



## AIR POLLUTION

Air pollution is the resultant of direct or indirect change in physical, chemical and biological characteristics of atmosphere, which mainly results from gases emission from industry, thermal power station, auto mobile and domestic combustions, etc.

### Air Pollutants

“Air Pollutant” can be defined as any solid, liquid or gaseous substance present in the atmosphere in high concentration more than prescribed limits that may be harmful to the living creatures.

Pollutants can be classified as primary and secondary pollutants.

Primary pollutants are carbon dioxide, nitrogen oxides, sulphur dioxide, carbon monoxide and CFC.

Secondary pollutants are acid rain and ozone.

### Sources of Air Pollution

The sources of Air pollution are natural and man-made (anthropogenic).

#### Natural sources

The natural sources of air pollution are volcanic eruptions, forest fires, thunder storms, cyclones, typhoons, fog, biological decay, photochemical oxidation, deposition of dead matters, vegetation and animals etc. Radioactive minerals present in the earth crust are the sources of radioactivity in the atmosphere.

#### Man-Made Sources

Manmade sources include industry, thermal power stations, industrial units, vehicular emissions, automobiles, farming practises, domestic equipment, nuclear weapons and test, etc.

#### Indoor Air Pollution

The most important indoor air pollution is radon gas. This is responsible for a large number of lung cancer deaths each year. These could be emitted from building materials like bricks, concrete, tiles etc. Many houses in the underdeveloped countries including India use fuels like coal, dung-cakes, wood and kerosene in their kitchens.

#### Air Pollutants Criteria

Major pollutants responsible for air pollution are: Sulfur dioxide (SO<sub>2</sub>), nitrogen oxides (NO<sub>2</sub> and NO), carbon dioxide (CO<sub>2</sub>) and carbon monoxide (CO), solid or liquid particulates (smaller than 10 μm).

## **Gaseous Pollutants**

Major gaseous pollutants are

Sulfur dioxide (SO<sub>2</sub>)

Nitrogen oxides

Carbon monoxide and carbon dioxide

Ozone, photochemical smog hydrocarbon and fluorocarbons

Ozone (O<sub>3</sub>) is outcome of chemical reaction between nitrogen dioxide and volatile organic components. Ozone layer in stratosphere protects from harmful UV rays via absorbs ultra violet radiation. Ozone is the key component of photochemical smog.

Nitric oxide in the atmosphere with ozone causes elimination of ozone layer. Thinning or hole of ozone layer can cause skin cancer .It is estimated that 1% reduction in ozone increases UV radiation by 2%.

The main hydrocarbon are benzene, venzbyrene and methane and it emerges from motor vehicles. Hydrocarbons combine with nitrites under UV radiation and form other pollutants known as photochemical products such as Aldehydes, Ozone Pans, Olifins, etc.

On the other hand fluorocarbons at higher level are toxic and creates problem of fluorosis, the source of fluoride in the environment are industrial process of phosphate fertilizers, aluminum, fluorinated plastics, uranium and other metals

## **Ozone Layer Depletion**

Earth's stratospheric ozone layer, which contains about 90 percent of the ozone in the atmosphere, makes the planet habitable by absorbing harmful solar ultraviolet (UV) radiation before it reaches the planet's surface. UV radiation at higher levels it can cause skin cancer and immune system suppression.depletion of ozone layer was identified during 1970's.this is mainly happened due to more release of manmade industrial chemicals called chlorofluorocarbons (CFCs), which at the time were widely used as refrigerants, in aerosol sprays, and in manufacturing plastic foams. CFC molecules are inert in the troposphere, so they are transported to the stratosphere, where they photolyze and release chlorine (Cl) atoms. Chlorine atoms cause catalytic ozone loss by cycling with ClO (Fig. 17.2).

## **Particulate Matters**

Discrete mass of any material which exist as a solid or liquid droplets and microscopic, sub microscopic dimension is known as particulate matter(PM).The main source of particulate matter are fuel combustions and industrial operations like mining, smelting ,polishing ,pesticides, fertilizer and chemical fertilizers,

Particulate matters can have adverse effect on human health and are generally less than 10 μm size.

## Effects of Air Pollution

Nitrogen dioxide has more harmful effect as compare to nitric oxide. Exposure to NO<sub>2</sub> causes resistance in air movement in lungs.

Nitric oxide and carbon monoxide can combine haemoglobin to reduce oxygen carrying capacity of blood.

These pollutants affect plants by entering through stomata. Particulate pollutants affect the photo synthetic activity which may damage the plants and can affect productivity. Air pollutants can enhance the acidity of water resources therefore can adversely affect aquatic life. Material can be damaged due to effect of pollutants when exposed to the environment

## Prevention and Control of Air Pollution

Steps to control and prevention of air pollution

Engineers should consider the possibility by changing the manufacturing process. For example to minimise the high level of lead in air simple solution is to eliminate lead in gasoline (supply of unleaded petrol)

Use CNG (compressed natural gas) as an alternative fuel .

Use gas additives to improve combustions.

Control devices: The following items are commonly used as pollution control devices by industry or transportation devices. They can either destroy contaminants or remove them from an exhaust stream before they are emitted into the atmosphere.

Mechanical collectors (dust cyclones, multicyclones)

Electrostatic precipitators An electrostatic precipitator (ESP), or electrostatic air cleaner is a particulate collection device that removes particles from a flowing gas (such as air) using the force of an induced electrostatic charge.

Baghouses Designed to handle heavy dust loads, a dust collector consists of a blower, dust filter, a filter-cleaning system, and a dust receptacle or dust removal system.

Wet scrubber is a form of pollution control technology. The term describes a variety of devices that use pollutants from a furnace flue gas or from other gas streams.