

Iqra National University

Name :- Alamgir Khan

I.D no :- 7282

Teacher Name :- Engr. Nadcerm-Ullah Khan

Subject :- Wastewater Engineering

Semester :- 16

Department :- Civil Engineering

Q1 What is wastewater treatment & its importance? Why rectangular tanks are preferred over circular tanks for removal of settleable solids during Preliminary treatment?

Ans Wastewater treatment :-

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

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

→ 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

Importance of Wastewater treatment :-

- 1) With the current emphasis on environment health, water and soil pollution issues, there is an increasing awareness of the need to dispose off generated wastewaters safely and beneficially.
- 2) Wastewater if properly treated, is an important resource and can be used for various purpose including irrigation, lawn watering, car washing, flushing toilets and landscaping etc.
- 3) Wastewater treatment can also generate biogas as final products which is a potential source of energy.
- 4) Conventional wastewater treatment consists of a combination of physical, chemical and biological processes and operations to remove solids, organic matter and nutrients from wastewater.

(Pg 3)

Rectangular tanks are preferable over circular tanks in sewage :-

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 sludge settling compared to feed/peripheral overflow circular clarifiers.

Q2 What is the difference between aerobic and anaerobic wastewater treatment? Briefly describe Activated Sludge process with diagram?

Ans Difference between aerobic & anaerobic :-

While both rely on a process of microbial decomposition to treat wastewater, the key difference between anaerobic and aerobic treatment is that aerobic systems require oxygen, while anaerobic systems do not. This is a function of the types of microbes used in each type of system.

Aerobic treatment is often used as a secondary treatment process and follows an anaerobic stage. This is because anaerobic treatment is preferred when the dissolved organic concentrations of untreated wastewater

are high. Aerobic treatment consists of activated sludge processes or aerated pond.

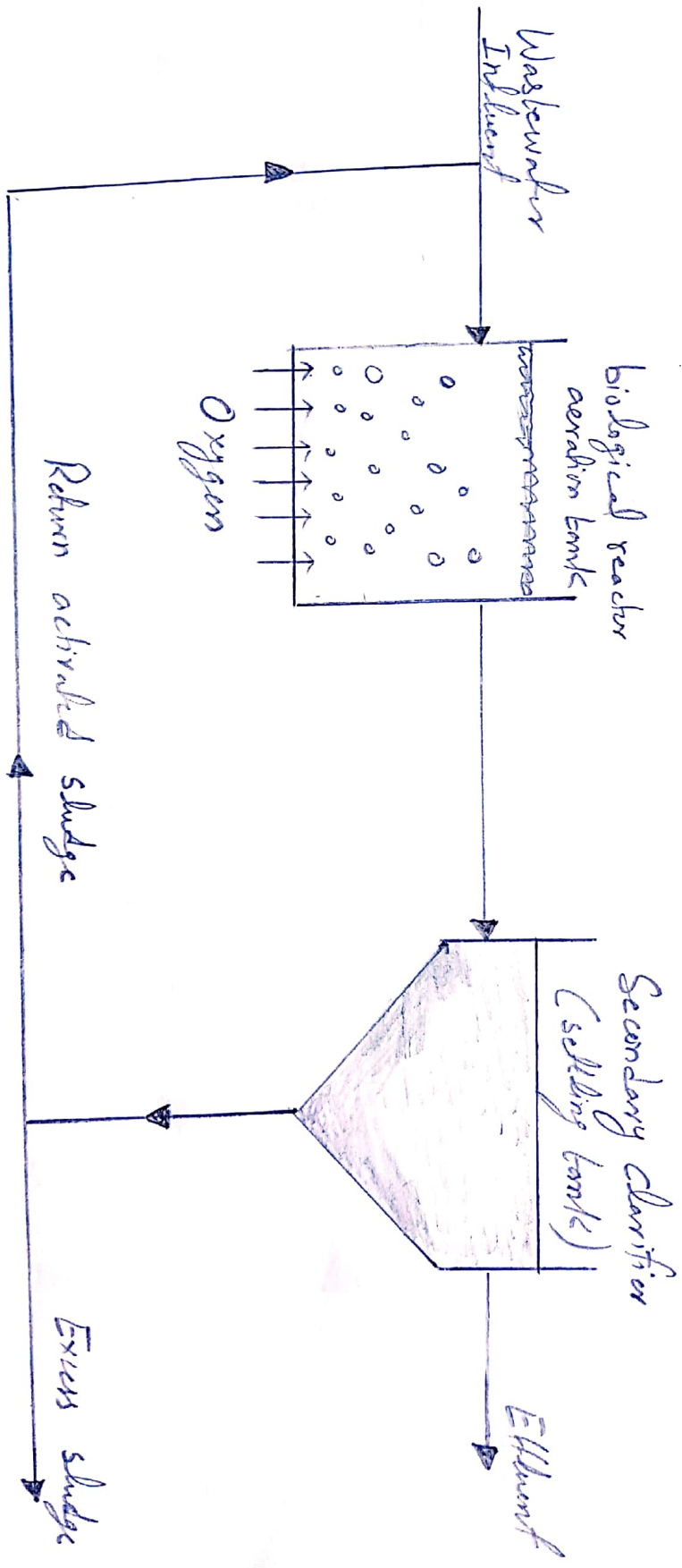
Activated Sludge process:-

is a type of wastewater treatment process for treating sewage or industrial wastewaters using aeration and a biological floc composed of bacteria and protozoa.

The general arrangement of an activated sludge process for removing carbonaceous pollution includes the following items: An aeration tank where air (or oxygen) is injected in the mixed liquor. This is followed by a settling tank (usually referred to as "final clarifier" or "secondary settling tank") to allow the biological flocs to settle, thus separating the biological sludge from the clear treated water.

Activated Sludge Process Diagram :-

(Pg 6)



Q3 What is meant by assimilative capacity of receiving water bodies? How does it help in wastewater treatment?

Ans Assimilative Capacity of receiving

water bodies :-

refers to the ability of a body of water to cleanse itself its capacity to receive 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 neutral 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 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.

Assimilative Capacity helps in Wastewater

treatment :-

- 1) Dilution: is the process of reducing the concentration of pollutants in receiving water, usually simply by mixing with more quantity of water.
- 2) Dispersion: is the distribution of pollutants in relatively large area of water. Dilution and dispersion are interrelated.
- 3) Sunlight :- facilitates biological decomposition of pollutants and kills pathogens by ultraviolet radiation (UV).

Q4

Briefly describe sludge management and its advantages in wastewater engineering?

Ans

Sludge management :-

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

Sustainable sludge handling 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.

Sludge management processes :-

- 1) Primary operations :- includes following
 - i) Grinding
 - ii) Screening
 - iii) Degritting
 - iv) Blending
 - v) Storage

2) Sludge Thickening :- is undertaken to increase percentage of solid content in sludge by removing a portion of liquid fraction.

Methods of sludge thickening:

- i) Gravity thickening
- ii) Flotation thickening
- iii) Rotary drum thickening

3) Sludge Stabilization :-

- i) Alkaline stabilization
- ii) Anaerobic Digestion

4) Dewatering :- to reduce the moisture content of sludge.

Centrifugation is the method used for separating liquids of different densities, thickening slurries.

5) Heat Drying :- involves the wastewater solids come into contact with hot gases, which cause evaporation of moisture.

Advantages in Wastewater Engineering:-

- 1) Land Scape Irrigation
- 2) Agriculture Irrigation
- 3) Ground Water Recharge
- 4) Street Washing
- 5) Fire Fighting
- 6) Non-portable domestic uses.
- 7) Rids Potential Diseases; Wastewater treatment systems eliminate disease-causing bacteria and kills harmful organisms.
- 8) Low-cost
- 9) Minimal odour Emissions
- 10) No-water bills
- 11) Less Wastewater
- 12) Break Down solids faster.

Qs Define Environment Impact Assessment (EIA)?

In your opinion, what parameters should be considered while conducting EIA for newly proposed wastewater treatment plant?

Ans Environmental Impact Assessment (EIA):-

The aim of any EIA should be to facilitate sustainable development. Beneficial environment effects are maximized while adverse effects are minimized or avoided to the greatest possible extent.

"A technique and a process by which information about environment 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."

In simple words EIA may be defined as:

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

EIA thus has three main functions:

- To predict problems
- To find ways to avoid/mitigate them, and
- To enhance positive effects.

Parameters considered while conducting EIA for newly proposed wastewater treatment:-

There are eight guiding principles that govern the entire process of EIA as mentioned below:

- 1) Participation :- An appropriate and timely access to the process for all interested parties.
- 2) Transparency : All assessment decisions and their basis should be open and accessible.
- 3) Certainty : The process and timing of the assessment should be agreed in advanced and followed by all participants.
- 4) Accountability : The decision-makers are responsible to all parties for their action and decisions under the assessment process.
- 5) Credibility : Assessment is undertaken with professionalism and objectively.
- 6) Cost-effectiveness : The assessment process and its outcomes will ensure environmental protection at the least cost to the society.

7) Flexibility: The assessment process should be able to adapt to deal efficiently with any proposal and decision making situation.

8) Practicality: The information and outputs provided by the assessment process are readily usable in decision making and planning.