

Using electrodialysis for low-energy municipal desalination

Demonstrating the potential of electrodialysis technology at a new pilot plant in Tuas

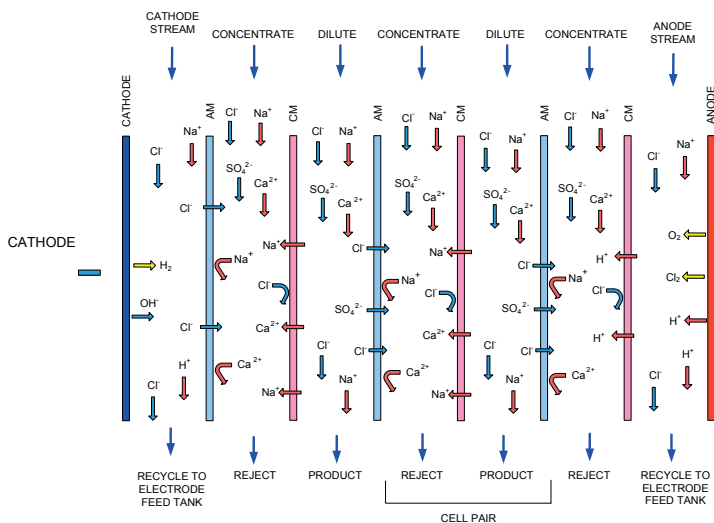


Fig. 1: The ED process to be tested at PUB's R&D facility in Tuas

Desalinated water is crucial to helping Singapore ensure water sustainability. Conventional seawater reverse osmosis (SWRO) processes use up to 3.5 kilowatt hours of energy to produce a cubic metre of desalinated water. With rising energy costs and desalinated water expected to meet a greater percentage of Singapore's water demand in future, there is an urgent need to explore innovative ways to reduce the amount of energy used for seawater desalination.

Instead of pushing seawater through dense membranes to remove the dissolved salt ions, another option could be to use electricity to treat seawater, a process known as electrodialysis (ED). ED is an electrochemical process in which salt ions, which carry either a positive or negative charge, are removed from water when they are attracted to electrodes of the opposite charge. In the process, ions selectively pass through alternating ion-exchange membranes (anionic and cationic) to create separate streams of purified and concentrated water (Fig. 1). The electrochemical concept of moving salts across an electric field uses much less energy than pumping large volumes of seawater through RO membranes under high pressure.

Evoqua Water Technologies is designing and constructing a feed plant at the PUB R&D facility that is able to treat 1 million gallons per day using its Nexed ED technology (Fig. 2). Compared to conventional SWRO, Nexed modules provide consistent water quality with variable feed water parameters or partial removal of contaminants without the need for blending. Because output quality can be manipulated by input power adjustments, this means that energy consumption, operating costs and the space required for SWRO can be reduced significantly. The system is also modular in design and thus fully scalable.

“The Nexed system represents a breakthrough in electrochemical desalination. We are now able to make low-cost, effective and reliable desalination possible. Nexed modules can be applied to a wide range of uses, including

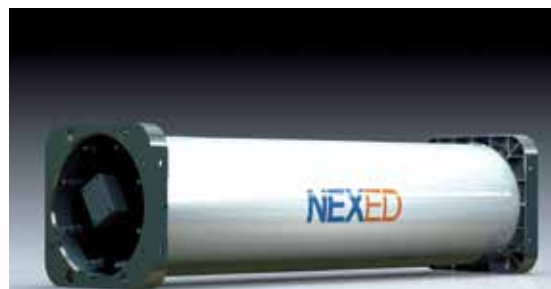


Fig. 2: Evoqua Water Technologies' Nexed ED Module

sea and brackish water, variable salinity applications, and water reuse options,” Evoqua Water Technologies CEO Ron Keating said.

The flow rate at the plant will be gradually increased in 2017 after the first feed flow system of 90 cubic metres per hour is installed in mid-2016. During this period, Evoqua Water Technologies will focus on improving the technology's operational performance and reliability through proper process design and optimisation while demonstrating its potential, the company announced in a press release.

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