

## ABSTRAK

Seiring dengan pertumbuhan jumlah penduduk menyebabkan tuntutan manusia untuk mencapai kenyamanan hidup juga meningkat. Salah satu perkembangan teknologi yang dapat memenuhi kenyamanan hidup adalah mesin pendingin. Penelitian ini bertujuan untuk 1) membuat *showcase* dengan siklus kompresi uap yang digunakan untuk mendinginkan minuman, dengan panjang pipa kapiler 250 cm dan daya kompresor 0,5 hp, 2) Mengetahui karakteristik *showcase* dengan siklus kompresi uap : a) Menghitung kalor yang dihisap evaporator ( $Q_{in}$ ), b) Menghitung kalor yang dilepaskan kondensor ( $Q_{out}$ ), c) Menghitung kerja kompresor ( $W_{in}$ ), d) Menghitung COP aktual dan COP ideal, e) Menghitung efisiensi.

Model pembuatan mesin pendingin *showcase* menggunakan siklus kompresi uap. Proses pengambilan data dilakukan di Laboratorium Konversi Energi Universitas Sanata Dharma Yogyakarta, data diukur setiap 20 menit dengan waktu 4 jam selama 3 kali. Data yang diambil dalam pengujian mesin *showcase* adalah nilai keluar tekanan refrigeran kompresor, suhu refrigeran masuk kompresor, nilai tekanan refrigeran masuk kondensor dan suhu refrigeran keluar kondensor.

Hasil perhitungan dari mesin pendingin *showcase* berupa kerja kompresor ( $W_{in}$ ), kalor yang diserap evaporator ( $Q_{in}$ ), kalor yang dilepas kondensor ( $Q_{out}$ ),  $COP_{aktual}$ ,  $COP_{ideal}$ , dan Efisiensi ( $\eta$ ). Hasil yang diperoleh energi kalor yang diserap evaporator  $Q_{in}$  rata-rata sebesar : 189,5 kJ/kg. Serta nilai  $Q_{in}$  pada saat stabil = 190 kJ/kg. Energi kalor yang dilepas kondensor  $Q_{out}$  rata-rata sebesar : 240,2 kJ/kg. Serta nilai  $Q_{out}$  pada saat stabil = 240 kJ/kg. Kerja yang dilakukan kompresor  $W_{in}$  rata-rata sebesar : 50,7 kJ/kg. Serta nilai  $W_{in}$  pada saat stabil = 50 kJ/kg. Koefisien prestasi aktual  $COP_{aktual}$  rata-rata : 3,7. Serta nilai  $COP_{aktual}$  pada saat stabil = 3,8. Koefisien prestasi  $COP_{ideal}$  rata-rata : 4,4. Serta nilai  $COP_{ideal}$  pada saat stabil = 4,3. Efisiensi *showcase* yang dihasilkan efisiensi ( $\eta$ ) rata-rata : 84,6%. Serta nilai efisiensi ( $\eta$ ) *showcase* pada saat stabil = 86,0%.

Kata Kunci : Mesin pendingin *showcase*, siklus kompresi uap, COP

## ABSTRACT

Along with population growth causes human demands to achieve a life of comfort is also increased. One of the technological developments that can meet the comfort of life is the engine coolant. This study aims to 1) create a showcase with the vapor compression cycle is used to cool drinks, with a length of 250 cm and a capillary tube compressor power 0.5 hp, 2) Knowing the characteristics of the showcase with the vapor compression cycle: a) Calculate the heat absorbed evaporator ( $Q_{in}$ ), b) Calculate the heat released condenser ( $Q_{out}$ ), c) Calculate the compressor ( $W_{in}$ ), d) Calculating the  $COP_{actual}$  and  $COP_{ideal}$ , e) Counting efficiency.

Model manufacture of refrigeration showcase using the vapor compression cycle. The process of data collection is done in Energy Conversion Laboratory Sanata Dharma University in Yogyakarta, the data measured every 20 minutes with a time of 4 hours for 3 times. The data were taken in the testing machine showcase is the value of the refrigerant compressor exit pressure, the temperature of the refrigerant entering the compressor, condenser pressure value and temperature of the refrigerant entering the condenser refrigerant exit.

The results of such work showcase refrigeration compressor ( $W_{in}$ ), heat is absorbed by the evaporator ( $Q_{in}$ ), heat is released condenser ( $Q_{out}$ ),  $COP_{aktual}$ ,  $COP_{ideal}$ , and efficiency ( $\eta$ ). The results of heat energy absorbed by the evaporator  $Q_{in}$  average: 189.5 kJ / kg. As well as a stable value at the time of  $Q_{in} = 190$  kJ / kg. Condenser heat energy released by an average of  $Q_{out}$ : 240.2 kJ / kg. As well as a stable value at the time  $Q_{out} = 240$  kJ / kg.  $W_{in}$  compressor work done by an average of: 50.7 kJ / kg. And when the value  $W_{in}$  stable = 50 kJ / kg. Coefficient of actual achievement  $COP_{aktual}$  average: 3.7. As well as a stable value at the time  $COP_{aktual} = 3,8$ . Koefisien  $COP_{ideal}$  achievement average: 4.4. As well as a stable value at the time  $COP_{ideal} = 4.3$ . Efficiency showcase the resulting efficiency ( $h$ ) on average: 84.6%. And the value of efficiency ( $h$ ) showcase at the time of steady = 86.0%.

Keywords: Engine cooling showcase, vapor compression cycle, COP