



## A comparative study of ultrafiltration and physicochemical process as pretreatment of seawater reverse osmosis

Gloria Fernández<sup>a</sup>, Fidel Plaza<sup>b</sup>, Gloria Garralón<sup>b</sup>, Antonio Garralón<sup>c</sup>,  
Jorge Ignacio Pérez<sup>a</sup>, Migual Ángel Gómez<sup>a,\*</sup>

<sup>a</sup>*Technologies for Water Management and Treatment Research Group, Institute of Water Research and Department of Civil Engineering, University of Granada, 18071 Granada, Spain*  
Tel. 34-958-246153; Fax: 34-958-246138; email: mgomezn@ugr.es

<sup>b</sup>*Department of Research and Development, CADAGUA S.A., Gran Vía 45, 7<sup>a</sup>, 48011 Bilbao, Spain*

<sup>c</sup>*Unit of Engineering and Geological Barriers, Department of Environment (CIEMAT), Av Complutense 22, 28040, Madrid, Spain*

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### ABSTRACT

The effectiveness of two pretreatments for open intake seawater reverse osmosis (RO), aerated spiral wound ultrafiltration (ASWUF) and physicochemical (PC) pretreatment, were evaluated. Their efficiency in removing particulate materials was assessed by SDI, turbidity and Particle Size Distribution. Aerobic bacteria levels indicated the effectiveness of bacterial removal. Organic matter was characterized by TOC and UV<sub>254</sub>. The apparent molecular weight (MW) distribution of organic matter was determined by centrifugal ultrafiltration fractionation and the effect of pretreated effluent on seawater RO flux decline was evaluated by a bench-scale test. Both pretreatments lowered feed water SDI to 2 and turbidity to 0.4 NTU and were highly efficient in removing particles larger than 1 µm. In general, ASWUF was more effective than PC, although PC removed TOC more efficiently. For both pretreatments, TOC fractions with a MW of under 3 kDa remained in treated water. Both pretreatments made effluents of excellent microbiological quality; however aerobic bacteria were isolated depending on the level of residual chlorine. Specific flux decline was slightly higher for seawater pretreated with PC and SEM revealed the presence of several foulants. Special care must be taken to prevent the contamination of the pretreated water zone (tanks, pipes...) in order to maintain the quality of influent to RO membranes.

*Keywords:* Ultrafiltration; Physicochemical pretreatment; Seawater reverse osmosis; Particle size distribution; Total organic carbon; Specific flux decline

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\*Corresponding author.