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Q1:-
Ans

Desalination:-

The process of Removing Salts & other minerals from the Saline water to render it suitable for drinking, irrigation or industrial uses. is called Desalination.

OR

Removal of salt (sodium chloride) & other minerals from the sea water to make it suitable for human consumption &/or industrial use.

: VARIOUS DESALINATION METHODS:

(i) NATURAL DESALINATION:

The natural desalination occure naturally by the process of

(1) Evaperation (2) Condensation

(3) Precipition (4) Collection.

The above are the major stages of natural desalination.

Principal Methods:-

(i) Distillation (Evaporation):-

The principal distillation System include "Multistage Flash (MSF) distillation Multi-effect Distillation (MED) & Vapour Compression distillation (VCD). Distallation plant can produced water Range from " (1 to 50mg/litter TDS)".

Alkaline cleaners remove organic fouling & acids cleaners remove Scale & Salts.

Distallation procers representin

Solution + Energy ⟶ Vapours + Concentrated Salt. Residue.

↓

Liquid + Engy.

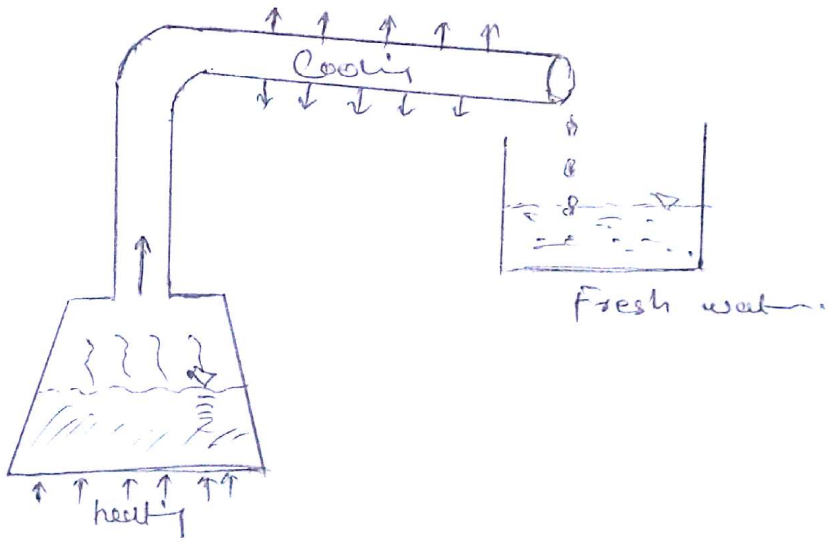
Procedure:-

→ Salt water is heated in one Container makes the water evaporate leaving the salt behind.

→ The disalination vapor is then

Condensed to form water in a separate Container.

→ Although long know it has found limited application is water supply because of the fuel costs involved in converting salt water to vapor is very high.



Electrodialysis:-

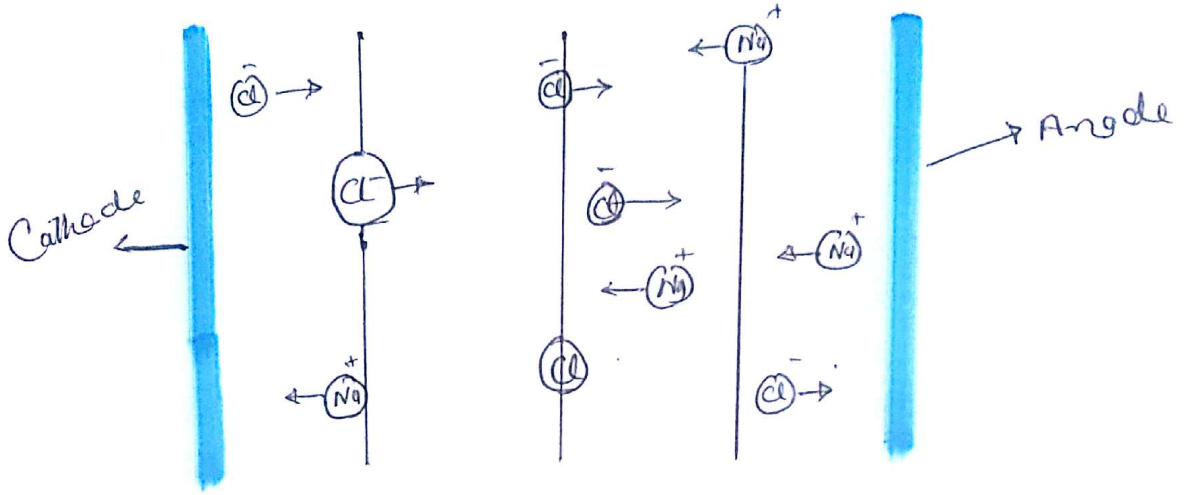
In Electrodialysis - Based treatment a direct current "DC" through the water which drives the ions through membrane to electrodes of opposite charge.

PROCEDURE:-

→ Electrodialysis utilizes a membrane & send an electric charge through

the solution.

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



(iii) Freezing Method:

→ This process based on the principle that water excludes salt when it crystallizes to ice.

→ It involve three steps

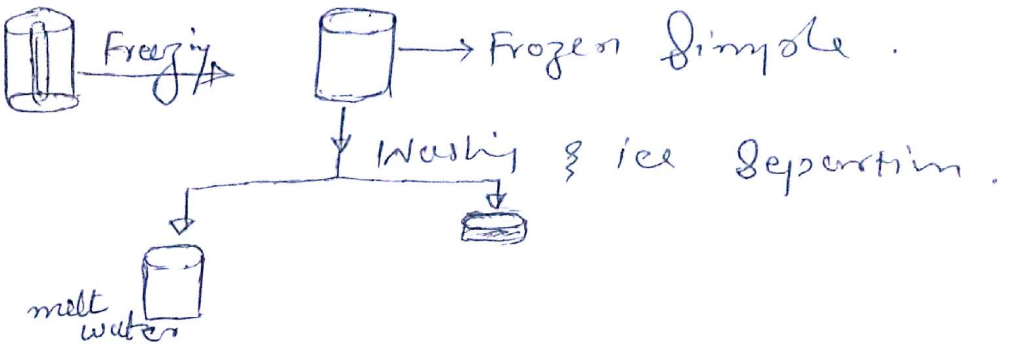
(i) Ice formation.

(ii) Ice washing

(iii) Ice melting.

To obtain fresh water with sub-

removal of contaminants.



(iv) Reverse Osmosis (RO).

RO is a purification method that use a semi permeable membrane to remove ions molecules & large particales from saline water.

→ It remove many types of dissolved & suspended species from water including bacteria & is used both industrial & production of portable water

→ It significantly decrese the salt & other potential impurities resulting high quality of water with great testy water.

Procedure:- 1st Step:- In first step the

Sedimonts is remove from water using 5-micron filter.

2nd Step:-

In this Step Carbon filter is used to remove "Chlorine" & other Chemicals.

3rd Step:-

The water passed through a dense membern to remove The Contamintd

4th Step:

In this ~~proces~~ Step the watr pass Thrgh a membr- to remove any metals present in water.

5th Step:-

In This Step involves teritiary treat-ment & polishing.

t

Effective Method:

The most effective method of The above is reverse osmosis. because of following reasen.

Reasons:

(i) → Enviornmental frindly:

RO System used less energy then the other proces. Power Comsumption is extremly small.

(ii) → Micro Organsism Remvel:

RO proces remove mony types of dissovelad & Suspended Species from water beacteria, fungi & other micro organsisines that cause deasies.

(iii) → High quality & great-test:

It significnly dereun the salt & other potential impuritiest in water, result trigh quality & great-test water.

(iv) → Not Hazardous:

The waste of Reverse osmosis system is less Hazardous. Because due to not requiring any harmful chemical within the process.

(v) :→ Maintenance Benifits:-

The RO System is extremly maintenance. friendly as it is a self-contained unite.

It required the membrane maintaine. in two/2 or 3/three years. & The membrane are self cleans & required minimal operater interaction.

Q2
Ans. Merits & Demerits of Distribution layouts:-

(i) Dead End Systems:-

Merits:-

- Pipes in this networks can be laid easily.
- The pressure & discharge in each pipes can be determind very easily.
- The cost of the project can be reduced. by designed the pipes diameter on the based of required demand for population.
- Dead end system requires less number of cutoff value.

Demerits:-

- The pressure is not constant & is very less remote parts.
- Because of dead ends water stagnation take place which results in

deposition of Sediment.

- If there is any damage occure in the branch the whole supply should be stopped.
- In this system limited discharge availible for fire fighting.

(ii) Grid Iron Systems-

Merits:-

- Water will flow Continously without any dead end.
- Head loss is minimum becaus of interconnection of pipes.
- The discharge will meet the required discharge for fire fighting
- Repair works can be easily done just closing cutoff valve.

Demerits:

- Because of circulating from all direction the pipes of large diameter required & large size/length.
- Cannot calculate accurate discharge velocity or pressure. So design is difficult.
- Laying pipes will done by skilled workers. which consume cost.
- Cutoff values required more for this system.

Ring Water Distribu System:

Merits:

- No stagnation of water.
- Repairs work can be done easily
- Large quantity of water available for fire fighting

Demerits:

- Larger length & large diameter pipes are required.
- More number of cutoff valves are necessary
- Skilled workers are required.

Redial Water Systems:-

Merits:

- The water distribution with high velocity & pressure.
- Head loss are very small.
- Give quick service.
- Stagnation does not occure.

Demerits:

- Cost of the project is more because of number individual distribution reservoir.
- More cutoff valve.

~~Practical~~

Hilly area Township Distribution System

I will recommend the ~~read~~ radical system. for the township in hilly area.

→ Because the ground surface in hilly are are not evenly distribute. There are more undulation in the hilly areas.

Thus we divide the area in to different zones. on the basis of "where ground surfaces are some what even & smooth"

& the water is pumped in to the distribution reservoir kept in the middle of each zone.

So the supply is distubute evenly in the community with quicle service & no stagnation will occure.

Q:
Ans

Types of Reservoirs:

(A) Depending upon their elevation w.r.t ground it may be classified into.

(i) Surface reservoirs:

(ii) Elevated reservoirs.

(B) Depending upon purpose served:

(i) Storage reservior.

(ii) Flood control reservoir.

(iii) Multipurpose reservior:

(iv) Distribution reservors:

(A)

(i) Surface Reservoir:

- These are called ground Reservoir.
- Mostly circular or rectangular in shape/form.

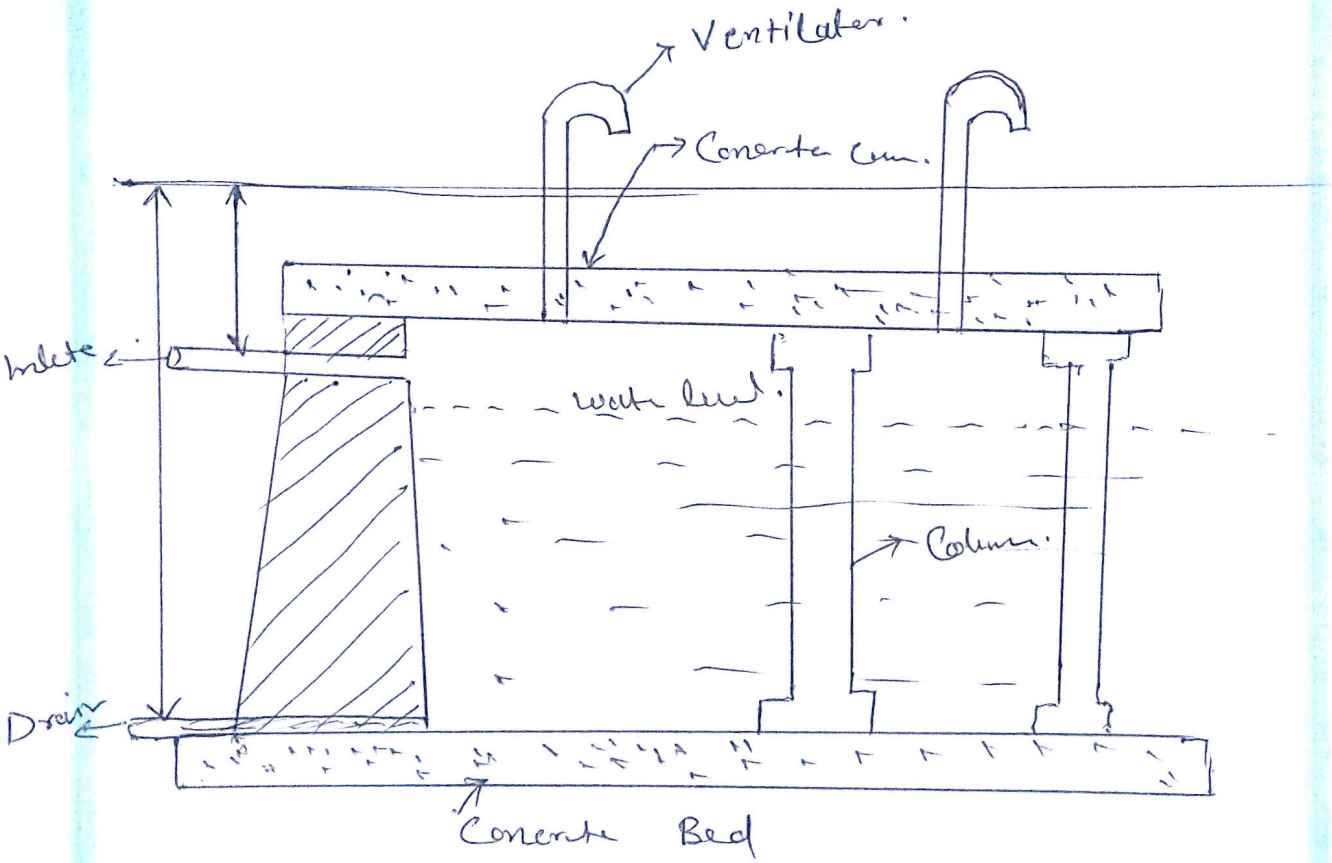
- Under ground reservoirs are preferred when the size are large.
- It case of gravity system under-ground reseroire are generally constructed on high natural ground. & made of Stone & Bride & RCC.
- The position of ground water table is also considered while desiging these reservior.

Importance:-

- Easy to abstract water by directly pumping.
- Water can be Collected & treated After used & put back into river.
- Dams & reseroir. can be used for hydroelectric power
- Reserors can be use for

recreation.

→ The water does not lose due because evaporation not take place.



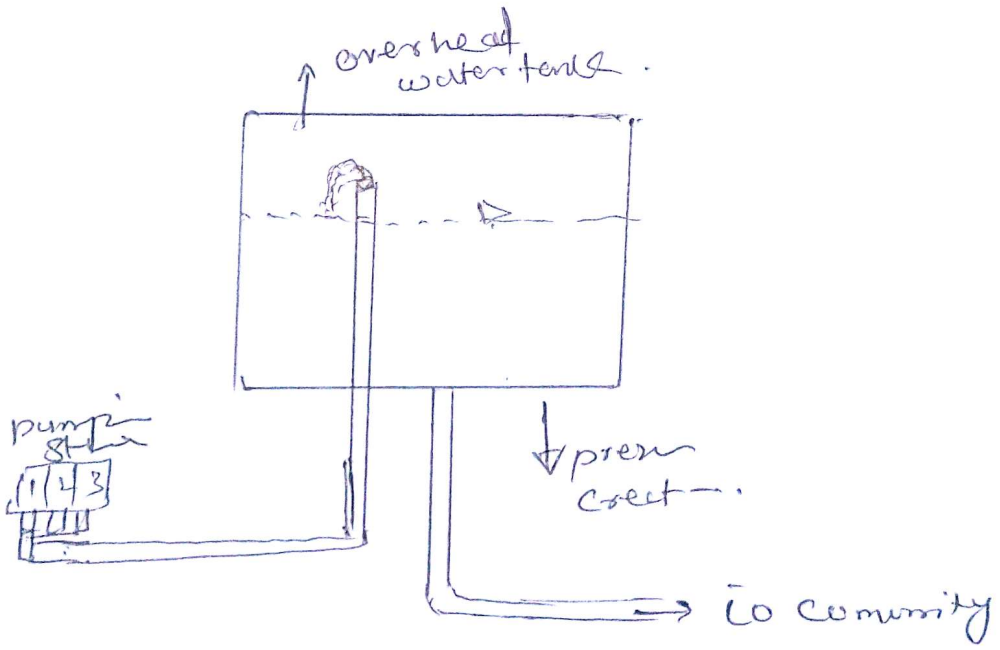
(2) Elevated Storge tanks.

→ Elevated Storge Reservoirs also called over head water tanks are requied at distribution area which are not govend & controlled by the gravity system of distribut

→ These are rectangular in shap.

→ It provide sufficient pressure head

→ They are constructed where Contone & pumping system of water distribu are adopted.



Store Importance:

- It create pressure head to reach the water to Community easly
- No power is required
- Flow due to gravity.

Storage Capacity:

The total storge is the sum of

(i) Balancing storage:

→ The quality of water required to be stored in the reservoir for equalizing or blancing fluctuating demand against constant supply is know as the blancing storge.

(ii) Breakdown Storage:

→ The breakdown storage or often called emergency storage is the storage reserved in order to tide over the emergency posed by the failure of pumps, electricity or any other reason.

→ A value of about 25% of the total storge capacity of reservoirs. or 1.5 or 2 time of the average hourly supply may be considered as enough provision for accounting this storage

③ Fire Storage:

→ The Third Component of the total reservoir storage is the fire storage

→ This provision takes care of the requirement of water for extinguishing fires.

→ Fire demand may be calculated by given formulae.

$$Q_F = 65\sqrt{P}(1-0.01\sqrt{P}).$$

$$Q_F = 53\sqrt{P}.$$

$$Q_F = 320 * C\sqrt{A}$$

Total Reservoirs Storage = Blancing Storage
+
Breakdown Storage
+
Fire Storage.

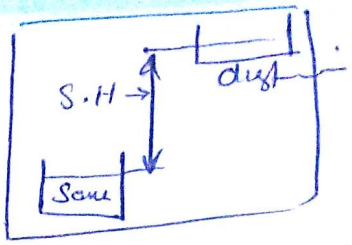
Pump in Water Supply Scheems:

A water Supply Scheems needs pumps to move the water produced from the source to its Consumers. In almost all cases in minnesota, the source is at a lower elevation than the user so the water must be raised to a higher. Some types of pumping equipment must be used to generate the pressure for raising the water to high elevation.

One types would be used for tranfering water from a well to a tower another would be better suited for pumping slude containg a lime byproduct from softing plent & many more.

(i) Tranfer liquid from Source to destination
(ii) Circulate liquid around a system

Calculation from Curve.



(1) **Static head: (S.H)**

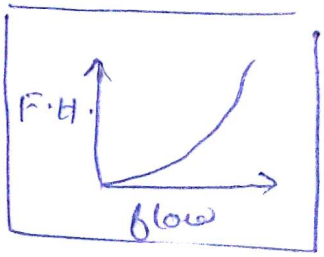
→ Vertical distance b/w the source & destination.

→ It is independent of flow condition.

(2) **Friction head: (F.H)**

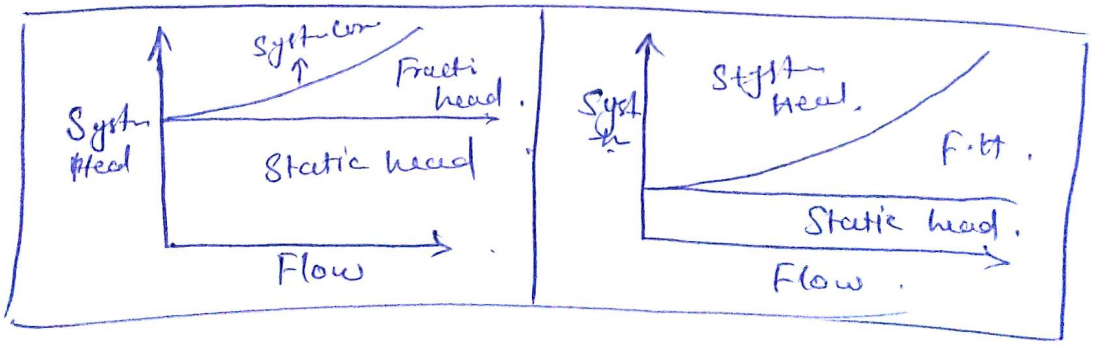
→ Resistance to flow in pump & fitting

→ Depend on size pipes, pipe fitting flow rate. etc.



System Head:

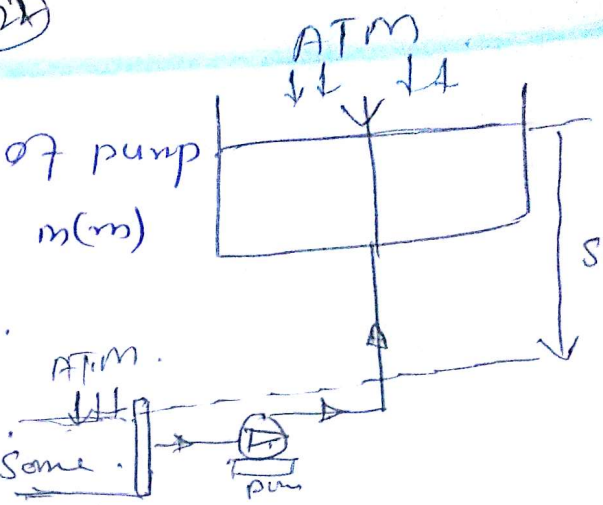
$$S.H = S.H + F.H$$



$$\text{Head} = \frac{\text{Pressure (psi)} \times 2.31}{\text{Specific gravity}}$$

P.T.O

The operating pressure of pump System is calculated in(m) To maintain dimensional.



Constantly, any pressure values used within the Calculation are therefore converted from kpa to (m) using the following

1 kpa = 0.102 m.

For above system the operating pressure or total system head H_{Total} on

$$H_{Total} = H_S + H_D + (P_{RT} - R_{RES}) \quad \text{---(1)}$$

H_S = Static head (m)

H_D = Dynamic head (m)

P_{RT} = pressure on the surface in receiving tank

P_{RES} = Pressure on the reservoir.

although $P_{RT} - R_{RE} \simeq 0$

$$H_{Total} = H_S + H_D.$$