

MODULE 2

ENVIRONMENTAL POLLUTION

2.6 HAZARDOUS WASTE

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2.6.4 E-waste management



2.6 HAZARDOUS WASTE

It is the waste that has potential threats to public health or the environment.

Examples:

- (i) Cleaning solvents(acids and bases)
- (ii) Spent acids and bases.
- (iii) metal finishing wastes.
- (iv) Painting wastes. (v)Disinfectants and pesticides.

2.6.1 Types and Characteristics of hazardous wastes

1. Toxic Wastes

These are poisonous even in very small or trace amounts.They may have

(i) Acute effects

Causing death or violent illness

(ii) Chronic effects

Slowly causing inseparable harm.

2. Carcinogenic waste

It causes cancer after many years of exposure.

3. Mutagenic

It causes major biological changes in the off-spring of exposed humans and wildlife.

4. Reactive wastes

These are chemically unusable and react violently with air or water. They cause explosions or form toxic vapours.

5. Ignitable wastes

They burn at low temperatures and cause an immediate fire hazard.

6. Infectious wastes

These include bandages, needles from hospitals.

7. Radioactive wastes

These emit ionizing energy that can harm living organisms.

2.6.2 HAZARDOUS WASTE MANAGEMENT

Definition

It is the collection and disposal of waste materials that can cause harmful to human health to the environment.

Improper hazardous waste storage or disposal contaminates surface water and ground water supplies as harmful water pollution and land pollution. People living in homes, built near waste disposal sites, may be in a vulnerable position. The best remedy for this problem is to regulate the practice of hazardous-waste management.

Various steps of Hazardous waste management

Hazardous waste management involves the following steps



Step 1: Analysis

Physical and chemical properties of hazardous waste must be analysed before collection and recovery of useful components. It is essential because it can be used as a fertilizer, liming material or soil amendment.

Step 2: Collection and Transport:

Hazardous waste generated at a particular place is generally collected and transported by truck over public highways. It can also be shipped in tank trucks made of steel or aluminum alloy, with capacity up to about 34,000 litres. It can be containerized and shipped in 200 litre drums.

Step 3: Treatment or Recovery

Hazardous waste can be treated or recovered by 1. Chemical method
2. Thermal method 3. Biological method 4. Physical method

1. Chemical method
It includes ion exchange precipitation, Oxidation and reduction and neutralization.

2. Thermal method**(a) High temperature incineration**

It can detoxify and destroy the waste.

(b) Special type of thermal equipment

Multiple hearth furnace, rotary kiln and liquid injection incinerator.

3. Biological method

Land farming is one method of treating hazardous waste biologically, in which waste is mixed with surface soil on a suitable land. Microbes that can metabolize the waste may be added along with nutrients.

Bio-remediation

Microbes can also be used for stabilizing hazardous waste on previously contaminated sites. This process is called **Bio-remediation**.

4. Physical Methods

Evaporation, Sedimentation, Solidification, flotation and filtration

The above treatment concentrates solidifies or reduces the volume of the waste. solidification is achieved by encapsulating waste in concrete, asphalt or plastic container. Encapsulation produces a solid mass of material that is resistant to leaching.

Step 4: Storage and disposal

Hazardous wastes that are not destroyed by incineration or other chemical processes need to be disposed properly. This can be done by following methods.

1. surface storage (or) environment systems temporary method

It includes

- (i) New waste piles
- (ii) Ponds (or) lagoons

i) New waste piles

It is carefully constructed over an impervious base. The piles must be protected from wind dispersion, erosion and leaching. Only non-containerized solid, non-flowing waste material can be stored in a new waste pile.

ii) ponds (or) lagoons

It is lined with impervious clay soils and flexible membrane liners in order to protect groundwater. Leachate collection systems are installed between the liners.

2. Deep-well injection

It involves pumping liquid waste through a steel casing in to a porous layer of limestone (or) sandstone. High pressure is applied to force the liquid into the pores, where it is permanently stored.

3. Land fills

It provides at least 3 metres (10 ft.) of separation between the bottom of the landfill and the underlying bed rock or groundwater table. It is also provided with two impermeable liners and leachate collection system, which pumps the collected

leachate to a treatment plant.

2.6.3 E –WASTE (ELECTRONIC WASTE)

Definition

e- waste describes discarded electrical or electronic devices'-waste are considered dangerous because they contain hazardous chemicals. The hazardous content of e waste pose a threat to human health and environment.

Causes of e –waste

1. Circuit boards in computer have heavy metals like lead and cadmium.
2. Cathode ray tubes have lead oxide and barium.
3. Batteries have cadmium.
4. Most of the electronic products have polyvinyl chloride
5. Plastics have dioxins and furans.

2.6.4 E-WASTE MANAGEMENT

Definition

E-waste management is defined as a holistic method of cutting down e -waste from the earth to prevent it harmful toxic to deteriorate earth.

e -waste management techniques

- (a) **Inventory management.**
 - (b) **Production process modification.**
 - (c) **Sustainable product design.** (d) **Use of renewable raw materials.**
- 1. Inventory management.**

Proper control over the materials, used in the manufacturing process, is an important way to reduce waste generation. By reducing the Quantity of hazardous material , used in the process , e-waste could be reduced.

2. Production process modification.

By changing the production process e-waste generation can be minimised

3. Sustainable product design.

Efforts should be made to design a product with less amount of hazardous material.

4. Use of renewable raw materials.

Bio based plastics are plastics made with plant based chemistry or plant produced polymers. Most e-waste has non degradable polymers in them. By using these bio polymers, we can reduce e wastes. Likewise, bio based toners, glues and inks are new development e- wastes.

