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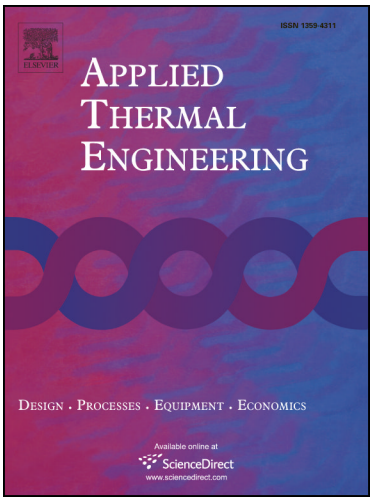

Experimental study of heat transfer and friction factor inside elliptic tube fixed with helical coils

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Experimental study of heat transfer and friction factor inside elliptic tube fixed with helical coils.

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Abstract:

The circular and rectangular helical-coils were sited in elliptic tube section with four various pitches of 20, 45,135 and 225 mm. The cold air Re number was ranged from ($11\times10^3 \leq Re \leq 3.375\times10^4$). The effect of reverse-flow for different pitches and inserted helical wire cross-sections can improve the heat transfer rate. Also, comparing with previous studies, the use of circular and rectangular wire cross-sections inserted in elliptic tube at various helical-coil pitches was useful over the smooth tube, and rectangular cross-section helical-coil is more potent in heat transfer enhancement rather than circular one. Nu, *f* and η for rectangular helical wire cross-section inserted in elliptic tube are higher than that is for circular one for all values of helical-coil pitches by about 15%, 3% and 14% respectively. η for the current elliptic tube fixed with circular and rectangular helical-coil are higher than that of Sharafeldeen et al. [23] for all helical-coil pitches by about 24.5% in average. Correlated data results of Nu, *f* and η for helical-coil with different wire cross-sections are obtained for the considered Re range.

Keywords:

Heat transfer enhancement; elliptic tube; helical coil; circular and rectangular wire.

Nomenclature:

A	Heat transfer surface area, m^2
C_p	Specific heat of air, J/kg.K
f	Friction factor coefficient
h_a	Heat transfer coefficient, $W/m^2.K$
I	Current, A
k	Thermal conductivity of air, W/m.K
L	Elliptic tube length, m
m	Mass flow rate, kg/s

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