

## Pretreatment of seawater for biodegradable organic content removal using membrane bioreactor

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### Abstract

Reverse osmosis (RO) is currently one of the most prevalent methods used for seawater desalination. During the past four decades, the research and development has reduced the energy consumption from about 20 to 4 kWh/m<sup>3</sup>, while improvements in membrane science has led to a 20-fold increase in the specific membrane flux. Nevertheless, research is still underway to reduce the operation and maintenance problems and thus improve the performance of RO systems. The most important maintenance problem associated with RO operation is the membrane fouling, especially biological fouling (biofouling). This work focuses on the aspects to eliminate biofouling in RO membranes, by adopting a proper pretreatment system. The experimental results revealed that fluidized bed biological granular activated carbon, at 15 min empty bed contact time (with dissolved organic carbon, DOC concentration of 6–8 mg/L) can be utilized effectively to remove nearly 100% biodegradable DOC from seawater. Continuous experiments of membrane bioreactor (MBR) have been conducted concomitantly to gain insight into the long-term effects of MBR on biodegradable organic content removal and biofouling control. The results show that MBR system produced better effluent with 78% DOC removal and quasi-total biodegradable DOC removal. Dissolved oxygen was not a limiting factor for the DOC degradation. Short-term experimental runs were conducted with RO membrane using both pretreated and non-pretreated seawater. The results showed that filtrate from MBR yielded the highest permeate flux improvement, which was approximately 300% compared with non-pretreated seawater.

**Keywords:** Biodegradable organic matter; Biofouling; Membrane bioreactor; Microfiltration; Pretreatment; Reverse osmosis

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