LPG REFRIGERATION SYSTEM

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ABSTRACT

Domestic refrigerators runs with refrigerants like CFC, R22, etc. Though R22 is better than CFC in terms of COP, but it also causes global warming and ozone depletion. To avoid this many researches are going on. Our project is about using Liquefied Petroleum Gas (LPG) as an alternative for the refrigerant. LPG also has the same effect of refrigerants but its COP is low. Though its COP is low, it doesn't cause global warming and ozone depletion.

Keyword: - *zero electricity, pollution free, and latent heat*

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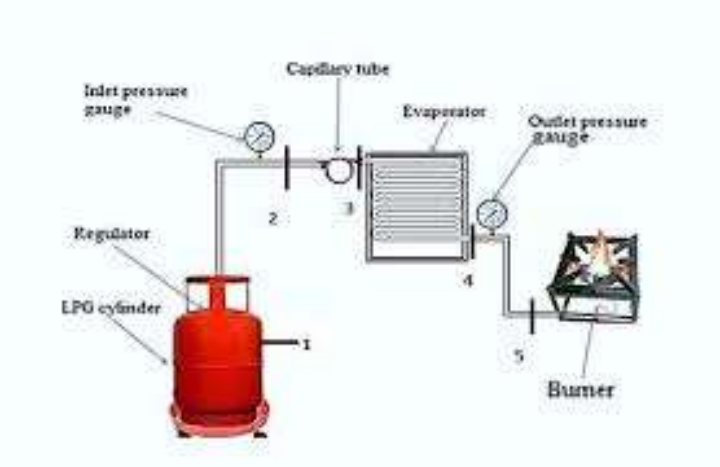
1. INTRODUCTION

Refrigerator became the daily part of our life. Its usage is increasing day by day. On the other side, its harmful effect to environment also increasing gradually. We need to reduce this harmful effect, but we can't avoid using refrigerator. But we can use some other techniques to produce refrigeration effect, which does not cause any global also increasing day by day, but its production rate remains the same. Usage of electricity should be reduced. It is estimated that electricity consumption of refrigerator is high among other household appliances. LPG refrigeration system does not requires electricity. Only input is high pressure Liquefied Petroleum Gas. Our aim is to produce Refrigeration effect by passing LPG through copper tubes of small diameter.

1.1 CIRCUIT

High pressured LPG from the cylinder is passed through series of tubes to evaporator coil made of copper tubes. The series of tubes are of decreasing order in their diameter. LPG from cylinder is passed through 4.5cm tube, 3.5cm tube and evaporator coil of 2.5cm diameter. After circulating through coil it released through same series of tubes to stove.

1.2 BLOCK DIAGRAM



2. OBJECTIVE

To make a Refrigeration system without causing Ozone depletion. Generally the refrigeration effect is done by some fluorocarbons especially chlorofluorocarbons, but it is the main reason for ozone depletion effects and other common refrigerants are ammonia, sulphur dioxide, and propane. To avoid ozone depletion, we are using LPG for refrigeration instead of other gases .To provide refrigeration effect without using electricity.

3. EXISTING SYSTEM

Existing domestic refrigerators runs with an evaporator coil, condenser, and compressor and with electric supply. The high pressured refrigerant flows through evaporator coil and it absorbs heat inside the refrigerator body and reaches condenser. In condenser the refrigerant gets cooled by a coolant which circulates around condenser. From condenser low pressure refrigerant reaches compressor where it gets compressed to high pressure and it circulates again.

3.1 DISADVANTAGES

1) Ozone depletion

2) Global warming

3) Consumption of electricity

4. PROPOSED SYSTEM

In our system we eliminate major parts used in existing system, we removed condenser and compressor. Refrigeration effect is done only with evaporator coil. The high pressured LPG from cylinder is passed to evaporator coil through a capillary tube and sent out as low pressure gas. In evaporator coil the gas absorbs the heat inside refrigerator.

4.1 ADVANTAGES

1) Zero consumption of electricity

2) Environment friendly

3) Pollution free

4) Higher COP

5. EQUIPMENTS REQUIRED

1) Copper tubes with diameter 2.5cm

2) Refrigerator body

3) LPG cylinder

4) Stove

5) LPG hose

6) Copper welding

6. WORKING

High pressure gas after passed through low diameter coil its pressure gets reduced and goes through a phase change from Gas to Liquid state by absorbing Latent heat. Latent heat is the amount of energy required to change the phase of a substance without changing its temperature. This gas then passes through copper tube which is fitted inside the insulation box. Gas absorbs the heat inside the box and goes out through series of tube with low pressure and reaches stove.

6.1 COP CALCULATION

Coefficient of performance = Desired output / Input

= Refrigeration effect / work done

COP in terms of heat = Q2 / Q1-Q2

Where,

Q2 – Amount of heat absorbed

Q1 – Amount of heat released

COP in terms of temperature = T2 / T1-T2

Where,

T2 - Temperature inside refrigerator

T1 – Room temperature

6.2 COP COMPARISON

For one hour,

COP of domestic refrigerants = T2 / T1-T2

= 14 / 30-14

= 0.875

COP of LPG refrigerator = T2 / T1-T2

= 16 / 30-16

= 1.142

Thus COP of LPG refrigerator is higher than domestic refrigerator.

7. LITERATURRE SURVEY

7.1 Thermodynamically Evolution of LPG Refrigerator

LPG with 64% Propane and 36% Butane by mass is suitable replacement for R-12 and 60% Propane and 40% commercial Butane is suitable replacement for R 134a in a domestic refrigerator with single evaporator coil. Enthalpy of gas remains constant when it expands inside the capillary tube. When there is an increase in inner diameter of capillary tube and coil diameter there will be increase in mass flow rate of gas and when there

is an decrease in inner diameter of capillary tube and coil diameter there will be a decrease in mass flow rate of gas.

7.2 Refrigeration effect

High pressure gas is basic requirement for producing refrigeration effect. A comparative study on COP's of different Refrigerants are done and it is concluded that R744 (carbon dioxide) requires high operating pressure. R717 can be used as a green refrigerant in home.

7.3 A Study Paper on LPG as an Alternative Refrigerant for Refrigeration

Least possible temperature attained by LPG refrigeration system is -20 degree Celcius and with COP of 6.4 which is greater than other domestic refrigerants. In average its COP varies between 6 and 13.

8. DISADVANTAGES

1. Closed cycle is not possible
2. Frequent refilling of LPG is required

9. CONCLUSION

1) Using LPG as an alternative for refrigerant is an effective method in terms of COP

2) Ozone depletion is neglected

3) Refrigeration effect is obtained without Electricity consumption.

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