A Review on Cascade Refrigeration system

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***Abstract*- In this paper a review of Cascade refrigeration system is done. It is a combination of two or more vapour compression refrigeration system used for low temperature refrigeration. Various experimental studies has been carried out by using different combination of refrigerant to improve overall Coefficient of Performance, evaluating the condenser, evaporator temperature and pressure, cooling capacity, energy saving and environmental aspects. Review says use different combination refrigerant meet the desired conditions.**

***Index terms*- Cascade system, two stage refrigeration system, coefficient of performance, various refrigerant**

I.INTRODUCTION

In a cascade refrigeration system, two or more vapor-compression cycles with different refrigerants are used. The evaporation-condensation temperatures of each cycle are sequentially lower with some overlap to cover the total temperature drop desired, with refrigerants selected to work efficiently in the temperature range they cover. The low temperature system removes heat from the space to be cooled using an evaporator, and transfers it to a heat exchanger that is cooled by the evaporation of the refrigerant of the high temperature system.

II. LITERATURE SURVEY

Messineo et.al [1] the thermodynamics analysis of a R744–R717 cascade system and of a R404A two-stage system has been carried out and noticed that's for condensing temperature from 35°C÷ 40°C decrease in COP with decrease is by 27% for the cascade cycle and evaporating temperature -50°C÷ 35°C increase in COP with increase is by 50% for the cascade cycle.

Akash Shakya et. al [2],study is carried out by using T-S diagram of cascade refrigeration system and concludes that's COP increases with increase in LTC evaporater temperature and decreases with increase in HTC evaporator temperature.

Mançuhan E et al. [3], a comparative analysis of cascade refrigeration system is carried out to analyze the energy efficient and environmental friendly system and finds that the environmental impact caused by system will decrease by having an efficient system rather than having a refrigerant with a low GWP.

Umesh C. Rajmane [4], a cascade refrigeration system using as refrigerant (R23) in low-temperature circuit and R404a in high-temperature circuit found that very low temperature & cascade refrigeration system is efficient than single stage refrigeration system.

Tushar Bora et. al [5], a review on cascade refrigeration system using R134a and HC is made and suggest that's COP will increase and lower power consumption expected.

III. WORKING

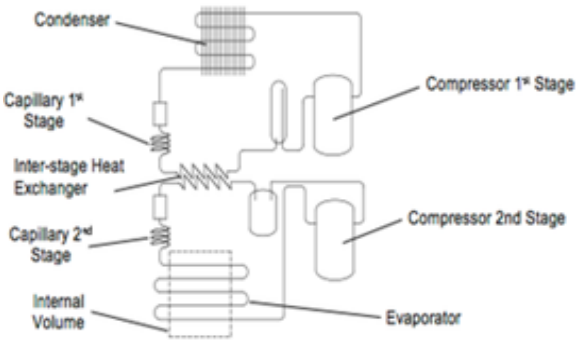
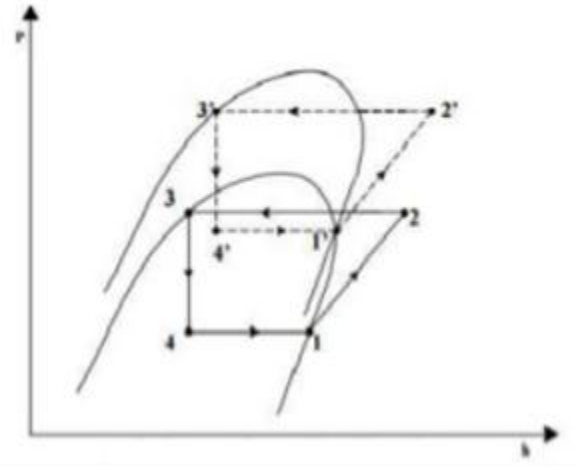


Fig: Cascade Refrigeration system

The system consists of two or more vapour compression refrigeration system in series. A two stage refrigeration system is shown in fig. A cascade condenser acts an evaporator for high temperature cascade system and a condenser for low temperature

system. The useful refrigerating effect is produced in evaporator in low temperature cascade system. The high temperature cascade system uses a refrigerant with high boiling temperature and low temperature cascade system uses a refrigerant with low boiling temperature. This system has higher coefficient of performance.



p-h diagram for cascade refrigeration system

IV. CONCLUSION

The various kind of experiments has been carried out by using various refrigerants in cascade system to improve the coefficient of performance, to minimize the work done, varying the condensing and evaporator temperature range. Focus should be made to increase the refrigerant effect, the use various refrigerant combination to reduce cost and to minimize the heat transfer.

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