RECLAMATION
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Chlorine Resistant Polyamide Reverse Osmosis Membranes

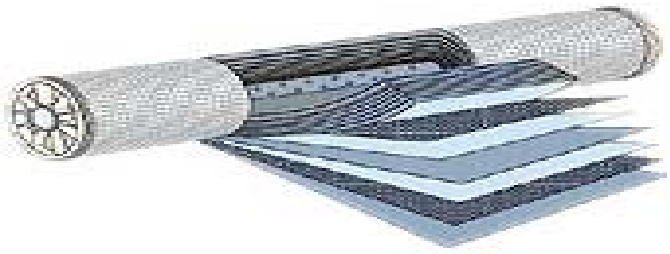
New polyamide membranes will reduce water treatment costs significantly

What Is The Problem?

Desalination and water treatment plants have been using RO polyamide (PA) spiral-wound membranes since 1977 to purify and remove salt from seawater, wastewater, and surface water to produce new sources of water for drinking and other needs. PA membranes used in RO are preferred by industry because they operate at lower pressures relative to other RO membranes, which mean lower energy demand and hence lower operating costs.

RO pretreatment and treatment processes typically use chlorine disinfection upstream of the desalination membrane in order to control microorganisms that biofoul and clog the membrane. In addition, chlorine is typically added to many source waters to prevent water-borne diseases. However, chlorine rapidly degrades PA membranes.

Therefore, to reduce chlorine levels immediately before filtering with standard PA membranes, RO plants use sulfur dioxide, bisulfite or sulfite. However, this requires additional equipment and chemicals and must be carefully balanced against the increased risk of biological growth on the membranes. The result is higher operating costs for the plants.



RO membrane is spiral-wrapped within the filter cartridge

What Is The Solution?

A high performance membrane that is resistant to chlorine degradation has been long-sought by the desalination industry to simplify and lower the cost of operating desalting plants.

Researchers from Reclamation, Separations Systems Technologies (SST), and the University of Denver (DU) have collaboratively developed new PA membrane chemical formulations that potentially can revolutionize the desalination membrane industry.

Initial tests of the new PA membranes constructed on flat sheets were conducted at SST. Samples of the most successful membrane formulations tested at SST were transferred to Reclamation's Water Quality Improvement Center (WQIC) in Yuma, AZ to verify how these membranes would react in actual field test situations. Information on the WQIC is available at http://www.usbr.gov/lc/yuma/facilities/wqic/yao_facilities_wqic.html. Water flux and salt rejection comparisons for a standard PA membrane and new PA membranes have been monitored since August 2005 at the WQIC. Currently, about 50% of the new PA membranes have completed long-term testing. Several of the new PA membranes tested indicated a superior degree of chlorine resistance and with transport properties equal to or better than traditional PA membranes.

Long term testing for chlorine resistant PA membrane at the WQIC

Who Can Benefit?

Existing RO treatment facilities could replace damaged membranes with chlorine resistant PA membranes that would significantly lower operating costs. New facilities using chlorine resistant PA membranes would benefit from reduced capital and operation costs. All current users of RO treated water and other applications including microfiltration, ultrafiltration, and nanofiltration could benefit.

Future Development Plans

Currently, long-term testing of new PA membranes is done on flat sheets rather than actual spiral-wound membranes. The next step is to run long-term tests using a number of 2" diameter by 40" long spiral-wound membranes in carefully designed experiments to establish industry standard engineering data. Reclamation is currently seeking a qualified industry partner to cooperate in further testing and commercialization. Please contact us if you are interested in exploring this partnership opportunity.

Contact Information

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Collaborators

Reclamation's Science and Technology Program and Yuma Area Office, SST and DU