Name Muhammad Adnan **ID# 6954**

Question #01:

I convince a client regarding to the waste water treatment in the housing society and which treatment process is suitable for this area/society:

WASTE WATER TREATMENT:

- It is a process used to convert wastewater into an effluent that can be returned to the water cycle with minimal environmental issues
- Instead of disposing of treated wastewater it is reused for various purposes, which is knows as water reclamation
- During the treatment process, pollutants are removed or broken down
- The infrastructure used for wastewater treatment is called a wastewater treatment plant or a sewage treatment plant in the case of municipal wastewater

We suggest to aerobic treatment process b/s of high rate with less land requirements.

Definition of Aerobic treatment system

An **aerobic treatment** system or ATS, often called (incorrectly) an aerobic septic system, is a small scale sewage treatment system similar to a septic tank system, but which uses an aerobic process for digestion rather than just the anaerobic process used in septic systems.

Unlike the traditional septic system, the aerobic treatment system produces a high quality secondary effluent, which can be sterilized and used for surface irrigation.

Process:

The ATS process generally consists of the following phases:

- Pre-treatment stage to remove large solids and other undesirable substances.
- Aeration stage, where aerobic bacteria digest biological wastes.
- Settling stage allows undigested solids to settle. This forms a sludge that must be periodically removed from the system.
- Disinfecting stage, where chlorine or similar disinfectant is mixed with the water, to produce an antiseptic output. Another option is UV disinfection, where the water is exposed to UV light inside of a UV disinfection unit

Name Muhammad Adnan **ID# 6954**

Uses Of 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 to reduce the chance of clogging the system
- Electricity is required for system operation

Pros

- Minimum odor
- Large BOD removal providing a good quality effluent
- High rate treatment with less land requirement

Cons

- Energy cost of aeration at an adequate rate to maintain the DO levels needed
- Some organics can't be efficiently decomposed aerobically
- Reduction in storage capacity of lagoons and/ or ponds.

What is Wastewater Reuse:

The U.S. Environmental Protection Agency (EPA) defines wastewater reuse as, "using wastewater or reclaimed water from one application for another application. A common type of recycled water is water that has been reclaimed from municipal wastewater (sewage).

Reuse of Waste Water : Pros & Cons

Pros:

1. This technology reduces the demands o potable sources of freshwater.
2. Pollution of rivers and groundwater may be reduced
3. Reduction in Potable Water Demand
4. Less Treatment Requirement.

Cons:

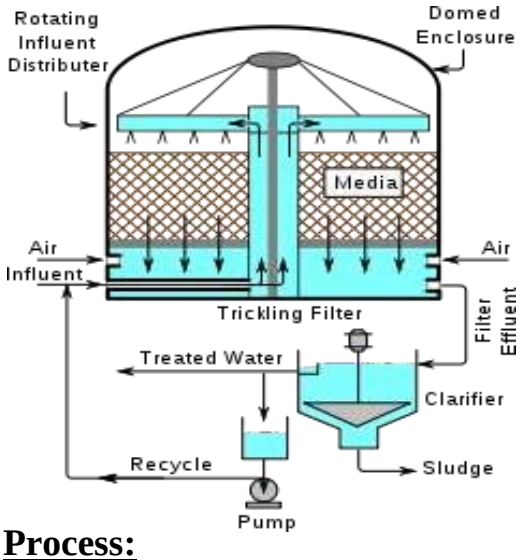
1. Health problems, such as water-borne diseases and skin irritations, may occur in people coming into direct contact with reused wastewater.
2. Gases, such as sulphuric acid, produced during the treatment process can result in chronic health problems
3. Reuse of wastewater is not economically feasible because of the requirement for an additional distribution system.
4. Hard to implement at large scale.

Name Muhammad Adnan **ID# 6954**

Question #02:

TRICKLING FILTER:

- First used by Dibden and Clowes
- It consists of rocks, lava, coke, gravel, slag, polyurethane foam, sphagnum peat moss, ceramic, or plastic media over which sewage flows downward and causes a layer of microbial slime (biofilm) to grow, covering the bed of media
- Aerobic conditions are maintained by splashing, diffusion, and either by forced-air flowing through the bed or natural convection of air if the filter medium is porous

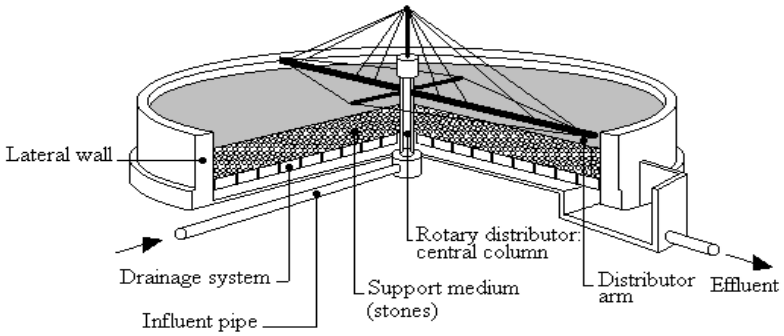


Process:

- Sewage flow enters at a high level and flows through the primary settlement tank
- The supernatant from the tank flows into a dosing device, often a tipping bucket which delivers flow to the arms of the filter
- The flush of water flows through the arms and exits through a series of holes pointing at an angle downwards
- This propels the arms around distributing the liquid evenly over the surface of the filter media

- The filter media is typically chosen to provide a very high surface area to volume
- Passage of the waste water over the media provides DO which the bio- film layer requires for the biochemical oxidation of the organic compounds and releases CO_2 gas, water and other oxidized end products
- As the bio film layer thickens, it eventually sloughs off into the liquid flow and subsequently forms part of the secondary sludge
- Other filters utilizing higher-density media do not produce a sludge that
- must be removed, but require forced air blowers and backwashing.

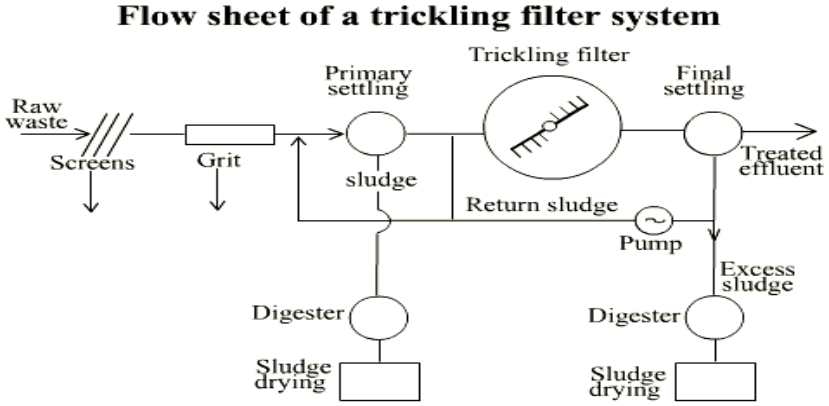
Design Trickling Filters:



Depth	1.8 to 2.4 m	
Number	Minimum Two	One Hectare = 10000m.sq.
Filter Loading Rate	Organic Load per filter Bed Volume = 1000 to 2200 kg BOD/hectare-m/day BOD/filter media volume = 15 to 30 kg BOD/day/100 m3. Surface Area of Filter Bed = 25 40 million Liters/hectare of surface area Filter Bed Vol = 7.50 to 22.50 million liters/hectare/day.	

Name Muhammad Adnan **ID# 6954**

Process Schematic of Trickling Filters:



Design Equations of Trickling Filters:

Generally trickling filter design is based on empirical relationship to find the require filter volume for a designed degree of wastewater treatment

Types of equation:

1. NRC equation (national research council of USA)
2. Rankins equation
3. Eckenfilder equation
4. .Galler and Gotaas equation

NRC and Rankin's equation are commonly used. NRC equation give satisfactory values when there is no re-circulation, the seasonal variation in temperature not

Large and fluctuation with high organic loading . Rankin's equation is used for high rate filters.

NRC equation: these equation are applicable to both low rate and high rate filters. The efficiency of single stage or first stage of two stage filters, e_2 is given by

$$E_2 = \frac{100}{1+0.44(F_{1.BOD}/v_1.RF_1)^{1/2}}$$

Where,

E2= % efficiency in BOD removal of single stage or first stage,

F1.BOD= BOD loading of settled raw sewage in single stage of the two-stage filter in kg/d,

V1= volume of first stage filter, m3,

Rf1= Recirculation factor for first stage.

- Efficiency Estimation:

$$E = \frac{Y_i - Y_o}{Y_i} X\ 100$$

Where,

Yi = Influent BOD load to TF

Yo = Effluent BOD from TF.

- Recirculation Factor Calculation:

$$F = \frac{1+R}{(1+0.1R)1^2}$$

Where,

R = Recirculation percentage

Pros and of trickling filters:

Pros:

1. They can remove about 80% of suspended solids and about 80% BOD
2. It is simple, cheap and does not required any skilled supervision
3. They are self cleansing
4. It require less electricity power to run mechanical equipment

Cons:

1. High capital costs
2. It requires large area
3. Final settlement in humus tank necessary
4. This process may develop odur and fly nuisance

Name Muhammad Adnan **ID# 6954**

Question #03:

What is renewable energy?

- Renewable energy is made from resources that nature will replace, like wind, water and sunshine.
- Renewable energy is also called "clean energy" or "green power" because it doesn't pollute the air or the water.

Three Uses Of Renewable Energy From Waste Water Sludge

- Sewage sludge contains significant amounts of nitrogen ranging from 16% and 0.1-2% of phosphorous and traces of selenium and copper, making it a cheap vital source for plant growth. Sludge originates partly from sewers and partly from microorganisms during treatment process.
- **BIOGAS PRODUCTION:**

  Increasing biogas production by digesting more of the available substrates is a promising way of increasing the share of renewable energy in society.

  Biogases production is already a popular method for energy production from the outside treatment of gastritis. Bacteria Methane (60-65%), use carbon dioxide (35-40%), and use toxic elements that use the body's physical contact. Hydrogen sulfide and water are like water and buckets are produced often used in the manufacture of boilers or CPRs.

- **USE IN AGRICULTURE:**

  At present, application of sludge to agriculture seems to be a most controversial but an inexpensive technique of sludge disposal. Application of sewage sludge to agriculture has proven advantageous and inexpensive for Eco cycling nutrients for land reclamation or land reuse

- **CONVERSION OF SEWAGE SLUDGE TO OIL AND GAS**

  Sludge can undergo chemical reactions to produce fuels that can be used to produce energy under strictly controlled conditions and extreme temperatures (450-1000 ° C). The newest innovative methods include gasification, which produces synthesis gas (similar to natural gas) and pyrolysis of bio-oil (similar to diesel oil).

Name Muhammad Adnan **ID# 6954**