Pressure Retarded Osmosis (PRO)

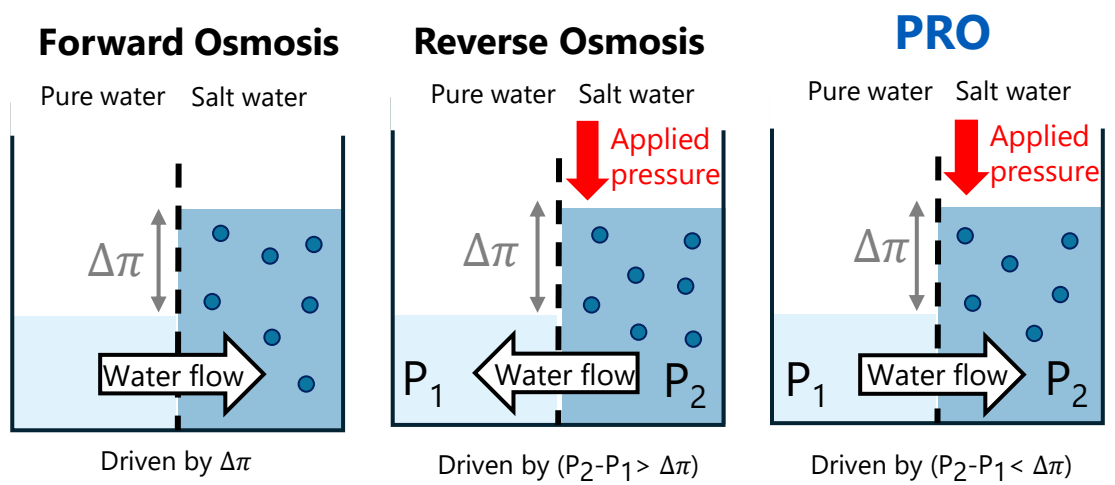
Process Description

PRO is a membrane-based process that harnesses the osmotic energy available between solutions of differing salinity. In PRO, a low-salinity feed solution is separated from a high-salinity draw solution by a semi-permeable membrane.

Water naturally permeates from the feed side to the draw side under an applied hydraulic pressure that is lower than the osmotic pressure difference. The resulting pressurized draw stream can be used to generate electricity through hydro-turbines or converted directly into mechanical energy using pressure exchangers. As with other membrane-based processes, effective pretreatment is key to minimize fouling and ensure reliable long-term performance.

Conventional PRO systems typically use seawater and freshwater as the draw and feed solutions. Alternative configurations can utilize hypersaline produced water and seawater to achieve higher power densities but require development of innovative membranes with higher pressure tolerance.

Process Schematic



Publications

- Evaluation of pretreatment and membrane configuration for pressure-retarded osmosis application to produced water from the petroleum industry (Link)
- Pressure-retarded osmosis for enhanced oil recovery (Link)

Patent

Water injection into a hydrocarbon reservoir (Link)

For further information, please contact us at email: GWSC@conocophillips.com