MODELLING AND SIMULATION OF INDUSTRIAL HEAT EXCHANGER NETWORKS UNDER FOULING CONDITION USING INTEGRATED NEURAL NETWORK AND HYSYS

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Abstract

Fouling is a deposit inside heat exchanger network in a refinery has been identified as a major problem for efficient energy recovery. This heat exchanger network is also called Crude Preheat Train (CPT). In this paper, Multi Layer Perceptron (MLP) neural networks with Nonlinear Auto Regressive with eXogenous input (NARX) structure is utilized to build the heat exchanger fouling resistant model in refinery CPT and build predictive maintenance support tool based on neural network and HYSYS simulation model. The complexity and nonlinierity of the nature of the heat exchanger fouling characteristics due to changes in crude and product operating conditions, and also crude oil blends in the feed stocks have been captured very accurate by the proposed software.The RMSE is used to indicate the performance of the proposed software. The result shows that the average RMSE of integrated model in predicting outlet temperature of heat exchanger$T_{H,out}$ and $T_{C,out}$ between the actual and predicted values are determined to be 1.454 °C and 1.0665 °C, respectively.The integrated model is ready to usein support plant cleaning scheduling optimization, incorporate with optimization software.

Keyword: Modeling, Simulation, Neural Network, Fouling, Heat Exchanger, Crude Preheat Trai