

# LPG refrigeration system with zero operating cost

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**Abstract:** - This paper is the result of the some research on domestic refrigerators which is used for preserve food and medicine. The availability of electricity is not available everywhere for those area, where electricity supply not available every time there we use LPG refrigeration system. This refrigeration system is available with zero operating cost. In this refrigeration system LPG (liquefied Petroleum gas) is used as refrigerant, which is available in every household. It comprises 24.4% propane, 56.4 % butane and 17.2% isobutane which is varied company by company. LPG is cheap and environment friendly type refrigerant it also does not affect ozone layer. For limited region the COP of LPG refrigeration system is slightly greater than domestic refrigerator.

**Key Words:** — LPG, Ozone layer, COP.

## I. INTRODUCTION

As we know the uses of refrigerator for cooling effect that means store a body at Lower temperature than atmosphere. The area where electricity is not available Because of where huge demand all over the world, then LPG refrigeration system Is to be used for cooling or Store items. LPG refrigeration system is easy to use and Operating cost is zero. By the second law of thermodynamics it is impossible to heat Flow from low temperature to high temperature without giving any work, but in Case of LPG refrigeration system expansion of LPG from liquid state to vapour state Decrease in pressure and increase in volume and the LPG gas temperature is drop. The LPG gas is work as refrigerant. Thousands of metric ton chlorofluorocarbon Gases uses as refrigerants which it is very harmful for depletion layer. To substitute The CFC gases is mandatory we continue our research find other solutions.

## II. THEORY

Its work on the principle that the expansion of liquid LPG to gaseous state. Due to expansion a pressure drop occurs and volume increases that results in drop of temperature and producing refrigeration effects. It is the modification of vapour absorption cycle. In VAC's Ammonia, water or Lithium Bromide is used as refrigerant.

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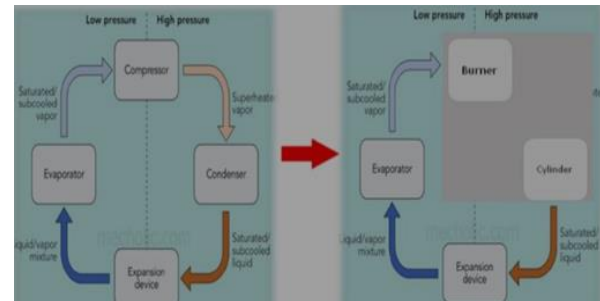


Fig.1. Compare of VAC and LPG refrigeration cycle

The refrigerant get condensed into condenser and Evaporated into evaporator. The refrigerant produce cooling effect into the evaporator and release heat into the atmosphere.

In LPG refrigeration system, LPG contains in a cylinder in which pressure is 0 to 24 bar. When the valve is open gas flows to the pipe to the pressure gauge. After that it goes through the capillary tube to the evaporator into which LPG expand and absorb heat and cooling effect is done.

### A. OBJECTIVES

- To determine the benefits of LPG refrigeration system over the domestic refrigeration system.
- To determine the COP of LPG refrigeration system.

### Properties of LPG as Refrigerant:

- Non toxic
- Colorless
- Heavier than air

- Odourless (odorant's are used for household uses to prevent leakage)
- High expansion

**B. Block diagram of LPG refrigeration system:**

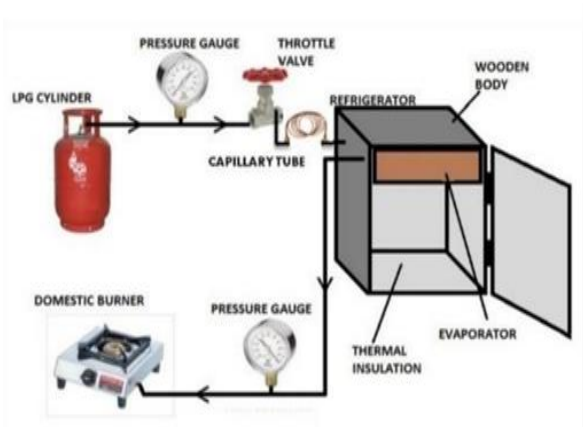


Fig: 2 Block diagram of LPG refrigeration system

**III. COMPONENTS OF LPG REFRIGERATION SYSTEM**

*Refrigeration box:*

The refrigeration box is made of wood or Thermocol, which is insulator of heat in this box two chamber are made one used as evaporator and other is used as cooling chamber

*LPG cylinder:*

It is the domestic LPG cylinder, which is used in household. This cylinder is attached to the evaporator by pipe. The pressure of LPG is about 12.5 bars. LPG is made of propane (C<sub>3</sub>H<sub>8</sub>) and butane (C<sub>4</sub>H<sub>10</sub>).



Fig.3. LPG cylinder

*Capillary tube:*

It is a throttling device, it is used for expansion of LPG and to reduce the temperature of LPG. It is made of copper or other material.



Fig.4. Capillary tube

*Pressure gauges:*

There are a procedure to maintain the pressure and vacuum. It is used for measure the pressure in pipes. Generally, Bourdon type mechanical pressure gauge is used.



Fig.5. Pressure gauge

*High Pressure pipes:*

For the need of transfer high pressure gas, high pressure pipes are to be used. It consist of two steel connector at both end. Which is prevent from leakage.



Fig.6. High pressure pipe

*Evaporator sheet:*

The genuine work of cooling is done inside of the evaporator. The cooling effect generates and heat is also eliminated by evaporator. It is a sheet with a loop of conducting pipes, in which refrigerant will flow.



Fig.7. Evaporator sheet

*Advantages of LPG refrigeration system:*

- Use of LPG as a refrigerant additionally improves the average efficiency of 10.0 to 20.0%.
- The ozone depletion capacity (ODP) of LPG is zero.
- It is environment friendly, means no pollutants are formed.
- There is 60% less in weight of the system because of better density of LPG.
- The components are effectively silent in Operation.
- Running cost is zero.
- Eliminates the compressor and condenser

#### IV. CONCLUSION

- Coefficient of performance of the LPG refrigerator is slightly greater than domestic refrigerator.
- Good enough to protect the consumable foods and medicine.
- Cheaper than domestic refrigerator in terms of operation and initial cost.

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