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Enhancing filterability of flat-sheet membrane by addition of cationic polymer for sludge thickening system

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ABSTRACT

The efficiency of coagulation-coupled membrane filtration as an alternative process for sludge thickening was evaluated using various parameters that could influence the thickened sludge, such as mixed liquor suspended solids (MLSS) concentration, viscosity, critical flux and soluble microbial products. Dead-end filtration experiment and determination of critical flux were conducted to investigate the change in permeation across the membrane after addition of coagulant. PVDF flat-sheet membrane with 0.08 μm pore size was used in the experiment. Two separate submerged systems were run in parallel, one with coagulant and the other served as the control. A significant difference between the transmembrane pressures (TMPs) of the two systems was observed. It was found that an increase in soluble microbial products (SMPs) concentration decreases filtration flux, which in turn increases TMP. PSD analysis confirmed that larger flocs were formed after addition of coagulant. Confocal laser scanning microscopy (CLSM) and scanning electron microscopy (SEM) images revealed that the cake resistance was the major contributor in membrane fouling and the coagulated sludge has less potential of pore blocking compared with the normal sludge. In general, deposition of small particles that causes membrane fouling can be decreased by the addition of coagulant, which increases the size of the particle, thus preventing flux decline and TMP increase.

Keywords: Flat-sheet membrane; Sludge thickening; Coagulation; Cationic polymer; Membrane fouling

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