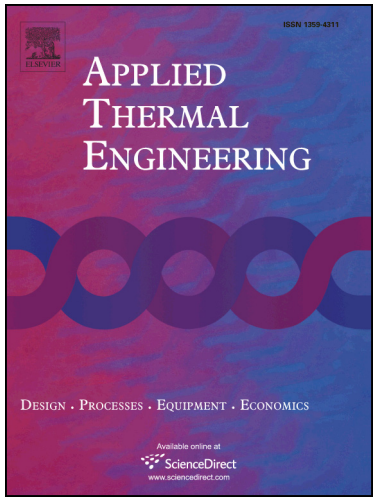

Unsteady Heat Transfer from a Reservoir Fluid by Employing Metal Foam Tube, Helically Tube and Straight Tube: A Comparative Experimental Study

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Unsteady Heat Transfer from a Reservoir Fluid by Employing Metal Foam Tube, Helically Tube and Straight Tube: A Comparative Experimental Study

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Abstract. The main purpose of this study is to experimentally investigate the transient heat transfer from a fluid stored inside a closed reservoir. Different cooling methods, i.e. th use of metal foam embedded tube, helical tube, and a straight tube, are used and compared for heat transfer from the fluid reservoir. CuO/Water nanofluid in various volume fractions in the range of 0 to 0.2 (w/v) are also employed as cooling fluid. The experimental data shows a heat transfer enhancement of 42% and 45% for helical tube and metal foam tube respectively, as compare with the straight tube by using 0.2% (w/v) Cuo/Water nanofluid. The experiments indicate that combination of the two presenting methods (metal foam /helical shape and nanofluids) has a significant capability to enhance the heat transfer rate. Finally, two correlations between Rayleigh number and non-dimensional heat flux are presented for the straight and porous tubes.

1. Introduction

Improvement of thermal performance of transient heat transfer in closed reservoirs is an important goal in various industrial applications such as food processing, heat recovery system, chemical processing [1] and solar water heating systems [2]. The convective heat