



SDI: is it a reliable fouling index?

A. Alhadidi^{a,*}, A.J.B. Kemperman^a, J.C. Schippers^b, M. Wessling^a, W.G.J. van der Meer^a

^aMembrane Technology Group, MESA Institute for Nanotechnology, Faculty of Science and Technology, University of Twente, PO Box 217, 7500 AE Enschede, The Netherlands

Tel. +31 53 489 2961; Fax: +31 53 489 4611; email: a.m.m.al-hadidi@tnw.utwente.nl

^bUNESCO-IHE Delft, Westvest7, P.O. Box 3015, 2601DA Delft, The Netherlands

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ABSTRACT

The ASTM considers the silt density index (SDI) test as a standard test for fouling potential of RO and NF feed waters. Up to date, the SDI is used at many full- and pilot-scale installations. The design and choice of the applied RO pretreatment is to a large extent based on the SDI test on the raw feed water. Comparing and monitoring UF/MF membrane performance is another SDI application. From a practical point of view, the SDI of RO feed water preferably should be lower than 3. The SDI has several disadvantages making it an unreliable test. The SDI has a non linear relationship with the colloidal concentration in the water and it is not corrected for the feed water temperature. Besides that, the SDI is not based on any filtration model. SDI is trying to simulate the RO fouling using dead-end MF membrane. The modified fouling index (MFI) is another fouling index. The MFI is based on the cake filtration model, can be corrected for pressure and temperature and is therefore used as a promising alternative for the SDI. Nevertheless, the procedure of measuring a MFI is more difficult and not directly suitable for carrying out “in the field”. The objective of this study therefore is to determine a theoretical relationship between SDI and MFI, and to validate this with experimental results. This relationship can be used to investigate the influence of membrane and testing parameters on SDI under cake filtration conditions, implying this model is valid for cake filtration mechanism and a particle rejection of 100%. In order to calculate the SDI, the times t_1 and t_2 for collecting the first and second sample are predicted using the measured MFI value and the MFI definition. In this research, the influence of several parameters (such as temperature, membrane resistance, etc.) on the SDI will be shown. The experimental results show a good agreement with the theoretical work, but only if the cake filtration start builds up directly at the beginning of the experiment. In general, this work clearly demonstrates that SDI currently is not reliable test for RO fouling. Either corrections for the SDI are necessary to give a more reliable index, or a new index has to be developed.

Keywords: Fouling index; Silt density index (SDI); Modified fouling index (MFI); Membrane resistance; SDI/MFI mathematical relation; Particle concentration

*Corresponding author.