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Experimental analysis of air conditions and refrigeration systems

Dax Shah[1], Pragnesh Kaptan[2], Ashish Mecwan[3], Jontin Macwan[4], Jay Bhavsar[5]

[1]*Mechanical Department, Valia Institute of Technology*
[2]*Mechanical Department, Valia Institute of Technology*
[3]*Mechanical Department, Valia Institute of Technology*
[4]*Mechanical Department, Valia Institute of Technology*
[5]*Assistant Professor, Mechanical Department, Valia Institute of Technology*

Abstract **— Refrigerator is one of the major home appliances which require many consideration suggestion and improvement with application of future technology. So the industry have cooperate over the last two decades to bring about dramatic reductions in refrigeration and air conditioning systems energy consumption and refrigerant emissions. Icing is occurs during the refrigeration process so to minimize it we have to stop the refrigeration system or by using the heating coil it is also minimize but this is also consume more energy which effects on the efficiency of refrigeration system. So we are implementing a system in which the refrigeration and air conditioner are work together using double evaporator one in refrigeration system and another one in air conditioner. By using this system increase the COP (Co-efficient of performance) of refrigeration system.**

Keywords-Multi-evaporator, Single Compressor, simultaneous use of A.C. and Refrigeration, VCR (Vapour compression cycle), Can cooler.

I. INTRODUCTION

Refrigeration is defined as the science of maintaining the temperature of Particular space lower than the surrounding space. This process is called refrigeration system. Refrigeration is a process in which work is done to move heat from one location to another. The work of heat transport is driven by mechanical work, but can also be driven by heat, magnetism, electricity, laser, or other means.

Air conditioning is the process of altering the properties of air to more comfortable conditions, typically with the aim of distributing the conditioned air to an occupied space such as a building or a vehicle to improve comfort and indoor air quality. In common use, an air conditioner is a device that lowers the air temperature.

1.1 Basic Vapour Compression Refrigeration Cycle:

The vapour compression cycle basically used for every household and some other refrigeration. The simple vapour compression cycle and the temperature vs. entropy graph also are as shown in figure.

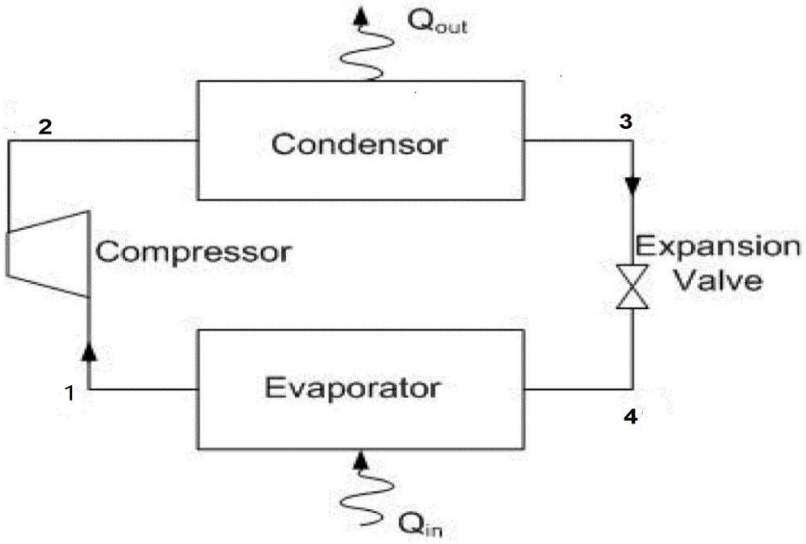

Fig.1 Vapour compression refrigerantion cycle

In this cycle the refrigerant use for the cooling the space. The refrigerant absorbs the heat from surrounding medium in evaporator and release the heat in condenser. The compressor sucks the vapour from evaporator and compress it high temperature. This is work as a pump. The Expansion Valve used for pressure drop of refrigerant. The evaporator is work as a heat exchanger which transfers the heat from surrounding (place to be cooled) to refrigerant and converts it into in vapour form. The condenser also works as a heat exchanger which transfers the heat from refrigerant to surrounding air.

1.2 Problem Definition and Solution

There are many problems occurs during refrigeration process like icing, flooding back into the compressor, highly power consumption, poor piping, high condensing temperature, low suction pressure, low COP, High running cost, higher noise, Refrigerant leakage, Drainage problem. It is reduce by using of heating coil but it is consumes more energy so we are implement a system that uses multi-evaporator to improve COP of Refrigeration system and increase the cooling of refrigeration system as well as surrounding atmosphere.

II. DESCRIPTION OF SYSTEM

In traditional cycle of refrigeration system, process starts with compressor which is connected with condenser at one side and another side is evaporator outlet take place. Evaporator and condenser links by using expansion valve. So we approach it by using the multi-evaporator besides the single evaporator. So where the evaporator and compressor connected, in between the second evaporator installed thus the coolant moves first through the evaporator-1 then evaporator-2 then and there the coolant goes into the compressor.

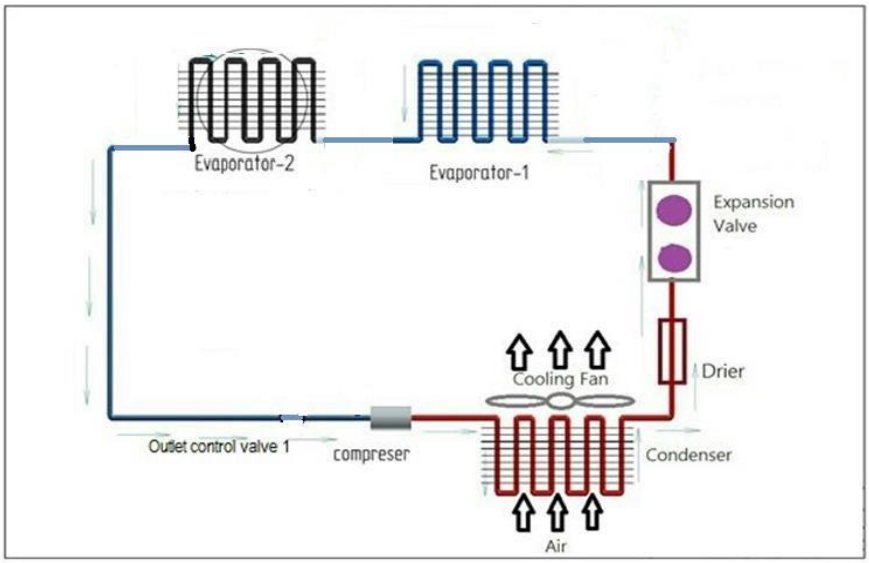

Fig.2 Schematic diagram of ssystem

2.1 Working principle

When cycle starts the refrigerant compress in the compressor in this phase temperature and pressure is increase after the compression. Then refrigerant is condensed by condenser in which the temperature decrease. After the condensing outcome coolant flow through expansion valve. In expansion valve coolant expands and temperature and pressure is decrease. After expansion coolant is flows first in evaporater-1 then in evaporator-2 after that coolant again goes into the compressor. Evaporatoe-1 is using for refrigeration system and the evaporator-2 is for air conditioner.

2.2 Mechanical parts

A. Compressor

The purpose of the compressor is to circulate the refrigerant in the system under pressure, this concentrates the heat it contains. At the compressor, the low pressure gas is changed to high pressure gas.

B. Condenser

In systems involving heat transfer, a condenser is a device or unit used to condense a substance from its gaseous to its liquid state, by cooling it. In so doing, the latent heat is given up by the substance, and will transfer to the condenser coolant.

C. Expansion valve

A thermal expansion valve is a component in refrigeration and air conditioning systems that controls the amount of refrigerant flow into the condenser thereby controlling the superheating at the outlet of the evaporator.

D. Evaporator

An evaporator is used in an air-conditioning system to allow a compressed cooling chemical, such as R-134a to evaporate from liquid to gas while absorbing heat in the process. It can also be used to remove water or other liquids from mixtures.

III. TEST RESULT

3.1. Result

Parameters	Inlet	Outlet
Compressor	0 °c	60 °c
Condenser	60 °c	40 °c
Expansion	40 °c	-16 °c
Evaporator-1	-16 °c	-1 °c
Evaporator-2	-1°c	10 °c
Compressor Pressure	250 psi	10 psi
COP (Coefficient of performance)		6

3.2. Summary of result

After compressor, phase of coolant is superheated and temperature is 60 °c then after condensing temperature is 40 °c after the condenser. Subsequently the coolant is flow on expansion valve at that time temperature is decrease to -16 °c. Next the evaporator-1 and evaporator-2 and final temperature and pressure of coolant 10 °c and 10 psi respectively. The final result we get is 6 COP.

IV. CONCLUSION

In refrigeration system number of parameters affected like surrounding, not proper utilization of power, coolant flow. Because of this all parameters the COP of system gets effected badly so instead of this to improve the COP of system by simultaneously working of refrigeration system and air conditioning system for that we install second evaporator in between the first evaporator and compressor. By using this process cycle we get more cooling in cabin as well as surrounding. Through which the COP of the system is Increases with low power consumption.

REFERENCES

[1] D.B. bivens, "Refrigeration and Air Conditioning with Reduced Environmental Impact", International Refrigeration and Air Conditioning Conference-Paper 521, pp. 504-512, July 25-28, 2000.

[2] Himanshu1, Kartik Upadhyay2, Nitish Sehgal3, Mohit Jaraut4, Prince Gautam5, Shubham Kalra6, Prof. S.K Gupta7 "Feasibility Study and Development of Refrigerator cum Air Conditioner", International Journal of Scientific and Research Publications, Volume 4, Issue 12, December 2014.

[3] J.K.Dabas 1, A.K.Dodeja2, Sudhir Kumar3, K.S.Kasana4, "Performance Characteristics of Vapour Compression Refrigeration System Under Real Transient Conditions", International Journal of Advancements in Technology, Vol . 2 No. 4, pp. 584-593, October 2011.

[4] U.V.Kongrea1, M.B.Salunkheb2, A.A.Pohekarc3, S.S.Shendekard4, "Design Methodologies of air-conditioner cum water dispenser", International Journal of scientific research and management volume 1, issue 1, pp. 18-22, 2013.

[5] He Bingqiang1, Liao Chunling2, "The Research on Optimal Control of HVAC Refrigeration System", International Journal of Computer Science Issues, Vol. 9, Issue 5, No 2, pp. 65-70, September 2012.