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"A REVIEW ON HEAT SINK OF CPU"

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ABSTRACT

This paper uses thermal analysis to identify a cooling solution for a desktop computer. In this modern world speed determines everything especially desktop PC, CPU have been popular. The computer revolution is growing rapidly in almost every field. CPU is the electronic components, which produces a lot of heat that reduces the performance. In this study the forced convection cooling of heat sinks mounted on CPU are investigated. The design is based on total chassis power dissipation. This represents significant power dissipation for the chassis components (Main processor chip, other chipsets North bridge heat sink and South bridge heat sink) the main processing chip has fin attachments (heat sink) over it for heat dissipation. There are many designs of heat sink to improve the efficiency, few heat sink designs are selected and analyzed, which would be give the maximum heat dissipation. There are many ways of cooling such as air cooling, heat pump cooling. The life of the electronic components strongly depends upon the heat transfer which is generated within that component or the cooling of that device. For this reason the need for forced air cooling is the main factor that should be consider at the starting phase of electronic system design. The one of the critical parts of any electronic device is heat sink, which dissipates heat from electronic device to surrounding. Thus the choice of an optimal heat sink depends upon the number of geometric parameters like fin height, fin length, fin thickness, number of fins, fin materials etc. With the help of commercially available computational fluid dynamics software's Icepak and Fluent, we can easily analyse the cooling effect of CPU.

Key Words: *Aspect ratio, Fins, Heat sinks*

I. INTRODUCTION

With the rapid development of electronic technology, electronic appliances and devices now are always ever-present in our daily lives. However, as the component size shrinks the heat flux per unit area increases dramatically. The working temperature of the electronic components may exceed the desired temperature level. Thus, promoting the heat transfer rate and maintaining the die at the desired operating temperature have played an important role in insuring a reliable operation of electronic components. There are a number of methods in electronics cooling, such as jet impingement cooling [1, 2] and heat pipe [3-5]. Conventional electronics cooling normally used forced air cooling with heat sink showing superiority in terms of unit price, weight and reliability. To design a practical heat sink, some criteria such as a large heat transfer rate, a low pressure drop, and a simpler structure should be considered. Porous-channel heat sinks or heat sinks combined with porous structures have been also suggested to improve the thermal performance of heat sinks [6-8]. Among various types of heat sinks, plate-fin and pin-fin heat sinks are widely used owing to their own advantages. The plate-fin heat sink has the advantages of a small pressure drop, a simple design and easy fabrication.

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On the other hand, the pin-fin heat sink has the advantages of a high heat transfer rate due to the redeveloping regions and an even thermal performance independent of the direction of the fluid flow [9, 10]. Recently, Kim et al. [11] revealed that the effective heat sink type between plate-fin and pin-fin heat sinks could be determined depending on the pumping power and heat sink length. In addition to above research activities, there has been a new attempt to combine the advantages of plate-fin and pin-fin heat sinks [12]. Usually, these types of heat sinks have several cuts, termed cross-cuts in the present study, perpendicular to the direction of the fluid flow.

Xu et al. [13] demonstrated a new silicon micro channel heat sink composed of longitudinal micro channels and several transverse micro channels that divide the entire flow path into several independent zones. Experiments for strip fin heat sinks were performed and empirical correlations were proposed to predict the Nusselt number and pressure drop [14, 15]. Noda et al. [16] performed numerical simulations of heat sinks.

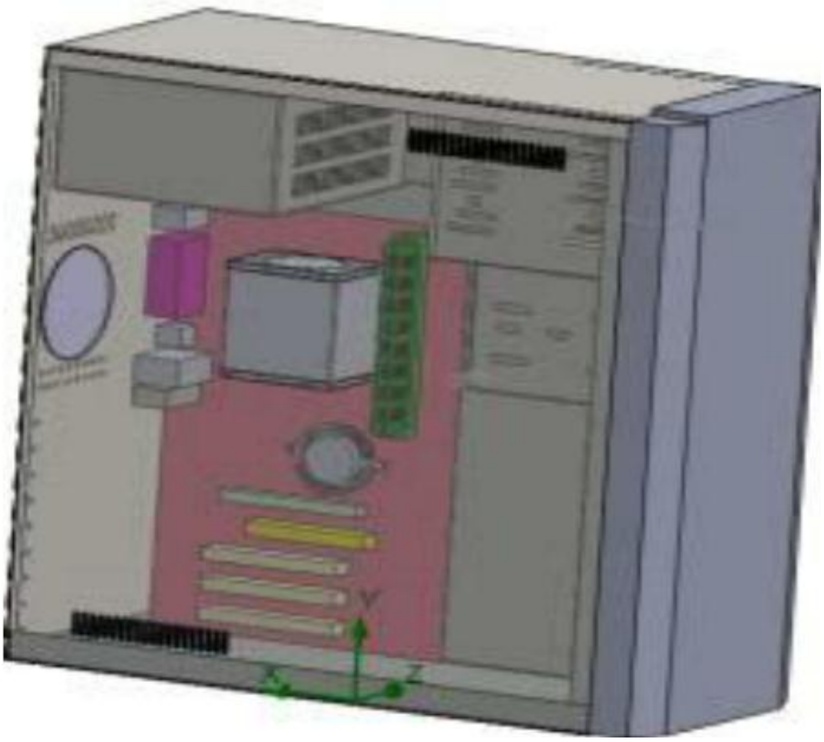

Fig.1 CPU cabinet

II. LITERATURE REVIEW

Optimal geometries have enhanced heat transfer surfaces which allow devices to take advantage of one of the following options consisting size reduction, increased thermodynamic process efficiency which leads to lower operating costs, increased heat exchange rate for fixed fluid inlet temperatures, or reduced pumping power for fixed heat duty. There are number of methods in electronic cooling to maintain the unwanted heat dissipation during the operation of such devices, which have been studied and investigated by different researchers.

Shivdas S kharche et.al [1] looked into likely and speculatively ordinary convection heat trade from vertical rectangular cutting edge groups with and without scores at the center. They analyzed the indents of different geometrical shapes. After the test study they have assumed that the glow move rate in indent adjusts is more than the unnotched edges.

U. S. Gawai, Mathew V. K. et.al. [2], they have done exploratory assessment of warmth trade by pin balance. The results for single cutting edge of aluminum and metal were focused on for warmth trade. The results showed that the glow trade coefficient and capability of aluminum balance was more noticeable than the metal cutting edge.

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K. Kumar, Vinay et.al. [3], they performed warm and helper examination of tree shaped cutting edge show. They had carried tree shaped sharp edge with openings and tree formed equalization without spaces for their examination. They moreover focused on the effect of material on the results for similar geometries by taking aluminum composite, helper steel and copper mix for the equivalent. The results got exhibited that the capacities of the opened tree adjusts are better than without opened tree cutting edges. As demonstrated by material the copper cutting edges with openings was best for warmth trade among all of the equalizations. The aluminum opened cutting edge was found best as it has effective warmth trade without contortion among all of the equalizations taken for the examination.

V. Kumar and Bartaria et al.[4], they have done exploratory and CFD assessment of a round pin balance heat sink using ANSYS Fluent v.12.1. They have done the examination by changing the estimation of bended pin cutting edge for example by moving the cross-section an area. The results exhibited that for all of the rates 2mm minor turn roundabout pin parity would be insightful to warm opposition and weight drop.

H. Dange and Patil et al. [5], they have done the preliminary and CFD examination for warmth trade on round sharp edge by obliged convection. They have done the examination by changing the speed. The results exhibited that the glow trade coefficient increases with development in speed of fluid.

Dhumne and Farkade et al.[6], they have done warmth trade assessment of cylinder molded punctured cutting edges in astonished game-plan. The punctured adjusts of different sizes were used for the assessment. The results showed that nusselt number additions with decrease in breathing space extent and bury balance isolating. The disintegration variable additions with decreasing in cover balance scattering

Singh, B. Ubhi., et.al. [7], they have made and separated the glow trade through cutting edge development in plate adjusts. They found out about various geometries, for instance, rectangular, trapezium, triangular, and round extensions in plate adjusts. The results showed that plate sharp edge with increases offered 5% to 13% more warmth trade than balance without extensions. The sufficiency of rectangular increase plate balance is more than interchange sorts of development.

D.D Palande and Walunj et. al [8], they have done exploratory assessment of evaluation dainty plate edges heat sink under basic convection. They have examined cutting edges concerning viewpoint extent and particular radiator information wattage the result showed that ordinary convection heat trade increases with warmth data. The convective warmth trade increases with perspective extent.

M. Reddy and G. Shivashankaran et al. [9], they have done numerical entertainment of obliged convection heat trade overhaul by porous pin balance in rectangular channel. They had found out about round, long roundabout and short bended pin sharp edge heat sink by changing inlet speeds for example 0.5m/s, 1m/s, 1.5m/s and 2m/s using ANSYS CFD natural programming. The result showed that the glow move efficiencies in porous pin balance are around half higher than solid pin balance.

M. Ali, Tabassum et.al. [10], they have performed warm and water driven assessment of rectangular offset displays with different gap size and number. They have done examination concentrate by taking base range 1088 mm2. They changed puncturing from 0 to 2, and contrasted opening broadness structure 0mm to 3mm. The results showed that glow trade and weight drop extended with extension in Reynolds number for all adjusts. With preliminaries it was found that with increasingly or bigger holes the proficiency and viability expanded, though the warm resistance and weight drop diminished.

K. Dhanawade and Sunnapwar et.al. [11], they have done the warm assessment of square and indirect punctured sharp edge bunch by compelled convection. They have changed the range of gap for the assessment for example 10mm square, 8mm square, and 6mm square and for indirect puncturing 10mm, 8mm, 6mm estimation. The result got exhibited that the Nusselt numbers extended with extension in Reynolds number, warm contact extended with development in puncturing and usage of punctured equalization assemble the glow trade besides there is diminishment in weight, saving of material that finally decays the utilization on balance material.

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K. Chaitanya and G. Rao et al.[12], they have done the transient warm assessment of drop shaped pin sharp edge group using CFD. They have done the close to concentrate between round shape pin sharp edge and drop formed pin balance. The results showed that the glow trade extended due to development in contact surface zone in fluid and the equalization. There was extension in the weight drop for drop shaped pin offsets appeared differently in relation to indirect pin adjusts.

Junaidi, Ansari et.al. [13], they have done warm examination of spread pin cutting edge heat sink. They have done CFD assessment using ANSYS Fluent 12.1 with different focuses (for example 4 degree, 5 degree, 6 degree and 7 level) of inclination of pin sharp edge with respect to base plate. The glow trade in the midst of regular convection is more in spread pin balance structure. The spread pin balance gives better air disturbance.

S. R Pawar and R. B. Varasu [14], they have the glow trade by basic convection from triangular scored sharp edge display. They found out about different indent geometries, for instance, balance without score, cutting edge with 20% indent with an area compensation and offset with 40% indent with extend pay concerning various parameters, for instance, stature, length, score estimation, balance isolating and balance thickness. The investigations showed that glow trade coefficient is lower in indented sharp edge when appeared differently in relation to without score. There was 7% extension in warmth trade for 20% scored sharp edge and 10% for 40% indent balance. The glow trade increases with extension in indent size with an area compensation.

Hagote and Dahake et. al [15], they have improved the ordinary convection heat trade coefficient by using V-balance group. They analyzed the V-balance using ANSYS CFX and probably. They used plate sharp edges where the parities were composed at an inclination of 60o. The best convective warmth trade got was 600.

V. Karthikegn, Babu et.al. [16], they illustrated and dismembered the normal convection heat trade coefficient between rectangular cutting edge display with extension and equalization group without increase. The glow trade through cutting edge bunch with rectangular development, indirect enlargement, trapezoidal extension, triangular development, 18mm gap, 20 mm puncturing, 22 mm gap, 24 mm puncturing were 27.32, 25.63, 25.62, 24.68, 23.82, 23.52, 22.97, 22.63 independently. The edge show with rectangular developments has least temperature close to the finish of equalization group, when diverged from offset display with rectangular increase, without enlargement and with gap.

Prakash.T [17] This paper uses CFD to perceive a cooling answer for a work station. Right now speed chooses everything especially work territory PC, CPU have been predominant. The PC upset is growing rapidly in essentially every field. CPU is the electronic fragments, which conveys a huge amount of warmth that decreases the introduction.

Nilesh Khamkar el.al [18] ,The reliably rising transistor densities and trading speeds in microchips have been went with a shocking augmentation in the structure heat movement and force dispersal. Right now rising IC ensities got together with a lot of progressively stringent execution and steadfast quality essential have made warm organization issues constantly obvious in the structure of present day microelectronic systems.

Ibrahim Mjallal el.al [19] As the temperature of electronic gadgets builds, their disappointment rate increments. That is the reason electrical gadgets ought to be cooled. One of the promising cooling strategies is utilizing Phase Change Materials (PCMs). Another detached temperature the executives strategy, that includes the immediate situation of PCMs on the chip, has been investigated and created. PCMs are potential temperature controllers that can store warm vitality and discharge it during dissolving and freezing separately. This paper analyzes the temperature dissemination on a warmth sink with and without PCM with various extents of warmth motion. Additionally, two diverse PCMs with various densities, to be specific salt-hydrate and wax, have been explored in cooling electronic gadgets.

Vivek kumar et. al [20] The current work examines the numerical recreation of warm examination of blended convection wind stream in a CPU Cabinet. The reenactment is centered around the non-consistently warmed mother board temperature dispersion. Right now speed decides everything particularly work area PC, CPU have been well known. Right now constrained convection cooling of warmth sinks mounted on CPU are researched. The plan is based all out suspension power dissemination. This speaks to critical force scattering for the case segments (Main processor

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chip, different chipsets North scaffold heat sink and South extension heat sink) the primary handling chip has blade connections (heat sink) over it for heat dispersal. There are numerous plans of warmth sink to improve the productivity, hardly any warmth sink structures are chosen and investigated, which would be give the most extreme warmth scattering. The wind stream and warm conduct of the warmth sink get together are reenacted with 2019 ANSYS Transient Thermal examination. In which limit condition take base of warmth sink applied fixed help and temperature of motherboard take 80 ºC and afterward discover results for various like Aluminum Oxide, ,Aluminum Nitride, Aluminum 6060 combination and Carbon fiber exclusively are 0.4 w/mm2 , 0.91 w/mm2 , 0.7 w/mm2 , 0.85 w/mm2 and 1.06 w/mm2 . Here we can indisputably observed that Carbon fiber materials have more estimation of warmth motion an incentive with various materials.

III. Summary

Researchers have found that rectangular plate fin heat sinks are easy to manufacture. Heat transfer rate from rectangular plate heat sinks in vertical orientation is more as compared to horizontal one. Heat transfer rate from plate heat sinks depends on base-to-ambient temperature difference as well as fin geometry. Geometric parameters like fin length, fin height, thickness play a significant role on convective heat transfer. It is observed that with an increase in fin height, fin length and base-to-ambient temperature difference heat transfer rate increases proportionately.
It is also found that optimum fin spacing depends on above mentioned parameters. Investigators have come to conclusion that optimum fin thickness depends on height, solid conductivity and conductivity of the surrounding fluid but is independent of Rayleigh number, fluid viscosity and length. Optimum fin spacing though differs for a difference in fin length and fin height this difference is not significant. It is proposed to investigate combined effect of low aspect ratio, variation in height and length as well as heat input on convective heat transfer and ultimately optimum fin spacing is to be achieved. Simultaneously flow pattern of air on plate surfaces in various positions is to be studied.

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