AIR POLLUTION

Compiled by
Anamika Das
Assistant Professor
Department of Agriculture
Netaji Subhas University, Jamshedpur

Air pollution

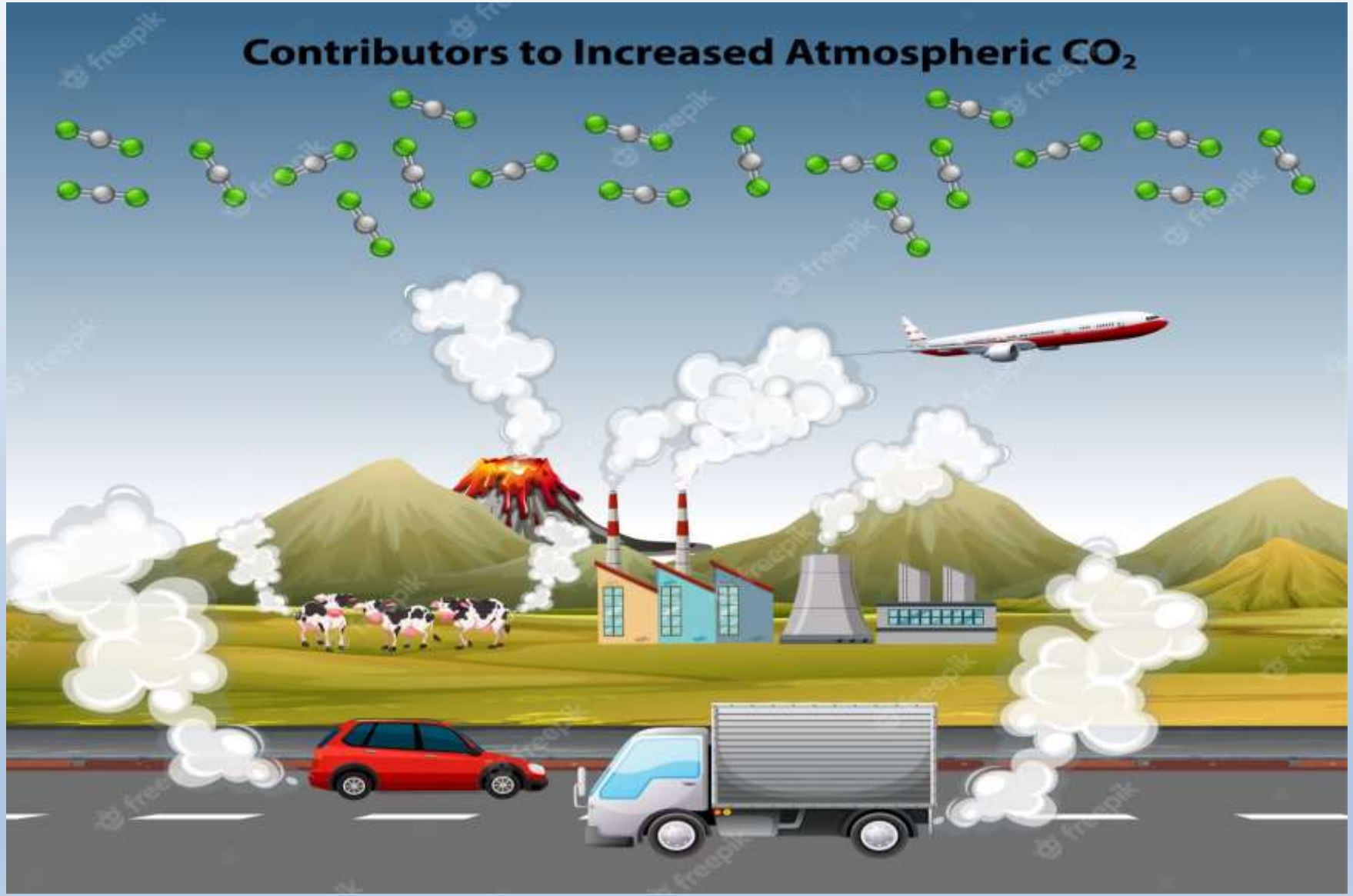
- Air pollution may be defined as any atmospheric condition in which certain substances are present in such concentrations that they can produce undesirable effects on man and his environment.
- These substances include gases (SOx, NOx, CO, HCs, etc) particulate matter (smoke, dust, fumes, aerosols) radioactive materials and many others.
- Most of these substances are naturally present in the atmosphere in low concentrations and are usually considered to be harmless.

Sources of air pollution

1. Natural sources- wind-blown dust, smoke, fly, ash, gases from forest fires, gases from swamps and marshes, Pollens, Fungi spores from micro organisms, salt spray from ocean, volcanic eruptions, etc.

2. Anthropogenic sources-

- Domestic- coal combustion, dust, smoke
- Automobiles- motor vehicles (60-70%)


Contributors to Increased Atmospheric CO_2

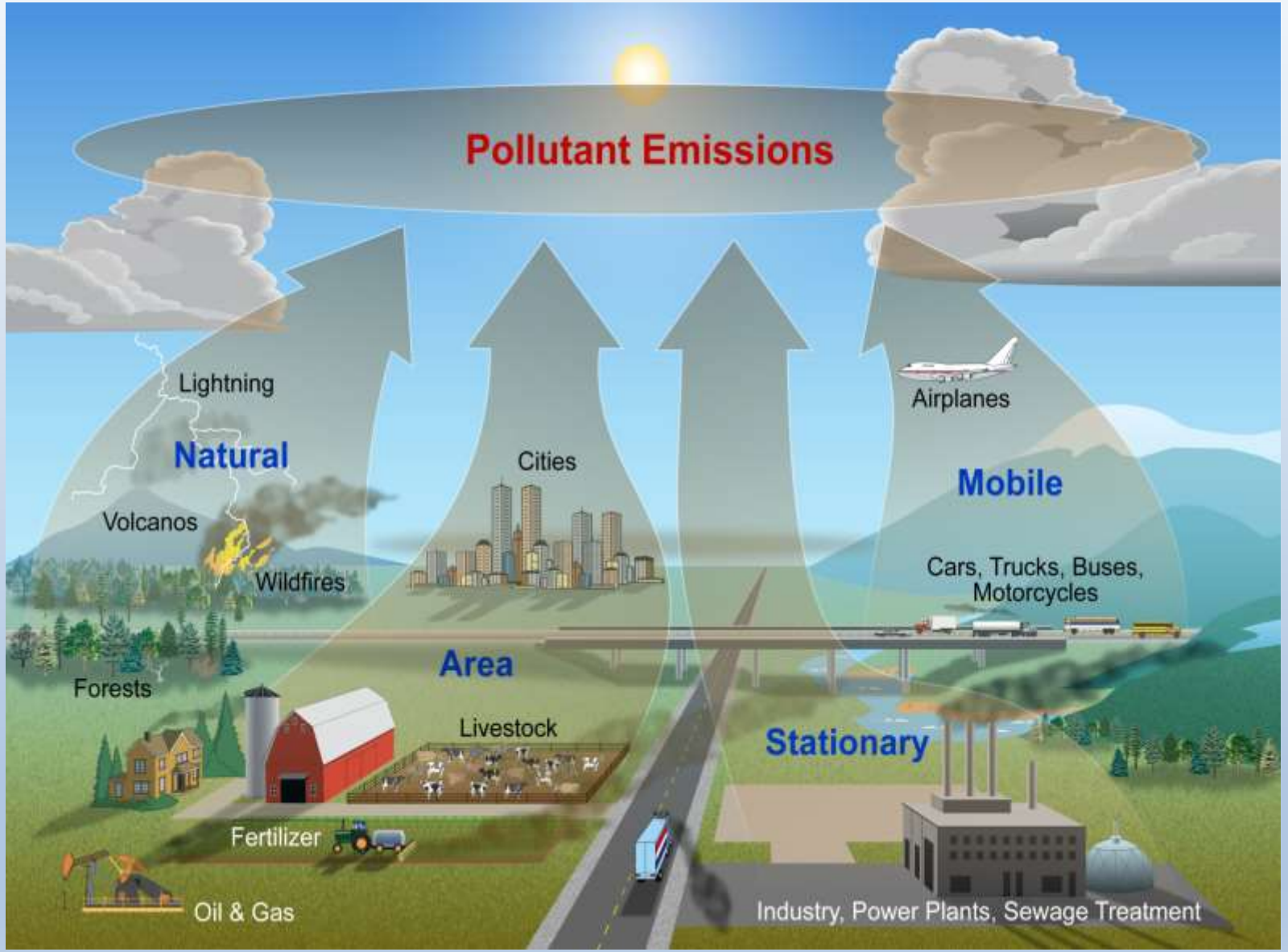
Sources of air pollution

3. Industries-

- Fertiliser plants, thermal plants, textile industries,
- steel plants, petroleum, paper and pulp, industry, food processing

4. Agriculture-

- Pesticides and herbicides like chlorinated, hydrocarbons, phosphates, nitrates, etc.


Pollutant Emissions
Lightning
Natural
Volcanos
Wildfires
Forests
Cities
Area
Livestock
Fertilizer
Oil & Gas
Airplanes
Mobile
Cars, Trucks, Buses, Motorcycles
Stationary
Industry, Power Plants, Sewage Treatment

Types of air pollutants

- Agents or contaminants that cause or induce the formation of air pollution are called air pollutants.

1. **Based on origin-**

- **Primary pollutants** – that are emitted directly into the air and are found in the same chemical form in which they are released. Examples- particulate matter, sulphur dioxide, carbon monoxide, hydrocarbons, etc.
- **Secondary pollutants-** are generated in the environment by the interaction between two or more primary pollutants. Examples- H_2SO_4, HNO_3, etc.

Types of air pollutants

2. **Based on chemical composition-**

- **Organic compounds-** containing carbon and hydrogen. Examples- formaldehyde, acetone
- **Inorganic compounds** - carbon monoxide, carbon dioxide, ozone

3. **Based on the state of matter –**

- **Particulate pollutants or suspended particulate matter-** fine size, solids and liquids, including dust, fumes and smokes
- **Gases pollutants-** CO, SO

Impacts of air pollutants on human health

- Many people suffer from some form of heart or lung disease, and are very susceptible to air pollution. Especially, new born and elderly people
- Typical effects of sulfur dioxide, and oxides of nitrogen include eye and throat irritation, coughing and chest pain.
- Nitrogen dioxide is known to cause pulmonary edema, an accumulation of excessive fluids in the lungs.
- Ozone, a highly irritating gas, produces pulmonary congestion; symptoms of ozone exposure may include dry throat, headache, disorientation, and altered breathing patterns.

Impacts of air pollutants on plants

- Prolonged exposure to higher levels of air pollutants from Iron smelters, coal burning power plants and industries, vehicles can damage trees and plants.
- Chronic exposure of leaves to air pollutants damages waxy coating, leads to damage from diseases, pests, drought and frost.
- Such exposure interferes with photosynthesis and plant growth, reduces nutrient uptake and causes leaves to turn yellow, brown or drop off.
- At higher concentrations of SO2 most of the flower buds become stiff and hard and fall off.

Impacts of air pollutants on materials

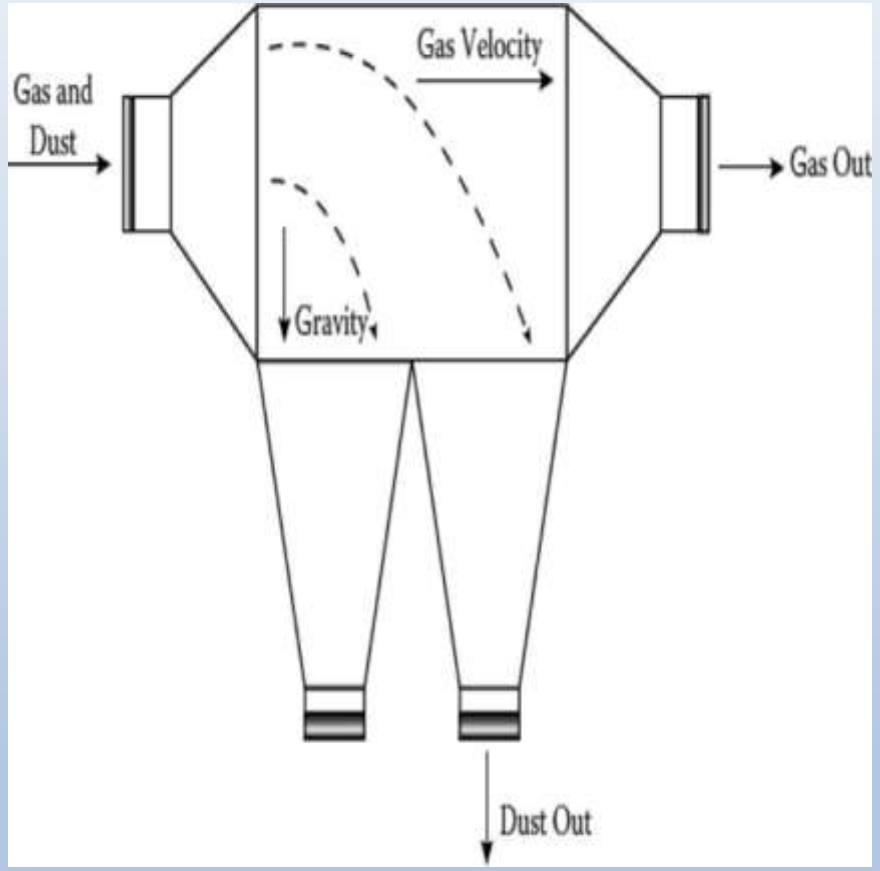
- Every year , air pollutants cause damage worth billions of rupees.
- Air pollutants breakdown the exterior paint in cars and houses.
- Air pollutants have discolored irreplaceable monuments, historic buildings, marble statues and other heritage and natural beauty sites.

Impacts of air pollutants on materials

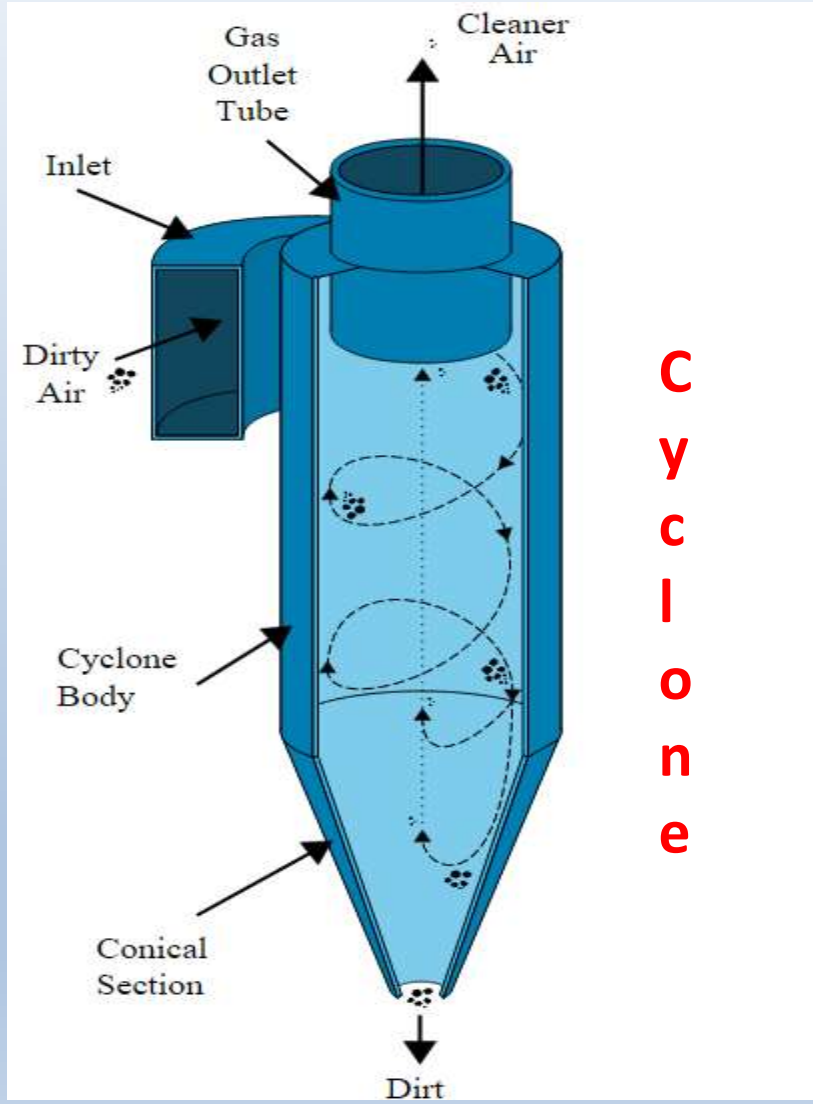
Control devices for particulate matter

1. **Settling chambers-** are nothing more than large places in the flues, similar to settling tanks in water treatment. These chambers remove only the large particulates.
2. **Cyclones (centrifugal collectors)** are widely used for removing large particulars. The dirty air is blasted into a conical cylinder, but off the centerline. This creates violent swirl within the cone, and the heavy solids migrate to the wall of the cylinder where they slow down due to friction and exit at the bottom of the cone. The clean air is in the middle of the cylinder and exits out the top.

Control devices for particulate matter



Settling Chamber

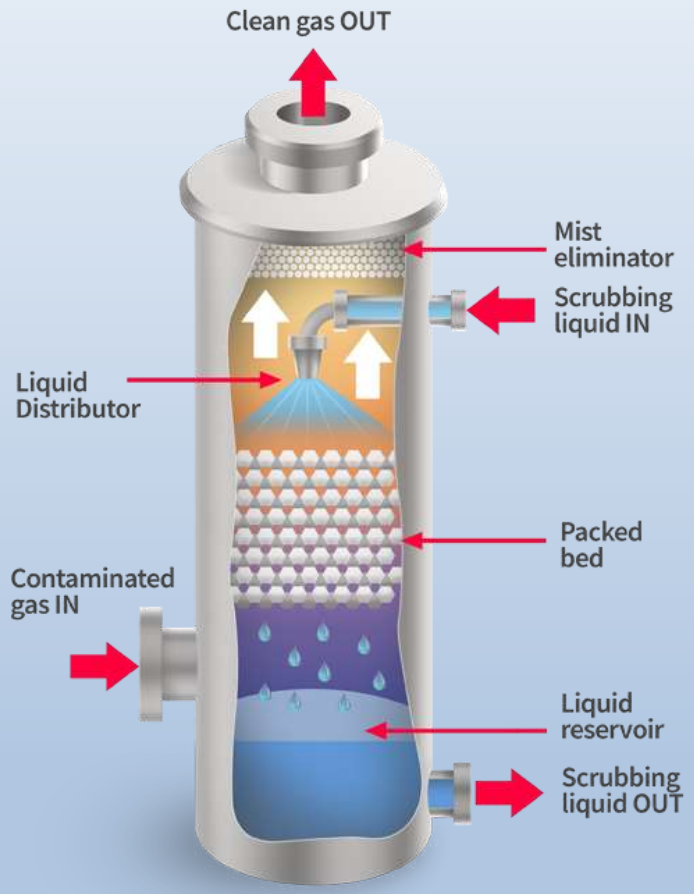


Cyclone

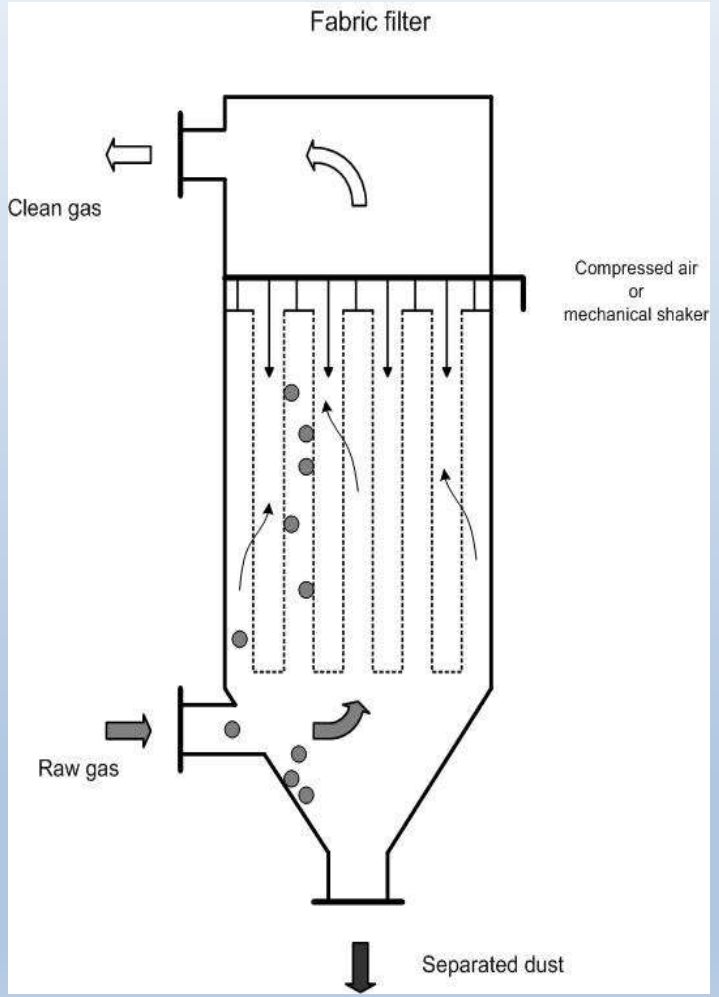
Control devices for particulate matter

- **Wet collectors –** are effective for removing large particulates. More efficient scrubbers promote the contact between air and water by violent action in a narrow throat section into which the water is introduced.
- **Fabric filters** operate like the common vacuum cleaner. Fabric bags are used to collect the dust which must be periodically shaken out of the bags. The fabric removes nearly all particulates. Bag filters are widely used in many industries, but are sensitive to high temperature and humidity.

Control devices for particulate matter



Wet collectors



Control of gaseous pollutants

- **Absorption** involves the transfer of a gaseous pollutant from the air into a contacting liquid, such as water. The liquid must be able either to serve as a solvent for the pollutant or to capture it by means of a chemical reaction.
- In **adsorption**, gaseous pollutants are removed from an air stream by transferring the pollutants to the solid surface of an adsorbent. Activated carbon is the most commonly used adsorbent, although zeolites, polymers, and other adsorbents may be used.

Control of gaseous pollutants

- **Condensation** can be used to remove a pollutant from a gas stream if the dew point of the pollutant is higher than the carrier gas (or non-pollutant gas).
- In such cases, the total gas stream can be reduced in temperature to below the pollutant's dew point, which will then separate the pollutant from the remaining gas stream as a liquid.
- Common examples can include distillation of various hydrocarbons in refining operations and drying of air.

Ambient Air Quality Standards

- Ambient air quality refers to the condition or quality of air surrounding us in the outdoors.
- National Ambient Air Quality Standards are the standards for ambient air quality set by the Central Pollution Control Board (CPCB) that is applicable nationwide.
- The CPCB has been conferred this power by the Air (Prevention and Control of Pollution) Act, 1981.
- The current standards (2009) comprise 12 pollutants as follows: Particulate Matter 10 (PM10), Particulate Matter 2.5 (PM2.5), Nitrogen Dioxide (NO2), Sulphur Dioxide (SO2), Carbon Monoxide (CO), Ozone (O3), Ammonia (NH3), Lead (Pb), Benzene, Benzopyrene, Arsenic & Nickel

CENTRAL POLLUTION CONTROL BOARD'S AIR QUALITY STANDARDS

AIR QUALITY INDEX (AQI)	CATEGORY
0-50	Good
51-100	Satisfactory
101-200	Moderate
201-300	Poor
301-400	Very Poor
401-500	Severe

The measurement of air quality for AQI is based on the eight pollutants for which short-term (up to 24-hourly averaging period) National Ambient Air Quality Standards are prescribed and the worst reading in these pollutants represents the AQI for that city.

Steps taken by Govt. to control air pollution

1. Introduction of cleaner/alternate fuel like CNG, LPG

2. Promotion of public transport network including Metro

3. Compulsory PUC (Pollution under control) certification of period driven vehicles which test for carbon monoxide and hydrocarbons.

- India has launched an ambitious National Clean Air Program to reduce particulate matter pollution by 30% by 2024.

Thank You