

Name

Asad Khan

I.D

15275

Semester

4th

M.S

Transportation
Engineering

INU Peshawar

25/06/2020

Desalination \div Desalination is the process of removing salts and other minerals from the saline water to make it suitable for drinking, irrigation or industrial uses.

OR
It is a process that takes away mineral components from saline water.

Desalination Methods

There are four basic desalination methods

- (1) Distillation
- (2) Electro dialysis
- (3) Freezing
- (4) Reverse Osmosis

Distillation \div In this method salt water is heated in one container to make the water evaporate, leaving the salt behind.

→ The desalinated water vapor is then condensed to form water in separate container.

Electrodialysis : Electrodialysis utilizes a membrane and sends an electric charge through the solution.

→ It draws metal ions to the positive plate on one side and other ions (like salt) to the negative plate on the other side.

Freezing Method

It is based on the principle that water excludes salts when it crystallizes to ice.

This method involves three steps

- (i) Ice Formation
- (ii) Ice Washing
- (iii) Ice Melting

to obtain fresh water with subsequent removal of contaminants.

Reverse Osmosis (RO)

Reverse Osmosis is a water purification method that uses a semi-permeable membrane to remove ions, molecules and larger particles from saline water.

⇒ RO can remove many types of dissolved and suspended species from water, including bacteria and is used in both industrial processes and the production of portable water.

⇒ Steps involved in Reverse Osmosis

1st Step: In this step all the sediments like clay, silt and stones are removed from the water. For this a 5-micron filter is used.

2nd Step: In this step carbon filter is used to remove the chlorine and other harmful chemicals that enter the water sources.

3rd Step: In this step focuses on passing the water from a dense and compacted carbon filter. Most of the contaminants are removed here.

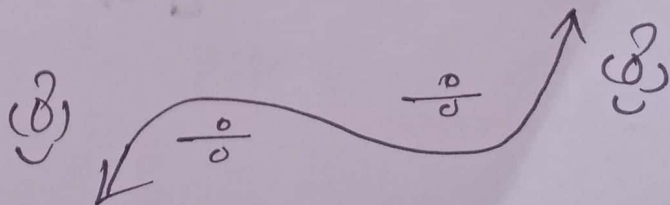
4th step ÷ In this step water passes through the membrane and all the heavy metals present in the water are removed.

5th step ÷ In this last stage the bacteria, chlorine and bad odour are removed from water. After water passes from this stage it comes out of the faucet and is perfect for consumption.

Effective Method

The most effective method is reverse osmosis because

- RO system uses less energy than other processes
- RO process remove many types of dissolved and suspended species.
- The wastes of RO is less hazardous
- The RO system is extremely maintainance friendly self contained unite. bcz it is



Layout Distribution System

The distribution pipes are generally laid below the road pavements and as such their layouts generally follow the layout of roads.

There are 4 types of layouts

- (i) Dead end system
- (ii) Radial system
- (iii) Grid iron system
- (iv) Ring system.

Merits and Demerits of 4 types of layout

① Dead End system

Merits (i) This system is relatively cheap
 (ii) Determination of discharges and pressure easier due to less number of valves.

Demerits ∴ In this system due to many dead ends, stagnation of water occurs in pipes.

② Radial System

- Merits :
- (i) Simplest as feed at only one end
 - (ii) The initial cost is low
 - (iii) Requires less amount of cables/pipes
 - (iv) Prefer when the station is located at the centre of the load.

Demerits : The main disadvantages are the following.

- (i) The end distributor near to the substation gets heavy loaded.
- (ii) When load on distributor changes the clients at the distant end of the distributor face serious water fluctuations
- (iii) Cost of project is more because of number of individual's distribution reservoirs.

③ Grid Iron System

- Merits :
- (i) Water is kept in good circulation due to the absence of dead ends
 - (ii) In the cases of breakdown in some section, water is available from some other direction.

(iii) The discharge will meet the require discharge for firefighting.

Demerits ∴ The main disadvantages are

- (i) Proper designing is relatively difficult
- (ii) Cut off valves required should be more in this system.

④ Ring System

Merits ∴ The main disadvantages of this system are

- (i) No stagnation of water
- (ii) Water can be supplied to any point from at least two directions
- (iii) Repair work can be done without affecting larger network.

Demerits ∴ The main disadvantages are

- (i) Longer length and large diameter pipes are required.
- (ii) Skilled workers are necessary while laying pipes.

In Hilly area the whole area is divided into several zones due to undulating terrain.

Compared to traditional water supply partition method this procedure is easier to operate time savingly by staff and is more automatic.

usually hilly areas contain the following landscape features

- (i) They are far away from water source and urban area.
- (ii) They contain more dispersed water distribution networks
- (iii) The terrain elevations in the house group vary greatly.

Thus in hilly areas Division method for distribution network in hilly areas is preferred.



Distribution Reservoirs

Distribution reservoirs are the storage reservoirs which stores water for distributing during emergencies.

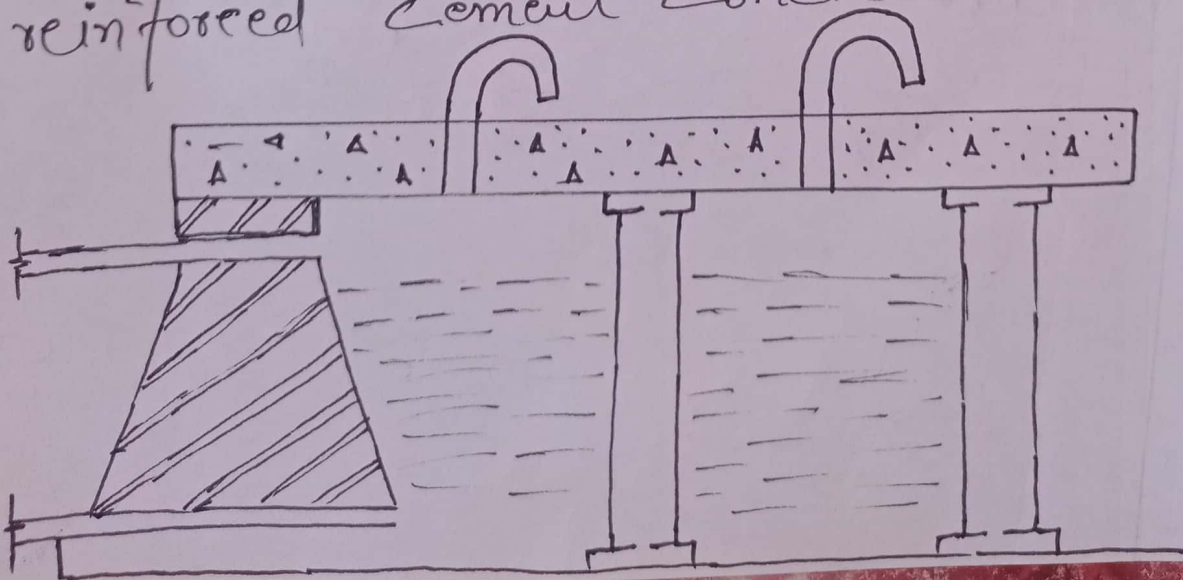
Types of Reservoirs

Depending upon their elevation with ground it may be classified into

- (1) Surface Reservoirs
- (2) Elevated Reservoirs

Surface Reservoirs \div These are also called ground reservoir.

In case of gravity system, underground reservoirs are generally constructed on high natural grounds and are usually made of stones, bricks, plain or reinforced cement concrete.



Elevated Storage Reservoirs :-

Elevated storage reservoirs also referred to as over-head tanks are required at distribution areas which are not governed and controlled by the gravity system of distribution.

⇒ If the topography of the town is not suitable for gravity system, the elevated tank or reservoir are used to provide sufficient pressure head.

The total storage capacity of a distribution reservoir is the summation of

- (i) Balancing storage
- (ii) Breakdown storage
- (iii) Fire storage.

Importance

Water is a vital resource to support all form of life. Unfortunately water is not evenly distributed by location or by the season of the year. The primary benefits of dams and reservoirs is water supply.

(ii) Reservoirs also provides benefits such as

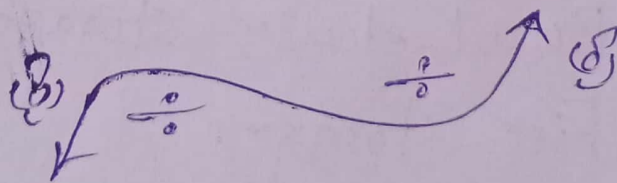
- (i) Flood control
- (ii) Scenic beauty
- (iii) Fish and wildlife habitat

(iii) Reservoirs are good source of production of electricity.

How to Calculate Storage Capacity

There are two methods that are generally used for determining the capacity of a storage reservoir.

- ① Analytical Method
- ② Mass Curve Method.



← Ans # 4 →

Why pumps are used in water supply Schemes :-

The primary objective of pumps used in water supply scheme is

(1) To Transfer liquid from source to destination

(2) Circulate liquid around the system

⇒ Many kinds of pumps are used in distribution systems

(1) Low-lift pumps are used to lift surface water and move it to a nearby treatment plant.

(2) High lift pumps are used to discharge treated water into arterial mains.

(3) Booster Pumps increases pressure within the distribution system.

(4) Well pumps lift water from underground and discharge it directly into a distribution system.

Pump Curve : Curves typically include performance metrics based on pressure, flow, horse power, impeller trim, Net positive suction head required.

Pump performance curve are important drawings produced by pump manufacturer. Pump performance curves are primarily used to predict the variation of the differential head across the pump, as the flow is changed.

pumps can generate high volume flow rates when pumping against low pressure or low volume flow rate when pumping against high pressure.

The possible combination of total pressure and volume flow rate for a specific pump can be plotted to create a pump curve. The curve defines the range of possible operating condition for the pump.

