

**PLANNING FOR SEWARAGE SYSTEMS**

**1. What are the types of treatment processes?**

- Preliminary treatment
- Primary treatment
- Complete final treatment
- Secondary treatment

**2. What are the various sources of wastewater generation?**

- Industrial Wastes
- Domestic wastes
- Agricultural Wastes

**3. List out the types of anaerobic biological units?**

- Anaerobic lagoons
- Septic tank
- Inhoff tank

**4. What is means by screening?**

Screening is the very first operation carried out at a sewage treatment plant and consists of passing the sewage through different types of screens so as to trap and remove the floating matter such as process of cloth, paper, wood, cork, hair, fiber etc.

**5. What is the purpose of providing screen?**

The main idea of providing screens is to protect the pumps and other equipments from the possible damages due to the floating matter of the sewage. It should be used for removing the floating matters.

## 6. What are the types of screen?

Classification based on size of the opening

- Coarse screens
- Medium screens
- Fine screens

## 7. Define bar screen?

Rectangular shaped coarse and medium screens are made of steel bars fixed parallel to one another at desired spacing on a rectangular frame and are called bar screen.

## 8. Define Comminutors?

Comminutors or shredders are the patented devices, which break the larger sewage solids to about 6 mm in size. When the sewage is screened through them such devices are used only in developed countries like USA.

## 9. What is meant by Screening?

The material separated by screens is called the screenings. It contains 85 to 90% of mixture and other floating matter. It may also contain some organic load which may putrefy, lacing bad smells and nuisance.

## 10. What are the methods adopted for disposal of screenings?

- Burning
- Burial
- Dumping

## 11. Define Grit Chamber?

Grit chambers, also called or grit channels or grit basins, are intended to remove the inorganic particles (specific gravity about 2.65) such as sand, gravel, grit, egg, shells, bones etc of size 2 mm or larger to prevent damage to the pumps and to prevent their accumulation in sludge digesters.

## 12. Define unit process?

Methods of treatment in which the application of physical forces predominate are known as unit operations while methods of treatment in which chemical or biological activities are involved are known as unit process.

**13. What are the types of unit operations & processes?**

- Physical unit operations
- Chemical unit process
- Biological unit process

**14. Give any two advantages of unit operations/ process?**

- It gives better understanding of the process as inherent in the treatment and of the capabilities of these processes in attaining the objectives.
- It helps in the development of mathematical and physical models of treatment mechanisms and the consequent design of treatment plants.

**15. Define phase transfer?**

Most waste water treatment process bring about changes on concentration of a specific substances by moving the substance either into or unit of the waste water it self. This is called phase transfer

**16. Define definition time?**

The definition time (t) of a settling tank may be defined as the average theoretical time required for the sewage to flow through the tank. Otherwise known as definition period or retention period

**17. Define the term Displacement efficiency?**

The ratio of the “Flowing through period” to the “detention period” is called the displacement efficiency.

**18. What is meant by principle of sedimentation?**

The turbulence is retarded by offering storage to sewage these impurities tend to settle down at the bottom of the tank offering such storage. This is the principle of sedimentation.

**19. Define the term “Sedimentation Burin”?**

The burin in which the flow of sewage is retarded is called the settling tank or the sedimentation Tank or the sedimentation Burin.

**20. Define the term “Detention Period”?**

The theoretical average time for which the water is detained is called the detention period.

**21. Give any two advantage of chemical coagulation process in sewage treatment?**

Sedimentation aided with coagulation produces better efficient with lesser BOD and suspended solids, as compared to plain sedimentation. Coagulated settling tank requires less space than that required by an ordinary plain settling tank.

**22. What are the Demerits of coagulation in sewage treatment?**

- Cost of chemicals is added to the cost of sedimentation, with out much use, and thereby making the treatment costlier.
- The process of coagulation requires skilled supervision and handling of chemicals.

**23. What are the types of sedimentation tank?**

Based on flow

- Vertical flow tank
- Horizontal flow tank
- Radial flow tank

According to use

- Primary
- Secondary

**24. What are the chemical used for precipitation of sediment?**

- Alum
- Ferrous sulphate
- Ferric sulphate
- Ferric chlorides
- Sodium alluminate
- Sulphuric acid
- lime
- copperas

**25. What are the factors that affect the precipitations?**

- Kind of chemical
- Quality of chemical
- character and concentration of sewage
- Ph values of sewage
- time of mixing and flowlations
- Temperature
- Violence of agitation

**26. What are the merits of chemical precipitation?**

- More rapid and through clarification
- Removal of higher percentage of suspended solids.
- Simplicity of operation
- Small size tank is enough

## UNIT-II

### SEWER DESIGN

#### 1. What are the Demerits of chemical precipitation?

- High cost of chemicals
- Large quantity of sludge which offers difficulty of its removal
- Skilled attendance
- Putrescible effluent

#### 2. What do you mean by chemical precipitation?

When certain chemicals are added to, sewage they produce a precipitate known as floc which is insoluble or slightly soluble in water. The floc attracts small particles to form large size and thus size goes on increasing during the process of settlement.

#### 3. What do you mean by transitional settling zone?

Grit particles however, generally lie between 0.1mm and 1 mm, and hence undergo settling which lies in between streamline settling and turbulent settling. This settling zone is called the transitional settling zone

#### 4. What are the users of Baffle?

- Baffles are required to prevent the movement of organic matter and its escape along with the effluent
- Distribute the sewage uniformly through the cross section of the tank.
- It is used to avoid short circuiting

#### 5. What are the classifications of biological process?

- Aerobic processes
- Anaerobic processes
- Aerobic – anaerobic processes

**6.List out the aerobic processes?**

- Activated sludge processes
- Trickling filters
- Aerobic stabilization pond
- Aerated lagoon

**7.List out the anaerobic process?**

- Anaerobic sludge digestion,
- Anaerobic contact processes
- Anaerobic filters
- Anaerobic lagoons or ponds

**8.What are the sources of waste water?**

- Domestic waste water (i.e sewage)
- Agricultural return waste water
- Industrial waste water

**9.What are the methods involved in the treatment of waste water?**

Mainly classified into

- Conventional treatment methods
- Advanced waste waster treatment

**Conventional treatment** methods

- Preliminary processes
- Primary treatment
- Secondary treatment

**Advanced waste water treatment**

- Tertiary treatment

**10.What are the functions involved in the chemical unit processes**

- Chemical precipitation
- Gas transfer
- Adsorption
- Disinfection
- Combustion

**11. What do you understand by waste water treatment?**

The waste water treatment or sewage treatment is a broad term that applies to any process/operation or combination of processes and operations that can reduce the objectionable properties of water carried waste and render it less dangerous with the following.

- Removal of suspended and floatable material
- Treatment of biodegradable organics
- Elimination of pathogenic organisms

## UNIT-III

### PRIMARY TREATMENT OF SEWAGE

#### 1. Define humus tank?

The effluent of the filter is therefore, passed through a sedimentation tank called Humus tank otherwise called secondary clarifier or secondary settling tank.

#### 2. What are the distinct stages in the sludge digestion processes?

- Acid fermentation
- Acid repression
- Alkaline fermentation

#### 3. Define the term ripened sludge?

This digested sludge is collected at the bottom of the digestion tank and is also called ripened sludge.

#### 4. What are the factors effecting sludge digestion?

Temperature

- pH value
- Seeding with digested sludge
- Mixing and stirring of the raw sludge with digested sludge.

#### 5. What are functions of aeration in ASP?

- Oxygenation of the mixed liquor
- Flocculation of the colloid in sewage influent
- Suspension of activated sludge

**6.What are the methods employed for the purpose of certain in ASP?**

- Diffused air aeration air aeration
- Mechanical aeration
- Combined diff used air and Mechanical aeration

**7.What are the patterns of mechanical aeration?**

- Haworth paddle or Sheffield aeration system
- Hartley paddle or bir Mangham Bio floclure lation system
- Simplex aeration system
- Link belt aeration system
- Kessner Brush aeration system

**8.List out the important aeration processes in the ASP?**

- Conventional process
- Tapered aeration process
- Step aeration process
- Contact slabolisection process
- Completely mixed process
- Modified aeration
- Extended aeration

**9.What are the advantage of stabilization ponds or cagoins**

- Lower initial lost than required for a mechanical plant.
- Tower operation costs
- Regulation of efficient discharge possible their provoelving control of collection during critical times of the year.

**10. What are the disadvantages of lagoons?**

- Requires extensive land area.
- Hence the method can be used only on rural areas.
- If used in urban areas, expansion of towns and new developments may encroach on the lagoon site.

**11. What do you understand by facultative ponds?**

A facultative pond combines the features of the aerobic and anaerobic ponds.

- Constructed of intermediate depth (1, to 1.5m)
- A facultative pond consists of three
  - ✓ Aerobic Zone
  - ✓ Facultative zone
  - ✓ Anaerobic zone

**12. What are remedial measures for rising sludge problem?**

- Increasing the return sludge age
- Increasing the speed of the sludge scraper mechanism, where possible
- Decreasing the mechanical cell residence time by increasing the sludge wasting rate

**13. What is meant by sludge bulking?**

Sludge with poor settling characteristics is termed bulking sludge. It results on poor influent due to the presence of excessive suspended solids and also in rapid loss of MLSS from aeration tank.

**14. What are the advantages of intermittent sand filters?**

- The effluent from intermittent sand filter is of better quality. It is more clean and more stable and hence does not need further treatment before disposal
- The filter works under aerobic conditions, and hence there is no trouble of odour, flies and insects
- The operation is very simple, requiring no mechanical equipment except for dosing

**15. What are the disadvantages of intermittent sand filters?**

- The rate of filtration and hence that of load per unit surface area of the filter is very small per unit surface area of the filter hence they cannot be employed for medium size or bigger plants
- They require large area and large quantity of sand due to which their construction is very costly.

**16. What do you understand by contact beds?**

- Contact beds, also called contact filters, are similar to intermittent sand filters in construction, except that the filtering media is very coarse, consisting of broken stones called ballast of 20 to 50mm gauge.
- A contact bed is a water trough with masonry walls and of rectangular shape.
- The depth of filtering media is kept between 1 to 1.8m

**17. What are the operations involved in the contact beds?**

- Filling
- Contact
- Emptying
- Oxidation

**18. What are the advantages of contact beds? i) Contact beds can work under small heads.**

- Contact beds can be operated without exposing the sewage effluent to view.
- There is no nuisance of filter flows
- The problem of odour is much less as compared to trickling filters.

**19. What are the disadvantages of contact beds in T.F?**

- Rate of loading is much less in comparison to trickling filters.
- Large areas of land are required for their installation
- intermittent operation requires continuous attendance
- The cost of contact beds is much more as compared to trickling filters

**19. What do you mean by trickling filters?**

Trickling filters, also as percolating filters or sprinkling filters or trickling filters are similar to contact beds in construction, but their operation is continuous and they allow constant aeration. In this system sewage is allowed to sprinkle or trickle over a bed of coarse, rough hard filter media and it is then collected through the under drainage system.

**20. What are the purposes of under drainage system?**

The purpose of under drainage system is two fold

- To carry away the liquid effluent and sloughed biological solids.
- To distribute air through the bed

**21. What are the merits of conventional trickling filter?**

- The effluent obtained from trickling filters is highly nitrified and stabilized. The effluent can therefore be disposed of in smaller quantity of deputation water
- It has good dependability to produce good effluent under very widely varying weather and other conditions
- The working of trickling filter is simple and cheap and does not require any skilled supervision

**22. What are the demerits of conventional trickling filters?**

- The loss of head through the filter system is high thereby making the automatic dosing through siphonic dosing tank necessary.
- The cost of construction of the filter is high.
- They require large area in comparison to their biological treatment processes.

**23. What is the necessity of Recirculation in T.F?**

Recirculation is necessary to provide uniform hydraulic loading as well as to dilute the high strength waste waters. In contrast to the low rate filters, in high rate filters a part of settled or filter effluent is recycled through the filter.

**UNIT – IV**  
**SECONDARY TREATMENT OF SEWAGE**

**1. Give any four advantages of activated sludge process?**

- Lesser land area is required
- The head loss on the plant is quite low
- There is no fly ash or odour nuisance
- Capital cost is less

**2. What are the disadvantages of the activated sludge process?**

- High cost of operation, too greater power consumption
- A lot of machinery to be handled
- The sudden change in the quantity and character of sewage may produce adverse effects on the working of the process thus producing inferior efficient

**3. What are the types of trick long filters?**

- Conventional trick long filter or ordinary or standard rate or low rate trick long filter
- High rate filters or high rate trick long filter

**4. What are the disadvantages of trick long filters?**

- The head loss through these filters is high, making automatic backwashing of the filters necessary
- The cost of construction is high
- These filters cannot treat raw sewage and primary sedimentation is a must

**5. What are the special types of filters?**

- Durban filter
- Magnetic filters
- Rapid sand filters

**6.What do you mean by magnetic filters?**

In this type of filter, a layer of crashed magnetic ore of Iron is provided in about 80mm, thickness, and is supported on a non-magnetic metal wire screen sewage is filtered through the magnetic layer which removes the impurities purely by mechanical starching action.

**7.What are the types of high late Filters?**

- Bio filters
- Accelo filters
- Aero filters

## UNIT – V

### **DISPOSAL OF SEWAGE AND SLUDGE**

#### **1. Define the term “Dilution Factor”?**

The ratio of the quantity of the diluting water to that of the sewage is known as the Dilution Factor.

#### **2. What are the methods adopted for sewage disposal?**

- Dilution is disposal in water.
- Effluent Irrigation or Broad Irrigation or Sewage farming is disposal on land.

#### **3. What are the conditions adopted for disposal by dilution?**

- When sewage is comparatively fresh (4 to 6 hr old) and free from floating and settleable solids.
- When the dilution water has a high dissolved oxygen (D.O.) content.
- When the out fall sewer of the city or the treatment plant is situated near some natural waters having large volumes.

#### **4. What are the natural forces of purification?**

- Dilution and dispersion.
- Sedimentation
- Oxidation – reduction in sun-light.
- Oxidation
- Reduction

**5.What are the factors affecting self purification of polluted streams?**

- Temperature
- Turbulence
- Hydrography such as the velocity and surface expanse of the river stream.
- Dissolved oxygen and the amount and type of organic matter.
- Rate of re aeration.

**6.What are the types of self purification?**

The self purification divided into four zones.

- Zone of degradation.
- Zone of active decomposition.
- Zone of recovery
- Zone of Cleaner water

**7. What is meant by “Self purification phenomenon”?**

When sewage is discharged into a natural body of water, the receiving water gets polluted due to waste products, present in sewage effluent. The natural forces of purification such as dilution, sedimentation, oxidation – reduction in sun light go on acting upon the pollution elements and bring back the water into its original condition. This automatic purification of polluted water, in due course is called the self purification phenomenon.

**8.What is meant by photo synthesis?**

The sun light has a bleaching and stabilizing effect of bacteria. It also helps certain micro organisms to derive energy from it and convert themselves into food for other forms of life, thus absorbing  $\text{CO}_2$  and releasing  $\text{O}_2$  by a process known as Photo synthesis.

**9. What do you mean by Oxidation?**

The oxidation of the organic matter present in sewage effluents, will start as soon as the sewage out falls into the river water containing dissolved oxygen. The deficiency of oxygen so created will be filled up by the atmospheric oxygen. The process of oxidation will continue till the organic matter has been completely oxidized. This is the most important action responsible for effecting self purification of rivers.

**10. What do you understand by Reduction?**

Reduction occurs due to hydrolysis of organic matter settled at the bottom either chemically or biologically. An aerobic bacteria will help in splitting the complex organic constituents of sewage into liquids and gases and thus paving the way for their ultimate stabilization by oxidation.

**11. Define the term Re-oxygenation curve?**

In order to counter – balance the consumption of D.O. due to de-oxygenation, atmosphere supplies oxygen to the water and the process is called re-oxygenation.

**12. What is meant by “Oxygen sag curve”?**

The amount of resultant oxygen deficit can be obtained by algebraically adding the de-oxygenation and re-oxygenation curves. The resultant curve so obtained is called the oxygen sag curve or the oxygen deficit curve.

**13. Write the equation for find out the B.O.D. of the diluted water.**

B.O.D. of the diluted mixture

$$C = \frac{C_s \cdot Q_s + C_R \cdot Q_R}{Q_s + Q_R}$$

Where

$C_s$  -B.O.D. of sewage

$C_R$  - B.O.D. of river

$Q_s$  - Sewage discharge

$Q_R$ - Discharge of the river

**14. What is meant by epilimnion zone?**

The water of a lake gets stratified during summers and winters. Since such turbulence extends only to a limited depth from below the water surface, the top layers of water in the lake become well mixed and aerobic. This warmer, well mixed and aerobic depth of water is called epilimnion zone.

**15. What is meant by hypolimnion zone?**

The lower depth of water in the lake which remains cooler, poorly mixed and an aerobic, is called are hypolimnion zone.

**16. What do you understand by monoclone? Give example.**

The water of a lake gets stratified during summers and winters. The change from epilimnion to hypolimnion can be experienced while swimming in a lake. When you swim in top layers horizontally you will feel the water warmer and if you dive deeper, you will find the water cooler. The change line will represent monoclone.

**17. What are the advantage of land filling methods of disposal?**

- It is simple and economical
- No plant / equipment is required
- There are no by products and hence there is no problem of the disposal of the by-products.
- Separation of various materials of the refuse is not required.

**18. What are the disadvantages of land filling methods of disposal?**

- Proper site may not be available near by
- Wind direction may not be favourable.
- Large land areas are required.
- It may be difficult to get large quantities of covering material.

**19. What do you understand by pulverization?**

In this method, the dry refuse is pulverized into powder form, without changing its chemical form. The powder can either be used as a poor quality manure, or else be disposed of by land filling.

**20. What are the disadvantages of incineration of method of disposal?**

- Large initial expenditure.
- Improper operation results in air pollution problems and incomplete reduction of the waste materials.
- Disposal of the remaining residue is required.
- High stacks needed for natural draft chimneys present safety problems.

**21. What do you understand by mechanical composting?**

The open window method of composting is very laborious and time consuming process. Also it requires large area of land which may not be available in big cities these difficulties are overcome by adopting mechanical composting in which the process of stabilization is expedited by mechanical devices of turning the compost.

**22. What are the methods adopted for composting?**

- Composting by trenching.
- Open window composting.
- Mechanical composting.

**23. What is meant by “humus”?**

The refuse gets stabilized in about 4.5 months period, and gets changed into a brown coloured odourless innocuous powdery form known as humus, which has high manure value because of its nitrogen content.

**24. What are methods adopted for sludge drying?**

- Drying the sludge on prepared sand beds.
- Drying the sludge on centrifuges.
- Drying the sludge by heat dryers

**25. What is meant by house refuse?**

This consists of vegetable and animal waste matters, ashes, cinders, rubbish, debris from cleaning and demolition of structures.

**26. What is meant by organic waste?**

It includes dry animal and vegetable refuse, cow dung, excreta of birds, tree leaves, sticks, plastic bottles, paper waste, rags. This waste is subject to decay with time and evolve highly offensive odour and gases which are highly detrimental to health.

**27. What are the types of preventive measure in adopted for sewage sickness?**

- Primary treatment of sewage
- Choice of land
- Under-drainage of soil.
- Giving rest to the land.
- Rotation of crops
- Applying shallow depths.

**28. Define the term “Raw sludge”?**

The sludge, which is deposited in a primary sedimentation tank is called Raw sludge. Raw sludge contains highly putrescible organic matter, and is thus, very objectionable.

**29. What is meant by “conditioning”?**

Conditioning improves the drainability of digested sludge. Prior conditioning of sludge before application of dewatering methods renders it more amenable to dewatering.

**30. What are the purpose of dewatering?**

The purpose of dewatering is to further reduce the volume of sludge and thereby increase the solids concentration.