

Visit to Biomedical Waste Management Plant

Management of Biomedical waste has emerged as an issue of major concern not only to hospitals and nursing home but also to the civic authorities in urban centres. Bio-medical wastes generated from health care units depend upon several factors such as waste management methods, type of health care units, occupancy of healthcare units, specialization of healthcare units, ratio of reusable items in use, availability of infrastructure and resources etc. Government of India has published “The Bio-Medical Waste (Management and Handling) Rules, 1998” on 20th July 1998 under the powers conferred by Sections 6, 8 and 25 of the Environment (Protection) Act, 1986.

Hospital Waste Management is a part of hospital hygiene and maintenance activities. This involves management of range of activities, which are mainly engineering functions, such as collection, transportation, operation or treatment of processing systems, and disposal of wastes. The Centralized system of waste management is the best method in terms of cost reduction and minimizes legal and ethical hassles of health care staff & authority. Through centralized system, the hospital would feel less burden of waste management and might devote more time on development of quality patient care. Common bio-medical waste treatment facility (CBWTF) set up where bio-medical waste, generated from several healthcare facilities, is imparted necessary treatment to reduce all adverse effect that such waste may pose. Installation of individual treatment facilities by small healthcare establishments requires comparatively high capital investment. In addition, it requires separate manpower and infrastructure development for the proper operations and maintenance of treatment systems. The concept of centralized facilities emerged as a necessity since having individual treatment technologies was very difficult even for very large setups. Setting up and running treatment technologies requires space, huge investment, high operation and maintenance charges, technically qualified staff, waste to the maximum capacity of the machine to bring down the per kg treatment cost & monitoring pressure of government reduces etc. In comparison, if the waste from several healthcare establishments is brought at a centralized facility, all the above problems get scaled down the concept of CBWTF not only addresses these problems but also prevents scattering of treatment equipment in the city. Moreover, monitoring these facilities is much easier and one can assure that best and cleanest technologies with adequate pollution control devices are installed. In last few years various centralized facilities have come up all around the country

Therefore, a visit was organised to observe and understand the management of Bio-medical management plant situated in Durgapur, Badnera, Amravati. Visit to such plants are subject to prior permission from Medical officer, Health department, Municipal Corporation office, Amravati. The Bio-medical treatment plant namely Global Eco Save System is a private plant and is managed by a manager and other workers.

Technical Details of the Biomedical Waste Management Plant:

Sources of Biomedical wastes can be divided into major and minor sources, as given in Table below.

Major Sources	Minor Sources
Hospitals, Nursing homes, dispensaries, Pathological Labs., primary health centers, medical colleges and research centers etc.	Physicians, dentist clinics, blood banks etc.

Global Eco Save System collect biomedical waste from 4 districts of Vidarbha. About 2000-3000 kg waste transported to the plant daily from all major hospitals of Vidarbha to the plant site. All the collected waste very first segregated according to the norms at the plant site. The manager explained that the Bio medical waste is broadly categorized into the following categories: 1. Human anatomical waste 2. Animal waste 3. Microbiology and biotechnological waste 4. Waste sharps 5. Discarded medicine and cytotoxic waste 6. Solid waste(contaminated) 7. Solid waste (non-contaminated) 8. Liquid waste 9. Incinerated ash 10. Chemical waste.

The manager described us the method followed for segregation of bio-medical waste. They are segregated in different coloured bags as in red, yellow, blue. Waste from Red and yellow bags are transported to the treatment plant. The vehicle was painted with appropriate colour and symbols.

Waste in yellow bags are mostly human anatomical waste and this bag is not opened. The yellow bag is directly put into incinerator without opening. On the other hand, the red bag contains gloves, tubing and plastics etc as it cannot be burnt, nor it can be buried according to the rules laid by pollution control board. Hence, they are autoclaved and then sent for shredding. In order to prevent reuse of rubber or plastic material after autoclaving of the material, shredding is done.

The plastic and rubber material are shredded into small pieces. These small pieces are sent for recycling.

Blue contains sharps like broken bottles, vials and ampoules etc. these are sent for chemical treatment. Sharps like needles are not put into blue bags. However, needles are put into white tamper proof or puncture proof containers containing 10% hypochlorite solution and water to disinfect it and once the container is full then hospital send it to the BMW plant. Later these sharps are put into sharp pits.

We were informed that many a times segregation is not done as per the BMW guidelines. As in waste coconut shell, paper, fruit peels etc are also put into wrong coloured bags. It is the duty of the doctor or the concerned hospital for proper segregation of the waste and send it to the treatment plant. Black is provided to the hospital to discard general waste in it and send it to municipal corporation.

Incineration Process

Incineration is a high temperature thermal process employing combustion of the waste under controlled condition for converting it into inert material and gases. Incinerators is oil fired in this case 35lit of diesel is required per hour. Incinerators have primary and secondary combustion chambers to ensure optimal combustion. In the incinerator, solid phase combustion takes place in the primary chamber whereas the secondary chamber is for gas phase combustion. These are referred to as excess air incinerators because excess air is present in

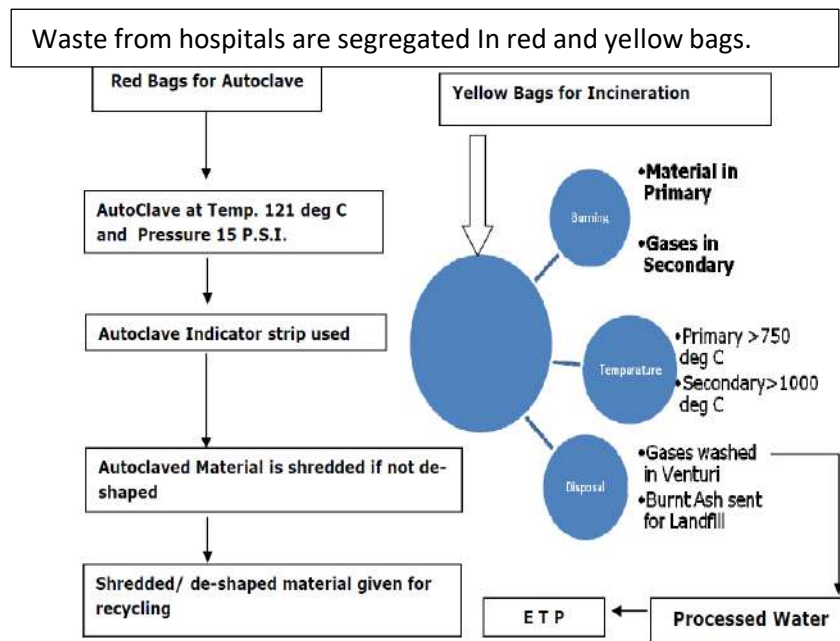
both the chambers. Thus, the waste is incinerated in two stages i.e. the primary chamber where temperature is as high as 850C. around 35lits of diesel is required for burning the waste. Once the temperature reaches 850 C then the burner goes off till temperature starts to drop. The secondary combustion chamber which are positioned adjacent to the primary chamber. The flue gases then pass to secondary chamber where the temperature is about 1050C and are let out to atmosphere via ID fan and 100ft high chimney. Then remaining gases and particles are sent through the high pressure drop Venturi Scrubber, droplet separator. The Primary Combustion Chamber operates under near pyrolytic condition wherein the wastes are decomposed & all volatiles are released. The substrate remaining gets converted into sterile ash. The volatiles released from the Primary Combustion Chamber are then completely burnt in the Secondary Combustion Chamber under high temperature and excess air. Incinerator runs for 7.5 hours a day and around 150 kg of waste is burnt everyday.

Autoclaving Process:

An autoclave is a specialized piece of equipment designed to deliver heat under pressure to a chamber, with the goal of decontaminating or sterilizing the contents of the chamber. Content of the red bags are sent for autoclaving and then for shredding.

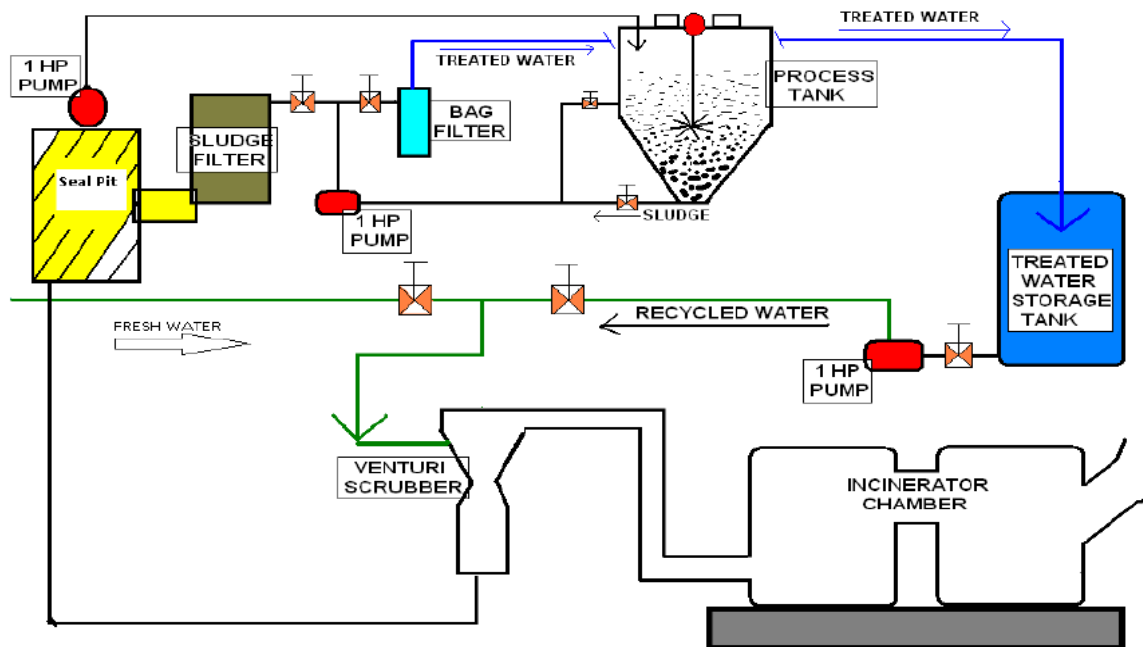
Shredding Process:

Shredding is a process by which wastes are de-shaped or cut into smaller pieces to make the wastes unrecognizable. Shredder has non-corrosive sharp blades capable for shredding of plastic wastes, sharps, bottles, needles, tubing’s, and other general wastes. The low speed two shaft systems is effective for shredding hard and solid wastes.



Water Recycling in Process:

The water discharged from the process of wet scrubbing of fuel gas generated by incinerator will be collected in the seal pit below ground level. The treated water is reused in the venturi scrubber.



FTP WATER RECYCLE SYSTEM

The Ashes and sludge formed by the bio-medical waste plant are further sent to hazardous material treatment plant situated in Butibori, Nagpur.

Since this treatment plant is private it levies minimum charges to various institutes is as given below:

Institutes	Charges
Hospitals	Rs 5.75 per bed per day
Pathology labs	Rs 800 per month
Blood bank	Rs 600 per month
Clinics	Rs 330 per month

Outcome of the visit:

Students were educated about new reforms in the biomedical waste management rules. They could understand in detail how the biomedical waste generated from hospital is segregated and treated. Three major treatment procedures were explained in detail i.e. incineration, autoclaving and shredding.