Scenario analysis and statistical analysis of simulation results of operation of activated sludge waste water treatment plants

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\textbf{ABSTRACT}

Several studies, both theoretical and experimental, have already proven that mathematical modelling of wastewater treatment plants (WWTP) is an elegant and cost-effective tool to study and to optimise these treatment processes. In most cases, interpretation of the simulation results is done on ad hoc complex databases based on so-called expert knowledge. As such, the interpretation of the results becomes difficult. In this study, interpretation of the WWTP simulation results is aided by the means of principal component analysis (PCA). The main influencing factors were found to be the influent flow rate and load, and the settler performance in terms of the non-settleable fraction of the biomass. A PCA analysis indicated three principal components. The first principal component explained 37\% of the total variance and contains most of the information on nitrogen removal. The second principal component (PC2) explains 20\% of the total variance and can be considered as a measure of the secondary settler performance. The third principal component (PC3) explains 17\% of the total variance and mostly contains information on the different flow rates in the WWTP (influent flow rate, nitrate recycle flow rate, sludge recycle flow rate and waste flow rate).

\textit{Keywords:} Scenario analysis; Statistical evaluation; ASM1; Modelling and simulation; Principal components analysis

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