

## Enhancement of Natural Convection Heat Transfer within Closed Enclosure Using Parallel Fins

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**Abstract :** A numerical study of natural convection heat transfer in water filled cavity has been examined in 3D for single phase liquid cooling system by using an array of parallel plate fins mounted to one wall of a cavity. The heat generated by a heat source represents a computer CPU with dimensions of 37.5×37.5 mm mounted on substrate. A cold plate is used as a heat sink installed on the opposite vertical end of the enclosure. The air flow inside the computer case is created by an exhaust fan. A turbulent air flow is assumed and k-ε model is applied. The fins are installed on the substrate to enhance the heat transfer. The applied power energy range used is between 15- 40W. In order to determine the thermal behaviour of the cooling system, the effect of the heat input and the number of the parallel plate fins are investigated. The results illustrate that as the fin number increases the maximum heat source temperature decreases. However, when the fin number increases to critical value the temperature start to increase due to the fins are too closely spaced and that cause the obstruction of water flow. The introduction of parallel plate fins reduces the maximum heat source temperature by 10% compared to the case without fins. The cooling system maintains the maximum chip temperature at 64.68°C when the heat input was at 40 W which is much lower than the recommended computer chips limit temperature of no more than 85°C and hence the performance of the CPU is enhanced.

**Keywords :** chips limit temperature, closed enclosure, natural convection, parallel plate, single phase liquid

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