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Section

A

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Subject

Waste water engg

Wastewater treatment:- Wastewater treatment is a process used to remove ~~contaminations~~ contaminants from wastewater or sewage and convert it into an effluent that can be returned to water cycle with minimum impact on the environment or directly reused. The treatment process take place in wastewater plant. (WWTP).

Importance ..

- ① The major aim of wastewater treatment is to remove the suspended solids as possible before the remaining water called effluent is discharge back to the environment.
- ② Wastewater treatment is fundamental to protect the health of many different ecosystems.
- ③ Good wastewater treatment allows the maximum amount of water to be reused instead of going to waste.

④ it is very important to provide some degree of treatment to wastewater before it can be for agricultural or for Irrigation.

⑤ it is important to produce an environmentally safe fluid waste stream and a solid waste suitable for disposal or reuse.

Why rectangular tanks are preferred over circular tanks for removal of settleable solids.

→ 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 center-feed/~~per~~ peripheral overflow circular clarifiers/tanks.

→ Rectangular ~~clarifier~~ tank require less land than circular tank.

→ Require less head loss for rectangular tank.

→ Flow distribution configuration for rectangular tank require simpler and less expansive pipework layout - while circular require complicated and expansive pipework.

Q No 2

Difference b/w aerobic and anaerobic wastewater treatment

Briefly describe Activated Sludge process with diagram?

Ans

Aerobic wastewater 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 wastewater.
- 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 waste treatment

- Anaerobic bacteria transform organic matter in the wastewater into 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 temperature.

- it can be used as a pretreatment prior to aerobic municipal wastewater treatment.

Activated Sludge process.

• The activated sludge process is a type of wastewater treatment process for treating sewage or industrial wastewater using aeration and a biological floc composed of bacteria and protozoa. It is known as activated sludge process.

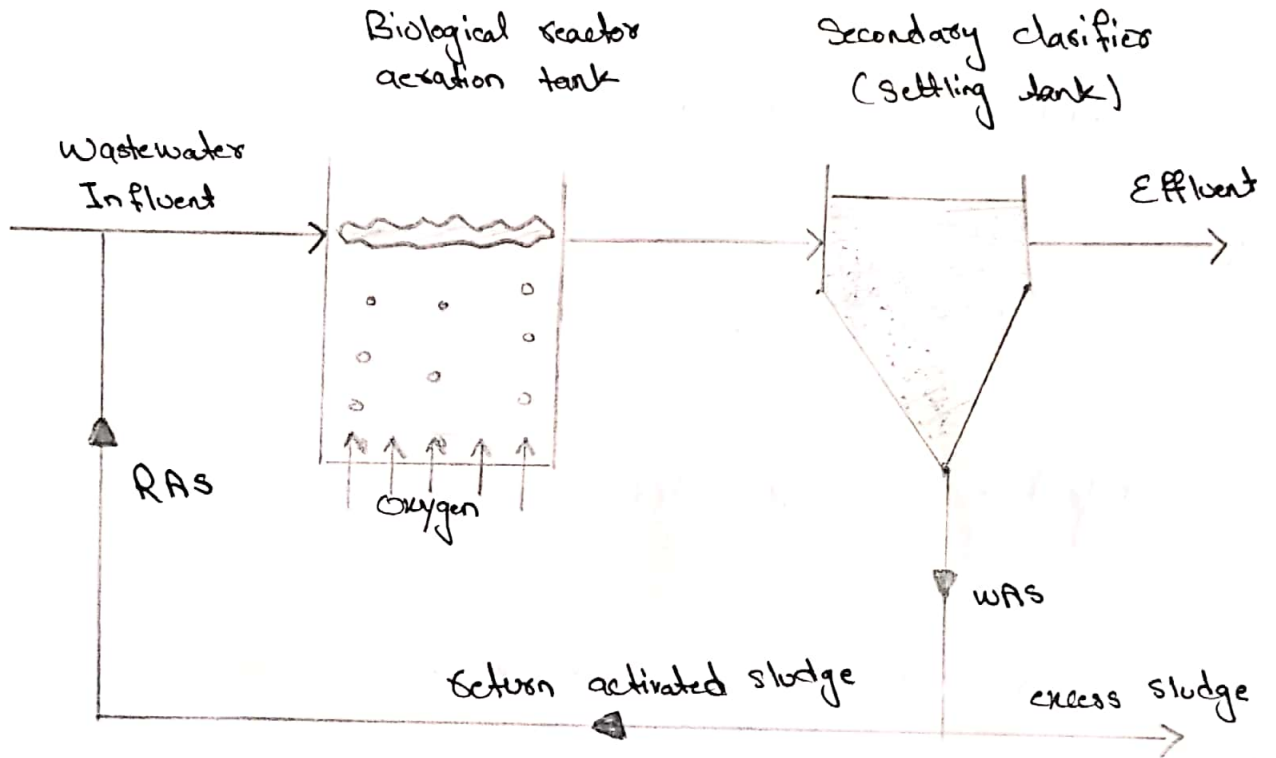
• Activated Sludge process is that biological process which can be used for oxidizing carbonaceous ~~but~~ biological matter, oxidizing nitrogenous matter (NH_3 and N_2), removing nutrients (N and P).

• Aeration method ~~used~~ diffused aeration surface aerators (aer) and pure oxygen aeration.

• The sludge blanket is measured from the bottom of the clarifier.

- Sludge volume Index is the volume of settled sludge in mm occupied by 1 gram of dry sludge solids after 30min of settling in a 1000 ml graduated.
- The F/M amount of BOD fed to the aerator (kg/day) divided by the amount of MLVSS (kg) under aerator.
- Some use Mixed liquor suspended Solids for experience but Mixed liquor volatile Suspended Solids is considered more accurate for the measure of microorganisms.

Activated Sludge Process (ASP).



Q No 3

assimilative capacity of receiving water bodies?

How does it help in wastewater treatment?

Ans The ability of a body of water to cleanse itself, its capacity 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.

⇒ The ability of a body of water to clean itself

⇒ The capacity for water body to absorb constituents without exceeding a specific concentration.

→ Wastewater is properly treated before it is disposed of the natural water stream still it has impurities/pollutants that need to be removed or made less effective so that receiving water bodies may not become unsuitable for use or cause damage to the aquatic life.

How does it help in wastewater treatment?

Ans Assimilative capacity help in wastewater treatment.

by following physical forces. and chemical forces.

⇒ A stream can assimilate a certain amount of waste and still maintain a dissolved oxygen level high enough to support a healthy population of fish and other aquatic life.

• Physical force which Includes

(i) Dilution.

(ii) Dispersion

(iii) Sunlight

• Chemical force which Includes

(1) Oxidation

(2) Reduction

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

Dispersion. Dispersion is 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)

Chemical force.

~~oxidation~~ oxidation

The adding of ~~reacting~~ oxygen to a compound.

Reduction

The loss of oxygen from compound.

QNo 4

Sludge Management. The process used to manage and dispose of sewage sludge produced during waste and drinking water treatment.

Sludge is mostly water with lesser amounts of solid material removed from liquid sewage.

Reducing sludge volume may increase the concentration of some of these toxic chemicals in the sludge.

Treatment processes of sludge treatment.

Thickening: This is the 1st step of sludge treatment process. Sludge is thickened about 8 to 10 percent solid. When solid thickens its form large in size and due to gravity it settles down.

Digestion: To reduce amount of organic matter and the number of disease-causing microorganisms present in the solids. Most common treatment options include aerobic and anaerobic.

Mechanical Dewatering.

Vacuum filtration, Centrifugation

Disposal :- Land application, Burial.

Advantage of Sludge treatment in wastewater engineering

- it reduces pathogens and volume to be disposed.
- protects wild life aquatic life and also prevents disease.
- Sustainable management of organics waste.
- Reduction of odors and disease causing agents
- producing bio gas.
- Capable of removing 97% of suspended Solids.

Q No 5

Environmental Impact Assessment.

An environmental impact assessment (EIA) is an assessment of the possible positive and negative impact that a proposed project may have on the ~~envir~~ environment, considering natural, social and economic aspects.

⇒ EIA is a legal procedure in which a project developer is required to provide environmental information to a consenting body so that this information can be better informed decision making.

~~Environment~~

In my opinion.. Wastewater contains a large number of contaminants and they are categorized as physical, chemical and biological contaminations.

- ① Biochemical oxygen Demand (BOD)
- ② chemical oxygen Demand (COD)

2) Total Suspended Solids (TSS)

3) Total Kjeldahl Nitrogen (TKN)

1) Biochemical oxygen demand (BOD)

The BOD is the amount of oxygen consumed by aerobic microorganisms to break down the organic matter present in the wastewater. It is the (BOD) which is the actual measured parameter and is an indication of amount of organic matter consumed within 5 days as from testing.

The value is used to ensure measure the efficient of treatment plant in term of organic matter removal.

Chemical oxygen Demand (COD)

The COD is an alternate measure of the amount of organic matter.

The amount of oxygen used by a strong oxidising agent is measured. This value of

greater importance when evaluating waste water from industries since these effluent tend to be toxic microorganism thereby affecting the validity of BOD results.

Total suspended Solids.

The TSS is measured to indicate the amount by mass of fine suspended particles. Effluent discharged in the water courses must contains low levels of TSS. Since TSS causes turbidity affecting plants and also causes visual pollution.

Total Kjeldahl Nitrogen (TKN)

Wastewater usually contains high level of nitrogen containing compounds. The nitrogen exists mostly in free forms. organic nitrogen ammonia and reduced

nitrogen. The TKN value hence indicates the amount of nitrogen of all these 3 forms. The TKN value is useful in monitoring the plant.