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OPTIMIZATION OF ANAEROBIC BAFFLED REACTOR (ABR) USING ARTIFICIAL NEURAL NETWORK IN MUNICIPAL WASTEWATER TREATMENT

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Abstract

This study is focused on simulating and optimizing design and configuration of anaerobic baffled reactor (ABR) by means of artificial neural network (ANN). This approach is aimed to assess an efficient ABR performance in various operational conditions treating municipal wastewater. For this purpose, to analyze comprehensively on a base of experimental data, the system is operated in two pilots of 48 liters net volume made of 8 compartments. In 7 months, more than 130 sets of data are obtained to be introduced to MATLAB neural network. These include removal efficiency of chemical oxidation demand (COD) and volatile fatty acids (VFAs) parameters.

The finest correlative architecture obtained consists of 12 neurons along with 1 hidden and 1 output layer. It can be concluded from predicting simulation diagrams that the most favorable design and operation can be achieved in 10 to 12 hours hydraulic retention time with a six-compartment configuration. Besides, to make reactor resistant against shock loads and environmental changes, two supplementary baffles are recommended. Accordingly, soluble COD removal efficiency of more than 90% is anticipated to be achieved and VFAs fully digested even in incompatible operating conditions. Finally, the study confirms the considerable role of artificial neural network in prediction and optimization of ABR.

Key words: anaerobic baffled reactor (ABR), artificial neural network (ANN), municipal wastewater treatment, optimization

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