

CHAMP CBWTF, Gulbarga India
Unique Endeavor of a partnership between an
NGO, Government and End Users towards
Biomedical Waste Management

Theme Number 3
Developing Models: Opportunities & Limitations

Ms. Shubhangi Wankhede, M.Sc. (Environmental Sciences)
CEE Gulbarga, Centre for Environment Education

Dr. Shyamala K. Mani, M.Sc. (Microbiology), M Phil, PhD (Environmental Science)
CEE Delhi, Centre for Environment Education

CONTACT

Ms. Shubhangi Wankhede, M.Sc. (Environmental Sciences)
Centre for Environment Education, Gulbarga Field Office
IInd Floor, HKADB Office premises, Aiwani-Shahi, Gulbarga 585 102
Ph- (+91) 8472-255273 / +919448039142
Email: shubhangi.wankhede@ceeindia.org

Dr. Shyamala K. Mani, M.Sc. (Microbiology), M Phil, PhD (Environmental Science)
CEE Delhi, Centre for Environment Education
D-35, First Floor, South Extension Part 2, New Delhi - 110049
Ph- (+91) 11- 26262878 - 81 / +919811428447
Fax: (+91) 11- 26262880
Email: shyamala.mani@ceeindia.org

EXECUTIVE SUMMARY

Growing urbanization has led to several changes in the healthcare sector in India. While on one hand, access to state of the art healthcare services are being provided to the community thereby resulting in the better health for all, improper management of biomedical waste emanating from these healthcare establishments has also given rise to many environmental and health problems, thereby negating the benefits of the expanding health sector. Disposal of biomedical waste has been haphazard and unplanned throughout the country although hospital waste management is an integral part of the hospital infection control programme and the Biomedical Waste (Management & Handling) Rules, 1998 promulgated by the Ministry of Environment and Forests, Govt. of India make it mandatory for every healthcare establishment in the country, whether big or small, to manage and treat their waste as per the Rules. Many infections have spread among the community as a result of this non-compliance and because of indiscrete disposal of waste inadequately treated or disposed without treatment. Inappropriate storage, transport and disposal of different kinds of hospital waste such as sharps, infected or blood soaked cotton and dressings, pathological waste, infected plastics etc. has caused increase and spread of hospital associated infections and multi-drug resistant strains, which have given rise to higher rates of morbidity and sometimes mortality. Hence the project 'Healthcare Establishment Waste Management and Education Programme (HEWMEP)' was initiated which aimed to bring about awareness and provide mitigating measures to achieve infection control in and around the health care establishments through appropriate hospital waste management practices in conjunction with the state, stakeholders and NGOs.

Under the HEWMEP project implemented in Gulbarga city of Karnataka, India, besides the widespread education and training that was provided to all the stakeholders, it was decided that a Common Healthcare waste Appropriate Management Plant (CHAMP), a Common Treatment Facility for biomedical waste management would also be set up. This project funded by Indo-Norwegian Environment Programme (INEP), Govt. of Karnataka started in

2002 and was ready by end of 2004. It was inaugurated and commissioned for operation on June 17th 2005 by the then Chief Minister of Karnataka, Mr. N.Dharam Singh. The CTF has been, in fact, functioning May 2005.

The processing technologies that are being used at CHAMP are incineration, autoclaving, shredding, chemical disinfection, liquid effluent treatment, deep burial and secured landfilling. Attention is given to the problems of incineration emissions particularly to avoid generation of dioxins and furans and the operation and maintenance of the air pollution control equipments essential to control these emissions, are in place and the Hydrochloric acid gas in the emissions, which are correlated with presence of dioxins are monitored regularly. The programme aims to evolve a functional protocol for testing of environmental parameters such as air, water and general cleanliness around healthcare establishments.

The CHAMP facility has many notable features, which make it unique among the Common Treatment Facilities, like the use of totally biodegradable wax coated paper bags developed by CEE for collection and disposal of soiled cotton waste & still births; Special containers for syringe needles and scalpels with safe needle extraction from the syringes and their safe transportation to the CHAMP facility; Ecofriendly energy saving solar water heating system - to provide the hot water to the autoclave and incinerator; Transport vehicle for waste from the health care establishments to CHAMP is fitted with special filters preventing escape of bacteria (0.3microns) and viruses (6 microns) from the container during transit; Use of special crates to provide safe and minimal handling of the bio-medical waste during collection, transport and delivery at the CHAMP site; Autoclaves modified with rotary stirrers for uniform exposure of the waste and its efficient sterilization; A cold room facility at the CHAMP site to store the bio-medical waste awaiting sterilization; High Pressure Venturi Scrubber system in the Incinerator to ensure compliance with the emission limit for the particulate matter of 150 m.g. / Nm³ and a unique Metal Sharps Manager, which can shred and sterilize in bulk, all the metal sharps and needles collected in unsterilized condition from the clinics, hospitals and other sources.

The CHAMP facility is evolving a path breaking and pioneering effort for the introduction and standardization of healthcare waste management with the maximum emphasis on Eco-friendly technologies. The CHAMP facility at Gulbarga will thus be among the most advanced in India, which will ensure safe and sound disposal of healthcare waste.

INTRODUCTION

The management of healthcare waste is a subject of considerable concern to public health administrators, infection-control specialists as well as to the general public. This is the waste that is generated during the process of patient care. Such waste has been unregulated till recently and their quantities in cities have been ranging from 1.5 to 2% of the municipal solid wastes. Though this quantity is relatively small, it can pose grave risks. It has been very poorly managed in the past, after being dumped along with municipal solid wastes.

Disposables are a serious problem anywhere. Plastic disposables such as syringes (with their needles), urine bags, I V Bags, catheters and other such material need safe disposal to prevent reuse. A WHO report regarding use of unsafe needles in the world indicates the percentage of

use of unsafe needles in India as 75%. The unscientific disposal of the healthcare waste leads to the transmission of communicable diseases such as gastro-enteric infections, respiratory infections, skin, eye and several others including HIV, Hepatitis B, C, E and TB. Healthcare professionals, rag pickers and the general public are equally at risk due to improper treatment and disposal of biomedical waste.

Realizing the gravity of the issue, the Ministry of Environment and Forest, Govt. of India promulgated the Biomedical Waste (Management and Handling) Rules on 27th July 1998 to enforce and implement the management of healthcare waste in India. These rules along with subsequent amendments dated 06th March 2000, 2nd June 2000, 17th September 2003 etc., are welcome steps for improving the status of healthcare waste management in India. The recent amendments to the Biomedical Waste (Management and Handling) Rules emphasize the need for the Common Treatment Facilities for effective biomedical waste management. The Common Facilities are recommended to be set up for the benefit of small and medium waste generators, for cost effectiveness and to check the mushrooming of small incinerators within city limits.

Present Scenario

Gulbarga is divisional headquarters of Gulbarga revenue division comprising Bidar, Raichur, Koppal, Bellary and Gulbarga as Districts. The city of Gulbarga is dry, arid and remains hot for most of the year. The present population is about 0.45 million.

The city has nearly 418 Health Care Establishments (HCEs). The break up of these 418 HCEs is-

Bedded HCEs	=	98
Non Bedded HCEs	=	197
Laboratories and Diagnostic Centres	=	32
Alternative Medicine	=	91

The facility caters to all the 418 HCEs numbering over 2000 beds and takes care of nearly 1500 kgs of biomedical waste per day.

The facility is complete in itself; it addresses collection, transportation, storage, treatment and disposal of the biomedical waste in the city.

Objective

- To setup a completely operational, model, common facility for Bio Medical Waste collection, transportation, storage, treatment and disposal facility in Gulbarga
- To train healthcare workers regarding methodology of proper Bio Medical Waste Management (BMWM) in their HCEs.
- To create awareness among the general public regarding Bio Medical Waste (BMW), it's hazards and the available methods of mitigation.
- To run the Common Healthcare waste Appropriate Management Plant (CHAMP) so created in an environmentally sustainable and economically viable manner.
- To prepare educational material regarding Bio Medical Waste Management and disseminate them through training programmes, workshops and the media to other common facilities and entrepreneurs.

Material & Methodology

The facility caters to all the 418 HCEs numbering over 2000 beds and takes care of nearly 1500 kgs of biomedical waste per day.

Methodology

1. **Quantification survey:** A survey was carried out by CEE in 2001 – 2002 to assess the waste generated by the HCEs and the disposal practices carried out by the HCEs. The results of the survey is annexed at **Annexure I**
 2. **Formation of Committees:** District Implementation Committee headed by Divisional Commissioner, Gulbarga and State level Technical and Finance Committees comprising of experts from IISc, KHSDP, INEP and CEE were constituted. The District Implementation Committee coordinated and facilitated smooth implementation of the project by fixing of user charges, evolving the plan and strategies and monitoring the process and progress of the implementation. The State level Technical and Finance Committee coordinated the selection of the technologies and facilitated the procurement process involved.
 3. **Sensitization and Orientation programmes:** The Sensitization and Orientation programmes were planned and held for the benefit of the public, HCEs and personnel involved in handling and disposal of BMW including those working in the Municipality. This was mainly to create awareness regarding BMW, its hazards and methods of mitigation.
 4. **Identification of site for setting up of CTF:** The District Administration allocated 5 acres of land 10 kms away from the city for setting up of the CTF.
 5. **Environmental Impact Assessment for Common Treatment Facility Site:** EIA was conducted to ensure the suitability of the site for setting up Common Treatment Facility and to plan for mitigation measures required if any.
 6. **Design of the facility and selection of technologies:** Technical experts in the field of BMW were involved in the process of identifying and selection of appropriate technologies involved in setting up of the CTF. The equipment selected for effective treatment of BMW were:
 - Incinerator (1) of capacity 50 kgs /hr for treatment of waste under category 1& 2.
 - Modified Autoclaves (2 nos) of capacity 100 kg/hr for treatment of waste under category 3,4,6,7
 - Metal Sharps Manager (1) of capacity 10 kg/hr for treatment for sharps.
- In addition to the above, a Cold room facility to store the BMW at site awaiting sterilization, Solar water heating systems for providing hot water to autoclaves and Diesel generator set to ensure uninterrupted power supply for the equipments, were opted for.
 - An effluent treatment plant was also decided to be set up for treating liquid effluent generated during treatment process and washing of BMW transport vehicles at the site.
 - Specially fabricated vehicles retrofitted with HEPA filters for collection and transportation of BMW from the HCEs to the CTF were also decided to be procured. (Specially fabricated vehicle for BMW transportation – **Annexure II**)

- Landfills, compost pits and deep burial pits were also designed to dispose the treated waste. (Layout of the site – **Annexure III**).
- 7. Training and Education Programme:** Education and Training is an integral component of the project. Training of HCE personnel has been done at different levels. This includes doctors, nurses, administrators, paramedical personnel, housekeeping staff, engineering, kitchen and laundry personnel, ayahs, wardboys, security staff, gardeners, rag pickers, sorters, reprocessors in different departments and areas in the hospitals which are involved in BMWM. Different types of educational material have been prepared and published for the training, which has been approved by the Ministry of Environment and Forests, Govt of India.
 - 8. Setting up of the Facility, Trial Run, Inauguration and Commissioning:** The above-mentioned equipments were installed and trial runs were undertaken for them. Routing for the collection of the biomedical waste from all the HCEs in Gulbarga city was also prepared. Prior to the formal inauguration of the facility, trial run of the complete plant was undertaken for a period of nearly 2 months to monitor the working of the system prior to the full-fledged operation. The CHAMP CTF was formally inaugurated on 17th June 2005 by the Hon'ble Chief Minister of the Karnataka state (province) in presence of other dignitaries.

Result & Discussion

The CHAMP facility caters to all the healthcare establishments of the Gulbarga city and provides for the collection, transportation, treatment and disposal of healthcare waste from these establishments. Education and training programmes are the integral components of the programme. The processing equipments that are installed at CHAMP site are incinerator, autoclaves, shredders, chemical treatment facility, liquid effluent treatment, deep burials and secured landfills. Attention is given to the problems of incineration emissions. To avoid the generation of dioxins and furans during incineration, essential air pollution control equipments are in place. Eco-friendly technologies like solar water heating system, composting pits etc., are employed to supplement the functioning of the plant. The programme aims to evolve a functional protocol for testing of environmental parameters like air, water and general cleanliness standards in healthcare establishments. The CHAMP facility has many notable features, which make it unique among the Common Treatment Facilities. These are –

- The use of totally biodegradable wax coated paper bags developed by CEE for collection and disposal of soiled waste and still births;
- Special containers for syringe needles and scalpels with safe needle extraction from the syringes and their safe transportation to the CHAMP facility;
- Ecofriendly energy saving solar water heating system to provide the hot water to the autoclave, washing of the vehicle and the equipment rooms;
- Transport vehicles from the HCEs to CHAMP are fitted with special filters preventing escape of bacteria (0.3microns) and viruses (6 microns) from the container during transit;
- Prevention of bad odour in the container with an Ion filter (under development);
- Use of special crates to provide safe and minimal handling of the bio-medical waste during collection, transport and delivery at the CHAMP site;

- Autoclaves modified with rotary stirrers for uniform exposure of the waste and its efficient sterilization;
- A cold room facility at the CHAMP site to store the bio-medical waste awaiting sterilization;
- High Pressure Venturi Scrubber system in the Incinerator to ensure compliance with the emission limit for the particulate matter of 150 m.g. / Nm³;
- A unique Metal Sharp Manager, which can shred and sterilize in bulk, all the metal sharps and needles collected in unsterilized condition from the clinics, hospitals and other sources.

CONCLUSION

A Common Bio-medical Waste Treatment Facility (CBWTF) is a set up where bio-medical waste, generated from a number of healthcare units, is imparted necessary treatment to reduce adverse effects that this waste may pose. Installation of individual treatment facilities by small healthcare units requires comparatively high capital investment. In addition, it requires separate manpower and infrastructure development for proper operation and maintenance of treatment systems. The concept of CBWTF not only addresses such problems but also prevents proliferation of treatment equipment in a city. In turn it reduces the monitoring pressure on regulatory agencies. By running the treatment equipment at CBWTF to its full capacity, the cost of treatment of per kilogram of waste gets significantly reduced. Its considerable advantages have made CBWTF popular and proven concept in many developed countries. The concept of CBWTF is also being widely accepted in India among the healthcare units, medical associations and entrepreneurs.

The CHAMP facility at Gulbarga, India is working towards the objective of the biomedical waste management by evolving a path breaking and pioneering effort for the introduction and standardization of healthcare waste management with the maximum emphasis on Eco-friendly technologies. The CHAMP facility at Gulbarga will thus be among the most advanced in India, which will ensure safe and sound disposal of healthcare waste.

ACKNOWLEDGEMENTS

- 1) Mr. Inge Tveite, Counsellor, Royal Norwegian Embassy
- 2) Mr. A.K.Agarwal, ACS & Development Commissioner, Govt of Karnataka
- 3) Ms. Tara Sharma, Advisor, Royal Norwegian Embassy
- 4) Mr. Siddharthan, Advisor, Royal Norwegian Embassy
- 5) Mr. Gokul Ram, former Principal Secretary, Environment, Govt. of Karnataka
- 6) Mrs.Lata Krishna Rao, former Secretary II, Environment, Govt. of Karnataka
- 7) Mr. Chakravarthy Mohan, Coordinator-Indo-Norwegian Environment Programme
- 8) Mr. LakshmiNarayana, Deputy Commissioner, Gulbarga District
- 9) Mr. Anjum Parvez, Deputy Commissioner, Gulbarga District
- 10) Mr. Pankaj Kumar Pandey, Deputy Commissioner, Gulbarga District
- 11) AVM V.S.Narayanan

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Annexure I**Results of Quantification Survey 2001-02**

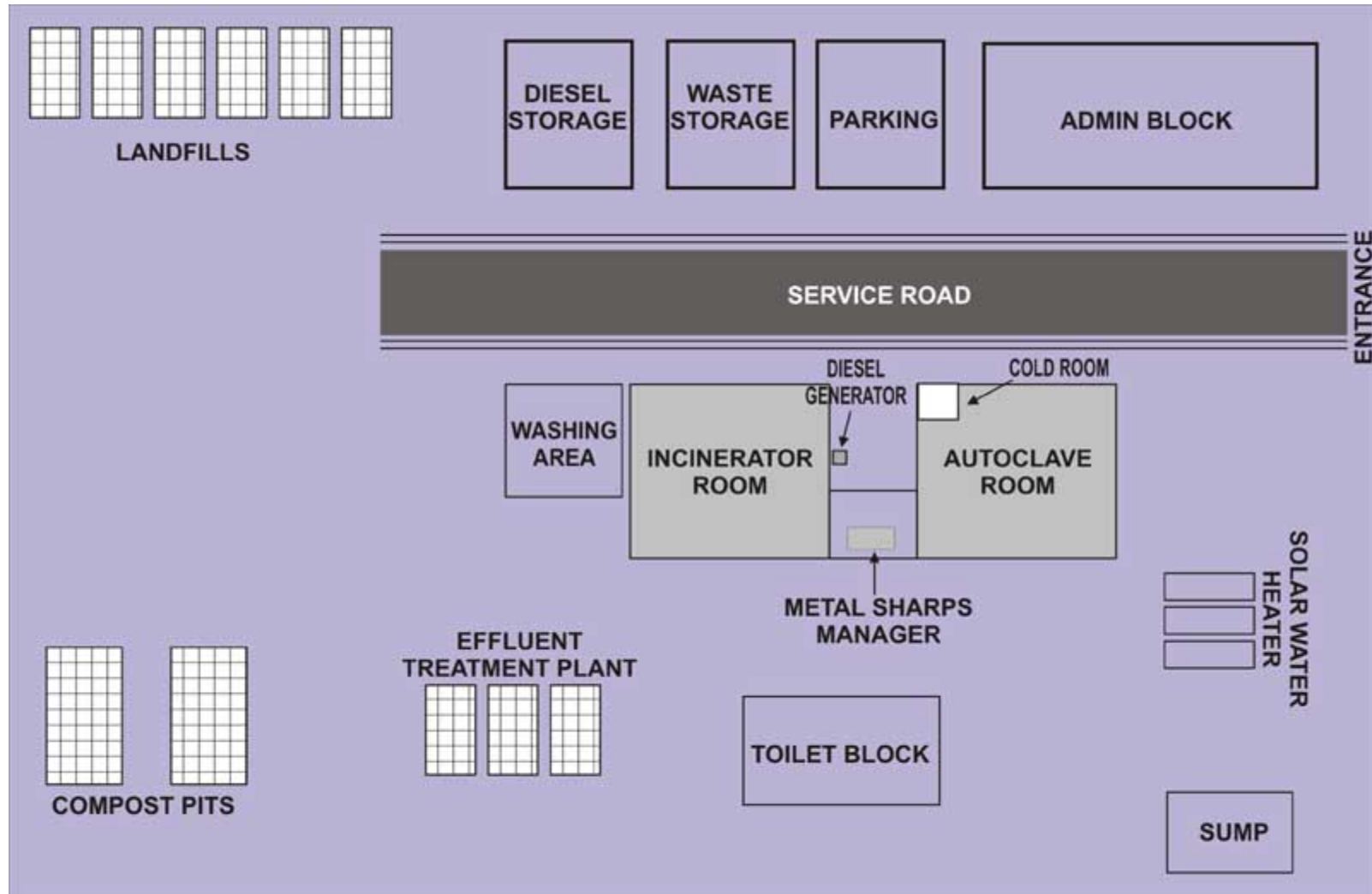
Sl. No.	Category	Description	Colour	Waste produced (Kgs / Day)	Remarks
		BIOMEDICAL WASTE			
01.	1& 2	Anatomical waste, animal waste	Yellow	178	534 kgs
	6	Solid Waste contaminated with blood and body fluids; cotton dressings; soiled plaster casts; linen; bedding and other materials contaminated with blood	Yellow	356	
02.	3	Microbiological and biotech waste; lab culture; specimens of microorganisms; cell culture; waste from products of biological toxins; devices used for transfer of culture	Red	502	502 kgs
	7	Soiled waste other than waste sharps Viz. tubing's, catheters, IV, Infected plastics	Red		
03.	4	Glass sharps	Blue	264	264 kgs
04.	4	Needles, scalpels, metal sharps	White	169	169 kgs
05.	5	Discarded Medicine, Cytotoxic drugs, Chemical Waste	Black	28.52 (3% of General Waste)	28.52 kgs
	9	Incinerator Ash			
	10	Chemical Waste from production of biological, chemical used in disinfections as insecticides etc.			
Total of Biomedical Waste					1498kgs~ 1500 kgs

Annexure – II



Biomedical Collection vehicle of CHAMP CTF, Gulbarga

Annexure III



SCHEMATIC LAYOUT OF CHAMP COMMON TREATMENT FACILITY, GULBARGA