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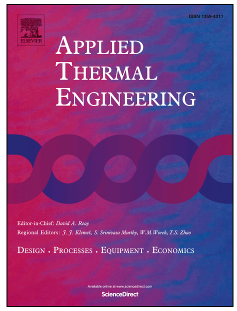

Experimental and simulation study on the air side thermal hydraulic performance of automotive heat exchangers

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Title: Experimental and simulation study on the air side thermal hydraulic performance of automotive heat exchangers

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Abstract： Flat tube heat exchangers with louvered fins were applied in order to meet the performance requirements and compactness in automotive air conditioning systems. Experimental and simulation study focusing on the air side thermal hydraulic performance of automotive heat exchangers were performed in this article. Test results showed that the heat capacity of a condenser with 5.4 mm height louvered fins can be 3.0% - 8.6% higher than the 8 mm fin height condenser of the same size. Automotive evaporator can have 9.3% volume reduction by using short louvered fins while retain the same cooling capacity. Distributed parameter models were developed for automotive heat exchangers and effectiveness NTU method was used to calculate the heat capacity. The models were validated by comparing the results to those calculated via Coil Designer 3.6. Verification has been done for several well-known correlations used for the calculation of thermal hydraulic performance of wet and dry louvered surfaces. The correlations were evaluated by comparing calculations with test data of 24 different specimens under typical automotive heat exchanger working conditions. It was concluded that the existing correlations can give satisfactory predictions for heat capacity of condensers and evaporators, and air side pressure loss of condenser. However, further study on the friction characteristic of wet louvered fins is still needed.

***Keywords*：** automotive; heat exchanger; louvered fin; correlation; comparison

Nomenclature

A	surface area (m^2)
C	specific heat ($J\ kg^{-1}\ K^{-1}$)
c_p	specific heat at constant pressure ($J\ kg^{-1}\ K^{-1}$)
Dh	hydraulic diameter of air passage between fins (m)
f	friction factor
Fd	fin width (m)
Fh	fin height (m)
Fl	fin length (m)
G	mass flux ($kg\ m^{-2}\ s^{-1}$)
h	heat exchange coefficient ($W\ m^{-2}\ K^{-1}$)
i	moist air enthalpy ($J\ kg^{-1}$)