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Performance Analysis of Heat Sink by Using Variable Fin Geometry

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Abstract: *All engineering systems under operations generates heat. If this heat is not removed periodically the system will fail due to overheating of components. The heat dissipation from surface is always been a hot topic of all time considering fins. Fins or extended surfaces are used to remove the heat from the system. Experimenting with various geometry in order to enhance the heat dissipation is been a constant research interest. In almost every field, increasing the heat dissipation capacity of the fins has been great challenge for all engineers. With the evolution of various shapes and sizes with different materials has helped our researchers and manufactures a lot. The objective research topic is to improve the performance of the fins using different geometry and material. There are various researches which are happening in this field to improve the performance of fins and to enhance the heat transfer. We know that, by increasing the surface area we can increase the heat dissipation rate. The main aim of the paper is to optimize the thermal properties by varying geometry, material and thickness of fin.*

Keywords– *Aluminum, fin, heat sink, hole, heat transfer rate, temperature.*

I.INTRODUCTION

Heat transfer is a science that studies the energy transfer between two bodies due to temperature difference. This temperature difference is thought of as a driving force that causes heat to flow. Heat transfer occurs by three basic mechanisms or modes.1) Conduction.2) Convection.3) Radiation. The subject of enhanced heat transfer has become much more important to industry with time elapse, use of intricate geometries were initially limited due to manufacturing process. However, new manufacturing methods allow manufacture of intricate surface geometries.

Extended surfaces have fins attached to the primary surface. Fins are primarily used to increase the total rate of heat transfer. Enhanced fin geometries also increase the total rate of heat transfer. The effect of variable in geometric parameter and material are of great importance to heat transfer therefore they need to be suggestive study. Therefore, Practical experimental result for proper parametric fin geometries and materials to increase the heat transfer is necessary.

Fig No. 1.1 Extruded heat sink

1.1*Problem Statement*

The subject of enhanced heat transfer has become much more important to industry with time elapse, use of intricate geometries were initially limited due to manufacturing process. However, new manufacturing methods allow manufacture of intricate surface geometries. Extended surfaces have fins attached to the primary surface. Fins are primarily used to increase the total rate of heat transfer. Enhanced fin geometries also increase the total rate of heat transfer. The effect of variable in geometric parameter and material are of great importance to heat transfer therefore they need to be suggestive study. Therefore, Practical experimental result for proper parametric fin geometries and materials to increase the heat transfer is necessary.

1.2 Objective

To study heat transfer performance in natural convection of Square Shape fin heat sink circular hole. To study the effect of variation in hole size and number of holes (4,6,8) on its performance.

To study the effect of temperature difference between heat sink and ambient on heat transfer coefficient.

To validate experimental results by using software.

II.EXPERIMENTAL SETUP

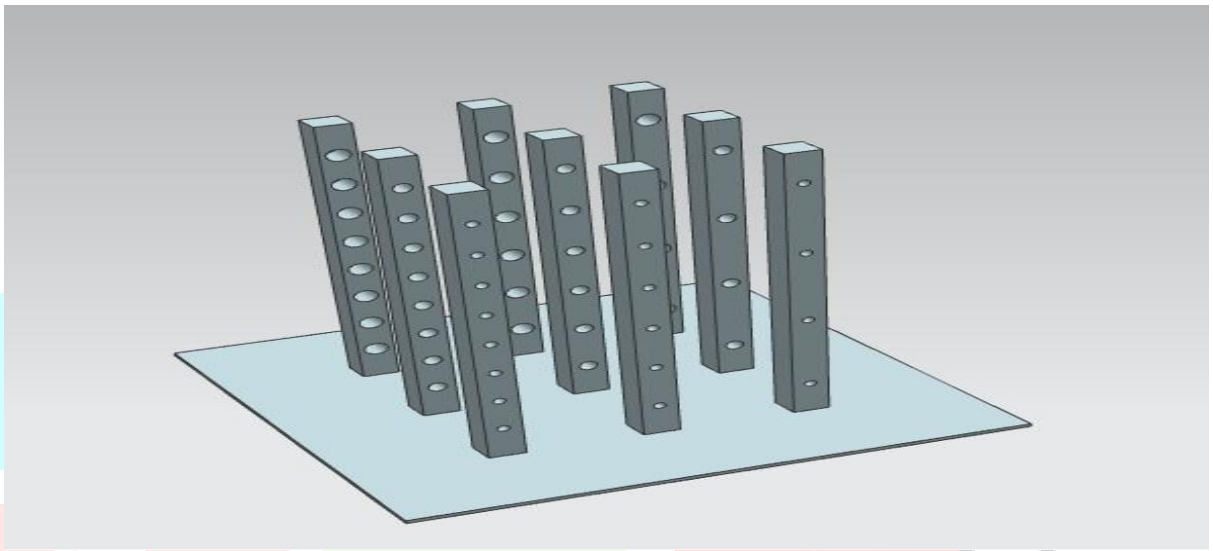

Fig No.2.1 Experimental setup

2.1Fin Geometry:

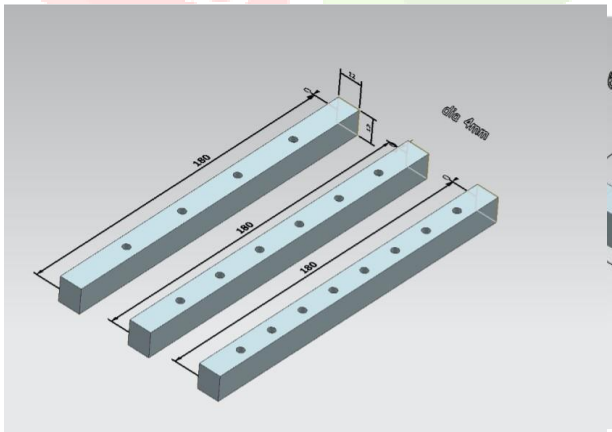

Fig No. 2.2 Square Fin (Dia. 4 mm)

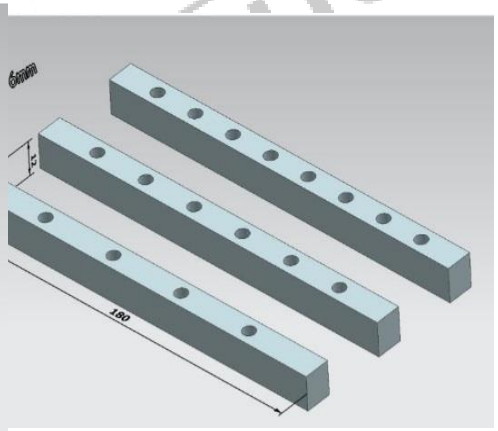

Fig No.2.3 Square Fin (Día. 6 mm)

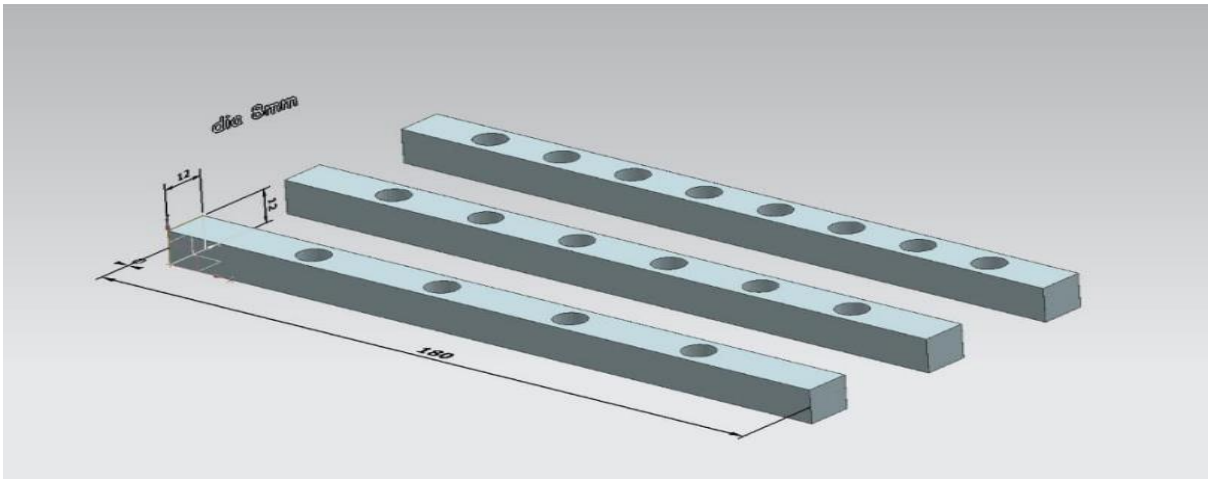

Fig No.2.4 Square Fin (Día. 8 mm)

III.RESULTS AND DISCUSSION

Comparisons of different shapes geometry (Square fin with variations in number of holes and variations in hole Diameters) of their properties by applying the same convection coefficient of 24 W/m2C and maximum temperature 150 C(423 kelvin), 200 C(473 kelvin) 250 C(523 kelvin) & 300 C(573 kelvin)

Table No.6.1 Material – Aluminium

Thermal Conductivity	215 W/m K
Density	2689 kg/m^3
Specific Heat	951 J/kg C
Nodes	14094
Elements	6650
Mass	0.89705 kg

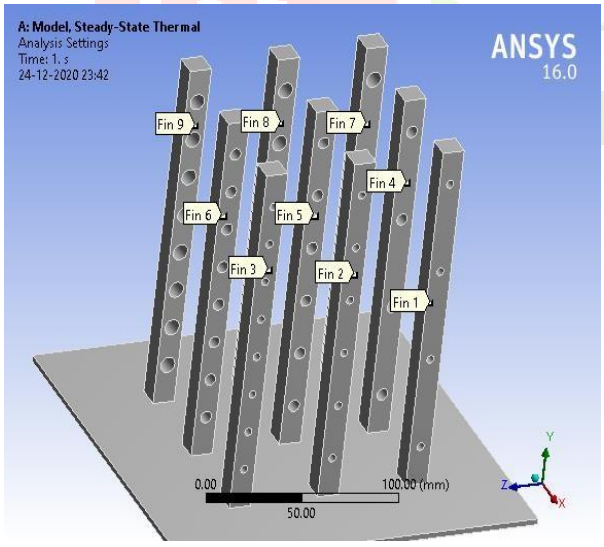

Fig No.3.1 Fin Number in Geometry

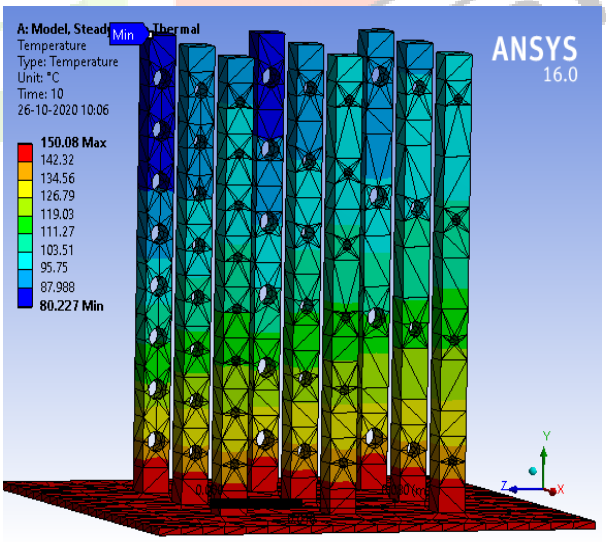

Fig No.3.2 Temperatures Result temperature result For 150 C

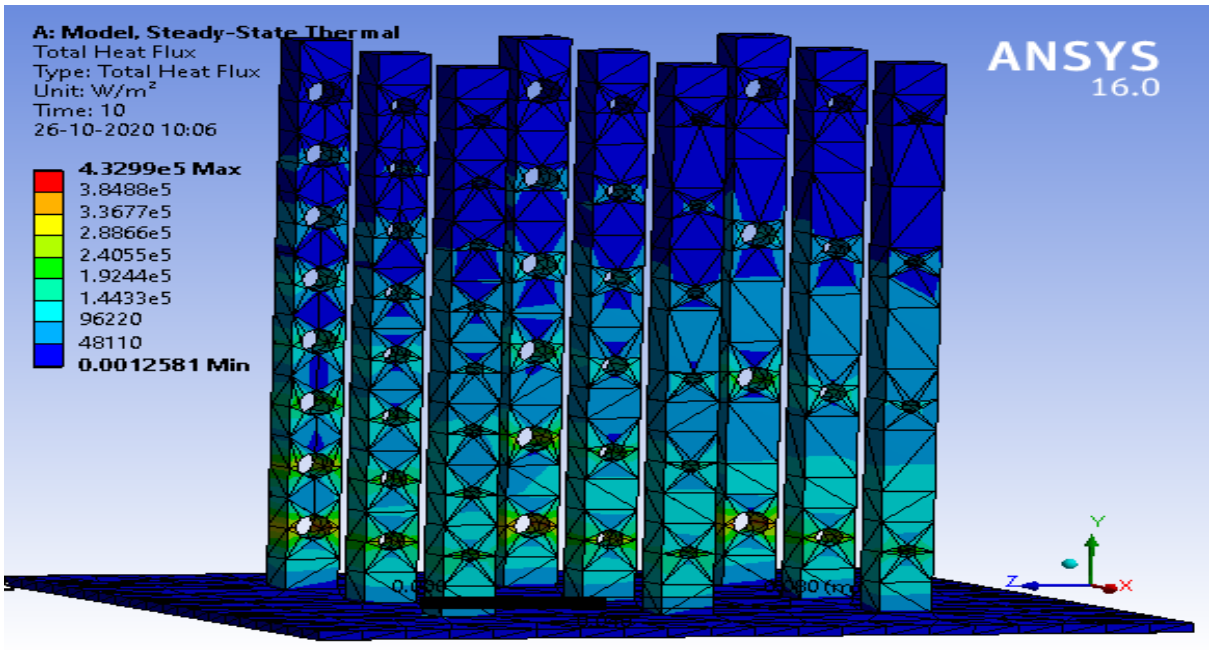

Fig No.3.3 Heat Flux Result temperature result for 150 C

IV. CONCLUSION

After comparing and observing all the above analysis, we come to know that all variable fins show different minimum temperature with different geometry. As we all know more the temperature difference more will be the heat dissipation. So Average Temperature of Fin 1 is high as compare to Fin 7 & Average Temperature of Fin 3 high as compare to Fin 8. Heat dissipation of Fin 8 is more than Fin 1 with increases in number of holes as well as diameter of hole. It is also observed that at 150 C temperature it is cleared that if number of holes increases the heat dissipation increases but if number of holes increases as well as the diameter of hole increases the area of fin reduces and heat dissipation increases.

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