Prolonged reuse of domestic wastewater after membrane bioreactor treatment

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ABSTRACT

In this study, experience in a nine-year operation of a full-scale 2000 PE vacuum rotating membrane bioreactor having a submerged flat-type membrane module having pore size of 0.038 μm and a total surface area of 540 m² is discussed. The plant was designed to treat and reuse raw wastewater collected from dormitories and the academic village at METU campus. Throughout the study, 99.99% BOD₅ and above 95% COD removals were achieved most of the time. Moreover, turbidity was consistently measured below 1 NTU and around 6–7 log coliform removals were achieved with less than 1 coliform/100 mL in the effluents most of the time, except for the leakage from the bearings. During the study, energy consumption by the plant was also analyzed by routinely measuring energy consumption in different parts of the plant. Consumption was analyzed in two parts. Energy consumed by the blower supplying aeration to the biological treatment tank was monitored separately from the rest of the plant. Except for the periods when problems have occurred during operation, the total energy consumption of the system was variable between 1.1 and 2.53 kWh/m³, averaging around 2 kWh/m³. The main problems encountered during operation were poor floc formation and dispersed growth, and sludge deposition between the membrane plates and mechanical malfunction of the bearing seals. The treated wastewaters were stored and used for the irrigation of METU Technopolis lawns.

Keywords: Wastewater treatment; Membrane bioreactor; Prolonged; Reuse

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