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ANLYSIS BASED ON CFD STUDY OF DIFFERENT TURBULENT PARAMETERS FOR A RADIATOR BY TAKING LOUVERED FINS

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Abstract - Today louvered fins are most preferable used in automotive sector, condensers application etc.It is most widely used because it increases the rate of heat transfer. By changing louvers angle and by Changes incoming velocities different parameters such as heat transfer rate, turbulent intensity, turbulent viscosity and turbulent length and turbulent energy changes significantly. In my work I performed work in Solid works software from this I got the result by using louvered angle at 24-degree and 29- degree and taking inlet velocity from 4 m/s to 8 m/s for analysis purpose by comparing the results at both angle for different parameters.

Key Words: CFD, Heat transfer rate, Turbulent energy, turbulent viscosity

1. INTRODUCTION

Fins are the continued surfaces that are used to increase for heat transfer rate. It is used in heat exchangers. In past simple rectangular fins are used but in present days different kind of fins are used such as

a) Plain-Rectangular fins
b) Plain-Trapezoidal fins
c) Wavy fins
d) Serrated or offset strip fins
e) Louvered fins
f) Perforated fins

Automobiles sector such as in two wheelers, 4 –wheeler such as in buses, cars, jeeps, trucks are widely used heat exchangers for cooling systems. Heat exchangers with air cooling system is made of a number of tubes and different louvered fins.These heat exchangers are air cooled and water cooled types also. This is used because of good heat transfer. From the past analysis it could be stated that heat transfer rate depends on fin patterns, louver angle, louver pitch length, fin materials, fin positions etc.

This learning presented CFD examination for result of changes of louvered pitch on different type's parameters such as turbulence intensity, turbulence energy, turbulence dissipation and heat transfer rate. Heat exchangers with having plate fins mostly used in automobile sector, aerospace sector and chemical industries. Fins is differentiated in terms of effectiveness, compact in size, low in cost, low in weight etc. from many years heat exchangers is extensively used throughout the world. Current scenario in India peoples are mostly engaged along the development and improvement for small plate fin heat exchangers in various usages such as in aerospace and cryogenic applications. Louvered fin have vast application in automobiles radiators, oil coolers, condensers etc. It has special use in automobile industry.

1.2 OBJECTIVE

1. To breaks the boundary layer by increasing the eddy-formation artificially by changing louvers angle and inlet velocity.

2. Another objective is to study the changes of turbulent energy by changing the louver angle at 24-degree and 29-degree by changing the velocities from 4 meter per sec to 8 meter per sec.

3. To study the variation of the turbulent viscosity at 24-degree and 29-degree louvers angle at different inlet flow velocities.

4. To study the variation of heat transfer rate at 24-degree and 29-degree louvers angle.

2. DESIGN MODULAR

Open the work bench Solidworks there will be a design modular in which geometry can be drawn. In this figure 2-Dimensional louvered fins are taken and fin is taken 306 mm length. Louvered angle is taken 24-degree and there are 10 louvered fins out of which first five fins are 24-degree leftward and remaining five are 24-degree rightward. Then draw a fluid domain. Take all the fins as solid.

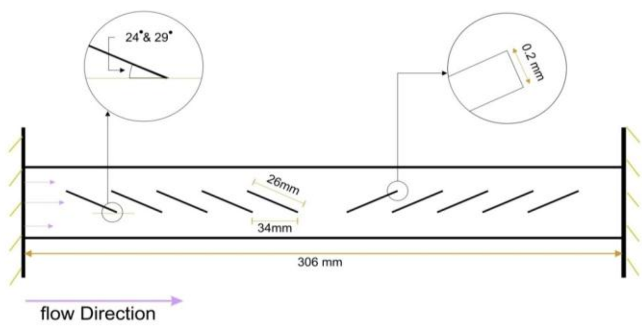


Fig. 1 Cross-section of louvered fins at angles

2.2 BOUNDARY CONDITIONS

After meshing, 'solving' is the next stage in which we put the boundary conditions first. There are the boundary conditions in following tables,

Table -1: Shows Boundary Conditions

Description	***Condition***
Air Inlet velocity	u = 4 m/s to 8 m/s
Temperature of Air	20 °C
Inlet Pressure	450 pa gauge
Air Outlet Temperature	Calculated by solver
Air Outlet Pressure	Calculated by solver
Fin wall Temperature	80 °C
Tube wall Temperature	80 °C
Other's fin surfaces	calculated by solver
Air surfaces temperatures	calculated by solver

Table -2: The Result of Heat Transfer of 24-degree and 29-degree louvered fins

Inlet velocity(m/s)	**Rate of heat transfer (w)**	
	24° Louvered Angle	**29° Louvered Angle**
4	188	206
5	215	236
6	243	264
7	269	292
8	292	319

Graph -1: Comparison of Heat Transfer rate for 24-degree and29-degree louvered angle fins

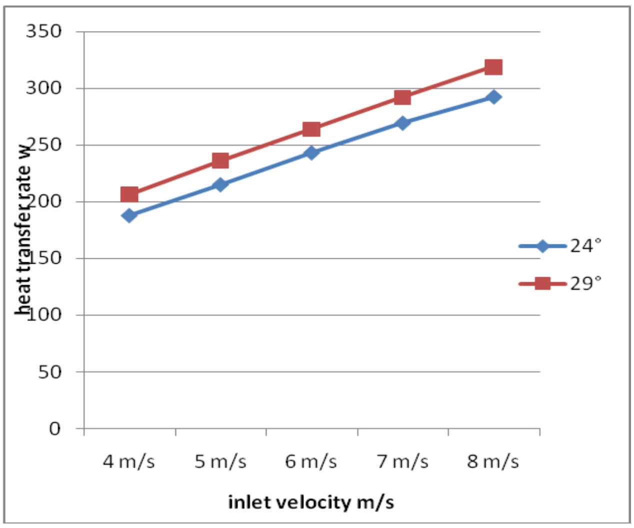


Table 3 The Result of Turbulent energy of 24-degree and 29-degree louvered fins

Inlet velocity(m/s)	**Range of turbulent energy (J/kg)**	
	24° Louvered Angle	**29° Louvered Angle**
4	2.53991	2.8491
5	3.8757	4.65614
6	5.52128	6.34128
7	7.42411	8.52422
8	9.72758	11.0022

Graph. -2: Comparison of turbulent energy for 24-degree and 29-degree louvered angle fins

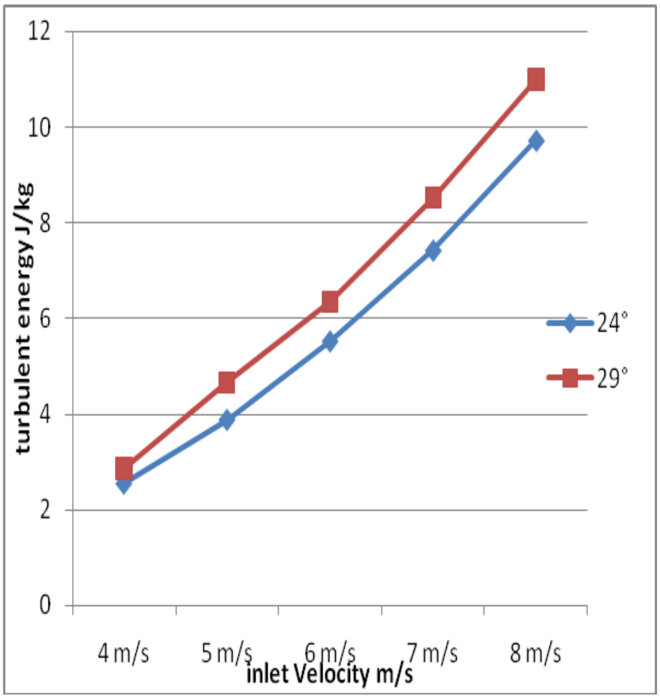
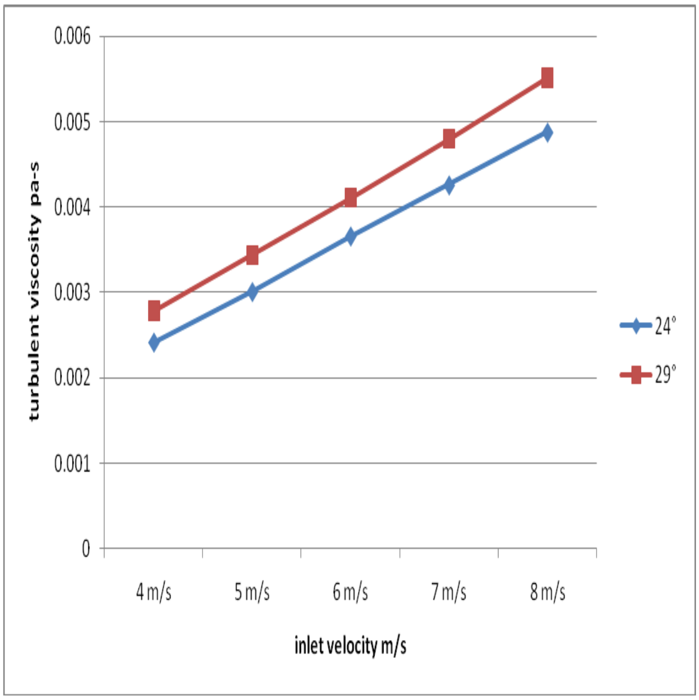


Table 4 The Result of Turbulent Viscosity of 24-degree and 29-degree louvered fins

Inlet velocity(m/s)	**Range of Turbulent Viscosity (Pa-s)**	
	24° Louvered Angle	**29° Louvered Angle**
4	0.00242009	0.00277935
5	0.00301065	0.00343567
6	0.00366297	0.00410782
7	0.00426034	0.00479841
8	0.00487721	0.00551431

Graph -3 Comparison of turbulent viscosity for 24-degree and 29-degree louvered angle fins



3. CONCLUSIONS

(1) For constant louver angle heat transfer rate increases continuously with increase in velocity from 4m/s to 8 m/s.

(2) For constant louver angle turbulent energy increases continuously with increase in velocity from 4m/s to 8 m/s.

(3) For constant louver angle turbulent viscosity increases continuously wit Increase in velocity from 4m/s to 8 m/s.

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