Desalination and Water Treatment
www.deswater.com

doi: 10.5004/dwt.2019.23370

140 (2019) 143–154
February

Application of the model of sludge volume index forecasting to assess reliability and improvement of wastewater treatment plant operating conditions

Bartosz Szeląg[a,*], Krzysztof Barbusiński[b], Jan Studziński[c]

[a]*Kielce University of Technology, Tysiąclecia Państwa Polskiego 7 Av., 25-314 Kielce, Poland, Tel. +41 342 47 35; email: bszelag@tu.kielce.pl*
[b]*Silesian University of Technology, Konarskiego 18 Street, 44-100 Gliwice, Poland, Tel. +32 237 11 94; email: krzysztof.barbusinski@polsl.pl*
[c]*Systems Research Institute PAN, Newelska 6 Street, 00-001 Warszawa, Poland, Tel. +22 381 02 75; email: Jan.Studzinski@ibspan.waw.pl*

Received 30 April 2018; Accepted 28 October 2018

ABSTRACT

The article presents a mathematical model for the analysis of operational reliability of a wastewater treatment plant, in which sedimentation of activated sludge and removal of biogenic compounds were taken into account. The presented model allows for continuous control and monitoring of both processes, even in the case of measurement discontinuities. In the presented approach, the values of quality indicators can be determined using selected data mining methods on the basis of wastewater flow and temperature measurements. The paper proposes an innovative indicator that takes into account the interaction between the quantity, the quality of inflowing wastewater expressed by means of physicochemical parameters and the susceptibility of activated sludge for bulking. Based on the presented calculation algorithm, an exemplary concept of controlling the biological process (mixed liquor suspended solids, oxygen concentration and the amount of coagulant dosed) is presented, taking into account the variable conditions at the inflow to the bioreactor.

Keywords: Wastewater treatment plant; Sludge volume index; Reliability; Control; Neural network

* Corresponding author.