WASTEWATER ENGINEERING

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SECTION A

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Q:NO:1

Wastewater Treatment:-

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

Wastewater treatment involves collecting the wastewater in a centralized location (Wastewater Treatment plant) and subjecting the wastewater to various treatment processes.

Importance of Wastewater Treatment:-

⇒ The principal objective of wastewater treatment is generally to allow human and industrial effluents to be disposed off damage to the natural environment.

⇒ Wastewater if properly treated,

is an important resource and can be used for various purposes including irrigation, lawn watering, car washing, flushing toilets and landscaping etc...

⇊ Wastewater treatment can also generate biogas as final product which is a potenial source of energy.

Why rectangular tanks are Prefferred over circular tanks for removal of settleable solids during preliminary Treatment:-

Rectangular tanks are preffered over circular tanks because the rectangular tanks has a large horizontal distance as compare to circular tanks and due to which

the settlebale solids gets more detention time and it settle down before reaching the outlet. And in rectangular tanks due to higher vertical velocity, the settlalable solids can easily be settle as compare to circular tanks which has less horizontal distance, due to which the settlable solids do not settle down well and reach to outlet Also the rectangular tanks are easy to operate, have low maintance cost and takes less surface area for construction as compare to circular tanks.

Q:2

Aerobic Wastewater Treatment:

⇒ The wastewater treatment Process which use bacteria that require oxygen, so that the air is circulated throughout the treatment tank, is called aerobic wastewater treatment.

⇒ And with the help of these aerobic bacteria then breaks down the waste within the waste-water.

⇒ Some of the waste-water treatment Plants utilize a Pretreatment to reduce the change of clogging the system.

⇒ Electricity is required for system operation.

Anaerobic Wastewater Treatment:-

⇛ The process of wastewater treatment in which Anaerobic bacteria transforms organic matter in the wastewater into biogas that contains large amountr of methane gas and carbon dioxide, is called Anaerobic waste-water Treatment.

⇛ As compare to Aerobic wastewater treatment, the anaerobic process is energy efficient process.

⇛ The Anaerobic wastewater treatment often used to treat industrial wastewater that contains high levels of organic matter in warm temperature.

⇛ This process can be used as a pretreatment prior to aerobic municipal waste water treatment.

Activated Sludge Process (ASP):-

⇒ The process for treating sewage or industrial wastewater using aeration and a biological floc composed of bacteria and protozoa, is called activated sludge process.

⇒ In this, 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-organism in suspension.

⇒ Aeration tank is followed by clarifier/settler in which the micro-organisms flows from 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 (R.A.S).

⇒ Remaining settled bio flocs are removed from the system and is termed as Wasted Activated sludge (WAS).

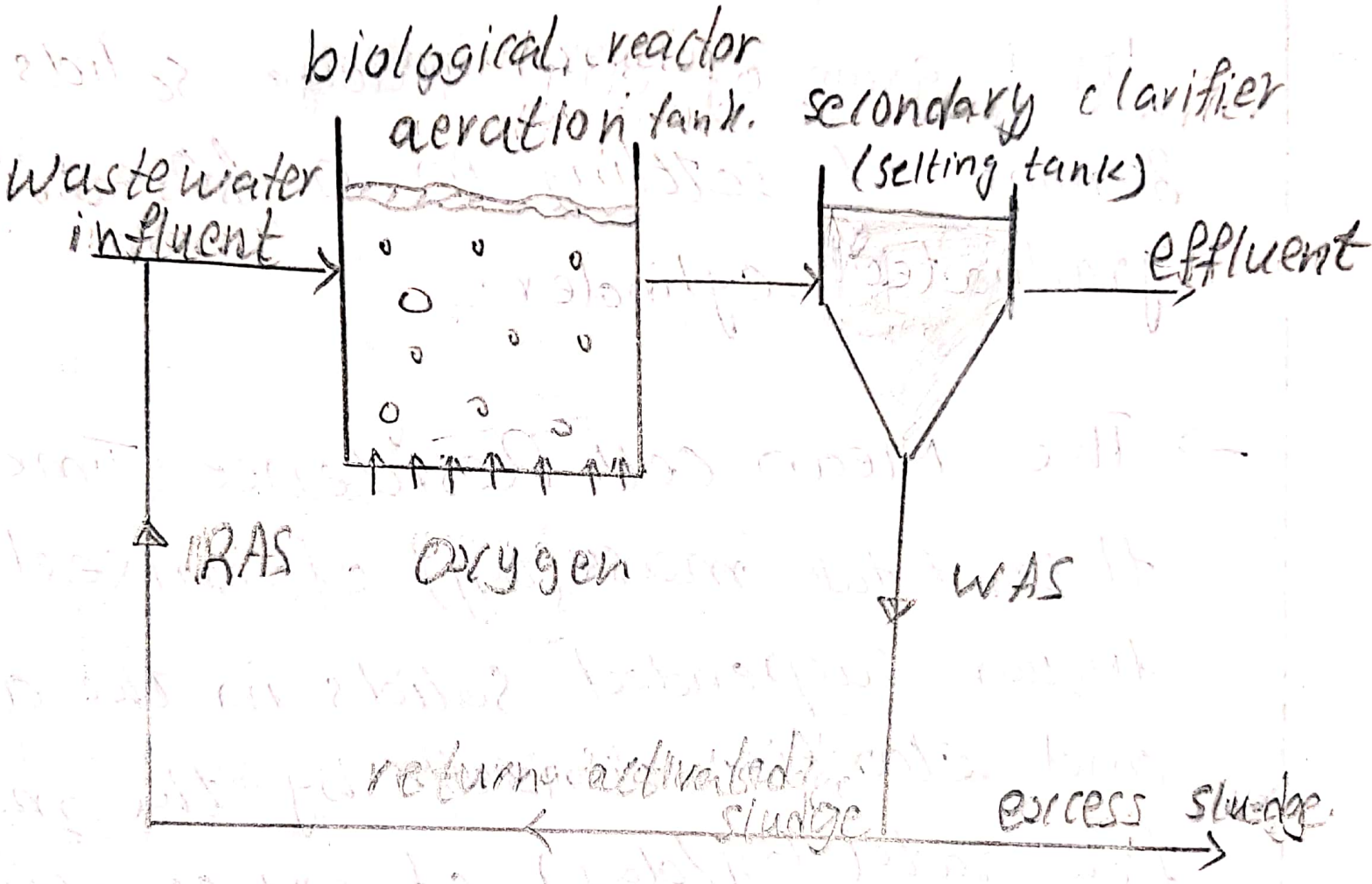
ASP involves production of activated mass of microorganisms

capable of stabilizing waste under aerobic conditions.

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

⇒ Typically 99% of suspended solids and up to 90% of dissolved organics are removed by Activated sludge Process.

⇒ The main drawback associated with ASP is its high electricity consumption particularly for aeration.



Q:-03

Assimilative Capacity OF Receiving water bodies:-

⇛ Assimilative capacity of receiving water bodies refers to the ability of a body of water to cleanse itself, its capacity to recive 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 nature 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 removed or make them less effective so that the receiving water bodies may not become unsuitable for use

Help of Assimilative capacity in Wastewater treatment:-

The assimilative capacity helps in wastewater treatment in the following aspects:-

① **Dilution:-** In this dilution occurs, which is a process in which the concentration of pollutants are reduce in recieving water, usually simply by mixing with more quantity of water.

② **Dispersion:-** Another help of assimilative capacity in wastewater treatment is the Dispersion, which is the distribution of pollutants in relatively large area of water. Dilution and dispersion are inter-related to help for treatment.

③ **Sunlight:-**
Another importance of Assimilative capacity for

treatment is sunlight which facilitates biological decomposition of pollutants and kills pathogens by ultraviolet radiation (UV).

④ **Temperature:-**

In Assimilative capacity, the temperature plays an important role. With increase in temperature of receiving water the biological decomposition of organics and thus assimilative capacity will improve. Increase in temperature, also increase the dilution process.

⑤ **Flow velocity:-**

Assimalative capacity of receiving water, also helps in terms of flow velocity, Higher the flow velocity will encourage quick dillution and dispersion of pollutants.

⑥ **Depth of Flowing water:-**

Assimilative capacity is directly related to the Depth of receving water bodies. Increase in depth, relates UV radiation, kills Pathogens.

Q: 04

Sludge Management:-

Sludge refers to the residual, semi-solid material left from, municipal wastewater or industrial wastewater treatment Processes.

Sustainable sludge handling/ Managing may be defined as a socially acceptable, cost-effective method that meets the requirement of efficient recycling of resources while ensuring that harmful substances are not transferred to humans or the environment i.e water, air or soil.

Advantages of sludge management in wastewater Engineering:-

(1) As wastewater engineering

is directly related to environment sludge management is approach towards a better environment.

(2) Residual wastes from hospitals, research facilities and other industries can be hazardous to our health and the environment. these harmful elements may require thermal treatment to control the spread of diseases or toxins. sewage sludge incineration reduces volume (upto 90%) and weight (upto 75%.) and breaks down dangerous substances such as Pathogens and toxic chemicals. Flue gases from exhaust Pipes must be handled properly by utilizing a complex treatment system to prevent hazardous emissions and

ashes from contaminating the environment.

(3) The other importance is, that as a result of sludge management, sludge which ~~Pos~~ manged is a agriculture manure.

(4) Due to excess of new problems in sludge management every year new techniques and professional/experts are emerges in waste water engineering industry to face the challenges and binding the solutions.

Q:05

Environmental Impact Assessment (EIA):-

A technique and a process by which information about environmental effects of a Project is collected, both by the developer and from other sources, and taken into account by the planning authority in forming the judgement on ~~which~~ whether the development should proceed.

Parameters Considered While Conducting EIA For newly Proposed Wastewater Treatment Plant:-

(1) Environmental damage should be minimum such as do not

affect water body greenery and energy consumption which affect the environment should be controlled.

(2) Environmental Benefits should be maximum and water life should be protected.

(3) Ensures that Development is according to National Quality standards (NEQs).

(4) The Project should not conflict with Govt. Policies.

(5) It should be ensure that the waste-water treatment Plant do not Pollute the air of the locality.

(6) Also the Noise Pollution should not affect if the Plant of treatment is in Populated Area.

(7) International obligations

should be strictly followed.

(8) Most treatment plants have Primary treatment (physical removal of floatable and settleable solids) and secondary treatment (the biological removal of dissolved solids).

(9) Some other treatment plants have tertiary treatment option.

(10) The purpose of tertiary treatment is to provide a final treatment stage to raise the effluent quality before it is discharged to the receiving environment (sea, river, lake, ground etc..). More than one treatment Process may be used at any treatment Plant.