Estimation of maximum water recovery in RO desalination for different feedwater inorganic compositions

A. Ruiz-García\textsuperscript{a,\ast}, J. Feo-García\textsuperscript{b}

\textsuperscript{a}Department of Mechanical Engineering, University of Las Palmas de Gran Canaria, 35017 Las Palmas de Gran Canaria, Spain, Tel. +34 928 451888; Fax +34 928 451879; email: alejandro.ruiz@ulpgc.es
\textsuperscript{b}Department of Electronic and Automatic Engineering, University of Las Palmas de Gran Canaria, 35017 Las Palmas de Gran Canaria, Spain, Tel. +34 928 451963; email: jose.feo@ulpgc.es

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\textbf{A B S T R A C T}

Groundwater is essential for agriculture in the Canary Islands. For example, in Gran Canaria 47.7\% of water demand for agricultural purposes is taken from groundwater and in Tenerife 162.7 hm^3/\text{year} are also taken from wells. In water desalination processes, water recovery is one of the most important indexes for reverse osmosis (RO) system design. This article aims to estimate the maximum recovery levels for RO systems, based on the scaling potential of the sparingly soluble salts shown in the chemical analysis. The required input data are the chemical composition of the feedwater, its pH and temperature range. Both islands were divided in different areas as the water composition can vary considerably. More than one hundred groundwater wells were analyzed to know the inorganic composition. This composition of the feedwater plays an important role in the operation of a brackish water reverse osmosis system since it may be responsible of extra cost due to scaling. The silica, calcium carbonate and calcium sulphate are the most commonly found salts in the groundwater of Gran Canaria and Tenerife. In most cases, silica had the highest effect on recovery limits. The results showed some cases where the maximum flux recovery was barely around 60\% even using specific silica anti-scalant. This has a considerable impact on the viability of the process. The calcium carbonate was also an important limiting factor in most of wells.

\textit{Keywords:} Brackish water; Reverse osmosis; Desalination plants; Recovery; Scaling

* Corresponding author.