Modification in Air Conditioning System

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Abstract- *The project has an aim of gaining high coefficient of performance (C.O.P.) in air conditioning system used in automobiles to condition the cabins in buildings with low consumption of electricity and less amount of refrigerant. Now a days new air conditioners consumes more power and hence becomes less economical.*

Introducing car air condition system with modifications of system to get high cooling effect with low consumption by economic range of instruments and proper use.

In this system the Refrigerant is pumped with the help of compressor in the condenser which has high pressure which passes through receiver dryer which is connected to the expansion valve which works as capillary which converts the high pressurized gas to high velocity gas which flows through the cooling coil and passed against the suction of compressor.

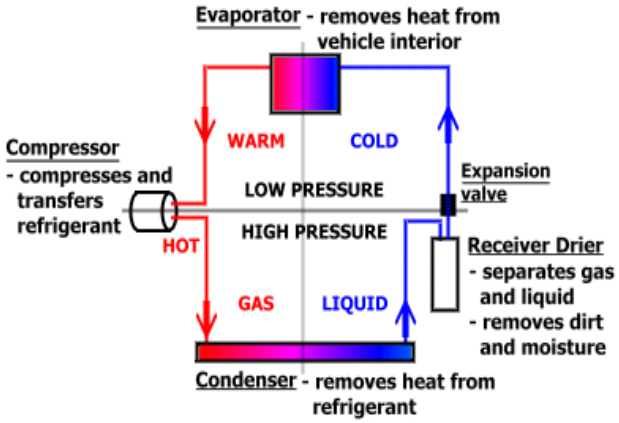
Keywords- Compressor ,condenser, Evaporator, Expansion device, D.C. motor

I. INTRODUCTION

At present the new ac's like split ac and window ac has internal winding to run the compressor to circulate the refrigerant in system which consumes more electric power .hence reducing the coefficient of performance of the system. The compressor of car air conditioning system is run by means of crank shaft of engine which causes variations.

The motor constantly runs the rotary compressor in this model which reduces the compressor load and thus result in increase in its performance. A non return valve is provided at suction line of compressor by giving a duct for easy charging of the refrigerant.

II. BASIC THEORY



Following parts are included in the theory

- Compressor
- Condenser
- Evaporator
- Expansion Device
- Receiver –Drier

III. OBJECTIVE

Aim of proposed work is to reduce the energy consumption and gain more cooling effect resulting increase in the efficiency of the system.

IV. PROBLEM DEFINITION

Now a day's the cost of the air conditioners has increased due to modern technologies .Resulting in the increase in the consumption of power. So we need to control the recurring cost by reducing the input power.

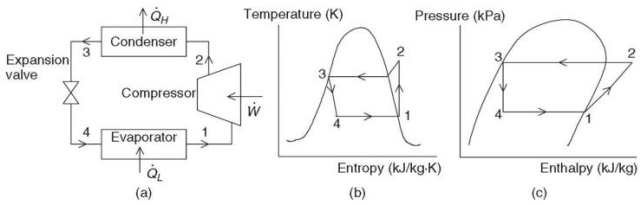
The cooling load is affected by many factors. Some of them are listed below

1) Faster the car moves, the greater amount of infiltration into the car and better rate of heat transfer.
2) The sun baking down on the blank road will raise the temp. up to 500
C to 600C and thus increases the amount of heat transferred into the car through the floor.

3) Because of the relatively large glass areas, metal construction and the flow of air around the moving vehicle (automobile) is very large, so the air conditioning capacity is also large in comparison with A. C. installed at home.
4) Quantity of fresh air in.
5) Number of occupants.
6) Quantity of heat directly rejected by sun on car. For all the above sources, it is necessary that capacity of automobile A.C. should be large, be capable to take overloads and operate for relatively long periods. The cooling capacity of automobile A.C. system ranges from 1 to 4 tones, which is the amount of refrigeration needed to cool a small house.

V. VCR SYSTEM

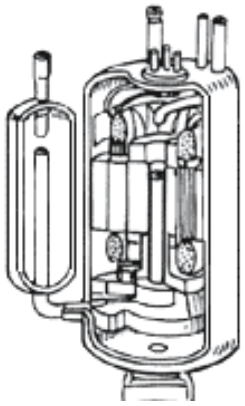
Vapour compression refrigeration cycle is used in the car air conditioning system . Vapour (fairly dry vapour) leaves the evaporator and enters the compressor at point 1. The vapour is compressed isentropically to point 2. During compression, the pressure and temperature increases. The temperature at point 2 should be greater than the temperature of the Condenser cooling medium. The vapour leaves the compressor in dry saturated state and enters the condenser at 2. The vapour is condensed and latent heat of condensation is removed in condenser. The high pressure saturated liquid leaves the condenser and enters the throttle valve at 3.Thus the flow through valve causes decrease in pressure and temperature of refrigerant and causes it to evaporate partly. This refrigerant liquid at every low temperature enters the evaporator where it absorbs heat from the space to be cooled thus producing refrigerating effect. This increases its pressure and temperature and the refrigerant is now dry vapour, which is supplied to compressor. This completes the cycle.



VI. CONSTRUCTION

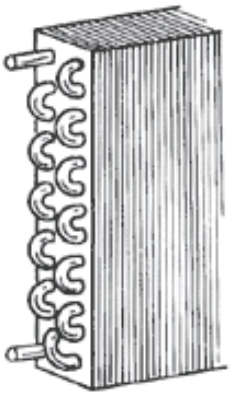
i. Compressor

Compresses the refrigerant from low pressure (low temperature) to high pressure (high temperature). This conversion raises the boiling point to higher temperature levels, facilitating elimination of the heat brought by the outdoor air.



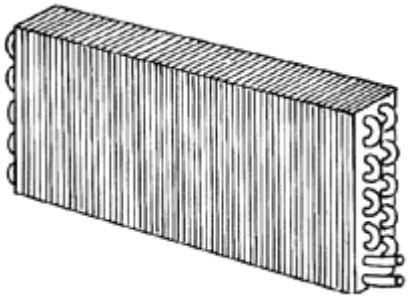
ii.Condenser

This component receives gas at high pressure and high temperature from the compressor. In air-cooled condensers, the metallic surfaces cool the gas which changes status and turns to liquid. In the case of water-cooled condensers, it is the circulation of the water that produces the same cooling effect.



iii. Evaporator

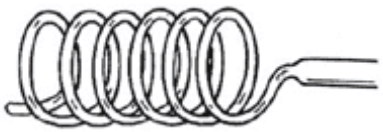
When the refrigerant evaporates in the evaporator, it absorbs heat from the surrounding air and produces cooled air.



iv. Capillary tube

A narrowing of the tube connected along the line between the condenser and the evaporator with diameters

ranging from 1 to 2 mm. and lengths ranging between 1 and 2 m, allows the adjustment of the amount of gas fed to the evaporator.

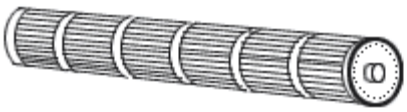


v. Electrical parts

Electric and electronic components needed by the various air conditioner functions.

vi. Indoor fan

It exhausts air from the indoor environment and conveys it through the evaporator; the air is now cool and distributed back into the environment.



Cross-flow fan

Radial fan

vii. Outdoor fan

This causes the air to circulate through the condenser in order to cool the refrigerant.

Axial fan

VII. PROPOSED WORK

Refrigerant gas is drawn into the compressor from the evaporator and pumped from the compressor to the condenser under high pressure and temperature due to compression, As this gas passes through the condenser, high pressure, high temperature gas rejects etc. Heat to the outside air as the air passes over the surface of condenser. The coding of the gas causes it to condense into a liquid refrigerant. The liquid refrigerant still in high pressure passes to receiver drier (dehydrator), The receiver acts as a reservoir for refrigerant. The liquid refrigerant flows from the receiver dehydrator to the thermostat expansion valve refrigerant will loses its pressure and temperature. This low pressure low temperature liquid enters the evaporator. The evaporator coil is mounted below front dash board. As the temperature of refrigerant passing through evaporator is low it absorbs heat and continues to boil, drawing heat from the surface of the evaporator core warmed bythe rush of air passing over the surface of the evaporator core. In addition to the warm air passing over- the evaporator rejecting its heat to the cooler surfaces of the evaporator core, any moisture in the air condenses on the cool surface of the core resulting in cool dehydrated air passing into the compartment of the car. By the time the gas leaves the evaporator, it gets completely vaporized and is slightly superheated. The pressure in evaporator is controlled by suction throttle valve. R12vapour passing through the evaporator flows through the suction throttle valve and is returned to compressor where refrigeration cycle is repeated.

Comparison:-

Sr. No.	Parameters	Normal Ac	Modified Ac
1.	Energy Input	230v 9a	230v 6a
2.	Refrigeration Effect	Grill temp 9°C (-3 to -4°C)	Grill Temp-7°C (-4to-6°C)
3.	C.O.P.	Better	More Compared To Simple Ac.
4.	Moving Parts	More	Less

VIII. CONCLUSION

The Modified A.C. is more efficient than the normal system. The refrigerating effect is more thus the COP of system is more. The compressor is run by motor thus input power is also reduced resulting in increase in COP. High cooling effect with low consumption by economic range of instruments and proper use.

IX. FUTURE SCOPE

Development of the air conditioning system mostly useful in various industries. With the help of motor the project aim to reduce the power consumption. This project works as the cost reduction including the high refrigeration effect.

These system can be used in various fields as in:-

- Pre cooler in agriculture industries
- Industrial workshop
- Agro huts frames
- Laboratories
- Small locomotive Cabins
- Hospitals
- CNC and VMC MACHINES to maintain high heat dissipation
- Houses
- Offices
- In control rooms for cooling of circuits.

X. ADVANTAGES

- Less consumption of electricity
- Comparatively high cooling effect
- Easy to refilled gas/refrigerant(gas charging)
- Less harmful due to less amount of refrigerant present in system
- No hermetic sealed compressor required
- No high risk of compressors Grounding
- Less corrosive due to aluminum system
- Easy to assemble and dissemble
- No permanent sealing required (Breezing)
- Can run on small generator in absence of electric supply
- Light in weight as compared to other AC systems

REFERENCES

[1] Ajinkya Deshpande ,Rohan Jadhav, Performance Optimization of Air Conditioning System of ATM Room Using PCM as TES, International Journal of Innovative Research in Science, Engineering and Technology, ISSN(Online): 2319-8753, Vol. 5, Issue 6, June 2016
[2] Dr. Akash Langde1, Zeeshan Jamal2, Air Conditioning System with Modified Condenser Ducts and Evaporative Cooling, International Research Journal of Engineering and Technology (IRJET) e-ISSN: 2395-0056, Volume: 05 Issue: 01 | Jan-2018
[3] Reference Book, Refrigeration and Air Conditioning, by R.S. Khurmi, S. Chand and Co.
[4] Reference Book, Refrigeration and Air Conditioning, by Ballany, 2009, Dhanpat rai & sons
[5] www.github.com
[6] Quora.com