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Modeling of dissolved oxygen parameter and optimization using RSM and ANN for paint industry effluent in semi batch fermenter

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ABSTRACT

Effluents from industries such as textile, distillery, bone wash, paper, and paint pose serious environmental hazards and lead to health problems for human beings. The purpose of this study is to analyze the dissolved oxygen parameter in such industrial effluent. The dissolved oxygen was monitored and recorded for ten concentrations and three different speeds with time till DO reached saturation in paint industrial effluent. Based on the data generated from 270 experimental results, the optimization techniques response surface method (RSM) and artificial neural network (ANN) are proposed to find the optimized operating parameters with 17 experimental runs using three inputs time, speed, and feed concentration. In RSM analysis, with a single objective function, a second-order quadratic has been represented with a higher degree of fitting which produced R^2 = 99.85% and R^2_{adj} = 99.65%. From ANN analysis, with the support of optimization tool ANN produced R^2 = 91.45%, R^2_{adj} = 93.82%. From the analysis, it is evident that RSM performed better than ANN. The error percentage is 0.59% which validates the predicted model from the predicted and confirmatory experimental results. From this experimental study, we can conclude that RSM-based results give superior results compared to ANN results.

Keywords: Paint industry effluent; Semi batch fermenter; Box–Behnken design; Artificial neural network; Dissolved oxygen

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