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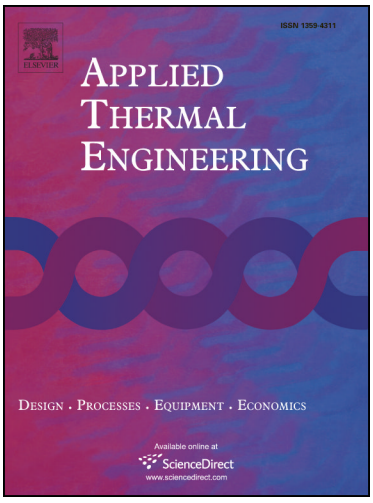

GMDH ANN TO OPTIMISE MODEL DEVELOPMENT: PREDICTION OF THE PRESSURE DROP AND THE HEAT TRANSFER COEFFICIENT DURING CONDENSATION WITHIN MINI-CHANNELS

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GMDH ANN TO OPTIMISE MODEL DEVELOPMENT: PREDICTION OF THE PRESSURE DROP AND THE HEAT TRANSFER COEFFICIENT DURING CONDENSATION WITHIN MINI-CHANNELS.

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Abstract:

In this paper, the authors propose the use of Artificial Neural Networks (ANN) coupled with Group of Method Data Handling (GMDH) to develop a new tool to optimise the development of empirical models. Additionally, to show its potential, this technique is applied to a dataset of experimental measurements of condensing two-phase flows within minichannels.

Experimental data was obtained in an experimental facility located in the "Technical University of Cartagena". In this installation, multiple experiments were performed with different parameters such as the saturation pressure, the refrigerant mass flow rate, the vapour quality, tube geometry and refrigerant fluid. The tests presented in this document deal with two different geometries with hydraulic diameters of 1.16 and 0.70 mm and five different refrigerant fluids (R32, R134a, R290, R410A, R1234yf).

The Group Method of Data Handling was applied to the experimental data set providing the information about which magnitudes are the minimum required (e.g: mass velocity, fluid properties, tube geometry, hydraulic diameter or vapour quality change) to have the best prediction tool for frictional pressure drop and heat transfer coefficient with the minimum number of variables.

Keywords (refrigeration, fuzzy-logic neural network, two-phase flow process, optimisation, model development).