EFFECT ON SWEPT VOLUME ON COOLING USING PUMPING MECHANISM BASED DEVICE

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ABSTRACT

Synthetic jet had been used as electronic cooling method that used diaphragm movement to initiate air flow through orifice. Synthetic jet was designed to overcome the problem of heat generated due to the increasing number of electronic component in a device. Miniaturization of electronic device has promising future of synthetic jet due to its advantage on space constraint. The performance of synthetic jet was affected by the fabrication of it design parameter such as driving frequency, size of cavity and orifice dimension. In this study, the synthetic jet was model using SolidWork CAD software. The CAD file was converted to STL file for 3D printing fabrication process. Five different swept volumes were fabricated from 1.26 X 10^{-6} m^3 to 6.28 X 10^{-6} m^3. Experiment was conducted to characterize heat removal and air velocity for each model. Driving frequencies were varied from 300 Hz to 700 Hz with three different heights. The performance of each model was measured based on the temperature of heater and the air velocity produce by synthetic jet. Result shows that at 500 Hz driving frequency has maximum amplitude which leads to resonance frequency of the piezo diaphragm. Furthermore, as the volume decrease, the heat transfer coefficient and the air velocity is increased. So, the volume 1.26 X 10^{-6} m^3 was the optimal model synthetic jet for heat removal. Maximum heat transfer coefficient is 277.91 W/m.°C, at frequency 500 Hz, for 1.26 X 10^{-6} m^3 volume at 3 cm distance to heater surface.