Simulation of the influence of wastewater quality indicators and operating parameters of a bioreactor on the variability of nitrogen in outflow and bulking of sludge: data mining approach

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ABSTRACT

A mathematical model to simulate and study the interaction between the content of nitrogen compounds in the outflow of a wastewater treatment plant and the efficiency of activated sludge sedimentation in its secondary clarifiers is presented in this paper. The goal of the model is to control the biological reactor settings (e.g. total nitrogen (TN) and sedimentation properties of the sludge) in case of discontinuity of quality indicators at wastewater inflow. Such an approach has not been applied so far. Continuity of calculated numerical values of model-dependent variables (TN, sludge volume index) was obtained by replacing the independent variables with the results of calculations obtained using the statistical models. Data mining methods were used to simulate the content of nitrogen compounds at the wastewater outlet. To simulate active sludge sedimentation a classification model based on the logistic regression method was used. According to the obtained results the proposed comprehensive model of simulation, referring to TN and activated sludge sedimentation, enables optimal selection of bioreactor settings.

Keywords: Wastewater treatment plant; Sludge volume index; Total nitrogen; Simulation and control; Neural networks