CFD Terminology Applying On W Shape Ribs Continuous Arrays Patterns of SAH

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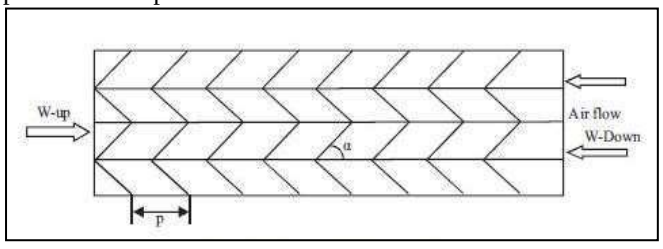
Abstract— The unique view of W rib subtracted material on solar air heater duct to to improve design and efficiency and thermal efficiency to investigate for cfd analysis on it. To verify cfd analysis to W type rib will look after design parameter such as W/w=2 and e/w= 0.032 and e/W= 0.016and p/e=21.88, etc. to investigate numerically match with experimentally data to execute design parameter for arrays on duct as given dimension, mentioned in specification .As acquire Reynolds no. , its k-omega range of turbulence to compute data to design parameter to perform better thermal efficiency to get better performance. Analysis will have to achieve to better performance result to get better acquire experimental result. The turbulence model for different p/e in the range of Reynolds number investigated for fixed values of other parameters. It is seen that the friction factor decreases with increasing Reynolds number in all cases due to the suppression of viscous sub-layer with the increase of Reynolds number. CFD analysis predicts performance of various ribs at different p/e which is demonstr.

Keywords: CFD for W-type, SAH of W-rib

I. INTRODUCTION

Energy is a basic need for human being; it is a prime agent in the generation and economic development. Energy resources may be classified in two ways conventional and non-conventional energy resources. Solar energy is available abundance on earth in the form of radiation. Solar energy is used for heating application and converts it into thermal energy. Solar air heater is the cheapest way of converting solar energy into thermal energy. Thermal performance of solar air heaters is comparably poor from solar water heaters. Thermal performance may be increased by increasing convective heat transfer coefficient. There are two way for increasing heat transfer coefficient either increase the area of absorbing surface by using fins or create the turbulence on the heat transferring surfaces.[11]

Cfd analysis as numerically for W-type subtracted rib arrays on duct with respected geometry with various angles of attack with help of various contour of turbulent, pressure. Temperature etc



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II. SPECIFICATION OF DESIGN

Length(W) = 210 mm
Breath(L) = 650 mm
Thickness = 20 mm
Hydralic Diameter(D) = 45.12 mm
Rib height(e) = 3.3 mm
Rib pitch(P) = 72.22 mm
Angle (α) = 20°, 35°, 40°
Reynold no.(Re) = 4000-9000

III. GEOMETRY & MESHING

The W arc shape geometry dawn in CAD software as follows

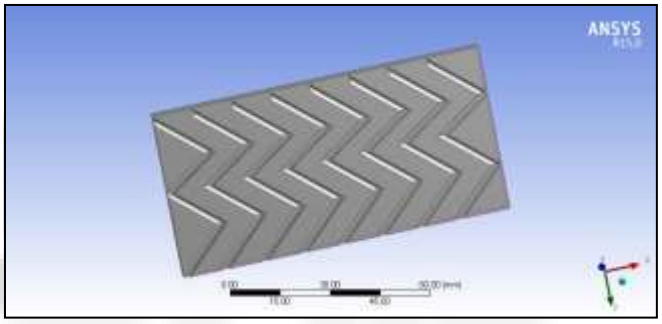

Fig. 1: Geometry of W arc plate of SAH

After modeling, we have meshing the model so next process of numerical method.

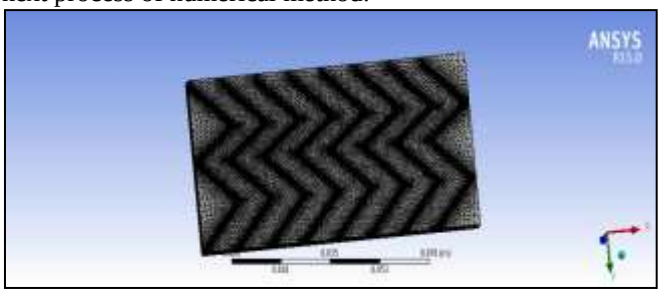

Fig. 2: Mesh of Model

Meshing detail

Type of element	Tetrahedral
No. of nodes	524011
No. of Elements	274181

IV. BOUNDARY CONDITION

A. At Inlet

Condition	Value
Pressure	0.2 bar
Temperature	320 k
Velocity(m/s)	0.3 m/s
Turbulent model	K-omega

Density of fluid on duct	1.225 kg/m^3
Turbulent intensity	5%

B. At Outlet

Condition	Value
Pressure	0.4 bar
Temperature	400 k
Velocity(m/s)	0.6 m/s
Turbulent model	K-omega
Turbulent intensity	5 %
Wall	Segmental flow region
Wall	No slip condition

V. Result & Discussion

Contour for turbulence for K-omega, velocity, contour due to subtraction rib for W shaped to efficiency improved and uniform turbulent get better performance. To discuss various types of roughness geometry in terms of geometrical and operating parameters. Rib cross-section affects the size of separated region and level of disturbance in the flow. The friction factor is less for circular cross-section ribs in comparison to that of rectangular or square cross-section ribs on account of reduction in the size of separated region. This results in decrease in inertial losses and increase in skin friction, thereby, decreasing the friction factor.

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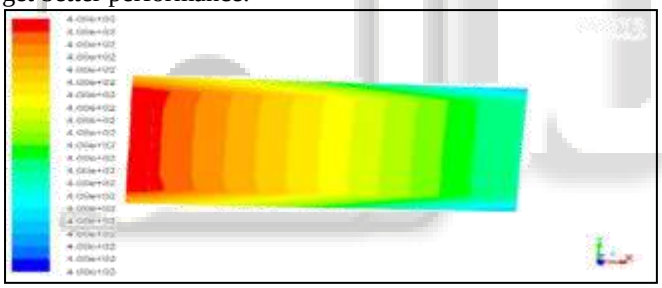

Fig. 3: Turbulent contour (K-omega) for W rib arrays

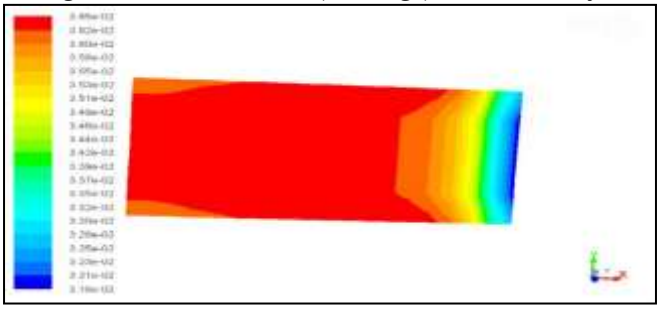

Fig. 4 : Velocity contour with inform of mass flow rate

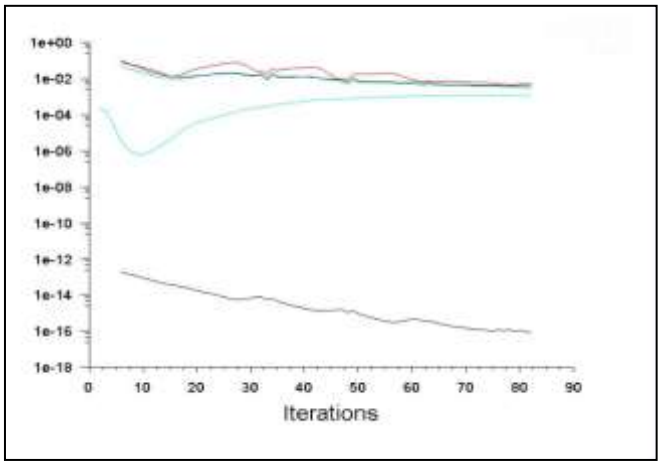

Fig. 5: Result graph

VI. Conclusion

Before analysis of CFD we knwen that as experimental says to W-type rib was excellent performance so we got better efficiency after getting result. To review the research of different investigators in terms of roughness geometries, which can enhance convective heat transfer in solar air heaters with minimum increase in friction losses to classify various types of roughness geometries so that for a specific purpose particular type of geometry can be selected as per the need. To discuss the variation of Nusselt number & friction factor dependence with respect to geometrical and operating parameters. As the size of separated region diminishes, level of disturbance in flow also decreases which affects the heat transfer adversely. Another possible factor contributing to the Nusselt number decrease is the reduction in heat transfer surface area associated with circular cross-section ribs

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