



Study Of Domestic Refrigerator And It's Component

¹Arishankuls jayanth Rao, ²Aryan Pradip Chaugule, ³Tirthal Seval Mehulkumar, ⁴Sakshi Balu
Borude, ⁵Prof: S.R. Londhe

¹Student, ²Student, ³Student, ⁴Student, ⁵Professor

¹Mechanical Engineering, ²Mechanical Engineering, ³Mechanical Engineering, ⁴Mechanical
Engineering, ⁵Mechanical Engineering

¹JSPM'S Rajarshi Shahu College of Engineering & Polytechnic Tathawade , Pune , India.

Abstract: a domestic refrigerator is a common household appliance used to preserve food by maintaining low temperatures. it works on the vapor compression refrigeration cycle, which includes compression, condensation, expansion, and evaporation processes. the main components of a refrigerator are the compressor, condenser, expansion device, and evaporator. these components work together to remove heat from the inside and keep the contents cool. this study explains the working principle, components, and importance of a domestic refrigerator in daily life.

1.INTRODUCTION

A domestic refrigerator is an electrical appliance used to remove heat from a closed space and maintain a low temperature for preserving food and beverages. it is commonly used in households, hotels, and medical facilities to store perishable items such as fruits, vegetables, milk, and medicines. the main purpose of a refrigerator is to slow down bacterial growth and prevent food spoilage.

refrigerators work on the principle of heat transfer, where heat is extracted from the inside compartment and released to the surroundings. this is achieved using a refrigerant that circulates through different components of the system. the basic working of a refrigerator is based on the vapor compression refrigeration cycle.

in modern times, refrigerators have become an essential part of daily life due to their convenience and efficiency. with advancements in technology, modern refrigerators are more energy-efficient and environmentally friendly. this paper focuses on the study of the working principle and major components of a domestic refrigerator.

2.PROBLEM STATEMENT

in today's modern world, domestic refrigerators have become an essential appliance in almost every household for preserving food and maintaining its quality. despite their widespread use, many users lack a clear understanding of the working principle and the role of individual components involved in the refrigeration system. this lack of knowledge often leads to improper usage, inefficient operation, and increased power consumption.

refrigerators sometimes face common problems such as inadequate cooling, excessive energy usage, and component failure. these issues may arise due to poor maintenance, improper handling, or lack of awareness about how the refrigeration cycle works. additionally, with the growing concern about energy efficiency and environmental impact, it is important to understand how modern refrigerators operate and how their performance can be improved.

therefore, there is a need to study the domestic refrigerator in detail, including its working principle and major components such as the compressor, condenser, expansion device, and evaporator. this study helps in understanding the functioning of the system, identifying common issues, and improving efficiency, proper usage, and maintenance of the refrigerator.

3. OBJECTIVES OF THE PROJECT

specific objectives:

- to understand the basic concept of refrigeration
- to study the vapor compression refrigeration cycle
- to identify the main components of a refrigerator
- to understand the function of each component (compressor, condenser, evaporator, expansion device)
- to analyze the working process of a domestic refrigerator
- to study the importance and applications of refrigeration in daily life
- to improve knowledge about proper usage and maintenance of refrigerators

4. METHODOLOGY

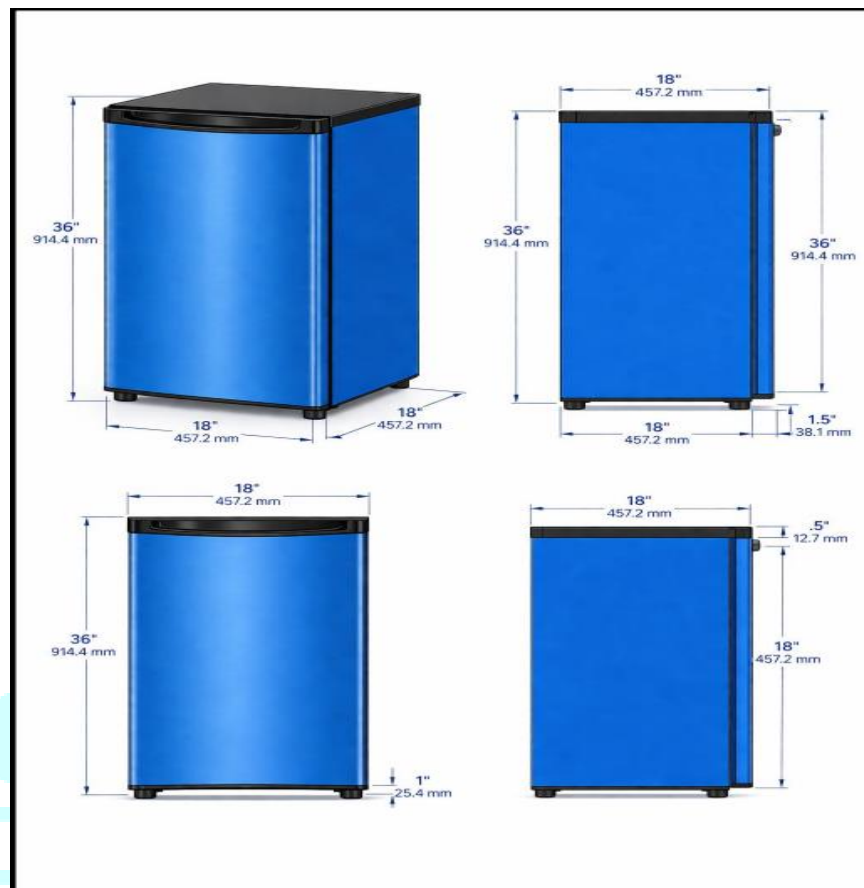
the methodology of this study explains the approach used to understand the working principle and components of a domestic refrigerator. this study is mainly based on theoretical analysis and simple observation methods.

the data for this project has been collected from various sources such as engineering textbooks, online educational resources, and reference materials related to refrigeration systems. in addition, a domestic refrigerator was observed to identify its components and understand their practical arrangement and functioning.

the study focuses on analyzing the vapor compression refrigeration cycle and the role of major components such as the compressor, condenser, expansion device, and evaporator. the working process of the refrigerator is studied step-by-step to understand how cooling is achieved.

this methodology helps in gaining basic knowledge about the structure, working, and performance of a domestic refrigerator without using complex experimental setups.

5. SYSTEM DESIGN



5.1.1 Isometric view

components of domestic refrigerator:

1. compressor

the compressor is known as the heart of the refrigerator. it compresses the low-pressure refrigerant gas into high-pressure and high-temperature gas. this process helps in circulating the refrigerant throughout the system.

2. condensor

the condenser is located at the back side of the refrigerator. it converts high-pressure hot gas into liquid by releasing heat to the surrounding air. it helps in removing heat from the refrigerant

3. expansion device (capillary tube)

the expansion device, usually a capillary tube, reduces the pressure of the liquid refrigerant. it controls the flow of refrigerant into the evaporator and helps in cooling.

4. evaporator

the evaporator is located inside the refrigerator (freezer section). it absorbs heat from the inside and converts liquid refrigerant into gas. this process produces the cooling effect inside the refrigerator.

5. refrigerant

the refrigerant is the working fluid used in the refrigerator. it continuously changes its state from liquid to gas and helps in transferring heat from inside to outside.

6. thermostat

the thermostat controls the temperature inside the refrigerator. it switches the compressor on and off to maintain the desired cooling level.

7. insulation (p.u foam)

the refrigerator cabinet is insulated to prevent heat from entering inside. it helps in maintaining low temperature and improves efficiency.



5.1.2 Actual view

6. WORKING PRINCIPLE

working principle (step-by-step)

1. **compression (compressor)**
 - the compressor compresses a refrigerant gas, increasing its pressure and temperature.
2. **condensation (condenser coils)**
 - the hot, high-pressure gas flows through condenser coils at the back or bottom.
 - it releases heat to the surrounding air and condenses into a liquid.
3. **expansion (expansion valve)**
 - the liquid refrigerant passes through an expansion valve.
 - its pressure drops suddenly, causing it to cool rapidly.
4. **evaporation (evaporator coils)**
 - the cold refrigerant flows through evaporator coils inside the fridge.
 - it absorbs heat from the food and air inside, cooling the interior.
 - the refrigerant evaporates back into a gas.
5. **cycle repeats**
 - the gas returns to the compressor, and the cycle continues.

7. RESULTS AND DISCUSSION

the refrigerator was observed to effectively cool its internal space by removing heat and releasing it outside through the vapor-compression refrigeration cycle. the temperature inside the refrigerator decreased below the surrounding temperature due to the evaporation of the refrigerant in the evaporator coils, while heat was expelled through the condenser coils. this process demonstrates the principles of thermodynamics, where heat is transferred from a colder region to a warmer one with the help of external work done by the compressor. the performance of the refrigerator depends on factors such as proper compressor operation, cleanliness of condenser coils, and sufficient refrigerant levels. overall, the system works efficiently as a heat transfer device, confirming the practical application of refrigeration principles.

8. ADVANTAGES

- helps preserve food by using the vapor-compression refrigeration cycle
- increases the shelf life of perishable items
- prevents growth of bacteria and keeps food safe
- reduces food wastage
- allows storage of a variety of items like fruits, vegetables, milk, and medicines
- provides convenience for storing cooked food and leftovers
- saves time by enabling bulk storage
- maintains hygiene and freshness of food

9. APPLICATIONS

- used for storing and preserving food items in homes
- helps in safe storage of medicines and vaccines in hospitals and pharmacies
- used in hotels and restaurants to keep food fresh
- applied in supermarkets for storing frozen and dairy products
- used in laboratories for preserving chemicals and biological samples
- essential in food processing industries for storage and transport
- helps in making ice and frozen products like ice cream

10. REFERENCES

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11. CONCLUSION

in conclusion, the refrigerator is an essential appliance that works on the principle of the vapor-compression refrigeration cycle to remove heat from its interior and maintain a low temperature. it effectively demonstrates the laws of thermodynamics, particularly the transfer of heat from a cooler region to a warmer one with the help of external work. refrigerators play a vital role in daily life by preserving food, reducing wastage, and ensuring hygiene and safety. they are widely used in homes, industries, hospitals, and laboratories. overall, the refrigerator is a highly useful and efficient device that contributes significantly to modern living and food preservation.