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Numerical study of thermohydraulic performance of solar air heater duct equipped with novel continuous rectangular baffles with high aspect ratio

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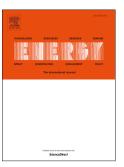
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12	Abstract
13	Turbulent flow and convective heat transfer of air inside channel of rectangular cross-section,
14	containing rectangular baffles with inclined upper part planted on the opposite surface of
15	absorber plate is investigated numerically under solar air heater boundary conditions. For a
16	fixed value of heat flux (1000 W/m^2) and the range of Reynolds number from $4000 \text{ to } 18000$,
17	the effect of four baffle blockage ratios, (B_R = 0.7, 0.82, 0.92, 0.98) and four baffle-pitch
18	spacing ratios, (P_R = 2, 4, 6, 8) in sixteen configurations on thermohydraulic behavior were
19	confirmed.
20	By means of commercial CFD code Fluent 6.3, the Reynolds average Navier Stokes
21	formulation was computed with RNG k - ε model to simulate the fully turbulent air flow
22	through a baffled rectangular duct. However, the configuration of $B_{\text{R}}\!\!=0.7$ and $P_{\text{R}}\!\!=2$ at a
23	Re=5000, yields the highest thermohydraulic performance factor THPF of about 0.857, with
24	both increment in heat transfer and friction factor, which noted to be 2.16 and 15.95 times of
25	those of the smooth duct, respectively.
26	Attempts were carried out to explain the mechanisms of fluid behavior in the presence of this
27	type of obstacles and their impact on both fields, thermal and dynamic.
28	Keywords: fully turbulent flow, solar air heater, rectangular baffled duct, recirculation region,
29	Reattachment, turbulent intensity.

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