Department of B.E Civil Engineering

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Q1. What is wastewater treatment and its importance? Why rectangular tanks are preferred over circular tanks for removal of settle able solids during preliminary treatment?

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 of WASTEWATER TREATMENT:

Essential for life, clean water is one of the most important natural resources on the planet. Wastewater, which is basically used water, is also a valuable resource, especially with recurring droughts and water shortages in many areas of the world. However, wastewater contains many harmful substances and cannot be released back into the environment until it is treated. Thus, the importance of wastewater treatment is twofold: to restore the water supply and to protect the planet from toxins.

Restoring the Water Supply:

Look at a global drought map and you will see that many areas of the world simply do not have enough water. All communities, especially areas with water scarcity, need to ensure they have good water treatment processes in place so that treated water can either be reused or returned to the water cycle, but never wasted.

Protecting the planet:

Wastewater can include contaminants from both residential and commercial use. Untreated, the chemical compounds and pathogens in wastewater can harm the health of animals, plants and birds that live in or near the water. It can also contaminate crops and drinking water, affecting human health. Wastewater treatment is fundamental to protect the health of many different ecosystems.

- RECTANGULARS TANKS ARE PREFFERED BECAUSE:

- It has low cost of maintenance.
- It is also suitable for large capacity of wastewater.

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

Aerobic vs. Anaerobic Wastewater Treatment	
Aerobic wastewater treatment is a biological wastewater treatment process which uses oxygen rich environment.	Anaerobic wastewater treatment is a process where anaerobic organisms break down organic material in an oxygen absent environment.
Bacteria involved the aerobic wastewater treatment are aerobes.	Bacteria involved the anaerobic wastewater treatment are anaerobes.
Air Circulation Air is circulated in aerobic wastewater treatment tanks.	Air is not circulated in anaerobic wastewater treatment tanks.
Aerobic wastewater treatment does not produce methane and carbon dioxide	Anaerobic wastewater treatment produces methane and carbon dioxide.
Aerobic wastewater treatment requires energy Hence, they are less energy efficient.	Anaerobic wastewater treatment is an energy efficient process.
Activated sludge method, trickling filter, rotating biological reactors, and oxidation ditch are examples of aerobic wastewater treatment.	Anaerobic lagoons, septic tanks, and anaerobic digesters are examples of anaerobic wastewater treatment.

Activated Sludge Process with diagram

Activated sludge process is a process for treating sewage and waste water commonly referred as effluent using bacteria (to degrade the biodegradable organics) and air (Oxygen for respiration).

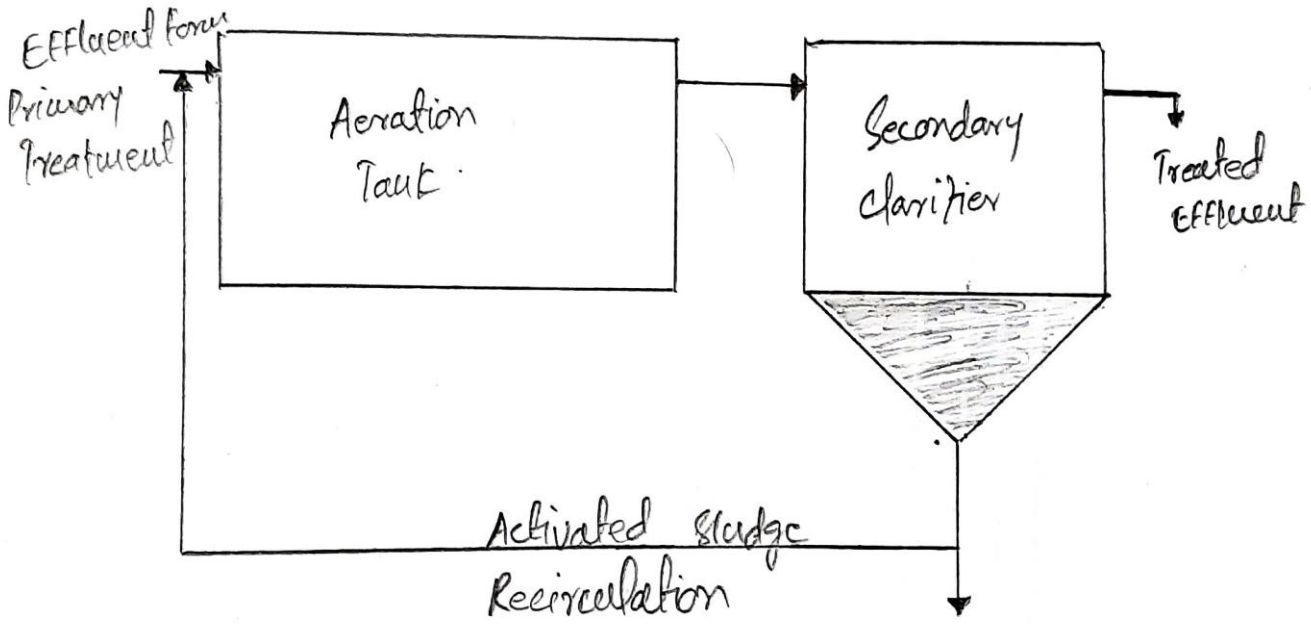
Activated sludge refers to a mixture of microorganisms and suspended solids. The bacterial culture is cultivated in the treatment process to break down organic matter into carbon dioxide, water, and other inorganic compounds. The typical activated sludge process has following basic components:

1) Primary Clarifier to separate the solids carried along with Sewage/Effluent

2) A reactor in which the microorganisms are kept in suspension, aerated, and in contact with the waste they are treating

3) liquid-solid separation; and

4) A sludge recycling system for returning activated sludge back to the beginning of the process.



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

➲ ***Assimilative Capacity of Receiving Bodies:***

- **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 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 receiving water bodies may not become unsuitable for use or cause damage to the aquatic life.

Help of *Assimilative Capacity:*

A classic example of assimilative capacity is the ability of stream to accept modest amount of biodegrable waste.

Bacteria in a stream utilize oxygen to degrade the organic matter present in such a waste causing the level of dissolve oxygen on the stream to fall; but the decrease in dissolve oxygen causes additional
Oxygen to enter the stream to fall enter from atmosphere.

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 organisms.

Q4. Briefly describe sludge management and its advantages in wastewater engineering?

Sludge Management:

The residue that accumulates in sewage treatment plants is called sludge (or bio solids). Sewage sludge is the solid, semisolid, or slurry residual material that is produced as a by-product of wastewater treatment processes. This residue is commonly classified as primary and secondary sludge. Primary sludge is generated from chemical precipitation, sedimentation, and other primary processes, whereas secondary sludge is the activated waste biomass resulting from biological treatments. Some sewage plants also receive seepage or septic tank solids from household on-site wastewater treatment systems. Quite often the sludge's are combined together for further treatment and disposal.t is produced as a by-product of wastewater treatment processes. This residue is commonly classified as primary and secondary sludge

Sludge management advantages:

Energy Generation:

Incineration, also called "mass burn," utilizes a high temperature furnace that burns any waste. In large treatment plants, high quantities of sludge are used as a source of energy used to produce steam when fed through a turbine

Control the Spread of Diseases:

Residual wastes from hospitals, research facilities and other industries can be hazardous to our health and the environment. These harmful elements may require thermal treatment to control the spread of diseases or toxins. Sewage sludge incineration reduces volume (up to 90%) and weight (up to 75%) and breaks down dangerous substances such as pathogens and toxic chemicals.

Flue gases from exhaust pipes must be handled properly by utilizing a complex treatment system to prevent hazardous emissions and ashes from contaminating the environment.

Recovery of Precious Metals:

Significant quantities of precious metals may be recovered from urban waste after it goes through the sewage sludge incineration process. These metals can be recycled from sewage ash.

Q5. Define Environmental Impact Assessment (EIA)? In your opinion, what parameters should be considered while conducting EIA for newly proposed wastewater treatment plant?

Environmental Impact Assessment (EIA):

Definition:

The process of identifying, predicting, evaluating and mitigating the biophysical, social, and other relevant effects of development proposals prior to major decisions being taken and commitments made.

OR

"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".

- ***PARAMETERS FOR NEW WASTEWATER TREATMENT PLANT:***

- Water supply and quality
- Oxygen
- Nitrogenous compounds
- Ph.
- Environmental salinity
- Temp of water
- Density
- Noise, light and feeding etc.