RESEARCH BRIEF
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NAWI National Alliance for Water Innovation

Field Pilot Testing of Electrically Conductive Reverse Osmosis (Active) Membranes for High Mineral Content Brackish Groundwater

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Challenge

The need for more reliable and drought-resilient potable water supplies will drive the interest in developing a broader portfolio of water supply sources beyond conventional fresh surface and ground waters to additionally include unconventional, impaired, and saline water sources such as municipal and industrial wastewater, brackish groundwater, and seawater. These unconventional water sources have complex geochemistry, often saturated in one or more sparingly soluble minerals and metals, and often have poor microbiological and/or organic quality. RO pre-treatment and membrane technologies that could reduce the cost, footprint, and operational complexity, while maintaining stable operation when facing feed waters with high fouling and scaling potential would be transformative in that they could dramatically accelerate and enable industry and end-user adoption.

Research Approach

For a period of three months of continuous operation, we plan to field test the performance of our anti-scaling electrically conducting reverse osmosis (Active) membranes against a commercial reverse osmosis (RO) membrane in a high TDS brackish water source in a plant in Sand City, CA, operated by California American Water. We plan to design and build a 10-20 gallons per minute pilot unit consisting of a train of Active membranes (Train A) parallel to an identical train of conventional brackish water RO (Passive) membranes (Train B).

The manufacturing process involves synthesizing an electrically conducting coating film on top of an already formed membrane. We have demonstrated the ability to coat microfiltration (ECMF), ultrafiltration (ECUF), nanofiltration (ECNF), reverse osmosis (ECRO) and membrane distillation membranes (ECMD). Herein ECRO membranes will be packaged in spiral-wound modules designed to function as drop-in replacements for existing RO membrane systems enabling a non-invasive retrofit business model creating minimum barrier for adoption. Customers will buy our membranes when they need to replace their old ones or build new plants

Impact

Our patented and innovative technology is electrically conducting membranes capable of actively resisting membrane fouling and scaling. Active fouling-resistance lowers energy demand, increases product water recovery (less waste generation), feed water quality adaptability minimizes pre-treatment, process complexity and footprint, and thus, significantly reduces operating and capital costs of membrane-based desalination plants. The resulting process significantly reduces the number of pre-treatment unit operations and chemicals required resulting in significant reduction in footprint, capital, and operating costs.

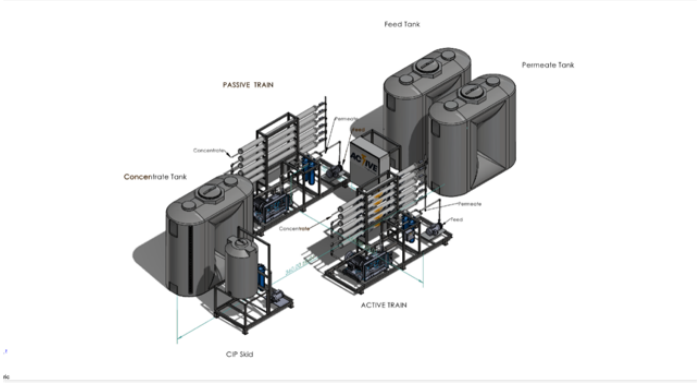

Figure 1. ECRO Process for desalinating a high mineral content unconventional water resource.

RESEARCH PARTNERS

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