrel Tear gas Shell Launcher) of MCV with another Industry, M/s Vijay Fire Vehicles and Pumps Ltd., Plot No 232, GIDC Ind. Estate, Umbergaon-396171, Dist Valsad, Gujarat and they can now manufacture and sell these two modules of MCV.

Following are the brief of the modules:

**1. Retractable Multi Barrel Tear Gas Launcher (MBSL) with PAN-TILT - 2 nos.**



2 nos of MBSLs are mounted at the front and rear side on the roof of the vehicle to fire Tear Gas shell simultaneously from several barrels. It can deliver large quantities of less lethal ammunition in a very short time covering larger areas. MBSLs can be retracted to load the Tear gas shell from inside the vehicle.

**Key Specifications**

- PAN Range :  $\pm 170^\circ$  ; TILT Range : -  $30^\circ$  to  $90^\circ$
- Retractable unit for loading/reloading of tear gas cartridge ; Position : Roof mount

**2. PTZ Camera with telescopic mast**

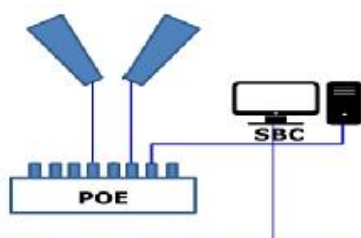


A high end PTZ camera with night vision features is installed on the roof to perceive the surroundings of the MCV. The PTZ camera is usually protected inside a wire-mesh structure. Whenever there is a need, a telescopic Mast elevates the PTZ Camera for clear long range view.

**Key Specifications**

- PTZ Camera
  - Range of Pan- $360^\circ$
  - Range of Tilt - $180^\circ$
  - Range of View-350 m
- Telescopic Mast
  - Max. Height – 750 mm
  - Hydraulic control
- Display –
  - Nos of display: 1
  - Resolution : 1920x1080

**3. Wide angle Surveillance through video stitching**



Twin camera systems are installed in front and rear side of the vehicle on the roof top to provide the first hand information of the surroundings to the security personnel



stationed inside the vehicle. Number of display units are installed in the cabin for in-situ surveillance. A video stitching algorithm is developed for combining multiple overlapped videos to produce an online seamless high resolution video.

#### **Key Specifications**

- FOV: Horizontal:  $\geq 140^\circ$
- Vertical :  $\geq 55^\circ$
- Range :  $\geq 100\text{m}$
- Night vision capability
- Displays at Drivers Cabin and main cabin

#### **4. Front Shovel**



It is mounted in front of the vehicle chassis and held above the ground clearance height by hydraulic cylinder during transport. The shovel is lowered down to the road level and vehicle is moved forward to remove any blocked, created by mob on road during riot situation.

#### **Key Specifications**

- Manually operated with Hydraulic Pump
- Width-2.5 m , Height-1.1 m
- Construction Material: Structural Steel
- Weight: 300 Kg
- Front thrust load capacity: 1.5 Tonne
- Minimum ground clearance : 90 mm
- Maximum Ground clearance : 400 mm

#### **5. Vehicle Mounted Tear Smoke System**

Two numbers of tear gas generator units are mounted under the chassis but accessible from inside the vehicle. Tear gas is generated by the combustion of petrol in the combustion chamber injecting Diesel and OC (Oleoresin Capsicum) for generation of the tear gas. The gas is distributed all-round vehicle except front side through distribution header and





nozzles . It helps to keep mob away from the vehicle.

#### Key Specifications

- Tear gas generator unit : 2 nos.
- Starting method: Push button/ switch
- Fuel consumption: 1.9 ltr / hr
- Chemical consumption: 25-40 ltr / hr

### 6. All Round Irritant Spray System



The irritant water mixture is stored in the tank cum seat mounted on-board of the vehicle. A triplex piston pump is utilized to supply the pressurized irritant water mixture all round spray nozzles through the suitable piping network. The spray system provides water mist spray near the vehicle as well as water jet spray about 10 m distance from the vehicle.

#### Key Specifications

- Combination of jet and mist forming nozzles
- Operation :Electrical switches and manual override
- Jet distance : 10 m

### 7. Positive Cabin Pressurization System



To avoid the infiltration of irritant and other pollutant gases/particles inside the cabin of vehicle, a positive cabin pressurized system is installed and the cabin is pressurized by injecting the excess air passing through suitable air filters. The system consists of blowers, duct, differential pressure based controller, variable frequency drive controller for flow rate and discharge ports to uniformly distribute the air within the cabin.

#### Key Specifications

- Air Flow rate : 1000 m<sup>3</sup>/hr
- Pressure : 10 Inches of Water Column at 20° C
- Filters : Pre-filter, HEPA Filter, Activated Carbon Filter

## 8. Water Cannon System with PAN-TILT on Heavy Category MCV



It is a light-weight joystick-operated water cannon system, placed on the roof of the cabin of the driver. It provides high flow of water in the form of a jet to disperse the mob. A centrifugal pump is mounted in the vehicle to supply highly pressurized water from a separate water bowser.

### Key Specifications

- Water Flow : 250-1000 GPM
- Operating Pressure: 50-150 psi (3.45-10.35 bar)
- Rotation: Horizontal: +/- 160°; Vertical: +80° /-70°
- Range: 10m to 50 m
- Water Bowser: Stand Alone separate
- Capacity: 5000- 15000 Lit
- Connection: Through 4 Inch female quick-coupling

### In addition to the above, MCV is equipped with

- All around wire mesh protection
- GPS Tracker
- GPS Navigator with Parking Camera
- Public Address System
- Uninterrupted Power Supply
- 5.5KVA Low Noise Generator
- LED bar (RED & BLUE)
- LED Spot Light
- Fire Extinguisher

It is important to note that all the above technology modules are independent to each other and the vehicles can be customized with selected modules based on the requirements of user department.

### Industry Partners (Medium Category)

- M/s Himatsingka Agencies Pvt.Ltd., Bhagalpur Road, Dumka-814101, Jharkhand
- M/s Vijay Fire Vehicles and Pumps Ltd., Plot No.232, GIDC Ind.Estate, Umbergaon-396171, Dist.Valsad, Gujarat

### YouTube Link:

[https://www.youtube.com/watch?v=FQpBX10C\\_2c&pp=ygUKIE1DViBjbWVyaQ%3D%3D](https://www.youtube.com/watch?v=FQpBX10C_2c&pp=ygUKIE1DViBjbWVyaQ%3D%3D)

