

Solid Waste Management: Treatment & Disposal process

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ABSTRACT

Solid waste management is the process in which we deals with reduction in the volume of solid waste production , recycling of waste products, collection of solid waste, treatment of hazardous solid waste, and then final disposal of solid waste. In this paper, an attempt is made to evaluate the major parameters of MSWM, in addition to a comprehensive review of MSW generation, its characterization, collection, and treatment options as practiced in India. The current status of MSWM in Indian states and important cities of India is also reported. The study concludes that installation of decentralized solid waste processing units in metropolitan cities/towns and development of formal recycling industry sector is the need of the hour in developing countries like India. Domestic, industrial and other wastes, whether they are of low or medium level wastes, they are causing environmental pollution and have become perennial problems for mankind.

KEYWORDS – Solid waste, onsite handling, solid waste collections, disposal methods, reuse, recycle.

1. INTRODUCTION

Solid waste management is a discipline associated with the control of generation, storage, collection, transfer, and transport, processing and disposal of solid waste in a manner that is in accordance with the best principal of public health, economic, conservation and other environmental consideration responsive to public attitude.

1.1 Solid Waste Generation: - Municipal solid waste can be classified into garbage, rubbish/trash, ashes and bulky wastes. Garbage comprises waste from preparing, cooking and serving food, and market wastes from the handling, storage and sale of food. Rubbish and trash includes paper, cartons, boxes, barrels, wood, tree branches, yard trimmings, metals, tin cans, glass, crockery and minerals. Ashes include residues from fuel and the combustion of solid wastes, while bulky wastes includes wood furniture, bedding, packing material, metal furniture and rubber tires

At times the "highly polluting" unprocessed solid waste in the dump sites reaches 3 crore MT. The solid waste in landfill sites and the uncollected trash - of the total 5.4 crore MT of solid waste generated annually - 4.5 crore MT are unprocessed. The Ministry of Environment, Forests and Climate Change (MoEFCC) provided the details of the ever-growing garbage citing a 2016-17 report by the Ministry of Housing and Urban Affairs.

1.2 CLASSIFICATIONS

Some of the major various classification of solid waste is as follows:

1. Municipal Waste 2. Domestic I Residential Waste 3. Commercial Waste 4. Garbage 5. Rubbish 6. Institutional Waste 7. Ashes 8. Bulky Wastes 9. Street Sweeping 10. Dead Animals 10. Dead Animals 11. Construction and Demolition Wastes 12. Industrial Wastes 13. Hazardous Wastes 14. Sewage Wastes 15. Biomedical/Hospital Waste 16. Plastics.

A comprehensive classification of wastes is described below (Manual on Municipal Solid waste Management, 2000). The classification of solid wastes, their sources and description are given in Table

Types of solid waste	Description	Sources
Food waste (garbage)	Wastes from the preparation, cooking & serving of food. market reuse, waste from the handling storage, & sale of meat & vegetables	Households, institutions, & commercials such as hotels, stores, restaurants, markets etc.
Rubbish	Combustible (primary organic), paper, cardboard, cartons, wood, boxes, plastics, rags, cloth, bedding, leather, rubber, grass, yard trimmings. Noncombustible(inorganic) metals, tin cans, metal foils, dirt, stones, bricks, ceramics, crockery, glass bottles, other mineral reuse.	
Ashes & residues	Residue from fires used for cooking & for heating buildings, cinders, clinkers, and thermal power plants.	
Bulky wastes	Large auto parts, tyres, stoves, refrigerators, other large appliances, furniture, large crates, trees, branches, palm fronts, stumps, floatage.	
Street waste	Street sweepings, dirt, leaves, catch basin dirt, animal droppings, contents of litter receptacles, dead animals.	Streets, side walks, alleys, vacant lots etc.
Dead animals	Small animals: cats, dogs, poultry, etc. large animals: horses, cows etc.	
Construction & demolition waste	Lumber, roofing & sheathing scraps, crop residues, broken concrete, rubble, plaster, conduit, pipe, wire, insulation etc.	Construction & demolition sites, remodeling, repairing sites
Industrial waste & sludge	Solid waste resulting from industry processes & manufacturing operations, such as food processing wastes, boiler house cinders, wood, plastic & metal scraps & shaving etc. effluent treatment plant sludge of industries & sewage treatment plant sludges, coarse screening, grit & septic tank.	Factories, power plants, treatment plants, etc.
Hazardous wastes	Hazardous wastes, pathological wastes, explosives, radioactive materials, toxic wastes etc.	Households, hospitals, institutions, stores, industry etc.

2. ONSITE HANDLING AND PROCESSING

These refer to the activities associated with handling of solid waste. Onsite means these functions are concerned with solid waste at the place where the waste is generated. For residential waste this means at home in the household. Onsite handling is the very first step in waste management. Onsite storage means the temporary collection of waste at the household level. It is important that waste is stored in proper containers. These could be baskets, preferably made from locally available materials, plastic buckets or metal containers

3. SOLID WASTE COLLECTION

Collection of solid waste (by external stakeholders) from its various sources or from communal storage facilities, and transportation of this waste to the place of final disposal is the largest cost element in most municipal solid waste management systems, accounting for 60–70 per cent of costs in industrialized countries, and 70–90 per cent of costs in developing and transition countries (IETC, 1996)

Basic Collection Scheme • Based on the availability of service

1. Communal system 2. Block Collection 3. Kerbside/alley 4. Door to door collection



4. PROCESSING AND DISPOSAL

It is often desirable to use an integrated approach to solid waste management that includes components of recycling, composting, incineration and land filling. All of these are often proposed as the solution. Both composting and incineration leave substantial amounts of waste that must be land filled. By far the most common method of disposal is land filling, as it is apparently the cheapest and easiest (Lema et al., 1988).

The various methods used for processing and disposal of solid waste materials-

- Open burning
- Dumping into the sea
- Sanitary Landfills
- Incineration
- Composting
- Ploughing in fields
- Hog feeding
- Grinding and discharging into sewers
- Salvaging
- Fermentation and biological digestion

From the above methods the most common used methods are following as-

4.1 Land filling

Site selection for landfill 1. In areas falling under the jurisdiction of „Development Authorities“ it shall be the responsibility of such Development Authorities to identify the landfill sites and hand over the sites to the concerned municipal authority for development, operation and maintenance. Elsewhere, this responsibility shall lie with the concerned municipal authority. 2. Selection of landfill sites shall be based on examination of environmental issues. The department of urban development of the state or the union territory shall co-ordinate with the concerned organizations for obtaining the necessary approvals and clearances. 3. The landfill site shall be planned and designed with proper documentation of a phased construction plan as well as a closure plan. 4. The landfill sites shall be selected to make use of nearby wastes processing facility. Otherwise, wastes processing facility shall be planned as an integral part of the landfill site. 5. The existing

landfill sites which continue to be used for more than five years shall be improved in accordance of the specifications given in the Schedule.



Figure: A Typical Sanitary Landfill for Solid Waste

4.2 Incineration

Incineration is "the process of reducing combustible waste to an inert residue by high temperature burning". It is not a complete method of solid waste disposal; the by-products of combustion are ash and gases, including noxious gases, particles and heat energy. The main advantage of incineration compared with other methods of waste treatment and disposal is the large reduction in the volume of material requiring final disposal

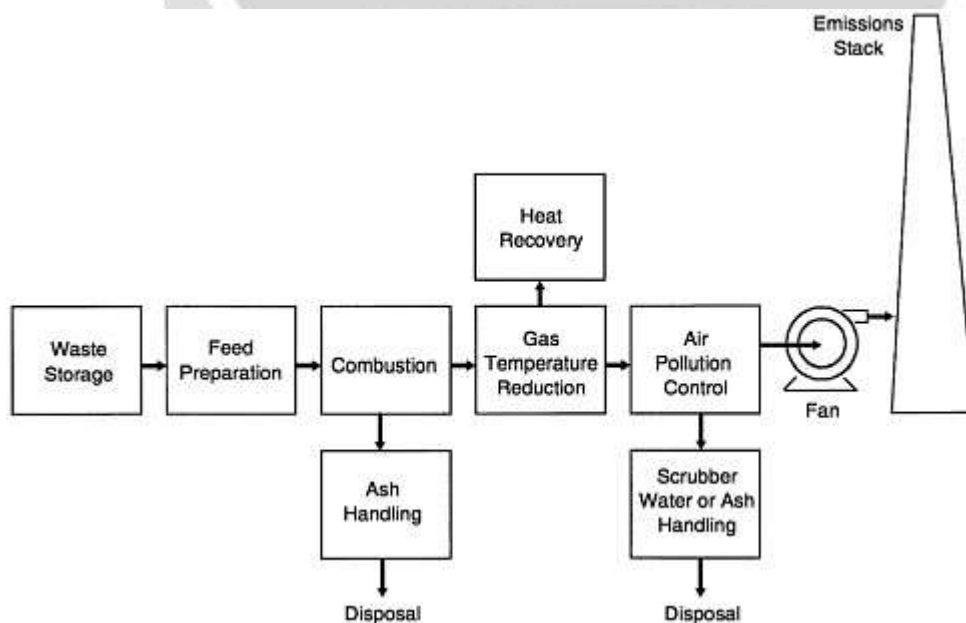


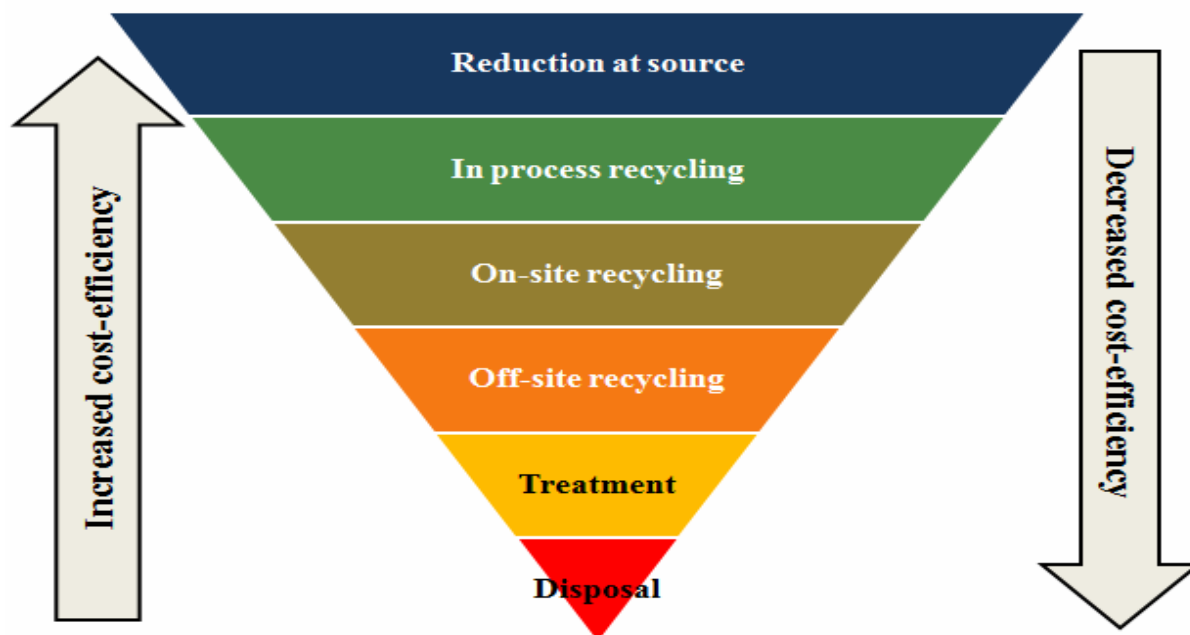
Figure: Incineration waste system

4.3 COMPOSTING

Composting, one of the oldest forms of disposal. It is the natural process of decomposition of organic waste that yields manure or compost, which is very rich in nutrients. Composting is a biological process in which micro-organisms, mainly fungi and bacteria, convert degradable organic waste into humus like substance

5. RECYCLING AND REUSE OF SOLID WASTE

Recycling is a significant way to keep large amounts of solid waste out of landfills, conserve resources, and save energy. Recycling is the recovery and reuse of materials from wastes. Solid waste recycling refers to the reuse of manufactured goods from which resources such as steel, copper, or plastics can be recovered and reused.



6. CONCLUSION

As we see that the population is increasing day by day and the usage of materials or the daily needs are also increasing as per the demand or population growth. The solid waste are simultaneously increasing as per the usage of materials by the peoples. So we have to manage this solid waste and if it's possible we have to reuse or recycle it. This paper gives the methods or ideas for handling the solid waste on site or managing it on a specified site by various methods. We have to be very aware on handling the solid waste and it should be resolved by the given methods. Solid waste also effects our environment in various aspects so it's very necessary to handle it in very proper way.

REFERENCES

- 1) K. Hadjibiros, D Dermatas, "Municipal Solid waste mgmt. & landfill site selection in Greece; Irrationality Versus efficiency" *Globel Nest Journal* 13(2),150-161, 2011.
- 2) P. sylim , " Handling of solid waste in Vietnam" <http://www.vncold.vn>. R. K. Kausal , G. K..Varghese ," Municipal solid waste management in India current state and future challenges." *International Journal of Engg. Science & Technology*, 4 (4), 2012.
- 3) R Ajay Kumar Varma, "Technology options for treatment for municipal solid waste with special reference to Kerala." [http:// www.sanitation .Kerala .gov.in /pdf workshop/technoz.pdf](http://www.sanitation.Kerala.gov.in/pdf/workshop/technoz.pdf)
- 4) M. Saleh A. Ansari, "Municipal Solid waste mgmt system in the Kingdam of Bahrain; " *International Journal of Water Resurces and Environmental Engg.* 4 (5),150-161,2012.
- 5) U. Arena, "Process & technological aspect of municipal solid waste gasification- A review." *Journal of waste management*, 32,- 2012, pp-625-639.

- 6) A. Babalola, I. Basu, "Selection of Landfill sites for solid waste Treatments in Damaturu Town using GIS Techniques ." *Journal of Environmental Protection*, 2011,2,1-10.Ministry of Health & Family Welfare. Government of India. Report of the Steering Committee on Air Pollution and Health Related Issues. 2015.
- 7) M. Saleh A. Ansari, "Municipal Solid waste mgmt system in the Kingdom of Bahrain; " *International Journal of Water Resources and Environmental Engg.* 4 (5),150-161,2012.Kulshreshtha P, Khare M. Indoor exploratory analysis of gaseous pollutants and respirable particulate matter at residential homes of Delhi, India. *Atmos Pollut Res.* 2011;2(3):337–50.
- 8) O. Schwarz-Herion, A. Omran, H. Rapp, "A case study on successful municipal solid waste management in industrialized countries by the examples of Karesrule city." *Journal of Engg annals of Faculty of Engg. Hunedoara-2008 Fascicule 3 ,(ISSN-1584-2873.*
- 9) Central Pollution Control Board "Consolidated Annual Review Report on Implementation of Solid Wastes Management Rules, 2016." (2017).
- 10) Central Pollution Control Board. "Status Report on Municipal Solid Waste Management." (2011).
- 11) CSIR – National Chemical Laboratory. "PET Recycling in India." (2017). Accessible at: petrecycling.in
- 12) International Solid Waste Alliance. "Waste and Climate Change." *ISWA White Paper* (2009). Accessible at: iswa.org
- 13) Ministry of Environment and Forests. "Municipal Solid Wastes (Management and Handling) Rules, 2000." (2000). Accessible at: moef.nic.in
- 14) Ministry of Environment, Forests and Climate Change. "Solid Waste Management Rules, 2016." (2016). Accessible at: moef.gov.in
- 15) National Institute of Urban Affairs. "Urban Solid Waste Management in Indian Cities." *PEARL Compendium of Good Practices* (2015). Accessible at: pearl.niua.org
- 16) Sharholy M., et al. "Municipal solid waste management in Indian cities – A review." *Waste management* 28.2 (2008): 459-467
- 17) US Environmental Protection Agency. "Solid Waste Management and GHGs - A Life-Cycle Assessment of Emissions and Sinks, 3/e." (2006). Accessible at: nepis.epa.gov
- 18) Zhu D, Asnani P.U., et. al. "Improving Municipal Solid Waste Management in India: A Sourcebook for Policy Makers and Practitioners." *WBI Development Studies, World Bank* (2008). Accessible at: openknowledge.worldbank.org