

A Numerical Investigation of Flow Maldistribution in Inlet Header Configuration of Plate Fin Heat Exchanger

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Abstract : Numerical analysis of a plate fin heat exchanger accounting for the effect of fluid flow maldistribution on the inlet header configuration of the heat exchanger is investigated. It is found that the flow maldistribution is very significant in normal to the flow direction. Various inlet configuration has been studied for various Reynolds Number. By the study, a modified header configuration is proposed and simulated. The two-dimensional parameters are used to evaluate the flow non-uniformity in the header, global flow maldistribution parameter (Sg), and Velocity Ratio (θ). A series of velocity vectors and streamline graphs at different cross-section are achieved and studied qualitatively with experimental results in the literature. The numerical result indicates that the flow maldistribution is serious in the conventional header while in the improved configuration less maldistribution occurs. The flow maldistribution parameter (Sg) and velocity ratio (θ) is reduced in improved configuration. The vortex decreases compared to that of the conventional configuration so the energy and pressure loss is reduced. The improved header can effectively enhance the efficiency of plate fin heat exchanger and uniformity of flow distribution.

Keywords : global flow maldistribution parameter, Sg, velocity ratio, plate fin heat exchanger, fluent 14.5

Conference Title : ICFDT 2016 : International Conference on Fluid Dynamics and Thermodynamics

Conference Location : London, United Kingdom

Conference Dates : January 18-19, 2016