Numerical Estimation of Hollow Fiber Membrane for Mobile Water Treatment

Abstrak

In the application of water treatment system, membrane has gained favour in the industry as well as in the research field. In pressure-driven category, ultrafiltration membrane with pore size of 3 to 10 nm is one of the choices for water treatment application. With the advantages of being compacted and self-supporting, hollow fiber membrane configuration has been widely used as ultrafiltration membrane. This is an important feature for a mobile water treatment system developed in this work. The mobile water treatment system is investigated in terms of its operational performance focusing for simple setup configuration. Mobility of the membrane treatment system in this work is aim to develop a stand-alone membrane water treatment system that can operates without electricity. Therefore, the system targeted to be a self-sufficient in rural areas where electricity and delivery of spare parts are difficult. A membrane filtration system with outside-in hollow fiber membrane is developed. The numerical approach of Response Surface Method (RSM) is used to estimate and optimize the flux performance in this work. The operating conditions i.e transmembrane pressure (TMP) as well as the local condition (water temperature) were considered in the numerical estimation. The initial numerical estimation found that the developed mobile system has permeate flux range from 0.422 L/m^2h up to 3.035 L/m^2h for local temperature of 20°C to 35°C and further optimization were discussed in this study.