



TECHNOLOGY COMPENDIUM TO FIGHT COVID-19 PANDEMIC



CSIR-Central Mechanical Engineering Research Institute
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CSIR-Central Mechanical Engineering Research Institute

Mahatma Gandhi Avenue, Durgapur - 713209

Foreword

Since the advent of the Lethal Coronavirus Pandemic, the Council of Scientific and Industrial Research (CSIR) has mandated to place itself as a Sentinel to contain and arrest the spread of the Contagion. The 38 Laboratories of CSIR, with varying specialities, are consistently engaged in their capacities to tackle the current crisis. Some of the Fortes that a few labs of CSIR are working upon are Vaccine Development, Rapid Testing Facilities/Kits, Drug Development & Formulation and Enhanced Detection Mechanisms. CSIR-Central Mechanical Engineering Research Institute (CMERI), Durgapur has been focussed upon development of Technologies/Products which aims at *non-pharmaceutical Interventions* and more so towards the development of Protective/Precautionary technologies. As has been stated by the *World Health Organisation*, the development of a comprehensive Anti-COVID19 vaccine may require a minimum of One year clinical trial to prove its efficacy. Therefore, CSIR-CMERI's efforts are consistently focussed upon development of an array of Small Protective/Precautionary Intervention Technologies (*Healthcare Assistive Devices*), which when synchronized collectively, can work as a veritable front against the spread of the lethal virus. Some of such technologies developed by the Institute are:

- Disinfection Walkway
- Road Sanitizing Unit
- Face Mask
- Mechanical Ventilator
- Oxygen Concentrator
- Soap, Sanitizer and Dispenser
- Indoor Disinfection Unit
- Hospital Care Assistive Robotic Device

Besides, to maintain Protocol Standard Hygiene, CSIR-CMERI has also tried to further intensify its efforts towards Waste Management. The two primary target areas for the Institute in this regard have been Municipal Solid Waste Management (MSW) and Hospital Waste Management. These technologies aim to upgrade current hygiene standards to a level, whereby contamination and transmission can be arrested to a major extent, even in the post-COVID19 era.

CSIR-CMERI is also committed throughout to prioritise the interests of the Micro & Small Enterprises (MSEs), while developing its products. For the benefit of the small industry, particularly MSEs, we are bringing a compendium of CSIR-CMERI's technology bouquet related to COVID-19 pandemic. The technology and pricing profile of the Institute-developed products and technologies have always been aligned to the needs of the MSEs and Rural Small Businesses. These priorities have been given a further thrust during the current National Crisis, so that the economic prospects of this Sector can be intensified to help develop a Self-Reliant India or AtmaNirbhar Bharat.

Prof.(Dr.) Harish Hirani
Director
CSIR-CMERI, Durgapur

May 19, 2020





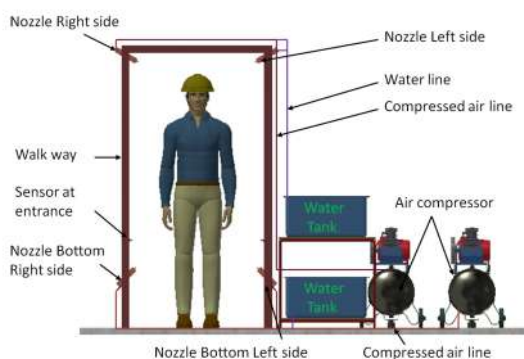
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Pneumatic Variant Disinfection Walkway:

The disinfection unit may be used for removal, deactivation or killing of pathogenic micro organisms present in face/skin/cloth/shoes of a human body using water having chemical disinfectants.

The unit comprises of a housing walkway, pneumatic systems, two storage tanks of different chemicals mixed with water and spray nozzles. There is one proximity sensor which detects the person while entering into the walkway. This walkway is designed to disinfect two persons in minute entering one after another. However, this disinfecting time, if needed may be made shorter/longer with change in the sensor setting. There are altogether four (04) nozzles inside the chamber. Two nozzles, located at upper level of the side walls, are used to spray one type of chemicals (30-50 ml per person) and another two nozzles, located at lower level of the side walls, are used to spray different type of chemicals (30-50 ml per person).

The unit may be installed in mass transit system entry points, medical centres and similar critical location with considerable amount of footfall.



Schematic Diagram



Installed at CSIR-CMERI Main Entrance Gate

Disinfectant walkway:

The disinfectant walkway is made by the acrylic transparent sheets fixed with aluminum frames. The approximate overall dimension of the system is 1.2 – 1.5 m (L) x 2.2 – 2.5m (H) x 1.0 m (W). The roof is made of non-metallic corrugated sheet.

- Aluminum Glaze section (2.5 inch x 1.5 inch) : Total Length - 22-26 m
- Acrylic sheet (approx. size) : 2.2 m x 1.2 m x 4 mm thickness – 2 Nos.
- Corrugated sheet for roof: 1.2 m x 1.3 m

Proximity sensor:

Two (02) IR based proximity sensors are installed on either side of the walkway. These sensors enable non-contact type switching on/off the sprayer system.

Pneumatic system:

The system comprises of two compressors, two solenoid valves, piping and fittings and spray nozzles. The system compressor pressure is maintained in the range 6-8 bar for operating the spray nozzles.

Storage tank(s) with supporting stands:

Each Tank capacity: 100 L capacity (approx).

Technology transfer fee (Non exclusive, 5 years validity):

- Rs. 2.5 Lakh including GST (For MSEs) and Rs. 4.9 Lakh plus GST (For others)
- Royalty @ 2% on sale value plus applicable GST

For further details please contact

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Hydraulic Variant Disinfection Walkway:

The CSIR-CMERI “Hydraulic Variant Disinfection Walkway” is a spraying system designed for Sanitizing every individuals before entering into Office, Hospital, Market premises. The Pathway has a width of 1.50 meter and length of 2.40 meter. Two nozzles are used from opposite sides with 2.5 bars of pressure to ensure effective delivery of the sanitizer. To ensure optimum overall coverage of sanitizer over every persons four 9inch dia wall mounted fans of 250rpm capacity are used from corners of pathway for spreading of mists. The system comes with two numbers embedded non-contact type sensors with one controller unit and timer for switch on and off of system. The system can also run nonstop bypassing the sensor system during entry of more persons at the start of shift duty.

This Disinfectant Sprayer Walkway unit can be effectively deployed in front of main entrance gates of Office campus, Shopping complex, Housing societies, Apartments, Railway stations etc, where there are movement of massive volume of peoples and more chance of spreading infections. This product will ensure maximum sanitization coverage of individuals within minimum possible time, which is the need of the hour.

This Disinfection Sprayer Walkway has already been installed and under operation at M/s. Gagan Ferroalloy Ltd. Jamuria, M/s.Shakambhari Overseas Trade Pvt Ltd., Durgapur, M/s. Gajanan Iron Pvt. Ltd., Jamuria. Number of other organization like, CMPDI Regional Institute, Asansol, SAIL-DSP, NHAI, Hazaribagh, CLW, Dankuni has shown interest for installation of same Disinfectant Sprayer Pathway unit at their Office entrance gate.



Installed at M/s Gagan Ferrotech Ltd., Jamuria



Installed at M/s Shakambhari Overseas Tread Pvt. Ltd., Durgapur

The Technical Configuration of the Unit is as follows:

- Hydraulic Pump Capacity : 1HP
- Line Pressure : 5 bar
- Tank Capacity : 500 Litre
- No of Nozzles : 2 Nos
- Fans : 4 Nos, 9 inch dia., 250 rpm
- Spray Mixture : As per guidelines issued by “Health and Family Welfare Department”, Government of W.B. or any other appropriate authority

Technology transfer fee (Non exclusive, 5 years validity):

- Rs. 2.5 Lakh including GST (For MSEs) and Rs. 5.0 Lakh including GST (For others).
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Tractor Mounted Road Sanitizing Unit:

The CSIR-CMERI Road Sanitizer Unit is a tractor-mounted Road Sanitizing System. The Road Sanitizer has a span of 16 feet, which uses 10 to 15 bars of pressure to ensure effective delivery of the sanitizer. 12 nozzles are used to ensure optimum radial coverage of sanitizer. The system utilizes a 2000-5000 litre tank with a pump of 22 LMP which can be used to sanitize a road stretch of upto 60-100kms.

This Road Sanitization unit can be effectively deployed in long stretches of highways, vicinity of toll plazas etc, where there is a massive volume of traffic and good chance of infection spreading. It can also be deployed in Housing Complexes, Office Complexes, Sports Arenas, Apartment buildings etc. This product will ensure maximum sanitisation coverage within minimum possible time, which is the need of the hour. There is also an in-built provision of two extendable hand spraying systems with a reach of 30 feet on both sides of the Vehicle. This provision can be used to reach remote nook and corners on any given site.

Asansol Municipal Corporation after Inspection of the Unit has placed an order for four such systems, of which one has already been delivered. Durgapur Municipal Corporation has also expressed interest for the Unit and procedural negotiations are under progress. Some MSMEs and Small Business Clusters have also expressed interest for the Unit and interactions are underway for the same.



Tractor operated road disinfection spray system

The Technical Configuration of the Unit are as follows:

- Pump Spray Capacity : 30 Litre/min
- Line Pressure : 10-15 bars
- Tank Capacity : 2000-5000 litres
- No of Nozzles : 6 Nos at the rear end and 3 on each side (Left and Right)
- Road Width Coverage : 16 feet on each run
- Road Speed during Spray : 5-10 km/hr
- Spray Mixture : Water and Sodium Hypochlorite Solution-6%

Technology transfer fee (Non exclusive, 5 years validity):

- Rs. 2.5 Lakh including GST (For MSEs) and Rs. 5 Lakh plus GST (For others).
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High Efficiency Hydrophobic Three-Layered Facemask:

To combat pandemic COVID-19, protection and the control measures are the key factors. In this regard, wearing of facemask is highly desirable personal protective equipment not only for frontline workers but also for common people. We must think about the technological solution apart from the quality of the product. Keeping these in mind, CSIR-CMERI has developed a low-cost but high efficiency three-layered facemask, which is believed to be efficient enough to provide much needed protection.

The facemask is composed of two hydrophobic non-woven polypropylene (PP) layers in the outer and inner side and a 'High Efficiency Particulate Air' filter in the middle. While the hydrophobic PP layer will restrict the contaminated droplets to enter or transmit, inside filter is capable to restrict particulates of as small as $0.3 \mu\text{m}$ effectively. The FESEM images in Figure 2 show the distribution of polypropylene fibers in the inner and outer layer of the developed face mask and inner layer contains very dense distribution of nonwoven fibers. It is anticipated that such distributions of fibers and choice of filter components will give rise to high efficiency facemasks.



Figure 1: High efficiency three-layered facemask by CSIR-CMERI

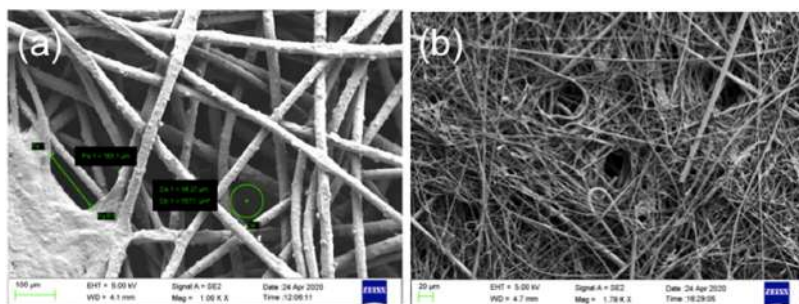


Figure 2: Field-Emission Scanning Electron Microscope of (a) PP layer as the outer and inner layer and (b) Middle layer filter



Figure 3: UV Sterilization

In order to check all the important parameters, the performance of the developed facemask has been evaluated by the South India Textile Research Association (SITRA). The performance of the developed mask based on the report received from SITRA are tabulated below:

Table 1: Performance of developed facemask based on the test reports from SITRA.

Sl. No.	Tests / Standards	Results
1.	Bacterial Filtration Efficiency (ASTM F 2101) Test Organisms Used : <i>Staphylococcus aureus</i> ATCC 6538 Mean particle size of challenging aerosol: $3.0 \pm 0.3 \mu\text{m}$ Flow rate of aerosol: 28.5 L/min	99.9%
2.	Particulate Filtration Efficiency at 0.3 Microns (ASTM F2299/F2299M-03 (2010))	95.46%
3.	Differential Pressure (IS 16289:2014 Annexure C)	43.0 Pa/cm ²
4.	Splash Resistance (ASTM F1862/F1862M-13) at 160mmHg	Pass
5.	Flammability (16 CFR Part-1610)	Class 1

Based on the test reports, the developed facemask can be recognized as a high efficiency facemask, with the bacterial filtration efficiency as high as 99.9% and particulate filtration efficiency as high as 95.46% along with good breathability and splash resistance against synthetic blood. CSIR-CMERI has developed the facility for sterilization of 6000+ masks per day under UV-C light of 254 nm wavelength.

Technology transfer fee (Non exclusive, 5 years validity):

- Rs. 1 Lakh plus GST (For MSEs) and Rs. 5.0 Lakh including GST (For others).
- Royalty @ 2% on sale value plus applicable GST

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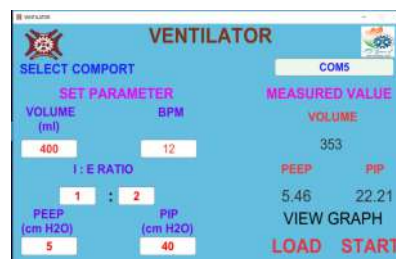
Mechanical Ventilator Using Motorized Bellow:

A mechanical ventilator is a machine that takes over the work of breathing when patients are unable to breathe enough on their own during surgery or due to a critical illness and they remain on the ventilator until they improve enough to breathe on their own. The ventilator makes sure that the body receives adequate oxygen and that carbon dioxide is removed. The patient is connected to the ventilator with a hollow tube (artificial airway) that goes in the mouth and down into the main airway or trachea. It is germane that ventilator alone cannot heal a patient, it gives the patient a chance to be stable while the medications and treatments help them to recover.

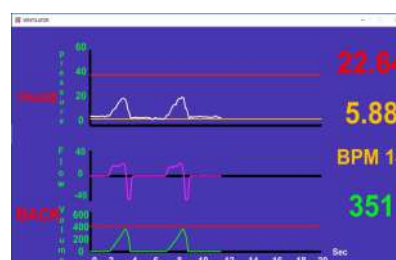
This ventilator has a closed loop monitoring system, which can sense patient breathing effort. If present, it will assist the patient in breathing and in its absence, it will allow the prescribed amount of tidal volume into the patient lungs. This version is primarily intended to be used in small clinics, medical colleges, nursing homes, isolation wards etc., where pressurised Medical Air and Oxygen supply pipelines are absent. The number of such establishments is quite large and during the current COVID-19 pandemic, there is a dire need of such ventilator, which can work in these establishments.

Specifications:

- A micro-controller along with pressure and flow sensors in closed loop:
 - a) Continuously monitors and displays pressure, volume and flow with time in the monitor
 - b) Parameters can be set on the fly through the GUI like Tidal Volume, BPM, I:E Ratio, PEEP and PIP
 - c) Alarms for different set limits
- Mechanical fail-safe valve: opens at 80 cm H₂O if there is electrical/electronic failure
- PIP: 40-70 cm H₂O adjustable in steps of 5 cm H₂O
- PEEP: 5-20 cm H₂O adjustable in steps of 5 cm H₂O
- Inspiratory: Expiratory ratio (I:E): 1:1 - 1:3 (adjustable)
- Respiratory Rate (BPM): 10 – 30 breaths per minute in increments of 2
- Tidal Volume: 350 ml – 650 ml in steps of 50 ml
- Modes available ("Volume Assist/Control"):
 - Volume Control (VC) – Continuous Mandatory Ventilation (CMV), for PASSIVE patients
 - Volume Control (VC) – Intermittent Mandatory Ventilation (IMV), for PARTIALLY ACTIVE patients



GUI for input parameters



Realtime graph of pressure, flow and volume



Testing of the unit at HealthWorld Hospitals

Technology transfer fee (Non exclusive, 5 years validity):

- Rs. 5 Lakh plus GST (For MSEs) and Rs. 7.5 Lakh plus GST (For others)
- Royalty @ 5% on sale value plus applicable GST

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Portable Touch free Soap-cum-Water Dispensing System - Compact Version:

In the context of practicing good hygiene, Portable Touch free Soap-cum-Water Dispensing System by CSIR-CMERI is unique in its own as soap and water are being dispensed at a fixed interval from the same tap.

When a person approaches the sensor (IR) on the portable soap-cum-water dispenser, a predefined amount of soap (a few millilitres) will be dispensed from the tap, momentarily. After rubbing his hand for twenty (20) seconds, clean water is dispensed from the same tap. The arrangement aims to reduce wastage of water as well. Internally, the 220 V AC line is used for soap dispensing as well as generating a 12 V DC line for powering the rest of the electronics circuit. The system is currently installed at the CSIR-CMERI main gate and is operational.



Portable Touch Free Soap-cum-Water Dispensing System

Novelty of the System:

- Portable and touchless dispenser
- Single tap dispenser for soap as well as water
- Single IR sensor for both soap and water
- Minimal water usage (400 ml approx.)
- Easy to install
- Tank Capacity (Liquid Soap): 1 Litre
- Two variants: 1) Table top
2) Wall mount
- Material used: 1) Acrylic (more attractive)
2) Powder coated steel (more durable)
- Dimension: 135x135x170 mm

Technology transfer fee (Non exclusive, 5 years validity):

- Rs. 2.5 Lakh including GST (For MSEs) and Rs. 5 Lakh plus GST (For others)
- Royalty @ 2% on sale value plus applicable GST

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Basic Liquid Soap (BLS) for hand wash:

Respiratory infections are transmitted through different sized droplets. According to current evidence, the primary route of transmission of COVID-19 virus is through respiratory droplets or contact routes. Transmission through contact occurs when hands contaminated with the virus touch the mucosa of the mouth, nose, or eyes. Contaminated hands are the primary source of indirect contact transmission which helps the virus to spread across different surfaces. Consequently, hand sanitation is the most effective measure to avoid the proliferation of COVID-19 virus. In spite of this, the availability of hand sanitation facility which includes sanitizers containing alcohol and combined soap-water solution is limited in the low- and middle-income groups. As per the estimate provided by WHO and UNICEF, around 3 billion people lack hand sanitation facilities at home globally. In addition, due to enormous demand the availability of the above products has reduced drastically. To tackle this situation, daily liquid soap production needs to be increased and the process needs to be easy and fully mechanized to meet the huge demand.

To meet the need of the society CSIR-CMERI took the initiative for the preparation of basic liquid soap in a cost effective manner so that the soap can be made affordable for the masses. For this purpose the soap is prepared from easily available palm oil. The oil has been saponified with appropriate proportions of caustic potash solution. The soap solution thus formed is mixed with foaming agent, moisturizing agent, appropriate colour and essential oil for fragrance purpose. The pH level of the soap solution is adjusted with neutralizing agent till it reaches a desirable level. A mechanized soap making unit has been fabricated so that large quantities of palm oil and caustic potash can be mixed with other important ingredients to produce soap in ample quantity on daily basis. The produced liquid soap can then be stored in a dispensing unit for future use as a hand wash. However, the idea behind soap making is to provide hands on training to the NGOs and SHGs for downstream knowledge generation, so that they can easily prepare soap for fighting COVID-19.



Basic Liquid Soap (BLS) for hand wash

Ingredients:

- Palm Oil
- Potassium Hydroxide
- Sodium laureth sulfate (SLES)
- Glycerine
- Boric acid
- Essential Oil
- Colour
- Distilled Water

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Alcohol-Based Hand Sanitizer:

Description of the Product:

CSIR-CMERI is preparing Alcohol (IPA)-based liquid hand sanitizers as per the formulation prescribed by the World Health Organization (WHO) to combat the COVID-19 pandemic. This hand sanitizer contains ~75% alcohol and is effective against most bacteria and viruses without water. It can keep hands clean and germ-free. The small sized 60 ml capacity bottle is suitable to keep in your pocket while going outside to market or workplaces. This hand sanitizer keeps your hands moisturized due to the presence of optimum amount of glycerol.



Direction of use:

- Apply 3-4 ml of CSIR-CMERI's hand sanitizer on your palm
- Rub gently for 20-25 sec till dry
- Use the hand sanitizer as and when required
- Can also be used to disinfect your hand phone, wrist watch, money wallet etc
- If your hands are heavily soiled or greasy, hand sanitizer may not work
- Keep out of reach of children

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Pneumatically Operated Mobile Indoor Disinfection (POMID) Unit:

Description:

The mobile disinfection unit may be used for deactivation or killing of pathogenic micro organisms present inside a chamber like rooms, halls, building corridors using water having chemical disinfectants.

The unit comprises of a mobile trolley, pneumatic compressor system, storage tanks of different disinfectants mixed with water and, copper nozzles for spraying disinfectants. This system is designed to disinfect the floor by the copper nozzles set in the lower tier, the upper tier copper nozzles are meant for disinfecting the beds, tables etc. There is flexibility to change angle of nozzles as per the requirement. The hand held flexible spray arm can be used for aerial space or walls of the room, cup boards, etc.

Application:

- Hospitals/Malls/Restaurants etc.
- Seminar/Conference Halls
- Govt./Corporate Offices



Three nozzles in the top tier



Prototype developed at CSIR-CMERI



Three nozzles in the bottom tier



Hand held flexible spray arm



Mopping facility

The major components of the mobile indoor disinfectant unit:

● Mobile Trolley:

The mobile indoor disinfectant unit is made by steel frames mounted on four wheels. The approximate overall dimension of the system is 1.0 m (L) x 0.9 m (H) x 0.5 m (W). The system is covered by top cover plate.

● Pneumatic system:

The system comprises of compressors, piping and fittings and spray nozzles. Three (03) nozzles are mounted (adjustable along horizontal plane) in the bottom tier and another three (03) nozzles are located (adjustable both in horizontal and vertical planes) in the top tier. The hand held flexible spray arm can be used for disinfecting in any direction as per requirement. The system pressure is maintained in the range 6-8 bar for operating the spray nozzles.

● Mopping Facility:

The system is equipped with mopping facility to mop the floor in order to soak the spread chemicals from the floor.

● Storage tank(s):

No. of tanks: 2, each tank capacity: 10.0 Litre (approx).

Technology Transfer fee (Non exclusive, 5 years validity):

- Rs. 2.5 Lakh including GST (For MSEs) and Rs. 5.0 Lakh plus GST (For Others)
- Royalty @ 2% on sale value plus applicable GST

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Battery Powered Disinfectant Sprayer (BPDS):

The disinfectant unit may be used for the deactivating or killing of pathogenic micro organism present on the human body/ surfaces/ environment by spraying water soluble chemical disinfection mist. The unit is designed for the ease of retro fitment on the standard wheelchair used in hospitals. The sprayer is suitable for disinfecting the indoor premises such as office, hospital, Industrial floor & machine, Malls, Hotels, banquets hall, conference rooms etc.

The sprayer comprises of two stage spraying unit with separate storage system. This storage can be used with two different chemical for effective utilisation of the spray. The sprayer is having an extended spray arm for reaching the obscure corners where standard sprayer machine can't reach. These features increase the machine versatility. Machine is equipped with high power battery pack which can run for four hours in a single charge. The Sprayer is equipped with mopping feature which enable the mopping of the floors and soaking the spread chemicals from the floors.



Sprayer movement without operation

Spraying and mopping operation



Spraying operation using extended arm

Application :

All type of indoor hospital, indoor Office buildings, inside of the factory supermarket, shopping malls etc.

Key Features:

- Cordless machine
- Two nozzle spray system
- Extended arm spray unit
- Cost effective

Specification:

- Storage Capacity: 20 Litres each tank
- Battery back-up time in a single charge : 4 hours
- Gross weight (empty tank): 25 Kg
- System Dimension (Overall) : L 41 x W 44 x H 44 (in cm)
- Covering width: 10.5 cm
- Pump capacity & spec: 4- 5 L/min flow with 7 bar pressure
- Extension sprayer length (Full stretch): 250 cm

Technology Transfer Fee (Non exclusive, 5 years validity):

- Rs. 2.5 Lakh including GST (For MSEs) & Rs. 5 Lakh plus GST (For others)
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Hospital Care Assistive Robotic Device (HCARD):

The CSIR-CMERI developed Health Care Assistive Robotic Device is an essential device in the fight against highly contagious diseases. The present device relates to a nursing care system that navigates the existing facility without intervention and within the programmed constraints to deliver and transport materials and be able to provide two-way communication between patient and clinicians.

The HCARD is powered by two nos. of lead acid battery with the capacity 12V, 7Ah, having a continuous run time of around 5 Hrs. after full charge. It has remotely controlled drawers to transport medicine, food, water, documents etc. Drawers are fitted with UV light to reduce hospital-acquired infections. The system has the path following capability to allow it to move in a predetermined path. The system also has obstacle detection and collision safety modules. The system is designed to operate in manual (using Joystick) and/or in automatic modes.

The system when deployed will work on demand, tirelessly and precisely. The deployment requires minimum addition/ alteration of the existing facilities. The system is efficient as compared to other existing models available in the market and has the technical support of the CSIR-CMERI.



Salient Features:

- Autonomous mode of locomotion through path following
 - Manual mode of Locomotion with joystick
 - Remote activation of drawers
 - Bi-directional voice and video communication
- Collision avoidance circuitry with highest safety protection

Technical specification:

- | | |
|----------------------|---|
| ● Dimension | : 1120mm(L)x700mm(W)x1115mm(H) |
| ● Weight | : Approximately 80 Kg with Battery |
| ● Operation Duration | : Approximately 4 hours |
| ● Charging Time | : Approximately 10 hours |
| ● Load capacity | : Max.20 kg |
| ● Drive | : Steer drive |
| ● Standard Sensors | : Path Following Sensors, Obstacle Sensors |
| ● Delivery Objects | : Medicine, Lab Samples, Documentation etc. |
| ● Power Supply | : Lead-Acid Battery, 12V, 7Ah; LiPo Battery |
| ● Navigation | : Manual and Autonomous (Line following) |
| ● Communication | : Audio-Visual |
| ● Maximum Speed | : 0.5M/s |
| ● Turning Radius | : 910 mm(Approx.) |
| ● Power Consumption | : 336 Watt@24V |

Technology Transfer Fee (Non exclusive, 5 years validity):

- Rs. 5 Lakh plus GST (For MSEs) & Rs. 10 Lakh plus GST (For others)
- Royalty @ 5% on sale value plus applicable GST

For further details please contact

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Hospital Solid Waste Disposal Plant:

Defination

Any waste which is generated during the diagnosis, treatment or immunization of human beings or animals or in research activities pertaining thereto or in the production or testing of biological samples.

Preamble and Novelty

- High temperature (~2500-3000°C) plasma arc assisted eco-friendly disposal of Hospital Solid Waste (HSW) with high waste destruction efficiency (~85-90%) by mass and combustion efficiency (>99%).
- The level of toxin emission from HSW treatment plant lies below the CPCB standard of toxic gases emission.
- This process route of hospital waste destruction is safe, hygienic, efficient and easy to control and in compliance with Hospital Waste Management Rules prescribed by CPCB.
- Major system components include plasma gasifier, secondary chamber, electrode and a gas cleaning unit comprise of catalytic converter, scrubber, booster drive, chimney.
- Capacity of the plasma gasifier of HSW plant: 15 kg/h



Plasma Arc assisted Hospital Solid Waste Disposal Pilot Plant at CSIR-CMERI



~ 21 Kg HSW

Waste destruction with
respect to volume

About 90% volume reduction



~ 2 Kg Slag

Deployment

- The developed technology is already tested at laboratory level with different controlling parameters. Ready for field deployment.
- Various healthcare organisation like Hospital, health centre can avail this technology for safe disposal of HSW.
- Governments, NGOs can utilise this technology to build a commercially available waste management facility.

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