

Application of World Ocean Atlas data for estimating the relative performance of a new construction of SWRO desalination plant

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ABSTRACT

Desalination offers one of the reasonable alternatives as a solution to water scarcity. Among the desalination technologies, seawater reverse osmosis (SWRO) process becomes increasingly attractive for freshwater supply with comparatively low energy consumption and cost-effective operation. In this study, a benchmark of operating Fujairah SWRO desalination plant in the United Arab Emirates is applied to assess the relative performance of a new and large plant construction in other sites. A process model was developed to simulate the performance of SWRO desalination process and to estimate its operating cost. The developed model was validated using one-year SWRO operation data obtained from Fujairah SWRO desalination plant. Temperature and salinity data were collected from World Ocean Atlas 2005, and then applied to the model to estimate the operating cost under the site-specific conditions of 9 different countries. The results of this study present that the performance of the SWRO desalination process was significantly influenced by feed water concentration (i.e., mainly salinity) and temperature, and that the total operating cost is significantly dependent of the local electricity costs. As a conclusion, World Ocean Atlas data and the benchmark provide a method of comparing the performance of various SWRO desalination systems among different countries. Furthermore the methodology is applicable to simulate the process model with site-specific water quality data and to estimate the operating cost before a new construction of SWRO desalination plant at a target area elsewhere.

Keywords: SWRO desalination; Cost estimation; Site-specific water quality data; World Ocean Atlas

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