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EVALUATION AND COMPARISON OF ECOFRIENDLY REFRIGERANT AS AN ALTERNATIVE TO CONVENTIONAL REFRIGERANT

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ABSTRACT

R134a (1,1,1,2-tetrafluoroethane) has been used in domestic as well as commercial purpose in many vapour compression refrigeration system. Although it has zero ozone depleting potential but its high global warming potential of 1300 is a serious issue. This paper explains the possible replacement of R134a from vapour compression refrigeration cycle. The basis of replacement is to analyze an ice plant working on R134a as refrigerant. Pressure and temperature reading of the plant has been taken. Based on the working pressure and temperature theoretical COP of the plant is calculated using P-h chart of R134a. R134a is replaced with mixture of three refrigerant R32, R152a and R245a in definite proportion. All the three refrigerant replacing R134a have global warming potential less than R134a. mixture of refrigerant obtained to replace R134a is analyzed on the basis of their COP, GWP, their density, enthalpy and entropy in liquid as well as in vapour phase. Based on our experimental analysis two refrigerant can be selected as possible replacement of R-134a namely M1 and M2 having R32, R152a and R245a in ratio by mass as 0.1:0.4:0.5 and 0.1:0.5:0.4 respectively. Also due comparatively low GWP, M2 composition can be suggested as best possible replacement out of M1 and M2.

Keyword: *ODP, GWP, COP, R152a, R134a, Refrigerant, Vapour, Compression, Enthalpy, Entropy, Coefficient of Performance*

I. INTRODUCTION

Refrigeration will be laid out a method of moving or transferring heat from one area or point to an alternate area or point. basically it's a craft of keeping up temp of framework not exactly surrounding and it will be accomplished by transferring heat from lower to higher temp to achieve this work should be provided to the framework. Work will be mechanical work, attraction, power and a lot of elective supply.

It has outsized affected a few ventures, life, agribusiness and a lot of other issue. The idea nourishment safeguarding goes back to the old civilization. Be that as it may, refrigeration innovation has immediately developed inside the only remaining century, from ice reap to temperature-controlled rail vehicles. The presentation of virus rail autos added toward the westbound broadening of the us, allowing settlement in areas that weren't on primary transport channels like waterways, harbours, or discouragement trails. Settlements were conjointly creating in sterile segments of the nation, brimming with new common assets. These new settlement designs started the structure of tremendous urban communities that are prepared to flourish in areas that were generally thought to be aloof, similar to Houston, Texas and city, Nevada. In most created nations, urban communities are vigorously reliant upon refrigeration in grocery

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stores, in order to get their sustenance for day by day utilization. the ascent in nourishment sources has prompted a greater grouping of rural deals coming back from a littler offer of existing homesteads. Homesteads nowadays have a way bigger yield for each individual contrasted with the late 1800s. This has brought about new sustenance sources possible to whole populaces, that has outsizedly affected the nourishment of society.

II. LITERATURE REVIEW

R. Cabello, E. Torrella and J. Navarro-Esbri, have broke down the execution of a vapor compression refrigeration framework utilizing three diverse working liquids (R134a, R407c and R22). The working factors are the evaporating weight, gathering weight and level of superheating at the blower channel. They examined that the power utilization diminishes when compression proportion increments with R22 than utilizing the other working liquids.

B.O. Bolaji et al researched tentatively the exhibitions of three ozone well disposed Hydro fluorocarbon (HFC) refrigerants R12, R152a and R134a. R152a refrigerant found as a drop in trade for R134a in vapour compression framework. B.O. Bolaji [3] talked about the way toward choosing natural neighbourly refrigerants that have zero ozone exhaustion potential and low an unnatural weather change potential. R23 and R32 from methane subordinates and R152a, R143a, R134a and R125 from ethane subsidiaries are the rising refrigerants that are nontoxic, have low combustibility and ecological well disposed. These refrigerants need hypothetical and test examination to explore their execution in the framework.

James M. Quiet has contemplated the emanation and natural effects of R11, R123, R-134a because of spillage from radiating chillers framework. He additionally examined the all out effect in type of TEWI and change in framework effectiveness or execution because of charge misfortune. He additionally outlined the methods to decrease the refrigerant misfortunes by the framework like plan alterations, improvement in preventive support procedures, utilization of cleanse framework for refrigerant vapour recuperation, adjusting and oil changing in framework. Samira Benhadid-Dib and Ahmed Benzaoui, have demonstrated that the employments of halogenated refrigerants are destructive for condition and the utilization of "characteristic" refrigerants become a conceivable arrangement. Here regular refrigerants are utilized as an elective answer for supplant halogenated refrigerants. The answer for the ecological effects of refrigerant gases by a gas which contains no chlorine no fluorine and does not dismiss any CO2 emanations in the climate. The scientists demonstrated that discharges affect our condition. They additionally worried by a commitment to the decrease of ozone depleting substances and by the substitution of the contaminating cooling liquids (HCFC).

III. REFREGERANT SELECTION CRITERION

Selection of refrigerant for a selected application is predicated on the subsequent necessities.

1. Thermo dynamic and thermo-physical properties.
2. Environmental and safety properties
3. Economics.

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IV. EXPERIMENTATION

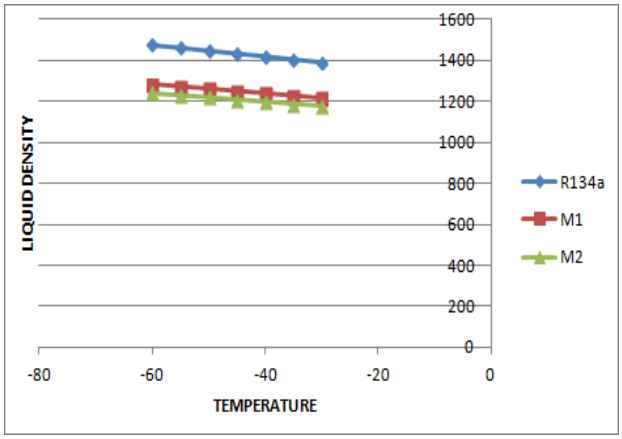

Figure 5.1 liquid density vs temperature

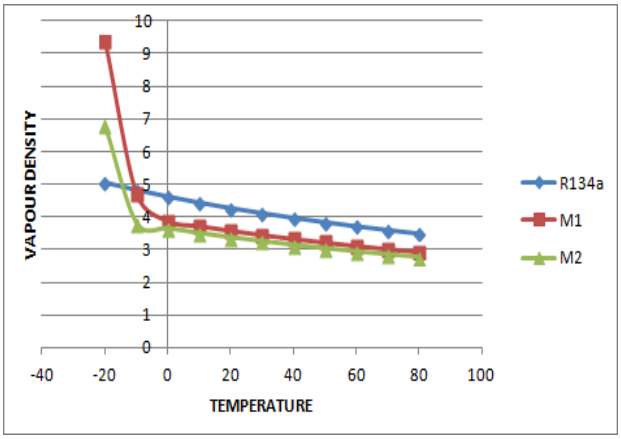

Figure 5.2 Vapour density vs temperature

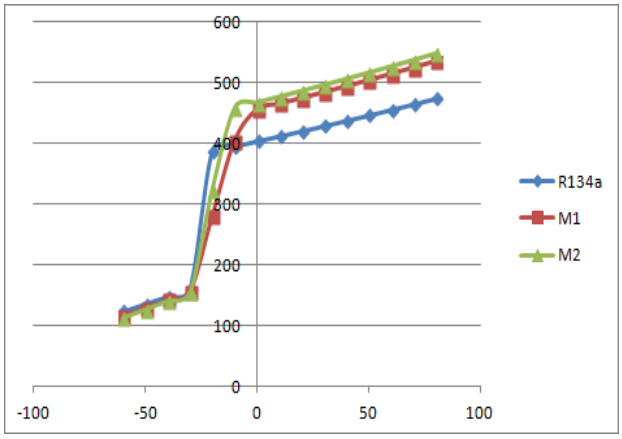

Figure 5.3 Variation in enthalpy with keeping constant temperature

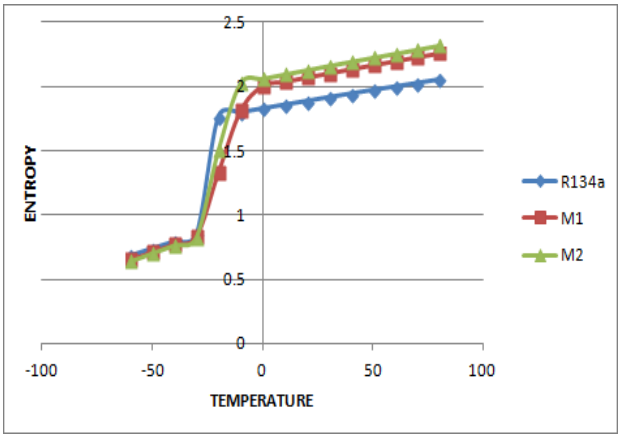

Figure 5.4 Variation in entropy with keeping constant temperature

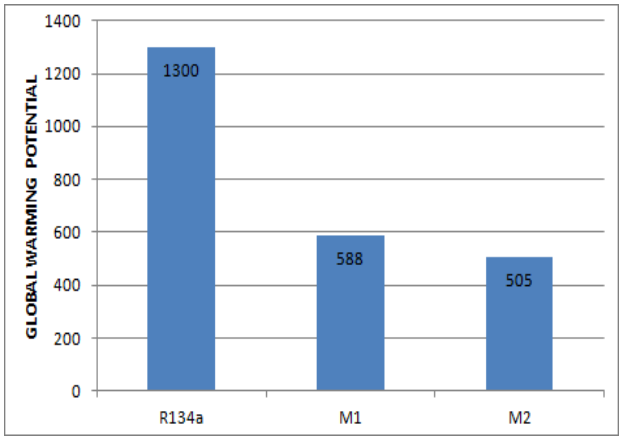

Figure 5.5 Global warming potential(GWP)

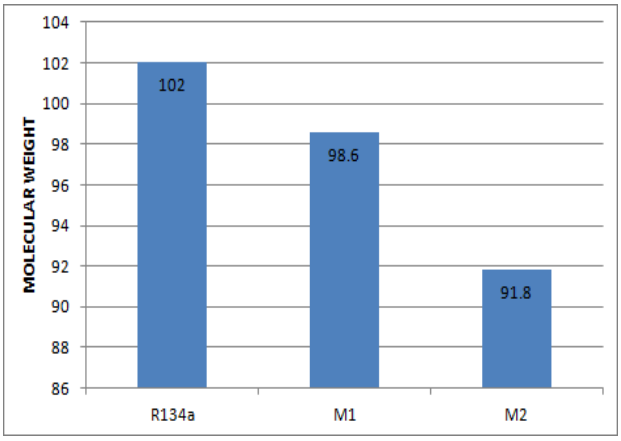

Figure 5.6 shows the molecular weight of mixture refrigerants

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V. RESULT & DISCUSSION

REFRIGERENT	R134a	M1	M2
C.O.P	5.86	6.84	6.84
Molecular weight	102	98.6	91.8
Global warming potential	1300	588	505
Ozone depleting potential	0	0	0

Table shows of R-134a comparisons with their possible replacement M1and M2 over its COP, molecular weight, global warming potential and ozone depleting potential. R134a can be replaced with M1 and M2 since both M1 and M2 has higher cop than R134a also global warming potential le less in both M1 and M2 as compared to R134a.it can also be seen that refrigerant has zero ODP. There is not much variation in molecular weight of M1 and M2 as compared to R134a. So it can be compatible in same compressor.

VI. CONCLUSION

Available 2 refrigerant samples, M1 and M2, M2 can be taken as better replacement. Both M1 and M2 has same COP but global warming potential is less for M2. Also it has high enthalpy at both liquid and vapour stage so it has higher heat extracting and releasing capacity at evaporator and condenser respectively. Also the replacement M1 and M2 are halocarbon with which is nontoxic and non flammable. Hence M2 can be suggested as best replacement.

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