

Abstract

This work presents an experimental study of the heat transfer coefficients of shell and helically coiled tube heat exchangers. Three heat exchangers with different coil pitches were tested for both parallel-flow and counter-flow arrangement. Water is used as working fluids in shell side and tube side. The study is conducted at the hot water mass flow rates ranging between (0.02 - 0.12) kg/s while cold water is kept constant at (0.055 kg/s). The range of inlet temperatures of cold and hot water are (19 - 28 °C), and (50 - 80 °C), respectively. All experiments were performed at the Dean Number for coiled side range of (3803 - 12117). The work is performed to evaluate the influence of the tube diameter, coil pitch, shell-side and tube-side mass flow rate, and inlet temperatures of tube-side over the axial temperature distribution of heat exchanger, effectiveness, modified effectiveness and heat transfer coefficient. The evaluating has been performed for the steady-state. The results show that the major effect on the axial temperature distribution of heat exchanger is the mass flow rate ratio (mr) and the modified effectiveness is decreased with increasing mass flow rate ratio. The main influence on the shell-side heat transfer coefficient is the coil pitch, this influence is present by empirical correlations for the Nusselt Number with Dean Number and Prandtl Numbers are as follow:

For coil#1

For (4585 < De < 12117)

For coil#2

For (3803 < De < 9925)

For coil#3

For (3849 < De < 10093)

Also the empirical correlation obtained for the Nusselt Number with Helical coil number Number and Prandtl Numbers for different coil pitches is: Correlation between the Nusselt number with Prandtl and Reynolds number for shell side is:

For (1450 < Re < 1807)
