Desalination and Water Treatment
www.deswater.com
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doi: 10.5004/dwt.2009.256

2 (2009) 195–202
February

Evaluation of membrane fouling mechanism in various membrane pretreatment processes

C.W. Jung[a]*, H.J. Son[b]

[a]*Ulsan Regional Innovation Agency, Ulsan Industry Promotion Techno Park, Ulsan, Republic of Korea*
Tel: +82 52 219 8562; Fax: +82 52 289 8334; email: cwjung@uria.or.kr
[b]*Busan Water Quality Institute, 421-1 Maeri, Sangdongmyun, Kimhae, 621-813, Republic of Korea*

Received 24 July 2007; Accepted 20 August 2008

ABSTRACT

Pretreatment of organic matter with coagulation and MIEX® was evaluated using bench-scale experimental procedures on NOM to determine its effect on subsequent UF or MF membrane filtration. Moreover, this work determines the membrane fouling mechanisms according to membrane pretreatment conditions. When applying the MIEX® process as a pretreatment, flux decline was significantly higher than that of the coagulation process. The flux decline curves for MF membranes are very different from the curves for UF membranes presented earlier. It is very interesting that while the MIEX®–UF process shows much higher removal of DOC than that of coagulation, the rate of flux decline was significantly greater. In addition, when comparing coagulation with MIEX®, coagulation caused a lower rate of flux decline for both hydrophilic and hydrophobic membranes due to enhanced formation of flocs. The permeate flux rapidly declined due to simultaneous pore blocking and cake formation. Also, the permeate flux declined with decreasing internal pore size resulting from particle deposition into the membrane pore. In addition, the experimental results prove that the MIEX® and coagulation pretreatment significantly reduced the fouling of the membrane. Especially, the combination of MIEX®+coagulation pretreatment significantly reduced membrane fouling. Consequently, applying a pretreatment process before UF was found to be very effective in fouling reduction as well as critical flux increase.

Keywords: NOM; Membrane fouling; Coagulation; MIEX®; Pretreatment

* Corresponding author.