Dissertation Title	Thermal performance of heat pipe heat exchanger under electric field
Dissertation Credits	36
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Degree of Study	Doctor of Engineering
Department	Energy Technology
Academic Year	2001

Abstract

The objective of this research is to enhance the performance of air to air thermosyphon heat pipe-heat exchanger by electric field. The heat pipe tube bank is a set of 42 copper tubes each has 12mm diameter, 800 mm in length and uses water or R-134a as working fluid. High voltage is supplied by taking a set of copper wires installed in the tube bank as the positive electrode. The operating inlet hot air temperature (70-150°C), the air Reynolds number (58-230), the flow pattern (counter and parallel) and the high voltage supply (0-17.5 kV) are considered

The first part is thermal performance study of heat pipe heat exchanger using water as working fluid. With the introduction of EHD, the experimental results showed that the enhancing of the heat transfer coefficient is approximately 15 % at the Reynolds number 58 and the supplied voltage 17.5 kV. The power consumption relative to the heat transfer rate improvement is less than 25%. In addition to, the modified Nusselt number under electric field equation is presented and has ±5% deviation from the experimental result.

In the second part, the thermosyphon heat exchanger when using R-134a as working fluid is operated with and without EHD (electrohydrodynamic). The present correlations of Nusselt number with and without the EHD are shown with ± 5% from the experiment. Furthermore, a simulation program for calculating the performance of air to air thermosyphon heat exchanger with and without electric field is developed. From the simulation program value, it is found that the heat transfer rate in the counter flow and the parallel flow is concern with previoused research. In addition to, the program simulation value and the experimental test value of the heat transfer rate were also compared, and found that the simulation can predicts the experimental results good agreement within ± 10% deviation.

Keywords: Heat exchanger / Heat transfer enhancement / Electrohydrodynamic / Heat pipe