

LOW COST REFRIGERATION SYSTEM USING LPG



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MAY, 2026

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**A Graduation Exercise Submitted to the Department of Mechanical Engineering
in Partial Fulfillment of the Requirements for the Degree of
Bachelor of Mechanical Engineering**

**DEPARTMENT OF MECHANICAL ENGINEERING
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MAY, 2026

CERTIFICATION OF APPROVAL

The thesis titled "**LOW COST REFRIGERATION SYSTEM USING LPG**" Submitted by Shourav Hossain Millat (ID: ME2203028240), Shahadat Hossain (ID: ME2203028068), Md. Shakib Hassan (ID: ME2203028097), Md. Rezaul Karim (ID: ME2203028300) and Ariful Islam (ID: BME1703013105), has been accepted as Satisfactory partial fulfillment of the requirement for the degree of Bachelor of Science in Mechanical Engineering on 18 May 2026.

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DECLARATION

We do hereby solemnly declare that, the work presented here in this project report has been carried out by us and has not been previously submitted to any University/ Organization for award of any degree or certificate

We hereby ensure that the works that has been prevented here does not breach any existing copyright.

We further undertake to indemnify the university against any loss or damage arising from breach of the foregoing obligation.

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ABSTARCT

Refrigeration is essential for preserving food, beverages, medicines, and other perishable products. However, conventional refrigeration systems depend heavily on electricity, which is not always available in rural and remote areas. This project presents an LPG-based refrigerator that operates without a compressor or continuous electrical power, providing a low-cost and energy-efficient cooling solution.

The main objective of this project is to develop a simple, portable, and eco-friendly refrigeration system using Liquefied Petroleum Gas (LPG) as the refrigerant. The system is designed to provide cooling in off-grid areas while reducing electricity consumption and operational cost.

The methodology involves using an LPG cylinder, pressure gauge, capillary tube, evaporator coil, aluminum insulation sheet, and PVC refrigerator body. LPG passes through the capillary tube where pressure drops suddenly, causing the gas to evaporate inside the evaporator coil. During evaporation, heat from the refrigerator chamber is absorbed, producing the cooling effect. A battery-operated temperature sensor is used to monitor the chamber temperature.

The experimental result showed that the system successfully reduced the chamber temperature up to 24°C, demonstrating stable cooling performance without electricity. The project proved to be economical, easy to construct, and suitable for rural applications. In conclusion, this LPG refrigerator provides an effective alternative cooling system for areas with limited power supply while supporting sustainable and low-energy refrigeration technology.

ACKNOWLEDGMENT

First, we started in the name of almighty Allah. This thesis is accomplished under the supervision of **Prof. Md. Mostofa Hossain**, Head, Department of Mechanical Engineering, Sonargaon University. It is a great pleasure to acknowledge our profound gratitude and respect to our supervisor for this consistent guidance, encouragement, helpful suggestion, constructive criticism and endless patience through the progress of this work. The successful completion of this thesis would not have been possible without his persistent motivation and continuous guidance.

The authors are also grateful to all respect teachers of the Mechanical Engineering Department for their co-operation and significant help for completing the thesis work successfully.

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TABLE OF CONTENTS

Approval		ii
Declaration		iii
Abstract		iv
Acknowledgment		v
Table of Figure		viii
List of Abbreviation		ix
CHAPTER-1	INTRODUCTION	1-3
1.1	Introduction	1
1.2	Problem Statement	2
1.3	Objective	2
1.4	Methodology	2
1.5	Work Flow Diagram	3
1.6	Research Outline	3
CHAPTER -2	LITERATURE REVIEW	4-7
2.1	Introduction	4
2.2	Literature Review	4
2.3	Summary	7
CHAPTER-3	EXPERIMENTAL DESIGN	8-17
3.1	Introduction	8
3.2	Proposed Design	8
3.3	Block Diagram	9
3.4	Working Principle	9
3.5	Cost Analysis	10
3.6	Component List	10
3.7	Liquefied Petroleum Gas	10
3.8	Aluminum Sheet	11
3.9	Pressure Gauge	12

3.10	Evaporators	14
3.11	Capillary Tube	16
3.12	Temperature meter	16
CHAPTER-4	RESULT ANALYSIS	18-23
4.1	Project Output	18
4.2	Final Project	19
4.3	Project Data Analysis	20
4.4	Advantages	22
4.5	Limitation	22
4.6	Application	23
4.7	Discussion	23
CHAPTER-5	CONCLUSION	
5.1	Conclusion	24
5.2	Future Scope	24
	REFERENCE	25

LIST OF FIGURES

FIGURE NO	FIGURE NAME	PAGE NO
1.1	Work flow Diagram	3
3.1	Our System Structural Image	8
3.2	Block Diagram	9
3.3	LPG Cylinder	11
3.4	Aluminium Sheet	12
3.5	Pressure Gauge	13
3.6	Bare Tube Evaporator	15
3.7	Capillary tube	16
3.8	Temperature meter	17
4.1	Project Progress Image	19
4.2	Complete Project Prototype	19

LIST OF ABBREVIATIONS

LPG	Liquefied Petroleum gas
SU	Sonargaon University
AC	Alternative Current
DC	Direct Current
ME	Mechanical Engineering
PVC	Polyvinyl chloride

Chapter 1

INTRODUCTION

1.1 Introduction

Refrigeration is the process of removing heat from a closed space to create a cooling effect for preserving food, medicines, beverages, and other perishable items. Conventional refrigerators mainly depend on electricity and compressors, which increase power consumption and operational cost. In many rural and remote areas, continuous electricity supply is not available, making traditional refrigeration systems difficult to use.

This project presents an LPG-based refrigeration system that works without a compressor and requires very little electrical support. The system operates on the principle of LPG expansion. When liquid LPG passes through a capillary tube, its pressure suddenly decreases and the LPG changes into gaseous form. During this process, heat is absorbed from the evaporator chamber, producing a cooling effect inside the refrigerator.

Compared to conventional refrigerants such as CFCs and HFCs, LPG is more environmentally friendly and economical. The system is simple in construction, energy-efficient, and suitable for off-grid applications. It can also support dual-purpose usage, such as cooling and cooking, using the same LPG source, making it highly useful for rural and low-cost refrigeration applications.

1.2 Problem Statement

In many rural and remote areas, access to reliable electricity for refrigeration is limited or unavailable, leading to food spoilage and lack of proper storage for medicines and perishables. Conventional refrigeration systems are expensive, power-dependent, and not feasible in off-grid regions. There is a pressing need for an alternative, low-cost, and energy-independent refrigeration solution. This project addresses the problem by developing a refrigeration system that uses the vaporization of Liquefied Petroleum Gas (LPG) to achieve cooling without electrical components. The aim is to provide an affordable, efficient, and safe cooling method suitable for low-income and electricity-deficient communities.

1.3 Objectives

The aim of this project is to design and construct a Low cost refrigeration system using LPG. The objectives are

- To design and construct a low-cost LPG-based refrigeration system capable of maintaining a cooling temperature up to 24°C without electricity.
- To reduce the overall cost of refrigeration for rural and low-income users.
- To demonstrate practical refrigeration in off-grid or power-deficient regions.

1.4 Methodology

Our used methodology for the project

- Creating an idea for Design and construction of a low cost refrigeration using LPG.
- Drawing and listed of components/materials to know which components / materials need to construct it.
- Collecting the all components / materials for construct the system.
- Finally, we constructed this system & checked it finally that working very well.

1.5 Work Flow Diagram

This image represents the step-by-step methodology of the Low-Cost Refrigeration System Using LPG project. It begins with studying the concept and design, followed by identifying and collecting the necessary components. Once all materials are gathered, the system is assembled according to the design. Finally, the project is completed and tested for functionality. This process ensures systematic development, efficiency, and successful implementation of the refrigeration system without electrical dependency.

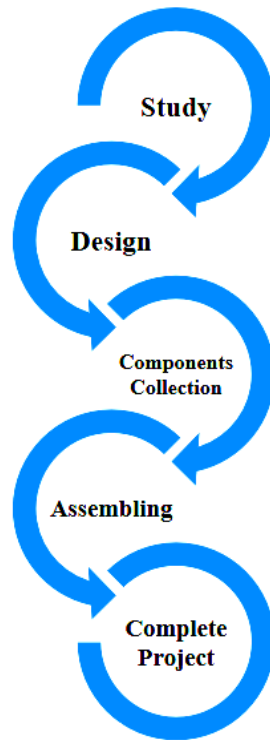


Figure 1.1: Work Flow Diagram

1.6 Research Outline

This project book consists of five chapter. The chapter One contains the statement of the Introduction, Problem Statement, Objectives of the study, Methodology, Work Flow Diagram and Research Outline. Chapter Two contains System Literature e Review details. Chapter Three Discussed in Proposed Design, Block Diagram, Working principle, Cost analysis, Component list. Chapter Four describes the Project Output, Project Data Analysis, Advantages, Limitation, Application and Discussion. Last chapter, we have discussed the, Future Scope, conclusion of the project.

CHAPTER 2

LITERATURE REVIEW

2.1 Introduction

In this chapter, we discuss our system overview. In this paper, they also work about **Low Cost Refrigeration System using LPG**. In below section we will describe some previous literature review. From previous literature we gather more knowledge to build this project and we successfully made it.

2.2 Literature Review

Christian Hermes' paper on "Thermodynamic Design of Condensers and Evaporators: Formulation and Applications" presented at the International Refrigeration and Air Conditioning Conference in 1990 provides valuable insights into the thermodynamic design of refrigeration systems. The paper discusses the mathematical formulation of condensers and evaporators, their thermodynamic processes, and their role in determining the overall performance of refrigeration systems. It also presents practical examples and applications of the design principles. Overall, the paper is a useful resource for engineers and researchers working in the field of refrigeration and air conditioning [1].

C.P. Arora's book "Refrigeration and Air Conditioning (Third Edition)" published by TATA McGraw Hill Publishing Company Ltd is a comprehensive guide on the principles and practices of refrigeration and air conditioning systems. The book covers a wide range of topics, including basic principles, refrigerants, compressors, condensers, evaporators, and controls. It also includes case studies and practical examples to help readers understand the concepts better. The book is suitable for students, engineers, and professionals working in the field of refrigeration and air conditioning. Overall, the book is an excellent resource for those looking to deepen their knowledge of refrigeration and air conditioning systems [2].

The papers by Ibrahim Hussain Shah and Kundan Gupta published in the International Journal of Engineering Sciences and Research Technology in July 2014, and Khandare R. S. and Bhane A. B published in the International Journal of Emerging Technology and Advanced Engineering in March 2015, provide insights into the use of alternative

refrigerants such as LPG in refrigeration systems. The papers discuss the thermodynamic properties of LPG, its environmental benefits, and its potential as a low-cost and locally available refrigerant. The studies present experimental results and performance analyses of LPG-based refrigeration systems and compare them with traditional refrigerants. Overall, these papers are valuable resources for researchers and practitioners seeking to explore alternative refrigerants for sustainable refrigeration and air conditioning systems [3].

The paper by Vishwadipsingh J. Ghariya and Swastik R. Gajjar published in the International Journal for Scientific Research and Development in March 2014 presents an experimental study on the performance of a refrigeration system using LPG as a refrigerant. The study includes the design and development of a prototype system, along with a detailed analysis of its thermodynamic properties and performance characteristics. The authors conclude that LPG-based refrigeration systems have significant potential as low-cost and environmentally friendly alternatives to traditional refrigerants. Overall, this paper provides valuable insights into the use of alternative refrigerants and their potential applications in the refrigeration and air conditioning industry [4].

ZainalZakaria and ZulaikhaShahrin's paper "The possibility of using liquefied petroleum gas in domestic refrigeration system" published in the International Journal of Research and Reviews in Applied Science in December 2011 explores the feasibility of using LPG as a refrigerant in domestic refrigeration systems. The study includes experimental results and thermodynamic analysis to investigate the performance of the LPG refrigeration system. The authors concluded that LPG has potential as a refrigerant in domestic refrigeration systems due to its availability, low cost, and environmentally friendly properties. Overall, this paper provides valuable insights into alternative refrigerants and their potential application in the domestic refrigeration industry [5].

A. Baskaran & P. Koshy Mathews have performance Comparison of Vapour Compression Refrigeration System Using Eco Friendly Refrigerants of Low Global Warming Potential. R600a performance have a slightly higher (COP) than R134a for the condensation temperature of 50 C° and evaporating temperatures ranging between -30 C° and 10° [6].

Bilal A. Akash, Saleem A Said [7] conduct performance tests on the performance of liquefied petroleum gas (LPG) as a possible substitute for R12 in domestic refrigerators.

The refrigerator which is initially designed to work with R12 is used to conduct the experiment for LPG (30% propane, 55% n-butane and 15% isobutane). Cooling capacities were obtained and they were in the order of about three to fourfold higher for LPG than those for R12 [7].

R. W. James & J. F. Missenden perform Implications of using propane in domestic refrigerators are examined in relation consumption, compressor costs, availability, to energy lubrication, environmental factors and safety propane is an attractive and environmentally friendly alternative to CFCs used currently [8].

N. Austin, Dr.P. Senthil Kumar, N, (2012) have performed experiments on house hold refrigerator designed to work with R134a. The recital of the refrigerator using mixed refrigerant was investigated and compared with the performance of refrigerator when R-134a was used as refrigerant. The energy consumption of the refrigerator during experiment with mixed refrigerant and R-134a was measured. The outcome shows the permanent running and cycling results showed that R134a with a charge of 100 g or mixed refrigerant with charge of 80 mg or more satisfy the required freezer air temperature of $-12\text{ }^{\circ}\text{C}$. The lowest electric energy consumption was achieved using mixed refrigerant with heat level is less than $-15\text{ }^{\circ}\text{C}$. This mixture achieved higher volumetric cooling capacity and lower freezer air temperature compared to R134a. And actual COP of mixed refrigerant refrigerator was higher than that of R134a by about 7.6%. From the experiment it was conclude the every mode of mixed refrigerant yields higher COP than HFC-134a. And the mixed refrigerant in domestic refrigerator the freezer temperature lower than that of R134a. And when the evaporator temperature increases, COP will be increase and the condenser temperature will decreases, COP will also increases [9].

NARALE P.D. (2017) has perform comparison between LPG refrigeration system and CFC-22 refrigeration system. And detect various waste in domestic refrigeration system. They also compare the performance of LPG refrigeration system and domestic refrigeration system [10].

Vishwadipsinh J. Ghariya has perform an experimental study on LPG refrigerator system and conclude that propane is an attractive and environmentally friendly alternative to

CFCs used currently. COP of LPG refrigerator was higher than of R134a by about 7.6% [11].

A.S. Raut, U.S.Wankhede , have worked on selection of capillary tube for Retrofitting in Refrigeration application and try to use of alternative refrigerant play an important role in forming problems such as global warming and ozone depletion. The coefficient of performance of refrigeration application improve in case of retrofitting the capillary tube. It is possible to obtain effective size of capillary tube by using mathematical techniques and by maintaining proper pressure equalization between condenser and evaporator [12].

M. Rasti, M.S.Hatamipour, S.F. Aghamiri, M. Tavakoli have investigate on Enhancement of domestic refrigerators energy efficiency index using hydrocarbon mixture refrigerant, and showed that R436A (admixture of R290 and R600a with a mass ratio of 56/44) in a 238 L single evaporator domestic refrigerator without any modification in refrigeration [13].

2.3 Summary

From the discussed literature, we gained valuable insights and inspiration to undertake this project. With continuous effort and teamwork, we successfully designed and implemented the low-cost LPG-based refrigeration system. The shared knowledge and dedication of everyone involved played a vital role in completing the project effectively and efficiently.

CHAPTER 3

EXPERIMENTAL DESIGN

3.1 Introduction

The previous chapter explained the project's objectives, methodology, and literature review in detail. This chapter will focus on the proposed design, including the block diagram, working principle, and cost analysis. It aims to provide a clear understanding of how the system functions and its overall economic feasibility.

3.2 Proposed Design

The proposed design of this low-cost refrigeration system using LPG is simple, efficient, and safe. It utilizes the cooling effect generated by LPG vaporization through a capillary tube and evaporator coil. This system allows dual-purpose use of LPG—for both cooking and cooling—maximizing fuel efficiency. It is compact, easy to install, and suitable for household or industrial applications. The design ensures effective cooling without electrical power, making it ideal for off-grid areas.

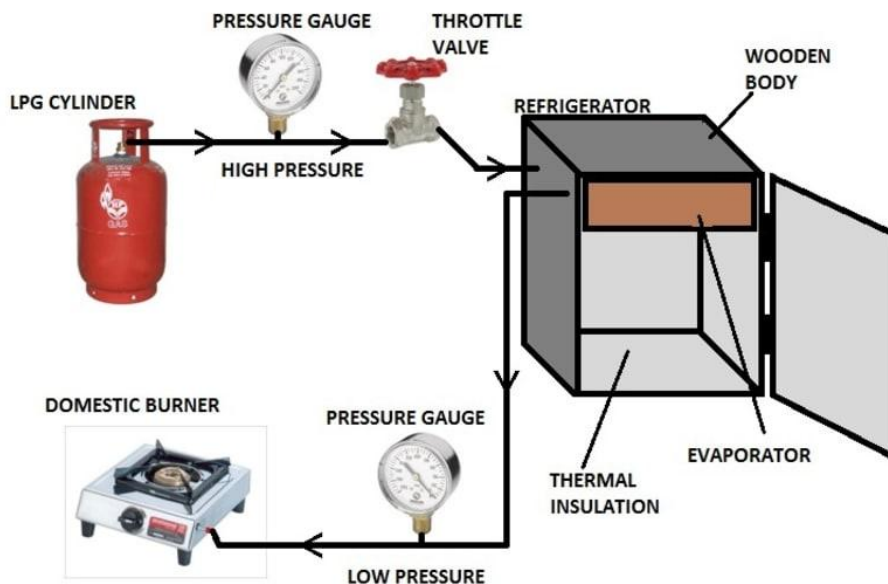


Figure 3.1: Our System Structural Image.

3.3 Block Diagram

This diagram presents a low-cost refrigeration system utilizing LPG as a refrigerant. It circulates LPG through a capillary tube and evaporator to cool a refrigerator. A solenoid valve, pressure gauges, and a temperature controller maintain safety and efficiency. It also supports dual use by connecting to a burner for cooking.

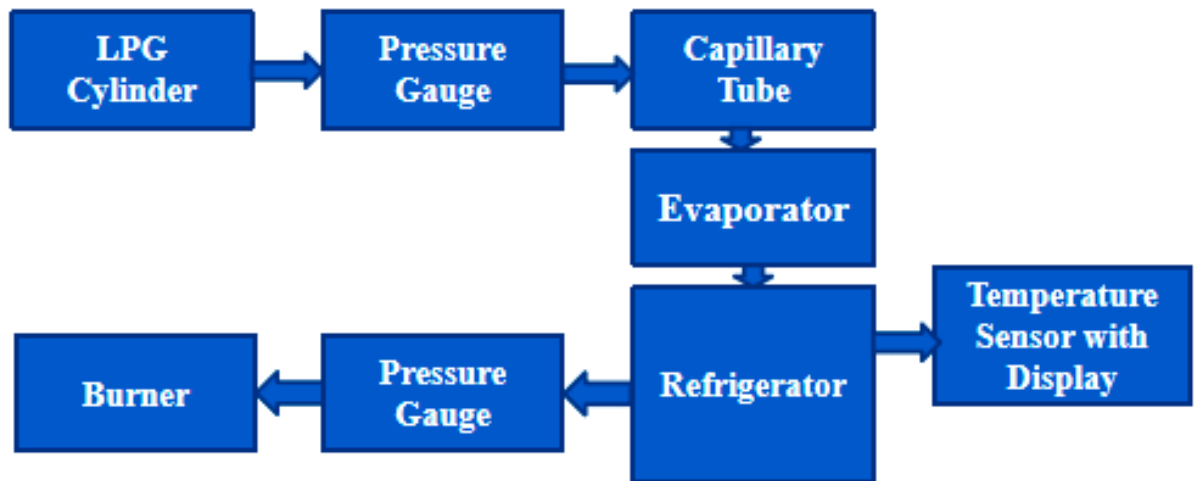


Figure 3.2: Block Diagram

3.4 Working Principle

The LPG-based refrigerator works by using Liquefied Petroleum Gas (LPG) as the cooling refrigerant instead of electricity-driven compressors. LPG stored inside the cylinder flows through a regulator and pressure gauge, which help maintain safe and controlled gas flow within the system. The gas then enters the capillary tube, where a sudden reduction in pressure takes place. Due to this pressure drop, the LPG rapidly expands and evaporates inside the evaporator coil.

During the evaporation process, the LPG absorbs heat from the surrounding space inside the PVC refrigerator chamber, creating a cooling effect and reducing the internal temperature. A battery-operated temperature sensor with display is used to monitor the temperature condition inside the chamber. The system does not require any compressor or continuous electrical power, making it energy-efficient, economical, and suitable for rural or off-grid areas. This simple design provides effective refrigeration while also supporting dual-purpose LPG utilization for cooling and cooking applications.

3.5 Cost Analysis

Table 1: List of Component with Price

Sl.no	Particulars	Specification	Qty.	Unit Price (Taka)	Total Price (Taka)
1	LPG Cylinder	12 kg	1	1720	1720
2	Pressure Gauge		2	600	1200
3	Capillary Tube	Copper	1	120	120
4	Evaporator	Copper	1	1100	1100
5	Burner	Single	1	900	900
6	LPG Regulator		1	400	400
7	Temperature Sensor		2	135	270
8	Others				1500
				Total	7210/=

3.6 Component List

- LPG Cylinder.
- Pressure Gauge
- Capillary Tube.
- Evaporator.
- Refrigerator (PVC Body).
- Burner.
- Temperature Sensor with Display.

3.7 Liquefied Petroleum Gas

Liquefied petroleum gas (LPG, LP gas, or condensate), is a flammable mixture of hydrocarbon gases such as propane and butane. LPG is used as fuel gas in heating appliances, cooking equipment, and vehicles. It is increasingly used as an aerosol propellant and a refrigerant,^[2] replacing chlorofluorocarbons in an effort to reduce damage to the ozone layer. When specifically used as a vehicle fuel it is often referred to as auto gas.

Varieties of LPG bought and sold include mixes that are mostly propane (C_3H_8), mostly butane (C_4H_{10}), and, most commonly, mixes including both propane and butane. In the northern hemisphere winter, the mixes contain more propane, while in summer, they contain more butane. In the United States, mainly two grades of LPG are sold: commercial propane and HD-5. These specifications are published by the Gas Processors Association (GPA) and the American Society of Testing and Materials. Propane/butane blends are also listed in these specifications.



Figure 3.3 : LPG Cylinder

Propylene, hydrocarbons are usually also present in small concentrations such as C_2H_6 , CH_4 , and C_3H_8 . HD-5 limits the amount of propylene that can be placed in LPG to 5% and is utilized as an auto gas specification. A powerful odorant, ethanethiol, is added so that leaks can be detected easily. The internationally recognized European Standard is EN 589. In the United States, tetra hydrothiophene (thiophane) or amyl mercaptan are also approved odorants, although neither is currently being utilized.

3.8 Aluminum Sheet

An aluminum sheet is a lightweight, durable, and corrosion-resistant metal material widely used in refrigeration and insulation systems. In this project, the aluminum sheet is used as a protective and heat-resistant insulating layer around the refrigerator body. It helps reduce external heat transfer, improving the cooling efficiency of the LPG refrigeration system. Aluminum also has good thermal conductivity, which assists in maintaining stable temperature distribution inside the chamber. Due to its low weight, easy fabrication, and long service life, aluminum sheet is suitable for portable and low-cost refrigeration

applications. It also provides mechanical strength, improves system durability, and protects internal components from environmental damage.



Figure 3.4 : Aluminum sheet

Features of Aluminum Sheet

- Lightweight and easy to install
- Corrosion and rust resistant
- Helps reduce external heat transfer
- Improves cooling efficiency of the refrigerator
- Strong, durable, and long-lasting material
- Provides protective covering for the system

3.9 Pressure Gauge

Pressure measurement is the analysis of an applied force by a fluid (liquid or gas) on a surface. Pressure is typically measured in units of force per unit of surface area. Many techniques have been developed for the measurement of pressure and vacuum. Instruments used to measure and display pressure in an integral unit are called pressure meters or pressure gauges or vacuum gauges. A manometer is a good example, as it uses the surface area and weight of a column of liquid to both measure and indicate pressure. Likewise the widely used Bourdon gauge is a mechanical device, which both measures and indicates and is probably the best known type of gauge.

A vacuum gauge is a pressure gauge used to measure pressures lower than the ambient atmospheric pressure, which is set as the zero point, in negative values (e.g.: -15 psig or

–760 mmHg equals total vacuum). Most gauges measure pressure relative to atmospheric pressure as the zero point, so this form of reading is simply referred to as "gauge pressure". However, anything greater than total vacuum is technically a form of pressure. For very accurate readings, especially at very low pressures, a gauge that uses total vacuum as the zero point may be used, giving pressure readings in an absolute scale.



Figure 3.5: Pressure Gauge

Working Principle of a Pressure Gauge

The working principle of pressure gauges is based on Hooke's law, which states that the force required to expand or compress a spring scales in a linear manner with regards to the distance of extension or compression. There is inner pressure and outer pressure. So, when pressure is applied on the surface of the object, it is more on the inner side as the pressure area is less. Bourdon pressure gauges are widely used across industries, and they work on this principle.

Digital pressure gauges are nowadays commonly used. In case of digital pressure gauges, the AC and DC power supplies play a major role. The switching circuit or AC is converted to DC. The measured pressure is transmitted to the sensor diaphragm which senses the pressure, based on which an electrical signal is generated to reach to the computer or smartphone. These gauges come with a small LCD display.

Pressure gauges range from basic measuring ones to completely automated ones, which can be connected to your smartphone to send alerts. Pressure sensors are crucial components of pressure gauges. There are various types of pressure gauges in the market such as commercial gauges, general service gauges, stainless steel industrial pressure gauges, differential pressure gauges, double-sided pressure gauges, and so on. With so many choices, it is obvious to get confused. Among various factors, the size of an application must be one of the key considerations when it comes to choosing the pressure gauges for any process. These pressure gauges need to be serviced and maintained regularly as an out of service gauge is as much a threat to the plant as not having one. So, it is always better to have few but well-serviced gauges in your plant. From an accuracy perspective, installing and correct calibration of the pressure gauge are important aspects. Calibration can be a complicated task and needs to be done by experts, after considering the application requirements.

3.10 Evaporators

Introduction Evaporation and vapouration are two processes in which simultaneous heat and mass transfer process occurs resulting into separation of vapor from a solution. Evaporation and vaporization occur where molecules obtain enough energy to escape as vapor from a solution. The rate of escape of the surface molecules depends primarily upon the temperature of the liquid, the temperature of the surroundings, the pressure above the liquid, surface area and rate of heat propagation to product.

Working Principle of Evaporator and its Types

The function of evaporator is to absorb heat from surrounding location or medium which is to be cooled by means of refrigerant. The refrigerant either boils as it flows through a pipe, tube or other type of space so that liquid is continuously wetting all the inside surface or it boils in a shell around submerged tubes through which the fluid to be cooling is flowing. Various methods are used for evaporators, depending upon the refrigerant to be used and evaporator application, but iron, steel and copper predominate. Refrigerant evaporators should be of extended surface or finned tube type whatever practical. In order to keep the average surface temperature down, a good bond between the fin and tube is essential. Integral fins formed out of the tube itself are best in this respect and give the best heat transfer rate.

Type of evaporators based on operating condition:

- Flooded type evaporator
- Dry or direct expansion type evaporator

Type of evaporator based on construction:

- Bare tube evaporator
- Plate evaporator
- Finned tube evaporator
- Shell tube evaporator
- Tube in tube evaporator

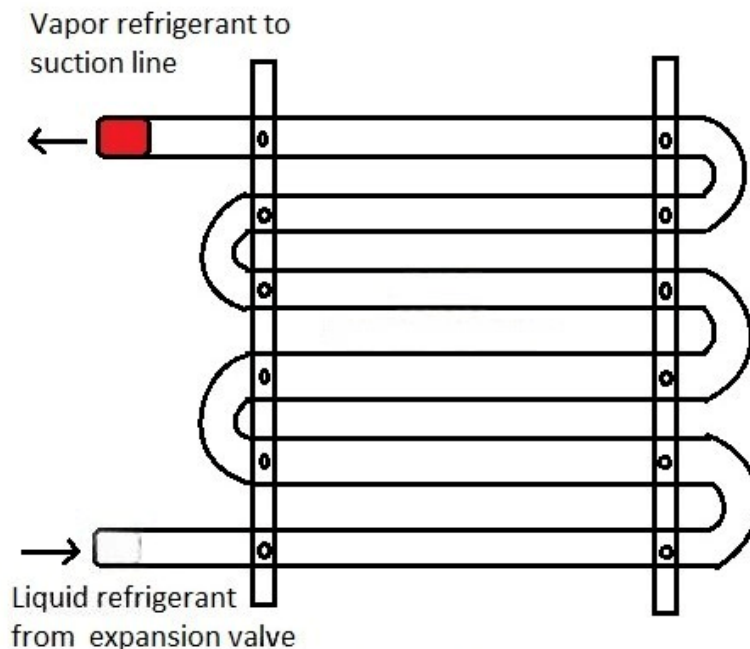


Figure 3.6: Bare Tube Evaporator

Bare tube evaporator

The bare tube evaporators are made up of copper tubing or steel pipes. The copper tubing is used for small evaporators where the refrigerant other than ammonia is used while the steel pipes are used with the large evaporators that use ammonia as refrigerants. The evaporator comprises of several turns of tubing and are usually used for liquid chilling. In blast cooling and freezing operations, atmospheric air flows over bare tube evaporator and the chilled air leaving it is used for cooling purposes.

3.11 Capillary Tube

A capillary tube is a small-diameter tube, often made of glass or plastic, used to handle and transfer small volumes of liquids or gases. They are characterized by their ability to utilize capillary action, where liquids rise or fall within the tube due to surface tension, allowing for precise measurement and transfer of fluids. Beyond scientific applications, capillary tubes are also used in HVAC systems as a metering device for refrigerant flow.



Figure 3.7: Capillary Tube

Specification

- Pressure: -1~50 bar.
- Connector material: brass.
- Connection size: G1/4.
- Tube size in diameter: 2.8 mm.
- Length: 1500 mm

3.12 Temperature Meter

A Digital Temperature Meter is an electronic measuring device used to measure and display temperature in digital form. It uses temperature sensors such as thermistors, LM35, thermocouples, or RTD sensors to detect temperature changes and convert them into electrical signals. These signals are processed by a microcontroller or electronic circuit and shown on an LCD or LED display.

Digital temperature meters provide accurate, fast, and easy-to-read temperature measurements compared to analog thermometers. They are widely used in industries,

laboratories, home appliances, medical equipment, HVAC systems, and electronic projects for monitoring and controlling temperature.



Figure 3.8: Temperature Meter

Specification

- Digital Display -50C to +110C.
- Modeling simple, elegant, LCD panels inline connections, moisture-resistant.
- Strong anti-interference, applies to refrigerated cabinets, display counters and other needs of temperature measurement and display of various equipment.
- Remote wired probe can read temperature up to 3 feet away.
- No need to wire to any permanent power source. Size:48 x 28 x 15 mm.

Chapter 4

RESULT ANALYSIS

4.1 Project Output

After finally completing this project, we ran it & we observed the output of this project. We can see that it is working well as expected. After making our project we observe it very careful. It works as we desire. Our project give output perfectly and all equipment are work perfectly. We check how much it works and we get perfect output from this project.

- Finally, we have completed our project successfully & check our project its run accurately according to our objective.
- At first, we start our system.
- The LPG-based refrigeration system was successfully constructed and tested according to the project objective.
- The system achieved a cooling temperature near the targeted 24°C inside the refrigerator chamber.
- Cooling performance was stable under normal operating conditions without using electricity or a compressor.
- Slight temperature variation was observed depending on ambient temperature and LPG flow condition.
- The battery-operated temperature sensor successfully monitored the chamber temperature.
- The project proved to be low-cost, energy-efficient, and suitable for rural or off-grid applications.

4.2 Final Project



Figure 4.1: Project Progress image



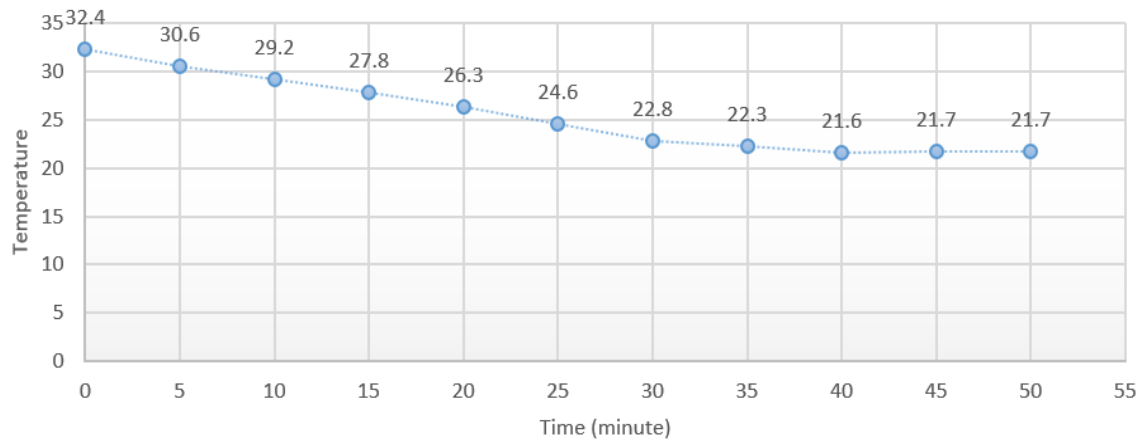
Figure 4.2: Complete Project Prototype

4.3 Project Data Analysis

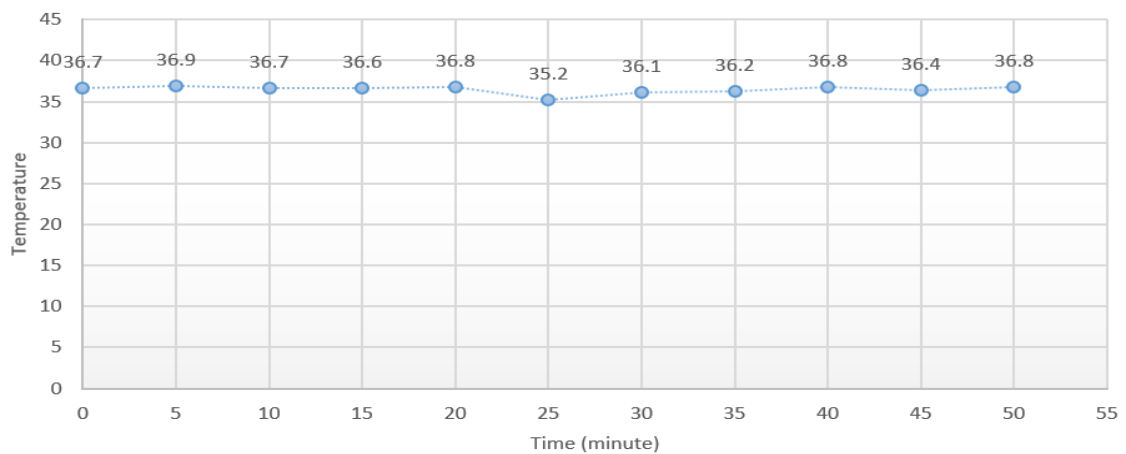
- Temperature Analysis with LPG Flow ON

Time (minute)	Refrigeration In Temperature	Ambient temperature
0	32.4 °C	36.7°C
5	30.6 °C	36.9°C
10	29.2 °C	36.7°C
15	27.8 °C	36.6°C
20	26.3 °C	36.8°C
25	24.6 °C	35.2°C
30	22.8 °C	36.1°C
35	22.3 °C	36.2°C
40	21.6 °C	36.8°C
45	21.7°C	36.4°C
50	21.7°C	36.8°C

Refrigeration In Temperature



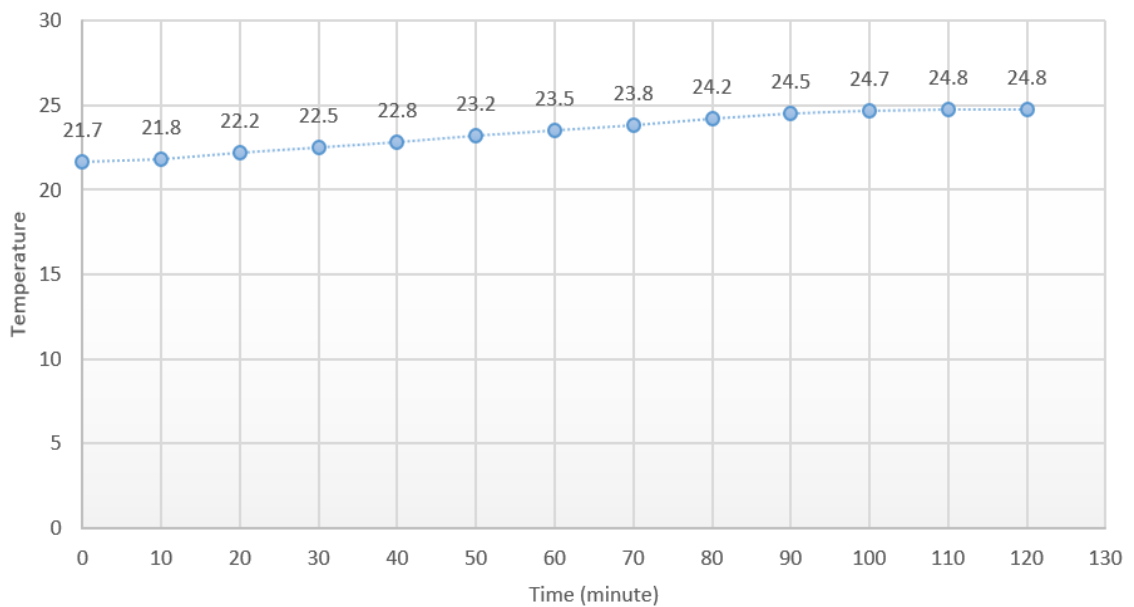
Ambient Temperature

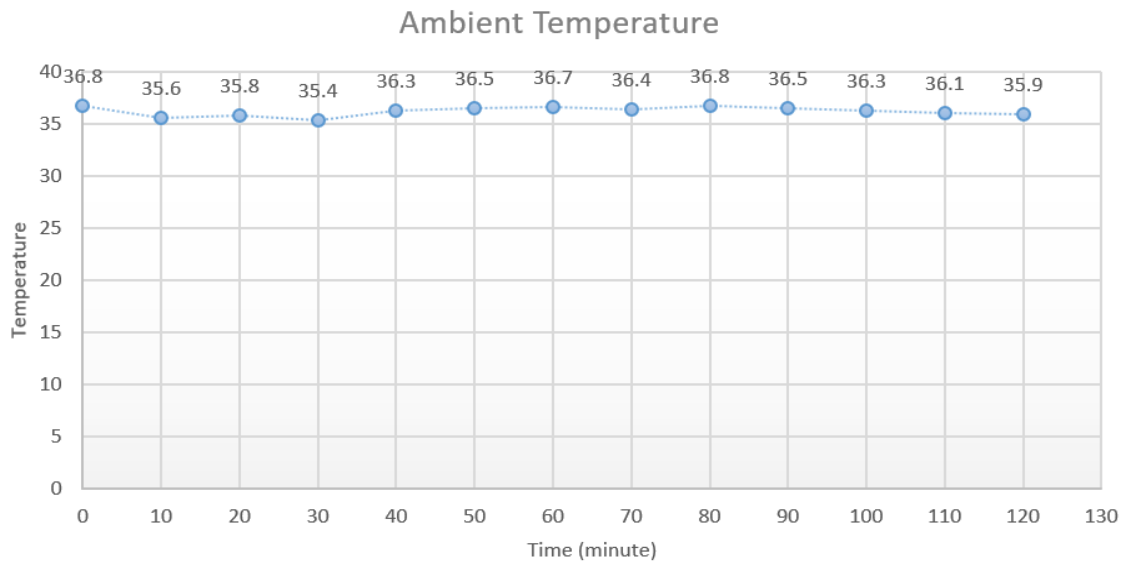


- **Temperature Analysis with LPG Flow OFF**

Time (minute)	Refrigeration In Temperature	Ambient temperature
0	21.7 °C	36.8°C
10	21.8°C	35.6°C
20	22.2°C	35.8°C
30	22.5°C	35.4°C
40	22.8°C	36.3°C
50	23.2°C	36.5°C
60	23.5°C	36.7°C
70	23.8°C	36.4°C
80	24.2°C	36.8°C
90	24.5°C	36.5°C
100	24.7°C	36.3°C
110	24.8°C	36.1°C
120	24.8°C	35.9°C

Refrigerator In Temperature





4.4 Advantages

There are certainly many advantages of our project and some of the major ones have been given below -

- Operates without electricity, suitable for rural and off-grid areas.
- Dual use of LPG improves fuel efficiency and utility.
- Low construction and operational cost make it budget-friendly.
- Simple design ensures easy handling and maintenance.
- The parts are effectively silent in operation.
- Pollution free
- Fuel saving
- Portable and compact, ideal for household or small-scale use.
- Environmentally safe with no harmful refrigerants.
- The ozone depletion potential (ODP) of LPG is zero

4.5 Limitation

It is a demo project so we found some limitation. In future we will work for reduce this kind of limitation. These limitations are -

- Risk of fire or explosion due to flammable LPG gas.
- Limited to small-scale refrigeration applications only.
- Lacks automation or smart temperature adjustment.
- There was no gas leakage system for protection.

4.6 Application

Some of the application areas of the project has been pointed out below-

- Food preservation in rural and off-grid areas
- Storage of medicines and vaccines in remote locations
- Emergency cooling system during power outages
- Low-cost cooling solution for small shops and households
- Dual-purpose use for both cooking and cooling applications
- Suitable for disaster-prone areas with unstable electricity supply
- Eco-friendly and energy-efficient refrigeration alternative

4.7 Discussion

While working on our project, we did face some difficulties as it is a very complex system but the end results, we came up with were quite satisfactory. We have put the whole system through several tasks to validate our work and also have taken necessary notes for future improvements. Some future recommendations that we have involves improvement in system design and wiring, adding features for more efficient.

The Low-Cost Refrigeration System Using LPG offers an efficient cooling solution without electricity by utilizing the vaporization effect of LPG. It provides dual-purpose use for both cooking and refrigeration, making it ideal for rural or off-grid areas. The system is simple, cost-effective, and easy to operate. However, safety precautions are essential due to the flammable nature of LPG, requiring careful handling and ventilation.

Chapter 5

CONCLUSION

5.1 Conclusion

The Low-Cost Refrigeration System Using LPG proves to be an innovative and practical solution for areas where electricity is limited or unavailable. By utilizing the vaporization property of LPG, the system achieves efficient cooling without the need for traditional compressors or refrigerants. It offers a significant advantage in terms of cost, energy independence, and dual-purpose use of LPG for both cooking and refrigeration. The system is easy to construct, user-friendly, and requires minimal maintenance, making it suitable for rural households, small businesses, and off-grid environments.

However, while the system is highly efficient and environmentally friendly, safety remains a critical concern due to the flammable nature of LPG. Proper installation, handling, and ventilation are essential to ensure secure operation. Overall, this project highlights a sustainable approach to refrigeration technology, promoting energy efficiency and affordability. It can be a stepping stone toward wider adoption of alternative energy-based cooling systems in developing regions.

5.2 Future Scope

We are thinking about adding many features to our project in the future to get more desirable outcomes. Some of the steps that we are thinking about taking are given below:

- In future development this project can be develop by Microcontroller Unit .
- In future we will adding a gas leakage detection system . If there will be any leakage in gas pipe then it will make an alert before getting any unwanted situation.
- In future develop in IoT system Controlled our project

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