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Analysis of membrane fouling in a pilot-scale microfiltration plant using mathematical model and artificial neural network model

Younjong Park[a], Yongjun Choi[b], Sangho Lee[b,*]

[a]*Research Center, SK Engineerign & Construction, SK E&C Building, 192-18 Gwanhoon-dong, Jongno-gu, Seoul 100-130, Korea*
[b]*School of Civil and Environmental Engineering, Kookmin University, Jeongneung-Dong, Seongbuk-Gu, Seoul 136-702, Korea, Tel. +82-2-910-4529; Fax: +82-2-910-4939; email: sanghlee@kookmin.ac.kr*

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ABSTRACT

Since membrane fouling is one of major challenges in hollow fiber microfiltration (MF) membrane processes, many studies have been done to analyze and control it in laboratory-scale systems. However, relatively few works have been accomplished for fundamental understanding of the fouling in pilot- or full-scale systems. Accordingly, this study intended to predict membrane fouling in a pilot-scale MF plant using a mathematical model and a statistical model based on artificial neural network (ANN). The effects of temperature, turbidity, total organic carbon, total operating time, and filtration time after chemical cleaning on the membrane fouling were considered. The major fouling mechanism was determined to be cake formation regardless of feed water quality changes. The cake formation model was found to be useful in explaining the membrane fouling in the short-term prediction of pilot-scale hollow fiber submerged membrane system. The results of application of the ANN model indicated high correlation coefficient between the measured and predicted output variables. Therefore, it appears that the ANN model is applicable in the long-term prediction of the membrane performance at different water qualities of the pilot-scale system.

Keywords: Microfiltration; Mathematical model; Artificial neural network; Drinking water; Submerged

* Corresponding author.