International Journal of Advanced Engineering and Technology
ISSN: 2456-7655; Impact Factor: RJIF 5.54
Received: 08-12-2020; Accepted: 23-12-2020; Published: 08-01-2021
www.newengineeringjournal.com
Volume 5; Issue 1; 2021; Page No. 04-05

Analysis and optimization of material for pin fin

Shraddha Sonone, Vandan Thakare, Harshal Burde, Yash Vispute, Prajwal Bhoyar
Student (Mechanical Engineering), SGBAU, Yavatmal, Maharashtra, India

Abstract
In the present report, the 3-dimensional CFD simulation of heat transfer and air flow in circular pin fin heat sink are presented for Electronic component cooling application. The circular pin fin heat sink are simulated for different alloys like Aluminium alloys i.e.6063-T83, 7075O (SS) and Copper alloys i.e. Chromium Copper. In this study comparing the heat transfer rate with respect to different alloys under Natural Convection. The goal of this study was to maximize the thermal performance of heat sink with respect to different material such that it helps to finding material selection, low cost material and good heat transfer rate for designing the heat sink. Aluminium are the materials especially used rather than brass and iron. The utilization of pins in the heat sink increases the heat transfer area to reach the extreme rate of heat loss in a restricted space.

Keywords: aluminium, heat, sink, alloy

Introduction
Power dissipation of electronic components are increasing and more and more electronic packages are requiring some form of thermal enhancement to adequately cool the components. One of the commonly used methods of improving thermal performance is to use heat sinks [2]. In number of applications, such as UPS, Inverter, Thermo-electric generator etc. Air flow Velocity and direction are not very well defined or controlled such application require heat sink that are not sensitive to air flow direction pin fin heat sinks are one of the types that are not sensitive to air flow direction and are widely used in electronic applications [1]. This report presents the results of a study to optimize the material of pin fin heat sink for use of electronic component cooling applications that is UPS, Thermo-electric generator etc. The goal of this study was to maximize the thermal performance [3]. It was conclude that Maximum temperature has been found out for plate fins which is 53.062 °C and Maximum Temperature is found out for Fins With circular pin fin which is 71.677 °C. Circular pin fin heat sink displayed higher heat transfer rate than the plat fin heat sink. The overall performance of the six different heat sinks with different shaped pin-fin structures was studied in this paper for different velocities varying from 5, 10 & 12 m/s. Heat sink with Rhombus prism pin fins (HS-RPPF) is found to be more effective in dissipating heat compared to other configuration of fins [3]. The results obtained for heat sink with rectangular pin fin have been established by comparing the FEM and analytical techniques. As the number of fins were increased, the total heat transfer rate also increases.

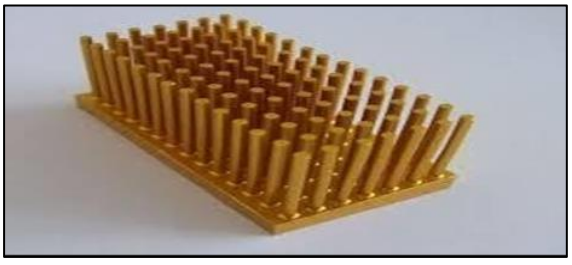

Fig 1

Literature survey
Many of project work concentrated on design optimization of heat sink but in this study concentrated in material optimization. Materials used in this work are alluminium alloys i.e.6063-T83, 7075-O (SS) and Copper alloys i.e. Chromium Copper. These types of materials not used in many of project work.

Methodology

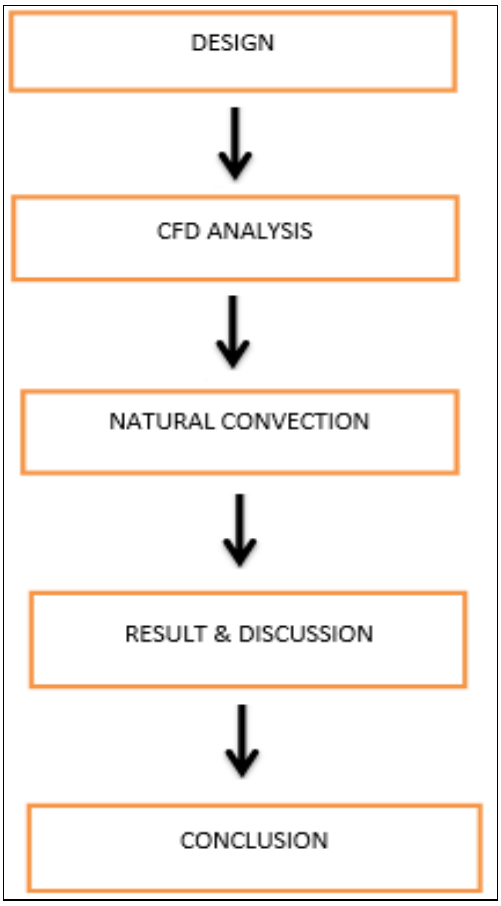

Fig 2

Comparision of the material

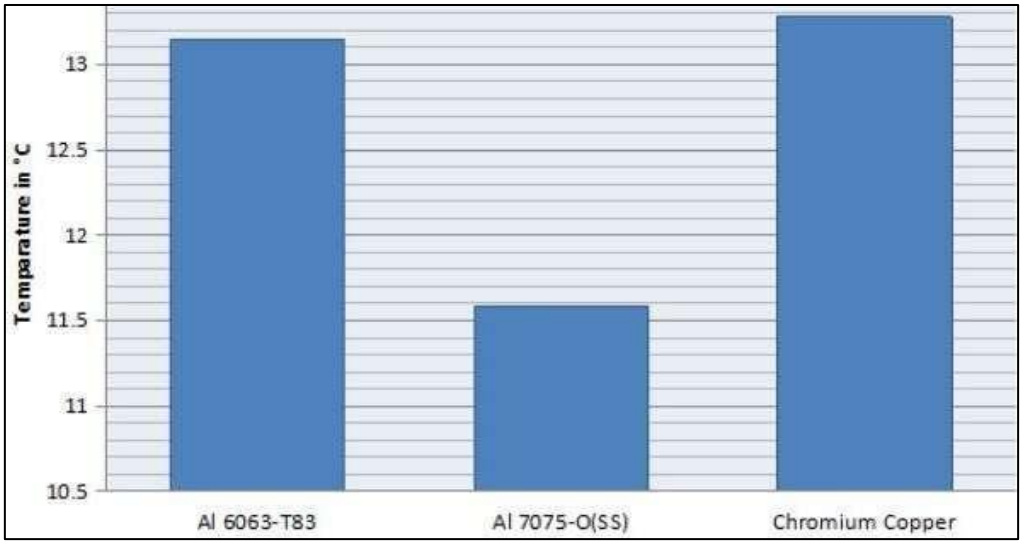

Fig 3: Temperature Comparision

Table 1: Price of the material

Material	Price
Al 6063-T83	200 Rs
Al 7075-O	500 Rs
Chromium Copper	750 Rs

Conclusion

By observing CFD results, use of Circular pin fin heat sink with material Chromium Copper is better because temperature drop is more and good heat observing capacity Compare to Al 6063-T83, and Al 7075-O alloy.

By observing, cost of material Al 6063-T83 is less compare to other two materials. Temperature drop of Al 6063 is only 0.13°C lesser than Chromium copper. Best material for manufacturing pin fin heat sink is Al 6063T83 because low cost and light weight compare to other two materials

Acknowledgement

The authors are willingly thankful to all the professors and mentors who help for the preparation of this paper and would also like to thank all the reviewers, our main authors for their comments to improve the quality and presentation of paper.

References

1. Dishi Saxena, *et al*. Study and optimization of heat transfer analysis for engine fins using ansys. International journal of scientific Research in Computer Science and Engineering. 2019; 7(5):22-32.
2. Mohammad Saraireh. Computational fluid dynamics simulation of plate fin and circular pin fin heat sinks. Jordan journal of mechanical and industrial engineering. 2016; 10(2):99-104. ISSN 19956665.
3. Santosh Kansal, Piyush Laad. Performance & Thermal analysis of heat sink with fins of different configuration using cfd, International journal of scientific & engineering Research, 2015, 6.
4. K Subahan, *et al.* CFD analysis of pin-fin heat sink used in electronic devices, international journal of scientific & technology Research, 2019, 8.