



## Fouling reduction by formation of iron oxide cake layer on the pretreatment membrane in an SWRO plant

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### ABSTRACT

There has been a recent increase in the interest for desalination technologies, and this has also brought attention to the importance of pretreatment processes. Applying the appropriate pretreatment processes makes it possible to improve the efficiency of reverse osmosis, as the primary treatment, as well to improve the output of the entire desalination process. Although pretreatment methods using microfiltration and ultrafiltration, which are able to produce a permeate with stable qualities, have been actively considered, fouling inevitably occurs in these membranes, so it is important to actively investigate methods to reduce fouling. In this study, iron oxide was used to apply a pretreatment process in order to reduce membrane fouling in a seawater reverse osmosis plant since iron oxide has a high removal efficiency for dissolved organic carbons in seawater which has a high ionic strength. Powdered iron oxide was used to form a cake layer on the surface of the dynamic membrane in order to improve the membrane performance, and as a result, an additional, temporary intensive process will not be necessary when there is an algal bloom. This study investigated whether the dynamic membrane filtration system could operate in a stable manner without additional injection by forming a cake layer with iron oxide on the surface of the membrane at the beginning of the operation. The results indicate that stable operation was in fact achieved, even when the backwashing flow rate was applied at  $0.67 Q$  compared with filtration flow rate ( $Q$ ) without aeration. This is because the membrane fouling loading was reduced by the presence of the iron oxide, and the membrane performance improved as a result. This method is thus expected to increase the recovery rate of the pretreatment processes and to reduce maintenance costs.

*Keywords:* Iron oxide; Dynamic membrane filtration; Pretreatment; Fouling; Desalination

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