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Performance of ultrafiltration and coagulation in an UF-RO seawater desalination demonstration plant

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ABSTRACT

Evides Water Company is conducting extensive test work in an open intake ultrafiltration reverse osmosis (UF-RO) sea water desalination demonstration plant in the Oosterschelde area, South-Western Netherlands. Efficacy of chemically enhanced backwash (CEB) and coagulant in maintaining UF permeability were studied. It appeared that long CEB intervals (>3 – >7 d) and hence low chemical consumptions were attained for the period July–February without coagulant and at moderate flux (55 l $m^{-2}h^{-1}$). For the period March–June, UF fouling accelerated, shortening CEB interval to 0.5 d. For 4 weeks in April–May severe UF fouling rendered operation without coagulant practically impossible. Therefore, coagulation was still required to overcome that period, whereas for the remainder of time (i.e., 90%) no benefit of coagulation became yet apparent, neither in filtrate quality, nor in UF operation. Observed UF fouling coincided with algal bloom, whereas raw water turbidity up to 50 FTU did not affect UF performance. If coagulation was applied, low doses (PACL, 0.3–0.5 mg l^{-1} Al^{3+} and ferric, 1 mg l^{-1} Fe^{3+}) sufficed to restore long CEB intervals. However, PACL caused unacceptable degradation of SWRO membrane condition, whereas effects of ferric are still to be determined.

Keywords: Coagulation; Seawater desalination; Ultrafiltration; Pretreatment; Algal bloom

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