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Section A

Deptt: Civil Engg

Paper Wastewater Engg.

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Question No: 01:

Answer:

Wastewater treatment:

It can be defined as a process of removing organic and inorganic matter from the waste water to make it suitable to be discharged back to the environment. Before releasing wastewater it has to pass through a series of processes such as seperation, filtration, disinfection, and removal of organic and inorganic components.

Importance:

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.

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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 a final product which is a potential source of energy.

Why Rectangular tank are preffered over circular tanks for removal of settleable solids during preliminary treatment:

Rectangular tanks are preffered on circular tank because rectangular tank has a large horizontal space/distance so settable solids have more time to settle. More amount of settleble solids settled &

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minimum solid goes from outlet. Rectangular tank are easy to handle and operate as compared to circular tank. Even the flow distribution configuration for rectangular clarifer require simpler and less expansive pipe work layout and pumping as compared to circular.

Rectangular tank typically require less land than circular tank for a same surface area.

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Question No: 02:

Answer:

Parameter	Aerobic Treatment	Anaerobic Treatment
Application	Low to medium strength wastewater (< 1000 ppm) eg. Muncipal sewage, refinery wastewater etc.	Medium to high strength wastewater (> 4000 ppm) e.g food and beverage industry wastewater
Capital investment	Relatively high	Relatively low with pay back
Energy Consumption	Relatively high	Relatively low
Foot-print	Relatively large	Relatively small and compact.
Net sludge yield	Relatively high	Relatively low
Post-treatment	Typically direct discharge	Required to fullfill wastewater standard discharge requirement.
Example technologies	Activited sludge Process (ASP), Trickling Filter and Rotating Biological Contractor (RBC).	Anaerobic digestors (AD), continous stirred Tank Reactors (CSTR), sequencing batch reactor (SBR), Upflow Anaerobic sludge blanket (UASB) Reactor.

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Question No: 02

Answer

Activated Sludge Process (ASP):

Microorganism responsible for treatment are maintained in liquid suspension by appropriate mixing method.

Main constituents of ASP are aeration tank in which oxygen is provided for the micro-organism to grow. This aeration also helps to keep microorganism in suspension.

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

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

A part of settled bio flocs are recycled back to the aeration tank to maintain certain

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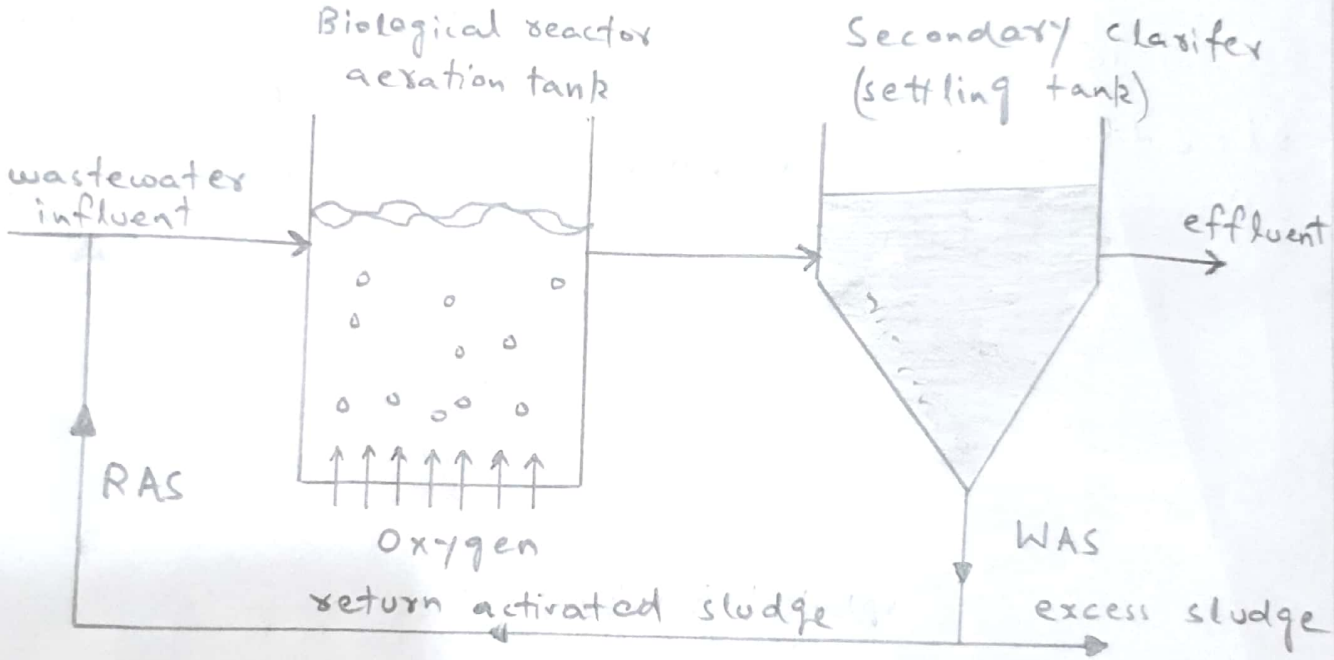
amount of micro-organism in the system for efficient operation of the system. This is known as Recycled Activated sludge (RAS).

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



(ASP Diagram)

APS involves production of activated mass of microorganism capable of stabilizing waste under aerobic conditions.

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

Typically 99% of suspension solids up to 90% of dissolved organics are removed by ASP.

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

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Question No: 03

Answer:

Assimilative Capacity of receving water bodies:

It refers to the ability of a body of water to cleanse itself; its capacity to receive wastewater without ~~det~~ 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 receving water bodies may not become unsuitable for use or cause damage to aquatic life.

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How does it help in wastewater treatment?

Dilution:

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

Dispersion:

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

Sunlight:

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

Temperature:

Increase in temperature will increase the biological decomposition of organics and thus assimilative capacity will improve. Temperature increase also causes to increase dilution process.

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Flow velocity:

Flow velocity is also critical to assimilative capacity of receving water bodies. Higher the flow velocity will encourage quick dilution and dispersion of pollutants.

Dissolved Oxygen (DO):

Rate of biological decomposition is directly related to the amount of dissolved oxygen. DO is replenished by re-aeration. Re-aeration may be provided by maintaing sufficient flowing velocity.

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Question No: 04

Answer:

Sludge Management:

Sludge refers to residual semisolid material left from muncipal 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 transfered to humans or the enviroment i.e water, air or soil.

Advantages of sludge Management:

(i) As wastewater engineering is directly related to environental sludge management is approach toward a better environment.

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(ii) The other importance is that as a result of sludge management sludge which managed is a agriculture manure.

(iii) Due to excess of new problems in sludge management every year new techniques and proffesional experts are emerges in wastewater engineering industry to face the challenges and finding the solutions.

(iv) Residual wastes from hospitals ~~resear~~ research facilites and other industries can be hazards to our health and enviroment. These harmful elements may require thermal treatment to control the spread of diseases or toxics. Sewage sludge incineration reduces volume upto 90% and weight upto 75% and breaks down dangerous substances such as pathogens and toxics chemicals.

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Question No : 05

Answer

EIA:

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

EIA thus has three main functions.

(i) to predict problems

(ii) to find ways to avoid/mitigate them and,

(iii) to enhance positive effects.

Parameter Considered while Conducting EIA for Newly proposed wastewater treatment Plant;

The following consideration should be kept in mind while conducting EIA for the newly proposed wastewater treatment Plant. ~~Environmental~~

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(i) Enviromental damages should be minimum such as do not affet water, greenery and energy consumption which effects the enviroment should be controlled.

(ii) Environment benifits should be maximum and water life should be protected.

(iii) Most treatment plants have primary treatment and secondary treatment. ~~Plants have~~ Some other treatment plants have tertiary treatment is to provide a final treatment stage to the receving enviroment like sea, river lake, ground. More than one treatment process may be used at any treatment plant.

(iv) The project should not conflict with government policies.

(v) International obligations should be strictly followed.

End

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