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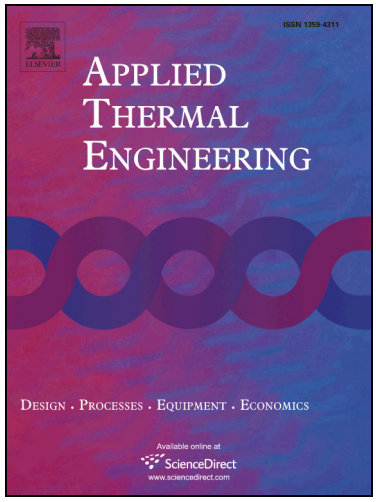

Research Paper

Analysis of artificial neural network in prediction of circulation rate for a natural circulation vertical thermosiphon reboiler

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Analysis of artificial neural network in prediction of circulation rate for a natural circulation vertical thermosiphon reboiler

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The present study has been carried out on the applicability of Artificial Neural Networks (ANNs) for predicting circulation rate in a vertical thermosiphon reboiler for different liquids with wide variation in thermo-physical properties and operating parameters. The different architecture of feed forward artificial neural network with back-propagation error technique is studied. The experimental data from the literature including the author's own work were used for training and testing the different networks. It has been shown that the trained network can predict the circulation rate better than the empirical correlations from the literature. Effect of the different structures of the network on its performance has also been studied. In most of the cases it has been noted that by increasing the nodes and hidden layers network performance improved up to certain limit. Five different training algorithms have been applied with different hidden layers and nodes to train the network. However it is seen that SCG and BFGS training algorithm is more efficient with respect to CPU time in comparison to other algorithms like GDA, GDM and LM. A comparison of the ANN-based model was made with the empirical correlations reported in the literature. It was observed that the proposed network based model significantly showed a better prediction.

Keywords: Heat Transfer, Simulation, Hydrodynamics, Transport processes, Artificial Neural Networks (ANNs), Vertical thermosiphon reboiler.

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