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LPG Refrigeration System

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Abstract

According to the Indian Government, the refrigerator is the 3rd heaviest consumer of power amongst household appliances. It is one of the few appliances that is running 365 days a year, increasing the importance, whenever possible, to have an eco-friendly refrigerator in your household. A new eco-friendly refrigerator in 2006 was estimated to consume 481 kilowatt hours per year. The energy consumption of refrigerators has improved steadily year over year. It works on the principle that during the conversion of LPG into gaseous form the expansion will be take place. Due to this expansion in LPG gas the pressure will drops. And the volume will be increase this will be result into dropped in temperature and it acts as refrigerant.

Keyword- *LPG,REFRIGRENT*

I.INTRODUCTION

. According to the Indian Government, the refrigerator is the 3rd heaviest consumer of power amongst household appliances. It is one of the few appliances that is running 365 days a year, increasing the importance, whenever possible, to have an eco-friendly refrigerator in your household. A new eco-friendly refrigerator in 2006 was estimated to consume 481 kilowatt hours per year. The energy consumption of refrigerators has improved steadily year over year. It works on the principle that during the conversion of LPG into gaseous form the expansion will be take place. Due to this expansion in LPG gas the pressure will drops. And the volume will be increase this will be result into dropped in temperature and it acts as refrigerant. According to second law of thermodynamics, this process can only be performed with the aid of some external work. It is thus obvious, that supply of power (say electrical motor) is regularly required to drive a refrigerator. The substance which works in a heat pump to extract heat from a cold body and to deliver it to a hot body is called refrigerant. The different water cooling processes incorporated are since old age are as follows: 1. Earthen pots 2. Using ice 3. Using vapor compression refrigeration cycles (VCC) 4. Using vapor absorption cycles (VAS) Cooling of water in earthen pot is one of the earliest method employed by the man for cooling the water in their houses. Only in recent years, it has been put on sound footing thermodynamically. It is a process of adiabatic saturation of air when cooling of surface water on container is made evaporator to cool with transfer of heat from water particles and a moving air stream. The water may be sufficiently cooled by evaporative process is to results in a considerable degree of drinking comfort in climates of high dry-blub temperatures associated with low relative humidity. The minimum outdoor temperature required for successful evaporative cooling is above 35 c and LPG Refrigeration System Mechanical Engineering, SND COE & RC, Yeola. 2 another requirement is a relatively low. The cooling effect given by the evaporative cooling always depends upon the outdoor temperature although the evaporative cooling does not perform all the function of true water-conditioning but it provides cooling by filtering heat and circulating the cooled air. Refrigeration is defined as the process of removing heat from a body or enclosed space so that its firs lowered and then maintained at a level below the temperature of surrounding. In such case, the body or enclosed space is said to be refrigerated system. The equipment used to maintain the required temperature is call refrigerating equipment. The working substance used to produce refrigeration is called the refrigerant

II PROBLEM STATEMENT

To design, fabricate and testing the cooling system by using LPG as a refrigerant to obtain refrigerating effect about 7-8 J/Sec.

III LITERATURE SURVEY

Ibrahim Hussain Shah et al. studied the comparison of domestic refrigeration in the LPG cooling system and they also studied the properties of the refrigerant also properties of LPG. Above all researchers conclude that LPG cooling system is very useful for refrigeration purpose because, it gives the cooling effect also the LPG as burning purpose. LPG cooling system has moderate "Coefficient of Performance" so it is very efficient system for cooling purpose. Nikam S.D. et al. studied the LPG cooling system for analysis of what exactly how much electricity we can save from this LPG cooling system. Nikam S.D. et al also studied parameters affecting the LPG cooling system. By studding among the all constraints they conclude that LPG cooling system is very much effective solution over the saving the electricity. Ajeet Kumar Rai et al. studied properties of the different kind of refrigerant now a days using in different kind of refrigeration system for cooling purpose. Specially they studied the properties of R-134a and compared with LPG as considering the all parameters when cycle is working. Ajeet Kumar raj et al. studied also vapor compression cycle and compare it with LPG cooling system.At last they conclude that LPG as refrigerant is very useful because it used as refrigerating purpose and burning purpose at same time. Mhaske M. S et al. studied the performance analysis of LPG as refrigerant. In this paper they have designed and analyzed a refrigerator using LPG as refrigerant. As the pressure of LPG is high this stored in cylinder. As this pressurized LPG is passed through the capillary tube of small internal diameter, the pressure of LPG is decreased due to expansion and phase change of LPG occurs in an isenthalpic process. Due to phase change from liquid to gas latent heat of evaporation is gained by the liquid refrigerant and the temperature decreased. In this way LPG can produce refrigerating effect in the surrounding. From experimental investigations, we have found that the COP of a LPG Refrigerator is higher than a domestic refrigerator. Finally they conclude the LPG cooling system is most useful for refrigeration effect because its two way use of LPG as refrigerant.

IV OBJECTIVES OF BLISTER DE-FOILING

1. To obtain the desired cooling effect.
2. To design the cooling system model and component
3. Fabrication of project model.
4. testing the project model and find out actual referencing effect.

V. PROPOSED METHODOLOGY

1. Literature Survey.
2. Selection of important process parameters.
3. Design of system component.
4. Performing the experiment.
5. Analysis of the result.

VI PROPERTIES OF THE LPG GAS

Some of the important properties of the LPG gas are as follows: 4.5.1. Liquid Density LPG in the liquid state is nearly half as heavy as water. Specific gravity ranges from 0.55 – 0.58 knowledge of these properties helps us in calculating the safe quantities that can be field in a given container whose volume is known. An LPG container should be filled in such a way that there will be 5 % passages left at the designed temperature. Otherwise as the temperature rises excessive pressure are likely to be encountered leading to bursting of cylinder. 4.5.2. Vapor Specific Gravity LPG vapor is nearly 1.5-2 times as heavy as air. This would mean that any escaping vapors of LPG would tend to settled down. Hence, gear should be adequate ground level ventilation where LPG cylinder are stored. For these very resion LPG cylinder installations should not be undertaken in cellars or basements which have no ventilation at ground level. Also, cylinder installation should not be within 1 Meter drain openings. 4.5.3. Co-Efficient Of Expansion of Liquid Co-efficient of expansion of liquid of LPG is approximately 12 times that of water. This property in conjunction with liquid density should take in to consideration for arriving at safe filling capacities of containers. 4.5.4 Vapor Pressure This is the most important property of LPG. The vapor of LPG in equilibrium with its liquid exerts a pressure called the vapor pressure and the magnitude of this pressure is dependent on the

ambient temperature and not on the quantity of the contents. Vapor Pressure Vapor pressure increases rapidly with temperature. Boiling point of the liquid is that temperature at which the vapor pressure of the liquid equals atmospheric pressure. Since boiling point of LPG is below 0° C the pressure inside a cylinder is always higher than atmospheric pressure.for temperature above 25° C and hence this is the resion that gas gushes out cylinder when the valve is open. From this it naturally follow that LPG cannot be withdrawn in the vapors state from cylinders when the temperature outside is below its boiling point. Since , as already mentioned the vapor pressure is depend on the temperature and not on the quantity of the contents two points emerge from this property of LPG

VII LAYOUT OF THE MODEL

The main principle behind this project is of making use of liquid LPG as refrigerant for this latent heat required for phase transformation of liquid LPG in to gaseous state is taken from water which is too cooled by the phenomenon of heat transfer effect. The layout consist of cylinder, regulator valve, gas regulator pipes, evaporator coil, burner etc. the cylinder is as shown in vertical form and regulating valve connected to it so as to get gaseous LPG at the outlet of the valve. The heat exchanger is placed in between burner and cylinder with the help of pipe (wire reinforced). The length of pipe between cylinder and heat exchanger is less as compare with length between heat exchange and burner. So as to allow liquid LPG to enter in heat exchanger and pipe connected between heat exchanger is long enough so as to convert remaining liquid LPG into gaseous state.

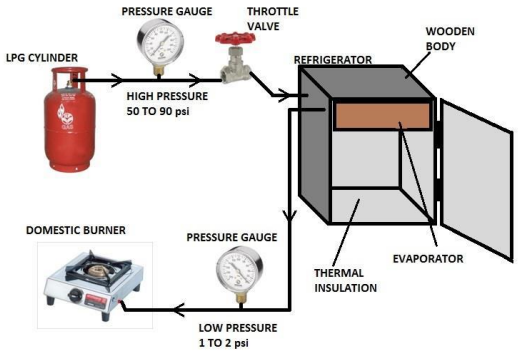

Fig. 1.1 Layout of the Model

VIII Design Of The Project Component

1. LPG cylinder

Range: 14.5 Kg

2. Gas regulator pipe

Inner Diameter = 7mm

Outer Diameter = 10mm

Length = 1M

3. Pressure gauges

Before throttling

Type: air pressure gauge

Range: 0 to 42.2 Kg/cm2

After throttling

Type: air pressure gauge

Range: 0 to 2.8 Kg/cm2

4. Expansion valve

Type: Manually operated

Range: (0 to 50 Kg/cm2)

Dimension: (0.25 Inch Opening)

5. Evaporator Coil

Material of coil: Copper

Thermal Conductivity of Cu: 387 w/mk

Outer Diameter: 7mm

Inner Diameter: 6mm

Length of coil: 5M

No of turns of coil: 6

6. Rubber Pipe

Outer Diameter: 12mm

Inner Diameter: 7mm

7. Gas burner

Standard available in the market

8. GAS tank

Standard available in the market

IX ADVANTAGES

1. Portability

Cylinders can be transported easily to the jobs, or can be fixed to mobile equipment. The smallest once can be carried by hand.

2. Own storage

Alternative gas supplies make use of pipe delivery. Should the supply fail the effect is immediate. LPG in the form of cylinder or bulk on the other hand provides a margin of safety.

1. Ease of Control
2. Consistent quality
3. Clean combustion

X. DISADVANTAGES

1.Explosive in nature
2. Poisonous in nature
3. Corrosive in nature
4. Hazardous to environment

CONCLUSION

The aim of the LPG refrigerator was to use LPG as a refrigerant and utilizing the energy of the high pressure LPG cylinder for producing the refrigerating effect. We also conclude that we are trying to burn the exhaust LPG, the pressure of exhaust gas is less than 10PSI, so that the flame produce by the burner is spreading outside.

This system most suitable for hotel, industries, refinery, chemical industries where consumption of LPG is very high. We are continuing this project with some fabrication work and we have collected various equipment's which is required for this project like high pressure pipes, regulator valve, and capillary tube

We are going to analyses the excremental details of LPG refrigerant, in the major project.

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