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Section

A

Subject

Waste Water Engineering

Q No 1

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ANS

## Waste Water Treatment

Waste Water treatment is the process of converting waste-water that no longer needed or is no longer suitable for use into treated water that can be discharged back into the environment without causing any environmental or human health concerns.

⇒ Waste water is full contaminants including bacteria, chemicals and other toxin. Its treatment aims at reducing contaminants including bacteria to acceptable levels to make the effluent safe for discharge back into the environment or reuse it for various purposes.

# Important

It is very important to provide some degree of treatment to waste water before it can be used for agricultural or landscape irrigation or for aquaculture.

The principle objective of waste water treatment is generally to allow human effluents to be disposed of without danger to human health or unacceptable damage to the natural environment.

According to research, a large number of people die from water born disease in most of the development countries therefore it is very important to get proper treatment of the water for a healthy living.

The objective is produce an environmentally safe fluid, waste stream and a solid waste suitable for disposal or reuse.

Why rectangular tank are preferred over circular tanks for removal of settleable solids during preliminary treatment:-

The shape of rectangular clarifiers provide a longer path for waste water and suspended solids to travel and subsequently longer detention time which warrants less short circulating and more sludge settling. In addition flow distribution among several clarifiers is usually more even and after raw water less head loss for rectangular clarifiers.

Q No 2

Difference between aerobic and anaerobic waste water treatment

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Aerobic

anaerobic

Aerobic waste water treatment is biological waste water treatment process which uses an oxygen rich environment

Anaerobic waste water treatment is a process where anaerobic organisms break down organic material in an oxygen absent environment.

Bacteria

Bacteria

Bacteria involved in aerobic waste water treatment are aerobes.

Bacteria involved in anaerobic waste water treatment are anaerobes.

Air Circulation

Air Circulation

Air is circulated in aerobic waste water treatment tanks.

Air is not circulated in anaerobic waste water treatment tanks.

Production of Bio gas

does not produce methane and carbon dioxide.

Produces methane and carbon dioxide.

## Energy Efficiency

Aerobic waste water treatment requires energy. Hence they are less energy efficient.

Anaerobic waste water treatment is an energy efficient process.

## Examples

Activated Sludge Method, Trickling filter, Rotating biological reactors, and oxidation ditch are example of aerobic waste water treatment.

Anaerobic lagoons, Sematic tank, and anaerobic digester are example of anaerobic waste water treatment.

## Activated Sludge Process (ASP)

Microorganisms responsible for treatment are maintained in liquid suspension by approximate mixing methods.

Main constituents of ASP are aeration tank which oxygen is provided for the microorganisms to grow. This aeration

also help to keep micro-organisms in suspension.

Aeration tank is followed by Clarifier / settler in which the micro organisms from flocs and settle down at the bottom.

Formation of floc particles, varying in size from 50 to 200  $\mu m$ , formed by gravity setting, leaving relatively clear liquid or treated effluent.

A part of settled bio flocs are recycled back to 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 bio flocs are removed from the system and is termed as Wasted Activated Sludge.

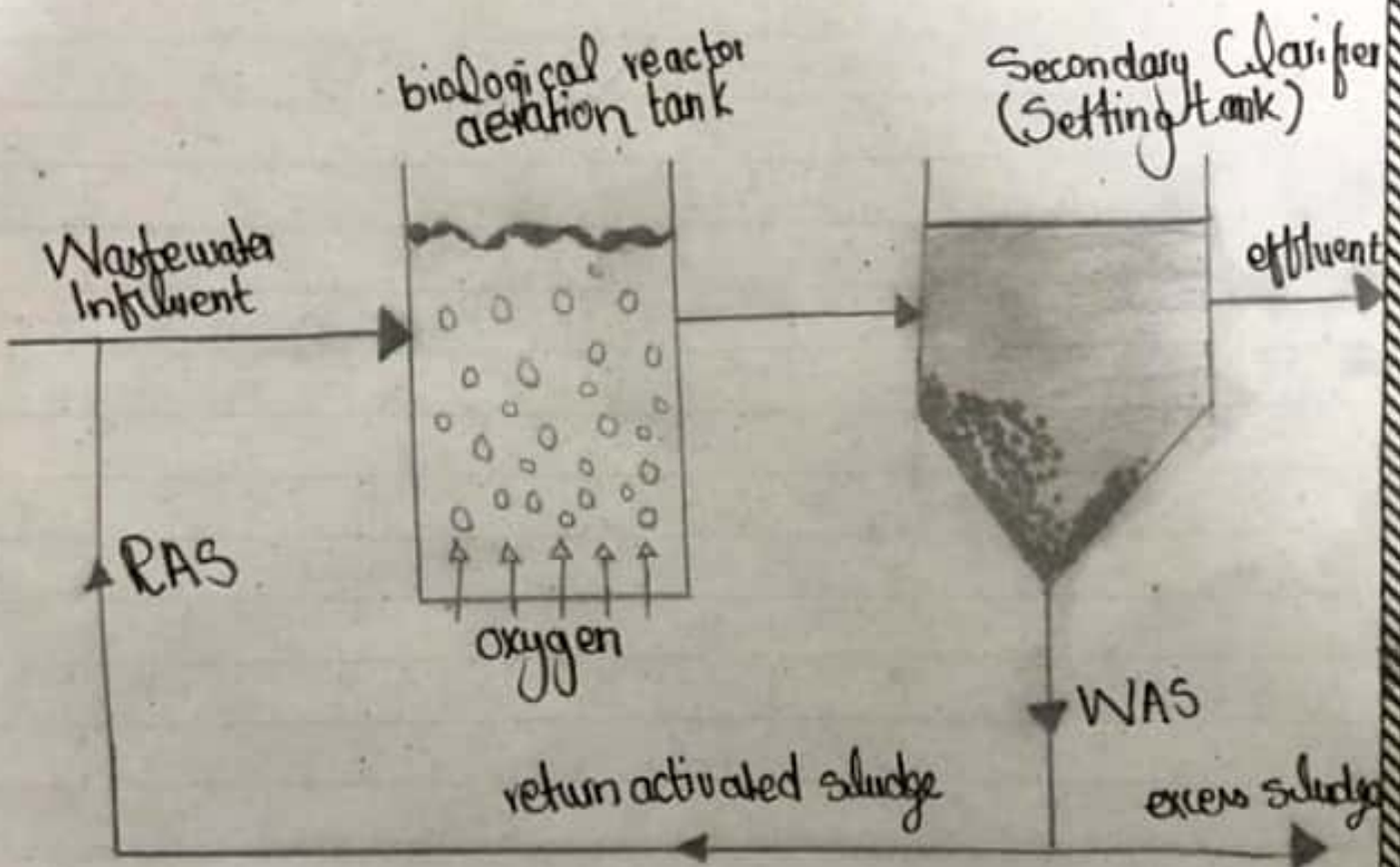
APS involved the production activated mass of micro organisms capable of stabilising waste under aerobic conditions

Typically 99% of suspension solids  
up to 90% of dissolved organics  
are removed Activated Sludge  
Process.

The main drawback associated  
with Aps is its high electricity  
consumption particularly for aeration.



# Activated Sludge Process (ASP)



## Q No 3

Ans

## Assimilative capacity of Receiving Water bodies

This is the ability of a body of water to clean itself.

It capacity to receive waste water without causing damage to aquatic life or human who consume the water.

It is a level to which water body or nature control the toxicity without affecting the aquatic life.

- Although waste water is properly treated before it is disposed of to the natural water stream still it has impurities / pollutants that need to remove so that the receiving water bodies may not become wastable for use of cause damage to aquatic life.

# Help in Waste Water treatment

## 1) Dilution

It is process in which reducing the concentration pollutants in receiving water, usually simply by mixing with more quantity of water.

## 2) Dispersion

Dispersion is the distribution of pollutants in relatively large area of water. Dilution and dispersion are inter related.

## 3. Sunlight

Sunlight facilitates biological decomposition of pollutants and kill pathogens by ultraviolet radiation.

Q4

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### Sludge Management

Sludge management is the most different and challenging task of waste water treatment plant due to its high water content and poor dewatering and strict regulation for sludge reuse or disposal.

One of the recent goal of latest water treatment plant is to develop more environmentally friendly process to reduce the volume of sludge for disposal and convert sludge into bio energy.

Energy recovery for sludge in to biogas - oil, syngas which can be further converted into electricity, mechanical energy and heat.

### Treatment Process

Thickening - Gravity and floatation  
 Design - Aerobic, Anaerobic  
 Mechanical Dewatering - vacuum filtration

Disposed - Land application, Burial

## Advantages of Sludge Treatment

- 1) It reduces pathogens and volume to be disposed
- 2) protect wild life, aquatic life and also prevent diseases.
- 3) Sustainable management of organic waste.
- 4) Reduction of odors and diseases causing agents
- 5) produce Bio gas.
- 6) Solid liquid separation
- 7) Stabilizing of sludge.
- 8) Oxidation and Nitritation achieved.

Q No 5

# Environmental Impact Assessment (EIA)

It is an environmental study comprising collection of data prediction of qualitative and quantitative impacts comparison of alternative 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 consider while conducting EIA for Newly proposed Waste Water treatment.

Althrought legislation and practice vary around the world, The fundamental components of EIA would be necessary include the following stages.

Scanning ~~to~~ to determine which projects or developments requires a full or partial impact assessment study.

- Scoping to identify which potential impact are relevant to assess (based on legislative requirements, international convention, expert knowledge and public involvement) to identify alternative solution that avoid mitigate or compensate adverse impact on biodiversity (including the option of not proceeding. With the development finding alternative design or sites which avoid the impact incorporating safe guards in the design of the project or providing compensation for adverse impact. and finally derived terms of reference for the impact assessment.

Assessment and evaluation of impact and development of alternatives, to predict and identify the likely environmental impacts of a proposed project or development including detailed, elaboration of alternatives.

→ Reporting the Environmental Impact Statement (EIS) or (EIA) report, including an environmental management plan (EMP) and a non technical summary for a general audience.

→ Review The environmental impact statement (EIS) based on a term of Reference (scoping) and public (including authenticity) participation.

→ making compliance, enforcement and environment auditing. Monitor whether the predicted and proposed mitigation measures occur as define in the EMP.