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A REVIEW ON DESIGN & DEVELOPMENT OF COOLING SYSTEM BY USING LPG

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ABSTRACT - Refrigeration has made the milestone in human life. Since from very long time the human being has developed so many ways of refrigeration for preserving food, cooling water, etc. but yet the techniques are developing. The science of refrigeration has developed so many ways to improve our lifestyle.Our paper considers law of conservation of energy maximum utilization of the fossil fuel and saving energy. This project has done LPG as refrigerant, instead of using closed cycle as it is used in normal practice (VCR); the open cycle has been used. Before burning the LPG in burner, it is passed through the expansion device and evaporator and produces the refrigeration effect without using electric energy.LPG is cheap and posses environmental friendly nature with no ozone depletion potential.

Keywords –VCR, CFC

I. INTRODUCTION

The energy crisis persists all across the globe. We think of recovering the energy which is already spent but not being utilized further, to overcome this crisis with no huge investment. The climatic change and global warming demand accessible and affordable cooling systems in the form of refrigerators and air conditioners. Annually billions of dollars are spent in serving this purpose. Hence forth, we suggest NO COST Cooling Systems.Petroleum gas is stored in liquefied state before its utilization as fuel. The energy spent for pressurizing and liquefying is not recovered afterwards. If it is expanded in an evaporator, it will get vaporized and absorb heat to produce cooling. This property has been used for refrigeration and air conditioning. So that the liquefied form of LPG can be used for cooling and the expanded gas (LPG) can be further used for combustion as a fuel.The ozone depletion potentials (ODPs) of HFC-134a relative to CFC-11 are very low (<5 · 10_4), the global warming potentials (GWPs) are extremely high (GWP¼1300) For this reason, the production and use of HFC-134a will be terminated in the near future.The applications of new refrigerant mixtures to replace conventional refrigerants in domestic refrigerators have been studied by a number of researchers. Jung and Radermacher, performed a computer simulation of single evaporator domestic refrigerators charged with many pure and mixed refrigerants. The study attempted to find the best potential replacement for CFC-12. James and Missenden studied the use of propane in domestic refrigerators. Energy consumption, compressor lubrication, costs, availability, environmental factors and safety were the criteria for investigation. The results revealed that propane showed as an attractive alternative to CFC-12. Richardson and Butterworth determined the performance of a vapor compression refrigeration system working with propane and a mixture of propane and isobutene. The obtained performance was higher than that obtained from CFC-12 under the similar experimental conditions. Alsaad and Hammad, investigated experimentally the refrigeration capacity, compressor power and coefficient of performance (COP) to determine the performance of a medium size CFC- 12 domestic refrigerator working with a propane/butane mixture. The results indicated the successful application of the mixture of propane and butane for the replacement of CFC-12 in domestic refrigerators. Jung et al., examined the performance of a mixture of propane and isobutene used in refrigerators. A thermodynamic analysis showed that the coefficient of performance of the system was increased up to 2.3% as compared toCFC-12 when the test was run at a mass fraction of propane ranging between 0.2 and 0.6.

1.1 Cooling methods

From the ancient age man always prefers to have cold water for drinking purpose. Also in India, our country the weather is too hot. Particularly in summer season, the normal water temperature in open space is 35 to380 C. The water is not suitable for drinking purpose. The required temperature is at the most 250 C. Hence lowering down of the temperature is an essential task. In old age there was ample space available to keep the earthen container also the houses were sheltered by the trees and bushes which were enough to lower down the water container temperature. Because in most of the situations the temperature was depending on the temperature of the flowing air.

1.2 Other water cooling processes

The different water cooling processes incorporated are since old age are as
Follows:-
1. Earthen pots
2. Using ice
3. Using vapour compression refrigeration cycles
4. Using vapour absorption cycle

Cooling of water in earthen pot is one of the earliest methods employed by men 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 to evaporate to cool t with transfer of heat from water to the surroundings. The initial investment cost of such a system is low & the operation is simple & cheap. Simple evaporative cooling is achieved by direct contact of water particles & a moving air stream. The water may be sufficiently cooled by evaporative process to results a considerable degree of drinking comfort in climates of high dry-bulb temperatures associated with low relative humidity. The minimum outdoor temperature required for successful evaporative cooling is above 350 c & another requirement is a relatively low. Wet bulb temperature. 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 coolness by filtering heat & circulating the cooled air.

II. DESIGN METHODOLOGY

Considering LPG as refrigerant, the system for cooling water is as designed below.

In this section the layout & various components like cylinder, regulating valve, pipe, heat exchanger, etc used in the system are explained. Also considering various properties of material properties, standard specimens, & various theories of design &heat transfer the system is designed.

2.1 Layout

The main principle behind this project is of making use of liquid LPG as coolant for this latent heat required for phase transformation of liquid LPG in to gaseous state is taken from water which is to cooled thus the layout of system is as shown in following fig.

Block Diagram &Technical Specification

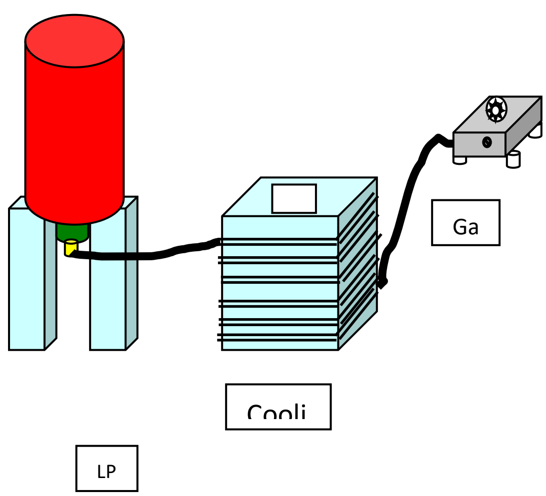

Fig. No.1: Basic layout of system

The layout consist of cylinder ,regulator , suraksha pipes, heat exchanger, burner, etc. cylinder is as shown in inverted form & regulating valve connected to it so as to get liquid LPG at the outlet of the valve . The heat exchanger is placed in between burner & cylinder with the help of pipe (wire reinforced). The length of pipe between cylinder & heat exchanger is less as compare with length between heat exchanger & burner. So as to allow liquid LPG to enter in heat exchanger & pipe connected between heat exchanger is long enough so as to convert remaining liquid LPG into gaseous state.

III. OBSERVATION

READING TEST NO -1 (industrial regulator)

Reading test readings -Duration of test is $^3/_4$ hour. The above readings are taken in demo test . They shows gradual decrease in temperature as time get lapsed. The initial reading is 26.9ºc&final reading is 12.9ºc. Thus the difference between them shows decrease in temperature. It shows approximately 14.1ºc decrease in the initial temperature within ½ hour.The above diagram shows the readings taken during demo test with industrial regulator. The time temperature diagram shows the change in temperature & time. As in first case flow rate is less due to domestic regulator but in this case the industrial regulator is used which increases flow of liquid LPG through regulator. This causes the increase in efficiency of refrigeration. The temperature difference given is approximately 12.9ºc for 30 min. But as time increases the refrigerating effect also increases.

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Table No. 1- Observation table for Reading Test 1

NO	TIME(MIN.)	READINGS IN (°C)
1	INITIAL	26.9
2	2	27.3
3	4	26.1
4	6	24.8
5	8	23.8
6	10	22.7
7	12	21.5
8	14	20.1
9	16	19.1
10	18	18.3
11	20	17.8
12	22	16.3
13	24	15.4
14	26	14.5
15	28	13.7
16	30	12.9

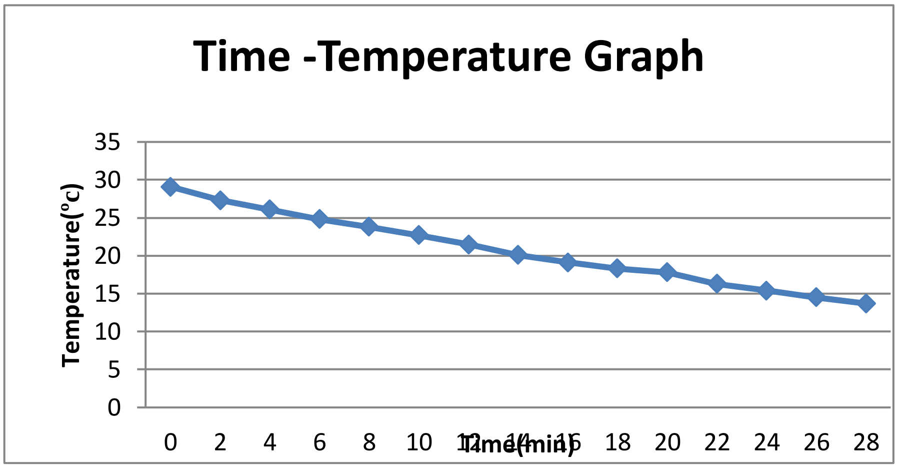

Fig No. 2 - Time –temperature graph for demo 1

IV. CONCLUSION

Studying all aspects of LPG it can be stated that, LPG is versatile fluid can be utilized as better cooking gas. A better fuel for IC engine as well as better &eco friendly refrigerant .The zero phenomenon of system is most existing one of this project, which the potential of LPG is directly harnessed from commercial LPG cylinders.

Actually the system employed is designed for chilling effect equal to 5ºc & practically the result obtained are in the range of 6ºc to 6.6ºc indicating the efficacy & accuracy of the system. Hence it can be concluded that, whatever the consumption of commercial LPG isconsiderably high, the system will definitely work positively.

This system in beginning fruitful in case of restaurant, hotels, where consumption of LPG is high enough. The only limitation of the system can be inflammable property of LPG. But the proper arrangement & operation an easily evade this limitations, as the construction & operation made during the process are very handy.

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