Nature & Environment
Vol. 19 (2), 2014: 195-198
Website: www.natureandenvironment.com

ISSN (Print) : 2321-810X
ISSN (Online) : 2321-8738

RESEARCH ARTICLE

Medical Waste Disposal: Incineration and Non Incineration Technology their Effects and prospects

Ranjana Verma
Department of zoology, B.L.P. Govt. P.G. College, MHOW (India)
Email: ranjana_verma3@yahoo.com

Received: 9th June 2014, Revised: 21st June 2014, Accepted: 20th June 2014

ABSTRACT

Safe disposal of medical waste is one of the major environmental issues. Medical waste consists of infectious and other general waste. Incineration technology is most common and routine practice in disposal of medical waste it reduce huge amount of waste in to small volume and finally converted into ash. Medical waste incinerator generate air and soil pollution and are major source of dioxins and furans which pose burden over environmental and human health. In present study we discuss alternative or non incineration waste disposal techniques; that is environmental friendly, economically cheap and useful. Although no one technology offers a panacea to the problem of medical waste disposal but other alternative waste disposal technique can control pollution through incineration unit at some extent.

Key Words: *Medical waste disposal, incineration technology, environmental threats, solution*

INTRODUCTION

Medical waste disposal is a serious and growing problem though out the world. Commonly medical waste is referred as bio waste because it generate from biological sources or is used in the diagnosis, prevention, or treatment of disease. The sustainable management of medical Waste has continued to generate increasing public interest due to the health problems associated with exposure of human beings to potentially hazardous waste arising from hospitals (Tudor *et al*., 2005; Ferreira 2003; Da Silver *et al.*, 2005). Medical waste constitutes variety of waste including infectious and general waste. Since general waste is not defined as hazardous or potentially dangerous wastes, it does not require special handling, treatment, and disposal (CEC, 1993; Hasselriis and Constantine, 1992). Infectious waste needs special attention because it contains chemical waste, pathogenic waste and radioactive waste.

There are many technologies for the treatment of medical wastes (Park and Jeong, 2001; Yoon, 2001; MWC 1994; CEC 1993). According to the treatment studies of medical wastes, about 59–60% of medical waste are treated through incineration, 37–20% by steam sterilization, and 4–5% by other treatment methods (Park and Jeong, 2001; Hyland *et al.*, 1994).

Incineration technology a high temperature thermal process employing combustion of the waste under controlled condition for converting them into inert material and gases. This method is useful for disposal of residue of both solid waste management and solid residue from waste water management. This process reduces the volumes of solid waste to 20 to 30 percent of the original volume. Incineration and other high temperature waste treatment systems are sometimes described as "thermal treatment". Incinerators convert waste materials into heat, gas, steam and ash. Ash is regularly dumped into a landfill where it is rarely or insufficiently covered with inert material, and ground water pollution through leaching is common (WHO 1994). Medical waste includes significant quantities of chlorine containing wastes, such as polyvinyl chloride (PVC) or disinfectants, and it might be incinerated with status lacking proper controls and emission reduction devices. Therefore, incineration of medical waste might produce dioxins and furans known as hazardous pollutants (Alvim Ferraz *et al.*, 2000).

There are some advantages of incineration technology-

1. Significant volume and weight reduction of waste.
2. assured destruction, sterilization.
3. ability to manage most types of waste with little processing before treatment.
4. Suitable for all types and large quantity of waste.
5. The waste is completely destroyed.
6. In dual-chamber incinerator Micro-organisms and all types of organic waste (liquid and solid) are completely destroyed.

The disadvantage includes-

1. Relatively high operating and maintenance costs.
2. Increased cost associated with controlling pollution emission; the more sophisticated the emission control system, the higher the costs.
3. Requires electricity, highly skilled staff, and fuel.
4. Potential pollution risks associated with incineration processes.
5. Emitted pollutants include dioxins (polychlorinated dibenzo-p-dioxins) and furans (dibenzofurans), pathogens, metals, acid gases eg. Nitrogen oxides, sulfur dioxides and hydrogen chloride.
6. Unsafe and improper land filling of ash containing toxic residues may contaminate soil and water also after leaching.

Non-incineration technologies have its advantages and disadvantages, and any single technology cannot offer a panacea because of the complexity of medical waste disposal. Although non- incineration treatment of medical waste can avoid the release of dioxins and furans, it is still necessary to decide how to best meet the medical waste management needs while minimizing the burden on the environment and public health. There is still a long way to go to establish the sustainable application and management mode of non-incineration technologies.

MATERIAL AND METHOD

Present research paper is designed to find out safer alternative mode of medical waste disposal. Here we compare incineration technology and non incineration waste disposal technology with reference to pollution, cost and handling.

NON INCINERATION WASTE DISPOSAL TECHNIQUES

Alternative technologies are being studied for medical waste disposal. Non incineration waste disposal method can be classified in following manner. Thermal processes are those that depend on heat (thermal energy) to destroy pathogens in the waste. It includes autoclave and retorts, microwave disinfection, dry heat system, depolymerization. pyrolysis, dielectric heating, bio-oxidizer, laser waste destruction, radiofrequency irradiation, encapsulation, shredders etc. Thermal disposal techniques can treat cultures and stocks, sharps, materials contaminated with blood and limited amounts of fluids, isolation and surgery wastes, laboratory wastes (excluding chemical waste), and soft wastes from patient care. If proper precautions are taken to exclude hazardous materials, the emissions from thermal processes are minimum. Capital costs are relatively low compared to other non-incineration technologies. Chemical waste disposal processes treated waste through chlorine and non chlorine based system.

Since past, the most common chemical disinfectant for treating medical waste was chlorine because of the ability of chlorine and hypochlorite to inactivate a broad range of microorganisms. Recently, non-chlorine chemical disinfectants have been introduced in to the market, such as peroxyacetic acid, glutaraldehyde, sodium hydroxide, ozone gas, and calcium oxide. Some of these are commonly used in disinfecting medical instruments. Chemical waste disposal can treat wide range of medical waste includes cultures and stocks, sharps, liquid human and animal wastes including blood and body fluids, isolation and

surgery wastes, laboratory waste (excluding chemical waste), and soft wastes (gauze, bandages, drapes, gowns, bedding, etc.) from patient care.

Lastly we discuss irradiation and biological treatment system, here ionizing radiations are used for e.g. x-rays and gamma rays also known as e beam technology it can treat cultures and stocks, sharps, materials contaminated with blood and body fluids, isolation and surgery wastes, laboratory waste (excluding chemical waste), and soft wastes (gauze, bandages, drapes, gowns, bedding, etc.) from patient care.

DISCUSSION

Incineration technology is most common and routine practice in developing countries**.** Reason to find alternative mode of incineration is high cost, emission of ash contains dioxin and furan most toxic substances which causes health hazards. Dioxins have been linked to cancer, immune system disorders, diabetes, birth defects and disrupted sexual development (cole, 1997).

The toxic ash residues sent to landfills for disposal have the potential to leach into groundwater. Medical waste has been identified by US Environmental Agency as the third largest known source of dioxin air emission (Emmanuel *et al.,* 2001). The intention here is to identify those pollutants of primary concern in medical waste incineration because of their potential human health and environment impact.

There are many technologies are available to dispose medical waste, out of which some are safe and having low cost in comparison to incineration technology. They are classified under thermal, chemical, biological and irradiation waste disposal techniques.

Out of which microwave and autoclave disinfection method is comparatively safe and cheap. Due to significant environmental advantages, autoclave system has over incineration, and its simpler operation and maintenance processes, the autoclave system is the logic option for treatment of hospital wastes in Isfahan (Ferdowsi *et al.,* 2013).

CONCLUSION

Incineration technology shows disadvantage that may affect environment actively by air, soil and water pollution. There is urgent need to move at safer side. Improper landfills and leaching of ash may contaminate soil water. Comparatively non incineration waste management techniques are more reliable and safer. Although no one technology offers a panacea to the problem of medical waste disposal but other alternative waste disposal technique can control pollution through incineration unit at some extent.

In order to achieve best technology it must fulfils certain criteria like it must have huge capacity, versatile handling of waste, microbial inactivation capacity, safe environmental emission, small set up, significant waste volume and weight reduction, occupational safety and health and lastly it must be at low cost.

REFERENCES

1. Alvim Ferraz M.C.M., Barcelos Cardoso J.I. and Ribeiro Pontes S.L. (2000): Concentration of atmospheric pollutants in the gaseous emissions of medical waste incinerators. *J. Air and Waste Manage. Assoc*., 50: 131-136.
2. Citizens Environmental Coalition (CEC) (1993): Managing Medical Waste, *CEC Fact Sheet 6*. Albany, New York, 12210.
3. Cole E. (1997): Application of Disinfection and Sterilization to Infectious Waste Management. *North Carolina Board of Science and Technology.*
4. Da Silva C.E., Hoppe A.E., Ravanello M.M. and Mello N. (2005): Medical waste management in the south of Brazil. *Waste Manage*, 25: 600-605.
5. Emmanuel J., Puccia C.J. and Spurgin R.A. (2001): Non-incineration medical waste treatment Technologies. *Health Care without Harm,* Washington, DC.
6. Ferdowsi A., Masoud F. and Mehrani M.J. (2013): Incineration or Autoclave? A Comparative Study in Isfahan Hospitals Waste Management System (2010). *Mat Soc Med*., 25(1): 48-51.
7. Ferreira A.P. and Veiga M.M. (2003): Hospital waste operational procedures: A case study in Brazil. *Waste Manage. Res*., 21: 377-382.
8. Hasselriis F. and Constantine L. (1992): Characterization of Today's Medical Waste, Medical Waste Incineration and Pollution Prevention. *Van Nostrand Reinhold, Green, A.E.S. (Ed.),* New York: 37–52.

9. Hyland R.G., Drum D.A. and Bulley M. (1994): Disposal medical wastes. *87th Annual Meeting and Exhibition, Air & Waste Manage Assoc.*, Paper No. 94-RP-123B.02, Cincinnati, OH, 19–24 June.
10. Medical Waste Committee (MWC) (1994): Medical waste disposal. *J. Air & Waste Manage. Assoc.,* 44: 1176–1179.
11. Park H.S. and Jeong J.W. (2001): Recent trends on disposal technologies of medical waste. *J. Korean Solid Wastes Engineering Soc.*, 18(1): 18–27.
12. Tudor T.L., Noonan C.L. and Jenkin L.E.T. (2005): Healthcare waste management: A case study from the Cornwall NHS*, UK. Waste Manage.*, 25: 606-615.
13. Yoon O.S. (2001): Disposal measures and problems of medical waste. *J. Korean Solid Wastes Engineering Soc.,* 18(1): 1-12.