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Performance of a stainless steel membrane in membrane bioreactor process

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ABSTRACT

Stainless steel membrane has recently emerged as a durable membrane for microfiltration. An aerobic membrane bioreactor (MBR) equipped with a tubular stainless steel membrane of pore size 0.3 μm was submerged in a wastewater reactor to treat municipal wastewater of about 1,000 mg/L COD. The membrane operational performance was tested at three different permeate flux (7.5, 10 and 15 $L/m^2 h$ [LMH]) for 2 days each. In all cases, the rate of trans-membrane pressure (TMP) rise was very high at 30, 45 and 80 kPa for 7.5, 10 and 15 LMH, respectively. Different analytical techniques i.e. particle size distribution, UV spectrometry, fluorescent spectrometry and size exclusion chromatography were used to study the nature of mixed liquor and the fouling deposited on the membrane surface. Rapid rise of TMP and decrease in permeate flux was observed during the experiment. Analysis of the fouling indicated a negligible difference in nature of organics between it and the mixed liquor. Filtration flux test showed a high sludge cake and pore-blocking resistance of 4.4×10^{19} and $2.8 \times 10^{16}\ m^{-1}$, respectively, compared to a clean membrane resistance $5.4 \times 10^{12}\ m^{-1}$. The similar nature of organics in the mixed liquor and the foulant and recovery of flux after removal of the foulant after gentle washing in water, indicated a rapid sludge accumulation rather than the irreversible fouling.

Keywords: Stainless steel membrane; Membrane bioreactor; Municipal wastewater; Foulant

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