WASTEWATER ENGINEERING

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Answer To Question # 01

Wastewater Treatment

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

→ Wastewater treatment involves collecting the wastewater in a centralized or decentralized location (Wastewater treatment plant) & subjecting the wastewater to various treatment processes.

Importance Of Wastewater Treatment

1. The principal 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.

2. Wastewater if properly treated, is an important resource and can be used for various purposes including irrigation, lawn watering, car washing, flushing toilets & landscaping etc

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

Rectangular Tanks Are Preffered Over Circular Tanks For removal of Settlable Solids during Prelimiary treatment;

Rectangular tanks are preferred over circular tanks because the

rectangular tanks has a large horizontal distance as compare to circular tanks, due to which the settlebale solids gets more detention time and it settles down before reaching the outlet. And in rectangular tanks due to higher vertical velocity the settleble solids can easily be settle as compare to circuda tanks which has less horizontal distance due to which in circular tanks settlable solids do not settle down well & reach to outlet.

Also the rectangular tanks are easy to operate and low maintance cost and rectangular tanks require less surface area for construction as compare to circular tanks.

Answer To Question # 02

Aerobic Wastewater Treatment

The wastewater treatment process which use bacteria that require oxygen, so that the air is circulated throughout the treatment tank, such type of treatment is known as aerobic wastewater treatment.

With the help of these aerobic bacteria, the waste within the wastewater is broken down.

Some of wastwater treatment plants utilize a pretreatment to reduce the chance of clogging the system.

Electricity is also required for the opelation of system.

Anaerobic Wastewater Treatment

The process of wastewater treatment in which Anaerobic bacteria transforms organic matter in the wastewater into biogass that contains large amounts of methane gas & carbon dioxide, is called Anaerobic wastewater treatment.

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

The Anaerobic wastewater treatment is 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 wastewater treatment.

Activated Sludge Process (ASP)

The process for treating sewage or industrial wastewater using aeration and biological floc composed of bacteria & 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 micro-organism to grow. This aeration also helps to keep micro-organisms in suspension.

Aeration tank is followed by clarifier/settler in which the micro-organisms from flocs & 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 & is termed as Wasted Activated Sludge (W.A.S)

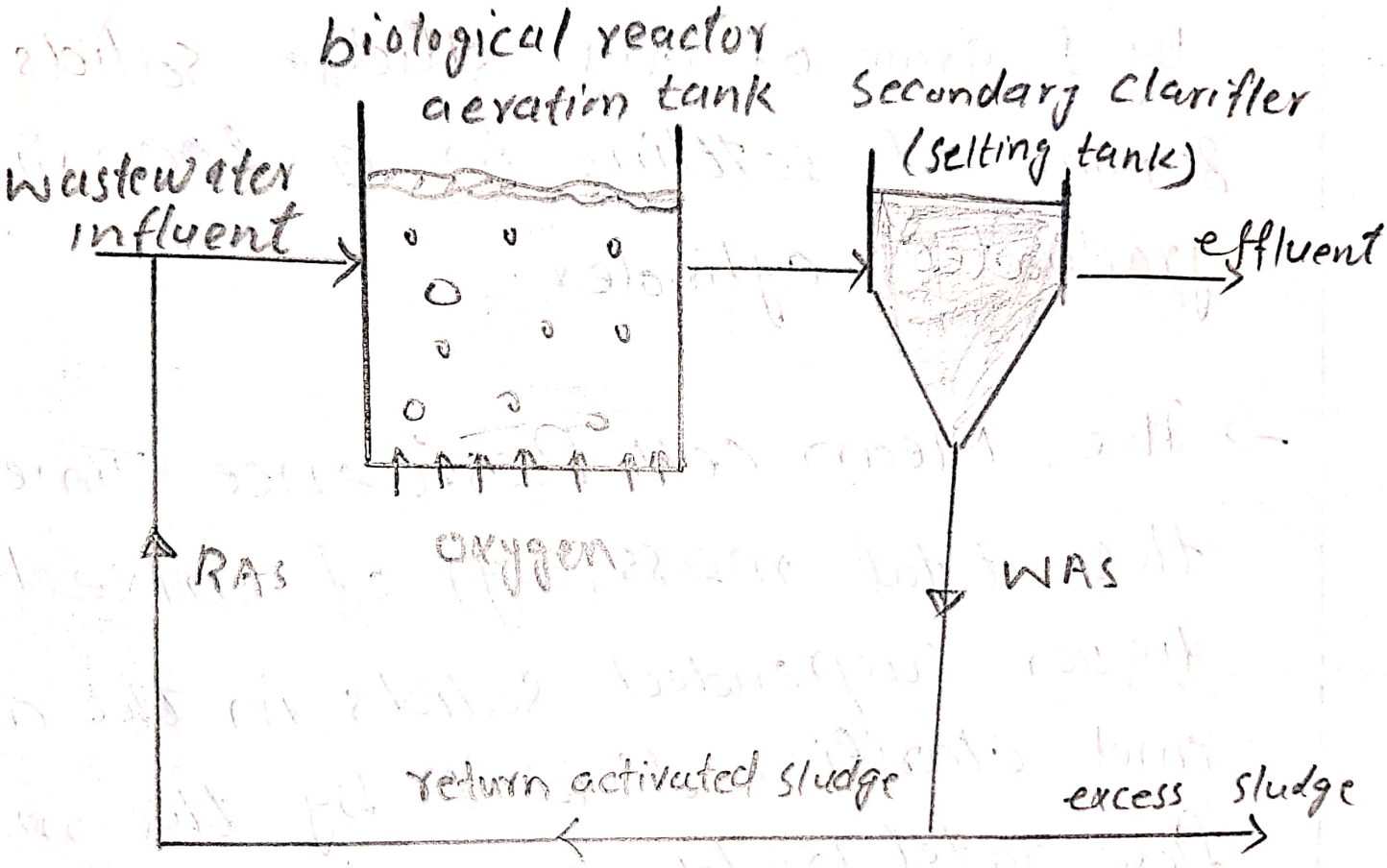
ASP involves production of activated mass of micro organisms capable of stablizing waste under aerobic conditions.

In aeration tank, contact time is provided for mixing

and aerating influent wastewater with microbial suspension, generally refferred to mixed liquor suspended solids (MLSS)

Typically 99% of suspended solids & upto 90% of dissolved organics are removed by Activated sludge process

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



Answer To Question # 03

Assimilative Capacity Of Receiving Water Bodies

It refers to the ability of a body of water to cleanse itself; its capacity to recieve wastewaters without deleterious effects & 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 off to the natural water streams still it has impurities/pollutants that need to removed or make them less effective so that the recieving water bodies may not become unsuitable for use or cause damage to the aquatic life

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 & dispersion are interrelated to help for treatment.

3) Sunlight

Another importance of Assimalative

treatment is sunlight which facilitates biological decomposition of pollutants & kills pathogens by ultraviolet radiation.

4) Temperature

In assimilative capacity the temperature plays an important role. With increase in temperature of recieving water the biological decomposition of organics and thus assimilative capacity will improve. Increase in temperature also increases 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 dilution & dispersion of pollutants.

6) Depth of Flowing Water

Assimalative capacity is directly related to the Depth of receiving water bodies. Increase in depth relates UV radiation & in turns pathogens are killed

Answer To Question# 04

Sludge Management

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

Sustainable sludge manging 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 environment. i.e water, air, soil.

Advantages of Sludge Handling/ Managing In Wastewater Engineering

1. As wastewater engineering is directly related to environment, sludge management is approach towards better environment.

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

3 Due to excess of new problems in sludge management every year ~~new~~ new techniques & professional/experts are emerges in wastewater engineering industry to face the challanges & finding the solutions.

4 The other impoetance is that as a result of sludge mangement, sludge which is managed is agriculture manure.

Answer To Question #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 whether the development should proceed

Parameters To Be Consider;

1. Environmental damages should be minimum such as they do not affect water body, greenery & energy consumption which affect environment should be controlled.

2. Environmental benefits should be maximum & water life (water pollution) should be protected.

3. It must be ensured that Development is according to National Environmental Quality Standards (NEQs).

4. The project should not conflict with Government Policies

5 International obligations should be strictly followed.

6. Most treatment plants have primary treatment (physical removal of floatable & settleable solids) & secondary treatment (the biological removal of dissolved solids). Some other treatment plants have tertiary treatment option. 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.

7. It should be ensured that the wast-water treatment plant do not pollute the air of the locality.

8 Also the noise pollution should not effect if the plant of treatment is in polluted area.