ABSTRAK

Penelitian ini bertujuan untuk (a) membuat program untuk mendapatkan nilai efisiensi dan efektivitas sirip lurus berpenampang segilima yang berubah terhadap posisi x pada keadaan tak tunak kasus 1 dimensi, (b) mendapatkan efisiensi sirip berpenampang yang berubah terhadap posisi x pada keadaan tak tunak kasus 1 dimensi, (c) mendapatkan efektivitas yang berubah terhadap posisi x pada keadaan tak tunak kasus 1 dimensi, (d) mendapatkan hubungan antara efisiensi dengan ξ pada keadaan tunak.

Metode yang digunakan dalam menghitung distribusi suhu pada penelitian dilakukan dengan menggunakan metode komputasi beda hingga cara eksplisit dengan batasan diasumsikan sifat bahan sirip seragam (massa jenis (ρ), kalor jenis (c), dan koefisien perpindahan kalor konduksi (k)) dan tetap (tidak berubah terhadap waktu), tidak ada pembangkitan energy di dalam sirip, sirip tidak mengalami perubahan bentuk saat proses, sifat fluida merata dan tetap, arah perpindahan kalor konduksi hanya dalam satu arah yaitu arah x, dan suhu dasar sirip tetap dari waktu ke waktu.a)

Hasil penelitian terhadap sirip lurus berpenampang segilima fungsi poisisi x keadaan tak tunak kasus 1 dimensi adalah a)didapatkan kesimpulan bahwa semakin kecil sudut kemiringan sirip akan membuat laju aliran kalornya besar, nilai efisisiensi sudut kemiringan sirip besar maka nilai efisiensi akan bertambah besar sedangkan efektivitasnya akan semakin kecil. Hal ini dibuktikan pada detik ke-200 variasi sudut kemiringan sirip $3,5^o$; $3,75^o$; 4^o; $4,25^o$; dan $4,5^o$menghasilkan nilai laju aliran kalor berturut-turut sebesar 53,205 W, 52,795 W, 52,398 W, 51,984 W, 51,582 dan nilai efisiensi sebesar 79,264 %, 79,284 %, 79,302 %, 79,317 %, 79,330 %, serta nilai efektivitas nya sebesar 11, 047; 10,96; 10,878; 10,794; dan 10,711. b) disimpulkan bahwa semakin besar koefisien perpindahan kalor konveksinya maka laju aliran kalonya akan semakin besar, namun berbeda dengan efisiensi serta efektivitasnya justru akan menurun. Hal ini dibuktikan bahwa pada detik ke-200 variasi koefisien perpindahan kalor konveksi (h) yang ditetapkan sebesar 50 W/m^2 □C, 100 W/m^2 □C, 250 W/m^2 □C, 500 W/m^2 □C, dan 950 W/m^2 □C menghasilkan laju aliran kalor berturut-turut sebesar 30,062 W, 54,132 W, 106,46 W, 163,724 W, 233,086W dan efisiensinya sebesar 88,150 %, 79,366 %, 62,435 %, 48,009 %, 35,973 % serta nilai efektivitasnya sebesar 12,484; 11,240; 8,842; 6,799;dan 5,095.c) semakin besar difusivitas termal suatu behan material sirip maka laju aliran kalor yang didapatkan sirip semakin besar. Selain nilai laju aliran kalor yang semakin besar, semakin besar difusivitas termal suatu bahan dasar sirip akan menghasilkan nilai efisiensi serta efektivitas yang semakin besar.

Kata kunci : sirip segilima, efisiensi, efektivitas, perpindahan kalor, distribusi suhu

ABSTRACT

This research was conducted to: (a) make a program to get value of efficiency and effectiveness of straight fin function with pentagon profile which was affected by x position 1 dimension case of unsteady state condition, (b) get efficiency of straight fin function with pentagon profile which was affected by x position 1 dimension case of unsteady state condition, (c) get effectiveness of straight fin function with pentagon profile which was affected by x position 1 dimension case of unsteady state condition, and (d) get a comparison between the efficiency and ξin unsteady state condition.

The method which was used in calculating heat distribution in this research was computational method and numerical simulation, with finite-difference method assumed that the materials of the fin are the same (material density (ρ), specific heat (c), coefficient of thermal conductivity transfer (k)) and steady from time to time, no energy generation in the fin, the fin does not encounter any changes during the process, the fluid disposition is well distributed and steady, the thermal conductivity flows only in one direction which is x, and the basic thermal is steady from time to time.

The result of the research with the object of straight fin function of x position with pentagon profile 1 dimension case of unsteady state condition are: (a) the smaller the oblique angle of the fin, the higher the heat transfer and vice versa. It is proven in second 200, variation with the oblique angle of the fin which are $3,5^o$; $3,75^o$; 4^o ; $4,25^{o,}$ and $4,5^o$ produced the value of heat transfer which are stated continously 53,205 W, 52,795 W, 52,398 W, 51,984 W, 51,582 and the value of efficiency which are statedcontinously 79,264 %, 79,284 %, 79,302 %, 79,317 %, 79,330 % and the value of effectiveness which are stated continously 11, 047; 10,96; 10,878; 10,794; dan 10,711. (b) the higher the heat transfer convection (h) coefficient, the rate of the thermal's flow will be higher, however the efficiency and effectiveness will get lower. It is proven in second 200, the variation of heat transfer convection (h) that are defined as 50 W/m^2 □C, 100 W/m^2 □C, 250 W/m^2 □C, 500 W/m^2 □C, and 950 W/m^2 □C produced the rate of the thermal's flow which are stated continously 30,062 W, 54,132 W, 106,46 W, 163,724 W, 233,086W, the value of efficiency which are statedcontinously 88,150 %, 79,366 %, 62,435 %, 48,009 %, 35,973 %, and the value of effectiveness which are statedcontinously 12,484; 11,240; 8,842; 6,799; and 5,095 (c) if the diffusion thermal of a fin material is higher, the rate of heat flow that will be higher too. The high rate of heat flow will also affect the thermal diffusion of a fine base material to be higher and resulting the high value of efficiency and effectiveness.

Keywords: pentagon fin, efficiency, effectiveness, heat transfer, thermal distribution