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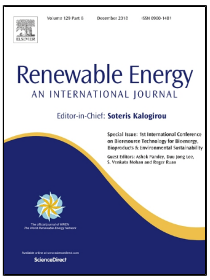

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Performance improvement and development of correlation for friction factor and heat transfer using computational fluid dynamics for ribbed triangular duct solar air heater

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Solar air heater (SAH) is a device used to convert sun radiations into heating applications. To improve its performance, the heat absorbing side of SAH is modified with the ribs called roughness. The flow characteristics and augmentation of heat due to square shaped ribs in SAH having triangular cross-sectional passage has been simulated using computational fluid dynamic (CFD) technique. The CFD simulations consisted of design and modeling of SAH. Two different roughness parameters has been considered in the analysis i.e. relative roughness pitch (*P/e*) and relative roughness height (*e/D*) and their value ranges from 5 to 13 (in four sets) and 0.013 to 0.05 (in four sets), respectively for Reynolds number varies from 3900-17900. Better augmentation of heat has been seen in SAH by providing ribs on the absorber plate. The highest improvement in heat transfer is seen of the order of 97% in *P/e* value of 10 and *e/D* value of 0.05 at *Re* of 17900. The thermohydraulic performance parameter (TPP) is also calculated and have highest value of 1.97 for *P/e* value of 10 and *e/D* value of 0.05 at *Re* of 17900. Correlation has been developed for both friction factor and Nusselt number based on observed results.

Keywords: Computational fluid dynamics; turbulence models; square rib roughened duct; Triangular duct SAH; correlation for Nusselt number and friction factor.

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