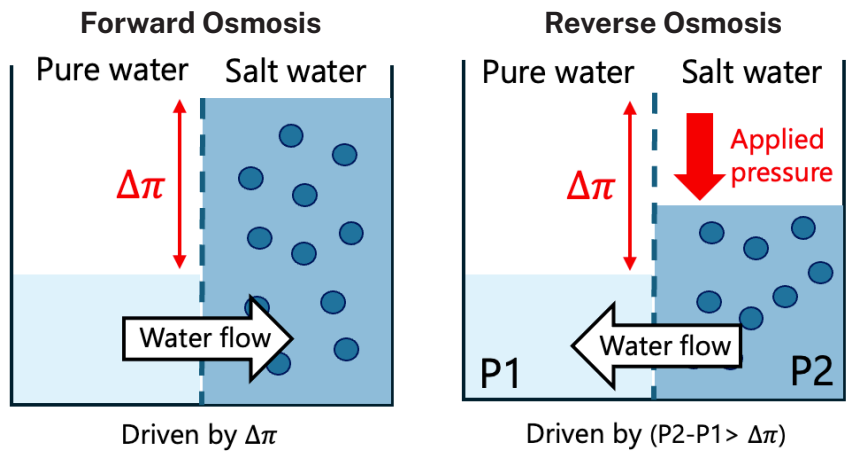
Reverse Osmosis (RO)

Process Description

RO is an energy-efficient, pressure-driven membrane desalination process that removes dissolved contaminants, including monovalent and divalent ions, from water. Pressure exceeding the osmotic pressure of the feed solution is applied to drive water through a semi-permeable membrane while rejecting salts and impurities. Commercial RO membranes are primarily composed of thin-film composite and cellulose triacetate materials. Depending on feedwater salinity, RO typically consumes 0.5–4 kWh/m^3 of treated water. RO is a mature technology widely used for seawater desalination, particularly in the Arabian Gulf region.

Owing to its proven performance in seawater and municipal applications, RO is increasingly being adopted in the oil and gas sector for water reuse applications, including boiler feed and cooling water production. Effective pretreatment is essential to minimize fouling and scaling and ensure reliable long-term operation.

Process Schematic



Publications

- Membrane applications and opportunities for water management in the oil & gas industry (Link)
- Evaluation of high-temperature reverse osmosis for recycling boiler blowdown in industrial applications (Link)
- Detailed organic characterization of process water to evaluate reverse osmosis membrane fouling in industrial wastewater treatment (Link)
- Osmotically assisted reverse osmosis: assessing pretreatment on hypersaline produced water (Link)

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