

Collector Efficiency by Single Pass of Solar Air Heaters with and without Using Fins

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Abstract

This paper presents the study of heat transfer in a solar air heater by using new design of solar collector. The collector efficiency in a single pass of solar air heater without, and with using fins attached under the absorbing plate has been investigated experimentally. Due to the adding the fins inferior an absorber plate, the desirable effect of increasing the heat transfer coefficient compensates for the undesirable effect of decreasing the driving force (temperature difference) of heat transfer, while the attached fins provide an enlarged heat transfer area. In this study, the absorbing plate of solar collector is attached with fins for further improved performance. The improvements of collector efficiencies in the single pass solar air heaters with, and without fins attached; increase with increasing the mass flow rate, especially for operating at lower air flow rate. Experiments were performed for two air mass flow rates of 0.012 and 0.016 kg/s. Moreover; the maximum efficiency obtained for the 0.012 and 0.016 kg/s with, and without fins were 40.02, 51.50% and 34.92, 43.94% respectively. A comparison of the results of the mass flow rates by solar collector with, and without fins shows a substantial enhancement in the thermal efficiency..

Keywords : Design of experiments, efficiency, solar energy, fins, temperature, heat transfer, ambient temperature.

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