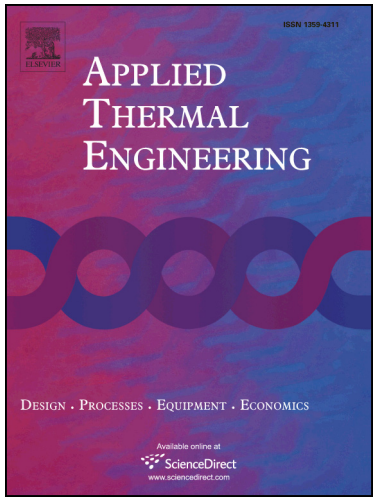

Study on the Heat Transfer and Fluid Flow Characteristics in V-shaped Corrugated Composite Fin

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Graphical abstract

The study on the composite fin with louver and slit combined is performed numerically to enhance fin performance. It is confirmed that the performance of V-shaped corrugated composite fin is better than that of plate fin, which shows that flow vorticity is stronger due to interaction between corrugate, slit and louver. Slit dimensions optimized in fin performance are drawn by numerical analysis for key parameters of slit using Response Surface Methods (RSM). It is also numerically confirmed that JF-factor of the specification with optimized composite fin is higher than that of X-shaped slit fin by 6.1% on average. Part-level performance test is conducted with heat exchanger samples including the V-shaped composite fin and X-shaped slit fin respectively, and confirmed that the heat exchanger with X-shaped slit fin of 1.5mm fin pitch could be replaced by that with V-shaped composite fin of 1.7 mm fin pitch resulting in the reduction of fin weight by 11.7%.

Accelerated flow passing the tube is partially guided into slit ‘a’ due to corrugate shape formed around tube[refer to Fig. 7a]. Different slit angles(S_{a1}) are assigned to the slit ‘a’ and ‘b’ to guide the air passing over the tube to the louver. In the contour plot shown in Fig. 7b, vorticity generated by tube and louver is guided into slits.

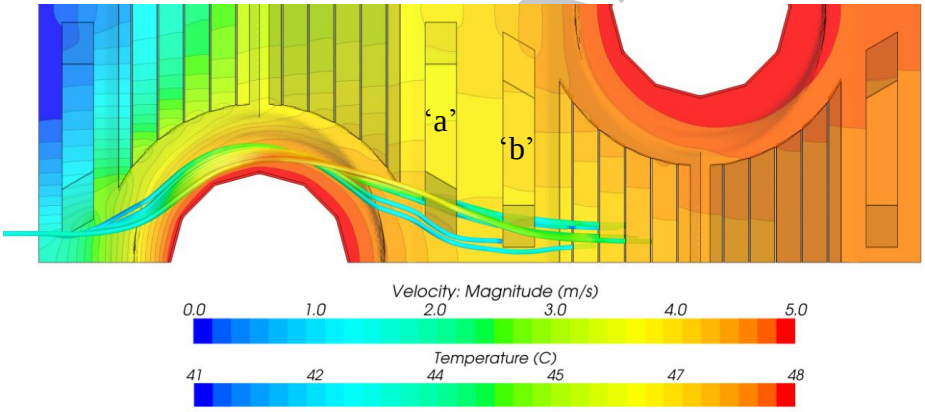

Fig.7a. Streamline and Temperature Profile of New Fin at Re=569

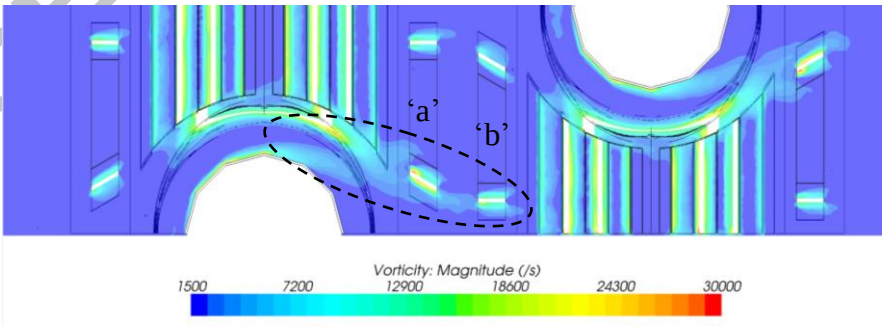

Fig.7b. Vorticity Plot of New Fin at Re=569