Three years operational experience with ultrafiltration as SWRO pre-treatment during algal bloom

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ABSTRACT

In the period 2009–2012 Evides conducted extensive research with an open intake UF-SWRO desalination demonstration plant in the Oosterschelde area, Netherlands. Major attention was devoted to the performance of ultrafiltration (UF) as pre-treatment. It was established that in the period from July to March, i.e. outside Spring, limited UF fouling occurred and the UF could be operated continuously without coagulation and at limited chemical consumption. However, during the period April–June, UF fouling rate (i.e. permeability decline) increased severely. This coincided with the occurrence of algal bloom, as manifested by peak levels of algal count, chlorophyll and transparent exopolymer particles (TEP, as measured by Unesco-IHE). During the algal bloom, implementation of inline coagulation by ferric chloride was required. In 2010, coagulation was conducted by dosing in the UF buffer tank. However, UF operation appeared unstable, requiring increased coagulant doses (1–4 mg Fe/L). In Spring 2011, the dosing point was relocated to the UF feed pump suction side i.e closer to the UF skid. Now, a stable UF operation was accomplished for several weeks continuously at low doses (<0.5 mg Fe/L). Therefore, the latter setup appeared promising for restoring a stable UF operation during algal bloom. The exact impact of the various regimes of mixing, floc formation and waste water recirculation on the interaction with (algal) foulants and UF membrane capillaries and the resultant operational stability of UF performance during algal bloom warrant further research efforts.

Keywords: Seawater desalination; Ultrafiltration pre-treatment; Algal bloom; Coagulation

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