Lecture Seven

Hazardous Waste Definition and Characteristics

7.1 Definition of HW

Hazardous waste have been defined as wastes or combination of wastes that pose a substantial present or potential hazard to human or other living organisms because such wastes are non degradable or persistence in nature, they can be biological magnified, they can be lethal and they may otherwise cause or tend to cause detrimental cumulative effects.

7.2 Hazardous wastes

Generators must determine whether their generated material is first a waste, second a solid waste and last a hazardous waste. There are two methods for making this third determination. The substance may be a listed waste on a list of hazardous wastes. In the United States, the treatment, storage, and disposal of hazardous waste is regulated under the Resource Conservation and Recovery Act (RCRA). Hazardous wastes are defined under RCRA in 40 CFR 261 (Code of Fedral Regulation) where they are divided into two major categories: characteristic wastes and listed wastes. A solid waste is classified as listed hazardous waste if it is named on of the following four lists:

(i) Nonspecific source or F wastes (40CFR 261.31). These are generic wastes, commonly produced by manufacturing and industrial processes. Examples include spent halogenated solvents used in degreasing and wastewater treatment sludge from electroplating processes as well as dioxin wastes, most of which are acutely hazardous wastes due to the danger they present to human health or the environment.

(ii) Specific source or K wastes (40 CFR 261.32). This list consists of waste from specifically identified industries such as wood preserving, petroleum refining and organic chemical manufacturing. These wastes typically include sludge still bottoms, wastewater, spent catalysts and residues.

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(iii) Discarded commercial chemical products or P and U wastes (40 CFR 261.33(e) and (f). The third and fourth lists consist of specific commercial chemical products and manufacturing chemical intermediates. They include chemical such as chloroform and creosote, acid such as sulphuric acid and hydrochloric acid and pesticides such as DDT and Kepone.

However the substance may be a characteristic hazardous waste, if through testing, it exhibits any of the following four characteristics hazardous waste (a) *ignitability* (b) *Corrosivity* (c) *Reactivity* or (d) *Toxicity*.

7.3 Characteristics of Hazardous Wastes

1. **Ignitability** – Ignitable wastes can create fires under certain conditions, undergo spontaneous combustion, or have a flash point less than 60°C (140°F). Examples include waste oil and used solvents.
2. **Corrosivity** – Corrosive wastes are materials, including solids, that are acids or bases, or that produce acidic or alkaline solutions. Aqueous wastes with a pH less than or equal to 2.0 or greater than or equal to 12.5 are corrosive. A liquid waste may also be corrosive if it is able to corrode metal containers, such as storage tanks, drums, and barrels. Spent battery acid is an example.
3. **Reactivity** – Reactive wastes are unstable under normal conditions. They can cause explosions or release toxic fumes, gases, or vapors when heated, compressed, or mixed with water. Examples include lithium-sulfur batteries and unused explosives.

4. **Toxicity** – Toxic wastes are harmful or fatal when ingested or absorbed (e.g., wastes containing mercury, lead, dichlorodiphenyltrichloroethane DDT , Polychlorinated biphenyls PCBs, etc.). When toxic wastes are disposed, the toxic constituents may leach from the waste and pollute ground water.

7.4 Source of Hazardous wastes

Hazardous waste can be distinguished either by their form (Solid, liquid or gaseous) or their original point of production (Industrial, agricultural, household or medical). The latter classification of hazardous wastes by their origin is widely employed. Hazardous wastes from the four sources are described below.

7.4.1 Industrial hazardous Wastes

Hazardous wastes are generated by nearly every industry ranging from manufacturing industry to mining industry.

An industrial hazardous waste is therefore that solid waste which is generated from any industrial processes and which may pose a substantial threat or potential hazard to human health or the environment when managed improperly.

The nature of industry, the processes and materials involved are among the determining the quantity and characteristics of the generated hazardous wastes. For example, the main producer of the large amounts of hazardous wastes is Texas, USA, is the chemical processes. Establishments classified in this major group manufacture three general classes of products:

(1) Basic chemicals such as acids, alkalies, salts and organic chemicals

(2) Chemical products to be used in further manufacture, such as synthetic fibers, plastics materials, dry colors, and pigment

(3) Finished chemical products to be used for ultimate consumption such as drugs, cosmetics and soaps or to be used as materials or supplies in other industries, such as paints, fertilizer and explosives.

The geographical distribution and density of industries also determines the spatial distribution of the type and amounts of generated hazardous wastes. Foe example, of the total amount of 40 millions tons of hazardous wastes generated in 1999 in USA about 15 millions tone (nearly 37% of the total generation) was generated in Texas. The large size and industrial base of the state are contributing significantly to its number one ranking among the largest generators of hazardous waste in USA.

7.4.2 Agricultural hazardous Waste

Agricultural produces such wastes as pesticides and herbicides and the materials used in their application. Fluoride wastes are by products of phosphate fertilizer production. Even soluble nitrate from manure my dissolved into ground water and contaminate drinking water wells, high level of nitrates may cause health problems. Most of the pesticides used in agricultural activities are classified as either toxic or acutely toxic. Toxic pesticides are those which contain certain heavy metals above specific concentrations, such as very dangerous wastes like arsenic and cyanide compounds.

7.4.3 Household Hazardous Waste

House hold hazardous waste is the discarded, unused or leftover portion of households products containing toxic chemicals. Household sources of hazardous wastes include toxic paints, flammable solvents, caustic cleaners, toxic batteries, pesticides, drugs and mercury from broken fever thermometers. Some examples of hazardous wastes from homes are given in Table 7.2 Renovations of order homes may cause toxic lead paint to flake off from walls. Insulation material on furnace pipes may contain asbestos particles, which can break off and hang suspended in air, when inhaled they cause lung diseases and cancer.

Table7.2 : Examples of hazardous waste from home

Antfreeze	Lye
Batteries	Mothballs
Brakefluid	Nail polish remover
Chemical strippers	Old propane tanks
Chlorine bleach	Paints
Contact cement	Pesticides
Drain cleaners	Pool chemicals
Fire extinguishers	Prescription drugs
Flea collar displays	Solvents
Herbicides	Spot removers
Insecticides and insect repellent	Stains and finishes
Kerosene	Toilet cleaners
Lawn chemicals	Used motor oil
Lighter fluid	Oven cleaners

Plumbing system can be damaged when corrosive chemicals are down the drain. Buried wastes can filter down through the soil and contaminate ground water burning hazardous waste simply distributes them over a larger area and release them into the air and pouring hazardous liquids on the ground can poison soil and plants and water. Therefore, local waste-disposal systems may refuse these items.

7.4.4 Medical hazardous wastes

Medical Waste is generally defined as any solid waste that is generated in the diagnosis, treatment or immunization of human beings or animals in research pertaining thereto or in the production or testing of biological, including but not limited to

- Soiled or blood-soaked bandages
- Culture dishes and other glassware
- Discarded surgical gloves-after surgery
- Discarded surgical instruments-scalpels
- Needles-used to give shots or draw blood
- Cultures, stocks, swabs used to inoculate cultures
- Removed body organs-tonsils, appendices, limbs etc.
- Lancets- the little blades the doctor pricks your finger with to get a drop of blood.

It is generally considered that the path any person whose act or process produces medical waste to be a medical waste generator (e.g. a facility or a business that generates and / or stones medical waste onsite). Medical waste generators may be either large quantity generators (LQR) producing more than 1000kg/month, small quantity generators (SQG) producing more than 100kg but less 100kg a month and accumulates less than 6000kg a month or conditionally exempt generator who produces less than 100kg and accumulates less than 1000kg of hazardous wastes a moth. Medical hazardous waste usually originates from hospitals, medical and pharmaceutical industries as well as from supplier and distributors of pharmaceuticals products such as pharmacies. Depending on their origin, the composition of these medical hazardous wastes varies from one source to the other. Hospital Hazardous waste comprises the whole range of medical waste while those from pharmacies usually consist of expired medicines including tablets, syrups etc which have different chemical compositions. Therefore, medical wastes may need separation at their source to avoid mixing together of wastes that require different treatment and disposal processes.