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Modeling Approach to Better Control Fouling in a Submerged Membrane Bioreactor for Wastewater Treatment: Development of Analytical Expressions in Steady-State Using ASM1

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Abstract : This paper presents a dynamic mathematical model of activated sludge which is able to predict the formation and degradation kinetics of SMP (Soluble microbial products) in membrane bioreactor systems. The model is based on a calibrated version of ASM1 with the theory of production and degradation of SMP. The model was calibrated on the experimental data from MBR (Mathematical modeling Membrane bioreactor) pilot plant. Analytical expressions have been developed, describing the concentrations of the main state variables present in the sludge matrix, with the inclusion of only six additional linear differential equations. The objective is to present a new dynamic mathematical model of activated sludge capable of predicting the formation and degradation kinetics of SMP (UAP and BAP) from the submerged membrane bioreactor (BRMI), operating at low organic load (C / N = 3.5), for two sludge retention times (SRT) fixed at 40 days and 60 days, to study their impact on membrane fouling, The modeling study was carried out under the steady-state condition. Analytical expressions were then validated by comparing their results with those obtained by simulations using GPS-X-Hydromantis software. These equations made it possible, by means of modeling approaches (ASM1), to identify the operating and kinetic parameters and help to predict membrane fouling.

Keywords : Activated Sludge Model No. 1 (ASM1), mathematical modeling membrane bioreactor, soluble microbial products, UAP, BAP, Modeling SMP, MBR, heterotrophic biomass
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