

Liquid and solid pollution Radioactive pollution



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Solid and Liquid waste

Waste can be defined as:

Any solid/liquid that is left over after productive use.

Waste can be classified in different ways: Based on its **physical properties**, waste can be categorized into solid waste (for example, garbage) and liquid waste (for example, waste water)

Solid wastes: is all the wastes arising from human and animal activities that are normally solid and that are discarded as useless or unwanted.

Liquid waste is water which has been used once and is no longer fit for human consumption or other uses where clean water is required

Sources of solid waste

Main sources of solid waste generation

- domestic waste
- Construction and Demolition waste
- Animal compost
- Industrial waste
- Agricultural solid waste

solid waste environmental Impact

- It can be best media for the growth of microorganisms .
- Open dump can contaminate water sources.
- Can contaminate food supply.
- Hospital and pathological wastes are potential disease.
- Radioactive wastes are highly dangerous.
- It can create fire accident.
- It can create Bad odor, smoke, dust.

solid wastes treatment:

- An integrated waste management strategy includes three main components:
 - 1. Source reduction**
- is one of the fundamental ways to reduce waste. This can be done by using less material when making a product, reuse of products on site.
- 2. Recycling**
- is reusing some components of the waste that may have some economic value.
- 3. Disposal**
- Incineration
- Safe land landfill
- Organic composting
- pyrolysis

Liquid waste

Liquid waste is water which has been use once and is no longer fit for human consumption or other uses where clean water is required

Classifications of liquid waste/sewage

- **domestic sewage** contains human wastes and wash water from homes, public buildings
- **Industrial sewage** :is the used water from manufacturing processes, usually carrying a variety of chemical compounds
- **Storm water:** is the surface run off caused by rainfall, it carries organics, suspended and dissolved solids, and other substances picked up as it travels over the ground
- **Mixed sewage**

Wastewater/sewage composition

domestic wastewater comprises about 99.9% water and only about 0.1% impurities. In other words, if a 1-liter sample of wastewater is allowed to evaporate, only about 1 gram of solids will remain behind.

Actually, sewage can contain so many different substances, both suspended and dissolved, that it is impractical to attempt to identify each specific substance or microorganism. This is measured by the biological oxygen demand, or BOD and the total amount of suspended solids, or TSS. On the average, untreated domestic sanitary sewage has a BOD of about 200 mg/L and a TSS of about 240 mg/L. Industrial wastewater may have BOD and TSS values much higher than those for domestic sewage; its composition is source dependent.

Another group of impurities that is typically of major significance in wastewater is the plant nutrients. Specifically, these are compounds of nitrogen, N, and phosphorus, P. On the average, raw domestic sewage contains about 35 mg/L of N and 10 mg/L of P.

Health effect of waste water:

If household, industrial, or commercial wastes are not properly disposed, then the disease problems caused by pollution will still remain to be persistent in the environment.

The disease commonly transmitted through water such, as **Cholera, dysentery and typhoid are waste related**. If waste was safely deposited, or treated and disposed most of the water born diseases would have not been a problem

sewage disposal technique

A-Disposal by dilution/ “Self-purification of water bodies”

It is a common practice in some communities to discharge raw sewage into near by water bodies such as rivers, streams, etc., so that it is diluted or reduced in strength by the water

The damages:

- Water and soil pollutions
- Spread of infectious organisms greatly increases

B-Cesspool

A cesspool is a pit dug in the ground in order to receive wastewater/sewages from kitchen, toilet ,etc..

C-Septic tank



Sewage/wastewater treatment

Before discharging wastewater back into the environment and the natural hydrologic cycle, it is necessary to provide some degree of treatment in order to protect public health and environmental quality.

Also, the renewed wastewater can be used in industrial water, agricultural irrigation

The basic purposes of sewage treatment are:

- To destroy pathogenic microorganisms
- To remove most suspended
- To remove dissolved biodegradable organic materials.

Treatment methods

Treatment methods are grouped into three general categories:

- Primary treatment: **The main task of primary treatment** is to remove suspended solids in sewage, adjust pH value, etc..
- Secondary or biological treatment: **The task of secondary treatment** is to remove the dissolved and colloidal organic pollutants significantly. It is mainly used biological method
- Tertiary or advanced treatment: **The purpose of tertiary treatment** is to further remove the pollutants which are not removed in secondary treatment.

Radiological & Nuclear pollution

Special form of physical pollution of air, water and soil with radioactive materials.

- Radioactivity-Property of certain elements like Ra, Th, U etc to spontaneously emit alpha, beta & gamma rays by disintegration of atomic nuclei.

Sources of Environmental Radiation:

Sources of environmental radiation are both natural and manmade.

(i) Natural Radiation:

This includes cosmic rays that reach the surface of the earth from space and radiations from radioactive elements present in the earth's crust.

Many radioactive elements such as radium 224, uranium 235, uranium 238, thorium 232, radon 222, potassium 40 and carbon 14 occur in rocks, soil and water.

(ii) Man-made Radiation:

(a) Atomic Reactors and Nuclear Fuels

The operation of a nuclear power plant releases large amounts of energy. This energy is used in large turbines, which produce electricity. Both the fuel elements and coolants contribute to radiation pollution. Wastes from atomic reactors also contain radioactive materials. The biggest problem is the disposal of these radioactive wastes. If these wastes are not properly disposed off, can harm the living organisms wherever they may be dumped. **Inert gases and halogens** escape as vapors and cause pollution as they settle on land or reach surface waters with rain.

Sources of artificial radioactivity:

- nuclear-bombs
- nuclear experiments
- aerospace
- radioactive waste
- medical exposures (X-rays, X-ray treatment, irradiation with radioactive cobalt)
- nuclear accidents

(b) Radio Isotopes:

Many radioactive isotopes such as ^{14}C , ^{125}I , ^{32}P and their compounds are used in scientific research. Waste waters containing these radioactive materials reach water sources like rivers through the sewers. From water they enter human body through food chains.

(c) X-rays and Radiation Therapy:

Human beings also voluntarily receive radiation from diagnostic X-rays and radiation therapy for cancer.

(d) People working in, nuclear reactors, fuel processors or living nearby are vulnerable to radiation exposure.

Effect of radioactive pollution on health:

- radiations destroy the cells in human body and causes cancer.
- A longer exposure to radioactive radiations can damage the **DNA** cells that results in cancer, genetic defects for the generations to come and even death.
- Affects animals, some species preferentially accumulate specific radioactive materials- oysters deposit Zn-65, fish Fe-55, marine animals Sr-90

Control of Radioactive Pollution:

The following preventive measures should be followed to control radioactive pollution.

- (i) Leakage of radioactive materials from nuclear reactors, industries and laboratories using them should be totally stopped.
- (ii) Radioactive wastes disposal must be safe. They **should be changed into harmless form or stored in safe places** so that they can decay in a harmless manner. Radioactive wastes only with very low radiation should be discharged into sewerage.
- (iii) Preventive measures should be taken so that natural radiation level does not rise above the permissible limits.
- (iv) Safety measures should be taken against accidents in nuclear power plants.