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QNO 1:

Answer:

WasteWater Treatment :

The processs which convert wastewater which is no longer needed or suitable for it most recent use - into in effluent that can either return to water cycle with minimal envirnmental issue or reused.

Wastewater treatment is the means by which water that has been used and/or contaminated by humans or nature is restored to a desirable quality. Treatment may consist of chemical, biological, or physical processes or a combination thereof. Water may be treated to any level of quality desired; however, as its purity increases, so does the cost of attaining that purity. The required quality of water is dictated by its intended use, for example, aquatic life, drinking water, or irrigation. The purpose of this chapter is to describe wastewater treatment technologies predominantly in use today. Ultimately, the technology selected as appropriate for one application may not be the optimal for another. Selection will be based on site-specific factors, such as resources available, climate, land availability, economics, etc.

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.

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 Wastewater Treatment :

Aerobic processes use bacteria that require oxygen, so air is circulated throughout the treatment tank.These aerobic bacteria then break down the waste within the wastewater.

Some systems utilize a pretreatment stage prior to the main treatment processes, as well as more treatment and sanitizing prior to release into the environment.

Electricity is required for system operation.

The pre-treatment process: Some systems reduce the solids that the aerobic bacteria could not easily break to reduce the chance of clogging the system.

Main treatment: Treats household wastewater and includes both domestic greywater and blackwater. Forced air from a compressor is mixed with the wastewater where the aerobic bacteria feed on waste in the water and reproduce.

Solid wastes that the bacteria cannot process settle out as sludge. Some aerobic treatment systems include a secondary settling tank to facilitate this process. The sludge is frequently pumped out of the system to reduce opportunities for clogging.

Final Treatment and Disposal: This process prepares the water for return to the environment. It may include disinfection using chlorination or UV light, discharging the water to a soil absorption field, filtering through sand filters, drip irrigation, or evapotranspiration.

Anaerobic Wastewater Treatment :

Anaerobic bacteria (bacteria that live in environments that contain no oxygen) 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.

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 wastewaters using aeration and a biological floc composed of bacteria and protozoa.

→ 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 know as Recycled Activated Sludge (RAS).

→ Remaining settled bio flocs are removed from the system and is termed as Wasted Activated Sludge (WAS).

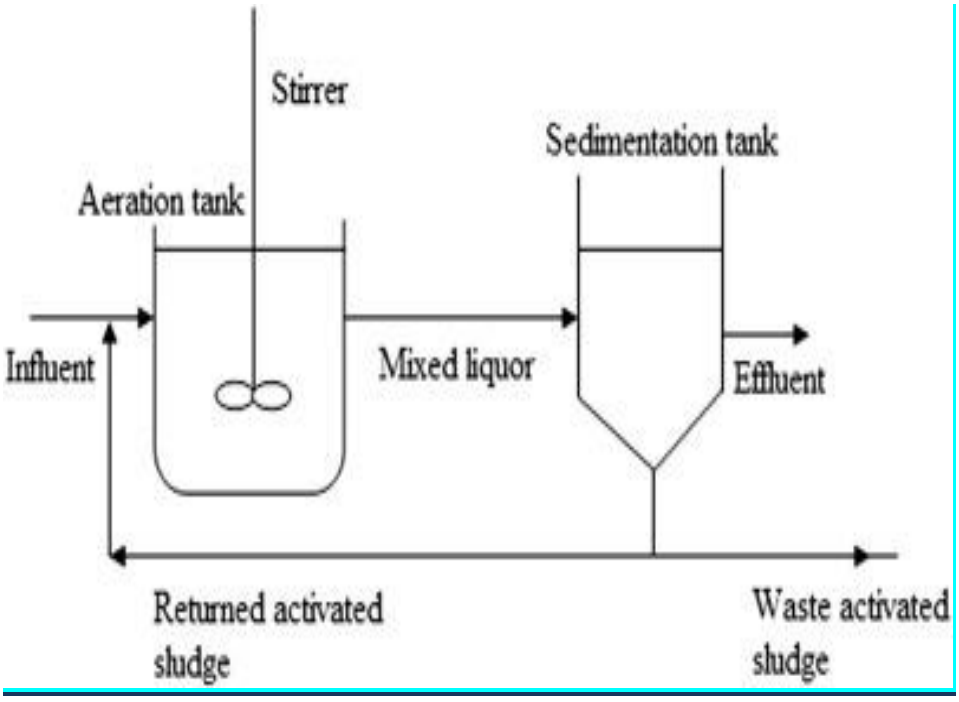
→ APS involves production of activated mass of microorganisms capable of stabilizing waste under aerobic conditions;

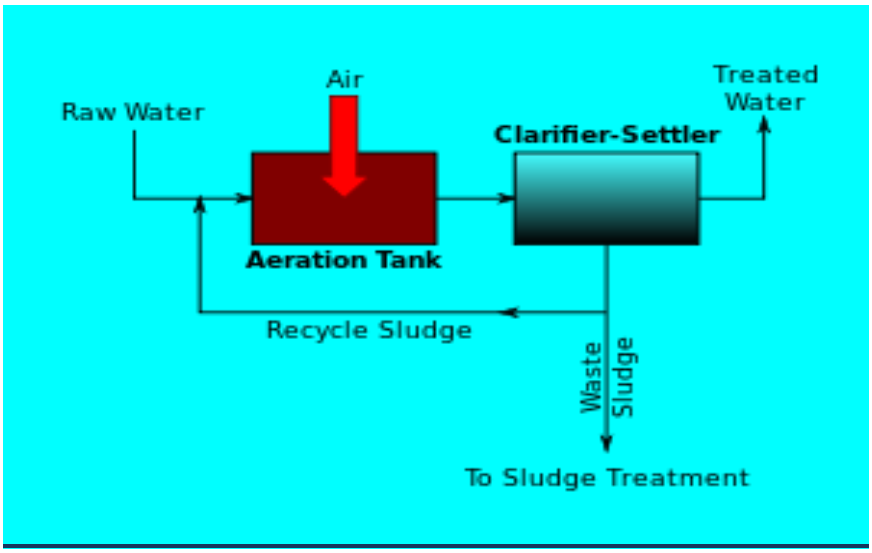
→ In aeration tank, contact time is provided for mixing and aerating influent wastewater with microbial suspension, generally referred to mixed liquor suspended solids (MLSS).

→ 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.

Diagram of Activated sludge process :





QNO 3:

Answer:

Assimilative capacity of receiving water 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.

How does it help in wastewater treatment?

→ when wastewater or contaminated water meet fresh water or natural water bodies ,then because of the assimilative capacity of natural water bodies two process are done contaminated water, one delusion and second dispersion , In delusion contaminated water meet greater amount of fresh water than then concentration of contaminated water decrease , while in dispersion the contaminated water disperse on greater area and it concentration get low .

Due to that two process Assimilative capacity help to treat water .

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.

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.

1. Primary operations .

2. Thickening .

3. Stabilization .

4. Dewatering.

5. Heat drying.

1. Primary operations :

- **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.

2. Sludge Thickening :

Sludge thickening is undertaken to increase percentage of solid content in sludge by removing a portion of liquid fraction.

Volume reduction of approximately 30 – 80 % can be reached with sludge thickening.

Various methods of sludge thickening are:

i. Gravity thickening

ii. Flotation thickening

iii. Rotatory drum thickening

Gravity Thickening :

Gravity thickening employs gravity to do the job of sludge thickening . The sludge solution is made to flow under a baffle and up through a sludge blanket – a layer of

sludge lying on the bottom of a container. The sludge is filtered out as soon as it contacts or strikes the sludge blanket .

3. Sludge Stabilization

Sludge Stabilization is undertaken to reduce pathogens, eliminate offensive odors, minimize production of usable gas (methane).

Methods of stabilization are:

i. Alkaline Stabilization .

ii. Anaerobic Digestion.

i) **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 .

Anaerobic Digestion:

A biological process that uses bacteria in an oxygen free environment. These bacteria converts volatile solids into carbon dioxide, methane and ammonia .

4) Dewatering :

Dewatering is undertaken to reduce the moisture content of sludge. Compared to thermal (evaporative processes) for water reduction, mechanical dewatering is often selected due to its low energy requirement.Centrifugation is the method used for separating liquids of different densities, thickening slurries.

5) 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 used.

Advantages:

⟶ High treatment efficenies possible for BOD ,COD,TSS,N,P.

⟶ It reduces pathogen and volume to be disposed .

⟶Protect wild life ,equatic life and also prevent diseases .

⟶Reduction odor and disease causing agent .

⟶Producing Biogas .

⟶Sustainable management of organic waste .

⟶High Flexibility in operating condition.

⟶ possibility of producing electric energy from biogas .

⟶ low land requirment of CAS,Somewhat higher land Requirment for EA .

⟶ High effluent Quality .

QNO 5:

Answer:

Environmental Impact Assessment (EIA) :

“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”.

“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 .

“an environmental study comprising collection of data, prediction of qualitative and quantitative impacts, comparison of alternatives, evaluation of preventive, mitigatory and compensatory measures, formulation of environmental management and training plans and monitoring arrangements, and framing of recommendations and such other components as may be prescribed”.

“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.

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

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 wourld, 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 envirnmental impact Statement (EIS) or EIA report ,including an envirnmental management plan (EMP) and non Technical summary for the general audience

→ Review of Envirmental impact statement (EIS) based on the term of reference (Scoping) republic participation .