

Abstract

The present study deals with experimental investigations of the forced convection heat transfer from heated different ducts (circular, triangular, rectangular) having the same length (1m) and hydraulic diameter (0.1m) filled with porous media (glass spheres in 12mm diameter at a constant heat flux (1070W/m^2) and Reynolds number values for circular duct (12461-6066) , rectangular duct (5503.4-2701.3) and triangular duct (4051.9-2499.7) . The value of porosity for circular duct (0.448) , for the rectangular duct (0.6) and for the triangular duct (0.616).

The results showed the effect of Reynolds number and cross section on the temperature profile and local Nusselt number. The local wall temperature gradually increases with the increase in the axial position along the flow direction and decreases with Reynolds number with constant heat flux for the three ducts. The results also revealed that the local Nusselt number decreases with the axial position along the flow direction and increases with the increase in the Reynolds number.

Comparison was made between three duct for local temperature distribution and local Nusselt number, also comparison was made between the present work with the available previous studies which follow the same behavior for local Nusselt number.

Also, the results showed that the local Nusselt number for triangular duct is more than in rectangular duct and circular duct, the maximum difference value for the local Nusselt number between circular and triangular duct was 29.1%.

The effect of Peclet number on the average Nusselt number was studied , also empirical correlations for average Nusselt number and Peclet number were obtained for the three ducts.