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Optimization of the operations conditions in membrane bioreactors through the use of ASM3 model simulations

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ABSTRACT

The aim of this work was the application of the ASM3 models simulations to obtain most favorable operations conditions in membrane bioreactors for efficient organic matter removal, sludge production reduction and oxygen transfer costs. Simulations were realized used the ASM3 model (activated sludge model) for three theoretical influents. The organic load rate (OLR) and the hydraulic retention time (HRT) were fixed at 1 kg COD m^{-3} d^{-1} and 0.4 d^{-1} respectively and the sludge retention time (SRT) was varied from 2.5 d to 67 d. The steady state values of the active biomass concentration (XBH), the total biomass concentration (XSS) (active biomass + inert suspended solid), and the oxygen uptake rate (OUR) were obtained for each condition. Thus the observed conversion yield was evaluated (YOBS). The results show that, if the SRT increases, the XBH increases until a maximal value. In the other hand, a constant increase evolution of the XSS is observed, without reach a saturation value. Therefore, the suspended solids accumulation after this maximal value are due to a dilution of the active biomass by inert compounds coming from endogenous respiration and also, inert influent. If the OLR restricted the amount of active biomass, on the contrary, high SRT induced high XSS concentration, thus generating rheological sludge properties that penalize the phenomena of mixing, oxygenation and membrane separation

Keywords: Wastewater treatment; MBR control; ASM; Active biomass

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