

SAMRO™

Salinity-Adaptive Multi-Step Reverse Osmosis

Single-stage desalination for 20,000–90,000 mg/L TDS

OVERVIEW

SAMRO (Salinity-Adaptive Multi-Step Reverse Osmosis) is a single-stage reverse osmosis process that adjusts its operating point to feed salinity across 20,000–90,000 mg/L TDS, including fouling-prone and chemically complex waters. Specific energy on seawater is 0.48 kWh/m³, compared with 1.36 kWh/m³ for standard reverse osmosis on the same feed. In integrated trains, SAMRO conditions the feed to the MemBrine Concentrator.

KEY FEATURES

Adaptive control

Operating pressure follows feed salinity automatically.

No interstage boosting

Single-stage configuration without interstage pumps.

Single-stage concentration

100,000 mg/L TDS in one stage in the King Salman Park design basis.

TYPICAL APPLICATIONS

- Seawater and high-salinity brackish desalination
- SWRO and CCRO brine pre-concentration
- Industrial wastewater recovery
- Feed preparation for MBC in ZLD trains

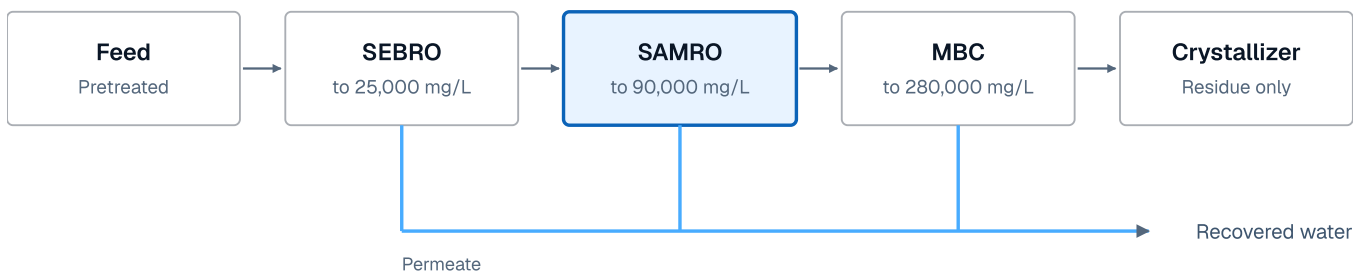
SPECIFICATIONS

Feed salinity	20,000–90,000 mg/L TDS
Concentrate salinity	≤ 90,000 mg/L TDS; 100,000 mg/L TDS in the King Salman Park design basis
Specific energy	0.48 kWh/m ³ , seawater feed
Standard RO reference	1.36 kWh/m ³ , same feed
Configuration	Single stage, salinity-adaptive
Permeate	Two streams: high and standard quality
Membrane equipment	Standard spiral-wound elements and pressure vessels
Downstream process	MemBrine Concentrator or disposal

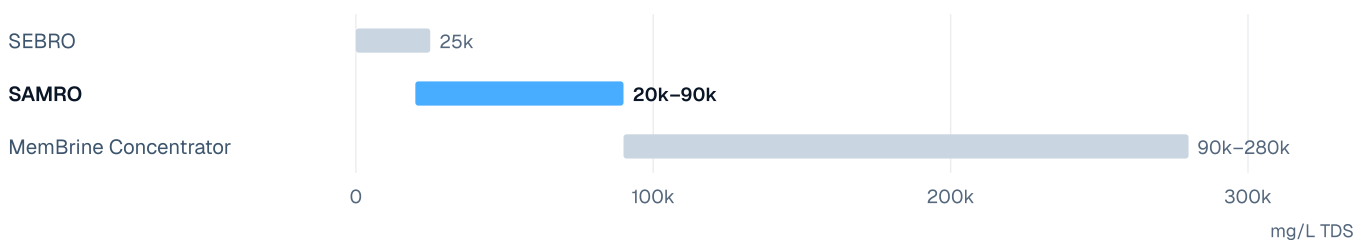
SCOPE OF SUPPLY

- Process design, mass balance, and design basis
- Membrane skids with high-pressure pumps and energy recovery devices, as required
- Instrumentation, control system, and control philosophy
- Factory acceptance testing
- Commissioning, performance testing, and operator training
- Operations support and service

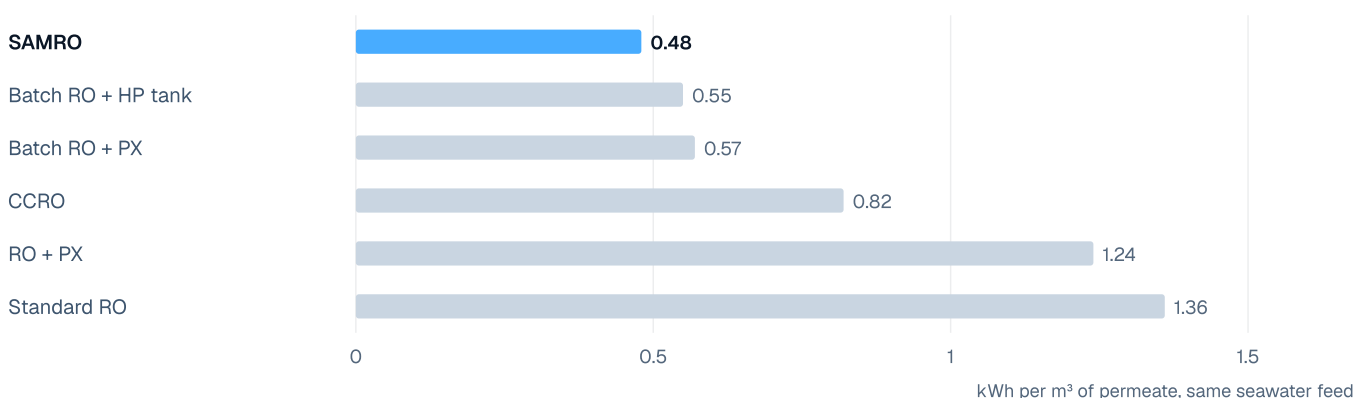
POSITION IN AN OSMOSYS TREATMENT TRAIN



PLATFORM OPERATING ENVELOPES



SPECIFIC ENERGY ON SEAWATER



PLATFORM SPECIFICATION

Process	Operating range, mg/L TDS	Specific energy	Role in the train
SEBRO	≤ 25,000	Feed-dependent	First stage on dilute feeds
SAMRO	20,000 → 90,000	0.48 kWh/m³ on seawater	High-recovery desalination
MBC	90,000 → 220,000–280,000	5–12 kWh/m³	Brine concentration
Thermal evaporation	≥ 90,000	25–60 kWh/m³	Conventional alternative

DATA REQUIRED FOR A FEASIBILITY ASSESSMENT

- ☐ Design flow rate and expected variability
- ☐ Full ionic analysis, including silica
- ☐ TDS, pH, and temperature range
- ☐ Suspended solids, SDI, and turbidity
- ☐ Organics: TOC, COD, and oil and grease where present
- ☐ Target recovery, concentrate strength, or discharge limit
- ☐ Site utilities and footprint constraints

ENGAGEMENT

01 Feasibility

Flow, full chemistry, variability, and the treatment objective, compared with the incumbent disposal or thermal route.

02 Pilot

Bench and pilot testing on site water to establish recovery, energy, pretreatment, and achievable concentration.

03 Design and supply

Process design, P&IDs, and control philosophy, with supply of the membrane stages or the complete packaged system.

04 Commissioning and operation

Performance testing against the design basis, operator training, and long-term operating support.