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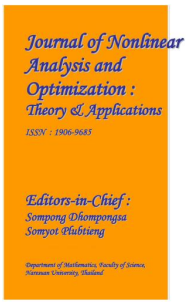

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FABRICATION OF LOW COST REFRIGERATION SYSTEM BY USING LPG

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ABSTRACT: In this project, we designed and tested a refrigerator that uses LPG as a refrigerant. High-pressure LPG cylinders are available. This high-pressure LPG gas undergoes an isoenthalpic phase transition as it travels down a capillary tube with a small internal diameter, causing the pressure to drop due to expansion. When the temperature drops and the liquid refrigerant changes from a liquid to a gas, latent heat is produced. In this approach, LPG can provide cooling.
Keywords:LPGRefrigerationsystem,COP,VCR's,RefrigeratingEffect, LPG.

1.INTRODUCTION

Many areas in the country and around the world still lack consistent access to power. This approach will help to keep food, medicine, and other products at a low temperature in these areas. This study looks at the results of an experiment designed to evaluate the efficiency of a residential refrigerator when using liquefied petroleum gas (LPG) as a refrigerant. Locally available LPG that can be used as a refrigerant contains varying amounts of propane (24.4%), butane (56.4%), and isobutene (17.2%), depending on the producer. Because of its low global warming potential (GWP) and ozone depletion potential (ODP), LPG is both cost-effective and environmentally beneficial. It is a popular cooking equipment globally.

This practical employs an LPG-powered refrigerator. When R134a refrigerant was replaced with LPG, the refrigerator ran more efficiently. By studying the atmospheric conditions experimentally, we can predict the maximum amount of cooling impact by adjusting the operational settings for regulating the capillary tube in the setup. LPG refrigerant is better for the environment because it has no ozone depletion potential. Liquefied petroleum gas (LPG) is widely used as a cooking fuel in private homes, restaurants, and lodging facilities. LPG gas combustion creates byproducts such as carbon dioxide (CO2) and water vapor (H2O). For this project, we used LPG as the refrigerant in the refrigerator design.

AIM AND OBJECTIVES

Aim: To create a refrigeration system that uses LPG instead of electricity.

Objectives: An examination of the performance development of a household refrigerator powered by LPG.

- Analyze and compare the basic characteristics of a typical refrigeration system to an LPG refrigeration system.
- To distinguish between the estimated cost of

an LPG refrigerator and the actual cost of a refrigerator.

- The performance of an LPG refrigerator must be compared to that of a regular refrigerator.

II.LITERATURE REVIEW

Study performed by Prof. Sushant S. Bhansali, 2018

The company creates LPG, which is used as a fuel in burners and a coolant in air conditioners. Because of LPG's mobility and widespread availability, they conducted a performance test on an air conditioner using it as the refrigerant. The use of LPG for refrigeration could potentially provide environmental benefits. LPG is widely used for food preparation in a variety of settings, including homes, restaurants, and hotels. LPG has the potential to chill a restricted space, making it suitable for air conditioning when paired with a fan. By conducting studies, he established that an LPG refrigerator had a higher coefficient of performance (COP) than a residential refrigerator.

Study Performed by Mhaske M.S., 2016

The project's goal is to evaluate the performance of an LPG-powered household refrigerator. In this work, LPG was used as a refrigerant to build and test a refrigerator. LPG is stored in cylinders due to its high pressure. LPG phase transitions occur during an isoenthalpic process, in which the compressed LPG gas expands as it passes through the capillary tube, causing pressure to decrease. As the temperature drops during the liquid-to-gas transition, the liquid refrigerant absorbs latent heat from evaporation. This permits LPG to have a cooling impact on the surroundings. Following an experiment, it was determined that an LPG refrigerator has a higher coefficient of performance (COP).

Study Performed by Bilal A. Akash, 2002

This article discusses studies looking into the viability of utilizing LPG as a replacement for R-12 in residential freezers. The residential refrigerator was developed to work with the RR-12. The practical required the use of LPG gas with masses of 50, 80, and 100 g. The findings illustrate the efficacy of LPG in contrast to R-12. The coefficient of performance increased for all mass charges when the evaporator temperatures were less than 15 °C. The most beneficial results were obtained when the refrigerator was charged with 80 g of LPG. The capacity for collection has been discovered.

III.WORKINGPRINCIPLE

The essential principle of Vapour Compression Refrigeration System theory serves as the foundation for the operation of an LPG refrigeration system. Figure 1 illustrates a VCR. A simple Vapour Compression Refrigeration System consists of five key components:

1. Compressor
2. Condenser
3. Receiver
4. ExpansionValve
5. Evaporator

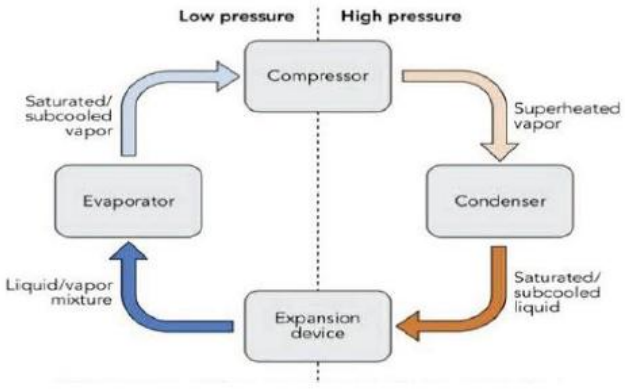

Figure1:VapourCompressionCycle

1. **Compressor:**The refrigerant vapor is compressed in the evaporator, resulting in a large increase in temperature and pressure.
2. **Compressor.**The condenser receives the high-pressure, high-temperature vapour refrigerant.
3. **Condenser:**A condenser is a coil-based component that converts high-pressure, high-temperature gases into condensed state.
4. **Expansion Valve (also known as the throttle valve):**designed to manage the temperature and pressure of the liquid refrigerant that flows through it.
5. **Evaporator:**The evaporator has coils via which a liquid-vapour refrigerant evaporates and converts to a vapour refrigerant due to low pressure and temperature.

IV.ACTUAL SETUP WORKING

The fundamental premise of an LPG

refrigeration system is to use LPG evaporation to collect heat from the surrounding air. The LPG refrigerant is kept at around 80 pounds per square inch (psi) within the cylinder. To cool the surrounding region, we used capillary action to reduce the LPG pressure to 15 to 20 psi, which allowed for better heat absorption.

When the regulator is opened, the high-pressure LPG refrigerant from the LPG gas cylinder enters the gas line at an extremely high pressure. The high-pressure pipe is then used to introduce high-pressure LPG into the capillary tube. Within the capillary tube, the high-pressure LPG transforms into a low-pressure oscillatory condition while keeping a constant enthalpy. The evaporator is then charged with low-pressure LPG refrigerant. The LPG refrigerant circulates cold air into the chamber while also absorbing heat from the evaporator. Consequently, the cooling chamber experiences a drop in temperature.

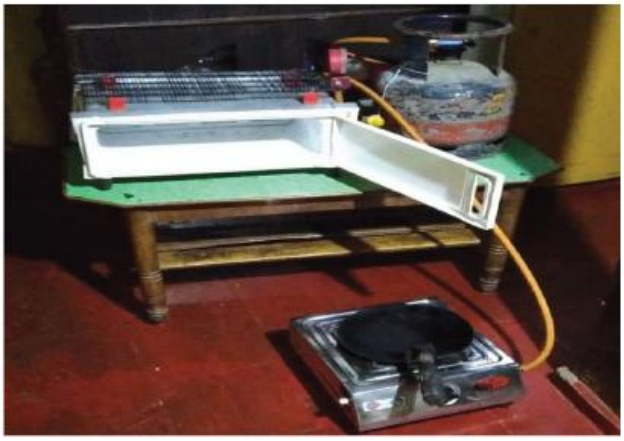

Figure2:LPGRefrigerationSystem

As a result, the refrigerator generates a cooling effect. The low-pressure LPG refrigerant is used for combustion and other functions after being transferred into the burner via a high-pressure tube. This design involves using a recompressed LPG gas cylinder instead of a compressor. As a result, this mechanism produces a cooling effect. Figures 2 and 3 provide illustrations of this occurrence.

Figure 3: LPG Refrigerator

- The cylinder contains liquefied petroleum gas (LPG) at a high pressure. When you open the regulator, the high-pressure LPG flows through the high-pressure pipe. Next, the pressure pipe is linked to the capillary tube.
- The capillary tube converts high-pressure LPG to low-pressure LPG while keeping the enthalpy constant.
- The LPG refrigerant is now stored in the evaporator under low pressure. The evaporator contains low-pressure, low-temperature vapors created from LPG that absorb heat in the chamber. The temperature of the chamber falls as a result. The refrigerator will chill as a result.
- Following the evaporation process, the pipeline transports the low-pressure LPG to the burner. Following that, we use this low-pressure liquefied petroleum gas (LPG) for all combustion-related processes.

ADVANTAGES

- Unlike other refrigerants, LPG does not contribute to global warming or ozone depletion.
- LPG is a less expensive and more environmentally friendly alternative to traditional refrigerants used in homes.
- The greater density of LPG reduces the system's weight by 60%.
- Even in the absence of electricity, this refrigeration unit stays working.
- While a system is in operation, its components stay quiet.
- There are no ongoing expenses.
- The compressor has no purpose.

DISADVANTAGES

- The level of efficiency is dropping.
- Repairing and maintaining the cooling system may be time-consuming.
- The system is quite large.

APPLICATION

- Continuous heating and refrigeration may be beneficial in hotels and restaurants.
- Used in the chemical industry as a refrigerant.
- Employed in refineries that make extensive use of liquefied petroleum gas (LPG).
- This technology has uses in both residential air conditioning and refrigeration, as well as industrial central cooling systems.
- It is suitable for air conditioning in cars powered by gaseous substances such as LPG.

V.CONCLUSION

The primary purpose of an LPG refrigeration system is to use LPG as a cooling refrigerant. The pressure of LPG in a normal residential cylinder can reach 12.14 bar. We used a capillary tube to control the temperature, moving it from the highest to lowest position. The initial and recurring costs of an LPG refrigeration system are negligible. The system generates all of its own power. Furthermore, the system's lack of rendering components helps to reduce maintenance costs. This LPG refrigeration system is perfect for the restaurant and hotel industries, as well as chemical plants that use a lot of LPG.

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