

Water pollution

Def:

It is defined as the alteration in physical, chemical and biological characteristics of water which may cause harmful effects on humans & aquatic life.

The pollutants include sewage, industrial chemicals & effluents, oil & other wastes.

Besides, chemicals from the air dissolved in rain water, fertilizers, pesticides and herbicides leached from the land also pollute water.

Types, effects & sources of water pollution

Infectious agents:

ex: Bacteria, viruses, protozoa

Human sources

Human & animals wastes

Effects

Variety of diseases

Oxygen Demanding wastes (Dissolved Oxygen)

Ex

Organic wastes such as animal manure & plant debris that can be decomposed by aerobic bacteria.

Saturated point of DO varies from

8-15 mg/lit

Human Sources

Sewage, animal foodlots, paper mills & food processing facilities

Effects:

Large populations of bacteria decomposing these wastes can degrade water quality by depleting water of dissolved oxygen

Inorganic chemicals

ex water soluble inorganic chemicals
acids, Pb, As, Se, NaCl

Human Sources

Surface runoff, industrial effluents & household cleansers

Effects:

Can make fresh water unusable for drinking

Causes skin cancers & neck damage

Damage the nervous system, liver & kidneys

Harm fish

Lower crop yields

Organic Chemicals

ex oil, gasoline, plastics, solvents

Human Sources

Industrial effluents, household cleansers

Effects:

Harm fish & wild life

Can threaten human health

Plant Nutrients:

ex: water soluble compounds containing nitrate

phosphate & ammonium ions

Human Sources:

Sewage, manure

Effects:

Excessive growth of algae & other aquatic plants

Drinking water with excessive levels of nitrates lower the oxygen carrying capacity of the blood & can kill urban children & infants

Sediment:

ex Soil, silt

Human resources

Land erosion

Effects

Can reduce photosynthesis & cloud water

Disrupt aquatic food webs

Settle out & destroy feeding & spawning grounds of fish.

Radioactive materials

ex: Radioactive isotopes of iodine, radon

Uranium, Cesium

Human Sources:

Nuclear power plants, mining & processing of Uranium & other ores

Effect:

Genetic mutations, birth defects & certain cancers.

Heat

excessive heat

Human Sources

Water cooling of electric power plants & some types of industrial plants

Almost half of all water withdrawn in United States each year is for cooling electric power plants.

Effects:

* Lower dissolved oxygen levels & makes aquatic organisms more vulnerable to disease, parasites & toxic chemicals.

* When a power plant first opens or shuts down for repair, fish & other organisms adapted to a particular temperature range can be killed by the abrupt change in water temperature known as thermal shock.

point & non point sources of water pollution

point Sources:

point sources are discharged pollutants at specific locations through pipes, ditches or sewers into bodies of surface water.

ex Sewage treatment plants

Includes factories

Non point Sources

They are usually large land areas or air sheds that pollute water by runoff, subsurface flow or deposition from the atmosphere.

ex:

Include acid deposition & runoff of chemicals into surface water from croplands.

Control measures of water pollution

* The administration of water pollution control should be in the hands of state or central government.

* Scientific techniques are necessary to be adopted for the environmental control of catchment areas of rivers, ponds or streams.

* plants, trees \rightarrow forest control pollution and they acts as natural air conditioners.

* Highly qualified & experienced persons should be consulted from time to time for effective control of water pollution.

* It is not advisable to discharge any type of waste, either treated, partially treated or untreated into streams, rivers lakes, ponds & reservoirs.

* public awareness regarding adverse effects of water pollution is a must so there should be propoganda for water pollution control on radios, TVs

* Suitable laws, standards & practices should be framed to regulate the discharge of undesirable flow of water in water bodies & such regulations should be modified from time to time in order to accommodate the changing

requirements and technological advancements.

* Basic & applied research in public health engineering should be encouraged.

* The possible reuse or recycle of treated sewage effluents and industrial wastes should be emphasized & encouraged.

Wastewater Treatment

Objectives:

- To eliminate the offensive smell
- To convert harmful into harmless compound
- To remove solid content of the sewage
- To destroy the disease producing microorganisms.

Treatment process

Preliminary Treatment → Bar & Mesh Screens
Coarse Solids &
Suspended impurities
↓

primary treatment (or) Settling process



Secondary (or) Biological treatment

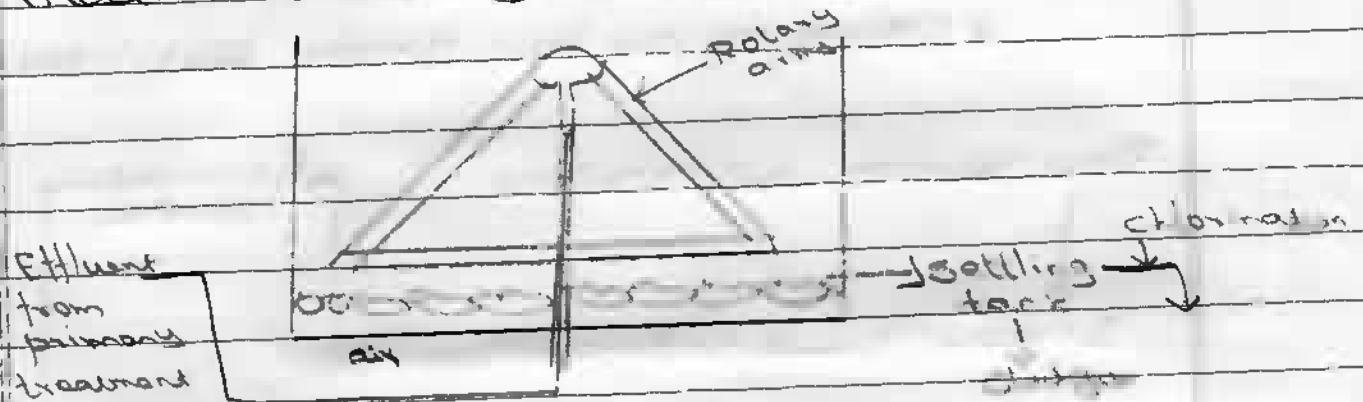
In this treatment, biodegradable organic impurities are removed by aerobic bacteria.

It removes upto 90% of the oxygen demanding wastes. This is done by trickling filter or activated sludge process.

a) Trickling filter process:

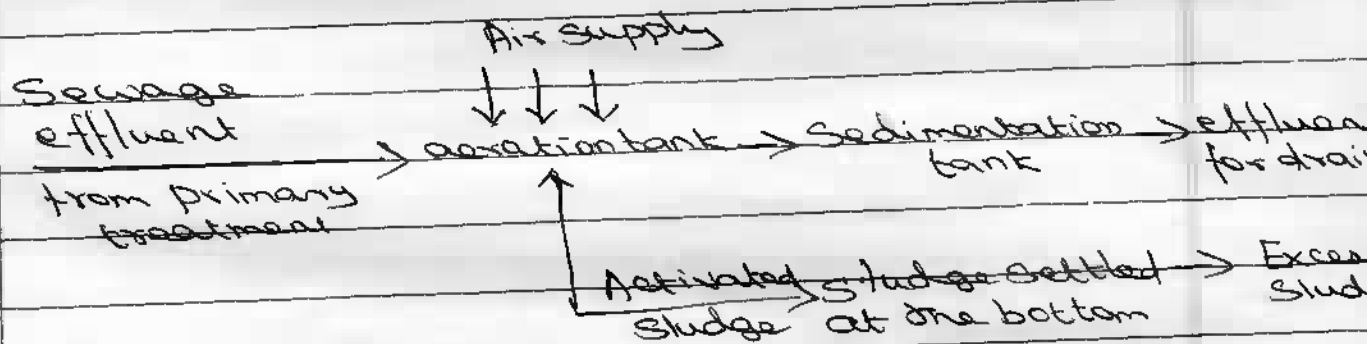
It is a circular tank & is filled with either coarse or crushed rock.

Sewage is Sprayed over this bed by means of slowly rotating arms.



b) Activated sludge process

Activated sludge is biologically active sewage as it has a large number of aerobic bacteria, which can easily oxidise the organic impurities of the sewage get oxidised rapidly by the microorganisms.



Tertiary treatment

After the secondary treatment, the sewage effluent has a lower BOD (25 ppm) which can be removed by the tertiary treatment process.

Disposal of Sludge:

* Dumping into low lying areas

* Dumping into the sea

* Burning of Sludge

* Using it as low grade fertilizers

