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Simulation and mechanisms of aeration impacts on the permeate flux in submerged membrane systems

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ABSTRACT

This study was designed to investigate the impacts and mechanisms of aeration of the liquid cross-flow along membrane surface, and the air bubble contact with membrane surface on the permeate flux in a submerged membrane system. The results indicate that the decline of the permeate flux over filtration time and filtered volume could be characterized by an initial short period of fast permeate flux decline, followed by a longer period of slower permeate flux decline, according to an exponential equation. Aeration had a great impact on enhancing the permeate flux. The maximum pseudo-steady state permeate flux and the minimum pseudo-steady-state permeate flux decline coefficient were achieved when the membrane system was operated with aeration. Aeration had a significant impact on the pseudo-steady-state permeate flux and the pseudo-steady-state permeate flux decline coefficient. As the intensity of aeration increased, the pseudo-steady-state permeate flux increased, and the pseudo-steady-state permeate flux decline coefficient decreased. However, there were no significant meanings in pseudo-steady-state permeate flux and pseudo-steady-state permeate flux decline coefficient if the aeration intensity is operated too high. Throughout this study, a better knowledge of aeration impacts and mechanisms are gained, and the submerged membrane systems could be designed and operated so as to maximize the permeate flux.

Keywords: Submerged membrane system; Aeration; Permeate flux; Impacts; Simulation; Mechanisms