Power Consumption for Refrigerant R134A and R600A

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Abstract— This paper basically center around the exhibition examination of refrigerants utilized in household fume pressure refrigeration framework. two distinct refrigerants considered for correlation of R600a and R134a. Co-proficient and examination in the middle of Isobutene and hydro fluoro carbon (HFC) gathering. The refrigerants are utilized for residential and family unit employments. Isobutene is R600a, when you contrast the difference in temperature and weight the change is exceptional on account of isobutene than in R134a.Condition. The accomplished outcomes show that 50g of R600a produces the yield as created by R134a dependent on the outcomes. Cop of R600a a lot higher than R134a. At conditions which are ideal the charging (power utilization) sum essential for R600a was seen as 60g which was 68% lesser than R134a.

Keywords: Compressor coefficient, Domestic refrigerator, R134a, R600a, COP

I. INTRODUCTION

Coolers have become an integral part of the basic man's life. Practically all household coolers take a shot at the system of fume pressure. Henceforth with the end goal of examination, refrigeration cycle of fume pressure is considered. The fundamental parts of such a cycle incorporate evaporator, blower, condenser and the extension valve. The blower work is to pack the refrigerant and to maintain its weight. As weight expands, temperature builds relative to it in this manner making the particular temperature higher than that of the cooling medium. In short the cooler weight is expanded from evaporator strain to condenser pressure.

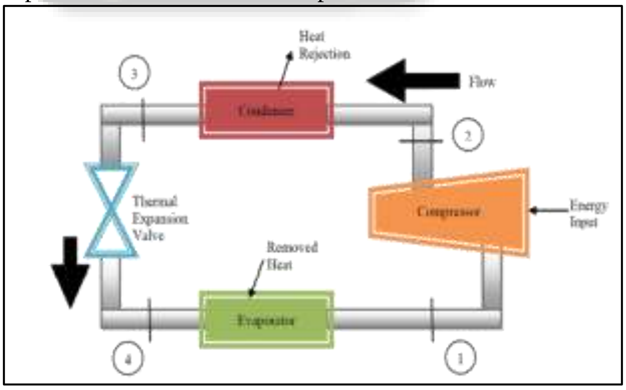

Fig. 1: Vapor Refrigeration Cycle

The cycle of fume pressure refrigeration can likewise be characterized as a system that cools a shut space to a temperature lesser than the environment. To accomplish this, heat must be expelled from the space encased and scattered into the environment. Warmth tends to spill out of a high temperature region to that of a lesser temperature. The iso butane and Tetrafluoroethane add to ozone layer consumption and a worldwide temperature alteration and have high ozone exhaustion potential and an unnatural weather change potential. Consequently these refrigerants ought to basically be supplanted with eco-accommodating refrigerants to ensure the condition the R134a refrigerant has an ODP of zero level. The hydrocarbons as refrigerants has a few positive properties, for example, zero ODP, low GWP, non-harmfulness, miscibility of high flexibility with mineral oil and great similarity with the materials normally utilized in refrigeration frameworks. Iso butane is R600a, when you contrast the difference in temperature and weight the change is exceptional on account of iso butane than in R134a. also iso butane is a greater compound. Inert warmth of vaporistion of R600a is a lot higher than R134a With little change in pressure the temperature of R600a can be effectively brought to required virus condition. Cop of R600a a lot higher than R134a. However, the thickness is somewhat low for R600a.from the previously mentioned reasons R600a superior to R134a in the exhibition. a clarification on family unit coolers, working liquids, the development and working guideline of a refrigeration framework, exploratory arrangement, results and exchange, end and references.

II. LITERATURE REVIEW

In [1], experimentation is directed to watch the exhibition of Hydro- fluorocarbon (HFC) refrigerants (R134a) in fume pressure refrigeration cycles. In this situation, R152a has developed as the most vitality productive refrigerant among both the researched refrigerants. It displayed the most minimal force utilization per ton of refrigeration with a normal estimation of 13.23% which is not as much as that of R134a. [2] led a test investigation of R134a, R406 and R600a mixes as an option in contrast to Freon 12. The outcomes show that R134a/R600a blend in the proportion 50:50 can be utilized as an option in contrast to R-12 in household fridges, without changing the blower greasing up oil. [3] clarifies that there are different obstructions looked in the working of various refrigerants because of their natural effect (R11, R12), poisonous quality (NH3), combustibility (HC) and high weight (CO2) which makes them more unsafe than other working liquids because of security and ecological issues. In [4] direct development framework (DX), which is utilized generally in grocery store cooling applications, is mulled over. The evaporator temperatures of −25 °C and 0 °C, the refrigerants of R-22 and R-134a, which are favored broadly in DX frameworks and least and most extreme spillage paces of 3 and 30 %, are taken as reference esteems for the investigation. As per the outcomes, while sub cooling and sub warming procedures increment, roughly 10 % of COP and vitality efficiencies dependent on refrigerants increment and CO2 outflows are diminished for all refrigerants. It is finished up with an accentuation on the significance of sub cooling and superheating applications, particularly for DX frameworks and the significance of the inclination refrigerant.

[5] In request to improve the entrainment execution of warm fume blowers (TVCs) that are generally utilized in multi-impact refining (MED) desalination frameworks preheating of entrained fume is done. So as to affirm its adequacy and concentrate the impact of the entrained fume

superheat on the TVC entrainment proportion, a four-impact parallel-stream MED-TVC exploratory framework was set up. [6] Refrigerant is the liquid utilized for heat move in a refrigerating framework that ingests heat during vanishing from the area of low temperature and weight and discharges heat during buildup to a locale of higher temperature and weight.. [7] Analyzed qualities of stream bubbling warmth move and weight drop of a low an unnatural weather change potential refrigerant R32 streaming in an even copper roundabout cylinder with 1.0 mm inside measurement for the advancement of an elite warmth exchanger utilizing little distance across cylinders or smaller than usual channels for cooling frameworks.

III. EXPERIMENTAL WORK

Trial set up is structured so that it tends to be utilized to locate the local fume pressure framework COP. The fume pressure framework will be of the size of a 180 L family cooler.

Property Name	Property Value
Molecular Weight	58.124 g/mol
Hydrogen Bond Donor Count	0
Hydrogen Bond Acceptor Count	0
Rotatable Bond Count	0
Complexity	4.8
Corrosive	No corrosive action
Vapor Pressure	3.1 atm at 70^{0}F
Density	0.557 g/cu cm at 68° F
Solubility	Soluble in ethanol, ether, chloroform, In water, 48.9 mg/L at 25 deg C, in water at 20°C
Melting Point	-427.5° F, FRZ: -255°F
Boiling Point	10.8° F at 760 mm Hg, -12°C

Table 1: Computed Properties

Figure 2 shows the plan format of the test arrangement which is utilized to discover the coefficient of execution of family unit fridges fume pressure system. In this exploratory arrangement, refrigerant R-600a is contrasted and R-134a. The blower which is loner fixed sort, the characteristic convection air cool condenser and the slim cylinder utilized for the set-up is like the ones utilized for residential refrigerators.

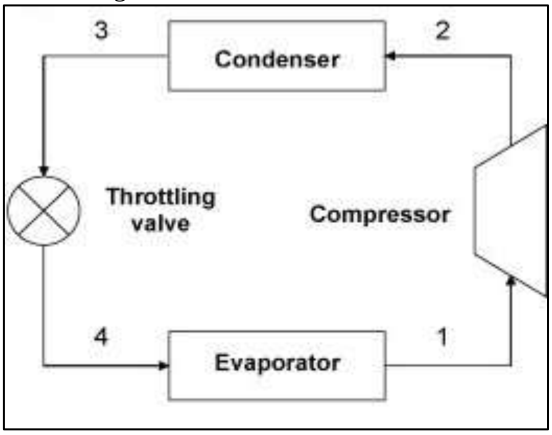

Fig. 2: Refrigeration Process

The blower as a rule has a limit of 1/eighth of its customary worth. The impact of the fridge will be in the scope of 100watts.The cooling load is given by light bank. The heap can be fluctuated with lights of 16 watt, 20 watt and 46watt. The arrangement of fume pressure refrigeration is aligned so that the test arrangement can be done at loads in various conditions. The light watt is determined quickly. Investigation arrangement structure format the accompanying conditions are remembered while directing the analyses

- The light bank of evaporator be set in a protected council of the instruments
- Pressure check is fixed at the sucking and the releasing parts of the bargains
- At different focuses the thermocouple is utilized to quantify the temperature

IV. RESULTS

The results show that 50g of R600a produces the output.

Time	Temperature of evaporator ^0C	Energy consumed reading (Kwh)
10:00	26.9	0.96
11:00	-16.8	1.14
12:00	-18	1.30
1:00	-22	1.55
2:00	-24	1.58
3:00	-26	1.70
4:00	-26	1.82
5:00	-26	1.97
6:00	-26	2.14

Table 2: Test results of R-134a

Time	Temperature of evaporator ^0C	Energy consumed reading (Kwh)
10:00	30.1	0.77
11:00	-13	0.91
12:00	-14	0.96
1:00	-22	0.99
2:00	-25	1.09
3:00	-27	1.16
4:00	-29	1.23
5:00	-29	1.26
6:00	-29	1.27

Table 3: Test results of R-600a

V. CONCLUSION

The outcomes acquired by contrasting the presentation of coefficient and the refrigerants R-600a and R-134a at consistent state.

- R600a execution coefficient was seen as in the higher range contrasted with R134a. It was practically 42.88%-47.56% superior to R134a at a consistent refrigerant impact of 48W and at a steady dissipating temperature.R-600a refrigerating limit was additionally evaluated to be more noteworthy than R-134a.
- The release blower temperature is decreased by 11% properly by utilizing R600a refrigerant. Additionally the blower vitality utilization is diminished in a bit by bit

way to 4% when contrasted with typical R134a cooler utilized in local blower

- A family unit fridge which utilized 160 g of R134a refrigerant had the most noteworthy vitality demolition in the blower followed by the condenser, hairlike cylinder, and evaporator. In actuality a residential fridge which utilizes 60g R600a indicated ideal blower vitality pulverization followed by the condenser, narrow cylinder and evaporator.
- The charge sum required for R600a is around 60g which is lower than that of R134 by 68%. As indicated by the related norms under the test condition, vitality utilization for R600a is 265units every year and R134a is 303 units for every year.

References

[1] Sandip P.Chavhan and S.D.Mahajan, Experimental Performance Evaluation of R152a to Replace R134a in Vapour Compression Refrigeration System, International Journal of Modern Engineering Research, Vol. 5, No. 2,2015, pp. 37-47.

[2] S.Naresh Kumar Reddy and M.Lava Kumar, Performance of Domestic Refrigeration System With Sub Cooling by Use of Eco-Friendly Refrigerants, International Journal of Engineering Research Science & Technology, Vol. 4, No.3, 2015, pp.185-.191.

[3] D.Ravindra, Difference between CFC/HCFC and HFC Refrigerant, Air Conditioning and Refrigeration Journal, 2014.

[4] M.Ziya Sogut, Hikmet Karakoc, Zuhul Oktay and Arif Hepbasli, Investigating the Exergetic and Environmental Effects of Subcooling and Superheating Processes on the Performance of Direct Expansion Systems Progress in Exergy, Energy, and the Environment, 2014, pp. 713-722, http://dx.doi.org/10.1007/978-3-319-04681-5_68.

[5] J.M.Belman-Flores,J.M.Barroso- aldonado, A.P.Rodriguez Munoz and G.Camacho-Vazquez, Enhancements in Domestic Refrigeration Approaching a Sustainable Refrigerator – A Review, Renewable and Sustainable Energy Reviews, Vol. 51, 2015, pp. 955-968.

[6] Deepak Paliwal and S.P.S.Rajput, Experimental Analysis of Hydrocarbon Mixtures as the New Refrigerant in Domestic Refrigeration System, International Journal of Scientific & Engineering Research (IOSR-JMCE), Vol.6, No.6, 2015.

[7] Matsusea, K, Enoki, Hideo Mori, Keishi Kariya and Y Ho, Boiling Heat Transfer and Pressure Drop of a Refrigerant R32 Flowing in a Small Horizontal Tube, Heat Transfer Engineering, Vol. 37, No. 7-8, 2015, pp. 668-678.