



Raising nutrients removal efficiency by improving the internal recycling strategy in an anoxic/oxic-membrane bioreactor package plant

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ABSTRACT

The effects of two internal mixed liquor recycling strategies on nutrients removal from municipal wastewater were investigated in an anoxic/oxic-membrane bioreactor package plant with a capacity of 100 m³/d. In the original strategy, in which the mixed liquor was directly pumped back to the anoxic tank from the membrane tank, the removal efficiencies of total nitrogen (TN) and total phosphorus (TP) decreased significantly due to the high dissolved oxygen concentration in the anoxic tank with an increase of the internal recycling rate from 50 to 100%. In contrast, in the improved internal strategy, i.e., the mixed liquor in the membrane tank was returned to the oxic tank with a recycling rate of 150%, and meantime, the mixed liquor in the oxic tank was refluxed to the anoxic tank at a recycling rate of 250%, the average effluent concentration of chemical oxygen demand, NH₄⁺-N, TN, and TP were 25.3, 0.55, 28.89, and 1.71 mg/L, respectively. When external acetic acid (2.66 L/d) was added, the effluent concentration of TN decreased to 8.5 mg/L. In addition, a reduction of membrane fouling with the high nutrients removal efficiency was achieved by the improved strategy as compared with that of the original strategy. PCR–DGGE fingerprints showed that bacterial community in the activated sludge from the tanks had a high similarity under the conditions of the improved strategy. The bacteria belong mainly to phyla-*proteobacteria*, *Firmicutes*, and *Bacteroidetes*, which were important for nitrogen and phosphate removal.

Keywords: Anoxic/oxic-membrane bioreactor package plant; Internal mixed liquor recycling strategy; Membrane fouling; Bacterial community

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