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Industrial pollution:

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5. Water pollution:-
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Different noise environments and their sources measurments of noise and the equipments, Noise pollution laws, vibration isolation, and noise control in industries. 6

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Modern environmental assessment method, pollution control in steel plants and coal industries. → 3.

→ books

1. Managing Industrial Pollution by Sc Bhatia.
2. Environmental pollution by HM Dix.
3. Chemistry for environmental Engineering by Sawyer.

1. Introduction :-

Environment and human activities :-

→ Population, pollution, Global warming, climate change, Genetic modification, ocean acidifi-cation, water pollution, Deforestation, Acid Rain, Ozone Depletion are.

→ Industrial pollution :-

Industrial pollution is generally referred to the undesirable outcome when factories emits harmful by products and waste into the environment such as emissions to air or water bodies, deposition on land fills or emission of toxic chemicals into the atmosphere.

Causes of Industrial pollution :-

(i) Lack of policies to control pollution.
(ii) unplanned industrial growth.
(iii) use of outdated Technologies.
(iv) presence of large numbers of small scale industries.
(v) inefficient waste disposal.
(vi)

→ Ecology is the study of the relationships between living organisms, including humans and their physical environment. Ecology as a science plays an important role in our understanding of various

ecosystem.

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Air Pollution:-

"Air pollution means the presence in the outdoor atmosphere of one or more contaminants such as dust, fumes, gas, smoke or vapour in quantities with characteristic, and of duration such as to be injurious to human, plant or animal life or to property or which unreasonably interfere with the comfortable enjoyment of life and property".

→ Air pollution has been mainly caused by rapid industrialization in some western countries, some critics comment on air pollution as 'the price of industrialisation'.

→ The WHO defines air pollution as the presence of material in the air in such concentration which are harmful to man and his environment. A number of ingredients find their way in the air and these are mostly gases, which rapidly spread over wide areas.

→ dry air contains 78.09% nitrogen by volume and 20.94% oxygen. The remaining 0.97% is composed of a gaseous mixture of carbon dioxide, helium, argon, krypton, nitrous oxide and xenon as well as very small amounts of some other organic and inorganic gases whose amount in the atmosphere vary with time and place. Various amounts of contaminants continously

enter the atmosphere through both natural and man-made processes that exist upon the earth. That portion of these substances which interacts with the environment to cause toxicity, disease, aesthetic distress, physiological effect or environment decay, has been labelled by man as a 'pollutant'.

Classification and properties of air pollutants :-

The foreign matter which polluted the air is called Air pollutants. There are mainly two types of air pollutants — gaseous and particulate.

→ oxides of carbon, nitrogen and sulphur are gaseous pollutants.

→ particulate pollutants may be solid or liquid particles, larger particles settle down quickly viz., sand and water droplets where as small dust particles remain suspended in air for a long time. These are added into the atmosphere by the processes of blasting, drilling, crushing, grinding and mixing.

→ Some air pollutant which source and their effect are following →

(2) Oxides of carbon — Mainly Co and CO_2.

Sources :- Carbon oxides are produced in nature by

→ Burning of fossil fuels.
→ Industries
→ Deforestation
→ Excess use of automobile
→ forest fire
→ over population.

CO :- Colourless, odourless (गंधहीन) and a poisonous gas which is produced by incomplete combustion of fuel.

Effect :- Carbon monoxide has a high affinity for haemoglobin and combines with it to form carboxy haemoglobin which reduces the oxygen carrying capacity of haemoglobin, leading to giddiness, laziness, reduced vision and even death.

CO_2 has a major effect temperature leading to global warming which can melt the ice caps resulting in rise in ocean levels, and submerging the coastal areas.

(ii) Oxides of nitrogen :→
mainly NO_2 and NO.

Sources :-

→ Burning of fossil fuel.
→ Industries.
→ Lightening.
→ forest fires.

NO is a colourless, odourless gas which like CO can combine with haemoglobin to reduce the oxygen carrying capacity of haemoglobin but is found in low concentration so it is not a major health hazard.

NO_2 has a capability to form highly corrosive acid, Nitric acid (HNO_3) on combination with water. NO_2 irritates eyes, nose, lungs.

(iii) Oxides of Sulphur :-

Mainly SO_2 and Sulphur trioxide (SO_3).

Sources -

→ Burning of fossil fuel.
→ Smelting of non ferrous metals.
→ Automobiles especially diesel engines.

Effect :- SO_2 and SO_3 can react with water to form acid sulphurous acid (H_2SO_3) and sulphuric acid (H_2SO_4) respectively.

→ The acid formed are very toxic and cause irritation of eyes, nose and throat. There may cause acid rains having an ill effect on aquatic life, can corrode the metals and spoil the beauty of building Tajmahal is loosing its sheen due to Mathura refineries.

(2nd) Hydrocarbons :-
formed by hydrogen and carbon.

Sources -
- Incomplete combustion of fuels in automobiles.
- component of natural gas.
- Agriculture.
- Animal husbandry.
- Decomposition of organic matters.
- Most of the hydrocarbons are carcinogenic can cause cancer.

(V) Photochemical oxidants :-
These are ozone, peroxyael nitrate and aldehydes.

Ozone :- → Ozone is produced in the troposph -ere layer of atmosphere when vapours of organic chemicals, hydrocarbons combine with nitrogen oxide compounds in the presence of sunlight.

Sources :-
- Motor vehicles
- paints and solvents
- chemical plants.
- Refineries.

Ozone is harmful in the lower layers of atmosphere. it reacts with lung tissues causing inflammation and chest pain. it is toxic for both plants and animals.

peroxy acetyl Nitrate

Peroxyacetyl Nitrate (PAN) and aldehydes by the reaction of nitrogen oxide with hydrocarbons in the presence of sunlight.

Effect of PAN :→ It causes irritation of eyes, throat and lead to respiratory problm like asthma, bronchitis ~~etc~~ etc.

(V2) Particulate matter are categorised according to their size –

(a) aerosols :→

It consists of liquid or solid particles which are less than 1 µm in diameter. These may include biphenyl (PCb), Chloro fluoro carbon (CFC), polychlorinated biphenyl etc.

(b) Dust :→

When the size of particulate matter is more than 1 µm in diameter. It is released in nature by burning of coal, mining process breaking of stone and from textile mills.

(c) Mist :–

When the size of particulate matter is more than 1 µm in diameter and is in liquid form it is called as mist. It is released from various industrial operation and spraying of insecticides on crops.

(d) Fumes:-

These are the solid particulate matter which are less than 1 μm in diameter. These are released in nature from industrial and Metallurgical operation.

*. Effect of Air pollution:-

on humans:-

→ irritation of respiratory system leading to bronchitis, asthma, emphysema or lung cancer.

→ irritation of eyes and Nasal tract.

→ Mercury released may result in nerve, brain and Kidney damage.

→ lead a major poisonous pollutants can damage nerves, brain, blood, cells, Kidney and reproductive organs.

→ Radioactive fall out has somatic (which is seen on the body) and genetic (which is passed to next progeny) effect.

→ on plants.

→ Reduction in the amount of Chlorophyl. for example SO_2 is responsible for chlorosis.

→ Killing or death of a tissue for example ozone causes necrosis and damage leaves.

→ Shedding of leaves for example NO_2 causes premature leaf fall or abcission resulting in reduced crop yield.

On materials:-

→ Corrosion, hence the economic loss of metals.
→ Disintegration of paper.
→ Cracking of rubber
→ Discolouration of paints
→ Discolouration and reduction in strength of Textiles.
→ Attack on building.

On climate:→

Rapid industrialisation, deforestation, fossil fuel combustion are some of the reasons which have rapidly increased the carbon dioxide concentration in nature.

On Aesthetic Beauty:→

Dust, fumes, smoke released in nature due to various activities of man, do not ~~allow~~ allow the true beauty of nature.

* Air Pollution law and act

The air (Prevention and control of pollution) Act, 1981 of the goverment of India came into force from May, 16, 1981. The act is applicable throughout the country unlike the earlier central Water pollution control Act, which

is applicable only in states, which have adopted it. The act provides for an integrated approach for tackling environmental problems relating to the pollution.
for administering the act, the state government have been authorised to declare, after consultation with the state Boards, any area or areas within the state Boards, any areas within the state as air pollution control areas.

The act includes the following -

(i) Definition of Terms used.
(ii) constitution of the central Board and state Boards
(iii) function of Boards.
(iv) power of Board.
(v) penalities and procedure.

Constitution of the Board:-

A state Board constituted under the act consist of the following 17 members - all nominated by the state government.

(i) A full time or part time Chairman.
(ii) five official members to represent the Government.
(iii) five persons representing the local authority.
(iv) three non-offical members.
(v) Two persons representing companies / corporations owned or managed by the state government.
(vi) A full time Member secretary.

function of the central Board.

Main functions of the central Board are as follows.

(i) To improve the quality of air and to prevent control or abate air pollution in the country.

(ii) To plan and execute a nationwide programme for the prevention, control or abatement of air pollution and arrange training programme.

(iii) To coordinate the activities of the state Boards, provide technical assistance, carryout and sponsor investigations and research relating to the prevention and control of air pollution.

(iv) Organize through mass media, a comprehensive programme regarding prevention and control of air pollution.

(v) lay down standards for the quality of air and establish or recognise laboratories.

function of the state Boards:

Main function of the state Boards -

(i) To plan a comprehensive programme for prevention and control of air pollution and implement the same.

(ii) Advise the state Goverment on any matter concerning air pollution including siting of any industry which is likely to cause air pollution.

(iii) Collect and disseminate information, to

collaborate with the central Board in organising training programmes and mass education programmes.

(iv) Inspect air pollution control areas, assess the quality of air therein and take appropriate steps for prevention and control of air pollution in such areas.

(v) power of Board:

(a) power to declare air pollution control areas.
(b) power to give instruction for ensuring standards for emission from automobiles.
(c) Restriction on use of certain industrial plants.
(d) power of entry and inspection.
(e) power to take samples of air or emission.
(f) Establishment of state air laboratory.

Air Quality Standard: *

Air Quality standards are legal limits placed on levels of air pollutants in the ambient air during a given period of time. As such, they characterize the allowable level of a pollutants or a class of pollutants in the atmosphere and thus define the amount of exposure permitted to the population to ecological system.

Air quality standards are expressions of public policy and thereby requirements for action. Thus, they are not based solely on air quality criteria but are also based on a

broad range of economic, social, technical and political consideration. Air quality standards have evolved differently in different countries depending on exposure condition, the socio-economic situation and the importance of other health related problem.

Preferenee sequence of development of air quality standards is given below –

(a) prepare air quality criteria which are analyse of the relationship between pollutant concentrations in the air and the adverse effect associated there with. The WHO calls these as 'guides'.

(b) from the air quality criteria develop air quality goals, which are the concentration of pollutants with which we believe we can live without adverse effect on health and welfare.

(c) from the air quality criteria, develop air quality standards which are the concentration of pollutants that we intend to achieve in the immediate future but that may fall short of our air quality goals because the standards must give consideration to feasibility of achievement within the immediate foreseeable future.

(d) In order to develop the above standards

theremust be standards for measurement and Testing of the ambient air and air pollution effects.

Stack Sampling techniques

Stack Sampling or source sampling may be defined as a method of collecting representative Samples or pollutants laden air/gases at the place of origion of pollutants to determine the total amount of pollutants emitted into the atmosphere from a given source in given time. Stack sampling is employed for the assessment of the following:

(i) To determine the quantity and quality of the pollutants emitted by the source.

(ii) To measure the efficiency of the control equipment by conducting a survey before and after installation.

(iii) To determine the effect on the emission due to changes in raw material and processes.

(iv) To compare the efficiency of different control equipment for a given condition.

(v) To ~~compare~~ acquire data from an innocuous individual source so as to determine the cumulative effect of many such sources.

(vi) To compare with the emission standards in order to assess the need for local control.

Sampling System:-

The method used for measuring gaseous emission from a stack or a vent depend on the nature of the compound and the purpose for making the measurment.

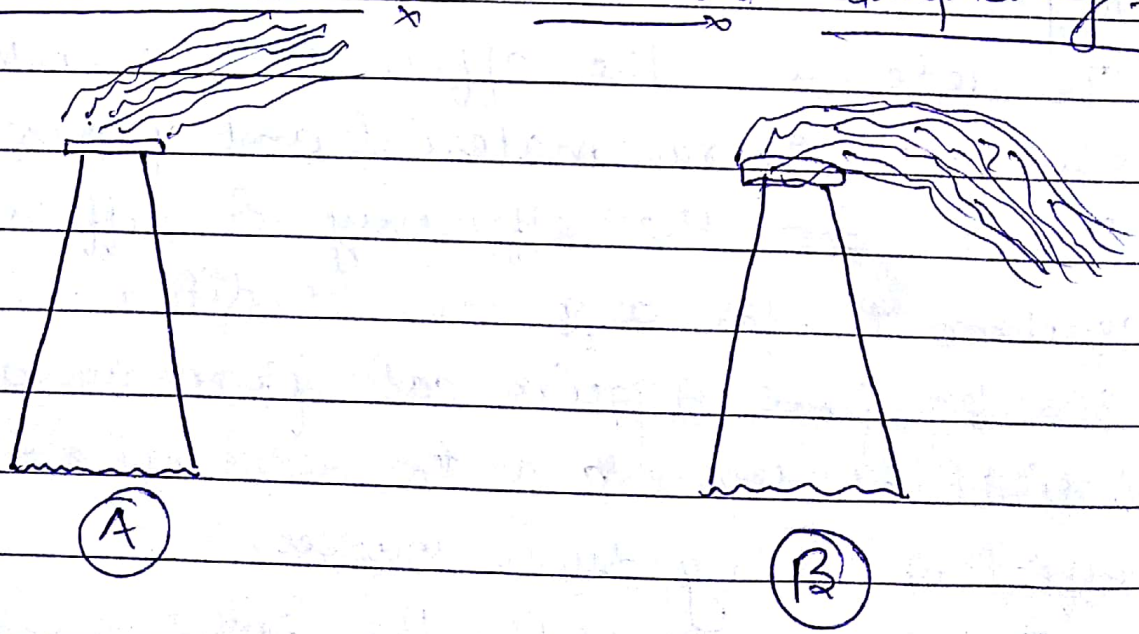
Sampling methods used for the study of air pollution can be classified under three different headings -

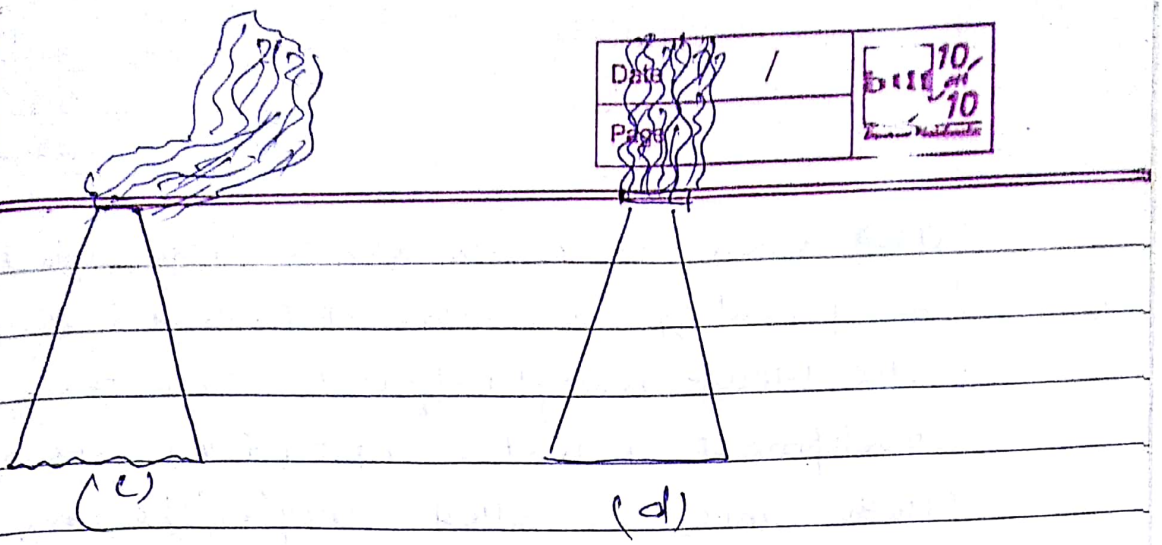
(i) Sampling of impurities of every nature (ranging from particulate matter to gases)

(ii) Sampling under various environmental condition (ranging from samples taken from chimney to samples taken in the open air)

(iii) Sampling methods ~~so~~ varying according to the time factor (ranging from intermittent to continuous sampling).

Inversion Ambient air Sampling:-





Normally, the temperature of the air falls with increase in height and warm flue gases rise and are gradually cooled by mixing with the air. on clear night, however, the temperature of the ground falls more quickly by radiation than does that of the air above, and there develops a boundry layer above, where the temperature of the air again increases with height. More than one inversion layer can develop. The mixture of air and flue gas from C, though still warm, cannot rise in the warmer air at the inversion boundry and, therefore accumulate below it. The flue gases from A issuing above the inversion, flow smoothly away and because of the temperature gradient, cannot diffuse down to the ground through the inversion layer. If the volume of flue gases is very large and the chimney reaches nearly up to the inversion boundry, they may penetrate it, as proved by observation from a lot.

Accumulation of flue gases below an inverson boundry can become most unpleasant

and even dangerous in a step-sided valley as proved by disastors at Donora (U.S.A) and the Meuse valley (Belgium). when there is a development of water mist (fog), its mixture with smoke is called 'smog'. The SO_2 in the flue gases dissolves in the water droplets and is quickly oxidized to form dilute sulphuric acid H_2SO_4; this hinders evaporation of the water and stabilizes the fog. Inversion frequently develop upwards from the ground to a height of about 40m and infrequently up to 100m as during the london smog of 1952. It is highly desirable that factory chimneys, with their large volume of flue gas, compared with that from houses, be atleast 40m high. At this height, turbulence and down-draughts from building do not disturb the flow of gases from most factories; immediately after the london smog, the 1952 UK Government committee on Air Pollution recommended a height for factory chimneys of 120ft (37m), with discretion for small emission. The complaints from certain small fertilizer factories ceased when the chimney were raised to 37m as reported in the united Kingdom.