Determination of biokinetic coefficients of an immersed membrane bioreactor

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Abstract: In order to design immersed membrane bioreactors (IMBRs) properly, it is essential to comprehend the behavior of microorganisms in such wastewater treatment processes. Moreover, properly designed treatment processes produce discharges that meet the requirements of environmental authorities concerning effluent standards. In this investigation, a lab-scale immersed membrane activated sludge process was operated for a period of more than 1 year to determine the biokinetic coefficients of the IMBR system under different MLSS concentrations of 3000, 5000, 10,000, and 15,000 mg/l and organic loading rates of 0.4-3 kg COD/kg MLSS/day. The investigation showed that the yield (Y), the endogenous decay coefficient (kd), the maximum specific growth rate (μm) and the saturation constant (Ks) were in the range of 0.487-0.583 mg/mg, 0.151-0.0261 day-1, 1.28-6.46 day -1, and 289-2933 mg COD/l, respectively. Values of the coefficients, except that of Ks, were within the range of those reported for conventional activated sludge processes. Values of Ks, especially at MLSS of 15,000 mg/l, were found to be much higher than those reported in the literature for conventional activated sludge processes, which was attributed to the estimation of the decay rate, kd. The results also showed a COD removal efficiency ranging between 80 and 98% was achieved, where the COD removal efficiency was found to increase insignificantly with the increase in the MLSS concentration. The effluent COD was simulated using the biokinetic coefficients determined during the investigation. Sludge production throughout the investigation was found to be on the average of 0.26 mg VSS/mg COD.