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Computational fluid dynamics based numerical simulation of thermal and thermo-hydraulic performance of a solar air heater channel having various ribs on absorber plates

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Abstract
A computational fluid dynamics based numerical simulation of thermal and thermo-hydraulic performance of a flat rectangular and V-shaped baffled channel of a solar air heater having various ribs, i.e., square, trapezoidal, triangular pointing upstream (called: triangular-upstream or I-type), triangular pointing downstream (called: triangular-downstream or II-type), and equilateral-triangular (called: III-type), on its absorber plate is carried out in the present work. Finite Volume Method (FVM), Semi Implicit Method for Pressure Linked Equations algorithm (SIMPLE), Quadratic Upstream Interpolation for Convective Kinetics numerical scheme (Quick), and Standard k-epsilon turbulence model (k-ε), by means of Commercial CFD software FLUENT are used in this recent simulation. The triangular-shape roughness geometry in II-type, at high values of Reynolds number, may be considered as the best operating regime when using the ribs for the lower surface of the upper hot wall to improve the heat transfer efficiency inside the channel. © 2019, Mathematical Modelling of Engineering Problems.

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