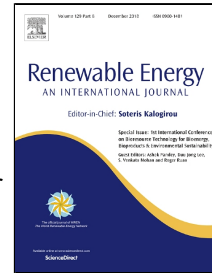


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Performance improvement and development of correlation for friction factor and heat transfer using computational fluid dynamics for ribbed triangular duct solar air heater



Rajneesh Kumar, Anoop Kumar, Varun Goel

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

4
5 **Rajneesh Kumar†, Anoop Kumar, and Varun Goel**

6 National Institute of technology, India -177005
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9 Solar air heater (SAH) is a device used to convert sun radiations into heating applications. To
10 improve its performance, the heat absorbing side of SAH is modified with the ribs called
11 roughness. The flow characteristics and augmentation of heat due to square shaped ribs in SAH
12 having triangular cross-sectional passage has been simulated using computational fluid dynamic
13 (CFD) technique. The CFD simulations consisted of design and modeling of SAH. Two different
14 roughness parameters has been considered in the analysis i.e. relative roughness pitch (P/e) and
15 relative roughness height (e/D) and their value ranges from 5 to 13 (in four sets) and 0.013 to
16 0.05 (in four sets), respectively for Reynolds number varies from 3900-17900. Better
17 augmentation of heat has been seen in SAH by providing ribs on the absorber plate. The highest
18 improvement in heat transfer is seen of the order of 97% in P/e value of 10 and e/D value of 0.05
19 at Re of 17900. The thermohydraulic performance parameter (TPP) is also calculated and have
20 highest value of 1.97 for P/e value of 10 and e/D value of 0.05 at Re of 17900. Correlation has
21 been developed for both friction factor and Nusselt number based on observed results.
22

23 **Keywords:** Computational fluid dynamics; turbulence models; square rib roughened duct;
24 Triangular duct SAH; correlation for Nusselt number and friction factor.
25

Corresponding author: †Rajneesh Kumar,
Email ID: rajneesh127@nith.ac.in
Contact number: +91-8679938484

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