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Artificial neural network analysis of an automobile air conditioning system

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Abstract

This study deals with the applicability of artificial neural networks (ANNs) to predict the performance of automotive air conditioning (AAC) systems using HFC134a as the refrigerant. For this aim, an experimental plant consisting of original components from the air conditioning system of a compact size passenger vehicle was developed. The experimental system was operated at steady state conditions while varying the compressor speed, cooling capacity and condensing temperature. Then, with the use of some experimental data for training, an ANN model for the system, based on the standard back propagation algorithm was developed. The model was used for predicting various performance parameters of the system, namely the compressor power, heat rejection rate in the condenser, refrigerant mass flow rate, compressor discharge temperature and coefficient of performance. The ANN predictions for these parameters usually agreed well with the experimental values with correlation coefficients in the range

of 0.968â€“0.999, mean relative errors in the range of 1.52â€“2.51% and very low root mean square errors. This study shows that air conditioning systems, even those employing a variable speed compressor, such as AAC systems, can alternatively be modelled using ANNs with a high degree of accuracy.

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Keywords

Artificial neural network; Automotive air conditioning; Refrigeration; Air conditioning

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