



Economic analysis on environmentally sound brine disposal with RO and RO-hybrid processes

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ABSTRACT

The critical environmental impact of brine solution has been pointed out as an important issue in desalination technology, which should be resolved urgently. In this study, an economic analysis with respect to environmentally sound brine disposal was conducted along with the open outfall system and seawater reverse osmosis (SWRO) basis processes (stand-alone SWRO, SWRO-pressure retarded osmosis (PRO) hybrid, and SWRO-membrane distillation (MD)-PRO hybrid processes). The parameters of an open outfall system were controlled to mitigate the environmental impacts, and the capital cost of the open outfall system was estimated with WTCostII software. The estimated capital cost data were treated with statistical techniques for cost factor analysis, and variations of the capital cost were observed according to the key parameters of desalination processes. Results shown found that the diameter of pipeline is a dominant cost factor and the total capital cost of an open outfall system can be approximately estimated only with the length and diameter of the brine discharge pipe. In addition, this study also confirmed the fact that the trade-off between the two variables made the capital cost fluctuate. Among the desalination configurations, the capital cost of the open outfall in the stand-alone SWRO process changed most since the brine flow rate from other processes kept increasing regardless of the RO recovery rate. Based on the results, further research for the cost analysis on brine disposal system is required to optimize an environmentally sound open outfall system.

Keywords: Seawater reverse osmosis; Hybrid desalination process; Brine disposal; Open outfall; Economic analysis

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