ENVIRONMENTAL POLLUTION

Pollution - It is the addition of unwanted constituents to the air, water, soil or to any part of the environment which adversely change the quality of environment.

Pollutant - Any substance or agent or factor which cause contamination to the environment is called pollutant. Eg. Carbon monoxide, dust particles, pesticides, radioactive substances and metals like lead, mercury, etc.

Air pollution - The contamination of air by undesirable substances which are harmful to the animals and plants is called air pollution.

Sources of Air Pollution –

a) **Natural Sources** – This include volcanic action, forest fire etc. which release poisonous gases like CO, H_2S, SO_2 etc and various particulate matter into the atmosphere.

b) **Man-made sources** – Eg. Automobiles, industry, electric power plants, agricultural activities, refrigerant, Boilers etc.

Volcano

Forest fire

Industry

Man-made sources - - - - -

Automobiles and industries release large amounts of toxic gases by the burning of fossil fuels. These gases include carbon dioxide, sulphur dioxide, nitrogen oxides etc.

The leakage of refrigerant gases into the atmosphere can cause ozone depletion and contribute to global warming.

Boilers emit a variety of pollutants, including those associated with combustion processes and HAPs, such as: Nitrogen oxides (NO_x). Sulfur dioxide (SO_2). Particle pollution. (**HAPs** - Hazardous Air Polltants)

Automobiles

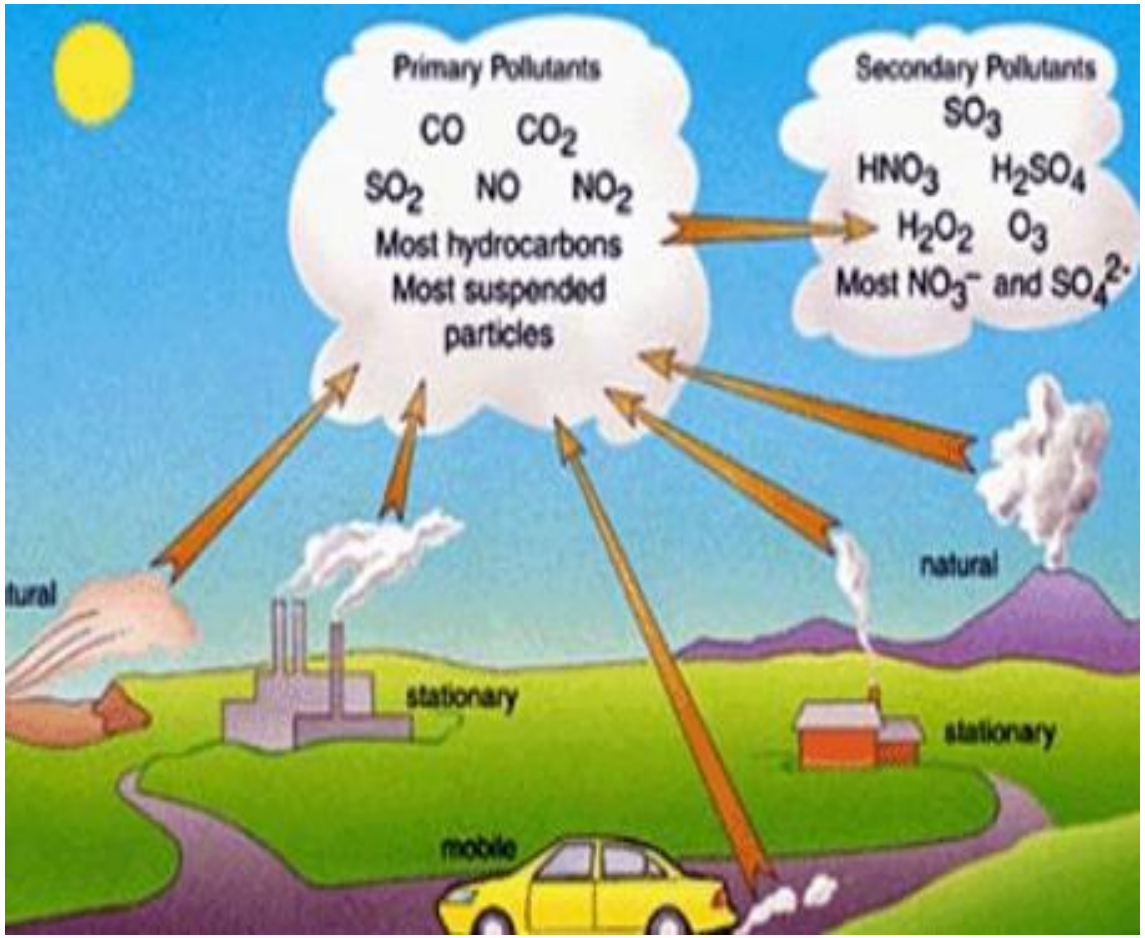
Refrigerant

Boiler

The air pollutants are classified as,

1. Primary pollutant – These are harmful chemical substances (pollutants) which are directly released in to the atmosphere. Eg.CO, CO_2, ammonia, hydrocarbons etc.

2. Secondary pollutants These are harmful chemicals formed in the air due to chemical reaction between the primary pollutants or between primary pollutants and air. Eg. SO_3, NO_2, Smog etc.

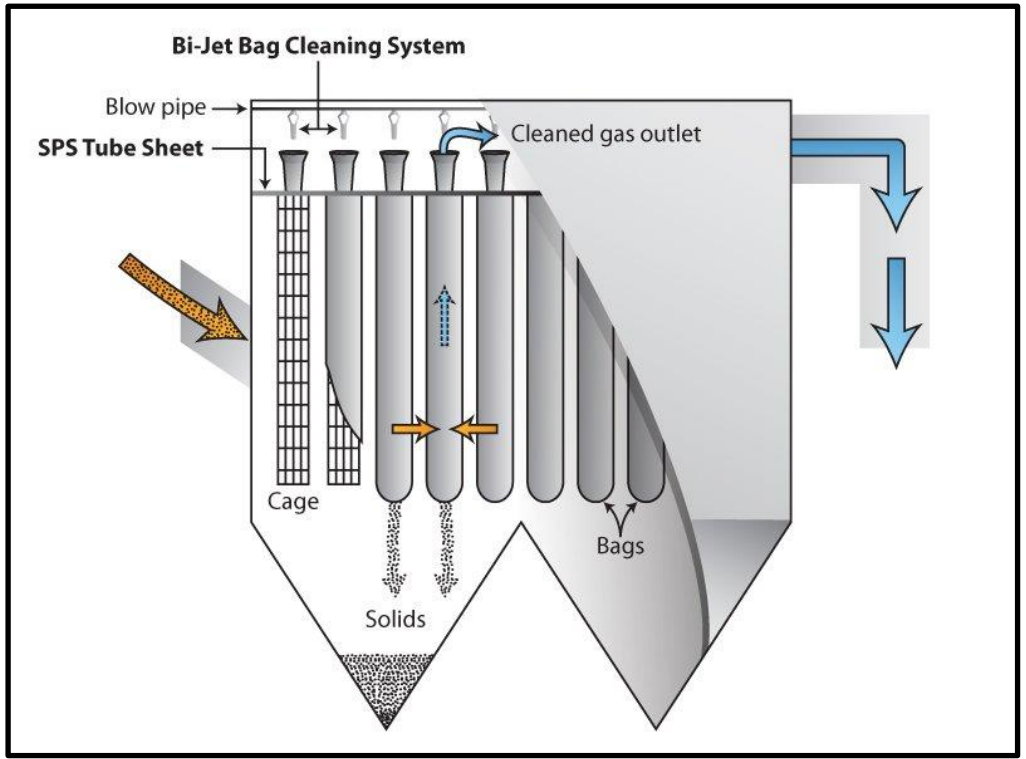


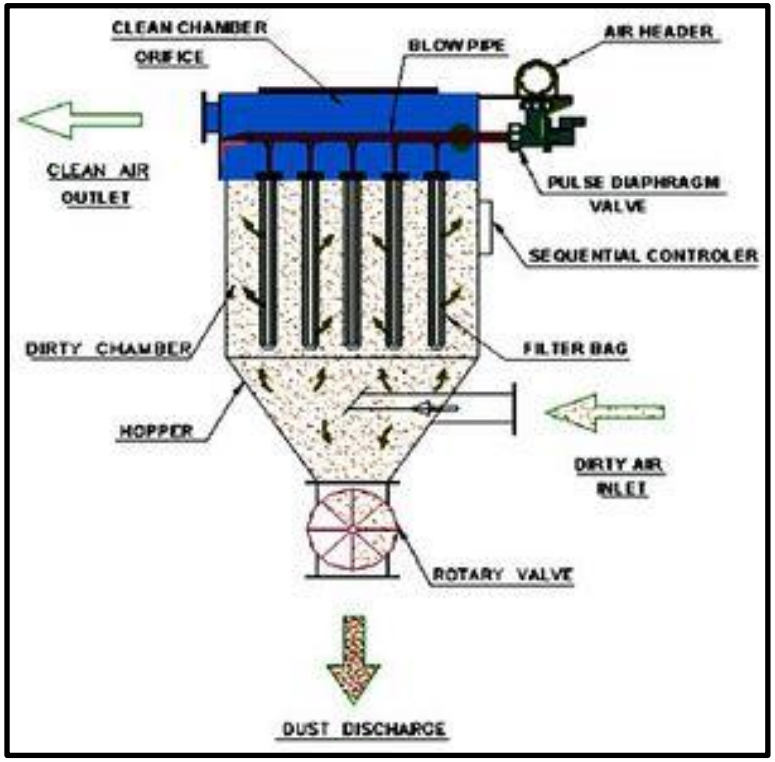
Major Air pollutants and their effects

Name of Pollutant	Effect
Oxides of Carbon	Carbon Monoxide (CO) - Head ache, dizziness, vomiting, breathing difficulty and death at high concentration
	Carbon dioxide (CO_2) – If present in excess quantity cause Green house effect and global warming
Oxides of Nitrogen (NO_2, N_2O_3, N_2O_5, N_2O, NO)	Oxides of nitrogen cause acid rain and photochemical smog. NO_2 - Cause respiratory problems, Internal bleeding, Lung cancer etc.
Oxides of Sulphur (SO_2, SO_3)	Bronchitis, Asthma, Lung cancer, sulphurous smog (London Smog) and acid rain.
Hydrocarbons	Breathing difficulty, cough, suffocation, lung cancer and photochemical smog
Particulate	Breathing difficulty, lung cancer, and brain damage (***Air borne small solid particles and liquid droplets are called Particulate***)

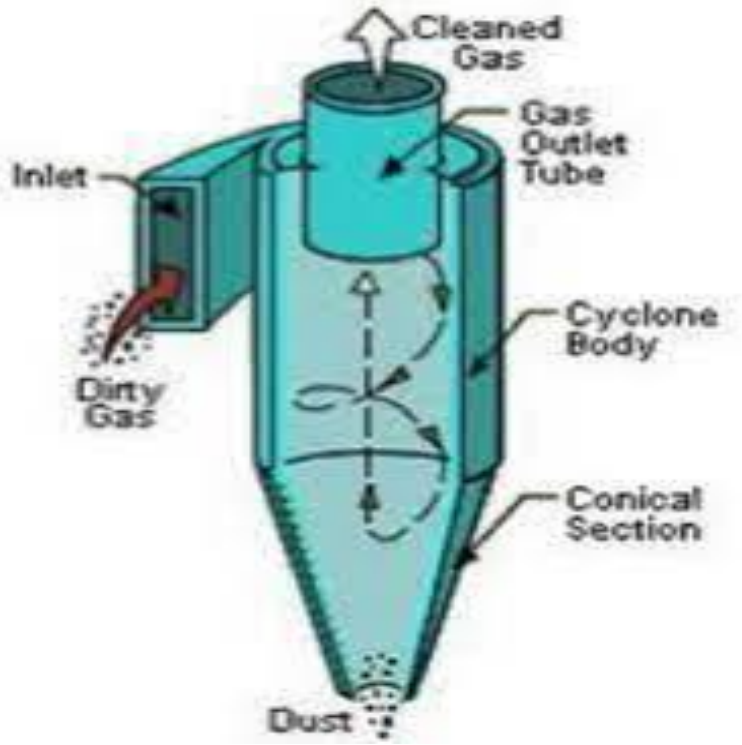
Air Pollution Control Methods

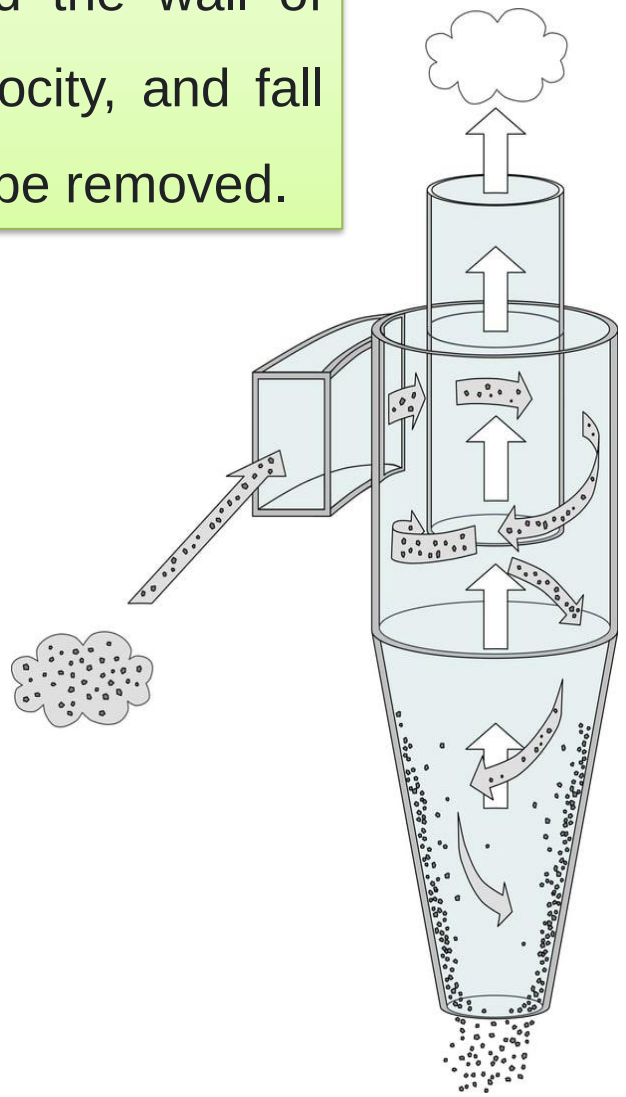
1. Bag Filter - A bag filter is a pollution control device and dust collector that removes particulates or gas released from commercial process out of the air. When the dust-containing gas passes through the filter media, the dust is stopped on its surface and the clean air is discharged through the gaps of the filter media.



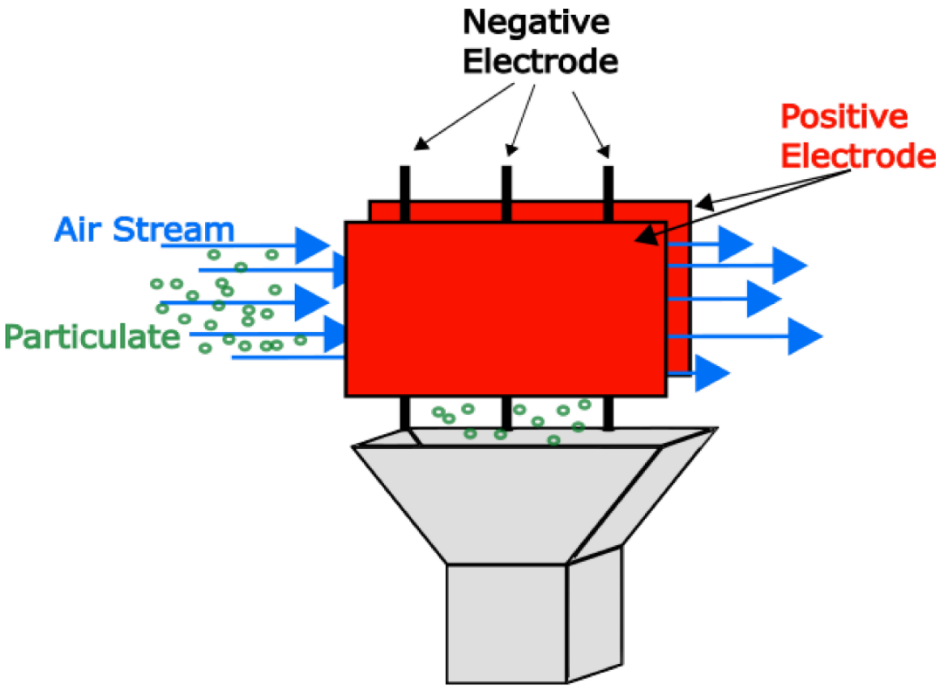


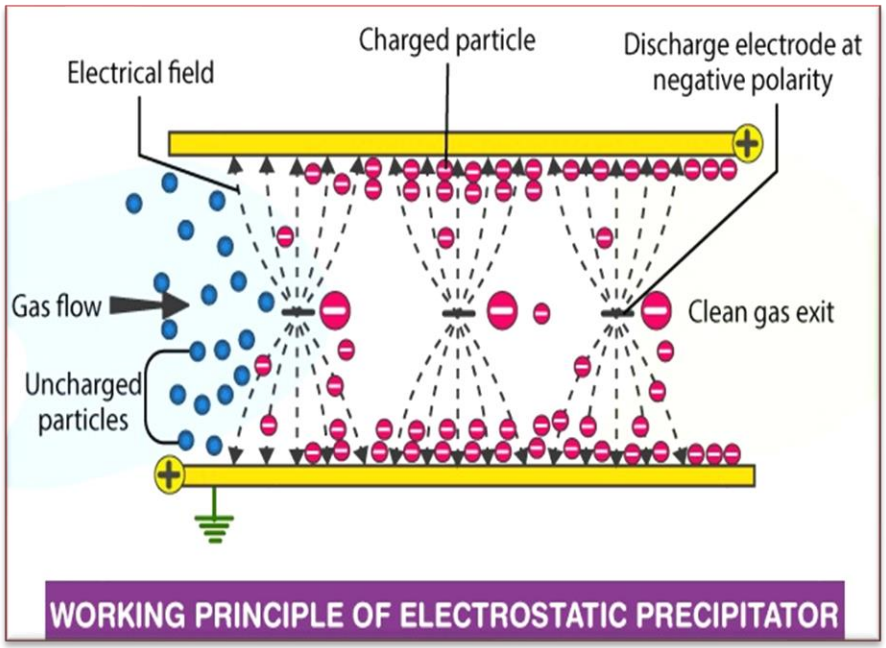
2. cyclone separator - In the cyclone separator air flows in a helical pattern. The centrifugal force created by this fast, circular air flow drives the heavier dust particles toward the wall of the cyclone chamber. They hit the wall, lose velocity, and fall down to the bottom of the cyclone where they can be removed.



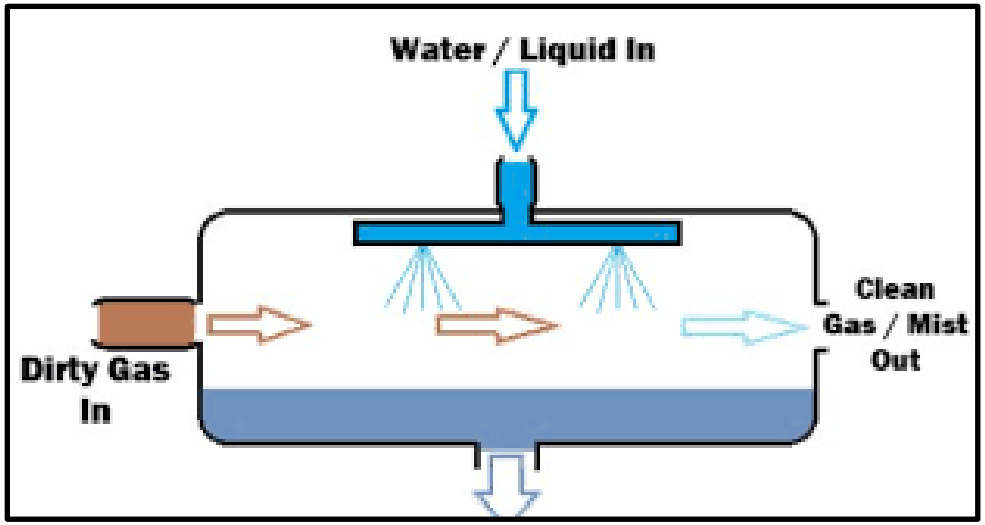


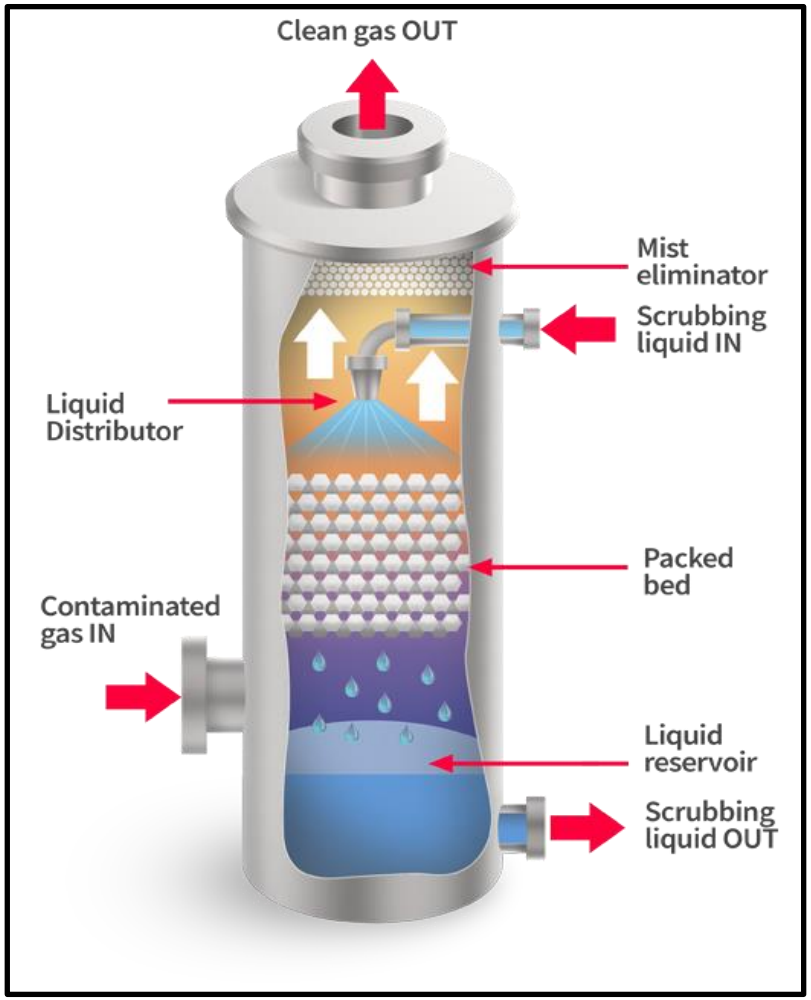
3. Electrostatic precipitator - Electrostatic precipitators operate on the principle of **the attraction of a charged particle for an oppositely charged collector**. It consists of two sets of electrodes: positive and negative. The polluted air is passed through the electrostatic precipitator containing positive and negative electrode. Depending on the charge, the particles in the polluted air are attracted towards the oppositely charged electrode.



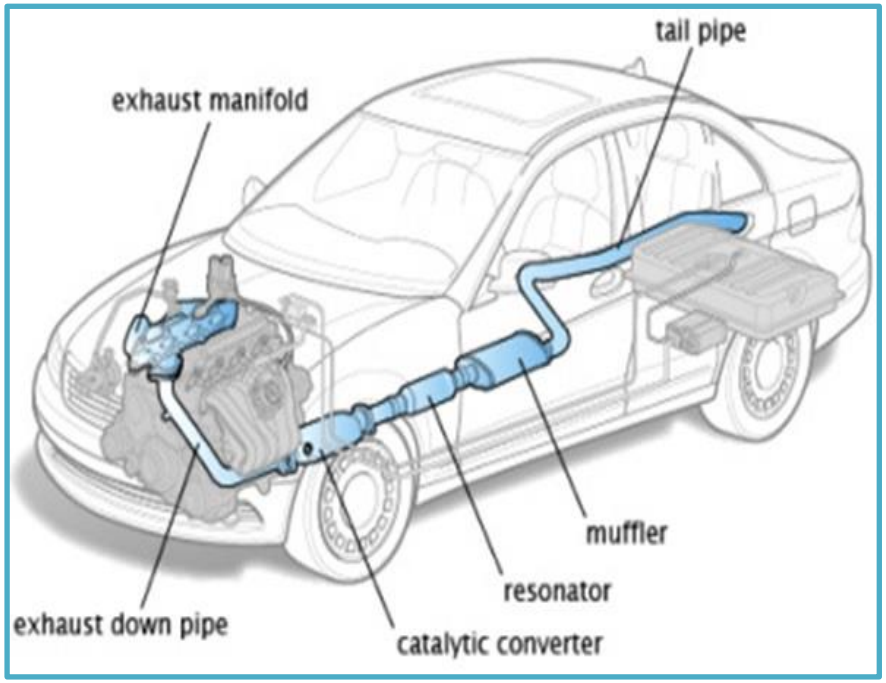


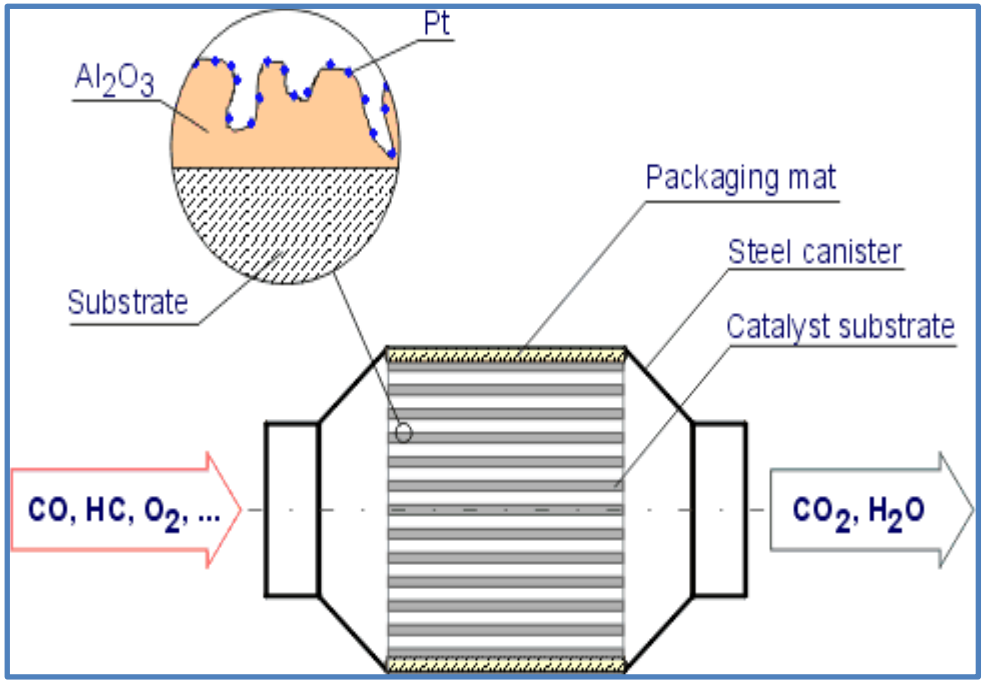
4. Absorber - Absorption is a physical or chemical process of removing a pollutant from a gas phase media by dissolving the pollutant into a solvent media. It involves the transfer of a gaseous pollutant from the air into a contacting liquid, such as water.





5. Catalytic converter - Catalytic converters make use of a catalyst, usually platinum or palladium, to speed up the chemical reactions between oxygen and pollutants in the air to convert them into less toxic byproducts like water vapor, carbon dioxide, and nitrogen gas.





Water pollution

Water pollution is the contamination of water by foreign substances which unfavorably alter its quality and characteristics.

Sources of Water pollution and their effects

a) Sewage – Foul smell, contain pathogenic microorganism, depletion of dissolved oxygen

b) Industrial effluents – Increase the toxic organic matter in water, depletion of dissolved oxygen, Eutrophication,

c) Soaps and detergents- Increase organic content in water, depletion of dissolved oxygen

d) Pesticides – Toxic to human being and other animals

e) Fertilizers – Eutrophication, Algal blooming

f) Heavy metals – Lead, Mercury, Cadmium, Arsenic, Chromium etc are toxic to human being and other animals

(*Eutrophication* – the process of increase in plant nutrients in water which leads to growth of Algae in water. *Algal blooming* – Sudden growth of algae in a particular area)

Water quality parameters

a) **pH** – pH of most drinking water lies in the range of 6.5 to 8.5

b) **Dissolved Oxygen (DO)** – It is the weight of oxygen in milligrams present per litre of water. For good quality water the value is 4 -6 mg/L

c) **Biochemical oxygen demand (BOD)** – Biological Oxygen Demand is defined as the amount of dissolved oxygen required by aerobic microorganisms to breakdown the organic materials in a sample of water at a specific temperature & timeframe. A higher value of BOD indicate pollution. For normal sample of water the value of BOD is 1-3 mg/L

d) **Chemical oxygen demand (COD)** – COD is defined as the oxygen equivalent required for the oxidation of organic matter in water determined with the help of a strong oxidant. COD value higher than 250 ppm indicates pollution.

Noise pollution- Noise pollution is defined as regular exposure to elevated sound levels that may lead to adverse effects in humans or other living organisms.

Sources of noise pollution–

a) Industries, Factories, Machinery

b) Vehicles – Train, bus, car, scooter etc

c) Domestic appliances – Mixie, Grinder etc

d) Construction work

Noise pollution induces hormonal imbalances, emotional disturbances, increases heart beat, raises blood pressure, disturbs sleep, cause fatigue, frustration, anxiety, and fright.

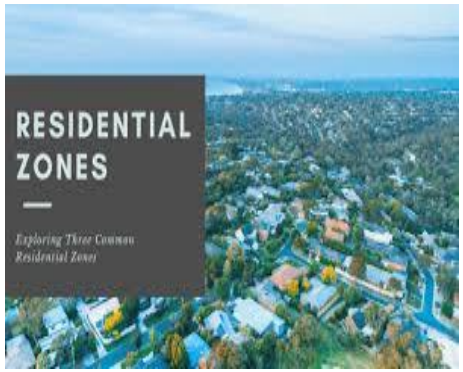
Noise level in the environment is expressed in decibels(dB). Noise level up to 85 dB is tolerable.

Beating of a drum --- 80-90 db
Exploding a cracker --- 120 dB,
Siren – 150 dB

The Noise Pollution Rules established in 2000. The noise pollution rules prohibit the use of loudspeakers at night and provide provisions for penalties in case of use of such devices without the permission from a competent authority.

This rule categorized the areas into industrial, commercial, residential or silence areas/zones for the purpose of implementation of noise standards for different areas. Noise pollution rules have defined the acceptable level of noise in different zones for both daytime and night time. Sound emitting construction equipments shall not be used or operated during night time in residential areas and silence zones

Silence Zone



Residential Zone

Commercial Zone

Industrial Zone

Permitted noise limits in different zones

Area Code	Category of Area/Zone	Limits in dB	
		Day Time	Night Time
(A)	Industrial area	75	70
(B)	Commercial area	65	55
(C)	Residential area	55	45
(D)	Silence Zone	50	40