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Subject:

Waste Water Engineering

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Question No (1):

Ans: WASTE WATER TREATMENT:

The process of making usable water re-usable by improving the quality of water through implication of technology. It includes collection of water in a waste-water treatment plant and making it to go through different processes of treatment As it is about making the quality of water better, by removal of solids, organics water etc is done.

→ It includes three major processes which are physical, biological and chemical.

→ Waste water treatment includes four important processes of treatment which aware about degree of treatment and they set-up in an increasing. They are:

→ Pretiminary treatment.

→ Primary treatment.

→ Secondary treatment.

→ Advanced treatment.

WASTE WATER TREATMENT IMPORTANCE:

Their importance are:

→ POTENTIAL SOURCE OF ENERGY:

In this process, the generation of Biogas takes place as a final product, It is a potential source of energy. It can be used as a fertilizer, source of heat & electricity etc.

→ A RESOURCE:

Waste water actually become a big resource. We would be able to use it at many places like for flushings of toilets, watering of plants and lawns, washing of cars, roads etc.

→ BENEFICIAL FOR IRRIGATION:

Waste water treatment would be able to help in irrigation. So it is beneficial for irrigational countries like Pakistan.

→ NEED FOR ENVIRONMENT & MOTHER LAND/EARTH:

We can take care of our environment by protecting it from waste water.

→ Privilege For Human Beings:

Waste water treatment gives privilege or freedom to human beings, of using water water as much as they need to and to drain it without thinking much about the environment's safety.

→ Rectangular Tanks Are Preferred Over Circular Tanks:

Rectangular tanks are preferred over circular tanks for removal of settlable solids during preliminary treatment because rectangular tanks are right choice for it and they are especially designed in a way that slow down the flow of water. They are long and narrow. The design makes the solids settle out of water.

Question No 2:

Ans: ACTIVATED SLUDGE PROCESS: (ASP):

→ Microorganisms responsible for treatment are maintained in liquid suspension by appropriate mixing methods.

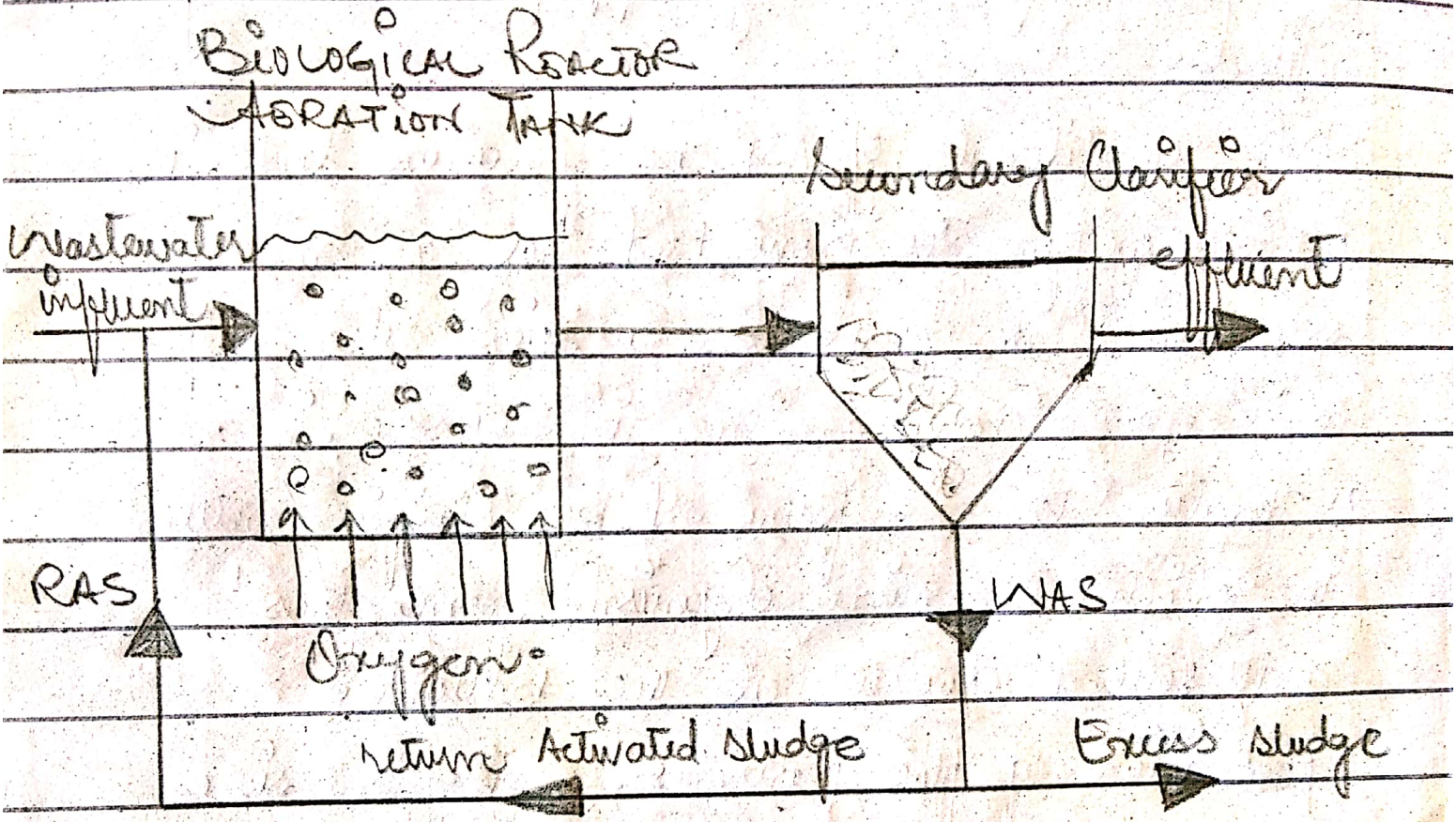
→ Main constituents of ASP are Aeration Tank in which oxygen is provided for the micro-organisms to grow. This aeration also helps to keep micro-organisms in suspension.

→ Aeration tank is followed by clarifier/settler in which the micro-organisms form flocs and settled down at the bottom.

→ Formation of floc particles, ranging in size from 50 to 200 μm, removed by gravity settling, leaving relatively clear liquid as treated effluent.

→ A part of settled bio flocs are recycled back to the aeration tank to maintain certain amount of micro-organisms in the system for efficient operation of the system. This is known as Recycled Activated Sludge (RAS).

→ Remainings are removed from the system process is known as Wasted Activated Sludge (WAS):



ACTIVATED SLUDGE PROCESS (ASP).

→ APS involves production of activated mass of microorganisms capable under aerobic conditions.

→ 99% of suspended solids and 90% of dissolved organics are removed by ASP.

→ APS consumes high electricity for aeration.

PARAMETER.	AEROBIC TREATMENT:	ANAEROBIC TREATMENT:
1- APPLICATION:	Low to medium strength waste water (<1000 ppm) eg. Municipal sewage, refinery waste water etc.	Medium to high strength waste water (>4000 ppm) eg food and beverage industry waste water.
2- CAPITAL INVESTMENT:	Relatively high	Relatively low with payback.
3- ENERGY CONSUMPTION:	Relatively high	Relatively low.
4- FOOT-PRINT.	Relatively large	Relatively small & compact.
5- NET SLUDGE YIELD.	Relatively high.	Relatively low.
6- POST-TREATMENT:	Typically direct discharge.	Required to fulfill wastewater standard discharge requirements.
7. EXAMPLE TECHNOLOGIES:	Activated sludge process (ASP), Trickling filters and rotating Biological Contactor (RBC).	Anaerobic Digestors (AD), continuous stirred tank reactors (CSTR), Sequencing Batch reactor (SBR), upflow anaerobic sludge blanket.

* CH_4 generated can be used to generate energy.

Question No (3):

Ans: ASSIMILATIVE CAPACITY OF RECIEVING BODIES:

Assimilative capacity of recieving bodies refers to the ability of a body of water to cleanse itself, its capacity to receive wastewater without deleterious effects and without causing damage to aquatic life or humans who consume the water. It is level to which water body or nature control the toxicity without affecting the aquatic life.

HELP IN WASTEWATER TREATMENT:

1) DILUTION:

Dilution is the process of reducing the concentration of pollutants in receiving water usually simply by mixing with more quantity of water.

2) Dispersion:

Dispersion is the distribution of pollutants in relatively large area of water. Dilution and dispersion are inter-related.

3) Sunlight:

Sunlight facilities biological decomposition of pollutants and kills pathogens by ultraviolet radiation (UV).

Question No 4:

Sludge:

The semi-solid and viscous material left from municipal wastewater & industrial wastewater treatment process.

Sludge Management:

Sludge management may be defined as cost-effective method that meets the efficient recycling of resources while ensuring harmful substances.

→ It contains the following process:

1) Primary operations
2) Thickening.
3) Stabilizing.
4) Dewatering.
5) Heat Drying.

1) Primary Operations:

1) Grinding: It includes particles size reduction.
2) Screening: Includes removal of fibrous materials.
3) Degritting: removal of sand & other inorganic materials.
4) Blending: includes making the sludge homogeneous.
5) Storage: ensure flow equalization in system.

2) Sludge Thickening:

It is increase percentage of solid content in sludge by removing a portion of liquid

→ Volume reduction of approximately 30-80%.

→ Methods are

1) Gravity thickening
2) Flotation thickening
3) Rotatory drum thickening

3) Sludge Stabilization:

→ to reduce pathogens, eliminate offensive odors, minimize production of usable gas. Methods are:

→ Alkaline Stabilization

→ Anaerobic Digestion.

4) Dewatering:

To reduce the moisture content of sludge.

→ It is selected due to low energy requirement.

→ Centrifugation is used for separating liquids of different densities.

5) Heat Drying:

The application of heat to evaporate water and to reduce moisture content of biosolids.

→ Direct drying involves the wastewater solids come in contact with hot gases which causes evaporation.

→ Rotary and bed dryers are used.

Advantages Of Sludge Management:

→ Sludge management recycles harmful substances and prevents from transferring it to humans or environment.

→ It is filtered out as it contains the sludge blanket

→ Controls and reduces pathogens, eliminates offensive odors

→ Minimize production of usable gas (methane).

→ Reduces moisture content of sludge

Question No (5):

Ans 2 ENVIRONMENTAL IMPACT ASSESSMENT (EIA):

A formal process to predict the environmental consequences of human development activities and to plan appropriate measures to eliminate or reduce adverse effects and to enhance positive effects.

→ It has three functions:

→ To predict problems.

→ To find ways to avoid/mitigate them.

→ To enhance positive effects.

PARAMETERS CONSIDERED WHILE CONDUCTING EIA:

The most important parameters to be considered for a local wastewater plant are:

1) BIOCHEMICAL OXYGEN DEMAND (BOD):

The BOD is the amount of oxygen consumed by aerobic microorganisms to breakdown the organic matter present in the wastewater. It is used to measure the efficiency of a treatment plant

in terms of organic matter removal. High BOD values would affect the ecological cycle by reducing the dissolved oxygen for aquatic life.

2) CHEMICAL OXYGEN DEMAND (COD):

It is the measure of organic matter. The amount of oxygen used by oxidizing agent is measured. It evaluates wastewater from industries.

3) TOTAL SUSPENDED SOLIDS: (TSS):

It measures the amount of mass of fine suspended particles. TSS causes turbidity affecting the amount of light to aquatic plants.

4) TOTAL KJELDAHL NITROGEN: (TKN):

Wastewater contains high level of nitrogen compounds. The nitrogen is in free forms, organic nitrogen, ammonia and reduced nitrogen. TKN is useful in monitoring the plant.