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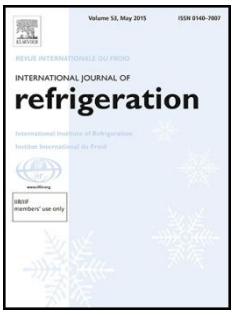

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Two-phase pressure drop and flow boiling heat transfer in an enhanced dimpled tube with a solid round rod insert

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Abstract:

An experimental study was conducted on a 19.05 mm (outer diameter) dimpled enhanced tube to evaluate the in-tube two phase heat transfer and pressure drop performance in an annular section created between the enhanced tube and a solid round PVC rod. The purpose of the study was to understand the effect of forced early transition to annular flow on the pressure drop and heat transfer coefficient in a horizontal tube. The refrigerant studied was R-134a at a saturation temperature of 5°C, heat flux range 2.5 to 15 kW m^{-2}, mass flux from 80 to 200 kg m^{-2} s^{-1} and inlet vapor quality of 0.12 to 0.72. Flow pattern and pressure drop results were obtained under adiabatic conditions. Under similar operating conditions the enhanced tube with a rod exhibited three times higher heat transfer performance versus same size smooth empty tube with lower pressure drop penalty at lower mas flux.

Keywords:

Shell and tube DX evaporator, enhanced tube, heat transfer coefficient, pressure drop

Symbols and Nomenclature:

A	Annular flow pattern
AP	Absolute pressure [kPa]
D	Dry-out region
d	Diameter [m]
DP	Differential pressure [kPa]
DX	Direct expansion
ΔP	Pressure drop [kPa]
f	Darcy type friction factor [-]