ABSTRAK

Penelitian ini bertujuan untuk: (a) Merancang dan merakit sistem pengkondisian udara yang dapat dipergunakan pada mobil. (b) Mengetahui sistem kerja pengkondisian udara pada mobil. (c) Mengetahui karakteristik dari sistem pengkondisian udara pada mobil yang meliputi : Q_{in}, Q_{out}, COP_{aktual}, COP_{ideal} dan efisiensi dan laju aliran massa *refrigerant.*

Penelitian ini dilakukan di laboratorium Perpindahan Panas Teknik Mesin, Universitas Sanata Dharma, Yogyakarta. Mesin menggunakan komponen utama meliputi : Kompresor, Evaporator, Kondensor dan Katup ekspansi. Mesin bekerja menggunakan siklus kompresi uap, penggerak motor listrik dengan putaran rotor 1420 rpm, perbandingan diameter pulley D_1 = 3 inch dan D_2 = 5 inch, menghasilkan putaran kompresor 852 rpm. *Refrigerant* : R-134a. Menggunakan pipa PVC berdiameter 3 inch, dan kipas yang berfungsi untuk mengambil udara segar. Ukuran kotak pengganti kabin *p* x *l* x *t* = *1,5 m* x *1,2 m* x *1 m* terbuat dari triplek dengan ketebalan 3 mm dengan isolator gabus.

Mesin AC mobil yang diteliti memberikan kesimpulan : (a) Mesin AC mobil bekerja secara baik dengan suhu kerja kompresor 43,25˚C dan suhu kerja evaporator – 3,5˚C, (b) Kerja kompresor per satuan massa refrigeran terendah 35 kJ/kg, dan tertinggi 40 kJ/kg, rata-rata 36,75 kJ/kg, (c) Kalor per satuan massa refrigeran yang diserap evaporator terendah 172 kJ/kg, dan tertinggi diserap evaporator 180 kJ/kg, rata-rata 175,5 kJ/kg, (d) Kalor persatuan massa refrigeran yang dilepas oleh kondensor terendah 207 kJ/kg, dan tertinggi dilepas kondensor 215 kJ/kg, dan rata-rata 212,25 kJ/kg, (e) COP_{aktual} terendah mesin AC mobil 4,3, dan tertinggi 5,1, rata-rata 4,78, (f) COP_{ideal} terendah mesin AC mobil 5,6, dan tertinggi 5,85, rata-rata 5,73, (g) Efisiensi mesin AC mobil terendah 70%, tertinggi 91%, dan rata-rata 82,75%, (h)Laju aliran massa terendah 0,052 kg/s, tertinggi 0,060 kg/s, dan rata-rata 0,050 kg/s.

Kata kunci : AC Mobil, putaran komporesor, siklus kompresi uap

ABSTRACT

This study aims to: (a) Design and assemble an air conditioning system that can be used in cars. (b) Discover he air conditioning working system in the car. (c) Find out the characteristics of the air conditioning system in the car which include Qin, Qout, COPactual, COPide and the efficiency and mass flow rate of the refrigerant.

This research was conducted at the Mechanical Engineering Heat Transfer Laboratory Sanata Dharma University, Yogyakarta. The operated machine applied main components included : Compressors, Evaporators, Condensers and expansion valves. The machine used a vapor compression cycle, the electric motor drive with rotor rotation of 1420 rpm, the ratio of pulley diameter D1 = 3 inch and D2 = 5 inch, resulted a compressor rotation of 852 rpm. Refrigerant: R-134a. Used a PVC pipe with a diameter of 3 inches, and a fan that serves to take fresh air. The size of the substitute box for cabin p x l x t = 1.5 m x 1.2 m x 1 m was made of plywood with a thickness of 3 mm with cork insulator.

The study of the car air conditioning machine provides some conclusions, such as : (a) The car air conditioner engine worked well with the compressor working temperature 43.25˚C and the evaporator - 3,5˚C working temperature, (b) The compressor worked per unit of refrigerant mass lowest 35 kJ / kg, and the highest was 40 kJ / kg, an average of 36.75 kJ / kg, (c) The heat per unit of mass of refrigerant absorbed by the evaporator was lowest at 172 kJ / kg, and the highest absorbed by the evaporator 180 kJ / kg, an average of 175, 5 kJ / kg, (d) The heat of the mass of the refrigerant released by the lowest condenser 207 kJ / kg, and the highest released condenser 215 kJ / kg, and an average of 212.25 kJ / kg, (e) COP 4.3, and highest 5.1, average 4.78, (f) The lowest COPide of the car air conditioning engine 5.6, and the highest 5.85, average 5.73, (g) The efficiency of the lowest car AC engine 70%, highest 91%, and average 82.75%, (h) The lowest mass flow rate is 0.052 kg / s, the highest was 0.060 kg / s, and an average of 0.050 kg / s.

Keywords : Car air conditioning, compositor rotation, vapor compression cycle