REVERSE OSMOSIS PROCESS

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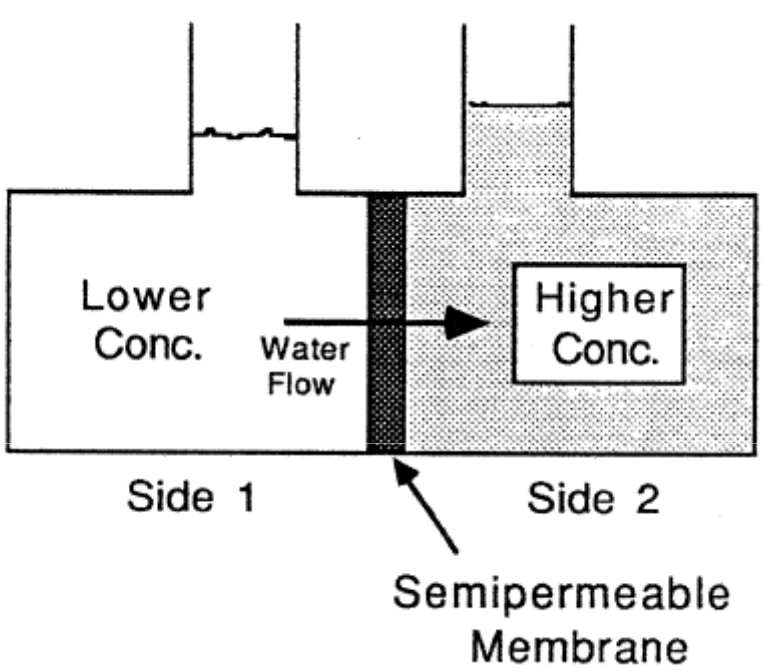
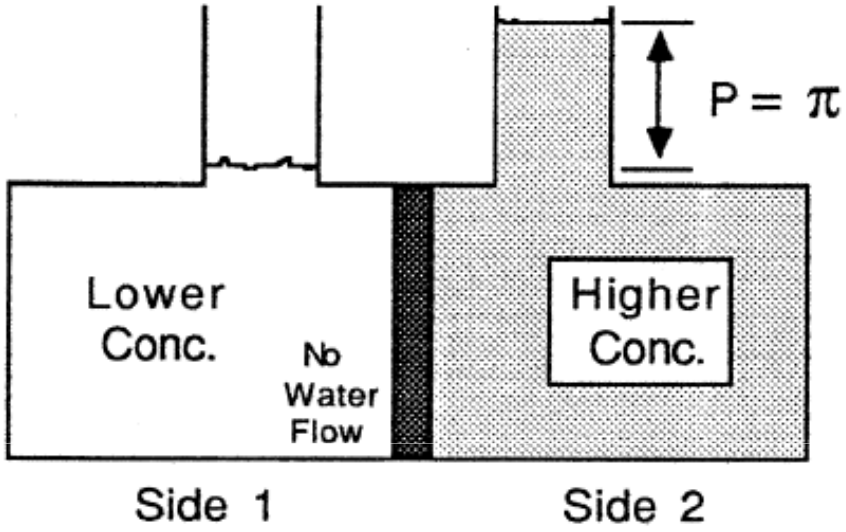
10/11/2012

Osmosis





$C_{s1} < C_{s2}$

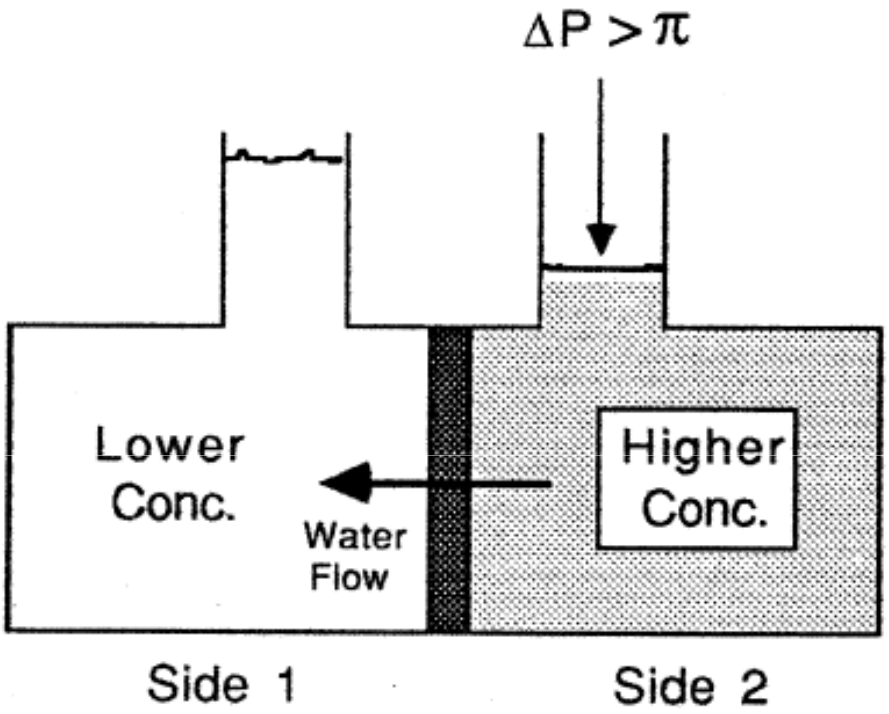
$\mu_{w1} > \mu_{w2}$

$\mu_{w1} = \mu_{w2}$

π = Osmotic pressure

Schematic of osmosis phenomena

Reverse Osmosis



$$C_{s1} < C_{s2}$$
$$\mu_{w1} < \mu_{w2}$$

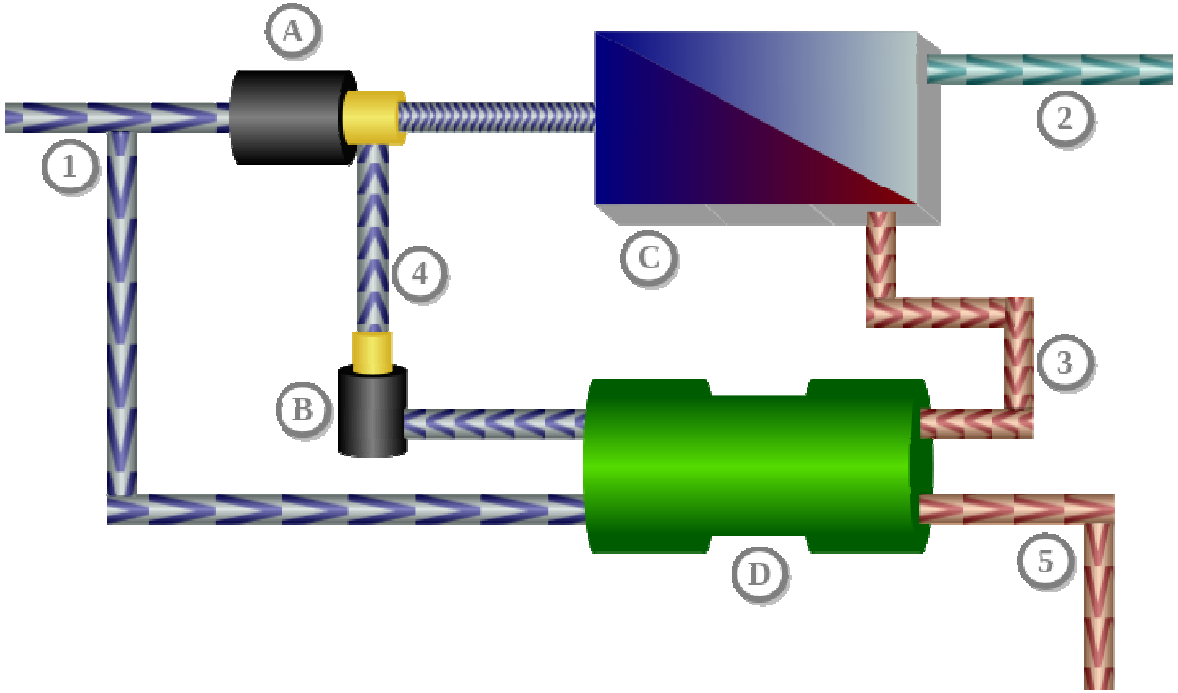
Schematic of reverse osmosis phenomena

History

- Studies on osmosis were carried out as early as 1748 by the French scientist Nollet.

- In the late 1950's the work of Reid showed that cellulose acetate RO membranes were capable of separating salt from water.

- In the early 1960's, Loeb and Sourirajan developed a method for making asymmetric cellulose acetate membranes with relatively high water fluxes and separations.



1: Sea water inflow
2: Fresh water flow
3: Concentrate flow
4: Sea water flow
5: Concentrate
A: Pump flow
B*: Circulation pump,*
C*: Osmosis unit with membrane*
D*: Pressure exchanger*

Schematic of a reverse osmosis unit

Important terms

- ***Permeate*** **-** the purified product water produced by a membrane system.

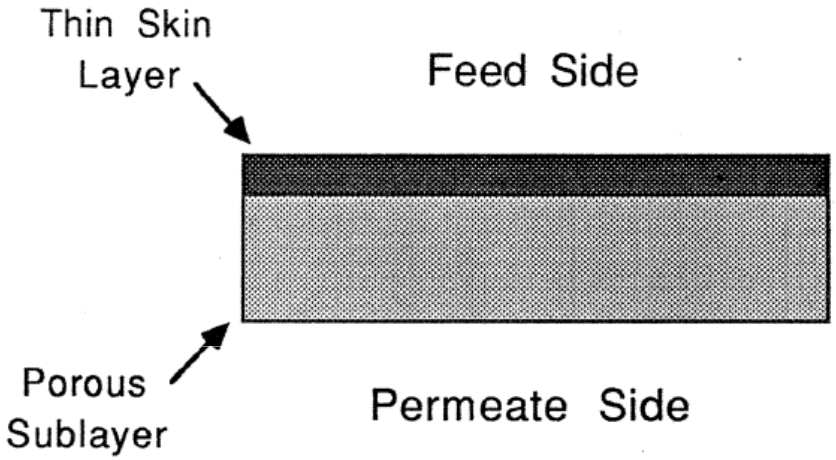
- ***Recovery*** **-** the percentage of membrane system feed water that emerges from the system as product water or “permeate”.

- ***Rejection*** **-** the percentage of solute concentration removed from feedwater by the membrane.

- ***Passage*** **-** the opposite of “rejection”, passage is the percentage of dissolved constituents (contaminants) in the feedwater allowed to pass through the membrane.

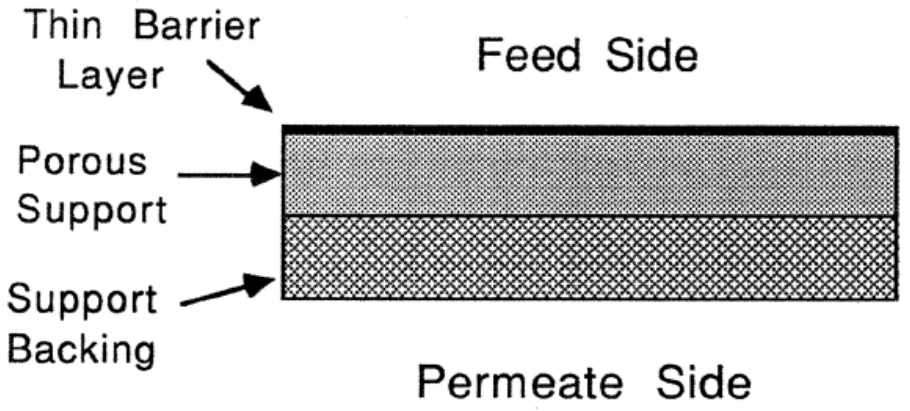
RO Membranes

Types of membranes

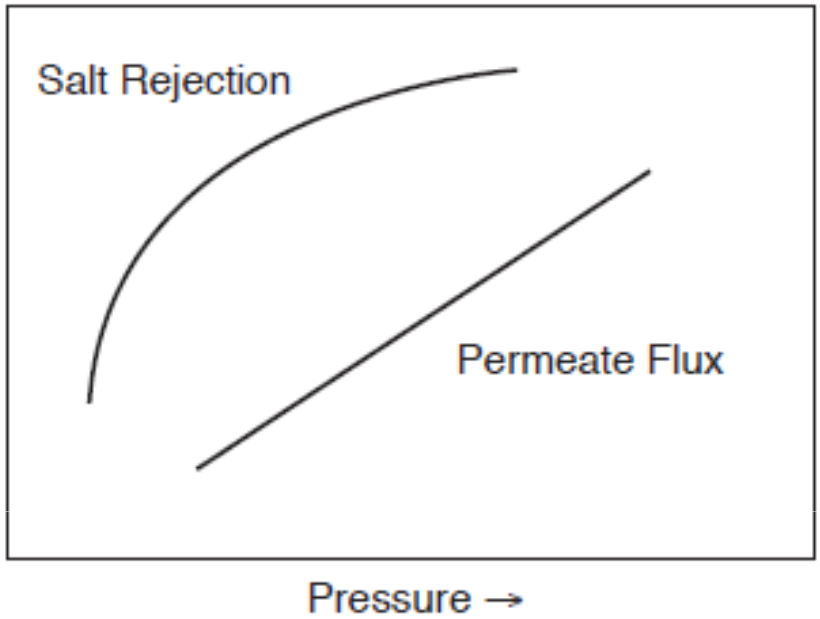


1) Asymmetric Membrane

2) Thin-Film Composite Membrane

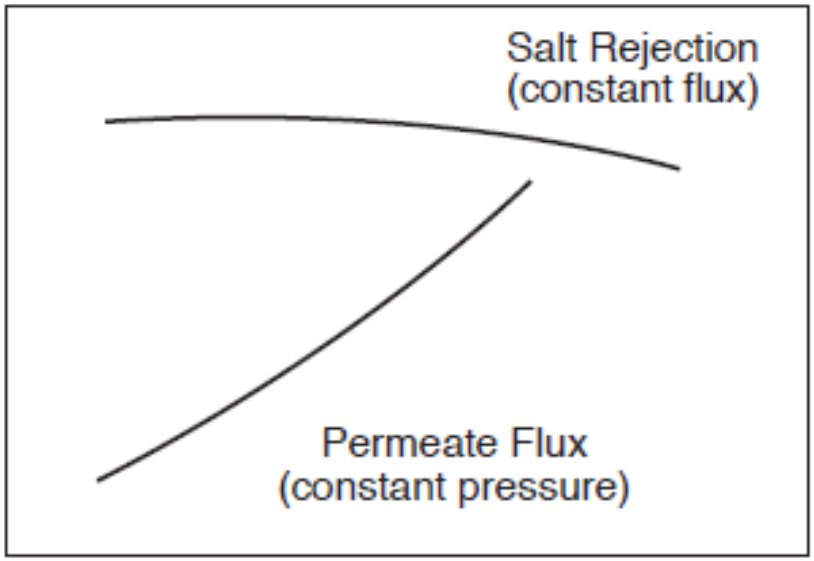


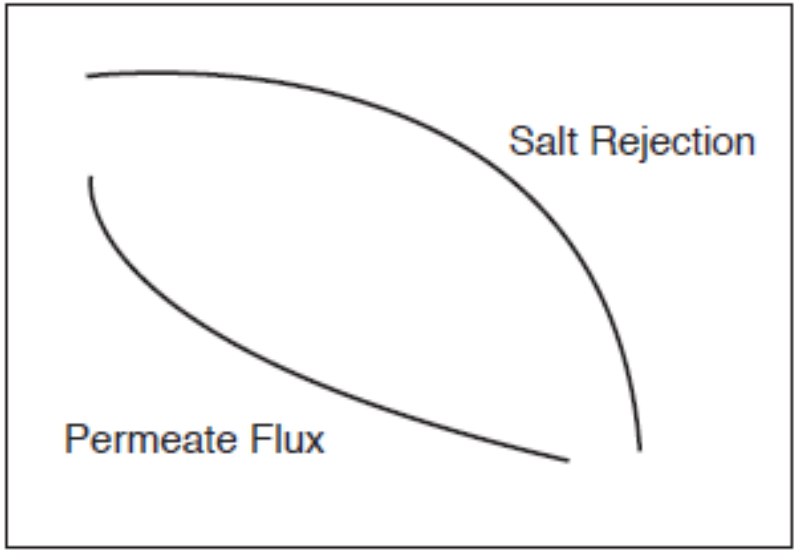
Factors affecting RO



Effect of Pressure

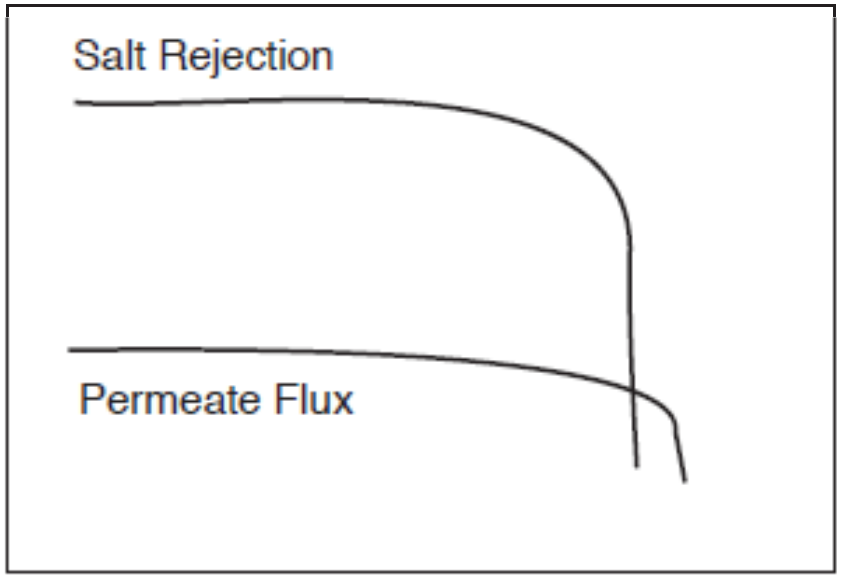
Effect of feedwater temperature





Effect of increasing concentration of salt in feedwater

Effect of Recovery



Applications of RO

- **Water purification**
- **Food industry**
- **Car washing**
- **Hydrogen production**

Thank You