Numerical Analysis of Natural Convection in a Square Enclosure with two insulated Baffles inside at different Positions

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Abstract

The natural Natural convection is the mode of heat transfer which occurs due to the existence of temperature gradient. It didn't require any external agent such as fan, pump and blower; it not only saves energy but avoids unwanted noise. Enclosure is a square segment which is a regular geometry, found in a number of applications such as a fully filled duct pipes, electronic systems, computer technologies, air conditioning applications, lubrication system, solar collector, a sheet metal covered store, a solar air heater and a compact plate heat exchanger etc.

The current study investigates laminar natural convection in a square enclosure with isothermal vertical walls along with two thin baffles at different positions on them and with adiabatic base and top of the enclosure. The domain is filled with air. This two- dimensional study focuses attention to understand changes in flow and temperature field development due to variation in position of baffles for each cases of Rayleigh number varies from $3.004x10^6$ to $1.147x10^7$. The flow behaviour and thermal characteristics have been investigated in case 1 and case 2 through streamlines and isotherms respectively. Complete domain has been chosen for analysis. Asymmetric solutions are also observed for some of the cases. These results are confirmed by development of the corresponding convection loops and also by the variation of Average Nusselt number. Finally, the thesis report summarizes the effects of different parameters on rate of heat transfer.

Key words: Heat Transfer, Square Enclosure, Baffles, Natural Convection