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DOI: 10.2478/auoc-2024-0015

Ovidius University Annals of Chemistry Volume 35, Number 2, pp. 111 - 117, 2024

Thermal-hydraulic analysis of a louver fin-and-tube radiator for a liquid–cooled PEMFC stack system

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Abstract. The present study aimed to develop a parametric analysis from the perspective of heat transfer and dimensionless pressure drop for a cross-flow heat exchanger with louvered fins and flat tubes. Four different radiator core models were considered here, with specific values of geometrical parameters as selected from the manufacturer's datasheets. Effectiveness – the NTU (Number of Transfer Units) method was used to evaluate the total heat flux transferred between the cold and hot sides of the radiator. A possible application of the designed louvered fin radiator can be as a part of a liquid–cooling system for an automotive Proton Exchange Membrane Fuel Cell (PEMFC) stack with coolant flow rates of 1 l/min and 2 l/min, frontal air velocities up to 14 m/s and inlet temperatures for the coolant and air side of 343 K and 298 K, respectively. One of the radiator models investigated, having the lowest louver pitch to fin pitch ratio, highest fin length to fin pitch ratio and lowest louver length, showed the best thermo–hydraulic performance, with the highest surface goodness factor values along the entire Reynolds number domain.

***Keywords*:** louvered fins; friction factor; Colburn factor; heat rejection rate.

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