

Abstract

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NUMERICAL INVESTIGATION FOR THE HEAT TRANSFER ENHANCEMENT IN HELICAL CONE COILS OVER ORDINARY HELICAL COILS

This numerical research is introducing the concept of helical cone coils; their enhanced heat transfer characteristics compared to the ordinary helical coils. Helical spiral coils are known to have better heat and mass transfer than straight tubes, which is attributed to the generation of a vortex at the helical coil known as Dean Vortex. The Dean number which is a dimensionless number used to describe the Dean vortex is a function of Reynolds number; the square root of the curvature ratio, so varying the curvature ratio for the same coil would vary the Dean number. Two scenarios were adopted to study the effect of changing the taper angle (curvature ratio) on the heat transfer characteristics of the coil the commercial software FLUENT was used in the investigation. It was found that Nusselt number increased with increasing the taper angle. A MATLAB code was built based on empirical correlation of Manlapaz; Churchill for ordinary helical coils to calculate the Nusselt number at each coil turn, then calculate the average Nusselt number for the entire coil turns, the CFD simulation results were found acceptable when compared with the MATLAB results.