NUMERICAL INVESTIGATION OF THERMAL-HYDRAULICS CHARACTERISTICS IN ENHANCED TUBES

By

Eng. **Amr Kaood Ismail Mohamed**

A Thesis Submitted to the
Faculty of Engineering at Cairo University
in Partial Fulfillment of the
Requirements for the Degree of
Doctor of Philosophy
in
Mechanical Power Engineering

FACULTY OF ENGINEERING, CAIRO UNIVERSITY
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Title of Thesis: NUMERICAL INVESTIGATION OF THERMAL-HYDRAULICS CHARACTERISTICS IN ENHANCED TUBES

Key Words: Friction factor; Nusselt number; Heat transfer enhancement; corrugated tube; PEC.

Summary:

Thermal and hydraulic characteristics of turbulent water flow in a transverse corrugated tube with various corrugation directions (inward/outward/oscillating), and corrugation shapes (triangle, curve, rectangle and trapezoid) are numerically investigated. The influence of combination between the corrugated tube with twisted tape insert and wire-coiled insert is also conducted in the current study. The model of corrugated tubes with 10 mm inner diameter was investigated by changing the geometrical parameters for within a range of Reynolds number from 5,000 to 61,000 and constant heat flux boundary condition. Structured, non-uniform grid system is applied. Momentum, continuity and energy equations were treated by means of a finite volume method using the SIMPLE scheme with the k–ε turbulence model and enhanced wall treatment. The effect of a combination between the various corrugated tubes and twisted tape insert (TT) and corrugated tubes and wire-coiled insert (WCI) on the thermal-hydraulic characteristics were also studied in the current study.

Disclaimer

I hereby declare that this thesis is my own original work and that no part of it has been submitted for a degree qualification at any other university or institute.
I further declare that I have appropriately acknowledged all sources used and have cited them in the references section.

Name: Amr Kaood Ismail Date:

Signature:

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Amr Kaood

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