Fuzzy Logic Modeling of Heat Transfer in Air Cooler Equipped with Jagged Twisted Tape Inserts

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Abstract

This paper focuses on the application of fuzzy logic (FL) to model and predict the Experimental Results of heat transfer in an air cooled heat exchanger equipped with the jagged twisted tape inserts. Experiments included Reynolds number (Re) ranging from 4021 to 16118 and the twist ratio (R) of the jagged inserts from 1.76 to 3.53. Average Nusselt numbers from Fuzzy analysis as a function of twist ratio and Reynolds number are presented by some figure in this paper. Modeling results showed that, the heat transfer rates obtained by employing the jagged inserts, increases by incising the Reynolds number and reduces by increasing the twist ratio. This can be due to the increase in the swirl intensity by decreasing the twist ratio which results to the increase of the average Nusselt number. A fuzzy inference system (FIS) named Mamdani was used to estimate the output membership functions of triangular symmetric type, to be fuzzy sets. It has been also shown that, fuzzy logic (FL) is a powerful instrument for predicting the experimental results due to its low error rate. The mean relative error (MRE) of fuzzy predictions with respect to experimental data was found to be 0.58% for this study.

Keywords: Air cooled heat exchanger, Fuzzy logic, Heat transfer, Mamdani inference system, Jagged twisted tape inserts.

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