Adaptive model and model selection for long-term transmembrane pressure prediction in membrane bioreactors

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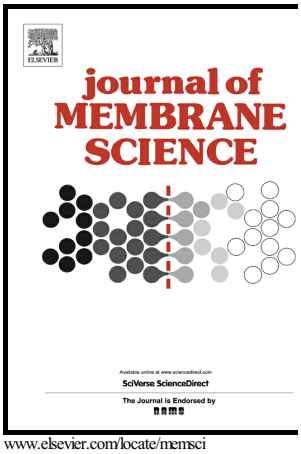

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PII: S0376-7388(15)30031-4
DOI: http://dx.doi.org/10.1016/j.memsci.2015.07.002
Reference: MEMSCI13821

To appear in: *Journal of Membrane Science*

Received date: 7 January 2015
Revised date: 10 May 2015
Accepted date: 1 July 2015

Cite this article as: H. Oishi, H. Kaneko and K. Funatsu, Adaptive model and model selection for long-term transmembrane pressure prediction in membrane bioreactors, *Journal of Membrane Science* http://dx.doi.org/10.1016/j.memsci.2015.07.002

Adaptive model and model selection for long-term transmembrane pressure prediction in membrane bioreactors

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Abstract

Fouling is one of the most significant problems in membrane bioreactors (MBRs). Membranes must be washed with chemicals at appropriate times before severe fouling occurs. Long-term transmembrane pressure (TMP) prediction is attempted to plan the schedule for chemical cleaning. TMP is directly proportional to membrane resistance caused by fouling under the condition of constant-rate filtration. Statistical models have previously been used to predict TMP from operating parameters in MBRs. However, TMP predictions are difficult when operating conditions or water quality varies. We therefore propose to introduce adaptation and selection mechanisms to statistical models. Multiple TMP prediction models are updated with new measurements and a target model is selected, based on the predictive ability of the models, for long-term TMP prediction. Through case studies using two data sets obtained from actual MBRs, we confirmed that the performance of long-term TMP prediction was improved by using the proposed method because the models can adapt appropriately to changes in operating conditions or water quality.

Keywords

fouling prediction; membrane resistance; long-term transmembrane pressure prediction; statistical model; cleaning schedule