FACT FINDING INSPECTION ON EFFECT OF MAGNETIC STRENGTH ON VAPOUR COMPRESSION REFRIGERATION SYSTEM

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***Abstract*:**VCRS is used for freezing of food products for the both trading and household purpose appliances.Advancement for the better execution of the system ends up fundamental issue and numerous examines are still on going to enhance productivity of the system. The primary target of this Project work is to improve the execution of the residential fridge by flooding the evaporator (i.e. if liquid refrigerant covers entire heat transfer surface) with liquid refrigerant. To attain this objective, the magnetic strength is installed on the refrigerator lineat the exit of the condenser.Utilization of magnetic strength will result in abatement in the viscosity of the fluid, improving the stream rates and thus cooling limit all the while decreasing the power of compressor.Then COP, refrigeration effect of the system enhances with the establishment of magnetic strength. Likewise the system gets profited as reduction in the compressor work with the establishment of magnetic strength and the refrigerant used is R-134a.

Keywords: Magnetic Strength, Refrigerant, Refrigerator.

I. INTRODUCTION

The vapor compression system is most widely used for refrigeration. Refrigerant used in this system undergoes a change of phase, and such a refrigerant can produce more refrigeration effect. Vapor used as a refrigerant condense during heat rejection process and evaporates during heat addition process. The refrigerants utilized for domestic icebox are Ammonia, Carbon dioxide, Sulfur dioxide, Freon gathering, Hydrocarbon bunches and so forth.

The magnetic field is the zone around a magnet in which there is magnetic power. Moving electric charges can make magnetic fields. The magnetic field at any given point is determined by both heading and an extent (or quality); all things considered it is spoken to by a vector field. This magnetic field is undetectable yet is in charge of the most remarkable property of a magnet, a power that pulls on other ferromagnetic materials, for example, press, and draws in or repulses different magnets. A changeless magnet is a question produced using a material that is polarized and makes its own particular tireless magnetic field. An ordinary case is a magnet used to hold a Domestic refrigerator door.

1. LITERATURE SURVEY

Writings has announced the change in execution on utilization of magnetic strength will result in abatement in the viscosity of the fluid, improving the stream rates and thus cooling limit all the while decreasing the power of compressor. From the above literature it is discovered that COP, refrigeration effect of the system enhances with the establishment of magnetic strength. Likewise the system gets profited as reduction in the compressor work with the establishment of magnetic strength.

2. ABATEMENT INVISCOSITY

The connection between the abatement rates of the surface tension of polarized Hydrocarbon Refrigerant is talked about underneath. The surface tension of the individual hydrocarbons reduces after polarization. At some specific magnetic fields the surface tension declines relatively extensively while at others itdiminishes nearlyunnoticeably. The purpose behind that could be the distinctive conduct of the hydrocarbon at various magnetic field strength so it can be effectively presumed that the surface tension of hydrocarbons diminishes with the expansion in magnetic field strength.

3. WORKING PRINCIPLE

Hydrocarbon refrigerants is a blend of natural synthetic mixes like Hydrogen and carbon iotas among others. The little ones are the lion's share, shaping the base fluid and the substantial ones, suspended in the base fluid, are called "particles". The thickness of Hydrocarbon refrigerants is consequently obviously identified with the consistency of fluid suspensions. The collected groups are accordingly of constrained size, viz. small scale meters. While the molecule volume division continues as before, the normal size of new "particles" is expanded. This prompts the decrease of Hydrocarbon refrigerants thickness. As appeared in figure beneath [1].

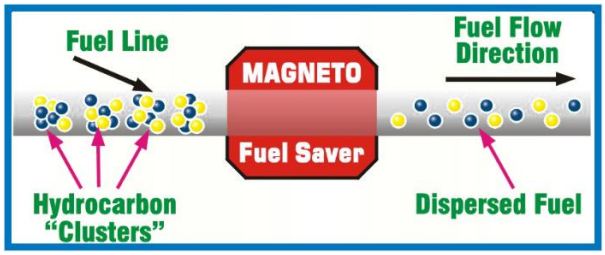


Figure 1 Declustering of hydrocarbon molecules

4. TYPE OF MAGNET USED

SINTERED FERRITE MAGNET

Permanent ferrite magnets are made of hard ferrites, which have a high coercivity and high remanence after magnetization. Iron oxide (Fe2O3) and bariumcarbonate (BaCO3) or strontium carbonate (SrCO3) are used in manufacturing of hard ferrite magnets. The density of this ferrite magnets is about 5 g/cm3. It is usually black in color and sometimes it is also called as Ceramic magnets. Generally they are used in applications such as Refrigerators magnets, Loudspeakers, Radios and small Electric motors.

PROPERTIES

- Ferrite magnet possess high magnetic permeability and high electrical resistance.
- They are very hard &Brittle in nature.

GRADE USED

Sintered Ferrite Magnet → Y30BH → Ferrite 4 → Certified by: ISO9001

- Y= It is an identifier for Ceramic magnet / Hard Ferrite magnet
- 30BH = the number following is linked to BH max Energy Product. (BH max = 27 To 30 KJ/Min)

Magnet Material → Hard Ferrite (Ceramic)
Composite → Fe203, Fe304
Operating Temperature → - 40 °C To + 250 °C

Type

Anisotropic → These have preferred direction of magnetization locked with their structure allowing better magnetic performance.
Isotropic → These versions are also available and can be magnetized in any direction but has lesser performance.
Note: In this project I used Anisotropic ferrite magnet.

Ferrite Magnet used for experiments
Y30BH – 9 pieces – Rectangle shape – 1000 gauss.
Y30BH – 18 pieces – Rectangle shape – 2000 gauss.

5. REFRIGERANT USED

The refrigerant used in this experiment is R –134a

- Also known as Tetrafluoroethane
- It is substitute of R – 12
- Chemical Formula =CH_2FCF_3
- Boiling Point = – 26.3 ˚C

Refrigerant Properties

Since R –134a has no chlorine atoms it has

- Zero Depleting Potential
- Negligible Global Warming Potential
- Compatible with Mineral Oils

II. RESEARCH METHOD

The domestic refrigerator is at first cleaned and the clearing of the framework is finished with the help of a vacuum pump for around 30 min and a while later the refrigerant is dashed into the framework. At first the framework is accused of Hydrocarbon refrigerant and afterward the accompanying tests were completed with and without nearness of Ferrite Magnets

1. Noloadperformance
2. Loadperformance

1. Noloadperformance:

In no load performance the refrigerator is switched on and kept in running condition without putting any kind of load inside the lodge until the point that the consistent state conditions are accomplished and afterward the readings are noted for computing the COP of the framework and framework is turned off.

Methodology:

• Initially the refrigerator is switched ON.
• The system is kept in running condition consistently to get relentless state conditions.
• After achieving unfaltering state conditions the pressure gauge and temperature readings are noted.
•COP is calculated from p-h graph of the refrigerants by use of enthalpy.

2. Loadperformance:

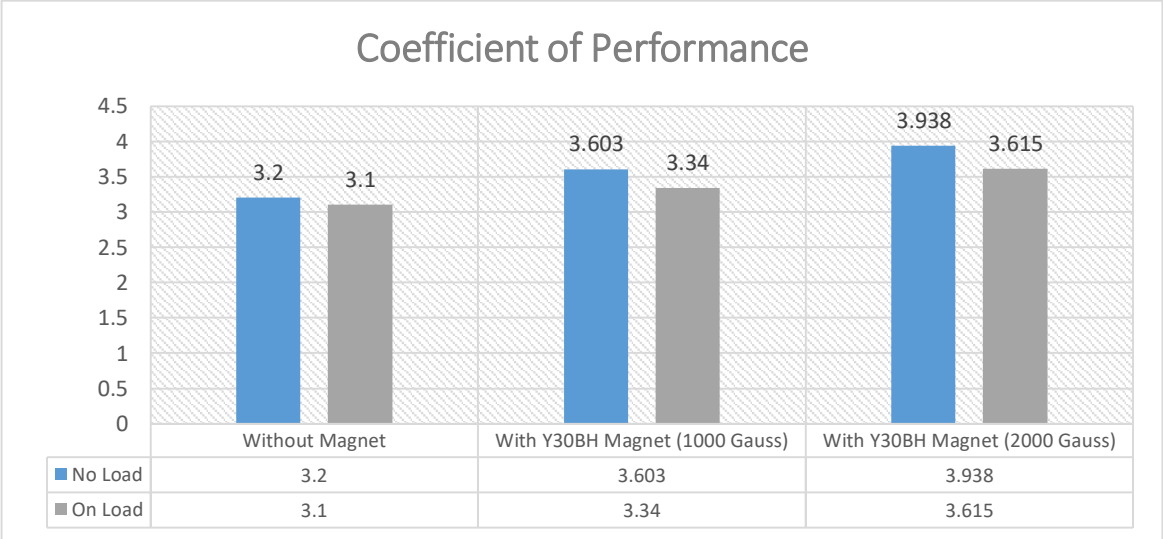
In load performance the refrigerator is loaded with 2.5 liters of water bottle inside the evaporator lodge and the system is exchanged on and kept in running condition until the point that the relentless state conditions are achieved and afterward the readings are noted for computing the COP of system and system is turned off.

Methodology:
• Initially the refrigerator is Turned ON.
• After some time 2.5 liters of water bottle is set inside the evaporator lodge and exchanged on for loading the system.
• The system is kept in running condition ceaselessly to obtain consistent state conditions.
• After accomplishing relentless state conditions the pressure gauge and temperature readings are noted and then turn it off.
• COP is calculated from p-h graph of the refrigerants by use of enthalpy
In the first place COP and Compression Power is calculated for the refrigerator without Magnet i.e. with and without load and afterward COP and Compressor Power is calculated for the refrigerator with Ferrite Magnet i.e. with and without load.

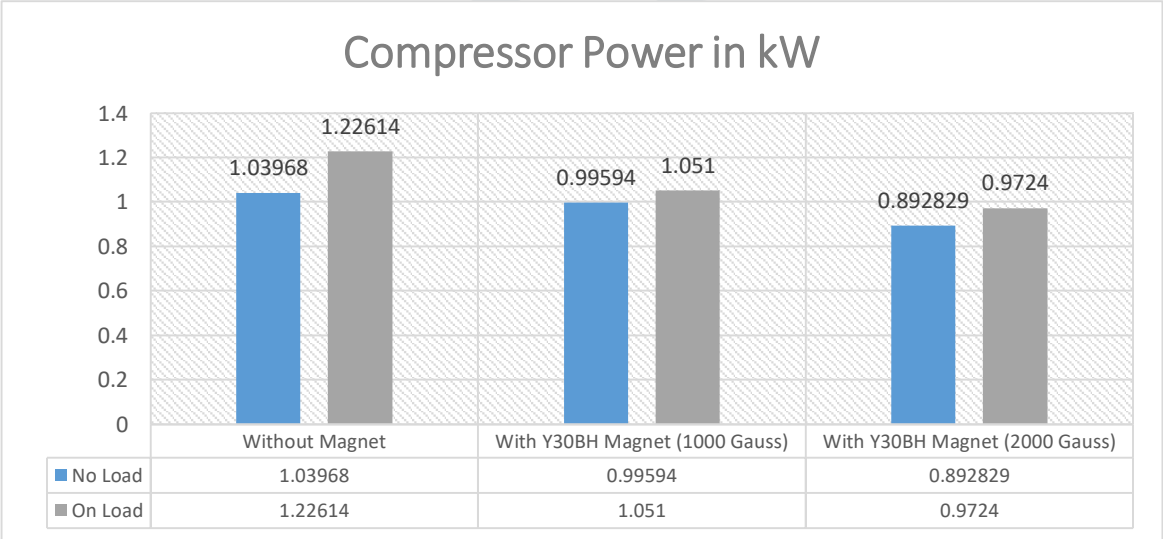
III. RESULTS AND DISCUSSION

A) Without Magnet
Case 1: No Load
Case 2: On Load
B) With Y30BH Magnet (1000 Gauss)
Case 1: No Load
Case 2: On Load
C) With Magnet (2000 Gauss)
Case 1: No Load
Case 2: On Load

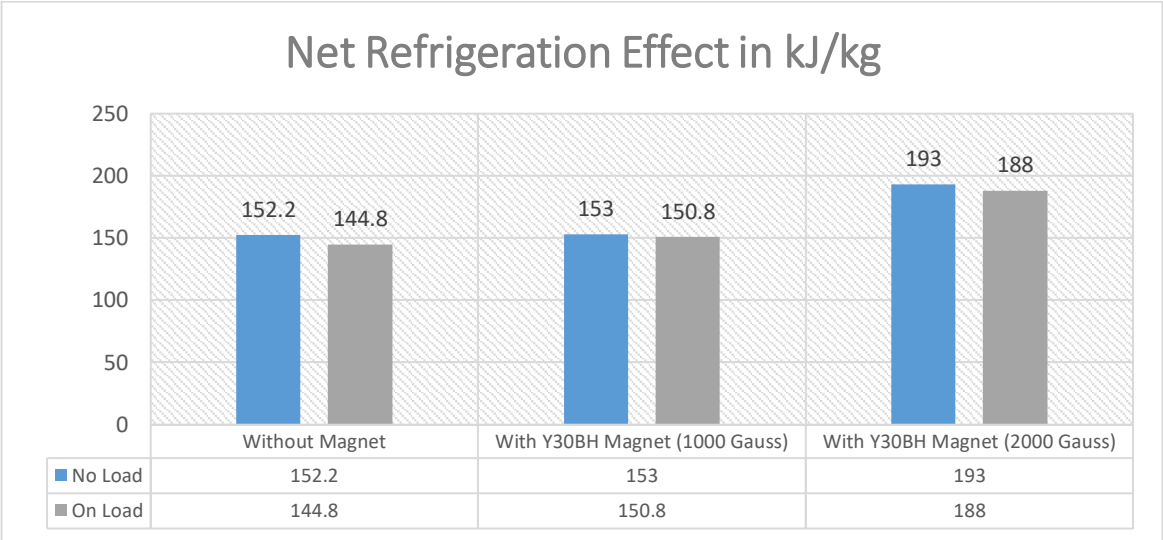
Coefficient of performance, Compressor Power, Net Refrigeration Effect of above experiment are discuss below in bar diagrams



COP of Domestic Refrigerator without Load is increase by 12.59% for Y30BH Magnet (1000 Gauss), 23.06% for Y30BH Magnet (2000 Gauss) if compared with No magnet is placed (without Magnet)
COP of Domestic Refrigerator with Load is increase by 7.74% for Y30BH Magnet (1000 Gauss), 16.612% for Y30BH Magnet (2000 Gauss) if compared with No magnet is placed (without Magnet)



Compression Power of Domestic Refrigerator without Load is decrease by 11.66% for Y30BH Magnet (1000 Gauss), 18.12% Y30BH Magnet (2000 Gauss) if compared with No magnet is placed (without Magnet)
Compression Power of Domestic Refrigerator with Load is decrease by 7.21 % for Y30BH Magnet (1000 Gauss), 12.93% for Y30BH Magnet (2000 Gauss) if compared with No magnet is placed (without Magnet)



Net Refrigeration Effect of Domestic Refrigerator without Load is increase by 1.05% for Y30BH Magnet (1000 Gauss), 6.08% for Y30BH Magnet (2000 Gauss) if compared with No magnet is placed (without Magnet)
Net Refrigeration Effect of Domestic Refrigerator with Load is increase by 1.43% for Y30BH Magnet (1000 Gauss), 2.98% for Y30BH Magnet (2000 Gauss) if compared with No magnet is placed (without Magnet).

IV. CONCLUSION:

The test results demonstrate utilization of magnetic strength has beneficial outcome on the COPif R-134a is utilized as refrigerant for Domestic refrigerator. In this manner this examination has possessed the capacity to approve the revealed wonders of change in COP of refrigerator by placing magnetic strength in between the condenser outlet and capillary tube.

- COP of Domestic Refrigerator without Load is increase by 12.59% for Y30BH Magnet (1000 Gauss), 23.06% for Y30BH Magnet (2000 Gauss) if compared with No magnet is placed (without Magnet)
- COP of Domestic Refrigerator with Load is increase by 7.74% for Y30BH Magnet (1000 Gauss), 16.612% for Y30BH Magnet (2000 Gauss) if compared with No magnet is placed (without Magnet)
- To obtainmoreCOP and to minimizecompressor power, magnets with more gauss power can be used.

V. REFERENCES

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