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# Performance of a flat-sheet submerged membrane bioreactor during long-term treatment of municipal wastewater

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**ABSTRACT**

A pilot-scale submerged membrane bioreactor (SMBR) with anoxic and oxic tanks was operated in an attempt to reduce the problems concerning effective removal of organic matter and nutrients from municipal wastewater. A flat type membrane with a pore size of 0.038 μm and having a total surface area of 3.60 $m^2$ was used in the experiments. During the operation, MLSS concentration in aeration (oxic) tank of SMBR was maintained at about 5–7 g/l. Influent and effluent pH in the SMBR also changed between 7.3–8.4. Raw wastewater with average chemical oxygen demand (COD): total nitrogen (TN) ratio of 12:2 was treated at various temperatures (10–30 °C) over an interval of about 160 d. When average influent nutrient mass ratio (COD:TN:TP) was 100:8.2:1.2 and $BOD_5$:COD ratio was 0.5, removal efficiencies of COD, $BOD_5$, TSS, TN and TP were 99.1%, 99.3%, 99.4%, 43.4% and 68.2%, respectively. Nitrification occurred in the aerobic reactor with $NH_4^+$–N removal efficiency ranging from 88.7 to 99.7% averaging at 97.8%. Nitrogen removal in the SMBR was limited not by nitrification but by denitrification. Increase in the concentration of TN in the treated water can be explained by increases in the concentration of $NO_3^-$–N.

*Keywords:* COD; Municipal wastewater; Pilot scale SMBR; Total nitrogen; Total phosphorus

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