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New and practical mathematical model of membrane fouling in an aerobic submerged membrane bioreactor

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Abstract

This study aimed to develop a practical semi-empirical mathematical model of membrane fouling that accounts for cake formation on the membrane and its pore blocking as the major processes of membrane fouling. In the developed model, the concentration of mixed liquor suspended solid is used as a lumped parameter to describe the formation of cake layer including the biofilm. The new model considers the combined effect of aeration and backwash on the foulants' detachment from the membrane. New exponential coefficients are also included in the model to describe the exponential increase of transmembrane pressure that typically occurs after the initial stage of an MBR operation. The model was validated using experimental data obtained from a lab-scale aerobic sponge-submerged membrane bioreactor (MBR), and the simulation of the model agreed well with the experimental findings.

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