

NON-CONVENTIONAL REFRIGERATION SYSTEM

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ABSTRACT :

First we keep the LPG cylinder in Inverted Position to get liquid at output, if you place it in normal position we get gas as output from cylinder and we not get effective cooling effect. The LPG flows control by using Regulator Valve, the function of regulator valve is to regulate the flow of LPG. Then LPG comes in refrigeration circuit via Rubber tube. In refrigeration circuit the first part is flow control valve to control the flow rate of LPG. The second part is pressure gauge to measure the pressure. The next part is Strainer is also called filter. Then passes through the capillary tube in which the pressure drop take place which gives the low pressure & low temperature LPG to evaporator, in evaporator the liquid is converted in to vapor and we get cooling effect (Refrigeration effect). This process occur in evaporator called as LATENT HEAT OF VAPORISATION

KEYWORDS: Refrigeration, LPG, Rankine cycle ,

1. Introduction

The Non-conventional refrigeration system works on the principle same as vapour compression refrigeration system. Instead of compressor & condenser we use LPG cylinder which having pressure in between 6bar-7bar for getting cooling effect. In normal refrigeration circuit we use refrigerant to get Refrigerating effect means we require to supply power to Compressor for this purpose but here inverted LPG gives the Cooling effect without any input.

Simple Vapour Compression Refrigeration System:

A simple vapour compression refrigeration system consists of the following Equipments:

- i) Compressor
- ii) Condenser
- iii) Expansion valve
- iv) Evaporator.

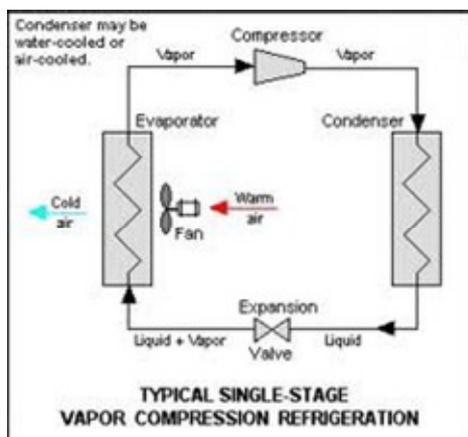


Figure Simple vapour compression system

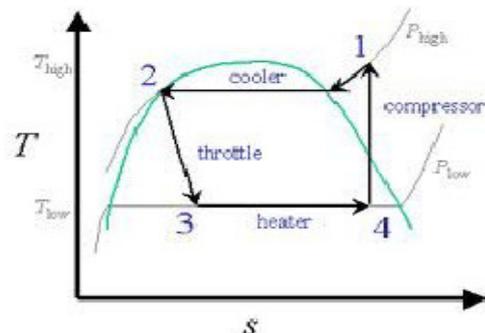


Fig.1 Simple Vapour Compression Cycle

Figure shows a simple vapor compression refrigeration cycle on T-s Diagram for Different compression processes. The cycle works between temperatures T_1 and T_2 representing the condenser and evaporator temperatures respectively. The various process of the cycle A-B-C-D (A-B'-C'-D and A-B''-C''-D) are as given below: Refrigeration Cycles.

- i) Process B-C (B'-C' or B''-C''): Isentropic compression of the vapor from State B to C. If vapour state is saturated (B), or superheated (B''), the compression is Called dry compression. If initial state is wet (B'), the compression is called wet compression as represented by B'-C'.
- ii) Process C-D (C'-D or C''-D): Heat rejection in condenser at constant Pressure.
- iii) Process D-A: An irreversible adiabatic expansion of vapor through the expansion valve.

The pressure and temperature of the liquid are reduced. The process is accompanied by partial evaporation of some liquid. The process is shown by dotted line.

iv) Process A-B (A-B' or A-B'') : Heat absorption in evaporator at constant Pressure. The final state depends on the quantity of heat absorbed and same may be wet (B') dry (B) or superheated (B''). COP of Vapour Compression Cycle:

Heat extracted at low temperature

$COP = \text{Refrigeration Effect} / \text{Work done}$

Heat extracted at low temperature = Heat transfer during the process A-B = refrigerating effect.

Refrigerating Effect = $m(h_4 - h_3)$ constant pressure

Work of compression = $w = (h_2 - h_1)$ (adiabatic compression).

Heat rejected to the condenser = $(h_2 - h_3)$

2. Non conventional Refrigeration System

Non Conventional Refrigeration System work on same principle as Vapour Compression Refrigeration System which include the Compressor, Condenser, Capillary tube, Evaporator in Non Conventional Refrigeration System instead of Compressor & condenser we use LPG gas cylinder for getting Cooling Effect (Refrigeration Effect) Components use in

Non conventional Refrigeration System

- a) LPG Cylinder
- b) LPG Gas Regulator
- c) Rubber Tube
- d) Flow Control Valve
- e) Pressure Gauge
- f) Strainer (Filter)
- g) Capillary Tube
- h) Evaporator Box
- i) Pressure Gauge
- j) Rubber Tube
- k) Burner
- l) Copper Tubing
- m) Digital Thermometer

a. LPG Cylinder

A **gas cylinder** is a pressure vessel used to store gases at Above atmospheric pressure. High pressure gas cylinders are also called bottles. Although they are sometimes colloquially called "tanks", this is technically incorrect, as a tank is a vessel used to store liquids at ambient pressure and often has an open top. In the United States, "bottled gas" typically refers to liquefied petroleum gas. "Bottled gas" is sometimes used in medical supply, especially for portable oxygen tanks. Packaged industrial gases are frequently called "cylinder gas", though "bottled gas" is sometimes used. Design codes and application standards along with the cost of **materials** dictated the choice of steel with no welding for most gas

cylinders, treated to be anti corrosive. There have been some newly developed lightweight gas cylinders from composite materials. Due to the very high tensile strength of **carbon fiber**, these vessels can be very light, but are much more difficult to manufacture.

LIQUEFIED PETROLEUM GAS (LPG)

LPG is a mixture of commercial butane and commercial propane having both saturated and unsaturated hydrocarbons. LPG marketed in India shall be governed by Indian PHYSICAL PROPERTIES AND CHARACTERISTICS

b. LPG Gas Regulator

A **pressure regulator** is a valve that automatically cuts off the flow of a liquid or gas at a certain pressure. Regulators are used to allow high pressure fluid supply lines or tanks to be reduced to safe and/or usable pressures for various applications. Gas pressure regulators are used to regulate the gas pressure and are not appropriate for measuring flow rates A pressure regulator's primary function is to match the flow of gas through the regulator to the demand for gas placed upon the system. If the load flow decreases, then the regulator flow must decrease also. If the load flow increases, then the regulator flow must increase in order to keep the controlled pressure from decreasing due to a shortage of gas in the pressure system.

c. Rubber Tube

Our range of rubber tubing are designed to provide a sturdy pipeline for wide range of fluid. These tubing are made from soft and flexible **elastomer**. The tubings provide excellent abrasion resistance, kink resistance and tight. The pipe can easily bend owing to its high flexibility and are highly durable. Our range of tubing is ideally suitable for adverse situations where vibration and flexing are high.

d. Flow Control Valve (Ball Valve)

A **ball valve** is a valve with a spherical disc, the part of the valve which controls the flow through it. The sphere has a hole, or port, through the middle so that when the port is in line with both ends of the valve, flow will occur. When the valve is closed, the hole is perpendicular to the ends of the valve, and flow is blocked. The handle or lever will be inline with the port position letting you "see" the valve's position.

e. Pressure Gauge

Pressure (the symbol: p) is the force per unit area applied in a direction perpendicular to the surface of an object. Gauge pressure (also spelled *gauge*

pressure) is the pressure relative to the local atmospheric or ambient pressure.

Pressure is the effect of a force applied to a surface.

Pressure is the amount of force acting per unit area.

The symbol of pressure is **p**.

f. Strainer (Filter)

Gas Line Strainers are designed to entrap and retain foreign matter, dirt, and metal chips that may flow in gas or air supply lines. Stainless steel baskets with 0.25" perforations will handle gases up to 750oF.

g. Capillary Tube

Capillary action, or **capillarity**, is the ability of a liquid to flow in narrow spaces without the assistance of, and in opposition to external forces like gravity. The effect can be seen in the drawing up of liquids between the hairs of a paint-brush, in a thin tube, in porous materials such as paper, in some non-porous materials such as liquified carbon fiber, or in a cell.

h. Evaporator Box

The solution containing the desired product and passes a heat source. The applied heat converts the water in the solution into vapor. The vapor is removed from the rest of the solution and is condensed while the now concentrated solution is either fed into a second evaporator or is removed. The evaporator as a machine generally consists of four sections. The heating section contains the heating medium, which can vary. Steam is fed into this section.

i. Digital Thermometer

Digital Thermometer is used to measure the temperature of evaporator.

3. Working principle of Non Conventional Refrigeration System

First we keep the LPG cylinder in Inverted Position to get liquid at output, if you place it in normal position we get gas as output from cylinder and we not get effective cooling effect. The LPG flows control by using Regulator Valve, the function of regulator valve is to regulate the flow of LPG. Then LPG comes in refrigeration circuit via Rubber tube. In refrigeration circuit the first part is flow control valve to control the flow rate of LPG. The second part is Pressure gauge to measure the pressure. The next part is Strainer is also called Filter. Then passes through the capillary tube in which the

pressure drop take place which gives the low pressure & low temperature LPG to evaporator, in Fundamentals of heat exchanger by DUSAN Refrigeration by Arora Advances in thermal design of heat exchangers by Eric M. Smith Thermodynamics by Domkundwa evaporator the liquid is converted in to vapour and we get cooling effect (Refrigeration effect). This process occur in Evaporator Called As Latent Heat Of Vaporisation

4. Advantages & Applications

- a) It can be use to keep perishable food, cold drinks, milk etc.
- b) It can be used in chemical industries
- c) It can be used to improve combustion efficiency
- d) It can be run without any power
- e) It is usable in such places where continuous burning is there.

5. CONCLUSION

Hence we obtains the Nson Conventional Refrigeration System which gives cooling effect without use of any input like compressor in vapour compression refrigeration system & improving combustion efficiency of LPG .

6. REFERENCES

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