



Submitted by:

Manzoor khan

ID: 7678

Section: (C)

Subject: Wastewater Engineering

Submitted to:

Engr. Nadeem Ullah

IQRA NATIONAL UNIVERSITY PESHAWAR

QNO 1:

Answer:

Wastewater treatment:

Wastewater treatment is the process of converting wastewater into treated water that can be discharged back into the environment without causing any environmental or human health concerns.

Importance:

Wastewater if properly treated, it is an important resource and can be used for various purposes including irrigation, lawn watering, car washing, flushing toilets and landscaping etc.

Wastewater treatment can also generate biogas as final product which is a potential source of energy.

Why rectangular tanks are preferred over circular tanks for removal of settleable solids during preliminary treatment?

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 centre-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.



QNO 2:

Answer:

Aerobic Vs Anaerobic wastewater treatment:

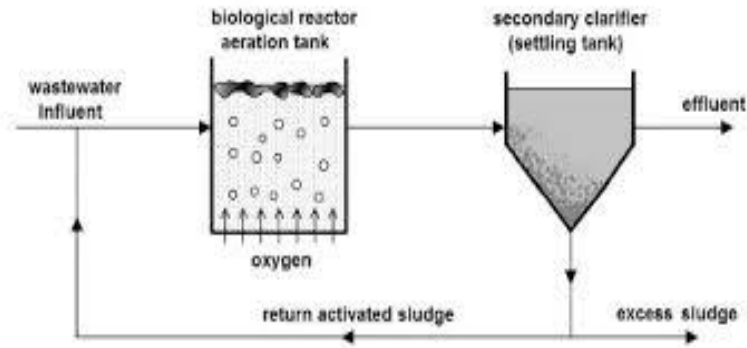
The main difference between anaerobic and aerobic treatment is that aerobic systems require oxygen, while anaerobic systems do not require oxygen. Some of the important ways in which anaerobic and aerobic treatment systems differ include the following:

Aerobic systems require some means of supplying oxygen to the biomass, which may be accomplished by wastewater treatment ponds, while anaerobic systems must be designed to prevent the exposure of the biomass sludge to air.

Aerobic treatment systems are best suited for streams with relatively low BOD/COD, and are also used for removal of nitrogen and phosphorus. On the other hand, anaerobic systems are typically used for treatment of waste streams with high concentrations of organic contaminants, and for warm wastewater streams.

Activated Sludge Process:

- 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 μm , 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 bioflocs are removed from the system and is termed as Wasted Activated Sludge (WAS).
- APS involves production of activated mass of microorganisms capable of stabilizing waste under aerobic conditions;
- In aeration tank, contact time is provided for mixing and aerating influent wastewater with microbial suspension, generally referred to mixed liquor suspended solids (MLSS).
- Typically 99% of suspended solids and up to 90 % of dissolved organics are removed by Activated sludge process.
- The main drawback associated with APS is its high electricity consumption particularly for aeration.



QNO 3:

Answer:

Assimilative capacity of receiving water bodies:

It refers to the ability of a body of water to cleanse itself; its capacity to 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 toxicity without affecting the aquatic life.

How does it help in wastewater treatment?

When wastewater or contaminated water meets fresh water or natural water bodies, then because of the assimilative capacity of natural water bodies two processes are done on the contaminated water one delusion and second dispersion. In delusion when contaminated water meets greater amount of fresh water then the concentration of contaminated water decrease, while in dispersion the contaminated water disperse on a greater area and its concentration gets low and because of this two processes assimilative capacity treats wastewater.

QNO 4:

Answer:

Sludge management:

Sludge treatment and management is a growing challenge for countries globally. Sludge refers to the residual, semi-solid material left from, municipal wastewater or industrial wastewater treatment processes.

Sludge management, including production, characterization, stabilization, digestion, thickening, dewatering, thermal processing, agricultural reuse, production of usable materials, and ultimate disposal.

I. Sludge Handling 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.

➤ **Primary operations:**

This process includes:

- Grinding: It includes particles size reduction
- Screening: It includes removal of fibrous materials.
- Degritting: It includes removal of sand or other inorganic materials.
- Blending: It includes making the sludge homogenous.
- Storage: It ensures flow equalization in the system.

II. Thickening:

The objective is that to remove water before stabilization and decrease volume.

Processes:

- Gravity thickening (same equipment as sedimentation, but smaller)
- Dissolved air flotation (DAF)
- Centrifuge

III. Sludge Stabilization:

The objective: Kill pathogens, eliminate odors, stabilize organics, and concentrate solids.

Processes:

➤ **Anaerobic digestion:**

- It is the most common method of stabilization.
- A biological process that uses bacteria in an oxygen free environment.
- Sludge is placed in a sealed tank
- Anaerobic bacteria grow and degrade sludge solids.
- **Produces:** CH₄ (Methane), CO₂ (Carbon Dioxide), and H₂ S (Hydrogen Sulfide).

➤ **Alkaline stabilization :**

- Lime is added to untreated sludge, to raise the pH to 12 or higher.
- Retards microbial reaction. Materials such as cement kiln dust ,fly ash are used instead of lime

IV. Dewatering:

- **Objective:** Remove water from stabilized sludge.
- **Processes:**
 - Vacuum filter
 - Centrifugation:(is the method used for separating liquids of different densities, thickening slurries)
 - Belt press •
 - Drying beds

V. Heat Drying:

It involves the application of heat to evaporate water and to reduce the moisture content of biosolids. Advantage of this method is to reduce product transportation costs, improve storage capability, and marketability.

Direct drying involves the wastewater solids come into contact with hot gases, which cause evaporation of moisture. Dryers such as rotary dryers and fluidized bed dryers are us.

VI. Sludge disposal:

Objective: Dispose of sludge in environmentally sound way

Processes:

➤ **LANDFILL:**

- Place sludge in a typical solid waste landfill.
- A site for the disposal of waste materials by burial and is the oldest form of waste disposal.
- Problem with this method is that many landfills are filling up, and towns are having trouble finding places to put new ones.
- No beneficial use with this method

➤ **LANDAPPLICATION**

- Sludge is injected or tilled into soil
- Done on either non-agricultural or agricultural land

➤ **COMPOSTING**

- Sludge solids are composted with other solids
- Compost is sold or given away.

Advantages:

- It reduces pathogens and volume to be disposed.
- Protect wild life, Aquatic life and also prevent diseases.
- Sustainable management of organic waste.
- Reduction of odors and disease causing agents.
- Producing bio gas.

QNO 5:

Answer:

Environmental Impact Assessment (EIA):

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 compare various alternatives for a project and seek to identify the one which represents the best combination of economics and environmental costs and benefits.

EIA concern the environmental concerns in the developmental activities right at the times of initiating for preparing the feasibility report.

In our opinion, the following parameters should be considered while conducting EIA for newly proposed wastewater treatment plant:

Although legislation and practice vary around the world, the fundamental components of an EIA would necessary of the following stages:

- **Screening** to determine which project or developments require a full or partial impact assessment study,
- **Scoping** to identify which potential impact are relevant to asses (based on legislative requirements, international convention) to identify alternative solutions that avoid, mitigate or compensate adverse impacts on biodiversity (including the option of not proceeding with the development, finding alternative designs or sites which avoid the impacts incorporating safeguards in the design of the project, or providing compensation for adverse impacts) and finally to derive teams of reference for the impact assessment.
- **Assessment and evaluation** of impacts and development of alternatives, to predict and identify the likely environmental impacts of a proposed project or development, including the detailed elaboration of alternatives.
- **Reporting** environmental impact Statement (EIS) or EIA report, including an environmental management plan (EMP) and non-Technical summary for the general audience.
- **Review** of Environmental impact statement (EIS) based on the term of reference (Scoping) republic participation.
- **Air pollution:** During the treatment process it may affects the air

- **Water pollution:** During the treatment process, the waste particles meet with natural particle and as a result it will affect the water and marine life.
- **Land pollution:** affects the land, destroying life and the environment.
- **Noise Pollution:** that can affect our hearing Visual/aesthetic pollution

END