

Name: Muhammad Hamza

Class: BE(C)

Section: A

ID # 7692

Subject: wastewater Engineering

Instructor: Engr. Nadeem Ullah

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Q.No.(01)

Answer:-

\* Wastewater treatment:-

Wastewater treatment is a process used to remove contaminants from wastewater or sewage and convert it into an effluent that can be returned to the water cycle with minimum impact on the environment, or directly reused.

\* Importance:-

The major aim of wastewater treatment is to remove as much of the suspended solids as possible before the remaining water, called effluent, is discharged back to the environment. As solid material decays, it uses up oxygen, which is needed by the plants and animals living in the water.

\* Rectangular tanks are preferred over circular tanks for removal of settleable solids during preliminary treatment because 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 / peripheral overflow circular clarifiers. In addition, flow distribution among several clarifiers is usually more even and often requires less head loss for rectangular clarifiers.

Q. No. (2)

Answer :-

\* Aerobic wastewater treatment:-

- Aerobic processes use bacteria that require oxygen, so air is circulated through out the treatment tank-
- These aerobic bacteria then break down the waste with in 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.

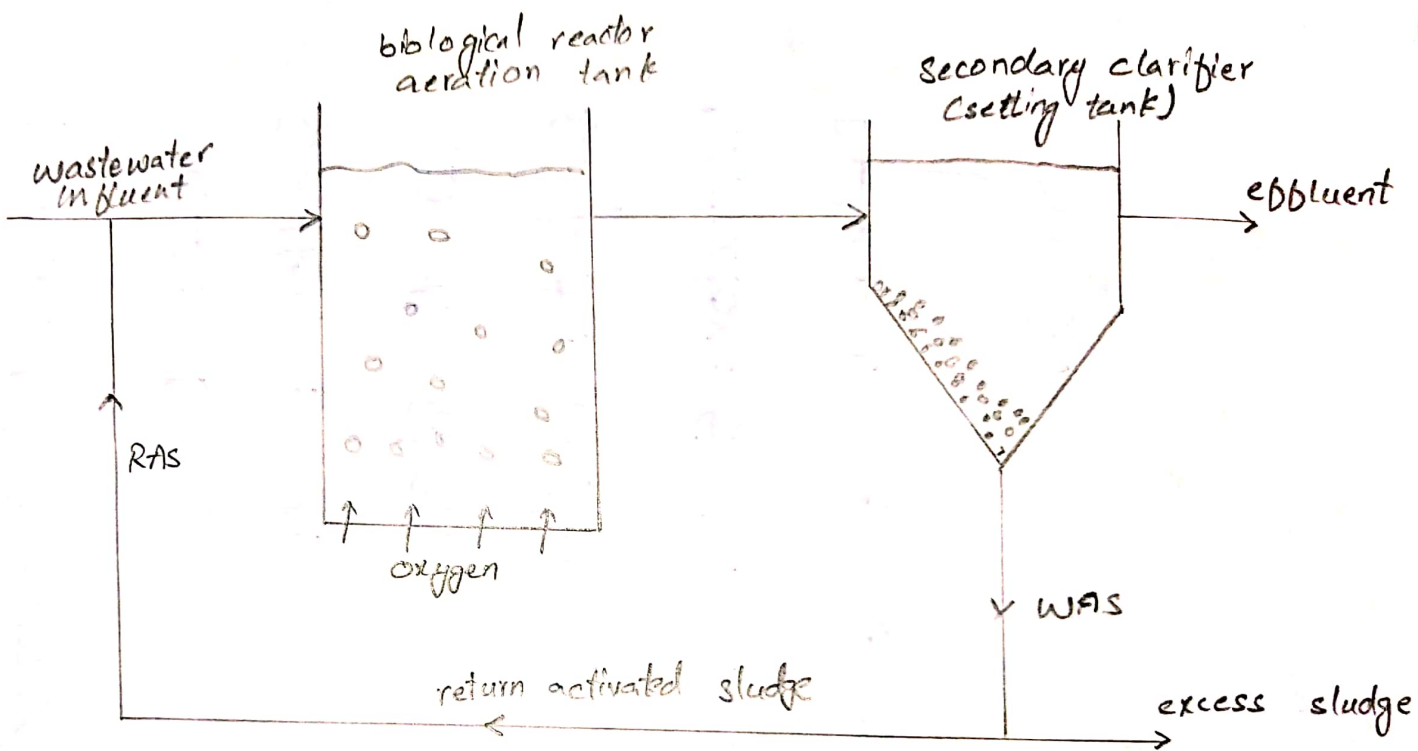
\* Anaerobic waste water treatments-

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

## \* 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. This aeration also helps to keep micro-organisms in suspension.
- Aeration tank is followed by clarifier/settler in which the micro-organisms form flocs and settled down at the bottom.
- Formation of floc particles, ranging in size from 50 to 200  $\mu\text{m}$ , 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 from the system and is termed as wasted Activated Sludge (WAS).



Q. No. (03)

Answer:-

Assimilative capacity refers to the ability of a body of water to cleanse itself; its capacity to receive waste waters or toxic substances without deleterious effects and without 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.

\* It helps in wastewater treatment as 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. Also it helps through dilution, dispersion, sunlight.



\* As dilution is the process of mixing more quantity of fresh water.

\* In dispersion the distribution of pollutants in relatively large area of water takes place.

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

Q. No (04)

Answer:-

Sludge Management:-

- Sludge treatment is the process used to manage and dispose of sewage sludge produced during waste water and drinking water treatment.

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

It can identify physical and chemical characteristics in sludge.

Treatment Processes:

- Thickening - Gravity and floatation.
- Digestion - Aerobic, Anaerobic
- Mechanical dewatering - Vacuum filtration, centrifugation.
- disposal - land application, Burial.

## \* Advantages of sludge treatment:-

- It reduces pathogens and volume to be disposed.
- Protects wild life, aquatic life and also prevents diseases.
- Sustainable management of organic waste.
- Reduction of odors and disease causing agents.
- Producing Bio gas.
- Removes organics.
- Oxidation and nitrification achieved.
- Stabilization of sludge.
- Capable of removing 97% of suspended solids.
- Solid liquids separation.
- Biological phosphorus removal.

Q. No. 05).

Answer:-

\* Environmental Impact Assessment:-  
(EIA):

It is "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 of EIA:-

wastewater contains a large number of contaminants and they are categorised as physical, chemical and biological contaminants. Different parameters have been established from experience and theory to define such characteristics.

The most important parameters to be considered for a local wastewater treatment plant that should be considered are;

①. Biochemical oxygen demand (BOD):

②. Chemical oxygen demand (COD):

③. Total Kjeldahl Nitrogen (TKN):

④. Total Suspended Solids (TSS):

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<sub>5</sub> which is the actual measured parameter and is an indication of the amount of organic matter consumed within 5 days as from testing. This value is used to measure the efficiency of a treatment plant in terms of organic matter removal.

②. Chemical oxygen demand (COD):-

The COD is an alternate measure of the amount of

organic matter. The amount of oxygen used up by a strong oxidising agent is measured. This value is of greater importance when evaluating wastewater from industries since these effluents tend to be toxic to microorganisms there by affecting the validity of BOD results (Metcalf and Eddy, 2003).

### (3) Total Suspended Solids (TSS) :-

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

### (4) Total Kjeldahl Nitrogen (TKN) :-

wastewater usually contains high levels of nitrogen containing compounds. The nitrogen exists

mostly in free forms; organics nitrogens ammonia and nitrogen. The TKN value hence indicates the amount of nitrogen of all these 3 forms. TKN is useful in monitoring the plant.