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Section:- C

Subject:- Wastewater Engineering.

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Quiz/Assignment:- 2nd

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IQRA NATIONAL UNIVERSITY:

Q.No1:

Wastewater treatment:-

Waste water 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 process 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 ~~techh~~ 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 of wastewater treatment:-

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.

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 ~~serv~~ several clarifier is usually more even and often requires less head loss for rectangular clarifiers.

Q2:-

Aerobic waste water treatment:-

- Aerobic process use becteria that require oxygen, so air is circulated throughout the treatment tank.
- These aerobic becteria then break down the waste within the wastewater.
- Some systems utilize a pretreatment stage prior to the main treatment to reduce of clogging the system.
- Electricity is required for system operation

Anerobic wastewater treatment:-

- Anaerobic bacteria transform organic matter in the wastewater into biogas that contains large amount of methane gas and carbon dioxide.
- Energy-efficient process.
- often used to treat industrial wastewater that contains high level of organic matter in warm temperatures.
- It can be used as a pretreatment prior to aerobic municipal wastewater treatment.

Activated Sludge process:-

- Process for treating sewage or industrial wastewater using aeration and a biological floc composed of becteria and protozoa.
- Is a biological procen that can be used for oxidizing carbonaceous biological matter, oxidizing nitrogenous matter (NH_3 and N_2).

Aeration methods - diffused aeration, surface aerators (cones) and pure oxygen aeration.

The sludge blanket is measured from the bottom of the clarifier.

The sludge volume index is the volume of the settled sludge in mm occupied by 1 gram of dry sludge solids after 30 mints of setting in a 100 ml graduated cylinder.

The main cell residence time is the total mass (kg) of mixed liquor suspended solids in the aerator and clarifier divided by the mass flow rate (kg/day) of MLSS effluent.

The F/M is amount of BOD fed to the aerator (kg/day) divided by the amount of MLVSS (kg) under aeration.

Some used mixed Liquor Suspended Solids for expendience, but mixed Liquor Volatile Suspended Solids is considered more accurate for the measure of microorganisms.

Pre-treatment stage to remove large solids and other undesirable substances.

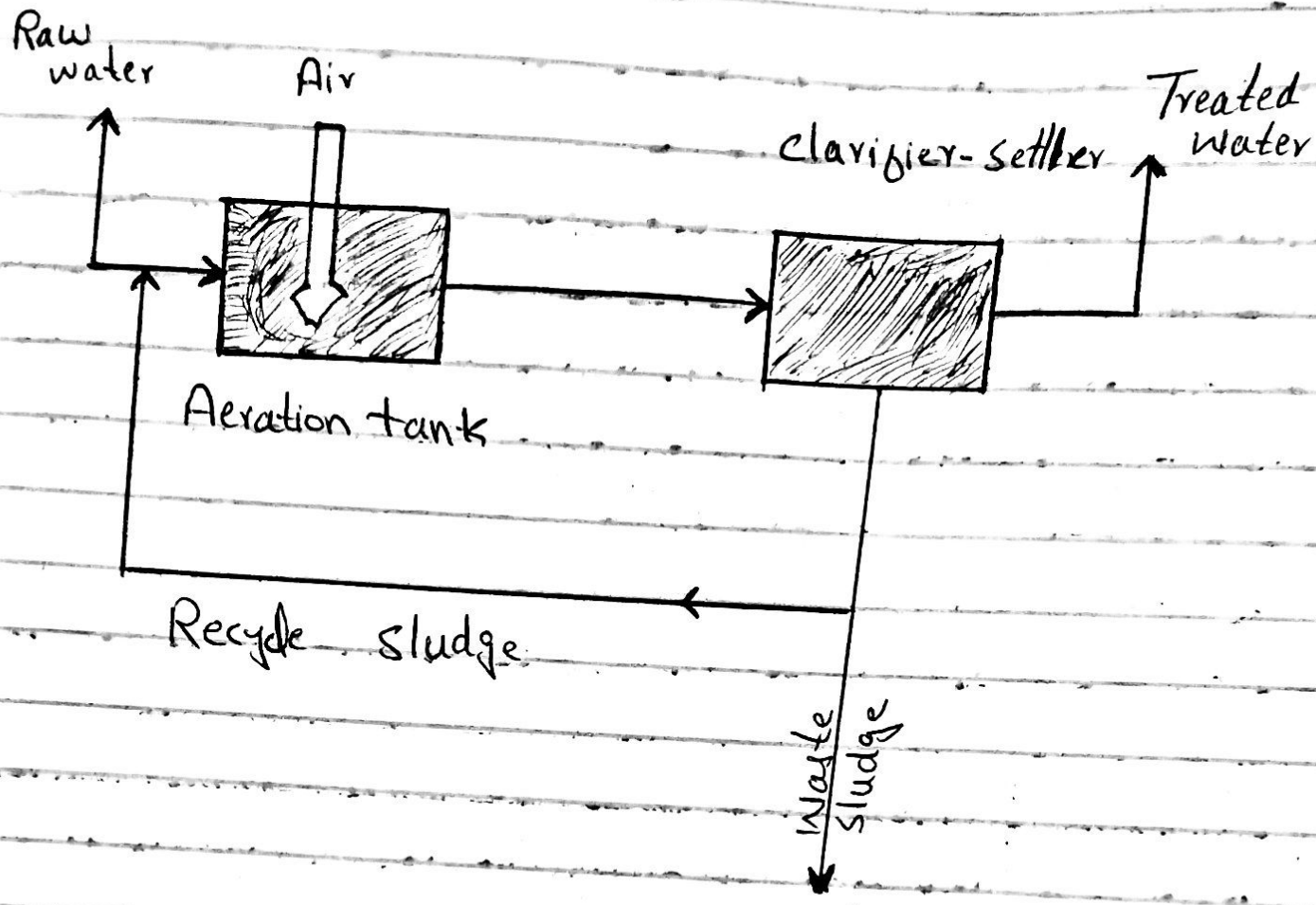
Aeration stage, where aerobic becteria digest biological waste.

Setting stage allows undigested solids to settle froms a sludge that must be periodically removed from the system.

Disinfecting stage, where Chlorine or similar disinfectant is mixed with water, to produce an antiseptic output.

@No2

Diagram :-


Raw water
Air
Clarifier-Settler
Treated water
Aeration tank
Recycle sludge
Waste sludge
To sludge treatment.

QNo3:

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 on natural controll the toxicity without affecting the aquatic life.

Although wastewater is properly treated before it is disposed of 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 demage to the aquatic life.

⇒ When wastewater or contaminated water meets fresh water or natural water bodies, then because of the assimilative capacity of natural water bodies, ~~then because~~ two processes are done on the contaminated water, one delusion and second dispersion, in delusion when contaminated water

greater amount of fresh water ~~than~~ than the concentration of contaminated water decreas, while in dispersion the contaminated water dispose on a greater area and its concentration gets low. And because of these 2 processes assimilative capacity treats wastewater.

Q No 4:

Sludge management:-

Sludge treatment and management is a growing challenge for Countries ~~Sludge treatment~~ globally. Sludge refers to the residual, semi-solids material left form, municipal wastewater or industrial wastewater treatment processes. Sludge management, including production, characterization, stabilization, digestion, thickening, dewarting, thermal processing, agricultural reuse, production of usable materials and ultimate disposal.

Sludge Handling Processes:-

1. **Primary operation:-**

This process includes:

i) **Grinding:** It includes particles size reduction

ii) **Screening:** It includes removel of fibrous materials.

iii) **Degritting:** It includes removal of sand or other inorganic materials.

iv) **Blending:** It including making the sludge homogenous.

v) **Storage:** It ensure 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 layor 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:-**

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

ii) **Anaerobic Digestion:-**

- a) A biological process that uses bacteria in an oxygen free environment.
- b) These bacteria converts volatile solids into carbondioxide, methane and ammonia.

4) **Dewatering:-**

Dewatering is undertaking 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 seperating liquids of different densities. thickening slurries.

5) **~~Head~~ Heat Drying:-**

- It involves the application of heat to evaporate water and to reduce the moisture content of biosolids.
- Advantages of this method is to reduce product transportation costs, improve storage capability, and marketability.
- **Direct drying** involves the wastewater solides come into contact with hot gases, which causes evaporation of moisture. Dryers such as rotary and fludized bed dryers are used.

⇒ **Advantages:-**

→ High treatment efficiences possible for BOD, COD, TSS, N, P.

→ High flexibility in operating conditions.

→ possibility of producing electric ~~en~~ energy from biogas.

→ Low land requirement of CAS, somewhat higher land requirement of EA.

→ High effluent quality.

Q No 5:-

EIA Definitions:-

"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".

Parameter to Be Considered while conducting EIA for Newly proposed Waste Water treatment:-

Although legislation and practice very around the world, the fundamental components of an EIA would neccessarily involve the following stages.

- Screening to determine, which project or developments require a full or partial impact assessment study.
- Scoping to identify which potential impacts are relevant to assess (based on legislative requirements, international conventions, expert knowledge and public involvement), to identify alternative solutions that avoid, mitigate or compensate adverse impact 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 ginally to derive terms of reference for the impact assessment.

- Assessment and evaluation of impact and development of alternatives, to predict and identify the likely environmental impact of a proposal project or development, including the detailed elaboration of alternatives.
- Reporting the environmental impact statement (EIS) o EIA report, including an environmental management plan (EMP) and a non-technical summary for the general audience.
- Review of the invironmental impact statement (EIS) based on the terms of referances (Scoping) republic (including authority) participation.
- Proposed mitigation measure occure as defined the EMP. Verify the compliance of.

Environmental Impact Assessment and Mitigation Measures:

The first attempt to assess the environmental impact was done within the "Initial Environmental Examination - IEE level study". Using the basic data from this study, following the general recommendation for elaboration of the environmental impacts. using updated information and large amount of new

data and taking into consideration all media and their interaction, detailed Environmental impact study was prepared. In order to assess in more details possible impacts during construction, operation phase and post operation phase (& closure) or some change which are planed in the view of capacity or technology, of the access roads, main collectors the siphon and the WWTP, following and activities have been taken in consideration.

Construction phase:.

Construction of the access road and main collectors (left and right river bank).
Construction of the siphon structure across the River Vardar.
Preparatory works at the location of the WWTP (tree cutting, human removals and flattering of the location) and excavation works
Disposal of construction waste.
Istallation of the equipment.