Evaluation of transparent exopolymer particles and microbial communities found post-UV light, multimedia and cartridge filtration pre-treatment in a SWRO plant

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ABSTRACT

Seawater reverse osmosis desalination is affected greatly by membrane biofouling which reduces membrane lifetimes and increases cost of permeate production. This work reports on the analysis of pre-treated seawater from a small-scale desalination plant operating with a three-stage pre-treatment system namely, (1) medium-pressure ultraviolet (MP-UV) disinfection, (2) multimedia filtration (MMF), and then finally, (3) cartridge filtration. Transparent exopolymeric particles (TEPs), chlorophyll a, phytoplankton, bacteria and viruses were evaluated in the pre-treated seawater after each pre-treatment stage over a one-year period (July 2012–July 2013). The concentration of TEPs was found to occasionally increase after MP-UV disinfection. MP-UV disinfection had no effect on the phytoplankton, bacterial or viral cell counts. In contrast, MMF was shown to be the most efficient step in removing TEPs and micro-organisms from seawater, while this removal was less significant for viruses. Cartridge filters had limited efficiency. Phytoplankton was observed to be more efficiently removed compared to bacteria. Although phytoplankton removal rates varied over time and were dependent upon cell size and shape, most of the micro-organisms were removed from seawater throughout the period of study. Investigating the seawater pre-treatment system during different season provided, thus, useful insights on its efficiency.

Keywords: Desalination; TEP; Pre-treatment; Biofilm; Microalgae; Micro-organisms; Fouling

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