

CFD STUDY OF DIFFERENT TURBULENT PARAMETERS FOR A RADIATOR IN LOUVERED FINS

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Abstract – Now day's louvers fins are used in various applications such as in automotive, air condensers and in air conditioning. In this work by changing in louvered angle and by varying inlet velocity turbulent intensity, turbulent length changes continuously. In this work I took louver angle as 24 degree and 29 degree at an interval of 5 degree and inlet velocity is taken as 4 m/s to 8 m/s at an interval of 1 m/s and comparing the result of both for 24 degree and 29 degree result.

Key Words: CFD, TURBULENT INTENSITY, TURBULENT LENGTH, LOUVERED FINS, SOLIDWORKS.

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.

In today's condition louvered fins are mostly used because it has capability to increase the heat transfer significantly and very effectively. It is artificial arrangements in plain fins. This artificial change in fins leads to eddy formation, that causes turbulence and it breaks the boundary layer so it causes to boost heat transfer capacity. This in addition causes pressure drop. The increased pressure drop unnecessary ample obstacle to cancel out the use of louvered fins. Today's each vehicle subsist component named as radiator that have a wide effects on the stability of operation and efficiency in respect of heat. Radiators are used for creating heat in surroundings air. Louvers help to increase heat transfer area outcome significant increase in heat transfer rate. Another analysis is stated that, in case of radiators, a high Reynolds number causes more air ventilation which will be catches by the louvers.

That is main reason of using a fin is to gives more surface for heat transfer and it provide another purpose as it decreases the boundary layer growth towards the surface of fin and that new boundary layer formation is the reason for provide a platform for high rate of heat transfer along the fin.

Around many type of fins are studied at heat exchangers such that.

a) Louvered Fins

- (i) Louvered fins resting on flat tube by triangular channels.
- (ii) Plates and Tube louvered fins geometry
- (iii) Louvered fins resting on flat tube with rectangular channels
- (iv) Louvered fin on flat tube with splitter plate rectangular channels
- (v) Louvered fins on flat tube with splitter plate triangular channels

b) Offset Fins,

c) Wavy Fins,

d) Strip Fins etc.

In among the all fin surfaces louvered types of fins are mostly used in automobile industries. Louvers have another advantage that without inadequate raise to flow resistance, the heat transfer is as well improved. In past analysis there a lot of things developed many methods for decreasing thermal resistance that not only reduce its size and weight but also reduce its cost. In mostly fins&tubes, air&water heat exchangers in typical operating conditions of, the domineering thermal resistance towards external side and could bias much that 95% of the overall thermal resistance.

1.1 OBJECTIVE

1. To breaks the boundary layer by increasing the eddy-formation artificially by changing louvers angle and inlet velocity.
2. To study the variation of the turbulent length at 24-degree and 29-degree louvers angle at different inlet flow velocities.
3. To study the variation of turbulent intensity at 24-degree and 29-degree louvers angle.

2. TURBULENT INTENSITY

The below table and graph result shows that maximum turbulent intensity is increase with increase of velocity but increase of intensity at 29° is more in compare to 24°.

Table -1: The Result of Turbulent intensity of 24-degree and 29-degree louvered fins

Inlet velocity(m/s)	Turbulent intensity (%)	
	24° Louvered Angle	29° Louvered Angle
4	42.50	49.15
5	42.61	49.79
6	43.61	50.13
7	43.56	50.37
8	43.91	50.41

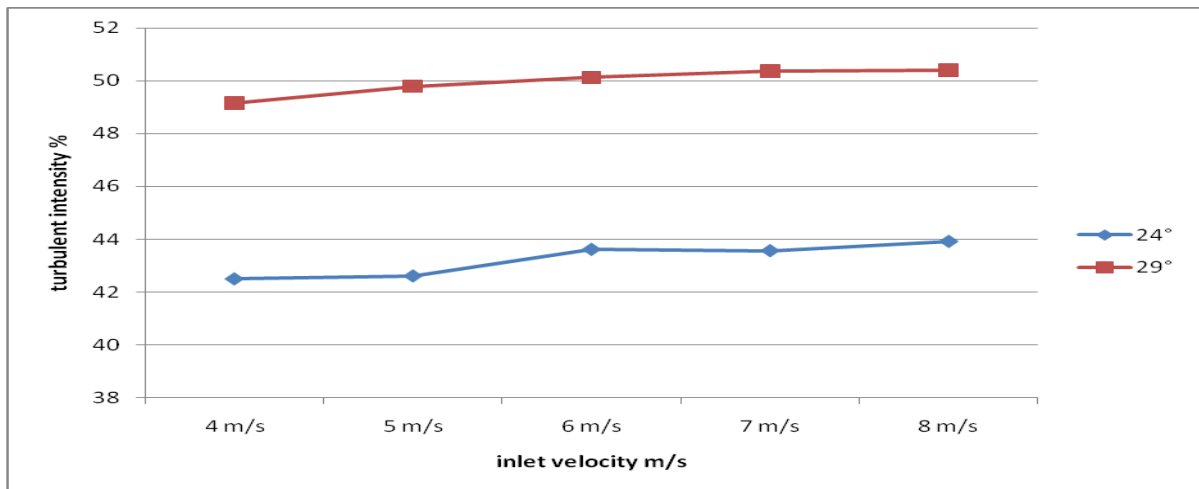


Chart -1: Comparison of turbulent intensity for 24-degree and 29-degree louvered angle fin

2.1 TURBULENT LENGTH

Below table and graph shows value of turbulent length at 29 degree is more than 24 degree louvered fins. For 29 degree it first decrease then increase continuously. And for 24 degree it increase continuously.

Inlet velocity(m/s)	Range of Turbulent Length (m)	
	24° Louvered Angle	29° Louvered Angle
4	0.00300574	0.00318548
5	0.00300857	0.00316259
6	0.00304705	0.00317192
7	0.00305246	0.00318174
8	0.00305337	0.0031967

Table -2: The Result of Turbulent Length of 24-degree and 29-degree louvered fins

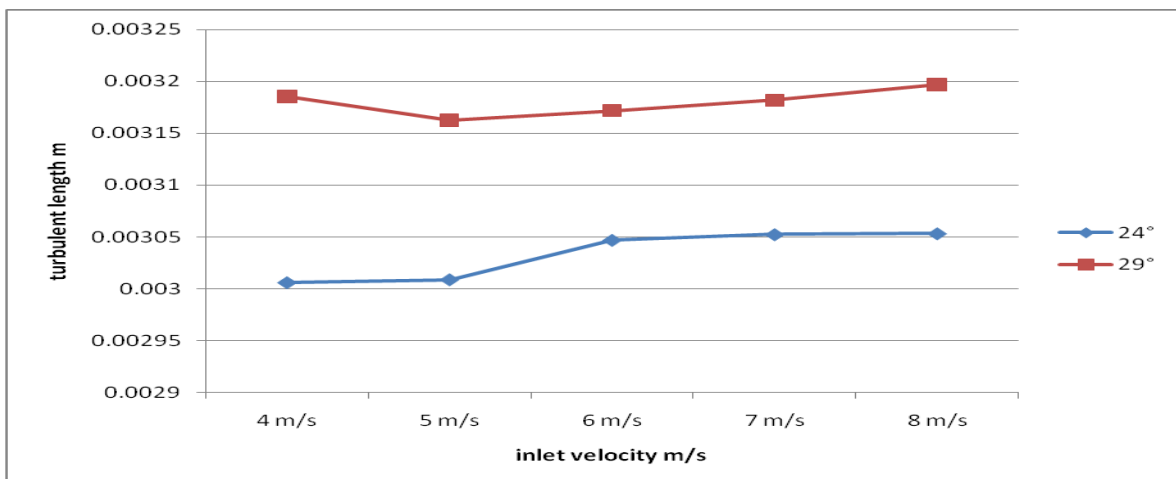


Chart -2: Comparison of turbulent length for 24-degree and 29-degree louvered angle fins

3. CONCLUSIONS

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

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

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