Ultra Chemistry Vol. 9(2), 229-232 (2013).

Review Paper: Hazardous Medical Waste &Treatment Technologies

K. GOUR

J.L. Chaturvedi College of Engg. Nagpur (INDIA)
846, new Nandanvan, Nagpur
gourkavita@yahoo.com

(Acceptance Date 26th July, 2013)

Abstract

Hospital waste is highly infectious and can be a serious threat to human health if not managed scientifically in discriminated manner. Public concern over disposal and treatment of medical waste has resulted in increasing regulation and court actions. The generators include hospitals, clinics medical research facilities. Hospitals, other health care units & research facilities in our country produce million of tons of waste every year. This waste is often mixed with municipal waste, dumped in landfills where it can contribute to environmental pollution. Government & public hospitals should act as the leaders model in demonstrating safe disposal of medical waste.

Key words: Waste, land filling,

Introduction

Hospitals, healthcare units, maternity, nursing homes & research facilities produce large quantity of hazardous waste. This includes human anatomical waste, discarded medicines, disposable etc. Hospital waste is highly infectious & can be a serious threat to human health if not managed in scientifically and discriminated manner. Public concern over disposal. The treatment of medical waste has resulted in increasing regulation & court actions. Hospitals, other health care units &research facilities in our country produce million of tons of waste every year. Almost 1 kg waste is infectious out of 4 kg waste. This waste is often mixed with municipal waste. Dumped in landfills where it can contribute to environmental pollution[1].

Types of Medical waste:

General Waste: Which is not potentially dangerous does not required special handling & disposal.

Hazardous waste: Which require special handling treatment & disposal usually according to specific regulations &guideline. There are three categories of hazardous waste.

(1) Chemical waste
(2) Infectious waste

(3) Radioactive waste

Typical Hospital Waste Components

S.No	Type of waste	Approximate Composition (%)
1	Paper &clothes	50-65
2	Plastics	20-60
3	Glassware	10-20
4	Fluids	1-10

Present scenario of hospital waste:

In many hospitals medical waste is burnt at dumpsites in open environment. Landfills are used to dump contaminated &toxic waste. The residue materials of incinerators Landfills are not designed properly& can pollute ground water. Many hospitals provide contract to private agencies for the disposal of their waste. Sometimes it is not properly destroyed by these agencies[2].

Medical waste treatment technology:

Incineration: Incineration is an industrial process designed to reduce unwanted materials to simple solid & gaseous residues. It is a process of controlled burning of the waste at high temperature (850 C) in presence of air. It is an alternative for land filling, it provides an efficient means for energy recovery. It releases number of toxic chemicals in the atmosphere. Before incineration it is better to remove batteries coating metals plastic containing chlorine. Removal of plastic will reduce emission of dioxin &poly chlorinated biphenyls. Most of the large hospital in Delhi have provided incineration facility and in some cases autoclaving facilities but this facilities are close to residential areas and positional environmental hazardous however medium and the small hospitals, nursing homes have not provided such facilities[2].

Plasma torch: A plasm torch is a device for generating a directed flow of plasma. Plasma jet can be used for applications including plasm cutting, plasm spraying, plasma arc waste disposal.

Thermal Plasma DC torches:Thermal plasmas are generated in plasma torches by direct current (DC) alternating current (AC), Radiofrequency (RF) other discharges. DC torches are most commonly used, researched when compared to AC:there is less flicker generation &noise, a more stable operation, better control, a minimum of two electrodes, lower electrode consumption, slightly lower wear & power consummation. In a DC torch, the electric arc is formed between the electrodes & the thermal plasma is formed from the continual input of Carrier /working gas, projecting output as a plasma jet/flame. In DC torches, the carrier gas can be, for example, either oxygen, nitrogen, argon, helium, air, hydrogen. The flow rate of the carrier gas can be raised to promote a larger, more projecting plasma jet, provided that the arc current is sufficiently increased[3].

Plasma gasification technologies: Plasma paralysis is a state-of-the-art technology for safe disposal of medical waste. It is an environment friendly technology, which converts organic waste into commercially useful by-products. The intense heat generated by the plasma enables it to dispose all types of waste including municipal solid waste, biomedical waste and hazardous waste in a safe and reliable

manner. Medical waste is paralyzed into CO, H_2, and hydrocarbons when it comes in contact with the plasma-arc. These gases are burned and produce a high temperature (around 1200°C). In the plasma paralysis process, the hot gases are quenched from 500° to 70°C to avoid recombination reactions of gaseous molecules that inhibit the formation of dioxins and furans. The gas analysis results reveal that toxic gases found after the combustion are well within the limit of the Central Pollution Control Board's emission standards. The plasma environment kills thermally-stable bacteria[4].

Advantages of Plasma pyrolysis:

Segregation of chlorinated waste is not essential in this process. Another advantages of plasma pyrolysis is reduction in volume of organic matter.plasm pyrolysis facilities burn the waste without producing any harmful residuals in plasma pyrolysis the quantity of toxic residue (Dioxan&furan) is much below the accepted emission standards & it does not require segregation of hazardous waste. In addition, the pathogens are completely killed & there is a possibility to recover energy.

Non incineration method: Autoclave &hydroclave are commonly used to sterilize waste. Which at a latter stage is burnt in incinerators both these techniques employ steam sterilization with direct & indirect heating methods.Micowave disinfection is a non incineration process that is used for sterilization of medical waste? The disadvantages of the process are that the reduction of waste volume is very less. Micowave technique also requires high investment.

Treatment technologies Comparison

	Treatment Technologies				
	Incinerations	Autoclave	Microwave	Chemical Disinfection	Plasma pyrolysis
Investment/operating cost	High	Moderate	High	Low	High
Suitability of waste	Not for radioactive	All except pathological	All except cytotoxic, radioactive	Liquid waste	All
Ease of operation	No	Yes	Yes	Yes	No
Waste volume reduction	Significant	Less	Significant		Significant
Odor problem	Yes	Slight	Slight	Slight	-
Environmental Friendly	No	Less	Less	No	Yes

Conclusion

The fundamental objective are ensured that all Hospitals, health care units &research facilities that use hazardous material and chemical, dispose of their waste in properly control manner.Hazordous waste disposal companies are also expected to offer support to hospitals in formulating a good system for dealing with the amount of medical waste generated. It would include training of medical staff on how to handle medical wastes properly & tips on how to segregate different categories of medical waste from another. There is need to establish of better communication &sharing information about the risks from medical waste among all shareholders (hospitals, other medical facilities, community & public) is very important. Government & public hospital should act as leaders& models in demonstrating safe disposal of medical waste.

References

1. www.epa.gov/osw/nonhaz/industrial/medical/mwpdfs/usps.pdf
2. www.eippcb.jrc.es/reference/BREF/wi_brief_0806.pdf
3. Huang H. and Tang L.tratment of organic waste using thermal pyrolysis technology, *Science Direct, 48,* 1331-37 (2007).
4. Nema S.K. and Ganeshprasad K.S. plasma pyrolysis of medical waste *Current Sciences* Vol. *83,* No. *3,* 272-278 (2002).