Factorization of physicochemical parameters of activated sludge process using the principal component analysis

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ABSTRACT

In order to reduce the complexity of wastewater treatment modeling, a principal component analysis (PCA) was introduced to allow reducing the dimensionality of the original historical data by projecting it into a lower dimensionality space. Indeed, an application of PCA on activated sludge treatment plant was effected to reduce the dimension of the problem described initially by several raw variables of the dominant parameters of the upstream and downstream pollution of the process, such as the physicochemical parameters necessary to describe organic and nitrogen pollutants (SS, COD, BOD, NH$_4^+$-N, NO$_3$-N, NO$_2$-N, PO$_4^{3-}$-P, and TKN, as well as the decision parameters like energy consumption and amount of recycled sludge. The results show that the performance of the purification process on the energy consumption is primarily related to the excess removal of organic pollution and to excess nitrates product in the process.

Keywords: Wastewater treatment; Activated sludge; PCA