

Modeling and Simulation of Textile Effluent Treatment Using Ultrafiltration Membrane Technology

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Abstract : The textile industry generates large quantities of wastewater, which poses significant environmental problems due to its complex composition and high levels of pollutants loaded principally with heavy metals, large amounts of COD, and dye. Separation treatment methods are often known for their effectiveness in removing contaminants whereas membrane separation techniques are a promising process for the treatment of textile effluent due to their versatility, efficiency, and low energy requirements. This study focuses on the modeling and simulation of membrane separation technologies with a cross-flow filtration process for textile effluent treatment. It aims to explore the application of mathematical models and computational simulations using ASPEN Plus Software in the prediction of a complex and real effluent separation. The results demonstrate the effectiveness of modeling and simulation techniques in predicting pollutant removal efficiencies with a global deviation percentage of 1.83% between experimental and simulated results; membrane fouling behavior, and overall process performance (hydraulic resistance, membrane porosity) were also estimated and indicating that the membrane losses 10% of its efficiency after 40 min of working.

Keywords : membrane separation, ultrafiltration, textile effluent, modeling, simulation

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