2.6 SOLID WASTE MANAGEMENT (OR) WASTE SHED MANAGEMENT

Rapid population growth and urbanization in developing countries have led to the generations of enormous quantities of solid wastes and consequential environmental degradation. An estimated 7.6 million tones of municipal solid waste is produced per day in developing countries. These wastes are disposed in open dumps creating considerable nuisance and environmental problems. These are potential risks to health and to the environment from improper management of solid wastes. Management of solid waste is therefore, become very important in order to minimize the adverse effects of solid wastes.

Definition

Solid waste management is the process of collecting, treating and disposing of solid waste.

2.6.1 Types and sources of solid wastes

Depending upon the nature, solid wastes can be broadly classified into three types

1. Urban (or) Municipal wastes.
2. Industrial wastes.
3. Hazardous wastes.

1. Sources of Urban (Municipal) Wastes

Urban (or) municipal wastes include the following wastes

(a) Domestic wastes

It contains a variety of materials thrown out from the homes.

Examples: Food waste, cloth, waste paper, glass bottles, polythene bags, waste metals, etc., **(b) Commercial wastes**

It includes the wastes coming out from the shops, markets, hotels, offices, institutions, etc.,

Examples: Waste paper, packing material, cans, bottle, polythene bags, etc.,

(c) Construction wastes

It includes the wastes of construction materials.

Examples: Wood, concrete, debris etc.,

(d) Biomedical wastes

It includes mostly the waste organic materials.

Examples: Anatomical wastes, infectious wastes, etc.,

Type and characteristics of urban (municipal) Wastes

(i) Bio-degradable wastes

The urban solid waste materials that can be degraded by micro organisms are called biodegradable wastes.

Examples: Polythene bags, scrap metals, glass bottles, etc.,

II Source and Characteristics of Industrial Wastes

The main sources of industrial wastes are chemical industries, metal and mineral processing industries.

Examples

(i) Nuclear power plants

It generates radioactive wastes.

(ii) Thermal power plants

It produces fly ash in large quantities.

(iii) Chemical industries

It produces large quantities of hazardous and toxic materials.

(iv) Other industries

Other industries produce, packing materials, rubbish organic wastes, acids, alkalis, scrap metals, rubber, plastic, paper, glass, wood, oils, paints, dyes, etc.,

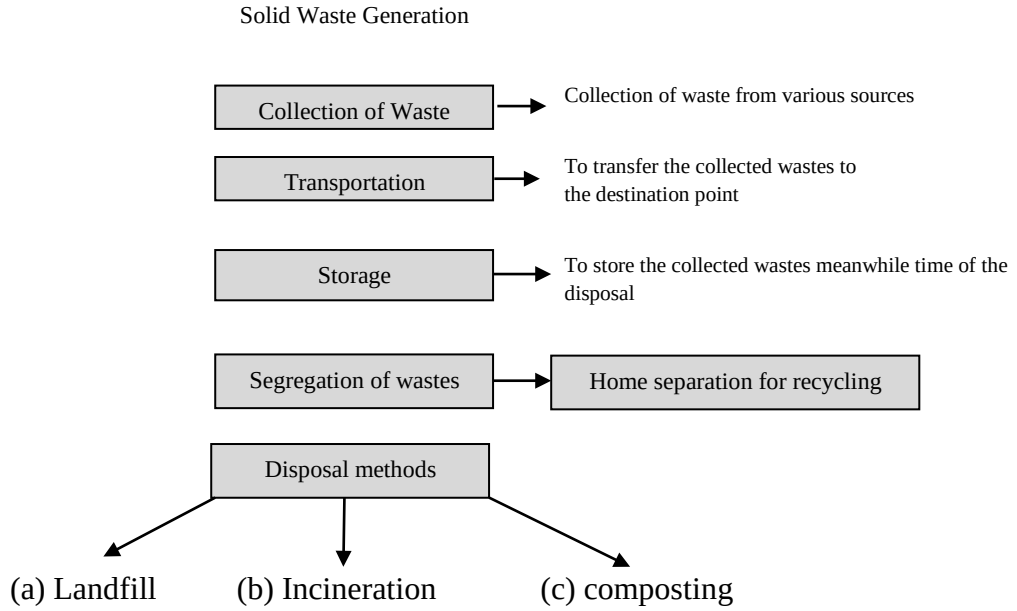
2.6.2 Effect of Solid Wastes (or) Effect of Improper Solid Waste Management

1. Due to improper disposal of municipal solid wastes on the road side and their immediate surroundings, biodegradable materials undergo decomposition. This produces foul smell and breeds various types of insects, which spoil the land value.
2. Industrial solid wastes are the sources of toxic metals and hazardous wastes, which affect the soil dumped on the soil. Characteristics and productivity of soils when they are dumped on the soil.
3. Toxic substances may percolate into the ground and contaminate the ground water.
4. Burning of some of the industrial wastes (or) domestic wastes (like cans, pesticides, plastics. radioactive materials, batteries) produce furans, dioxins and polychlorinated biphenyls, which are harmful to human beings.

2.6.3 Process of Solid Waste Management (or) Process of preventing solid waste generation in urban areas (or) Waste Shed management

Solid waste management includes the waste generation, mode of collection, transportation, segregation of wastes and disposal techniques.

Flow Chart



Steps involved in Solid Waste Management (or) Waste Shed Management

Two important steps of solid waste (waste shed) management is

Reduce, reuse and recycle, before destruction and safe storage of wastes.

I) Reduce, Reuse and Recycle (3R)

(a) Reduce the usage of raw materials

If the usages of raw materials are reduced, the generation of waste also gets reduced.

(b) Reuse of waste materials

(a) The refillable containers, which are discarded after use, can be reused.

(b) Rubber rings can be made from the discarded cycle tube, which reduces the waste generation during manufacturing of rubber bands.

(c) **Recycling of materials**

Recycling is the reprocessing of the discarded materials into new useful products.

Examples

(a) Old aluminium cans and glass bottles are melted and recast into new cans and bottles.

(b) Preparation of cellulose insulation from paper.

(c) Preparation of fuel pellets from kitchen waste.

(d) Preparation of automobiles and construction materials from steel cans.

The above process saves money, energy, raw materials, and reduces pollution.

II Discarding wastes

For discarding solid wastes the following methods can be adopted.

Methods of disposal of solid waste

1. Landfill 2. Incineration (Thermal) 3. Composting

1. Landfill

Solid wastes are placed in sanitary landfill system in altemate layers of 80 cm thick refuse, covered with selected earth fill 20 cm thickness. After two (or) three years, solid waste volume shrinks by 25-30% and the land is used for parks, roads and small buildings.

The most common and cheapest method of waste disposal is dumping in sanitary landfills which are invariably employed in Indian cities. Land-fill structure is built either into the ground (or) on the ground into which the waste is dumped. The method involves spreading the solid waste on the ground, compacting it and then covering it with soil at suitable intervals. **Advantages**

1. It is simple and economical.
2. Segregation not required.
3. Land filled areas can be reclaimed and used for other purposes.
4. Converts low-lying, marshy waste-land into useful areas.
5. Natural resources are returned to soil and recycled.

Disadvantages

1. A large area is required.
2. Since land is available away from town, transportation cost is heavy.
3. Bad odours, if landfills are not properly managed.
4. The land filled areas will be the sources of mosquitoes and flies and hence insecticides and pesticides are to be applied at regular intervals.

5. Causes fire hazard due to the formation of methane in wet weather.

2. Incineration (or) Thermal process

It is a hygienic way of disposing solid waste. It is more suitable if the waste contains more hazardous material and organic content. It is a thermal process and is very effective for detoxification of all combustible pathogens. It is an expensive technology compared to land-fill and composting because incinerators are costly.

In this method the municipal solid wastes are burnt in a furnace called incinerator. The combustible substances as rubbish, garbage, dead organisms and the noncombustible matter such as glass, porcelain, metals are separated before feeding to incinerators. The noncombustible materials can be left out for recycling and reuse. The left out ashes and clinkers from the incinerator may be accounted for only about 10 to 20% which need further disposal either by sanatory landfill (or) by some other means.

The heat produced in the incinerator during the burning of refuse is used in the form of steam power for generation of electricity throughout turbines. The municipal solid waste is generally wet but has a very high calorific value so it has to be dried up first before burning. The waste is dried in preheater from where it is taken into large incinerating furnace called destructors which can incinerate about 100 to 150 tons per hour. The temperature normally maintained in a combustion chamber is about 700°C and may be increased to about 1000°C when electricity is to be generated.

Advantages

1. The residue is only 20-25% of original weight; the clinker can be used after treatment.
2. It requires very little space.
3. Cost of transportation is not high as incinerators located within city limits.
4. Safest from hygienic point of view.
5. An incinerator plant of 300 tonnes per day capacity can generate 3MW of power.

Disadvantages

1. Its capital and operating cost is high.
2. Needs skilled personnel.
3. Formation of smoke, dust and ashes needs further disposal, due to which air pollution may be caused.

3. Composting

It is another popular method practiced in many cities in our country. In this method, bulk organic waste is converted into a fertilising manure by biological action.

The separated compostable waste is dumped in underground earthern trenches in layers of 1.5 m and is finally covered with earth of about 20 cm and left over for decomposition. Sometimes certain microorganisms such as actinomycetes are introduced for active decomposition. Within 2 to 3 days biological action starts, the organic matters are being destroyed by actinomycetes and lot of heat is liberated increasing the temperature of the compost by about 75°C and finally the refuse is converted to powdery brown coloured odourless mass known as humus and has a fertilizing value which can be used for agricultural field. The compost contains lot of nitrogen essential for plant growth apart from phosphates and other minerals.

World Health Organisation (WHO) has set up a compost plant in New Delhi in 1981 with a capacity to supplied to nurseries, kitchen gardens and handle 90 to 100 tonnes of waste every day. The prepared compost was supplied to nurseries, kitchen gardens and horticulture department. The composting technology is widely employed in developing countries.

Advantages

1. When the manure is added to soil, it increases the water retention and ion-exchange capacity of soil.
2. A number of industrial solid wastes can also be treated by this method.
3. It can (manure) be sold thereby reducing the cost of disposing of wastes.
4. Recycling - occurs.

Disadvantages

1. The non-consumables have to be disposed separately.
2. Use of compost has not yet caught up with farmers and hence no assured market.