



## Ultrafiltration used as pre-treatment for SWRO desalination: dynamic coagulant control under extreme conditions

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### ABSTRACT

The increasing global needs of individuals, communities, industries and countries cause a worldwide stressed water infrastructure. The new AquaFlex ultrafiltration (UF) technology addresses these emerging circumstances by delivering a water purification technology for municipalities and industries worldwide to secure their future potable and process water requirements. The concept is specifically designed for the treatment of seawater, surface water and polishing of effluents. The newly upgraded AquaFlex UF system combines the vertical design of Pentair X-Flow's AquaFlex inside-out technology with the advantages of a minor bleed flow across the membrane surface as well as a module with a larger surface area. This allows your system to be designed with higher flux rates and a reduced footprint, thus providing the flexibility to treat a broader range of feed water qualities. In order to achieve a stable operation of the UF process in-line coagulation is often used. The application of in-line coagulation, however, increases the operating costs due to chemicals consumption and the increased disposal costs of the concentrate stream. Hence, it is desirable to develop a good dosing strategy, which applies the minimum addition at which the UF process still shows the desired performance. In this study, a dynamic control algorithm is proposed which enables to control the coagulant dosing, thus minimizing the coagulant consumption without destabilizing the filtration process. The dosing strategy for in-line coagulation was tested successfully at full pilot scale (with 8-inch Pentair X-Flow UF membrane modules). Experiments were carried out for both surface water from a canal in The Netherlands and seawater with strongly changing characteristics during the season. Compared to the current coagulant dosing strategy, a large reduction in coagulant consumption was achieved; in average up to 75%!

*Keywords:* Ultrafiltration; In-line coagulation; Dynamic control and optimization; Surface water; Seawater; Pre-treatment

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