Desalination and Water Treatment
www.deswater.com

32 (2011) 256–261
August

1944-3994 / 1944-3986 © 2011 Desalination Publications. All rights reserved.
doi: 10.5004/dwt.2011.2708

Effect of a longer cleaning-frequency period on nanofiltration membrane fouling for long-term water supply production

Thanakorn Methatham, Chavalit Ratanatamskul*

Department of Environmental Engineering, Faculty of Engineering, Chulalongkorn University, Bangkok 10330, Thailand
Tel. +66 (81) 614-8623; Fax +66 (2) 218-6678; email: dr_chawalit@yahoo.com

Received 30 July 2010; Accepted in revised form 30 December 2010

ABSTRACT

A decline in membrane flux is recognized to occur for a long-term period of system operation and then followed by fouling later. Cleaning of membranes to restore the permeate flux is needed. This research focuses on the effect of a cleaning frequency period on nanofiltration membrane fouling for long-term water supply production. The experiments were conducted in a pilot-scale system, using the treated water after sand filtration from Bangkhen water treatment plant in Bangkok city. Microfiltration process was used as a pre-treatment before nanofiltration process. From the experimental results, it was found that providing a longer cleaning-frequency period of a nanofiltration system tended to decrease in the permeate flux. The flux dropped at around 16, 40, and 71% from the initial stage for each phase of 1, 2, and 3, respectively. Phase 1, 2, and 3 refer to a cleaning frequency period at every 30, 40, and 45% flux drop, respectively. Moreover, for phase 3, it was found that there was no flux recovery at the end of cycle 2, meaning that pore blocking was predominant and the result was confirmed by a pore-blocking mathematical model. In this experiment, the mechanism of fouling started with membrane resistance followed by cake formation, and finally pore blocking mechanism. Furthermore, nanofiltration fouling index (NFI) was developed in this study to indicate a degree of fouling and to prevent irreversible membranes. The NFI less than 0.6 could indicate severe membrane fouling due to pore blocking phenomena. The experiment also suggested that cleaning of nanofiltration membranes should be conducted before 40% of flux decline because the membrane flux could be able to restore with high treatment efficiency.

Keywords: Nanofiltration membrane; Fouling; Nanofiltration fouling index (NFI); Membrane cleaning period; Long-term water supply production

* Corresponding author.