

## ABSTRAK

Saat ini *showcase* sangat banyak digunakan untuk berjualan minuman kemasan yang sering dijumpai di supermarket, warung-warung, bahkan di pasar-pasar. Karena kegunaannya tersebut *showcase* sering kali dijumpai di depan warung-warung, hal ini dimaksudkan agar pembeli mudah melihat bahwa warung tersebut menjual minuman kemasan dingin. Tujuan dari penelitian ini adalah : (a) merakit mesin pendingin *showcase*, (b) mengetahui karakteristik mesin pendingin *showcase*, meliputi : energi kalor yang diserap evaporator ( $Q_{in}$ ), energi kalor yang dilepas kondensor ( $Q_{out}$ ), kerja kompresor ( $W_{in}$ ), nilai  $COP_{aktual}$  dan  $COP_{ideal}$ , laju aliran refrigeran serta nilai efisiensi mesin pendingin *showcase*.

Penelitian ini menggunakan mesin *showcase* yang bekerja dengan siklus kompresi uap. Komponen utama *showcase* meliputi kompresor, evaporator, kondensor, dan pipa kapiler. Daya kompresor sebesar 150 watt, komponen yang lain menyesuaikan dengan daya kompresor, refrigeran yang dipergunakan adalah R-134a. Variasi yang dilakukan pada penelitian yaitu volume air pendingin kondensor : (a) kondensor tanpa terendam air (b) kondensor terendam air sebanyak 16 liter dan (c) kondensor terendam air sebanyak 22 liter. Wadah penampung air 50 cm x 10 cm x 55 cm dan beban pendinginan sebanyak 6 botol air kemasan. Pengambilan data setiap 20 menit.

Penelitian ini memberikan kesimpulan : (a) *showcase* yang dibuat atau dirakit bekerja dengan baik hingga mencapai suhu ruang pendinginan : (1) kondensor tanpa terendam air 3,7 °C, (2) kondensor terendam air sebanyak 16 liter 2,1°C, dan (3) kondensor terendam air sebanyak 22 liter 1,9 °C, (b) karakteristik mesin pendingin *showcase* antara lain : pada kondensor tanpa terendam air (1)  $W_{in}$  rata-rata sebesar 52 kJ/kg, (2)  $Q_{out}$  rata-rata sebesar 213,1 kJ/kg, (3)  $Q_{in}$  rata-rata sebesar 161 kJ/kg, (4)  $\dot{m}$  rata-rata sebesar 0,0049 kg/s, (5)  $COP_{aktual}$  rata-rata sebesar 3,09, (6)  $COP_{ideal}$  rata-rata sebesar 4,06, (7)  $\eta$  rata-rata sebesar 76,1 %. Untuk *showcase* dengan kondensor terendam air sebanyak 16 liter (1)  $W_{in}$  rata-rata sebesar 52,3 kJ/kg, (2)  $Q_{out}$  rata-rata sebesar 218,3 kJ/kg, (3)  $Q_{in}$  rata-rata sebesar 166 kJ/kg, (4)  $\dot{m}$  rata-rata sebesar 0,0046 kg/s, (5)  $COP_{aktual}$  rata-rata sebesar 3,17, (6)  $COP_{ideal}$  rata-rata sebesar 4,01, (7)  $\eta$  rata-rata sebesar 78,9 %. Untuk *showcase* dengan kondensor terendam air sebanyak 22 liter (1)  $W_{in}$  rata-rata sebesar 48,8 kJ/kg, (2)  $Q_{out}$  rata-rata sebesar 221,6 kJ/kg, (3)  $Q_{in}$  rata-rata sebesar 172,8 kJ/kg, (4)  $\dot{m}$  rata-rata sebesar 0,0049 kg/s, (5)  $COP_{aktual}$  rata-rata sebesar 3,54, (6)  $COP_{ideal}$  rata-rata sebesar 4,11, (7)  $\eta$  rata-rata sebesar 86,1 %.

Kata Kunci : *Showcase*, volume air, siklus kompresi uap, R134a.

## ABSTRACT

In this time, the showcase very much to used for sell of beverage packaging, which is often found in supermarket, small shop, even in the markets. Because of its usefulness, the showcase is often to find in the front of shops, it's the mean for easy buyers to see that the shop for sell cold beverage packaging. The purpose from research is : (a) assemble the cooling machine showcase (b) to know characteristic of the cooling machine showcase, that is : the heat energy have the absorbed by evaporator ( $Q_{in}$ ), the heat energy has removed condensers ( $Q_{out}$ ), compressor work ( $W_{in}$ ), coefficient of performance (COP), refrigerant flow rate and efficiency value of cooling machine showcase.

This study uses a showcase engine that works with a steam compression cycle. The main components of the showcase include compressors, evaporators, condensers, and capillary pipes. Compressor power of 150 watt, other components adjust to the compressor power, refrigerant used is R-134a. Variations made in the study are the condenser cooling water volume: (a) the condenser without being submerged in water (b) the condenser submerged by 16 liters of water and (c) the condenser submerged in water by 22 liters. Water container 50 cm x 10 cm x 55 cm and a cooling load of 6 bottles of bottled water. Data retrieval every 20 minutes.

This study concludes: (a) the showcase that was made or assembled worked well until it reached the temperature of the cooling room: (1) the condenser without being submerged in water 3.7 °C, (2) the condenser submerged in water by 16 liters 2.1 °C, and (3) the condenser is submerged in water by 22 liters 1.9 °C, (b) the characteristics of the showcase cooling machine include: in the condenser without being submerged in water (1) the average  $W_{in}$  is 52 kJ/kg, (2) the average  $Q_{out}$  is 213, 1 kJ/kg, (3)  $Q_{in}$  average of 161 kJ/kg, (4)  $\dot{m}$  average of 0.0049 kg/s, (5) average  $COP_{actual}$  of 3.09, (6) average  $COP_{ideal}$  average of 4.06, (7)  $\eta$  an average of 76.1 %. For showcase with 16 liters of water-immersed condenser (1)  $W_{in}$  an average of 52.3 kJ/kg, (2)  $Q_{out}$  an average of 218.3 kJ/kg, (3)  $Q_{in}$  an average of 166 kJ/kg, (4)  $\dot{m}$  an average of 0.0046 kg/s, (5) an average  $COP_{aktual}$  of 3.17, (6) an average  $COP_{ideal}$  of 4.01, (7)  $\eta$  an average of 78.9 %. For a showcase with 22 liters of water-immersed condenser (1)  $W_{in}$  an average of 48.8 kJ/kg, (2)  $Q_{out}$  an average of 221.6 kJ/kg, (3)  $Q_{in}$  an average of 172.8 kJ/kg, (4)  $\dot{m}$  average of 0.0049 kg/s, (5) average  $COP_{aktual}$  of 3.54, (6) average  $COP_{ideal}$  of 4.11, (7)  $\eta$  average amounted to 86.1 %.

Keywords : Showcase, water volume, vapor compression cycle, R134a.