

**INDUSTRIAL WASTE MANAGEMENT
& DISPOSAL
B.TECH
IN
CIVIL ENGINEERING**



7TH SEM

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INDUSTRIAL WASTE MANAGEMENT & DISPOSAL

UNIT -1

Industrial Pollution

Industrial pollution is the pollution which can be directly linked with industry. This form of pollution is one of the leading causes of pollution worldwide. There are a number of forms of industrial pollution. Industrial pollution can also impact air quality, and it can enter the soil, causing widespread environmental problems.

Industrial activities are a major source of air, water and land pollution, leading to illness and loss of life all over the world. Major forms of pollution include: Air pollution, light pollution, littering, noise pollution, plastic pollution, soil contamination, radioactive contamination, thermal pollution, visual pollution, water pollution.

Types, Effects and Control of Industrial Pollution

In order to provide daily needs of the growing population, different types of industries are setup to produce different products. The industries use raw materials, process them and produce finished products. Besides the finished products, a good number of by-products are produced. Out of all the by-products, if some are in huge quantities and the processing is cost effective, the industrialist preserves the by-products. If the processing of waste is a cost prohibitive one, then the industrialist throws the waste into the environment in the form of gas, liquid or solid. The gases are usually released into the atmosphere, the liquids are discharged into aquatic bodies like canals, rivers or sea and solid wastes are either dumped on the land or in aquatic bodies. In all the cases, either the air or water or land is polluted due to dumping of wastes.

Till now, there are about 17 industries which are declared to be most polluting. These include the caustic soda, cement, distillery, dyes and dye intermediaries, fertilisers, iron and steel, oil refineries, paper and pulp, pesticides and pharmaceuticals, sugar, textiles, thermal power plants, tanneries and so on. The table 6.5 enlists few of the industries, their wastes (important) and the type of pollution these induce in the environment.

The wide variety of pollutants as shown above enter the environment and disturb the natural eco-system affecting the biota. Due to industrial activities, a variety of poisonous gases like NO, SO₂, NO₂, SO₃, Cl₂, CO, CO₂, H₂SO₄ etc.- volatile chemicals, dusts etc., are liberated into the atmosphere causing acute pollution problem. Besides, the accidental leakage of poisonous gases can cause havoc.

For example, Methyl Isocyanate gas leakage from Union Carbide factory at Bhopal caused mass killing which is known as Bhopal gas tragedy. In addition to accidents, many of the above poisonous gases induce depletion of ozone layer, creation of ozone hole. Green House effect, Global warming. Acid rain, destruction of monument and killing of living organisms disturbing the natural eco-systems.

The nature of the industrial waste depends upon the industrial process in which these originate and the raw materials the use.

Broadly the industrial wastes may be divided into two groups:

- (a) Process waste;
- (b) Chemical waste.

(A) *Process Waste:*

The waste generated in an industry during washing and processing of raw materials is known as process waste. The process waste may be organic or inorganic in nature depending upon the raw materials used and nature of the industry.

The organic process wastes are liberated from food processing units, distilleries, breweries, paper and pulp industry, sugar mills etc. The inorganic process wastes may be the effluents of chemical industries; caustic soda industry, paint industry, petroleum industry, pesticide industry etc. Both organic and inorganic process wastes are toxic to living organisms.

The solid wastes released by different industries can be divided in to two different groups i.e.

- (a) process wastes, and
- (b) packing wastes.

Since different industries use different raw materials, the quality and quantity of solid wastes differ from industry to industry. Industries releasing the solid wastes in the form of fly ash is dumped on the ground which leads to soil pollution.

Some amount of fly ash also contaminate atmospheric tract causing respiratory tract disorders. Metallic industries produce a lot of solid metallic waste and large quantities of slag. In addition to the release of hazardous chemical pollutants, the industries may also cause thermal pollution and noise pollution. The thermal pollution is due to release of hot water from industries into aquatic bodies. The noise pollution is due to running of heavy machinery producing a lot of noise.

(B) *Chemical Wastes:*

The chemical substance generated as a by-product during the preparation of a product is known as chemical waste product. The chemical waste include heavy metals and their ions, detergents, acids and alkalies and various other toxic substances.

These are usually produced by the industries like fertiliser factories, paper and pulp industries, iron and steel industries, distilleries, sugar mills etc. These are usually liberated into nearby water bodies like rivers, lakes and seas and sometimes into lands. The entry of these chemicals into bodies may alter the pH, BOD (Biological Oxygen Demand) and COD (Chemical Oxygen Demand).

The loading of suspended solids (ss), heavy metals and their ions brings about a drastic change in physiochemical nature of the water. The aquatic animals and plants absorb, accumulate and bio-concentrate the chemical wastes leading to bio magnifications and finally destroying the trophic levels and food chains of the ecosystem. Hence these disturb the eco-system dynamics and eco-system balance of the nature.

Effects of Industrial Pollution:

1. On human health:

- (i) It causes irritation of eye, nose, throat respiratory tracts, etc.
- (ii) It increases mortality rate and morbidity rate.
- (iii) A variety of particulates mainly pollens, initiate asthmatic attacks.
- (iv) Chronic pulmonary diseases like bronchitis and asthma are aggravated by high concentration of SO₂, NO₂, particulate matter and photo-chemical smog.
- (v) Certain heavy metals like lead may enter the body through lungs and cause poisoning.

2. On animal health:

In case of animals, the pollutants enter in two steps.

- (i) Accumulation of the airborne contaminants in the vegetation forage and prey animals.
- (ii) Subsequent poisoning of the animals when they eat the contaminated food. In case of animals, three pollutants namely fluorine, arsenic and lead are responsible for most livestock damage.

3. On plants:

Industrial pollution have been shown to have serious adverse effects on plants. In some cases, it is found that vegetation over 150 Km. away from the source of pollutants have been found to be affected. The major pollutants affecting plants are SO₂, O₃, MO, NO₂, NH₃, HCN, Ethylene, Herbicides, PAN (Peroxy Acetyl nitrate) etc. In the presence of pollutants, the healthy plants suffer from neurosis, chlorosis, abscission, epinasty etc.

Control of Industrial Pollution:

The ultimate object behind the measures to control pollution to maintain safety of Man, Material and Machinery (Three Ms). The implementation of control measures should be based on the principle of recovery or recycling of the pollutants and must be taken as an integral part of production i.e. never as a liability but always an asset.

Some important control measures are:

1. Control at Source:

It involves suitable alterations in the choice of raw materials and process in treatment of exhaust gases before finally discharged and increasing stack height upto 38 metres in order to ensure proper mixing of the discharged pollutants.

2. Selection of Industry Site:

The industrial site should be properly examined considering the climatic and topographical characteristics before setting of the industry.

3. Treatment of Industrial Waste:

The industrial wastes should be subjected to proper treatment before their discharge.

4. Plantation:

Intensive plantation in the region, considerably reduces the dust, smoke and other pollutants.

5. Stringent Government Action:

Government should take stringent action against industries which discharge higher amount of pollutants into the environment than the level prescribed by Pollution Control Board.

6. Assessment of the Environmental Impacts:

Environmental impact assessment should be carried out regularly which intends to identify and evaluate the potential and harmful impacts of the industries on natural eco-system.

7. Strict Implementation of Environmental Protection Act:

Environment Protection Act should be strictly followed and the destroyer of the environment should be strictly punished.

Biological Concentration and Bio-Magnification:

A pollutant present in the environment makes its entry into the food chain by the producers. After the entry, these get accumulated in their cells and tissues. The primary consumers when feed upon the producers, the pollutants deposited in the body of the former are transferred into the body of the primary consumer. In addition, the primary consumer may also directly absorb some amount of pollutants from the environment.

This leads to an increase in the concentration of the pollutant in the body of the primary consumer. Again the primary consumer, is consumed by a secondary consumer and the pollutants from the body of the former are transferred into the body of latter where these get deposited.

Thus, on moving along the food chain, it is seen that concentration of the pollutants become more in the tissues of the organisms belonging to higher trophic level than the organisms belonging to lower trophic level. Hence the residual retention of the pollutants is the richest at the higher trophic level.

From the above discussion, it is clear that the pollutants get magnified to a significant level because of the food chain link up- Such type of magnification of the pollutants in a food chain, mediated by biological agents (members of different trophic levels) is known as biological magnification or bio-magnification of pollutant in eco-system. Since man is omnivorous and can have access to different trophic levels of a food chain, he receives the pollutants in large amounts which become deposited in the various tissues.