

Modeling the impact of using multi-port RO pressure vessels in seawater reverse osmosis desalination plants using special simulation software

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ABSTRACT

The present paper describes the modeling of RO plant processes and systems using the simulation program IPSEPro™ which has helped to improve the design and optimization process in several large desalination projects. The program also covers power plant processes, which allows integrated power and desalination plants to be simulated in a single flow sheet. Hydraulic calculations including pipe work, pressure vessels, membranes and pumps are conducted simultaneously with mass transfer phenomena in the membranes. Mass transfer calculations in the membranes are based on the solution diffusion model. This paper presents an analysis of the impact of using multi-port RO pressure vessels on flow distribution between the various pressure vessels, and how this impacts the relative operating conditions of the individual membrane elements. Because the pipework hydraulics and membrane performance models are integrated within a single simulation environment, a true understanding of the impact of multi-porting on membrane system performance can be attained.

Keywords: Simulation; Seawater reverse osmosis; Energy demand; Hydraulic calculation; Multi-port pressure vessels

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