



Multivariate statistics for soft sensing primary clarifier effluent quality in industrial wastewater treatment plant

Nital Patel^{1*}, Jayesh Ruparelia², Jayesh Barve³

¹Instrumentation and Control Engineering Department, Institute of Technology, Nirma University, Ahmedabad, India

²Chemical Engineering Department, Institute of Technology, Nirma University, Ahmedabad,

³Ex-Professor, Nirma University, Ahmedabad (Now: GE Research, Bengaluru, India)

Abstract : In wastewater treatment plant clarification is a major step to remove the suspended solids. The performance of the primary clarifier is important as the effluent of primary clarifier subsequently treated further in downstream biological process. The main objective of primary clarifier is to remove the suspended solids present in influent wastewater. The monitoring of the primary clarifier operation is crucial in order to maintain the efficient performance. In this work, application of multivariate statistical techniques to predict or softsense the effluent quality of industrial primary clarifier is investigated. The industrial clariflocculator located at common effluent treatment plant (CETP), Vatva, Ahmedabad, India is considered. The Principal Component Analysis (PCA) is adopted to check and reveal the collinearity among influent COD, BOD, TDS and TOC. Three partial least square (PLS) models are developed to estimate effluent COD, BOD and TOC based on influent quality parameters. The PLS model of effluent TOC is found better than the PLS models for COD and BOD. It is observed that the fewer number of PLS components, that well explain the maximum variance in the effluent quality parameter (COD, BOD or TOC), gives better results. Hence, there is no need to consider all PLS components for effluent quality soft-sensor model development. The estimation of effluent COD, BOD and TOC can be done with two, three and four PLS components rather than all eight PLS components. These multivariate statistics based models are found effective and promising, hence can help avoid or reduce the need of sampling and experimental analysis for the effluent COD, BOD and TOC, because these can be estimated using soft sensors based on these PLS models using measured influent quality parameters.

Keywords : Primary clarifier, partial least square, principal component analysis..

DOI= <http://dx.doi.org/10.20902/IJCTR.2021.140125>

Nital Patel *et al* /International Journal of ChemTech Research, 2021,14(1): 249-258.
