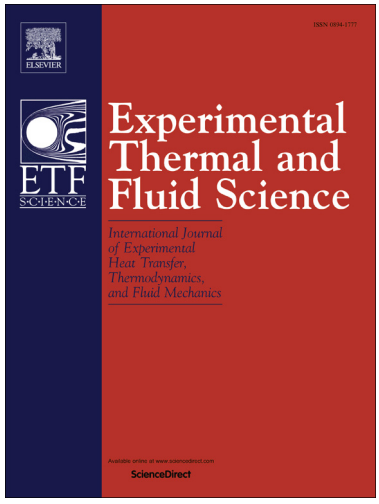

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Effects of Forced Convection on the Performance of a Photovoltaic Thermal System: An Experimental study

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Abstract

A photovoltaic thermal system (PV/T) is a combination of solar cells and solar heating systems that simultaneously produces electricity and low-grade heat. The present paper experimentally investigates the effects of forced convection on the thermal and electrical efficiencies of a single-pass air PV/T system. For this purpose, a modified air-cooled PV/T system that is equipped with four fans to produce forced convection conditions was tested. The effects of air mass flow rate and depth of the channel were studied. The results illustrate that the reduction in the depth of air channel increases the thermal efficiency, but it has no considerable effect on the electrical efficiency. With increasing the mass flow rate of air, the thermal efficiency is increased, but a slight enhancement is obtained for the produced electrical power by PV. The outcomes show that the thermal efficiency of system with 0.05 (m) channel depth and air mass flow rate of 0.018 (kg/s) to 0.06 (kg/s) is approximately in the range of 15%–31% while the electrical efficiency just changes in the range of 12%-12.4%.

Keywords: PV thermal system; forced convection, thermal efficiency; air-cooled PV/T