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Subject # Waste water Engineering

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Question #1

What is wastewater treatment and its importance? Why rectangular tanks treatment?

Ans)

Waste water :-

Wastewater treatment consists of applying known technology to improve or upgrade the quality of a wastewater.

* Wastewater treatment involves collecting the ^{waste} water in a centralized and or decentralized location (Wastewater treatment plant) and subjecting the wastewater to various treatment process.

* The principle objective of wastewater treatment is generally to allow human and industrial effluents to be disposed off without causing danger to human health or unacceptable damage to the natural environment.

* Wastewater treatment can also generate biogas as final product which is potential source of Energy.

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Importance of Wastewater treatment:-

* Water is essential to life, as we place more and more demand on our local water supplies, it becomes vital to ensure that wastewater treatment procedures are put in place to avoid problems with contamination, pollution, spreading diseases and poisons.

* In smaller communities, water is pumped from aquifers or harvested from rainfall. It is used in drinking, bathing, for cleaning and doing laundry. It is used in industrial process and more. Then it goes down the drain.

If you don't have wastewater facility your wastewater could be leaching back into the ground and contaminating your own drinking water, or it could be flowing downstream and poisoning others.

* With wastewater treatment systems in place the water used within a community can be disinfected, cleaned and then returned to the environment it is not reused at the same community.

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Why - rectangular tank are prefer
over circular tanks:!

The shape of the rectangular clarifiers provides a longer path for the wastewater flow and the suspended solids to travel and subsequently longer detention time which warrants less short circuiting and more sludge settling compared to the centre-feed peripheral overflow circular clarifiers.



Question #2

Q2) What is the difference between aerobic and anaerobic wastewater treatment? Briefly described activated sludge process with diagram?

Aerobic treatment

Aerobic processes use bacteria that require oxygen, so air is circulated throughout the treatment tank.

* These aerobic bacteria then breakdown the waste within the water.

* Some systems utilize a pretreatment stage prior to the main treatment to reduce the chance of clogging the system.

* Electricity is required for system operation.

Anaerobic treatment

* Anaerobic bacteria transform organic matter in the wastewater into the biogas that contains large amounts of methane gas and Carbon dioxide.

* Energy-efficient process.

* Often used to treat industrial wastewater that contains high levels of organic matter in warm temperatures.

* It can be used as pretreatment prior to aerobic municipal wastewater treatment.

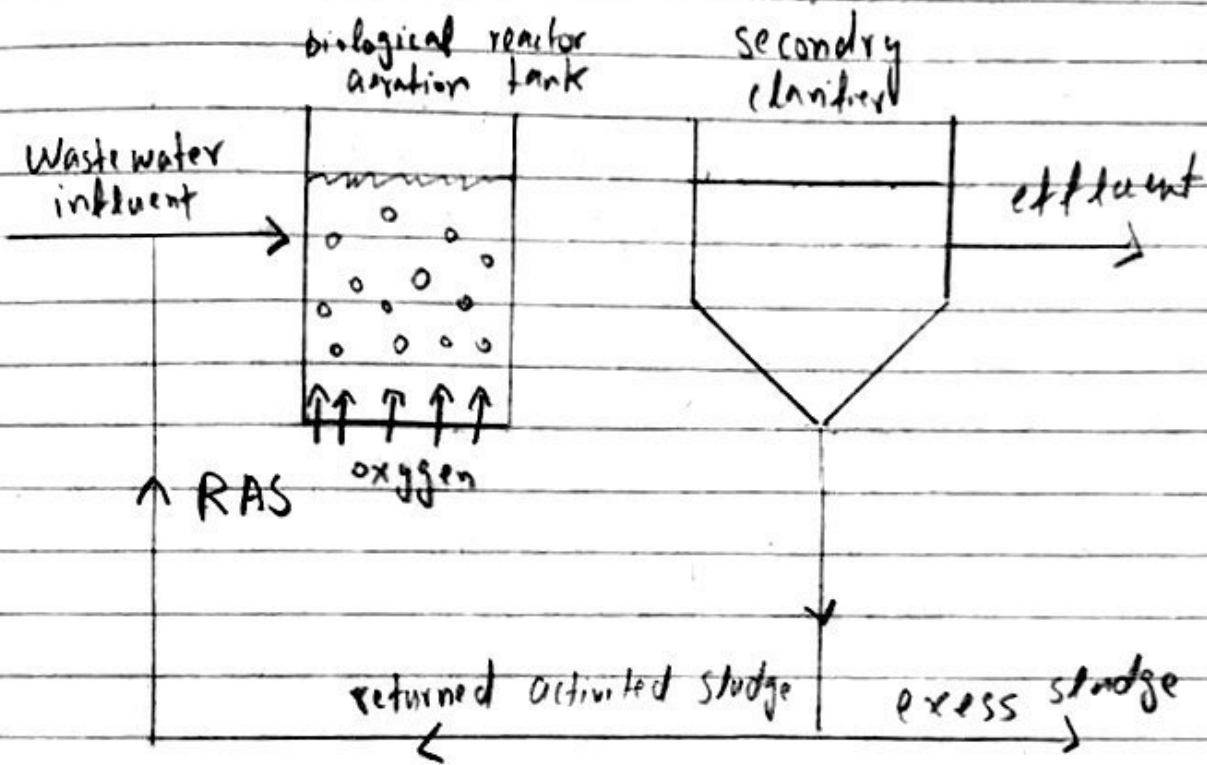
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Activated Sludge Process (ASP):-

- * 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. The aeration also helps to keep micro-organisms in suspension.
- * Aeration tank is followed by Clarifier 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)
- * Remaining settled bio flocs are removed

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from the system and is termed as Wasted Activated Sludge (WAS).



Activated Sludge Process ASP

*) APS involves production of activated mass of micro-organisms capable of stabilizing waste under aerobic conditions.

*) In aerobic tank, contact time is provided for mixing and aerating influent wastewater with microbial suspension, generally referred to mixed liquor suspended solids (MLSS).

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* Typically 99% of suspended solids upto 90% of dissolved organics are removed by Activated Sludge process.

* The main drawback associated with APS is its high electricity consumption particularly for aeration.



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Question # 3

What is meant by assimilative capacity of receiving water bodies? How does it help in wastewater treatment?

Ans) Assimilative Capacity of Receiving Water bodies :-

* Assimilative Capacity of Receiving water bodies refers to ability of a body of water to cleanse itself; its capacity to receive wastewaters without deleterious effects and without causing damage to aquatic life or humans who consume the water. It is level to which water body or natural control the toxicity without affecting the aquatic life.

* Although wastewater is properly treated before it is disposed of to the natural water streams still it has impurities pollutants that need to be removed or make them less effective so that the receiving water bodies may not become unsuitable for use or cause damage to the aquatic life.

Physical Forces helping Assimilative Capacity of Receiving Bodies:-

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 facilitates biological decomposition of pollutants and kill pathogens by ultraviolet radiation (UV)

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How it help?

Disposal of wastewater in a stream could be thus resulted with respect to both quantity and concentration in order to safeguard the aquatic life and desirable water use. Thus there is a limit on the amount of liquid wastewater that can be disposed of in a water body, which is called the assimilative capacity of that water body.



Question #4

Briefly describe sludge management and its development advantages in wastewater engineering?

Ans) Sludge Management :-

Sludge management describe the process used to manage and dispose of a sewage sludge produced during sewage treatment. Sludge is mostly water with lesser amounts of solid material removed from liquid sludge. Primary sludge include settlement solids remove during primary treatment in primary clarifier includes treated sewage sludge from secondary treatment bioreactors.

Advantages :-

- 1) Diverse can be used for one household up a huge plant.
- 2) Remove Organics
- 3) Oxidation and Nitrification Achieved.

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* Biological Nitrification without adding chemicals.

* Biological Phosphorus Removal.

* Solid / liquid Separation.

* Stabilization of sludge.

* Capable of removing 99.1% of suspended solids.

* The most widely used waste water treatment process.



Question #15

Define Environment Impact Assessment (EIA)? In your opinion
 wastewater treatment plant?

Ans) Environment Impact Assessment (EIA) :-

- * The concept of Environment Impact Assessment (EIA) is linked to development.
- * Development basically aims to bring about a positive change in a society. This change maybe of social wellbeing and economical advancement.
- * In the past promotion of economic growth for increased wellbeing of society was the main development goal with little sensitivity to adverse social or environmental impacts.
- * Although development aims to bring about a positive change it can also lead to social conflicts and environmental concerns.
- * Sustainability refers to an economic activity that means the needs of the present generation without comparing the ability of future generations to meet their own needs.

Importance :-

① BOD :-

Its amount of oxygen consumed by aerobic micro-organisms to break down organic matter present in water. Value is to measure efficiency of a treatment plant in terms of organic material removal.

② COD :-

Its an alternate measure of organic matter. The amount of oxygen used up by a strong oxidising agent is measured.

③ TSS Total Suspended Solids:

To indicate the amount by mass of fine suspended particle.

④ Total Kjeldahl Nitrogen (TKN) :-

Waste water contain high levels of nitrogen containing compounds. It exists in 3 forms, organic, nitrogen, ammonia & reduced nitrogen. The TKN value indicates amount of nitrogen of all these 3 forms.