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Pre-ozonation for high recovery of nanofiltration (NF) membrane system:
Membrane fouling reduction and trace organic compound attenuation

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Abstract

This study demonstrated the use of nanofiltration (NF) membrane with pre-ozonation for surface water brine treatment. Pre-ozonation, used for fouling control, with relatively low ozone doses (0.1–0.4 mg O₃/mg DOC ratios) significantly reduced organic fouling potential. A classical pore blocking model revealed that the dominant fouling mechanism was cake filtration. Based on a statistical correlation test, macromolecules (apparent molecular weight >10k Da) of typtophan-like aromatic protein and soluble microbial-like matter exhibited strong correlation to fouling potential. Small molecules (<1600 Da) of UV-absorbing matter were also correlated with fouling potential whereas bulk parameters such as SUVA displayed relatively lower correlation with fouling potential. Trace organic compound (TO_rC) attenuation by ozone, membranes, and combination of ozone and membranes were also examined. Greater than 70% removal of the 17 TO_rCs was achieved at 0.4 mg O₃/mg DOC ratio. The NF membrane (NF90) alone also could remove more than 90% of TO_rCs. When pre-ozonation was performed with the NF membrane,

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