Analysis of Thermal Enhancement on Spiral Radiator with Different Fin Shape

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Abstract

In a Computational Fluid Dynamics (CFD), the trial has been conducted on the heat transfer coefficient, effectiveness and temperature, for a spiral radiator with circumferential fins. In the CFD investigation it was assumed that, the circumferential fins with different configuration are proposed. This investigation was carried out on a Reynolds Number ranging in between 2000-3500.

Keywords— *Spiral radiator, Circumferential fin, Reynolds Number, Heat transfer coefficient.*

I INTRODUCTION

The suggested study focuses on a better heat exchanger (Radiator) design that may be used to either heat or cool a fluid. Additionally, it discusses the study specifically related to an enhanced fan assisted air-cooled heat exchanger utilised in automobiles and internal combustion engines (IC) power plants, engines, and refrigeration systems. Everybody is competing for manufacturing in the working diligently to improve the quality, effectiveness, and performance of their equipment as well as to enhance parts, such as heat exchangers.

There are several types of heat exchangers that use air as the heat transfer medium since it is readily and abundantly accessible and poses no disposal problems. Air flow is either spontaneously produced or helped by the use of one or more fans in recognized heat exchangers. Utilizing a fan lowers it is more compact because of the equipment's size and price. Consequently, fan-assisted air more people choose cooled heat exchangers than others.

TYPE HEAT EXCHANGERS IN AUTOMOBILES

Various heat exchangers employed in modern automobiles are,

- Radiator
- Transmission Oil Cooler
- Engine Oil Cooler
- Evaporator
- Condenser
- Engine water Jackets
- Exhaust Gas Cooler
- Brake Drums
- Turbo intercooler

According to the configuration of heat sink, it is classified as follows

- Rectangular channel heat sink
- Circular fin heat sink
- Stamped heat sink
- Annular fin shaped heat sink
- Zigzag shaped heat sink

III PREPARATION OF THE CAD MODEL:

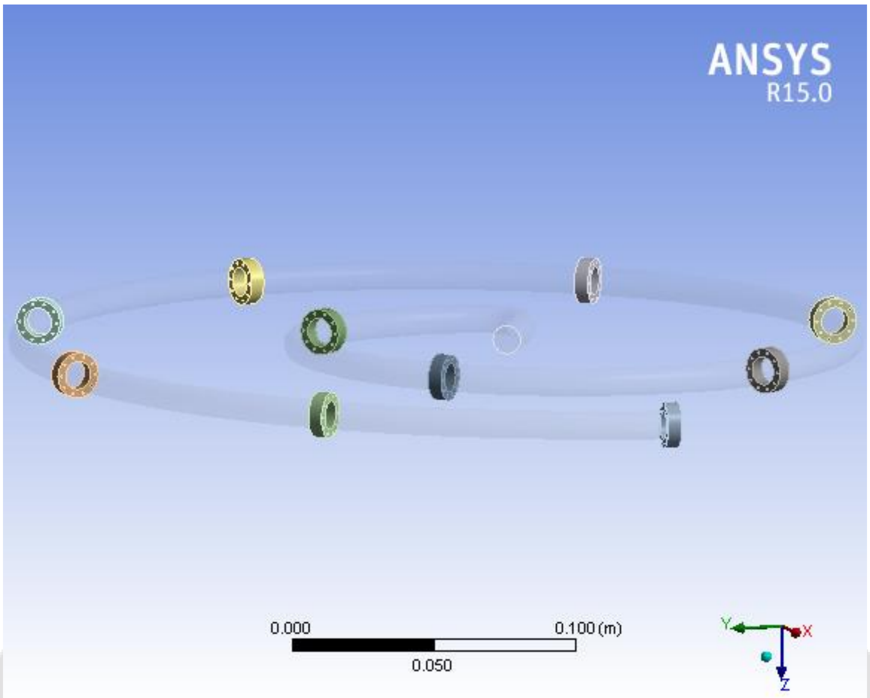

Fig. showing the geometric dimension of the spiral radiator with circular perforated circumferential fin

IV. Validation of CFD model

Water velocity (m/s)	Temperature (K)
0.25	345.2
0.3	334.5
0.4	323.7
0.7	309.7
1	304.1

V. Optimization result for radiator spiral tube with elliptical circumferential fin

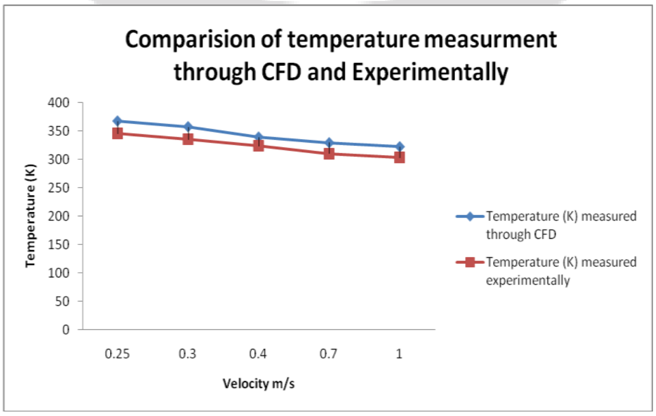

Fig.: Showing the comparison of temperature measure at the circumferential fin through CFD and experimentally (Base paper result)

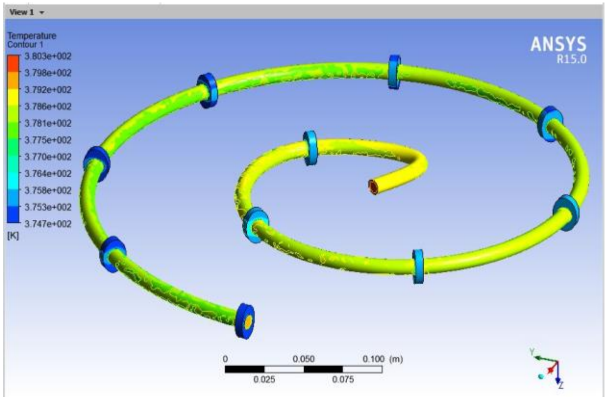

Fig : temperature distribution of spiral tube radiator with circular shaped circumferential fin.

VI. Optimization of circumferential fin geometry circular perforated

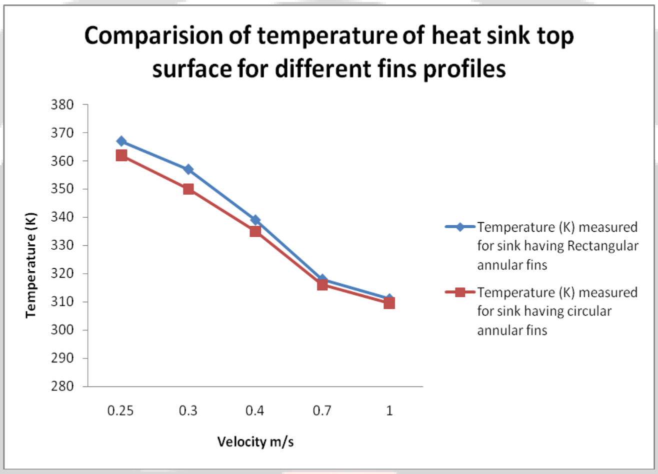

Fig.: Shows the comparison of temperature at the top of the heat sink using PLA as a working material for heat sink having different fins profile.

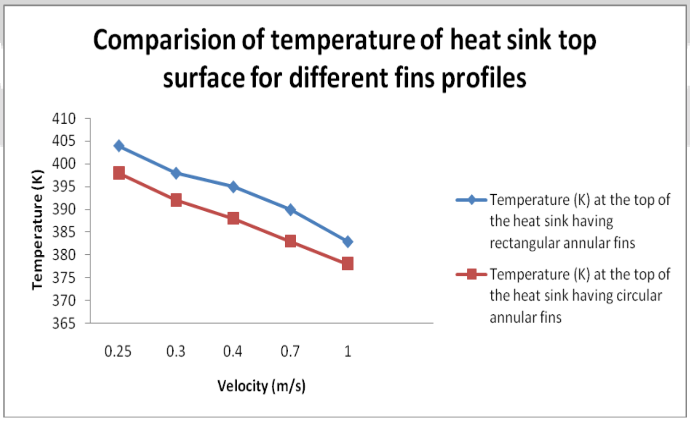

Fig.: Showing the comparison of the temperature at the top of the heat sink for different configuration.

CONCLUSION

- Simulated the spiral radiator having circumferential fin of rectangular, circular and circular perforated annulus shaped fins for different velocity of (0.25-1.00m/s).
- From the above result we have least temperature distribution for circular perforated shaped annular profiled circumferential fin for different velocity of water circulating inside the spiral radiator tube.

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