Amphistegina media filtration as pretreatment of SWRO desalination unit for producing different salinities to study the corrosion behavior of various materials

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\textbf{ABSTRACT}

According to literatures, the corrosivity of many materials was studied in different aqueous environments (different salinities). In the present work, a semi-pilot seawater reverse osmosis (SWRO) desalination unit was assembled in EPRI and was used for producing seawater samples with different salinities (925, 4,845, and 18,975 mg/l TDS). The natural seawater sample was obtained from the Mediterranean Sea with salinity of 38,500 mg/l TDS and then, the samples with different salinities were obtained by mixing technique. Amphistegina tests (shells or hard parts) of the Foraminifera genus with mesh size 1.0–1.5 mm were separated directly by sieving from fresh beach sediments. Amphistegina media filtration system demonstrated good performance in removing particulates from the feedwater and producing permeate of acceptable quality for feeding reverse osmosis (RO) membrane at temperature 40°C and flow rate 20 l/min. Operating the unit with addition of polyaluminum chloride coagulant at a concentration of 1.5 mg Al/l, enhances the performance of the RO unit. The produced filtrate has better SDI (<3), lower turbidity (less than 0.2 NTU), and higher TOC% reduction (97.1%, from 2.91 to less than 0.1 mg/l), while, the iron reduced from 1.82 to 0.05 mg/l. The susceptibility of Ni, Cu, and 70/30 Ni-Cu alloys for corrosion in the produced different seawater samples have been studied by weight loss measurements, potentiodynamic polarization, and electrochemical impedance spectroscopy methods. The surface analysis was carried out using scanning electron microscope and energy dispersive X-ray. The corrosion rate follows the order Cu > 70/30 Ni-Cu > Ni. Therefore, it was found that the desalination of seawater leads to enhancement of the water properties and decreases its corrosivity for all the studied materials.

\textbf{Keywords:} Desalination; Seawater; RO-membrane; Amphistegina tests; Filtration; Corrosion

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