2.7 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) Sludges from air and water pollution control units.
(vi) Disinfectants and pesticides.

2.7.1 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 irrseparable 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 wild life.

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 relatively low temperatures and cause an immediate fire hazard.

6. Corrosive wastes

These include strong acidic (or) alkaline substances. They destroy solid material and living tissue upon contact.

7. Infectious wastes

These include used bandages, hypodermic needles from hospitals (or) biological research facilities.

8. Radioactive wastes

These emit ionizing energy that can harm living organisms.

2.7.2 Hazardous waste management

Definition

It is the collection, treatment and disposal of waste materials that can cause substantial harm to human health (or) 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.

2.7.3 Various steps of hazardous waste management

Hazardous waste management involves the following 4 steps

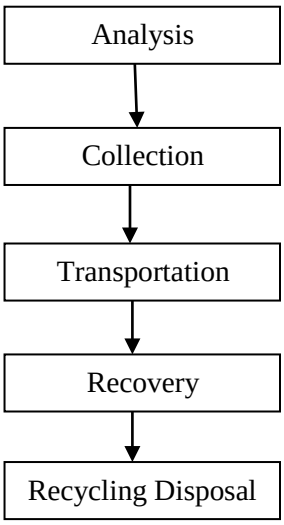

Fig. Steps of hazardous waste management

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) aluminium alloy, with capacities upto about 34,000 liters. It can be containerized and shipped in 200 liter drums.

Step 3: Treatment (or) Recovery

Hazardous waste can be treated (or) recovered by (i) Chemical method.

(ii) Thermal method.

(iii) Biological method.

(iv) Physical method.

1. Chemical method

It includes ion-exchange, precipitation, oxidation and reduction and neutralization.

2. Thermal method

High temperature incineration

It not only can detoxify certain organic wastes but also can destroy them.

Special type of thermal equipment

Examples

Fluidized-bed incinerator, multiple hearth furnace, rotary kiln and liquid-injection incinerator.

Problem

Hazardous-waste incineration is the source of air pollution.

3. Biological treatment

Example Land farming

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 wastes on previously contaminated sites this process is called bio-remediation.

4. Physical treatment

Example

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 the following methods.

1. Surface storage (or) containment 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 inorder to protect ground water. Leachate collection systems are installed between the liners.

2. Deep-well injection

It involves pumping liquid waste through a steel casing into 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 meters (10 ft) of separation between the bottom of the landfill and the underlying bed rock (or) ground water table. It is also provided with two impermeable liners and leachate collection system, which Pumps the collected leachate to a treatment plant.

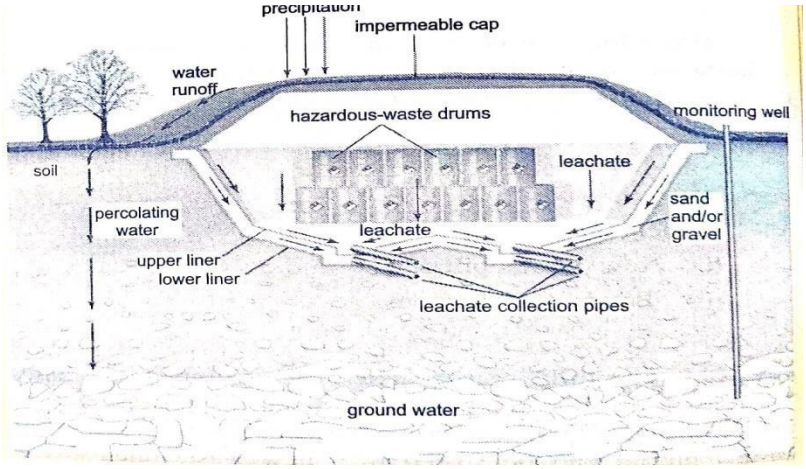

Fig. 2.5 Storage of Hazardous waste in Land fill

2.8 e-WASTE (Electronic Waste) Definition e-waste describes discarded electrical (or) electronic devices.

e-wastes are considered dangerous because they contain hazardous chemicals. The hazardous content of e-waste pose a threat to human health and environment.

2.8.1 Hazardous chemicals in e-wastes (or) Causes of e-wastes

Some of the hazardous chemicals present in some e-wastes are 1. Circuit boards in computer have heavy metals like lead and cadmium.

2. Batteries have cadmium.
3. Cathode ray tubes have lead oxide and barium.
4. Most of the electronic products have polyvinyl chloride.
5. Plastics have dioxins and furans.

So, if these waste electronic products are not properly disposed, they can leach hazardous elements such as lead, cadmium and other chemicals into the soil and ground water and cause severe threat to environment.

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

Management of e-waste should begin at the point of generation. This can be done by waste minimization techniques and by sustainable product design.

Some e-waste management techniques

Waste management in industries involves adopting,

(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 materials, 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.

Example

New computer designs that is lighter and more integrated.

4. Use of renewable materials

Bio based plastics are plastics made with plant based chemistry (or) plant producted polymers. Most e-waste have non-degradable polymers in them. By using these bio polymers we can reduce 'e'-wastes. Like wise bio based toners, glues and inks are new development e-wastes.