

# WASTE GENERATION AND MANAGEMENT

## WHAT IS A WASTE ?

Waste are unwanted or unusable materials. Waste is any substance discarded after primary use, or is worthless, defective and of no use.

## CATEGORIES OF WASTES

Broadly there are five major categories of waste:

- (i) Domestic waste given out from homes,
- (ii) Industrial waste given out from factories, thermal plants, etc.,
- (iii) Agricultural waste that is left behind after obtaining the consumable parts,
- (iv) Municipal waste which includes the overall waste given out from the township, and
- (v) e-waste (electronic waste) from electrical and electronic equipment.



## 1. Domestic waste:

An average home produces the following types of wastes :

(i) **Kitchen waste:** Several items such as:

- Peelings of vegetables and fruits
- Shells taken off from ground nuts, other dry fruits and from eggs, etc.
- Washing of pulses, rice, etc. before cooking
- Any stale or rotten non-usable food items, used tea leaves, etc.
- Any left overs in the food dishes.

(ii) **Plastics:**

- Plastic packings and wrappings
- Discarded used and broken plastic objects including toys, etc.

(iii) **Glass:**

- Broken glass utensils, mirrors, containers, window panes, electric bulbs, etc.

(iv) **Rags:**

- A huge variety of waste pieces of cloth, torn towels, handkerchiefs, etc.
- Old bed sheets, blankets, cushions, etc.

- Discarded worn out clothing and footwear, curtains, and so on .

**(v) Paper:** The daily newspapers and magazines are a very common waste. Such waste paper is even recycled for its reuse in the paper industry.

## 2. Industrial waste

There is a huge variety of industries producing different types of materials and articles. All of these use raw materials and give out a lot of waste. Some of these are as follows:

**(i) Mining operations:** There are hundreds of mines in India alone and thousands in the world, which extract copper, silver, gold, zinc, iron, coal, etc. Huge quantities of waste are produced while processing them. Such waste is usually called mine tailing (the left-over). The mine tailing mixed with other materials can be used for making tiles, masonry cement, etc.

**(ii) Cement industries:** The wastes given out may be solid, liquid and gaseous.

- The solid wastes are either used in construction activities or dumped in landfills.
- The liquid wastes including wash-offs are treated to remove harmful substances and then released into the rivers, ponds, lakes, or sea.
- The gaseous wastes includes fly ash.

**(iii) Oil refineries :** While refining crude oil a lot of poisonous gaseous and liquid wastes are produced.

- Gaseous waste is cleaned by passing through cleaners, and purified part is released into the atmosphere.
- The liquid wastes are processed and suitably dumped.

**(iv) Construction units :** These produce huge quantities of waste stones, pebbles, broken bricks, wood waste, etc. Mostly these are dumped in landfills. This is particularly a huge waste in large towns, and one sees heaps of landfills in the suburbs.

## 3. Agricultural waste

Agriculture is the art of cultivating the soil, producing crops and raising livestock (farm animals). The agricultural waste mainly includes:

- Agricultural residues: The plant parts left after obtaining the usable portions. Much of this is used as animal feed.
- Bagasse is the plant residue left after extracting the sugarcane juice. It is used as fire wood or in paper industry.

- **Pesticides and fertilizers** collect into the soil and are washed off with the irrigation and rain water leading to river and pond pollution. Strict precautions have to be taken with their use.
- **Animal wastes** include cow dung and other faecal matter which is used in making manure.

#### 4. Municipal waste

Municipal waste includes the following:

(i) Household discharge of excreta (faecal matter from toilets), and kitchen washings.

(ii) Discharge from public toilets, hospitals, hotels, restaurants, offices, etc.

All this waste is carried away through sewers, and is called the **sewage**. This sewage is separated into:

- **the degradable part** (capable of being broken down chemically into non-toxic parts) and
- **the non-degradable part** (cannot be broken down into non-toxic parts and acts as a source of pollution).

#### 5. e-WASTE

e-waste is the abbreviation of **electronic waste**. It consists of the discarded appliances using electricity, such as old computers, TVs, refrigerators, radios, mobile phones, batteries, fluorescent tubes, electronic toys, medical instruments, lead-acid batteries, etc.

e-waste may contain harmful substances as well as some valuable reusable material:

- **Harmful substances**: Lead, Cadmium, Mercury etc.
- **Valuable materials**: Gold, Silver, Copper, etc.



**Generation of e-waste:** The e-waste is mostly generated in large cities, but as the living standards are fast improving, even the smaller cities and towns are getting flooded with electronic gadgets, thus contributing to e-waste.

**Disposal of e-waste:** The rag pickers and waste dealers (kabadis) obtain the discarded electronic gadgets. They **remove the usable components** or extract the secondary raw materials. But these recycling processes are harmful causing health problems including cancers.

**Recycling:** Most electronic devices contain a variety of materials including metals which can be recovered for future use, but it needs to be done very carefully under skilled supervision.

## 6. Waste from scientific research laboratories

Teaching institutes and research laboratories also produce waste material of varied nature broken or discarded glass apparatus, condemned machines, waste chemicals, animal and plant wastes from biology laboratories, and from their culture rooms. All such waste needs to be properly disposed off either in deeply dug out pits or burnt in special enclosures.

## METHODS OF SAFE DISPOSAL OF WASTES

### 1. Segregation

**Segregation** means separating the refuse mainly into three categories : reusable, degradable and non-degradable parts.

- **Reusable waste** includes items such as paper (newspaper, old books, discarded exercise books, etc.). All such paper can be recycled.
- **Degradable** such as organic wastes (vegetable and fruit peelings, etc.) can be decomposed into useful manure. Such degradation involves the activity of microorganisms, so it is also called **biodegradation**.
- **Non-degradable** part such as certain plastics can be dumped.

### 2. Dumping

The non-degradable waste can be put at certain places in specially dug up pits away from human habitations.

### 3. Composting

Composting means putting the waste organic matter to decay so that it can be used for fertilizing the agricultural land.

Method of preparing compost :

- A trench of about 5 m long, 1.5 m wide and 1.5 m deep is dug.
- A layer of well mixed refuse and waste is spread in it for about 30 cm thickness.
- This layer is fully wetted with a watery mixture of cow-dung and some mud.

- A second layer of mixed refuse is spread over the first layer till the heap rises to project above the ground level by about half a metre.

#### 4. Drainage

A proper system of drains is required to carry away all kinds of fluid wastes other than sewage. If not done so, the watery fluids would accumulate in pits and puddles and will become the breeding places for mosquitoes and other harmful insects.

#### 5. Treatment of effluents before discharge

The industrial and municipal waste waters are treated in Effluent Treatment Plants before disposing them off into water bodies. This is done in three parts:

**(a). Primary treatment:** Separation of large debris by sedimentation in tanks.

**(b) Secondary treatment:** The waste water is pumped into oxidation ponds where micro-organisms oxidise the organic matter releasing CO<sub>2</sub>, and a solid precipitated material sludge is produced that can be used as manure.

**(c) Tertiary treatment** involves removal of dissolved chemicals, metals or even pathogens and then the waste water is discharged into natural waters or is used for irrigation.

#### 6. Incineration

Incineration is the disposal of waste by burning.

Incineration serves three main purposes :

- It reduces the volume of wastes.
- Reduces weight of the waste.
- Renders toxic wastes into less toxic or even non-toxic wastes.

#### Impact of incineration :

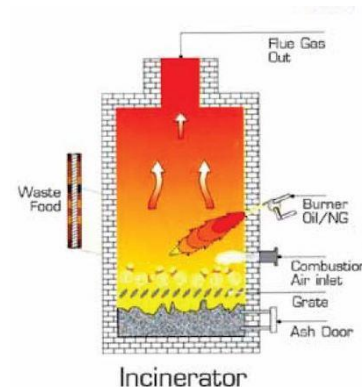
- Releases fumes and harmful substances.

#### Precautions :

- Incineration should be carried out at very high temperatures.
- Incinerators should be equipped with pollution control devices.
- Incinerators should be installed away from residential areas.

#### Advantages of incineration :

- (i) The ash left over occupies much less landfill space.

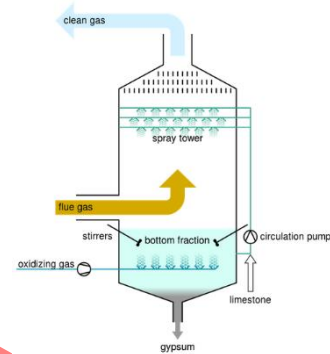


(ii) The residual bottom ash can be used for the recovery of some metals in it.

(iii) Electricity can be generated from the heat released during burning.

## 7. Scrubbers

The scrubbers are devices to remove gaseous and particulate air pollutants. In these, the air is passed through a dry or wet packing material. The air passing out of the scrubber is dust-free and clean, as well as free of certain gaseous pollutants which get dissolved in the wet packing.



## 8. Electrostatic precipitators

The dirty air containing particulates is passed through a chamber containing electrically charged plates. The particles may be naturally electrically charged and as they pass through the charged plates of the precipitators, they get collected on the plates carrying opposite charge and the clean gas passes out.

