Entropy generation of heat and mass transfer of humid-air inside an open cavity

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Abstract – In a lot of systems, mixed convection is commonly used for thermal control because it is inexpensive, dependable, and easy to maintain. This method is used in various applications such as aircraft electronic equipment, heat exchangers, turbomachinery, and nuclear reactors. A numerical study has been conducted on natural convection in an inclined open cavity that is heated by a wall heater. The momentum and energy equations are solved using the finite volume method in the form of stream function-vorticity. Only the right and left walls have a constant temperature, while the remaining parts are adiabatic. The inclination angle range covers an entire revolution. The validity of the method has been confirmed for a vertical cavity. A power law dependence of the Nusselt number on the Rayleigh number is provided, where the coefficient and exponent are dependent on the inclination angle. It was observed that as the inclination angle increases or decreases, the entropy generation augments.

Keywords –Open Cavity, Free Convection, Nusselt Number, Rayleigh Number, Entropy Generation.

GRAPHICAL ABSTRACT