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Experimental Study of LPG Refrigeration System: A Review

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Abstract-- Use of Lpg refrigeration System is increased on large scale seems last few years. The world today is concerned about saving the environment, everywhere measures have been taken in the world to reduce the raising pollution. Investigates the result of an experimental study carried out to determine the LPG is locally available which comprises of 24.4% propane, 56.4% butane, and 17.2% isobutene which is varied from company.

The LPG is cheaper safer and eco-friendly in nature with no Ozone Depletion Potential (ODP) and it does not cause Global Warming Potential (GDP). We have design and analysed a refrigerator using LPG as refrigerant. As the high pressure LPG stored in cylinder. Then we passed the pressurized lpg through the small internal diameter of capillary tube, due to this there is decrease in pressure and the heat of the surrounding temperature is also decrease. This result cause the refrigeration effect is produced for certain period.

The refrigerator working is efficiently when lpg is used as refrigerant as compared to any other refrigerant. We have done this experiment at atmospheric condition, we can predict the optimum value of cooling effect with suitable operation condition of regulating valve and capillary tube of the system and the temperature of the is goes down up to 0.5C. finally from above experiment we have conclude that the cop the lpg refrigerator is higher than the domestic refrigerator.

Keywords-- lpg, refrigeration system, cooling refrigerator.

I. INTRODUCTION

Nowadays, Lpg refrigeration systems are commonly and frequently used is domestic as well as in restronents. Domestic refrigerators consume approximately 17,500 metric tons of traditional refrigerants such as chlorofluorocarbon (CFC) and hydrofluorocarbon (HFC) every year which contribute to very high ozone depletion potential (ODP) and global warming potential (GWP).

There are very remote areas in India where electricity is not available, hence LPG as a refrigerant for refrigeration can be a better alternative. Although government agencies are not able to continuously supply a major portion of electricity in both the urban as well as in rural areas. Still the people in these regions require refrigeration for a variety of socially relevant purposes such as cold storage or storing medical supplies and domestic kitchens this project has the novelty of using LPG instead of electricity for refrigeration. This solution is convenient for refrigeration in regions having scares in electricity It works on the principle that during the conversion of LPG into gaseous form, expansion of LPG takes place. Due to this expansion there is a pressure drop and increase in volume of LPG that results in the drop of temperature and a refrigerating effect is produced. This refrigerating effect can be used for cooling purposes. So, this work provides refrigeration for socially relevant needs as well as replaces global warming creator refrigerants.

While going through the literature review in LPG refrigeration system, Conventional VCR (Vapor Compression Refrigeration System) uses LPG as refrigerant and produced the refrigerating effect. But in our proposed very simple type of refrigeration system in which the high-pressure LPG is passing through a capillary tube and expands. After expansion the phase of LPG is changed and converted from liquid to gas and then it passes through the evaporator where it absorbs the heat and produces the refrigerating effect. After evaporator it passes through the gas burner where it burns.



Figure 1: Lpg Refrigeration system

The concept is based on the fact that solids have high heat capacity as compared to fluid. So Nano sized particles or nanoparticles are dispersed into a base fluid in order to enhance physical properties of base fluid. The nanoparticle materials are usually of metal, non-metal and their oxides, which enhance the heat transfer performance of base fluids. Hence, there is huge scope of Nano particles application in heat transfer area.

II. METHODOLOGY

A. Components of LPG refrigeration system

1. *Lpg cylinder:* Lpg is a liquefied petroleum gas. Basically it is the combination of the propane (CH₈) and butane (C₄H₁₀). This is either stored separately or with combination of both gases. This is because that gaseous are liquefied at normal temperature by a moderate pressure, this is used in refrigeration process. Lpg is used as domestic fuel, used in industries, used in agriculture and heating of fuel.

2. *Capillary tube:* The capillary tube is a copper tube of very small internal diameter. The capillary tube is very long length and it is transformed into coil shape to occupied less space. Thus internal diameter of capillary tube is basically used for refrigeration process, the internal diameter of capillary tube is varies from 0.5 to 2.28mm. the decrease in pressure is depend upon the length of the capillary tube .mostly we saw that diameter of capillary tube is less area and the length is large due to this the pressure is drop and the refrigerant effect is produced.for this experiment we need three capillary tube.

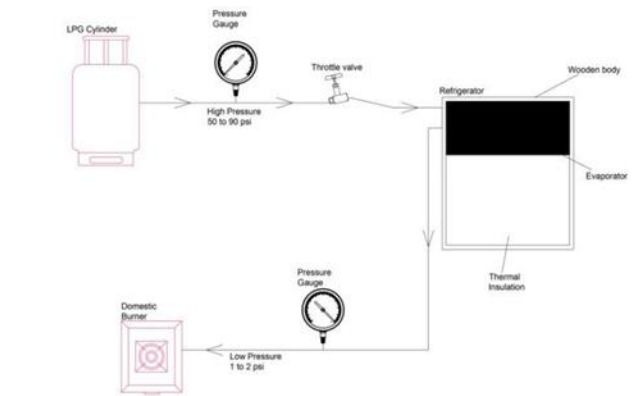


Figure 2: Basic block diagram of lpg refrigeration system

3. *Pressure gauge:* The most commonly used mechanical gauge is Bourdon type pressure gauge. It is a stiff, flattened metal tube bent into a circular shape. The fluid whose pressure is to be measured is inside the tube. One end of the tube is fixed and another end is free to move inward or outward. The inward and outward movement of free end moves a pointer, through a linkage and gear arrangement, a dial graduated in pressure unit i.e. bar. Pressure gauge records the gauge pressure which is the difference between fluid pressure and outside atmospheric pressure.

4. *Regulator:* This type of regulator is used to send high pressure gas from the cylinders. These are mainly used in functions to industrial purpose.

5. *Accumulator:* copper accumulator is used for liquid storage, liquid / gas separation, impurity filtering, and refrigerant cushion.

6. *Evaporator:* The evaporators is one of the most important part of the refrigeration systems. Without this refrigeration cannot work. We can obtained the cooling effect through the evaporator that is used in the refrigeration system. For more people the the evaporator is the main part of the refrigeration system as consider to other part is less useful. The evaporator is a heat exchanger from the substance to the cooled through refrigerant. Thus refrigeration removed the heat from the system and this used for wide variety and hence the available from the substance. The evaporator is basically found wide range of shape, size and also classified on the basis of method of feeding refrigerant , construction of evaporator and direction of air circulating around the evaporator. In the domestic refrigerator the evaporator is commonly known as freezer since the ice is made in this compartment.

In the evaporator the refrigerant is entering at a very low pressure and temperature from capillary tube, then the refrigerant absorbed the heat from the substance, due to this substance is cooled and refrigerant is get heated due to absorption heat from the substance after the leaving the evaporator. In the large refrigeration system the evaporator is normally used for chilling of water. In such type of case shell and tube heat exchanger is used for the evaporator..

III. CONCLUSION AND FUTURE SCOPE

A. Conclusion

1. we conclude that An introduction of new product in the field of refrigeration is expected and to give out positive result with this normal product. The main aim is to focus on restaurant and community program hall, mid-day meal of school so to preserve food products like vegetables, milk etc. Also, at small snack stores by increasing the probability of refrigerator by reducing its weight, removing compressor totally as well as maximum cost reduction due to no cost of refrigeration.
2. The Lpg refrigeration is generally used for the cooling of water, food. It removes the heat of particles which is placed inside it. We have used Lpg in our system which will provide more efficient cooling.
3. As Lpg do not harm environment as well as it too do not deplete the ozone layer. It will not release any harmful gas into the environment. This is environment friendly system.

No power consumption as compared to other refrigeration system. This systems will be the best cooling refrigeration system than any other system. This system can be used in domestic as well as small areas like hotels, restaurants etc.

B. Future Scope

1. By changing some components and rearranging the system, overall system efficiency can be increased.
2. Cooling rate of the system is comparatively low than other refrigeration system . So cooling rate too can be increased for better comfort.
3. This designed system is only for domestic use. Therefore redesign the system to use in hotels, restaurants like commercial use.

4. Availability of Lpg in local areas is large as compared to other refrigerants. So providing this to customers a proper arrangement can be done.
5. Use of lpg refrigeration will increased in future because of their low price and easily availability.

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