

Evaluation of Chemical Cleaning Efficiency of Fouled RO membrane using FO Testing Set-up

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Reverse osmosis (RO), a pressure-driven membrane process, has been widely used in the field of wastewater reclamation and desalination owing to its inherent advantages such as high contaminant rejection, simple operation, and low space requirement. However, a major problem of the RO membrane process is fouling. The fouling is compact and dense due to the high applied pressure, leading to the decrease in membrane permeability. To restore the membrane performance, a chemical cleaning process has been highlighted. To reduce the set-up installation as high-pressure pump and stainless-steel pipes in RO process, FO testing set-up which can be operated with low or no hydraulic pressure was conducted for performing the cleaning efficiency. In this work, the performance of different available chemical cleaning agents from companies, including A, B, C, D and E to clean fouled RO membrane tested by FO set-up were evaluated. Organic and inorganic fouled membranes were chemically cleaned with two steps for each chemical cleaning agent as recommended by the RO cleaning chemical supplier, then the membrane pieces were thoroughly rinsed with DI water. After that, each membrane sample was placed with the active layer facing the feed solution in the FO membrane cell for investigating the chemical cleaning efficiencies examined in term of membrane permeability. DI water and 2M NaCl were used as feed and draw solution, respectively. According to the membrane permeability results, the B agent, which cleaned with 2% organic cleaning solution followed by 2% inorganic cleaning solution, could provide a better performance in an organic fouled membrane cleaning with reverse flux selectivity of 0.40 L/mmol. While D agent which cleaned with 2% inorganic cleaning solution followed by 2% organic cleaning solution, provided a better performance in an inorganic fouled membrane cleaning with reverse flux selectivity of 0.55 L/mmol. However, the major effect to cleaning efficiency was the efficiency of the composition in chemical cleaning agent and the proper conditions not the sequence of chemical cleaning. The proper selection of the cleaning chemical could restore the membrane performance better than the improper chemical selection.