MODULE –II

Environmental pollution

2.1 Introduction

2.2. Air pollution

- **Classification of air pollutants**
- **Causes of air pollution**
- **Consciquence of air pollution**
- **Equipments used to control air pollution:**
- **Control measures of air pollution**

MODULE –II

ENVIRONMENTAL POLLUTION

2.1 INTRODUCTION

Pollution is derived from Latin word ‘polluere’ which means ‘to contaminate’ any feature of environment.Pollution is the effect of undesirable changes in our surroundings that have harmful effects on plants, animals and human beings. Pollution has become a very common yet serious issue in today's world. It has been there for a long time even before human evolution such as volcanic eruption, wildfire which lead to various photochemical reactions in the atmosphere. ... And, one of the pollutants is human and human-created machines. The pollution is the process or act that human did during our daily lives which had pollute or contaminated the environment or a state of being polluted with harmful chemical substances that may cause health problems to human beings or even cause some deathly disease such as cancer which is the growth of abnormal cells in the human bodies.

The Unfavorable alternation of our surroundings is called pollution.It changes the quality of air, water, land which interfere with human being health & other life on the earth.Depends on the nature of pollutant, generated from various sources, pollution are in many kinds.

(Ex) pollutants from industry, thermal & nuclear power plants, domestic wastages, chemical fertilizers, insecticide.

Pollution may be local, regional, trans-boundary or global. The agent which causes pollution is called pollutant.

Pollutants

Biodegradable	Non bio degradable
1. Decompose naturally	1. Do not decompose
2. Fast process	(or) slowly decompose.
(Ex) Sewage, heat, noise	2. Slow process.
	3, Very difficult to remove
	(Ex) DDT, aluminum cans
	Mercury salts.

Types of pollution

1. Air pollution
2. H_2O pollution
3. Soil pollution
4. Marine pollution
5. Noise pollution
6. Thermal pollution
7. Nuclear hazards.

2.2 Air pollution

Air we breathe in use to be pure and fresh. But, due to increasing industrialization and concentration of poisonous gases in the environment the **air** is getting more and more toxic day by day. Also, these gases are the cause of many respiratory and other diseases.

The presence of one (or) more contaminants like dust, smoke, mist, odour in the atmosphere which are injurious to human being, plants and animals.

Composition of atmospheric air

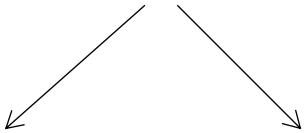
- N_2 ⟶ 78%
- O_2 ⟶ 21%
- Ar ⟶ <1%
- Co_2 ⟶ 0.037%
- H_2o vapour ⟶ remaining
- O_3, He, NH_3 ⟶ Trace amount.

Sources of air pollution

Natural sources	**Man-made activities**
1. Valconiceruptions,	1. Thermal power plants
2. Forest fire,	2. Vehicle emissions
3. Biological decay,	3.Fossil fuel burning
4. Pollen grains,	4.Agricultural activities.
5. Marsh gases	
6. Radio active materials	

Classification of pollutants

Air pollutants



Primary air pollutant	Secondary air pollutant
1.Air pollutants are emitted in harmful form.	1. Air pollutants reacted with one (or) more other pollutant to create a new pollutant.
(ex) Co, No, So_2	(ex) O_3, H_2so_4, aldehyde
2.primary pollutents are known as Indoor pollutants.	2. Secondary pollutants are known as Poisionous substances
(ex) radon gas	

Common air pollutants – causes – consciquence

1. Carbon monoxide (co)

- Colour less, odourless gas
- It is poisonous gas to air-breathing animals.
- c.Emitted from incomplete combustion of fossil fuels and wood.
- Industries and cigeratte smoking also produce CO

E**ffects:**

- It affects the o_2 carrying capacity of blood. So the reduced amount of o_2 is supplied to brain, heart, tissus causes head ache & anemia.
- At high level, it causes Coma, braincell damage and death.
- It increase the global temp.

2. Nitrogen – dioxide (No_2)

- It is a reddish brown irritation gas-air pollutant.
- It is converted into nitric acid
- No_2+ moisture ~~HNO_3~~
- Found in the emission of auto mobiles and industry.

Effect:

- Causes respiratory problems Asthma, Bronchitis.
- Acid deposition of HNO_3 can damage tree, soil, aquatic life in lakes, metal corrosion.

3.Chromium

- Solid toxic metal, emitted into the atmosphere as particulate matter.
- Produced from chromium manufacture, chromium plating ,paint, smelters.

Effect:

- Affects central nervous system,cancer, gastro intestinal ulcer.

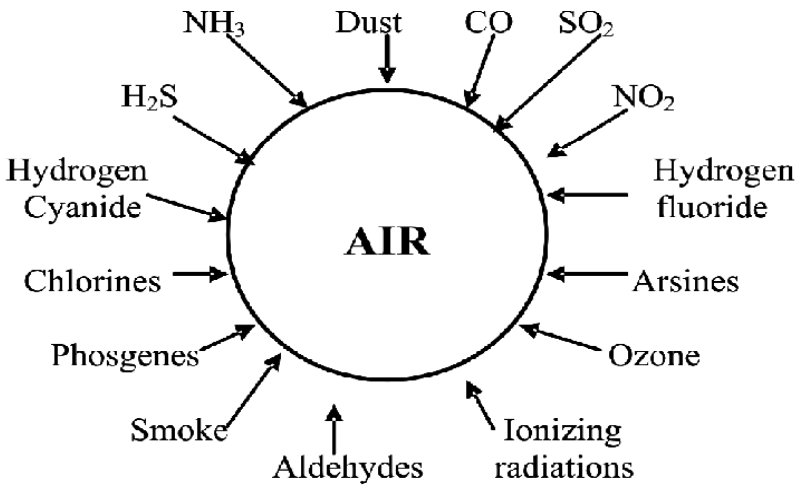
4. Ozone (O_3)

- O_3 is a gas composed of three oxygen atoms
- It is formed when oxides of nitrogen react with volatile organic compounds in the presence of sunlight.
- O_3 is good when it is present in the ozone umbrella above the earth. But bad when it is present at the ground level.

E**ffect:**

- Chest pain, Coughing, Throat irritation, Asthma, damage vegetation & ecosystem, Reduced crop production, Climate changes.

Causes, consciquence and control measures of Air pollution



Source: Engineering Chemistry by Ravikrishnan

Causes of air pollution

- Agriculture: Hydro Carbon released by plants, pollen grains, insecticide cause air pollution.
- Dust: Dust in the air is increased by dust storms, wind, valcones, automobiles.
- Industries: Combustion of fossil fuels like coal, petroleum in industries
- Auto mobiles: The combustion of petrol and diese in auto mobiles releases harmful gares into the air. They also produce dust. Vehicles are the major source of air pollution in India.
- Ionizing rodiations: Testing of atomic weapons, atomic explosions release Alpha,Beta,Gama - particles into the air.
- Freons: Use of freons, CFC in refrigerators,coolants,filling agents in aerosol packages cause pollution.
- Aerosol: Aerosols are small particles of solid (or) liquid substance in the air. They prevent the gaseous exchange in the air. They prevent the gaseous exchange between plants and atmosphere. It also change the climate.

- Chemical industries including pesticides, fertilizers, weedicides, fungicides.

- Cosmetics.

- Processing industries like cotton textiles, wheat flour mills, asbestos,Welding, stone crushing, gem grinding.

Consciquence of air pollution

- Death: When air is polluted with poisonous gases, death comes as a result immediately.
- (Ex) Bhopal episode – due to the leakage of methyl isocyanate – toxic gas into the air kill the mass of 3000 human beings.
- Green house effect: Green house effect is the increased warming of the earth, caused by the rise in CO_2 Content of the air. Due to this effect, the polar ice caps are melted, as a result sea level rises. Coastal regions, and low lying areas all over the world will be go under H_2o.
- Global warming: The overheating of the earth by the increased amount of green house is called global warming.
- Crop losses: Heavy loss of the crop plants is caused by smog. It damage leafy vegetables, Cereals, textile crops, ornamental plants, fruits & forest trees.
- Vomiting: SO_2 Causes vomiting.
- Jaundice: Arsines induce RBC breakdown & jaundice.
- Oxygen Carrying Capacity: COreduces O_2 carrying capacity of RBC by its permanent combination with heamoglobin.
- Caughing: Caughing is induced by phosgenes.
- Headache: It is induced by SO_2
- Cancer: It is caused by air pollutants like ash smoke, chromium, nickel.
- Cardiac diseases: Cadmium causes high blood pressure and heart disease.
- Pneumonia: Pneumonia is caused by breathing into much of manganese particles.
- Depletion of ozone layer: It is due to freons& CFC in Ac
- Acid rains: precipitation of oxides of sulphur and nitrogen with rain is termed as acid rain.
- Acid rain affects materials, organisms & aquatic eco system.

Equipments used to control air pollution:

- The emission of exhaust from automobiles can be reduced by devices such as " positive crankcase ventilation valve and catalytic converter".
- Electrostatic precipitators can reduce smoke and dust from industries.

- Gasious pollutants rising from industries can be removed by 'differential soubility' of gases in H_2O
- A 'fine spray' of water in the device called 'scrubber can separate many gases like NH_3, SO_2 from the emitted exhaust.
- Certain gases can be removed by filteration. (or) absorption through activated carbon.
- At the government level, pollution can be controlled by framing legislations.
- Euro II standard is introduced to reduce the pollutants in air.

Control of air pollution

- Use only unleaded petrol.
- Use petroleum products and other fuels that have low sulphur& ash content.
- Plant trees along busy streets because they remove particulates and carbon monoxide and absorb noise.
- Industries and waste disposal sites should be situated outside the country.
- Ensure that houses, schools, restaurants& places, where children play are not located on busy street.
- Use catalytic converters to help control the emissions of carbon monoxide & hydro carbons.
- The emission rates should be restricted to permissible level by each & every industry.
- Continuous monitoring of the atmosphere for the pollutants should be carried out to know the emission levels.
- Incorporation of air pollution control equipments in the design of the plant layout must be made mandatory.