Thirdpong Srisukphun 2009: Study of Fouling Mechanism and Fouling Indicators of Reverse Osmosis Membrane for Enhancing Reuse Potential of Wastewater from Textile Industry. Doctor of Engineering (Environmental Engineering), Major Field: Environmental Engineering, Department of Environmental Engineering.
Thesis Advisor: Associate Professor Chart Chiemchaisri, D.Eng. 130 pages.

This research studied the fouling mechanism and developed mathematical model predicting flux decline during yarn and knit dyeing wastewater reclamation using reverse osmosis (RO) membrane. It was found that RO flux rapidly decreased at initial period of operation and slightly decreased in long-term. The main cause of fouling was the organic foulants and sequential cleaning using the alkaline solution followed by acid solution was the most effective procedure in this study. Flux decline corresponded to the mathematical expression using variable fouling index. The operation data of 7 days or more from bench-scale provided a promising agreement for predicting flux decline in long-term operation of larger scale system.

The non-ionic surfactant was found to be the major organic foulant. When its concentration was maintaining lower than the critical micelle concentration (CMC, 1.62 mM as C), permeate flux was influenced by the concentration. In contrary, the increasing surfactant concentration above CMC did not yield further flux decline due to the micellisation. The aggregation of effluent organic matters (EfOMs) & dye, EfOMs & surfactants, and dye & non-ionic surfactant enhanced flux. A mathematical model assuming competitive deposition of monomers and aggregates, which reduces fouling of monomers, could successfully predict RO flux. The important model parameters were the initial fouling time and the reduction of available site, which was proposed corresponding to the foulant concentration, and fouling coefficient.

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