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Research Article

EXPERIMENTAL INVESTIGATION OF FLAT PLATE COLLECTOR WITH CYLINDRICAL FINS IN A SOLAR AIR HEATER

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ABSTRACT

The main objective of this work is to increase the efficiency of solar air heater (SAH). The efficiency of SAH is increased with increasing the rate of heat transfer. The rate of heat transfer can be increased by increasing the surface area by cylindrical fins. The cylindrical fins are arranged tangent to the absorber plate. The flat plate solar air heater with and without cylindrical fins on the absorber plate is constructed and tested for five different mass flow rates of air. From the experimental results, optimum mass flow rate is found for maximum collector efficiency.

INTRODUCTION

Environmental pollution and human health threatening diseases are composed of the consumption of fossil based energy sources. In parallel with the increase in human population, energy requirements, the development of economic and technological, industrialization and energy demand have increased worldwide. Therefore, researchers have focused on renewable energy sources. (Abhishek Saxena, *et al*., 2015) experimented solar heaters are used for applications at low and moderate temperatures like as, crop drying and space heating. In the recent work efforts are made to improve the rate of heat transfer and to advance the efficiency of flat plate collector on both natural and forced convection. (Deniz Alta, *et al*., 2010) presented the three types of collectors, two collectors having fins and the one without fins, one of the collectors with a fin had one glass cover and the others had two glass covers. (Fatih Bayraka, *et al*., 2013) investigated the porous baffles inserted in SAHs using exergy and energy analysis methods. The different thickness of baffles is used as passive element inside heaters. They are located sequentially and staggered manner on to the air heater. (Muneesh Sethi, *et al*., 2012) analyzed the influence of artificial roughness on heat transfer rate and friction features in SAH duct which is having dimple shaped elements prepared in angular fashion as roughness components on absorber plate. (Huseyin Benli, *et al*., 2012) proposed the exergy investigation of different types of solar collectors; corrugated and reverse trapeze, reverse corrugated and a base flat plate collector are experimented.

(Anil Singh Yadav and Bhagoria, 2013) designed the CFD based on five different turbulence models of the obtained results are tested. It performs from the calculations that the renormalization set k–e model produces the good results for 2D flow through conventional SAHs. (Mohammadi and Sabzpooshani, 2013) investigated the impact of baffles and fins fixed over the absorber plate on the upward single pass air heater. It is found that assigning baffles and fins well increases the temperature of outlet and efficiency in comparison to a simple predictable device. (Pin Yang Wang, *et al*., 2014) simulated a novel type all glass evacuated tubular heater with simplified CPC. The system is made up of 10 linked assembling panels and each panel contains a simplified CPC and an all glass evacuated tube with a U-shaped copper tube heat exchanger fitted inside. Air is steadily heated when transient through each U-shaped copper tube. (Ming Yang, *et al*., 2014) analyzed an offset strip fins in SAH was optimized by mathematical modeling. The number of sequence of experimentations

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