WATER - Pollution

Water:

Water is 2nd most imp. commodity for survival of living thing on earth. Our earth is called as 'Blue planet' due to presence of water on earth. About 71% of earth's surface is covered by water & remaining is ground.

~~Out of that~~ Global distribution of water:

Distribution	%
Ocean, sea	97.1 %
Polar ice caps	2.15 %
Ground water	0.65 %
Surface water	0.03 %
Atmospheric water	remaining (i.e 0.07 %)

We need water for almost all activities like - drinking, cooking, gardening, agricultural practices, industrial development etc.

Pollution of water is nothing but the contamination of water due to various unwanted components i.e. pollutants.

Def": The alteration or negative change in physical, chemical & biological properties of natural water due to addition of pollutants causing adverse effects on aquatic life & other living being, including man is called as water pollution.

Sources of water Pollution: - Since water has the property to dissolve many substance in it, it gets polluted easily. Pollution of water can be caused by point source or non-point sources.

Point source pollution is from specific sources where the source of pollution is identified such as effluent discharge from industries or sewage disposal from any plant, etc.

Non point source – The discharge of pollutant is not from particular point. It has been scattered.
eg:- Surface runoff from agricultural fields, overflowing small drains, etc.

Types of Water Pollution:- There are 2 types of water pollution Ground water poll^n & surface water poll^n.

(1) Ground water poll^n – The pollutant percolates & reaches to ground water table contaminating the groundwater & ground water poll^n takes place.
It is mainly occures due to – septic tanks, industries like chemical, textile etc. are mainly responsible for G.W.P. Presence of Arsenic, fluoride, nitrate, causes serious health Hazards.

(2) Surface water Pollution:- The surface water present on earth is in the form of lake, sea, river, estuary etc. These are polluted by mixing of following things in water.

i SEWAGE:- Discharge from drains & sewers in fresh water bodies causes poll^n.

ii INDUSTRIAL EFFLUENTS:- Industrial waste containing toxic chemicals, acids, alkalis, metallic salts, phenols, cynides, ammonia, radioactive substances are source of H2O poll^n

iii Synthetic detergents:- They are used in washing and cleaning purpose in domestic as well as industrial areas. They produce foam & pollutes water.

Water Pollution

iv) Agrochemicals: Fertilizers containing nitrates & phosphates, pesticides like, insecticides, fungicides, herbicides etc. gets washed by rainwater & surface runoff pollutes water.

v) Oil: Oil spillage into sea water during drilling as well as accidents in sea pollutes seawater.
eg: Exxon valdez - oil spill disaster
24 march 1989 in Alaska.
Tanker hit on submerged rock - created disaster.
The oil was spread upto 1000 km. About 3,00,000 to 6,45,000 water birds, harbour seals, whales & fishes were killed.

EFFECTS OF WATER POLLUTION:-

(1) The sewage contains organic waste or waste, due to that many bacteria, pathogens are present in that water. Pathogens are nothing but the disease causing organisms. Due to discharge of sewage waste into water causes many epidemic water born diseases like, jaundice, cholera, typhoid, dysentry, etc.

(2) Addition of Heavy metals, pesticides, cyanides, and other organic & inorganic compounds are harmful to aquatic organisms.

(3) Heavy metal from water have adverse effect on main body organs like - liver, kidney, brain etc. Then we will see some disease due to heavy metal.
- Mercury causes minamata disease (Japan).
- Cadmium causes Itai - Itai disease.

(4) Accumulation of domestic sewage and agricultural runoff increases nutrients in water body such as nitrates & phosphates. This results into rapid growth of aquatic weed, which reduces the D.O.

of water and creats foul smell. This process of water pollution is called as Eutrophication.

5. The nitrate present in water when enters to our digestive system, it gets converted to nitrite by the microorganism of digestive tract. This nitrite reacts with haemoglobin & form metahaemoglobin and reduces oxygen carrying capacity of blood. This disease is known as 'Methaemoglobinemia'.

6. The oil present in water remain on the surface & affects on gaseous exchange. This adversely affects the aquatic life, bird & fishes.

7. Hot water from Theemal power plants. ~~causes suffocation~~ increases the temp. of water & causes suffocation to aquatic animals. & reduces the D.O level.

8. Accumulation of radioactive waste leads to genetic damages, mutations & mortality (death).

9. Polluted water reduces economic value as well as asthetic value of any water body. eg — Rankala.

PREVENTION & CONTROL OF WATER POLLUTION

The prevention & control of water poll^n from point source is quite easy than non point source. There are various parameter to check the pollution level of water such as. pH, turbidity, D.O, BOD, COD, nitrates, phosphates, sulphates, chlorides etc. The biological parameter involves MPN (Most Probable Number) SPC (Standard plate count) etc. We are for

the detection of pathogens.
Some plant & animal species also indicates the presence of pollution.

To control the water pollution. the effluent should be treated before discharging in to water body.

There are various treatment units. They reduces the concentration of pollutant in water, which gives less damage to aquatic life water body. i.e. plants or animals.

The treament process is divided into 3 catagories depending upon their characters.

1. Primary 2. Secondary 3. Tertiary

Flowdiag.

1. Primary Treatment: It is a physical process. It removes large particles, debris with the help of screen. The wastewater after screening is passed through grit chamber, where sand, grit & other solid particles settles down.
- The water is then passed through the sedimentation tank or primary settling tank. Most of the suspended solids settles down due to gravity.
- In some cases chemical coagulant like aluminium sulphate is also added to increase the settlement.
- In primary treatment about 35% BOD reduction & 60% SS removal takes place.
- ~~In some cases If there is colour or~~
- If ~~there is~~ objectionable colour & taste is present in w/w, then it is passed the activated ~~char~~ carbon.
- Oil & grease removal chambers are also there in primary treatment process.

2) Secondary Treatment : (Biological treatment).

This treatment includes mostly biological treatments. such as Activated sludge process, unaerobic, digestion, aeration, Trickling filters. etc.

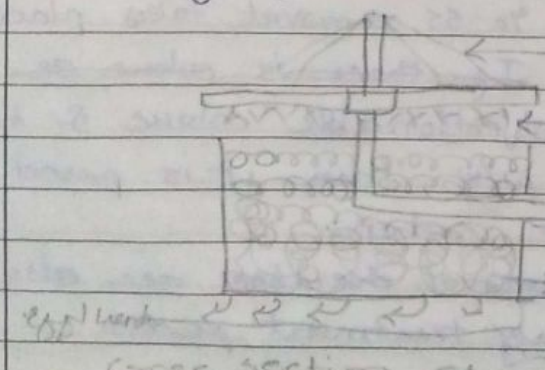
The effluent having organic waste. are treated by this process.

i) Activated Sludge process (ASP) :-

The effluent from primary settling tank or clarifier goes to aeration tank, In aeration tank the microbial culture is added. And the effluent is aerated by mixing for 4-8 hrs. In this process the m.os. consumes organic matter as food in pr. of O_2 & reduces the pollution load of effluent. This effluent is then given to secondary settling tank or clarifier. The active sludge i.e. load of microorganism is separated in clarified & again sent to the aeration tank as culture.

- In this process we achieve 85 - 90% BOD reduction & 90% S.S. removal.

ii) Trickling filters :-



Cross section of Trickling filter

Water Pollution.

Trickling filter:

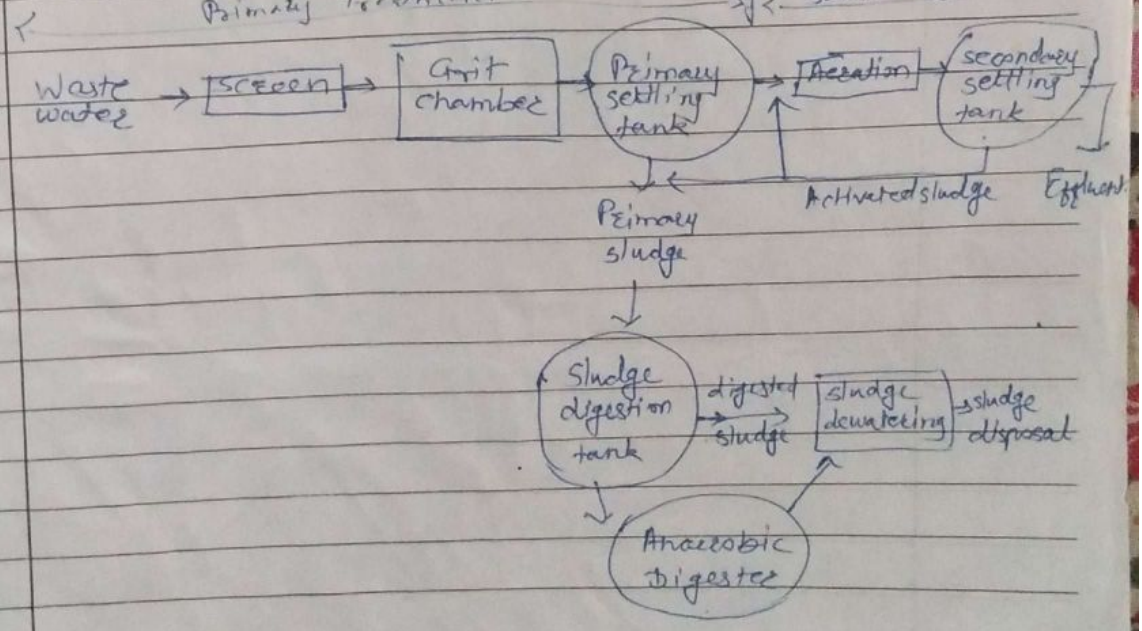
The T.F. contains fixed bed of stones or pebbles. The microbial culture is developed on this bed. The W/W is sprayed on the top of this bed. The water trickles down. During passing from bed the organic load is reduced due to microbial action. The treated effluent is collected at bottom & given to clarifier.

B) Tertiary Treatment: / Chemical Treatment / Final Treatment:

This is a form of chemical treatment. It contains chlorination, disinfection etc. to kill the microorganism. Sulphate removal, phosphate removal, etc.

The control measure ~~of~~ water pollution are

- Use of less amount of water whenever possible. Recycle & reuse the water
- Plantation reduces sediment load in water.



Flow Diag. of W/W Treatment plant.

- Periodic monitoring to treatment plant or industries should be done.
- The Govt. has ~~set a law of~~ act for water pollution — The Water (Prevention & Control of pollution) Act, 1974.
- To avoid the effect on human health, the drinking water should be properly treated before consumption.