

SOLID WASTE MANAGEMENT

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ABSTRACT

Waste management is the "generation, prevention, characterization, monitoring, treatment, handling, reuse and residual disposition of solid wastes". There are various types of solid waste including municipal (residential, institutional, commercial), agricultural, and special (health care, household hazardous wastes, sewage sludge). The term usually relates to materials produced by human activity, and the process is generally undertaken to reduce their effect on health, the environment or aesthetics.

Key words: *Hazardous Waste, Municipal Solid Waste, Sewage Sludge.*

I. INTRODUCTION

Solid waste is the unwanted or useless solid materials generated from combine residential, industrial and commercial activities in a given area. It may be categorized according to its origin (domestic, industrial, commercial, construction or institutional); according to its contents (organic material, glass, metal, plastic paper etc); or according to hazard potential (toxic, non-toxic, flammable, radioactive, infectious etc). Management of solid waste reduces or eliminates adverse impacts on the environment and human health and supports economic development and improved quality of life. A number of processes are involved in effectively managing waste for a municipality. These include monitoring, collection, transport, processing, recycling and disposal.[1][2][3]

II. REDUCE, REUSE, RECYCLE

Methods of waste reduction, waste reuse and recycling are the preferred options when managing waste. There are many environmental benefits that can be derived from the use of these methods. They reduce or prevent greenhouse gas emissions, reduce the release of pollutants, conserve resources, save energy and reduce the demand for waste treatment technology and landfill space. Therefore it is advisable that these methods be adopted and incorporated as part of the waste management plan.

2.1 Waste Reduction and Reuse

Waste reduction and reuse of products are both methods of waste prevention. They eliminate the production of waste at the source of usual generation and reduce the demands for large scale treatment and disposal facilities. Methods of waste reduction include manufacturing products with less packaging, encouraging customers to bring their own reusable bags for packaging, encouraging the public to choose reusable products such as cloth napkins and reusable plastic and glass containers, backyard composting and sharing and donating any unwanted items rather than discarding them. All of the methods of waste prevention mentioned require public participation. In order to get the public onboard, training and educational programmes need to be undertaken to educate the public about their role in the process. Also the government may need to regulate the types and

amount of packaging used by manufacturers and make the reuse of shopping bags mandatory.

2.2 Recycling

Recycling refers to the removal of items from the waste stream to be used as raw materials in the manufacture of new products. Thus from this definition recycling occurs in three phases: first the waste is sorted and recyclables collected, the recyclables are used to create raw materials. These raw materials are then used in the production of new products. The sorting of recyclables may be done at the source (i.e. within the household or office) for selective collection by the municipality or to be dropped off by the waste producer at a recycling centres. The pre-sorting at the source requires public participation which may not be forthcoming if there are no benefits to be derived. Also a system of selective collection by the government can be costly. It would require more frequent circulation of trucks within a neighborhood or the importation of more vehicles to facilitate the collection. Another option is to mix the recyclables with the general waste stream for collection and then sorting and recovery of the recyclable materials can be performed by the municipality at a suitable site. The sorting by the municipality has the advantage of eliminating the dependence on the public and ensuring that the recycling does occur. The disadvantage however, is that the value of the recyclable materials is reduced since being mixed in and compacted with other garbage can have adverse effects on the quality of the recyclable material.

III. WASTE COLLECTION

Waste from our homes is generally collected by our local authorities through regular waste collection, or by special collections for recycling. Within hot climates such as that of the Caribbean the waste should be collected at least twice a week to control fly breeding, and the harboring of other pests in the community. Other factors to consider when deciding on frequency of collection are the odours and the accumulated quantities.

IV. TREATMENT & DISPOSAL

Waste treatment techniques seek to transform the waste into a form that is more manageable, reduce the volume or reduce the toxicity of the waste thus making the waste easier to dispose of. Treatment methods are selected based on the composition, quantity, and form of the waste material. Some waste treatment methods being used today include subjecting the waste to extremely high temperatures, dumping on land or land filling and use of biological processes to treat the waste.

4.1 Thermal Treatment

This refers to processes that involve the use of heat to treat waste. Listed below are descriptions of some commonly utilized thermal treatment processes.

4.2 Incineration

Incineration is the most common thermal treatment process. This is the combustion of waste in the presence of oxygen. After incineration, the wastes are converted to carbon dioxide, water vapor and ash. This method may be used as a means of recovering energy to be used in heating or the supply of electricity

4.3 Pyrolysis and Gasification

Pyrolysis and gasification are similar processes they both decompose organic waste by exposing it to high

temperatures and low amounts of oxygen. Gasification uses a lowoxygen environment while pyrolysis allows no oxygen. These techniques use heat and an oxygen starved environment to convert biomass into other forms

V. DUMPS AND LANDFILLS

5.1 Sanitary Landfills

Sanitary Landfills are designed to greatly reduce or eliminate the risks that waste disposal may pose to the public health and environmental quality. They are usually placed in areas where land features act as natural buffers between the landfill and the environment. These landfills present the least environmental and health risk and the records kept can be a good source of information for future use in waste management, however, the cost of establishing these sanitary landfills are high when compared to the other land disposal methods.

5.2 Controlled Dumps

Controlled dumps are disposal sites which comply with most of the requirements for a sanitary landfill but usually have one deficiency. They may have a planned capacity butno cell planning, there may be partial leachate management, partial or no gas management, regular cover, compaction in some cases, basic record keeping and they are fenced or enclosed.

VI. BIOLOGICAL WASTE TREATMENT

6.1 Composting

Composting is the controlled aerobic decomposition of organic matter by the action of micro organisms and small invertebrates. There are a number of composting techniques being used today. These include: in vessel composting, windrow composting, vermin composting and static pile composting. The process is controlled by making the environmental conditions optimum for the waste decomposers to thrive. The rate of compost formation is controlled by the composition and constituents of the materials i.e. their Carbon/Nitrogen (C/N) ratio, the temperature, the moisture content and the amount to fair. The C/N ratio is very important for the process to be efficient. The micro organisms require carbon as an energy source and nitrogen for the synthesis of some proteins. If the correct C/N ration is not achieved, then application of the compost with either a high or low C/N ratio can have adverse effects on both the soil and the plants. A high C/N ratio can be corrected by dehydrated mud and a low ratio corrected by adding cellulose. Moisture content greatly influences the composting process. The microbes need the moisture to perform their metabolic functions. If the waste becomes too dry the composting is not flavored. If however there is too much moisture then it is possible that it may displace the air in the compost heap depriving the organisms of oxygen and drowning them.

6.2 Anaerobic Digestion

Anaerobic digestion like composting uses biological processes to decompose organic waste. However, where composting can use a variety of microbes and must have air, anaerobic digestion uses bacteria and an oxygen free environment to decompose the waste. Aerobic respiration, typical of composting, results in the formation of Carbon dioxide and water. While the anaerobic respiration results in the formation of Carbon Dioxide and methane. In addition to generating the humus which is used as a soilen hancer, Anaerobic Digestion is also used as a method of producing biogas which can be used to generate electricity.

6.3 Integrated Solid Waste Management

Integrated Solid Waste Management (ISWM) takes an overall approach to creating sustainable systems that are economically affordable, socially acceptable and environmentally effective. An integrated solid waste management system involves the use of a range of different treatment methods, and key to the functioning of such a system is the collection and sorting of the waste.[4][5] It is important to note that no one single treatment method can manage all the waste materials in an environmentally effective way. Thus all of the available treatment and disposal options must be evaluated equally and the best combination of the available options suited to the particular community chosen. Effective management schemes therefore need to operate in ways which best meet current social, economic, and environmental conditions of the municipality.

REFERENCES

- [1]. Waste Management (2013). [Retrieved from <http://www.sciencedirect.com/science/article/pii/S0956053X14000269> "Editorial Board/Aims & Scopes"].
- [2]. **Jump up** Davidson, G. (2011). "Waste Management Practices". Retrieved from [http://www.dal.ca/content/dam/dalhousie/pdf/sustainability/Waste%20Management%20Literature%20Review%20Final%20June%202011%20\(1.49%20MB\).pdf](http://www.dal.ca/content/dam/dalhousie/pdf/sustainability/Waste%20Management%20Literature%20Review%20Final%20June%202011%20(1.49%20MB).pdf).
- [3]. **Jump up** Barbalace, Roberta Crowell (2003-08-01). "The History of Waste". Environmental Chemistry.com. Retrieved 2013-12-09.
- [4]. **Jump up** Florence Nightingale, Selected Writings of Florence Nightingale, ed. Lucy Ridgely Seymer (New York: The Macmillan Co., 1954), pp. 38287
- [5]. **Jump up to:**^{a b} Herbert, Lewis (2007). "Centenary History of Waste and Waste Managers in London and South East England". Chartered Institution of Wastes Management.