Dynamic and thermal study of air flow control by chicanes with inclined upper parts in solar air collectors

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Abstract

A dynamic and thermal simulation for two-dimensional model is developed on air flow and heat transfer control by chicanes in solar air collectors. New chicane form is adopted with two parts: the first is orthogonal to the air flow direction and the second is titled (α=60°). It is apparent that the turbulence created by introducing chicanes, resulting in greater increase in heat transfer inside the dynamic air vein with a rise of 23%. The effect of the variation of the Reynolds number in the range of 100<Re<4500, on the convective heat transfer coefficient, the pressure drop and Nusselt number are analysed and have shown good agreements with the literature results. Therefore, the mass flow rates effect on the velocity magnitude, temperature and the turbulent intensity is analysed. The Reynolds number variation showed a substantial effect on the mechanism of vortex development and separation phenomenon.

Keywords : flat\-plate collector, artificial roughness, heat transfer, pressure drop, vortex.

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