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First year performance review of Magong UF/RO seawater desalination plant

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ABSTRACT

The aim of this article is to describe the long term performance of one of the first seawater reverse osmosis desalination plants with ultrafiltration as pre-treatment. The plant in question is located in Magong (Taiwan) and has a current capacity of 5,500 m^3/d. In the near future this current capacity will be increased up to 13,000 m^3/d. The Magong desalination plant is an important example of how ultrafiltration is a key component in seawater desalination plants to ensure sustainable and reliable operation of the downstream reverse osmosis installation. When the Magong desalination plant was initially started-up in 2002 it had a conventional pre-treatment. After six years of less than satisfactory performance, the conventional pre-treatment was replaced by a ultrafiltration system. Nowadays the plant consists of a self-cleaning filter, the ultrafiltration units, cartridge filter and reverse osmosis lines. The ultrafiltration system contains 7 racks, each with 60 modules DOW ultrafiltration SFP2860. The reverse osmosis installation consists of a first pass using FILMTEC SW30HRLE-400 membranes and a second pass using FILMTEC LE-400 membranes. During the first year of operation of the integrated system (UF + RO), the modus operandi of the ultrafiltration has been optimized in order to ensure smooth operation and low chemical consumption. Thanks to this optimization the filtrate produced is of extremely good quality in terms of turbidity and the measured values of SDI15 and MFI0.45-15 have been constantly below 2.1. Additionally, as a result of this optimization and of the stable performance of the ultrafiltration, the reverse osmosis units have been operating according to the expectations, i.e., very low permeate flow loss over the first twelve months and perfectly achieved quality requirements. More in detail, the current fouling factor in all three reverse osmosis lines is around 0.85 and the salt content in the permeate is approximately 40% lower than the predicted value. It should be also emphasized that the reverse osmosis installation has been successfully run at a flux of 17–18 L/m^2h, which is much higher than the flux that a conventional pretreatment would have permitted.

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