

**THERMAL-ECONOMIC MULTIOBJECTIVE OPTIMIZATION OF HEAT PIPE HEAT EXCHANGER FOR ENERGY RECOVERY IN HVAC APPLICATIONS USING GENETIC ALGORITHM**

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**Abstract**

Cost and effectiveness are two important factors of heat pipe heat exchanger (HPHE) design. The total cost includes the investment cost for buying equipment (heat exchanger surface area) and operating cost for energy expenditures (related to fan power). The HPHE was thermally modeled using  $\varepsilon$ -NTU method to estimate the overall heat transfer coefficient for the bank of finned tubes as well as estimating pressure drop. Fast and elitist non-dominated sorting genetic algorithm (NSGA-II) with continuous and discrete variables was applied to obtain the maximum effectiveness and the minimum total cost as two objective functions. Pipe diameter, pipe length, numbers of pipes per row, number of rows, fin pitch and fin length ratio were considered as six design parameters. The results of optimal designs were a set of multiple optimum solutions, called 'Pareto optimal solutions'. The comparison of the optimum values of total cost and effectiveness, variation of optimum values of design parameters as well as estimating the payback period were also reported for various inlet fresh air volume flow rates.

Keywords: heat pipe heat exchanger, heat recovery, effectiveness, total cost, multiobjective optimization, NSGA-II

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