ABSTRAK

Saat ini *showcase* sangat berperan dalam kehidupan masyarakat. *Showcase* dipergunakan untuk mendinginkan minuman kemasan seperti *soft drink,* minuman kaleng, dan minuman berenergi tanpa membekukan cairan di dalam kemasannya. Tujuan penelitian ini adalah : (1) merakit *showcase* yang bekerja dengan siklus kompresi uap (2) mengetahui karakteristik *showcase*, (a) koefisien prestasi aktual *showcase* (COP_{aktual}), (b) koefisien prestasi ideal *showcase* (COP_{ideal}), (c) efisiensi showcase (ŋ), (d) laju aliran massa refrigeran (ṃ).

Showcase yang dipergunakan dalam penelitian merupakan *showcase* dengan siklus kompresi uap standard dan dengan panjang pipa kapiler 225 cm, berdiameter 0,028 inch. Kompresor yang digunakan merupakan kompresor hermatik dengan daya 1/6 PK. Komponen lain seperti evaporator dan kondensor besarnya menyesuaikan dengan daya kompresor yang dipergunakan. Data langsung yang diperoleh dari penelitian adalah suhu dan tekanan. Nilai-nilai entalpi diambil dari p-h diagram berdasarkan dari data suhu dan tekanan. Untuk perhitungan kerja kompresor per satuan massa refrigeran (W_{in}), kalor yang dilepas kondensor per satuan massa refrigeran (Q_{out}), kalor yang diserap evaporator per satuan massa refrigeran (Q_{in}), koefisien prestasi aktual showcase (COP_{aktual}), koefisien prestasi ideal *showcase* (COP_{ideal}), laju aliran massa refrigeran (ṃ), efisiensi showcase (ŋ). Berdasarkan dari nilai-nilai entalpi yang telah diperoleh, Penelitian di lakukan dengan memvariasikan kecepatan aliran udara yang di hasilkan kipas kondensor. Penelitian dilakukan di laboratorium Teknik Mesin Universitas Sanata Dharma Yogyakarta.

Hasil penelitian ini memberikan kesimpulan. (1) Mesin pendingin *showcase* dapat bekerja dengan baik, (2) Karakteristik yang di dapat pada mesin pendingin *showcase* pada penelitian ini sebagai berikut : tanpa kipas kondensor suhu yang mampu dicapai pada menit ke 240 sebesar 4,8 ℃ dan memberikan nilai : (a) COP_{aktual} sebesar 2,59, (b) COP_{ideal} sebesar 3,85, (c) efisiensi sebesar 67,3 %, (d) laju aliran massa refrigeran sebesar 0,0040 kg/s. Sedangkan untuk *showcase* dengan kecepatan kipas 1 (3,8 m/s) kondensor suhu yang mampu dicapai pada menit ke 180 sebesar 4,8 ℃ dan memberikan nilai : (a) COP_{aktual} sebesar 3,29, (b) COP_{ideal} sebesar 4,10, (c) efisiensi sebesar 80,2 %, (d) laju aliran massa refrigeran sebesar 0,0042 kg/s. Sedangkan untuk *showcase* dengan kecepatan kipas 2 (4,10) m/s kondensor suhu yang mampu dicapai pada menit ke 140 sebesar 4,8 ℃ dan memberikan nilai : (a) COP_{aktual} sebesar 3,54, (b) COP_{ideal} sebesar 4,14, (c) efisiensi sebesar 85,6 %, (d) laju aliran massa refrigeran sebesar 0,0043 kg/s.

Kata kunci : *Showcase*, Kecepatan Kipas, Siklus Kompresi Uap, $COP_{aktual,}$, Efisiensi

ABSTRACT

Nowadays, showcase has very important role in the society life. Showcase is used for refrigerating the bottled water, such as soft drink, canned drink and energy drink, without freeze the water in it package. The purposes of this research is to: (1) construct the showcase that works with the vapour compression cycle, (2) know the characteristic of the showcase, (a) Coefficient of Performance actual showcase (COP_{actual}), (b) Coefficient of Performance ideal showcase (COP_{ideal}), (c) the efficiency of the showcase (ɳ), (d) mass flow rate of refrigerant (ṁ).

Showcase that was used in this research is a showcase with standard vapour compression cycle and with its length of the capillary tube is 225 cm, within its diameter is 0,028 inch. The compressor that is used is hermetic compressor with 1/6 PK energy. Other compressors, such as the size of evaporator and liquefier adapt to the compressor energy that is used. The direct data that were acquired from the research are temperature and pressure. The values of the enthalpy was taken from p-h diagram based on the temperature an pressure data. For the calculation of each mass of refrigerant in the compressor work (W_{in}), the heat that was loosed by the liquefier for each mass of refrigerant (Q_{out}), the heat that was absorbed by the evaporator for each mass of refrigerant (Q_{in}), Coefficient of Performance actual showcase (COP_{actual}), Coefficient of Performance ideal showcase (COP_{ideal}), mass flow rate of refrigerant (ṁ), the efficiency of the showcase (ɳ), based on the values of the enthalpy that had been acquired. This research was done by diversifying the air flow rate that was produced by the liquefier fan. This research was done at the mechanical engineering laboratory in Sanata Dharma University, Yogyakarta.

The result of this research gives the conclusions, as follow: (1) Showcase cooler can work properly, (2) The characteristic that was found in the showcase cooler of this research can be described as follow: without liquefier fan, the temperature that could be achieved in the 240 minutes in the scale 4,8 ºC and gave the value: (a) COP_{actual} in the scale 2,59, (b) COP_{ideal} in the scale 3,85, (c) the efficiency in the scale 67,3%, (d) mass flow rate of refrigerant in the scale 0,0040 kg/s. While, for the showcase with the fan rate 1 (3,8 m/s) the temperature liquefier that could be achieved in the 180 minutes in the scale 4,8 ºC and gave the value: (a) COP_{actual} in the scale 3,29, (b) COP_{ideal} in the scale 4,10, (c) the efficiency in the scale 80,2%, (d) mass flow rate of refrigerant in the scale 0,0042 kg/s. While, for the showcase with the fan rate 2 (4,10 m/s) the temperature liquefier that could be achieved in the 140 minutes in the scale 4,8 ºC and gave the value: (a) COP_{actual} in the scale 3,54, (b) COP_{ideal} in the scale 4,14, (c) the efficiency in the scale 85,6 %, (d) mass flow rate of refrigerant in the scale 0,0043 kg/s.

Keywords: Showcase, Fan Rate, Vapour Compression Cycle, COP_{actual}, Efficiency