Karakteristik perpindahan panas pada Heat Sink dengan menggunakan jet sintetik aliran silang dengan variasi gelombang sinusoidal dan segiempat = Characteristics of heat transfer on Heat Sink using cross flow synthetic jet with frequency variation of sinusoidal and square wave

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Abstrak

Seiring dengan cepatnya kemajuan teknologi dalam industri elektronik, muncul banyak produk baru yang semakin kecil. Kondisi ini menimbulkan tantangan baru, yaitu kebutuhan akan sistem pendinginan berdimensi kecil dan hemat energi namun memiliki efisiensi termal yang tinggi, dimana jet sintetik dengan input massa nol dan output momentum tidak nol hadir sebagai sistem pendingin yang menjanjikan. Penelitian ini membahas karakteristik perpindahan panas oleh jet sintetik bertipe aliran silang dan dilakukan dalam dua tahap, yaitu tahap komputasi dan eksperimental. Tahap eksperimental dilakukan menggunakan function generator untuk menggerakkan membran dua buah membran dengan mengirimkan variasi fungsi sinusoidal dan segiempat dengan frekuensi osilasi sin 80 Hz - square 80 Hz, sin 80 Hz - square 120 Hz, sin 80 Hz - square 160 Hz, sin 120 Hz - square 80 Hz, sin 120 Hz - square 120 Hz, sin 120 Hz - square 160 Hz, sin 160 Hz - square 80 Hz, sin 160 Hz - square 120 Hz, sin 160 Hz - square 160 Hz untuk melihat karakteristik perpindahan panas konvektif pada heat sink. Tahap komputasi dilakukan menggunakan software CFD Fluent dengan model turbulensi k- SST dengan tipe meshing Tet/Hybrid Tgrid untuk melihat distribusi aliran dari jet sintetik aliran silang. Hasil penelitian menunjukkan pengaruh gelombang dan frekuensi getaran membran terhadap laju perpindahan panas yang didapat pada jet sinjetik bertipe aliran silang, dengan penurunan terbesar dicapai variasi gelombang sin 120 Hz - square 80 Hz.
.....Along with rapid technological advances in the electronics industry, there are many new emerging advanced products which getting smaller in dimension with high space efficiency and work relying on components such as transistors and integrated circuit (IC). However, these conditions also cause new challenges to overcome, one of which is how to cope with the heat generated by the operation of the electronic components in the product with sophisticated cooling system. The cooling system, hence, needs less space and energy consumption but has high thermal efficiency. This is why the synthetic jet with zero net mass flux and non-zero net momentum flux sounds practicable as the new cooling system. This research will discuss the characteristics of flow and convective heat transfer in the cross-flow synthetic jet that was conducted in two stages, computational and experimental stage.The experimental stage was executed using the function generators to drive the upper and lower membranes by sending functions of sinusoidal and square frequency variations with multiple oscillation frequency of sin 80 Hz - square 80 Hz, sin 80 Hz - square 120 Hz, sin 80 Hz - square 160 Hz, sin 120 Hz - square 80 Hz, sin 120 Hz - square 120 Hz, sin 120 Hz - square 160 Hz, sin 160 Hz - square 80 Hz, sin 160 Hz - square 120 Hz, sin 160 Hz - square 160 Hzto see the characteristics of convective heat transfer on the heat sink at each trial. Computational stage was conducted by Fluent CFD software with k- SST turbulence model with Tet / Hybrid Tgrid meshing elements type to see the flow distribution of creoss-flow synthetic jet. The results showed the significant influence of waves mode and frequencies to the heat transfer rate of cross-flow synthetic jet, with the best result is on sin

120 Hz- square 80 Hz waves.