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DEVELOPMENT AND MODIFICATION OF REFRIGARATION SYSTEM

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Abstract:-*Our final year project, i.e. Development and Modification of Refrigeration system ,aims at increasing the COP of refrigeration, efficiency and reduce the overall power consumption of refrigerator by changing the shape of condenser as well as the cooling medium. The working is based on the principal of vapour compression cycle in which the cooling effect takes place due to the evaporation ofthe refrigent in the evaporator. The refrigerant absorbs heat from product and turns into a gas i .e. changesits phase from liquid to gas. The device i.e. condenser is mounted on the back side of the refrigerator. Theheat transfer from the condenser coils to the air is by natural convection in air cooled condenser and inwater cooled condenser water is used as the condensing medium. The cooling unit is primary component on which the whole project is based upon. Attempts will also be made to reduce the overall cost and make use of waste heat rejected by the condenser to increase its overall efficiency.*

I. INTRODUCTION OF MECHANISM

The present project is based on Vapour Compression refrigeration. The cooling unit i .e. condenser is primary component on which the whole project is based upon. The project is carried out in 4 steps. Firstly the parameter of existing air cooled condenser measured such as pressure, temperature, power consumption etc. For measuring the above parameter pressure gauge temperature gauge wattmeter and refrigerant chart is used. Then we have changed the cooling medium of existing condensing unit i .e. from air to water. Because the heat transfer coefficient of water is almost 4 times the air. For this we have made a air tight casing in which the existing condenser is place and water is circulated and then parameter aremeasured such as pressure, temperature. In this cooled water is supplied at the inlet and hot water extracted from the outlet due to which the refrigerant is sub cooled to a lower temperature before entering the expansion valve in the condense itself by rejecting heat to the cooling medium due to which there is small increases the C.O.P. of refrigerator. After this we have changed the shape of condenser to helical and then parameter are measured such as pressure, temperature .and a considerable amount of increase in C.O.P.is observed due to considerable reduction in compressor work. Then again we changed the cooling medium of condenser to water and due to this a considerable amount of increase in the C.O.P. is observed due to increase in refrigeration effect along with decreases in compressor work. And the mass flow rate of the refrigerant of Ton of refrigeration isalso reduced due to increases in refrigeration effect. Hence it the size of the condenser and evaporator can be reduced witch result in reduction in overall cost of the system.

A. Unit of Refrigeration

The practical unit of refrigeration is expressed in the terms of 'Tonne of refrigeration'. A tonne of refrigeration is defined as the amount of refrigeration effect produced by the uniform melting of one tone (1000kg) of ice from and at 0°C in 24 hours. The latent heat of ice is 335kj/kg, therefore one tonne of refrigeration,

1TR = 1000* 335 KJ 24 hours
= 1000 *335/24*60
= 232.6kj/min

In actual practice, one tonne of refrigeration is taken as a equivalent to 210kj/min or 3.5 Kw.

B. Coefficient of performance

The coefficient of performance is the ratio of heat extracted in the refrigerator to the work done on the refrigerant. It is also known as the theoretical coefficient of performance. Mathematically,

Theoretical C.O.P = Q/W
Q = Amount of heat extracted in the refrigerator or
The capacity of refrigerator
W= Amount of work done.

C. Refrigeration System

Deep Freezer is the Device which maintain the temperature always below than the atmospheric temperature. In other word we can say that it is the closed unit which converts the water in to ice. It is generally used for all industrial purpose from a small refrigerator to a big air conditioning plant.
The main components of Freezer are-
Compressor
Condenser
Chilling chamber (Evaporator)
Expansion device

II. MAIN FUNCTION OF PARTS

A. Compressor

It sucks the low pressure and temperature refrigerant from evaporator side through the inlet or suction valve and supply high pressure & temperature refrigerant after compression.

B. Condenser

High pressure vapor refrigerant is condensed into liquid form in the condenser using cooling medium such as air, water etc.

C. Evaporator

It is a component of a refrigeration system in which saturated refrigerant absorbs heat from product and turns into a gas. Evaporator becomes cold and remains cold due to following reason-

- The temperature of the evaporator coil is low due to the low temperature of the refrigerant inside the coil.
- The low temperature of the refrigerant remains unchanged because any heat it absorbs is converted in to latent heat as boiling proceeds.

D. Capillary tube or Expansion valve

Expansion valve or Capillary tube serves as throttle valve. In capillary tube refrigerant is expand and the pressure is decreased and it causes refrigerant to cool down. The expansion device performs following functions-

- It reduce high pressure liquid refrigerant to low pressure liquid refrigerant before being fed in to evaporator.
- It maintains the desired pressure difference between the high and low pressure sides of the system, so that liquid refrigerant vaporize at the designed pressure in the evaporator.
- It controls the flow of refrigerant according to the load on the evaporator.

E. Refrigerant

A refrigerant is a substance used in a is heat cycle usually for enhanced efficiency, a reversible phase change from a gas to a liquid and vica-versa.

III.SUMMARY

The present invention show the comparison between the conventional Air cooled and Water cooled condenser with Air cooled and Water cooled Helical condenser based on the various parameters such as C.O.P, refrigeration effect, compressor work, heat rejection in condenser etc. and it is observed that the Air cooled and Water cooled Helical condenser is better than the conventional Air cooled condenser. And it provides more refrigeration effect with lesser compressor work which ultimately results in higher C.O.P.

IV.DRAWING(S)

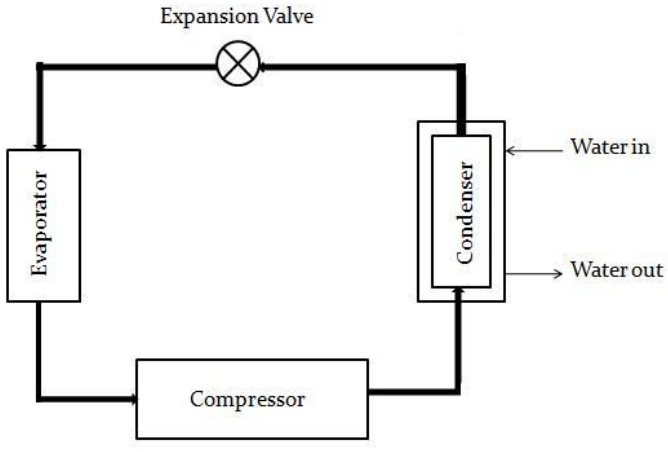


Fig. 1 VCR System with water cooled condenser

Fig. 2Experimental Setup VCR System with water cooled condenser

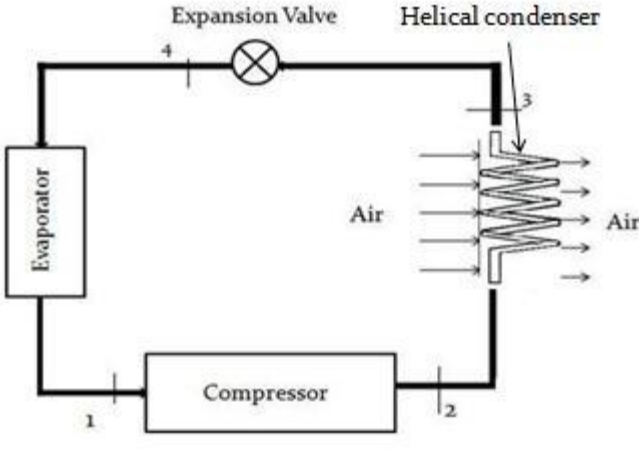


Fig. 3 VCR System with helical air cooled condenser

Fig. 4 Experimental Setup VCR System with helical air cooled condenser

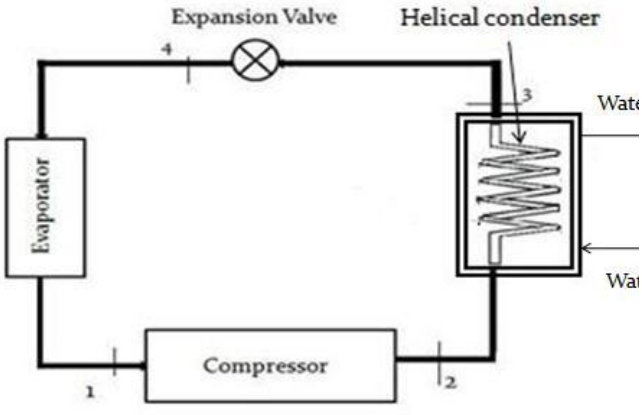
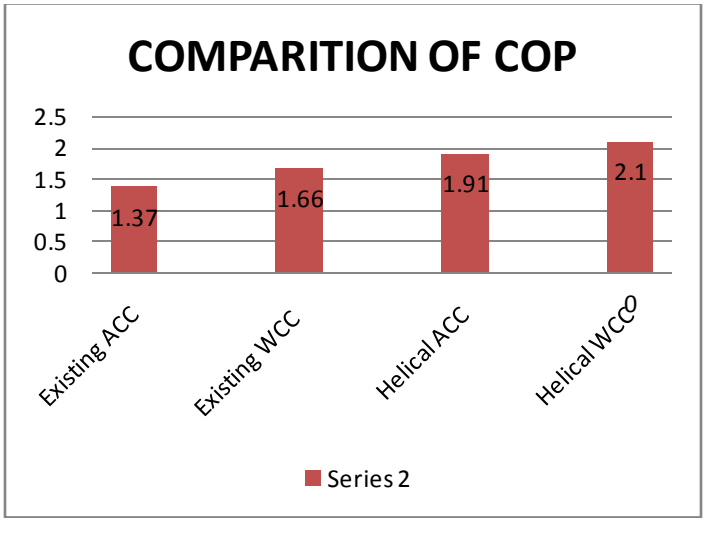


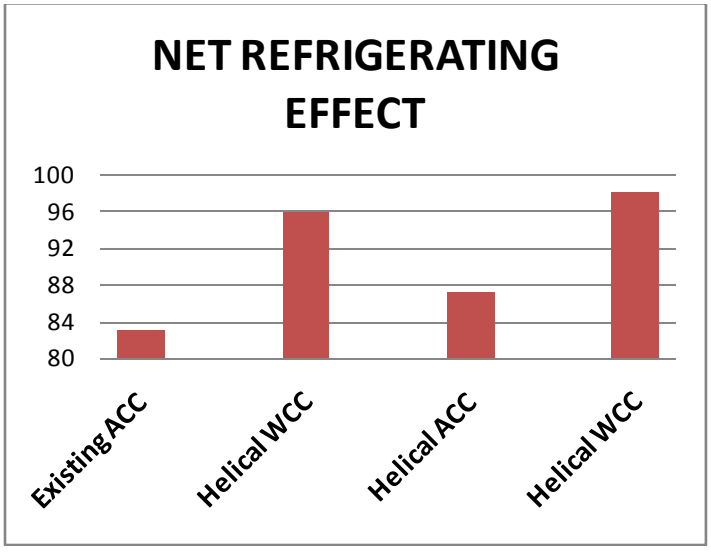
Fig. 5 VCR System with helical water cooled condenser

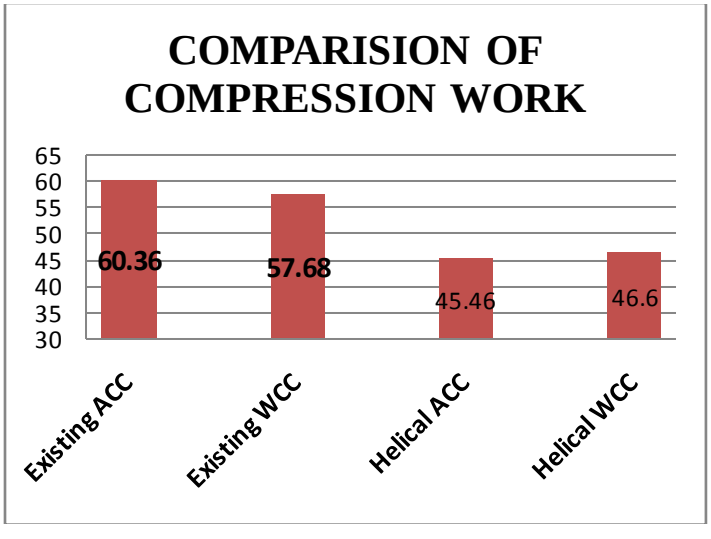
Fig. 6 Experimental setup VCR System with helical water cooled condenser

V.RESULT

COMPARITION OF THE RESULT BASED ON







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