Desalination and Water Treatment
www.deswater.com

doi: 10.5004/dwt.2017.21441

95 (2017) 18–33
November

Performance of nanofiltration and reverse osmosis after membrane bioreactor for urban source-separated urine treatment and water reuse

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Received 25 April 2017; Accepted 13 September 2017

ABSTRACT

In the context of wastewater treatment and reuse, separating urine from domestic wastewater promotes a more flexible and sustainable municipal treatment system and has attracted considerable attention in the scientific community. This study investigated the feasibility of applying nanofiltration (NF) and reverse osmosis (RO) as a complementary treatment after membrane bioreactor (MBR) treatment of source-separated urine. Experiments were conducted on a lab scale with a synthetic effluent containing natural organic matter representative of urine after MBR treatment. The performances of NF and RO in terms of productivity and water quality were compared. NF and RO could remove more than 95% of total organic carbon which is composed mainly of humic and fulvic acids. NF could only reduce the conductivity by less than 45% whereas RO removed more than 80% of ions which would make water reuse more feasible. A complete short-term fouling analysis by membrane autopsy was performed in order to understand the different contributions of organic and inorganic components on NF and RO fouling. The obtained results showed that NF was more prone to scaling as water rinsing and chemical cleaning were not fully effective in removing mineral deposits. RO seemed less prone to organic fouling and scaling than NF.

Keywords: Urine treatment; Wastewater reuse; Nanofiltration; Reverse osmosis; Source separation

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