Estimation of Fouling in a Cross-Flow Heat Exchanger Using Artificial Neural Network Approach

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Abstract : One of the most frequently encountered problems in industrial heat exchangers is fouling, which degrades the thermal and hydraulic performances of these types of equipment, leading thus to failure if undetected. And it occurs due to the accumulation of undesired material on the heat transfer surface. So, it is necessary to know about the heat exchanger fouling dynamics to plan mitigation strategies, ensuring a sustainable and safe operation. This paper proposes an Artificial Neural Network (ANN) approach to estimate the fouling resistance in a cross-flow heat exchanger by the collection of the operating data of the phosphoric acid concentration loop. The operating data of 361 was used to validate the proposed model. The ANN attains AARD= 0.048%, MSE= 1.811×10^{-11}, RMSE= 4.256×10^{-6} and r^2=99.5 % of accuracy which confirms that it is a credible and valuable approach for industrialists and technologists who are faced with the drawbacks of fouling in heat exchangers.

Keywords : cross-flow heat exchanger, fouling, estimation, phosphoric acid concentration loop, artificial neural network approach

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