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# Heat Transfer Augmentation through Different Passive Intensifier Methods (Review)

Mr. Pankaj R. Hatwar[1], Prof. Bhojraj N. Kale[2]
[1](Research Scholar, DBACER, Department of Mechanical Engineering, Nagpur University, Nagpur, India
[2](DBACER, Department of Mechanical Engineering, Nagpur University, Nagpur, India

**Abstract: In most of the previous experimental and numerical studies empirical correlations for duct flow with straight channel has been investigated and corresponding heat transfer and pressure drop are reported, very few paper have been presented for channel with turned flow therefore an experimental study is needed to be carried in a rectangular channel with turned flow (450, 600, 900) varying the Reynolds number which indicate turbulence. The bottom wall of the channel is mounted with a baffle, the channel would be heated from bottom with a constant heat flux, a separate heater arrangement would be made at the inlet for varying the inlet temperature. Furthermore the effect of baffle height on heat transfer and pressure drop will be investigated and finally empirical correlations including several dimensionless parameters for average Nusselt number and friction factor will be obtained and presented**

**Keywords - baffle height, constant heat flux, friction factor, Nusselt number, Reynolds number**

## I. INTRODUCTION

Necessity of saving energy and material imposed by the diminishing world resources and environmental concerns has prompted the development of more effective heat transfer equipment with improved heat transfer rate.

Heat transfer enhancement is divided into two major groups as active and passive method. The use of serpentine type or baffle type channel is commonly used heat transfer enhancement strategies in signal phase internal flow However an attempt have been made to overcome the thermal problems subject to high heat flux and to increase the heat transfer rate using the detail exploration of turned flow in a rectangular channel.

Since very few studies have been addressed in this issue it needs more effective study in this method We are employing a new method by varying the inlet condition by incorporating the heater at the inlet and also by varying the inlet geometry of the channel, an experimental investigation would be carried out to determine average heat transfer coefficient in uniformly heated rectangular channel with $45^0$,$60^0$,$90^0$ turned flow and also with wall mounted a baffle.

## II. LITERATURE SURVEY

[1]K. Yongsiri , P.Eiamsa-ard , K.Wongcharee , S.Eiamsa-ard, They studied experimentally effects of the inclined detached ribs with different attack angles (ɵ=0,15,30,45,60,75,90,105,120,135,150,165 ) on the heat transfer, friction factor and thermal performance behaviors have been investigated numerically for Reynolds numbers from 4000 to 24,000.

The numerical results show that Among the ribs examined, the ones with θ=60 yield comparable heat transfer rate1.74 times of those in the smooth channel and θ=120 yield thermal performance factor 1.21 which are higher than those given by the others

[2]Bodius Salam, Sumana Biswas, Shuvra Saha, Muhammad Mostafa K Bhuiya, An experimental investigation was carried out for measuring tube-side heat transfer coefficient, friction factor, heat transfer enhancement efficiency of water for turbulent flow in a circular tube fitted with rectangular-cut twisted tape insert. The results can be summarized as,

(a)The Nusselt number increased with the increase of Re. The experimental Nussselt values fall within -6% and -25%. The experimental values were enhanced by 2.3 to 2.9 times compared to Nus values.

(b) An average of 68% enhancement of heat flux was observed for tube with rectangular-cut twisted tape insert (qe) than that of smooth tube (qs).

(c) The experimental fe values were found to be 39% to 80% higher than fs values

[3]Md. Farhad Ismail, M.O. Reza, M.A. Zobaer, Mohammad Ali, They studied experimentally Thermal performance of perforated and solid fins is numerically investigated in this paper. Generally optimization of fins is focused on to maximize heat dissipation rate and to minimize pressure drop for a given mass or volume of the heat sink. Perforated fins have higher contact surface with the fluid in comparison with the solid fins. Thus the perforated fins have higher effectively than the solid fins. Again, it is found that though circular and square perforated fins have almost the same amount of heat removal rate but circular perforated fins have significantly less pressure drop than that of square perforated fins. Hence, fin optimization for practical applications can be achieved by the new types of perforated fins

 

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[4]Foued Chabane , Noureddine Moummi , Said Benramache, They studied experimentally the thermal performance of a single pass solar air heater with five fins attached was investigated experimentally. Longitudinal fins were used inferior the absorber plate to increase the heat exchange and render the flow fluid in the channel uniform. The effect of mass flow rate of air on the outlet temperature, the heat transfer in the thickness of the solar collector, and the thermal efficiency were studied.

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.

[5]R.I. Elghanam , M.M.EL. Fawal , R. Abdel Aziz ,M.H. Skr a, A. Hamza Khalifa, They studied experimentally the Saturated nucleate pool boiling experiments are performed on horizontal stainless steel tubes using pure distilled water and aqueous surfactant solutions having different concentrations (200, 500, 1000, and 1500 ppm). The three test surfactants types used in the present study are SDS, SLES and Triton X-100. The effect of wall heat flux and concentration of aqueous surfactant solution on the pool boiling heat transfer coefficient and active nucleate site density are the major studied parameters.

The results lead to the following conclusions:

For a given aqueous solution concentration, increasing the excess temperature; increases the nucleate pool boiling heat transfer coefficient and the active nucleation site density

[6]Weilin Qu, Gh. Mohiuddin Mala, Dongqing Li they studied experimentally the Experiments were conducted to investigate heat transfer characteristics of water flowing through trapezoidal silicon micro channels with a hydraulic diameter ranging from 62 to 169 mm. A numerical analysis was also carried out by solving a conjugate heat transfer problem involving simultaneous determination of the temperature in both the solid and the regions. The experimental results were compared with the numerical predictions and signicant difference was found. The comparison results indicated that the experimentally determined Nusselt number is much lower than that given by the numerical analysis. The measured lower Nusselt numbers may be due to the effects of surface roughness of the microchannel walls. Based on a roughness-viscosity model established in our previous work, a modied relation which accounts for the roughness-viscosity effects was proposed to interpret the experimental results.

[7]Y. Raja Sekhara, K.V.Sharmab, R.Thundil Karupparaja, C.Chiranjeevia, studied experimentally were conducted in a pipe under low Reynolds number range using water and water based nanofluids. Heat transfer coefficient and friction factor for Nano fluid in the flow path enhanced compared to water. The experimental data is compared with the data of literature and are found to be in good agreement. The increase in heat transfer coefficient in plain tube with use of nanofluids is greater by 8-12% compared to the flow of water in a plain tube. The nanofluid of 0.5% particle concentration is having highest friction factor compared to water. The Nusselt number and friction factor increases with increase of particle concentration. But, friction factor decreases with increase of Reynolds number of flow where as the Nusselt number increases. Using nanofluid with a high heat exchange can help in reduce the size of the heat exchanger or without increasing the size of the heat exchanger efficiency of the system can be improved.

[8]Irfan Kurtbas, He investigated heat transfer enhancement in a rectangular channel with/without baffle. The other variable parameters are the height of entry channel (hc), the angle of entry channel (θ) together with the Reynolds number (Re) range of 2800–30,000. The baffle is mounted on the bottom surface with constant heat flux. Pressure drops corresponding to the heat transfer enhancement are also measured. and he concluded that on Comparison of entry angle of the channel with the straight channel shows that the θ play a constructive role on the heat transfer. An increase in θ results in an increase in both the heat transfer and the pressure drop. The heat transfer and the pressure drops become at the maximum value for $\theta = 90$ and $hc < H$

**[9]**T.M. Liou , S.W. Chang , J.H. Hung , S.F. Chiou, They studied experimentally study of heat transfer in a radially rotating rectangular channel of aspect ratio 1/2 with two opposite walls roughened by 45 staggered ribs is performed. A selection of experimental data illustrates the individual and interactive influences of Re, Ro and buoyancy number (Bu) on local heat transfer with two channel orientations of 0 and 45. Local Nusselt numbers along the leading centerline of45 channel are higher than those in 0 channel as Ro < 0.5. With Ro>1, leading-wall heat transfer levels in the 45 channel become lower than the 0 channel references. The switch-over Ro above which the impacts of channel orientation on leading-wall heat transfer are reversed is found as 0.5 for the present channel configuration. Along the centerline of trailing-wall, local Nusselt numbers in the 0 channel are consistently higher than those in the 45 channel over the entire Ro range tested.

**[**10]Sheng-Chung Tzeng , Tzer-Ming Jeng , Yen-Chan Wang, They studied experimentally determined the local and average heat transfer characteristics in asymmetrically heated sintered porous channels with metallic baffles. The fluid medium was air. Measurements on the test specimen of four modes, without baffles (A), with periodic baffles on the top portion (B), with periodic baffles on the bottom portion (C) and with staggered periodic baffles on both sides (D), are performed. He concluded that

(1) At a given heat flux, the wall temperature increased with the axial distance, and declined as the Reynolds number increased. Additionally, when baffles were attached on the heated wall (as in modes B and D), the wall temperatures measured at the baffles were slightly lower than those at the nearby points, especially at large Reynolds numbers.

(2) In modes B and D, the heat transfer in the inlet region was smaller than that in modes A and C because in the inlet region, the first baffle on the heated wall in modes B and D prevents the air from flowing near the heated wall.

[11]H. Khorasanizadeh∗, J. Amani, M. Nikfar, They studied experimentally Irrespective of the location of the conductive baffle, Nu increases by increasing Ra number. For $Ra = 10^4$, the conduction is the dominant mechanism of heat transfer and as the

baffle moves toward the center of the cavity the conduction mitigates, thus Num decreases. For Ra = $10^5$ and Ra = $10^6$ by displacing the baffle toward the center of the cavity the convection gets stronger and the trend for Num is to increase.
The total entropy generation decreases by increasing the Ra for all volume fractions and all positions of conductive baffle.

## III. CONCLUSION

Different researcher's works about each one have been reviewed and many methods that assist their augmentation effects have been extracted from the literature. These methods presented in the literature are graded baffle and diamond shaped baffle found that more efficient. Many researchers work related to passive enhancement technique

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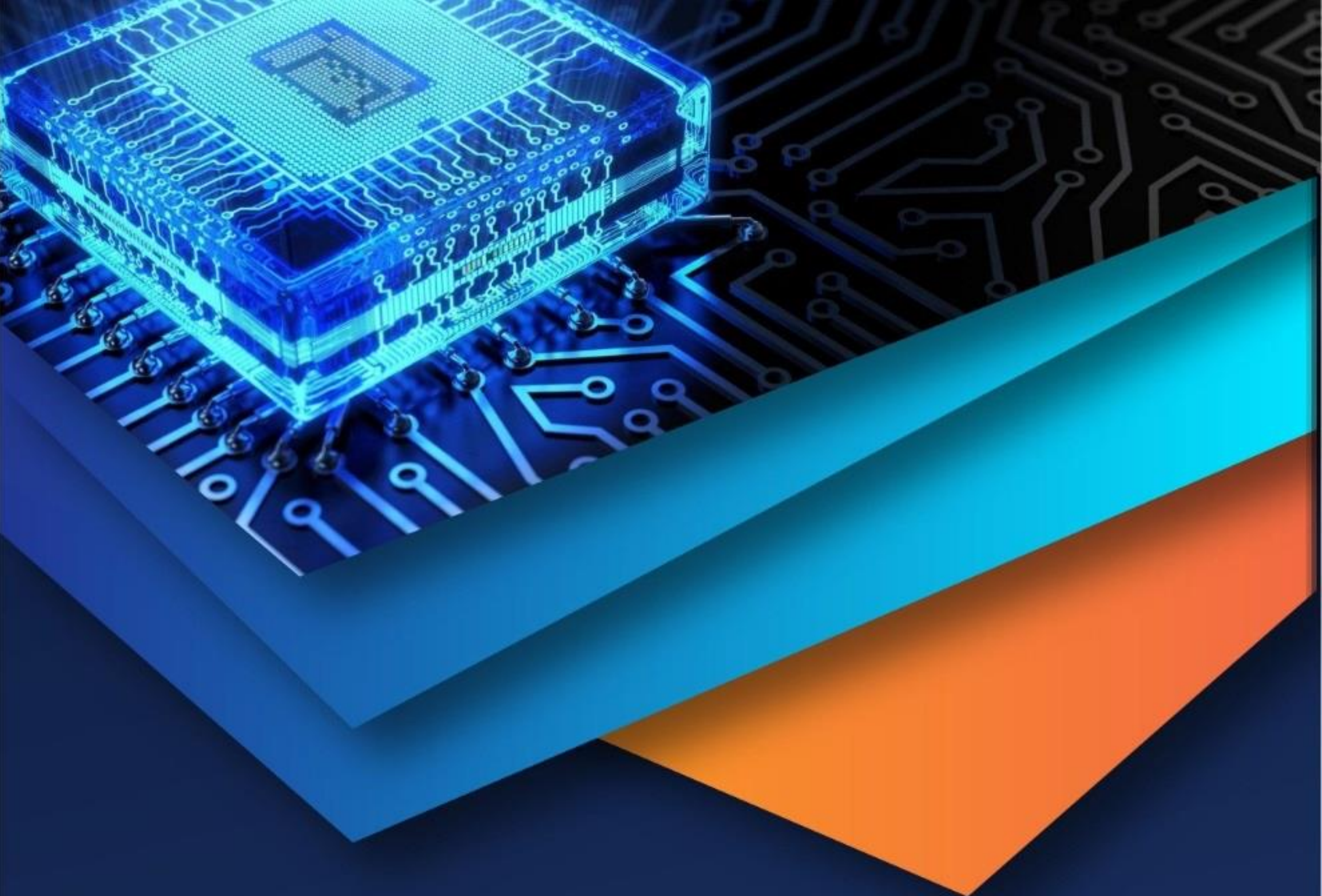


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