

Desalination

Fresh surface water is a scarce resource in Australia and many major cities are building desalination plants to increase their water supply. Desalination is carried out by reverse osmosis, an energy intensive process.

Perth, Adelaide, Melbourne, Sydney and the Gold Coast all have desalination plants as part of their strategy to secure urban water supplies. Energy costs are usually offset by solar and wind electricity generation.

Osmosis

Osmosis is the movement of water across a semipermeable membrane. This means that only water can move – not solutes like salt. Water will flow from an area of high water concentration to an area of low water concentration.

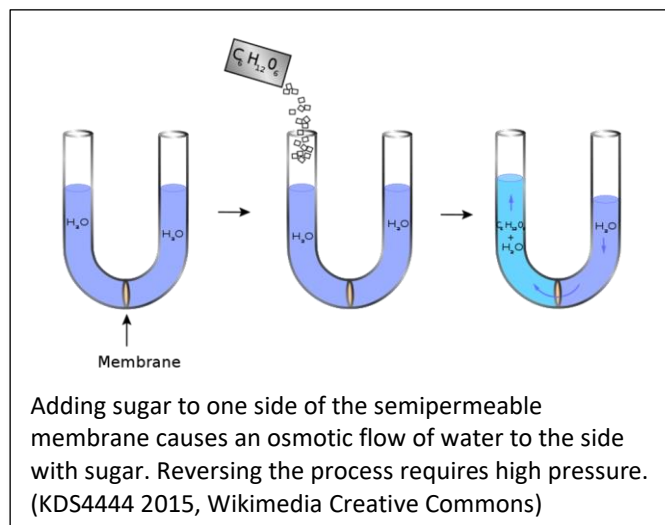
You can see the effect of osmosis by placing slices of cucumber in tap water and salt water. The cells of the cucumber have semipermeable membranes and a low salt concentration inside each cell. If the cucumber is placed in tap water, the water will flow INTO the cells, because there is a lower water concentration in the cells due to their salt. The cucumber slice will soak up water and become turgid.

If cucumber is placed into salt water, the water from the cells will flow OUT into the relatively low water concentration of the surrounding fluid. The cucumber slice will become floppy because it has lost water volume.

Reverse osmosis

In order to reverse osmosis and desalinate water, you must apply pressure to the salty water. A high pressure pump forces water molecules through the membrane and traps salts. The result is highly purified water filtrate and a brine solution that is pumped back to the ocean.

Reverse osmosis is also used to produce ultrapure water for industrial use or as a treatment of wastewater to be recycled for drinking. Sydney's St Mary's Sewage Treatment plant uses reverse osmosis as an additional wastewater treatment stage. The purified water is pumped into the Hawkesbury-Nepean River.





References:

Sydney Water: St Marys Advanced Water Recycling Plant.

<https://www.sydneywater.com.au/SW/education/Wastewater-recycling/Water-recycling/st-marys-advanced-plant/index.htm>

Australian Water Association: Desalination.

http://www.awa.asn.au/AWA_MBRR/Publications/Fact_Sheets/Desalination_Fact_Sheet.aspx

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