Counter Flow Reverse Osmosis (CFRO)

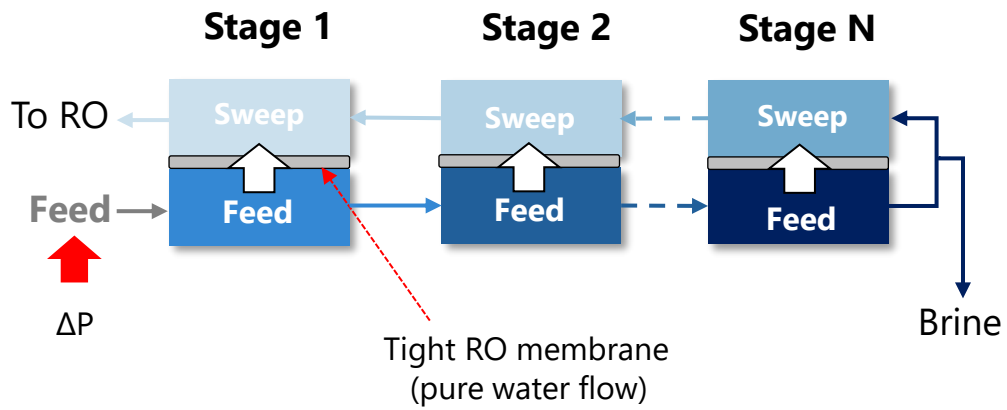
Process Description

CFRO is an advanced reverse osmosis (RO) configuration designed to treat high-salinity brines beyond the practical operating limits of conventional and high/ultra-high-pressure RO systems.

CFRO belongs to the broader family of osmotically assisted reverse osmosis (OARO) processes. A defining feature of CFRO is the use of dense, high-salt-rejection RO membranes in combination with a saline sweep solution on the permeate side. The sweep solution creates an opposing osmotic pressure, reducing the effective osmotic pressure difference across the membrane and lowering the hydraulic pressure required for water transport. CFRO typically employs hollow-fiber membrane modules, which are available from a few number of suppliers.

Multi-stage countercurrent CFRO achieves high water recovery and brine concentration for brine management and volume reduction applications.

Process Schematic



Publications

- Osmotically assisted reverse osmosis: assessing pretreatment on hypersaline produced water (Link)
- Experimental comparison between low salt rejection and counter flow reverse osmosis for produced water desalination (Link)

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