

Development of the Modified Fouling Index for the Assessment of Membrane Fouling Propensity

Javeed Mohammed Abdul – Masters Thesis Abstract
School of Chemical Sciences and Engineering, University of NSW, August 2006

Abstract

Membrane fouling is a function of the fouling propensity of the feed which is measured by a fouling index. The existing fouling indices such as silt density index SDI and modified fouling index MFI tends to inaccurately estimate the fouling propensity of the feed due to their inherent experimental test incompatibilities compared with the field conditions. A novel method of estimating the MFI due to the foulants that actually cause the membrane fouling was therefore examined in this study. The modified method called CFS-MFI estimated the fouling potential of the feed in crossflow filtration mode at constant applied flux using pure (latex polystyrene and silica spheres) and mixed (mixture of latex and silica feeds) model feeds. The MFI of the mixed feeds was higher than the pure feeds for the same concentrations of the feeds. The higher MFI of mixed feeds was due to feed polydispersity and the fouling mechanisms that occurred. Pore blocking and cake filtration were two main fouling mechanisms that occurred in all the feeds. Cake plugging i.e. filling of the voids of the cake formed by large silica particles by small latex particles with the mixed feed decreased the cake porosity and increased the specific cake resistance and MFI. The cake plugging occurred with mixed feed due to the convection of particles of all sizes on to membrane surface in MFI test at high constant applied pressure (210 kPa). The contribution to the membrane fouling from the large particles was significant in the standard MFI test. However, in membrane processes (to which the MFI data is applied) the larger particles seldom deposit on the membrane surface due to back diffusive forces of crossflow filtration. CFS-MFI used a crossflow sampler that allowed only particles which cause the membrane fouling to the standard MFI test. The CFS-MFI (of the mixed feeds) was equal to latex content (concentration) of the mixed feed i.e. the fouling due to foulants that actually caused the membrane fouling, The CFS-MFI estimated the fouling potential in conditions that better simulated the fouling in membrane processes such as RO.