Public Abstract

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Graduation Term:FS 2011

Department:Civil Engineering

Degree:PhD

Title:Membrane Wastewater Treatment Processes for Improved Nutrient Removal and Degradation of Synthetic Organic Nitrogen Compounds

ABSTRACT

The eutrophication problem in US wastewater treatment plants becomes more serious with increasing discharge of nutrients from wastewater to water bodies. The US EPA has required more stringent discharge standards on nutrients for higher effluent water quality. The main objective of this research is to investigate cost-effective and efficient environmental technologies such as membrane bioreactors (MBR) and membrane aerated biofilm reactors (MABR) for improved nitrogen removal and recalcitrant organic nitrogen compounds removal.

In this research, the MABR process had demonstrated efficient organic matter and nitrogen removal through simultaneous nitrification and denitrification with low sludge production. The metabolic selection via alternating anoxic/aerobic processes in the modified Ludzack-Ettinger (MLE) type MBR systems resulted in higher bacterial activities and improved nutrient removal than those of integrated fixed-film MBR (IFMBR) systems. The results of a start-up performance study of MBR systems indicated that MBR process configuration and reactor type affect MBR performance, membrane fouling, nutrient removal, and biomass activities. The high biomass MBR systems demonstrated good and stable nitrophenol biodegradation performance with simultaneous nitrogen removal. . The membrane flux and TMP profiles suggested that continuous stirred-tank reactor (CSTR) reactor type MBR appeared to have much better membrane fouling control performance than that of the pseudo-plug-flow-reactor type of MLE-MBR due to the difference of metabolic uncoupling by nitrophenol compounds in MBR systems.