

# Saltworks' Product Fit Map: Industrial Desalination Options<sup>1</sup>



Technology	Chemical Softening/ Targeted Precipitation	Robust Ceramic Ultrafiltration (UF)	High Recovery Reverse Osmosis (RO) and Nanofiltration (NF)	Electrodialysis Reversal (EDR)	Evaporator-Crystallizer- Solids Management
<b>Fit</b>	Measure & reduce scale potential e.g. prior to desalination with other technologies.	Filter waters (0.05 to 1.2 µm) and thicken slurries up to 40% total solids, which can then be filter-pressed.	Lowest cost first recovery of water, now capable of reaching ultra-high recoveries due to higher pressures and improved processes.	Selectively remove ions, desalinate higher organics than RO, and produce highly concentrated brines.	Concentrate brine further, after other systems reach operational limits.
<b>Max Brine Concentration</b>	N/A	N/A	1,200 psi: ~80,000 mg/L <sup>2</sup> 1,800 psi: ~130,000 mg/L <sup>2</sup>	~180,000 mg/L <sup>2</sup>	Zero liquid discharge (ZLD) solids <sup>4</sup> or Minimal (MLD) ~300,000 mg/L
<b>Cost</b>	\$	\$	\$-\$\$	\$-\$\$	\$-\$\$\$
<b>Tolerance for Organics</b>	✓	✓	✓ (with know-how)	✓	✓
<b>Tips</b>	<ul style="list-style-type: none"> <li>Measure, lower, or remove scaling ion concentrations in scale-saturated brines</li> <li>Coagulants (i.e. ferric chloride) should be avoided if an RO is downstream (key foulant)</li> <li>Slurry sludge or filter cake will be generated</li> <li>Reduce labour costs by investing in automation</li> <li>Consider ScaleSense sensors for real-time monitoring to control chemical dosing &amp; confirm treatment</li> </ul>	<ul style="list-style-type: none"> <li>Use lower cost polymeric filtration if possible, provided TSS &lt; 100 mg/L and oils/grease &lt; 2 mg/L</li> <li>Ceramics fit more severe applications</li> <li>Pick a commodity ceramic UF membrane with common geometry for interchangeability</li> <li>Ceramic UF system engineering needs to consider energy, membrane health monitoring, and self-cleaning</li> </ul>	<ul style="list-style-type: none"> <li>RO &amp; NF are common and commoditized: maximize recovery first, before expanding your treatment train<sup>3</sup></li> <li>Maximizing RO/NF recovery may require scaling ion removal (i.e. BrineRefine)</li> <li>Employ techniques to protect &amp; monitor membrane health</li> <li>Our experts can help select the right membrane</li> <li>Consider ScaleSense sensors for dynamic recovery control on changing waters</li> </ul>	<ul style="list-style-type: none"> <li>Treat water that is too challenging for RO i.e. high organics or silica</li> <li>Excellent for targeting chloride removal from challenging flows</li> <li>Desalt to any level, however efficiency diminishes for desalting to lower than 1,500 mg/L</li> <li>TDS change in desalinated flow will determine cost (Inlet TDS – Treated TDS) with economics challenging &gt; 10,000 mg/L TDS change</li> </ul>	<ul style="list-style-type: none"> <li>Explore brine management options and economics before choosing from different technologies.</li> <li>Ensure scaling does not impact performance by analyzing water chemistry and considering a pilot test</li> <li>If applicable, pre-concentrate with membranes</li> <li>For smaller flows (&lt; 200 m<sup>3</sup>/day), bypass membrane system treatment steps and go to evaporation</li> </ul>

Saltworks Product	<a href="#">BrineRefine/ScaleSense</a>	<a href="#">XtremeUF</a>	<a href="#">XtremeRO/NF</a>	<a href="#">FlexEDR with IonFlux Ion Exchange Membranes</a>	<a href="#">SaltMaker Family</a>
	<ul style="list-style-type: none"> <li>Compact, modular chemical treatment to target ions of concern (i.e. silica, calcium) with precision controls to prevent waste, improve operations, and automate solids management</li> <li>Handle variable and changing water chemistries</li> <li>No coagulants employed that could damage downstream RO membranes</li> <li>Automation integrates seamlessly to maximize system performance</li> <li><a href="#">SilicaSelect</a> will target silica for a low cost, low footprint recovery gain or to reduce freshwater use</li> </ul>	<ul style="list-style-type: none"> <li>Developed and designed to concentrate slurries to new levels (i.e. up to 40% solids vs. past practice of ~10%)</li> <li>Packaged system complete with self-cleaning, ceramic membrane monitoring, and a lower energy configuration than alternatives</li> <li>Employs robust and commoditized membrane elements, available from many vendors</li> <li>CPVC pipework for corrosion protection, with pressure vessels as either SS316 or titanium depending on chloride levels</li> </ul>	<ul style="list-style-type: none"> <li>Fully packaged automated system, including membrane protection</li> <li>Achieve maximum brine concentrations by removing scaling limits with BrineRefine</li> <li>We can deliver the full package or work with RO/NF vendors of your choice</li> <li>XtremeRO/NF provides start-of-the-art RO/NF with maximized recovery and 24/7 expert support with our ROAM (Remote Operations &amp; Asset Management) platform</li> </ul>	<ul style="list-style-type: none"> <li>Desalinates waters too challenging for RO, or specifically target chloride removal while rejecting sulfates</li> <li>Next-generation IonFlux ion exchange membranes that withstand solvents, hydrocarbons, and offer 98% monovalent ion selectivity</li> <li>Selective removal of monovalent ions (Li<sup>+</sup>, Na<sup>+</sup>, Cl<sup>-</sup>, etc.) with FlexEDR Selective</li> <li>Protect electrodes from calcium and avoid chemical softening using our patented electrode blocker</li> </ul>	<p>Choose from four packages for evaporation, crystallization, and &amp; solids management:</p> <ul style="list-style-type: none"> <li><a href="#">AirBreather</a> (thermal): Air emissions-safe, integrated management of volatile organics</li> <li><a href="#">MultiEffect</a> (thermal): treats saline waters up to ZLD without pre-treatment</li> <li><a href="#">ChilledCrys</a> (hybrid membrane): for specific chemistries avoid boiling for high efficiency and recover sodium sulfate</li> <li><a href="#">VapComp</a> (MVR, electric): smart design with self-cleaning and intelligent automation</li> </ul>

- Notes**
- Depending on the inlet water conditions, a number of these technologies can be combined to optimize system performance and cost.
  - Maximum achievable brine concentration is dependent on water chemistry & capacity needs. Contact Saltworks for free engineering analysis.
  - Inlet TDS must be lower than the max brine concentration. Recovery = 1 – (Inlet TDS / Outlet TDS).
  - Our ZLD experts can help you optimize your entire process, manage risk, and build-in smart controls.

Contact us to get started on your project:

[www.saltworkstech.com/contact/](http://www.saltworkstech.com/contact/)