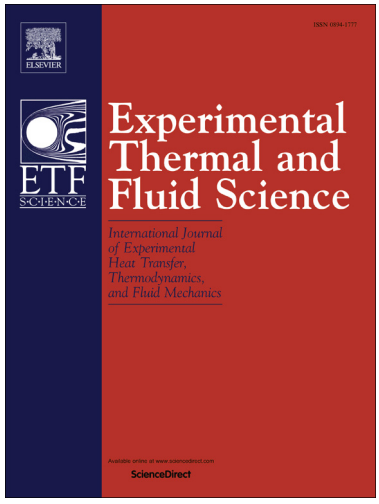

Experimental study and correlation development for Nusselt number and friction factor for discretized broken V-pattern baffle solar air channel

Raj Kumar, Ranchan Chauhan, Muneesh Sethi, Anil Kumar

PII: S0894-1777(16)30274-6
DOI: http://dx.doi.org/10.1016/j.expthermflusci.2016.10.002
Reference: ETF 8888

To appear in: *Experimental Thermal and Fluid Science*

Received Date: 30 June 2016
Revised Date: 22 September 2016
Accepted Date: 2 October 2016

Please cite this article as: R. Kumar, R. Chauhan, M. Sethi, A. Kumar, Experimental study and correlation development for Nusselt number and friction factor for discretized broken V-pattern baffle solar air channel, *Experimental Thermal and Fluid Science* (2016), doi: http://dx.doi.org/10.1016/j.expthermflusci.2016.10.002

Experimental study and correlation development for Nusselt number and friction factor for discretized broken V-pattern baffle solar air channel

*Raj Kumar, Ranchan Chauhan, Muneesh Sethi, Anil Kumar**

School of Mechanical and Civil Engineering, Shoolini University, Solan, India

Abstract

The present study examines the augmentation in heat transfer and friction in a flow through solar air channel with discretized broken V-pattern baffle. Experiments have been carried out for system parameter such as a width to height ratio, W/H of 10, the relative baffle gap distance, D_d/L_v range of 0.26-0.83, relative baffle gap width, g_w/H_b range of 0.5-1.5, relative baffle height, H_b/H range of 0.25-0.80, relative baffle pitch, P_b/H range of 0.5-2.5, and angle of attack, α_a range of 30^o-70^o. The effect of discretized broken V-pattern baffle has been investigated for the range of Reynolds number from 3000 to 21000. The maximum enhancement is observed at a D_d/L_v of 0.67, g_w/H_b of 1.0, H_b/H of 0.50, P_b/H of 1.5, and α_a of 60°. Discretized broken V-pattern baffle has better thermal hydraulic performance as compared to other baffle shapes investigated by various investigators under similar operating conditions. By the use of the experimental data, correlations for heat transfer and friction characteristics have been developed for solar air channel as function of system parameters of discretized broken V-pattern baffle.

Keywords: Energy, turbulence, heat transfer, baffle width, baffle distance, solar air channel

Nomenclature

A_p	Surface area of heated plate, m^2
A_o	Area of orifice, m^2
A_f	Area of flow, m^2
C_{do}	Coefficient of discharge
C_p	Specific heat of air, $J/kg\ K$
D_d	Gap or broken distance, m
D_{hd}	Hydraulic diameter of channel, m
f	Friction factor
f_{rs}	Friction factor of roughened baffle

* **Corresponding Author**. Anil Kumar, School of Mechanical and Civil Engineering, Shoolini University-India, E-mail addresses: anil_aheciit@yahoo.com (A. Kumar)