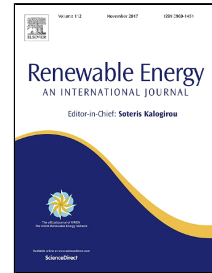


Accepted Manuscript

Performance evaluation of a novel solar air heater with arched absorber plate

Simarpreet Singh



PII: S0960-1481(17)30737-1
DOI: 10.1016/j.renene.2017.07.109
Reference: RENE 9084
To appear in: *Renewable Energy*
Received Date: 08 April 2017
Revised Date: 23 July 2017
Accepted Date: 25 July 2017

Please cite this article as: Simarpreet Singh, Performance evaluation of a novel solar air heater with arched absorber plate, *Renewable Energy* (2017), doi: 10.1016/j.renene.2017.07.109

This is a PDF file of an unedited manuscript that has been accepted for publication. As a service to our customers we are providing this early version of the manuscript. The manuscript will undergo copyediting, typesetting, and review of the resulting proof before it is published in its final form. Please note that during the production process errors may be discovered which could affect the content, and all legal disclaimers that apply to the journal pertain.

Performance evaluation of a novel solar air heater with arched absorber plate

Simarpreet Singh*

Department of Mechanical Engineering, BITS-Pilani, Rajasthan, India.

*Corresponding Author: +91-8094041444; email: simarpreet.singh@pilani.bits-pilani.ac.in

Abstract

The study presents a performance evaluation of a novel solar air heating system with arched absorber plate using turbulators. Simulation work is carried out in *ANSYS FLUENT (v16.2)* platform with *RNG $k-\epsilon$* turbulence model at constant heat flux (500 W m^{-2}), in order to compare the thermal-hydraulic performance of the proposed design for a range of Reynolds number (3800 to 14000). Performance of the solar air heater is projected in the terms of Nusselt number (Nu), frictional factor (Fr) and thermal-hydraulic performance parameter ($THPP$). It is observed that the arched absorber plate design increases the air turbulence and vortex generation, which results in reducing laminar sub-layer generation near the surface of the absorber plate. A significant improvement is observed in Nusselt number at high Reynolds Number (above 10000). However, a marginal enhancement is also observed in frictional factor due to providing an extra obstacle along the duct length with arched shaped design in the flow field. It is observed that arched shape design of absorber plate can significantly improve overall performance of the solar air heating system using various turbulators. This study will likewise provide a new direction to the work trend in this area.

Keywords: Solar air heater, turbulator, THPP, dimple, equilateral triangle.

1. Introduction

Prior to 1970, solar energy was viewed as a prominent alternative to fulfill the continuous increasing demand of energy. An extensive research work was carried out to extract the maximum benefit of this renewable source of energy, due to the high rise in oil prices in 1970s (Yadav and Bhagoria, 2014). Among various alternatives, solar energy stands out as the best resource option to fulfill the increasing energy demand. Instead of direct use of solar energy it is more useful when converted into thermal energy (Bhushan and Singh, 2010). From literature, it has been revealed that

Download English Version:

<https://daneshyari.com/en/article/4926205>

Download Persian Version:

<https://daneshyari.com/article/4926205>

[Daneshyari.com](https://daneshyari.com)