PLAGIAT MERUPAKAN TINDAKAN TIDAK TERPUJI

ABSTRAK

Salah satu masalah yang dihadapi sebagian besar orang adalah panasnya suhu udara di lingkungan sekitar. Permasalahan tersebut dapat diatasi dengan menggunakan mesin pendingin udara. Salah satu mesin yang dapat dipergunakan dalam sistem pengkondisian udara adalah *water chiller*. Penelitian ini bertujuan untuk: (a) merancang dan merakit mesin *water chiller* untuk pengkondisian udara dengan sistem kompresi uap, (b) mengetahui karakteristik mesin *water chiller* dengan variasi udara segar yang meliputi : (1) besarnya kerja kompresor persatuan massa refrigeran (W_{in}), (2) besarnya kalor yang dilepas kondensor persatuan massa refrigeran (Q_{out}), (3) besarnya kalor yang diserap evaporator persatuan massa refrigeran (Q_{in}), (4) besarnya *actual coefficient of performance* (COP_{actual}), (5) besarnya *ideal coefficient of performance* (COP_{ideal}), (6) Besarnya efisiensi siklus kompresi uap (ɳ), dan (7) besarnya laju aliran massa refrigerant (ṁ)..

Perancangan mesin *water chiller* yang menggunakan sistem kompresi uap dengan sumber energi listrik memiliki komponen-komponen utama sebagai berikut : kompresor dengan daya ¾ PK, kondensor, pipa kapiler, evaporator dan komponen tambahan berupa *filter dryer*. Dipergunakan fluida kerja refrigeran R-22. Dalam perancangan ini suhu kerja kondensor dipilih lebih tinggi dari suhu udara luar dan suhu kerja evaporator lebih rendah dari pada air yang didinginkan. Variasi penelitian dilakukan terhadap udara segar (a) tanpa udara segar, (b) ada udara segar.

Dari hasil penelitian ini diperoleh: (a) perancangan dan perakitan mesin *water chiller* untuk pengkondisian udara dengan sistem kompresi uap telah terlaksana dan mesin layak digunakan untuk penelitian lanjut. (b) dari data-data yang telah didapat dari penelitian, diperoleh : (1) nilai kerja kompresor persatuan massa refrigerant (W_{in}) tertinggi sebesar 49,40 kJ/kg dicapai variasi dengan udara segar. (2) nilai kalor yang dilepas kondensor persatuan massa refrigeran (Q_{out}) tertinggi sebesar 180,70 kJ/kg dicapai variasi dengan udara segar. (3) nilai kalor yang diserap evaporator persatuan massa refrigeran (Q_{in}) tertinggi sebesar 132,35 kJ/kg pada variasi tanpa udara segar. (4) nilai *actual coefficient of performance* (COP_{actual}) tertinggi sebesar 2,74 dicapai variasi tanpa udara segar. (5) nilai *ideal coefficient of performance* (COP_{ideal}) tertinggi sebesar 3,88 dicapai variasi tanpa udara segar. (6) nilai efisiensi siklus kompresi uap (ɳ) tertinggi sebesar 71,24 dengan variasi tanpa udara segar. (7) nilai laju aliran massa refrigerant (ṁ) tertinggi sebesar 0,00937 kg/s dengan variasi tanpa udara segar.

Kata Kunci : *water chiller*, siklus kompresi uap, karakteristik, COP

PLAGIAT MERUPAKAN TINDAKAN TIDAK TERPUJI

ABSTRACT

One of the problems most people face is the increasing temperature of the surrounding environment. This problem can be overcome by using an air conditioner. One of the machines that can be used in air conditioning system is a water chiller. This study aimed to: (a) design and assemble a water chiller machine for air conditioning with a vapor compression system, (b) determine the characteristics of a water chiller machine with the presence of fresh air variety which includes: (1) the amount of work of the refrigerant mass unity compressor (W_{in}), (2) the amount of heat released by the refrigerant mass unity condenser (Q_{out}), (3) the amount of heat absorbed by the refrigerant mass evaporator (Q_{in}), (4) the amount of the actual coefficient of performance (COP_{actual}), (5) the amount of the ideal coefficient of performance (COP_{ideal}), (6) the amount of the efficiency of the vapor compression cycle (ɳ), and (7) amount the refrigerant mass flow rate (ṁ).

The water chiller design which employed rapor compressor system had this main components as follow : ¾ HP compressor, condenser, capillary pipes, evaporator and additional component the form of filter dryer. The R-22 refrigerant working fluid was used in this design, the working temperature of the condenser was chosen higher than the temperature of the outside air temperature and the working temperature of the evaporator was lower than the cooled water. Variations of this research were carried out i-e: (a) without the presence of fresh air, (b) with the presence of fresh air.

The results of this study was: (a) the design and assembly of a water chiller machine for air conditioning with a vapor compression system were able to be carried out and the machine can be used for further research. (b) The obtained result of the research were : (1) the highest working value of the regrigerant mass compressor (W_{in}) was 49,40 kJ/kg which was achieved in the fresh air presence variation. (2) the highest heating value released by the refrigerant mass unity condenser (Q_{out}) was 180,7 kJ/kg which was achieved in the fresh air presence variation. (3) the highest heating value absorbed by the evaporator per one refrigerant mass (Q_{in}) was 132,35 kJ/kg which was achieved in the fresh air absence variation. (4) the actual highest rate of coefficient (COP_{actual}) of performance was 2,74. which was achieved in the fresh air absence variation. (5) the ideal highest rate of coefficient of performance (COP_{ideal}) was 3,88 which was achieved in the fresh air absence variation. (6) the highest value the efficiency of vapor compression cycle was 71,24 which was achieved in the fresh air absence variation. (7) the highest rate of refrigerant mass flow was 0,00937 kg/s which was achieved in the fresh air absence variation.

Keywords : water chiller, vapor compression cycle, characteristics, cop