

# Finding the biofouling control balance for SWRO plants

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## **ABSTRACT**

This paper focusses on biofouling issues sea water reverse osmosis plants (SWRO) are experiencing. Finding the balance of an optimum intake seawater system and the prevention of biofouling growth on the reverse osmosis (RO) membranes, presents significant operational challenges for plant owners and operators. With seawater, a variety of marine biofouling organisms enter the intake system. Intake structures are in general, an ideal environment and provide optimal conditions for settlement and growth of marine biofouling organisms. Marine biofouling results in an increased wall roughness and reduction of the inner pipe diameter which leads to a significant head loss in the intake structure. This has a high impact on the operational reliability of the intake system and often results in an unplanned shutdown. To prevent settlement and growth of marine biofouling species, biocides are generally dosed at the seawater intake. Chlorine (as sodium hypochlorite) is used at many SWRO plants to prevent marine growth in the seawater intake however, this has a direct impact on the rate of organics and biofouling growth on the RO membranes. There is clear evidence that the use of chlorine oxidises large organic molecules in the seawater, breaking them down into smaller organic species. The large organic molecules generally exhibit a relatively low biodegradability and a proportion of them can be removed to varying degrees by pre-treatment processes (coagulation, sand filtration, membrane filtration). In contrast, the smaller organic molecules exhibit a much higher biodegradability and cannot be sufficiently removed by coagulation or membrane filtration processes. As a consequence, whilst the use of chlorine in intake pipes can control the rate of growth in the seawater intake it does have an adverse affect on the downstream processes and in particular, the RO membranes. Establishing the correct methodology in terms of chlorination is essential to maintain a balance between the condition of the sea water intake system and the long term operability of the SWRO plant.

**Keywords:** Desalination, biofouling, Chlorine, membrane fouling, operational reliability

