

Solid Waste Management

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Abstract: Solid management is one of the basic essential services provided by municipal authorities, NGO, private sector to keep the clean cities. Solid waste management include the collection, transporting, treatment and disposal of solid waste together with monitoring and regulation. In India vast environmental problem are rising in solid waste management due to urbanisation. Solid waste is one of the biggest problem of cities. Solid waste are manage by three basic rule REDUCE, RECYCLE and REUSE. Improper solid waste management causes a hazardous inhabitant. The study of solid waste management has been carried out to evaluate the current status and identify the major problem. Solid waste are treated and dispose by a various method-Incineration, Composting, Landfill, Recycling and Windrow composting. Solid waste are use as a waste energy. Study of solid waste management is modified the present system of solid waste disposal and further use as energy.

Keywords: solid waste, types, method of disposal, problem, scope

1. Introduction

Solid waste refers to refuse, the solid and semi solid waste by the community. Solid waste contain organic as well as inorganic matter. Solid waste management deals with solid waste starting from collecting from primary source to ultimately disposal off it hygienically. So it may not create any harmful near the community.

- Waste management consist a collecting, transportation, disposal or recycle and monitoring of waste.
- Solid waste also rubbish, trace, garbage, refuse, junk.

1.1 Important of SWM

- Protection of environment
- Good health
- Waste causes resource depletion
- Reduce air and water pollution
- Reduce bad smell

1.1.1 Solid Waste

Non liquid, non soluble material ranging from municipal garbage to industrial wastes that contain complex and sometime hazardous substances.

1.1.2 Issues Associated with Solid Waste

- Volume/space
- Nuisances
- Public health
- Contamination of the environment
- Economy
- Resource issues

1.1.3 Type of Solid Waste

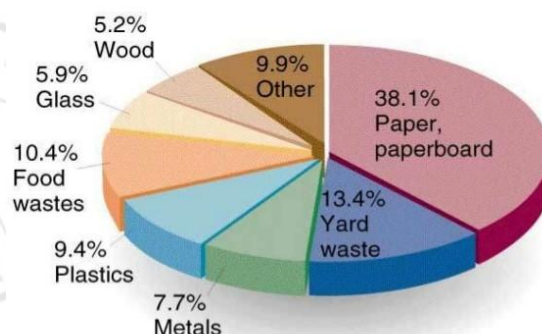
Solid waste broadly classified into three type

- Household waste as municipal waste
- Industrial waste as hazardous waste
- Biomedical waste as infectious waste

1.2 Municipal Waste

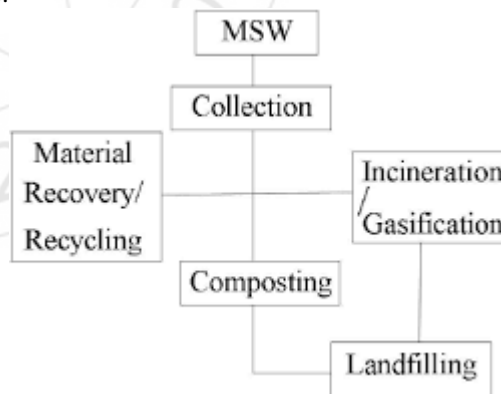
Municipal solid waste consists of household waste, construction and demolition debris, sanitation residue and waste from street. This waste mainly generated from residential and commercial complex. Due to urbanization,

modern lifestyle and food habit, increase in municipal solid waste.



Characteristics of municipal solid waste

Composition of municipal solid waste are change city to city. Below flow chart show the flow of municipal solid waste.



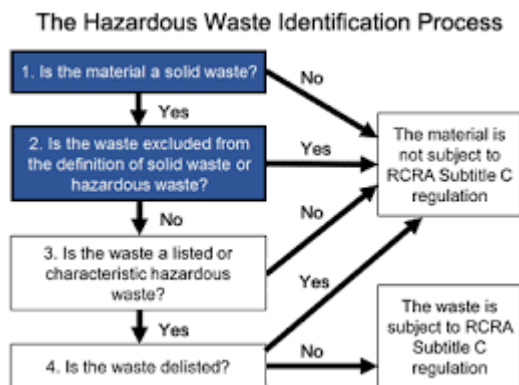
Process of MSW

1.3 Industrial Waste

Industrial waste is also known as hazardous waste. It contain toxic substances. Hazardous waste could be highly toxic in human, animal, plant, which are corrosive and highly inflammable. Industrial waste is generated from industrial or by manufacturing process. Chemical solvent, paints, sandpaper, metal, radioactive waste are some example of industrial solid waste.

1.3.1 Type of solid waste

- Solid waste from mining industry
- Solid waste from metallurgical industry
- Solid waste from power industry
- Solid waste from chemical industry



1.4 Biomedical waste

Biomedical waste is defined as waste which is generated by diagnosis, treatment of human or animal. Biomedical waste is also known as hospital waste. Hospital waste like sharp, soiled waste, disposable, anatomical waste, cultures, and chemical waste etc. Improper waste management of biomedical waste effect on human on animal.



1.5 Sources and type of solid waste

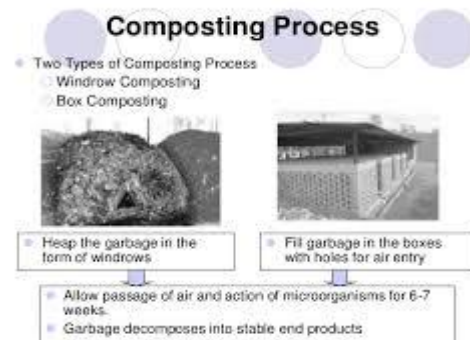
- **Residential:** Food wastes, paper, cardboard, plastics, textiles, leather, yard wastes, wood, glass, metals, ashes, special wastes (e.g., bulky items, consumer electronics, white goods, batteries, oil, tires), and household hazardous wastes.).
- **Industrial:** Housekeeping wastes, packaging, food wastes, construction and demolition materials, hazardous wastes, ashes, special wastes.
- **Commercial:** Paper, cardboard, plastics, wood, food wastes, glass, metals, special wastes, hazardous wastes.
- **Institutional:** Paper, cardboard, plastics, wood, food wastes, glass, metals, special wastes, hazardous wastes.
- **Municipal services:** Street sweepings; landscape and tree trimmings; general wastes from parks, beaches, and other recreational areas; sludge.
- **Agriculture:** Spoiled food wastes, agricultural wastes, hazardous wastes (e.g., pesticides).

2. Method of Treatment of Solid Waste

- Composting
- Incineration
- Landfilling
- Windrow composting
- Open burning
- Dumping into sea
- Ploughing in field
- Salvaging
- Hog feeding

1. Composting

Composting is a method of municipal waste treatment. , a biological process in which the organic portion of refuse is allowed to decompose under carefully controlled condition. Composting are aerobic method of disposal of solid waste.



Carbon, nitrogen, oxygen, water are the ingredient of composting. Certain ratios of these materials will provide beneficial bacteria with the nutrients to work at a rate that will heat up the pile. In composting process much water release steam.

In that process maintain high temperature 50C to 70C until material are break down.

Composting are different type which are given below:

- Windrow composting
- Aerated static pile composting
- In-vessel composting
- Decentralized composting
- Vermicomposting

2. Incineration

Incineration process is a solid waste treatment method by combustion of organic substances contained in waste material. In a incineration waste material convert into ash, flue gas and heat. In this plant recyclable material segregated and rest of material burnt.



Incineration plant

An incinerator capable of generating 3.75 MW power from 300 TPD MSW was installed at Timarpur, Delhi in the year 1987. It could not operate successfully due to low net calorific value of municipal solid waste.

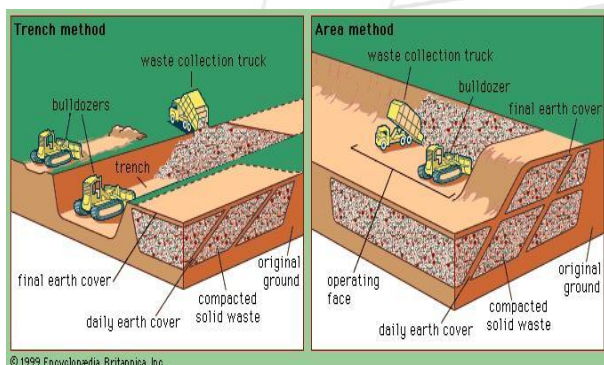
Waste to Energy Combustors

- Incinerators – Refuse was burned without energy recovery
- Modern combustor-combine with recovery energy.

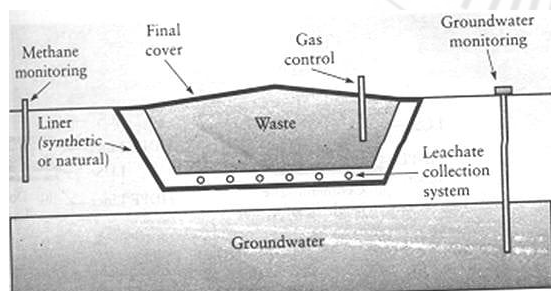
Waste to energy is process of generating energy from waste in the form of electricity, heat or fuel. Waste to energy project generally higher capital investment compare to other method of disposal waste. Such plants are financially viable in developed countries mainly because of the tipping fees/gate fees charged by the facility for the service of waste disposal, in addition to its revenue income from power sales.

3. Sanitary landfill:

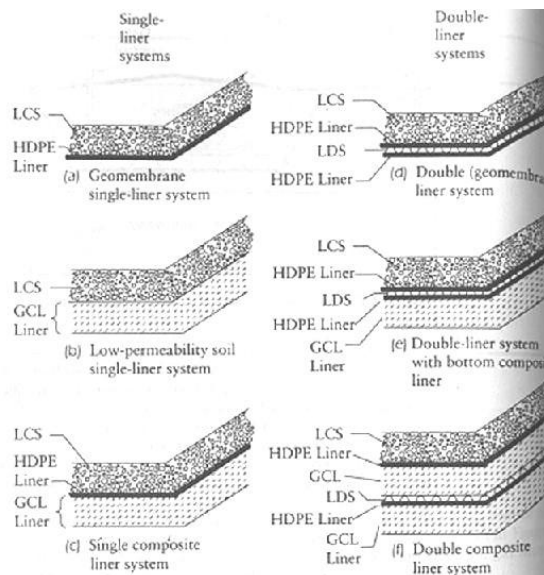
Sanitary landfill is a site disposal of waste material. It is also known as a tip, dump, rubbish dump, garbage dump or dumping ground. It is a most common management strategy of municipal solid waste. Which waste are not recycle that waste are dumped at outer area of city. Refuse can be safely deposited in a sanitary landfill, a disposal site that is carefully selected, designed, constructed, and operated to protect the environment and public health. The purpose of a landfill is to isolate waste from its surrounding environment, preventing water contamination and contact with air.



Method of sanitary landfill



Component of typical landfill



Examples of systems in municipal solid waste landfill

4. Open burning:

It is not ideal method in present day. In this method large amount of smoke.

5. Dumping into sea:

When a waste are dumped into sea. It is possible in coastal areas. Refuse shall be taken in barges sufficiently far away from the coast (15-30 km) and dumped there. It is very costly and it is not environment friendly.

Minimisation of waste:

Minimisation of waste is a process of eliminating amount of waste and eliminate the harmful solid waste. It is environment friendly process. It is based on refuse, recycle, reuse.

Following primary route of source reduction are:

- Eliminating the amount or toxicity of material used in the manufacture and packaging of products.
- Redesigning products for increased life span, reusability, and reparability.
- Changing social pattern.
- Modify pattern of consumption.

3R

It is a principal of solid waste management. Solid waste are manage by three basic rule- reduce, recycle, reuse. All non-hazardous solid waste are refuse by community are collecting to a processing or disposal site is called **refuse** or municipal solid waste. However, it is becoming increasingly difficult to find sites that offer adequate capacity, accessibility, and environmental conditions. All solid waste are not possible to recycle, so waste are dispose by incineration or other method.



Recycling:

Separating, recovering, and reusing components of solid waste that may still have economic value is called recycling. Separation: Before recycled it must be separated of raw material and sorted.



Separation of waste material

Reuse:

Reuse is the action or practice of using something again, whether for its original purpose or to fulfil a different function.

3. Quantities and Characteristics of SWM

Quantity and composition surveys have an essential role in determining the dimensions of the key elements in solid waste management. A list of such elements would certainly include method and type of storage, type and frequency of collection, crew size, method of disposal, and degree of resource recovery. Survey of quantities and characteristics are not only evaluate present condition also show the future trends. It show the generation of per capita solid waste which help in waste management.

In an Indian cities per capita waste generation range between .02Kg to .06Kg and about 1.15lakh MT per day and 42 million MT annually. Also, as the city expands, average per capita waste generation increases.

A full knowledge of the composition of the wastes is an essential element in:

- The selection of the type of storage and transport most appropriate to a given situation.
- The determination of the potential for resource recovery.
- The choice of a suitable method of disposal.
- The determination of the environmental impact exerted by the wastes if they are improperly managed.

Table: Waste generation rate in Indian cities

Population range (in million)	Average per capita waste generation (gm/capita/day)
0.1 to 0.5	210
0.5 to 1.0	250
1.0 to 2.0	270
2.0 to 5.0	350
5.0 plus	500

In India waste generation rate are lower than lower income countries and much lower compared to developed countries. Due to urbanization and change in life style changes, increase of more packing material and per capita waste generation rate increase by 1.3 percent per year. With the urban population growing at 2.7 per cent to 3.5 per cent per annum, the yearly increase in the overall quantity of solid waste in the cities will be more than 5 per cent.

4. Solid Waste Collection

Collection of separated and unseparated is a first stage of solid waste management. Collection start with holding container and end with transportation of solid waste, or recyclable, transfer or disposal. Management of collecting is more difficult and complex in urban areas because generation of residential, commercial, industrial waste in every home as well as street, park and vacant places. If successful in waste collection and storage, then the result is clean surroundings and good public sanitation; if unsuccessful, litter and poor public sanitation are everywhere self evident to the knowledgeable observer.



Collection of waste

Problem in collection and storage:

Problem in collection and storage are summarised as follows:

- Large numbers of open communal storage sites and unofficial dumps encourage the breeding of flies and rodents.
- Methods of collection often result in workers coming into direct contact with wastes that sometimes contain faecal matter.
- Collection vehicles generally are too old and too few in number. This problem is primarily due to poor maintenance and the lack of a vehicle replacement policy.

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