

Membrane fouling in nanofiltration/reverse osmosis membranes coupled with a membrane bioreactor used for municipal wastewater treatment

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Received 3 June 2009; Accepted 15 January 2010

ABSTRACT

Securing a new water resource is becoming an important issue as severe shortage of water is seen throughout the world. Reuse of highly treated wastewater can be a viable option to address this issue. In this study, an advanced wastewater treatment system comprised of a membrane bioreactor followed by nanofiltration (NF) and reverse osmosis (RO) membranes was examined at pilot-scale with real wastewater. Treatment performance of the system was evaluated on the basis of 40 days continuous operation. At the end of the operation, membrane fouling in NF/RO membranes was investigated by disassembling the membrane modules. Although there was no significant difference in water qualities of the permeates between the NF and the RO membranes, membrane fouling was more significant in the NF membrane than in the RO membrane. After disassembling the membrane modules, a portion of the fouled membranes was cleaned stepwise and pure water permeabilities of the membrane specimen at each cleaning step were determined with a bench-scale cross-flow filtration unit. It was revealed that contribution of the cake/gel layers to the total filtration resistance was limited in both NF and RO membranes. It was found that inorganic matter, particularly silica, was main foulant in the NF membrane whereas organic matter mainly caused fouling in the RO membrane.

Keywords: Wastewater treatment; Nanofiltration membrane; Reverse osmosis membrane; Membrane fouling

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