

Desalination and Reverse Osmosis

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What is Desalination?

- o The process of removing salt and other minerals from water
- o Water is desalinated in order to convert salt water to fresh water so that it is suitable for human consumption
- o Very costly as it requires large amounts of energy and specialised infrastructure

Methods of Desalination

Vacuum Distillation

- The boiling of water at a much lower temperature than normal, saving energy

Reverse Osmosis

- Uses membranes to desalinate, applying reverse osmosis technology
- Uses semi-permeable membranes and pressure to separate salts from water
- Less energy is used compared to thermal distillation
- Also used to purify fresh water for medical and industrial uses



Reverse Osmosis Desalination Plant

Reverse Osmosis

In normal osmosis:

- Water molecules move from a region of higher concentration to a region of lower concentration through a partially permeable membrane

In reverse osmosis:

- Water molecules are forced to move from a region of lower concentration to a region of higher concentration by applying a huge amount of pressure

Reverse Osmosis

Result:

- o The solute is retained on the pressurised side of the membrane
- o The pure solvent is allowed to pass to the other side

Membrane used:

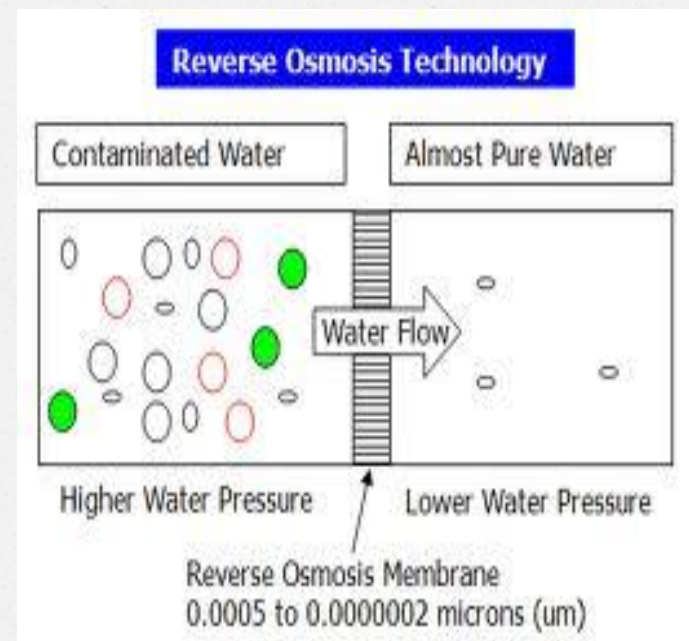
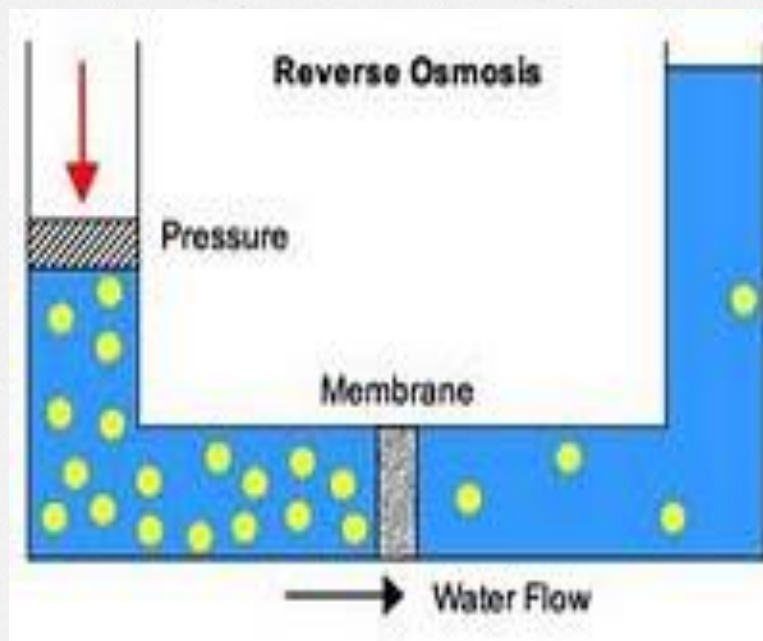
- o Designed to only allow water molecules to pass through
- o Does not allow larger molecules such as salt ions to pass through

Reverse Osmosis

- The pressure applied must overcome the natural osmotic pressure.
- Eg. 600-1200 psi of pressure must be used for seawater, as it has a natural osmotic pressure of 390 psi.

*Osmotic pressure: The tendency for the solvent to flow through the membrane until there is the same concentration of the solvent on both sides of the membrane

Process of Reverse Osmosis



Reverse Osmosis - NEWater

- o In 2002, Singapore announced that a process named NEWater would be a significant part of its future water plans
- o Involves using reverse osmosis to treat domestic wastewater before discharging the treated water into the reservoirs
- o Currently meets 30% of Singapore's total water demand
- o Projected to meet 50% of Singapore's future water demand by 2060
- o Involves advanced dual membrane and ultraviolet technologies



NEWater



NEWater Plant

Hope you have learnt something from this 😊

THANK YOU