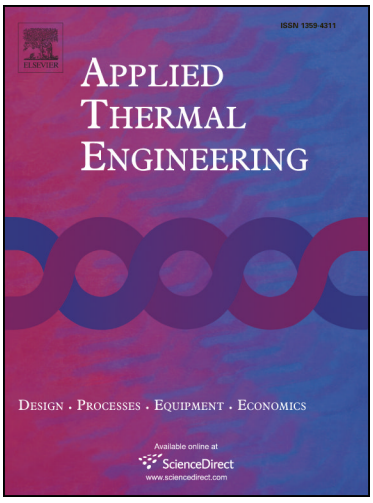

Research Paper

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Simplified analysis of thermal contact resistance on arc-slotted fin core

Jun Deng[1], Zuoqin Qian[2]

Abstract: The fin and tube exchanger is one of the widely used heat transfer equipment in the world**.** The thermal contact resistance (TCR) in fin collar is highly impacting on the heat transfer performance of the fin-and-tube heat exchangers. So this paper tests three versions of fin collar and does some CFD simulations in order to find out the rules of TCR varying; Uses CFD-simulation help to do some analysis on heat exchangers heat transfer performance. The results shows that, heat transfer performance of type-C version fin collar is enhanced nearly 14% comparing with the type-A version; the TCR is impacting on heat exchanger performance *K*, and has less impact on heat exchanger pressure drop *P* and fin surface convection; In a real arc-slotted fin core, as the *Re* increases, the TCR decreases. The evaluation method of TCR can be used to simulate the heat transfer process and the flow condition in the heat exchanger, and help to improve fin core design. The analysis results are also showing the reason of TCR exist.

Keywords: Arc-slotted fin-and-tube heat exchanger; Thermal contact resistance; Heat transfer performance; CFD simulation;

Nomenclature

K	Heat transfer coefficient (W/(㎡×K))
Q	Heat transfer flow rate (W)
q	Average heat flux (W/㎡)
Ff	Correction factor (-)
A_o	Heat transfer air-side surface area (㎡)
A_i	Heat transfer water-side surface area (㎡)
ΔT_m	Logarithmic mean temperature (*K*)
h_i	Tube inner convection coefficient (W/(㎡×K))
h_o	Airside outer surface convection coefficient (W/(㎡×K))
C_{p_air}	Air heat Capacity (W/ (kg× K))
Q_{m_air}	Air mass flow (kg/s)
Q_{v_air}	Air volume flow (m³/s)
ρ_{air}	Air density (kg/m³)
P	Airside pressure drop (Pa)
R_1	Heat resistance of the tube in fin collar ((㎡×K)/W)
R_2	Heat resistance of the fin in fin collar ((㎡×K)/W)
Re	Local fin Reynolds Number
δ_{tube}	Tube wall thickness (m)
δ_{fin}	Fin thickness (m)

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