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INFLUENCE OF APEX ANGLE ON THERMAL HYDRAULIC BEHAVIOR OF A POLYMERIC TRIANGULAR CROSS CORRUGATED PLATE

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ABSTRACT Flow and heat transfer in triangular cross corrugated plate heat exchangers are complicated and strongly influenced by geometrical parameters. Due to high geometric flexibility of polymeric materials, different apex angle are feasible for HVAC & R application. In this study the influence of the apex angle and Reynolds number on the thermal hydraulic performance of triangular cross corrugated channels are investigated while the corrugation angle is fixed at 90°. In addition the base remained unvaried. With the aid of computational fluid dynamics, three-dimensional simulations are performed for $426 < Re < 2021$ in a periodic unitary cell. The Reynolds Stress model is used as the turbulence model. The numerical results are in a very good agreement with experimental results correlation. They show deviations between 0.8 – 4.84 %. The highest thermal performances are achieved by the both apex angle of 120° and 90°. The lowest thermal performance is observed by the apex angle of 55°. The heat exchanger with the apex angle of 90° has the highest friction factor. Correlations for the friction factor and Nusselt number are proposed. For the Reynolds number lower than 1300, the apex angle of 120° shows the lowest friction factor. However for the Reynolds number higher than 1300, the apex angle of 55° shows the highest hydraulic performance.