INTISARI

Tujuan penelitian ini untuk mengetahui pengaruh koefisien perpindahan panas konveksi (h) dan pengaruh bahan sirip pada sirip benda putar dengan fungsi y=ln (x) keadaan tak tunak. Serta dapat mengetahui syarat stabilitas pada metode beda-hingga untuk mendapatkan distribusi suhu dari waktu ke waktu.

Sirip benda putar merupakan fungsi y=ln(x) dengan panjang 0,05 meter yang terbagi menjadi 101 node. Jari-jari sirip bervariasi berdasarkan jarak node terhadap fungsi y=n(x). Bahan sirip terbuat dari logam dengan variasi bahan yaitu: aluminium, besi, kuningan, perak dan tembaga. Koefisien perpindahan panas konveksi bervariasi yaitu: 500 W/m^{2O}C, 800 W/m^{2O}C, 1000 W/m^{2O}C, 1500 W/m^{2O}C dan 2500 W/m^{2O}C. Penelitian ini mengunakan metode komputasi beda-hingga cara eksplisit untuk menyelesaikan semua perhitungan.

Nilai koefisien perpindahan panas konveksi h=2500 W/m^{2O}C: (1) distribusi suhu sirip semakin cepat turun, (2) laju aliran kalor total sirip semakin besar, (3) efisiensi sirip menjadi semakin kecil, (4) efektifitas sirip menjadi semakin kecil.Urutan bahan yang memiliki penurunan suhu terbesar adalah : Besi, Kuningan, Aluminium, Tembaga dan Perak. Urutan bahan yang memiliki laju aliran kalor,efisiensi dan efektivitas terbesar adalah : Perak, Tembaga, Aluminium, Kuningan dan Besi. Perhitungan dapat dilakukan dengan memenuhi persyaratan stabilitas, yaitu : (1) $\Delta t > 0$, *(2)* $\Delta t \leq \dfrac{\Delta x V_i}{\alpha \left(A_{c,i+1/2} + B_i A_{s,i} \right)}$,

(3) $\Delta t \leq \dfrac{\Delta x V_i}{\alpha \left(A_{c,i-1/2} + B_i A_{s,i} + A_{c,i+1/2} \right)}$

ABSTRACT

The main objective of this study is to examine the correlations of heat transfer coefficient (h) and the fin's material to the rotating object fin whose function is y = ln (x) at the steady state condition. This study also examines the stability requirements of finite-difference method to obtain temperature distribution over time.

The following parameters are used in the experiments. The rotating object fin has a length of 0.05 m and consists of 101 nodes. The radius of the fin varies depending on the distance of a node in the equation y = ln(x). The fin's materials are made of metal, particularly aluminium, iron, brass, silver, and copper. The values of heat transfer coefficient (h) used are 500 $W/m^{2O}C$, 800 $W/m^{2O}C$, 1000 $W/m^{2O}C$, 1500 $W/m^{2O}C$, and 2500 $W/m^{2O}C$. The experiments use explicit numerical finite-difference methodl to solve all the necessary computations.

This study finds the following important conclusions. If the value of the heat transfer coefficient (h)=2500 $W/m^{2O}C$, (1) the temperature distribution of the fin decreases at faster rate, (2) the total heat flow of the fin increases at faster rate, (3) the efficiency of the fin decreases, (4) the effectivity of the fin decreases.The sequence of the material having the largest temperature drop is: iron, brass, aluminium, copper, and silver. In addition, the sequence of the material having the largest heat flow, efficiency, and effectivity is: silver, copper, aluminium, brass, and iron. Computations are done satisfying the stability requirements, i.e.

(1) $\Delta t > 0$ *, (2)* $\Delta t \le \dfrac{\Delta x V_i}{\alpha\left(A_{c,i+1/2} + B_i\ A_{s,i}\right)}$ *,* *(3)* $\Delta t \le \dfrac{\Delta x V_i}{\alpha\left(A_{c,i-1/2} + B_i\ A_{s,i} + A_{c,i+1/2}\right)}$.