

# **PERFORMANCE CHARACTERISTIC OF THERMOELECTRIC MODULE**

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## ABSTRACT

The purpose of this study is to determine the physical properties and performance curves of the thermoelectric module. In order to do that a test rig has been fabricated and 2 thermoelectric modules are tested which are TEC1-12705 and CP1.4-71-06L. The voltage generated by the thermoelectric module and the temperature difference are measured and by using some equations, physical properties such as Seebeck coefficient  $\alpha$ , Electrical resistance R and Thermal conductivity  $K_t$  are obtained. These experiments data are then compared with the manufacturer data. Performance curves are determined by testing the thermoelectric module with 3 different heat sinks which are water cooling jacket, cooling fan with fin and fin itself as a heat sink. Then by using some calculations, the values of P,  $Q_H$  and COP are determined. Optimizations have been done to improve the performance of thermoelectric module by studying the effect of different water flow rate in water cooling jacket, different power supply of cooling fan and the different number of fin and ratio between the fin area contacts to the thermoelectric module surface.

## ABSTRAK

Tujuan kajian ini ialah untuk mencari sifat fizikal dan lengkung prestasi bagi modul termoelektrik. Untuk itu satu kelengkapan ujian telah difabrikasi dan 2 buah modul termoelektrik iaitu TEC1-12705 dan CP1.4-71-06L telah diuji. Voltan yang dihasilkan oleh modul termoelektrik dan perbezaan suhu akan diukur dan dengan menggunakan beberapa persamaan, pekali Seebeck  $\alpha$ , Rintangan elektrik R dan Konduktiviti terma  $K_t$  telah diperolehi. Semua data eksperimen akan dibandingkan dengan data daripada pihak pembuatan. Lengkung prestasi telah ditentukan dengan melakukan ujian ke atas modul termoelektrik pada 3 pembuang haba yang berbeza iaitu jaket air penyejuk, kipas penyejuk bersama sirip penyejuk dan pembuang haba sirip penyejuk sahaja. Melalui pengiraan, nilai P,  $Q_H$  dan COP ditentukan. Prestasi modul termoelektrik boleh diperbaiki dengan melakukan kajian terhadap kesan aliran air dalam jaket air penyejuk, kesan perbezaan kuasa yang dibekalkan ke atas kipas penyejuk dan bilangan sirip penyejuk dan nisbah luas sentuhan antara permukaan sirip penyejuk dengan permukaan modul termoelektrik.