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A Review Paper on Experimental Investigation of Effect of Absorber Volume on Performance of Vapour Absorption Refrigeration System

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ABSTRACT

This paper focuses on the construction of a vapor absorption refrigeration unit, intended to operate in a 20^0c environment, with a compartment temperature of 3^0c. Gas absorption systems, unlike Vvapor-compression systems, use a heat source to facilitate refrigeration. Vapor absorption refrigerators use here electricity to heat the generator by an electric heater and 12 V DC motor pumps for delivering the aqua ammonia solution from absorber to generator. Unlike the vapor-compression cycle, which utilizes pressure gains and drops to produce refrigeration, the vapor absorption cycle uses the principle of partial pressure between two fluids to create the cooling effect. Extensive analysis of thermodynamics, heat transfer, and chemical properties of a two fluid absorption system was conducted to design and construct the structural model.The objective of this work is to design amonia water refrigeration system and what is the effect of absorber volume on Coefficient of Performance.

Keywords- Ammonia, absorber,coefficient of performance,concentration,vapour

I. INTRODUCTION

1.1 Objective of work

Development of water cooler using a Vapour absorption system based on water-ammonia as refrigerant and 500 watt air heater as heat source [2] that will represent the exhaust gas heat recovery, heat exchanger will be a modified spiral fin heat exchanger using cylindrical flat heat pipes for maximum heat recovery. The main aim is to find out coefficient of performance by preparing proper model of vapour absorption system by using generator, absorber, evaporator, pump, capillary tube etc. Experimental COP will be compared with theoretical. Later, volume of absorber changed and then what effect on COP takes place.

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1.2 Need of Project

Widespread efforts are currently underway to utilize available energy resources efficiently by minimizing waste energy and develop replacements for the traditional refrigerants (CFCs and HCFCs), which contributes to ozone depletion and greenhouse warming. Absorption chillers which are heat-powered refrigeration systems have got more and more attention, due to the recognition of rational utilization of energy and the concerns about ecological problem. The ammonia-water mixture is environmental friendly, which is the only working pair currently used for refrigeration purposes in absorption systems, and despite of the new mixtures under investigation, the ammonia-water mixture is the only one with a clear future. The principle of the absorption is providing the necessary pressure difference between the vaporizing and condensing processes, which alternately condenses under high pressure in the condenser by rejecting heat to the environment and vaporizes under low pressure in the evaporator by absorbing heat from the medium being cooled.

This paper helps in the development of water cooler using a vapour absorption system based on amonia as rerfrigerant and water as absorbent. 500 watt as air heater is used as heat source that will represent exhaust gas heat recovery. And accordingly we want to know that as per heat recovery how much quantity of mass flow of absorber volume will be send to generator so that we can get maximum coefficient of performance.

1.3 WORK

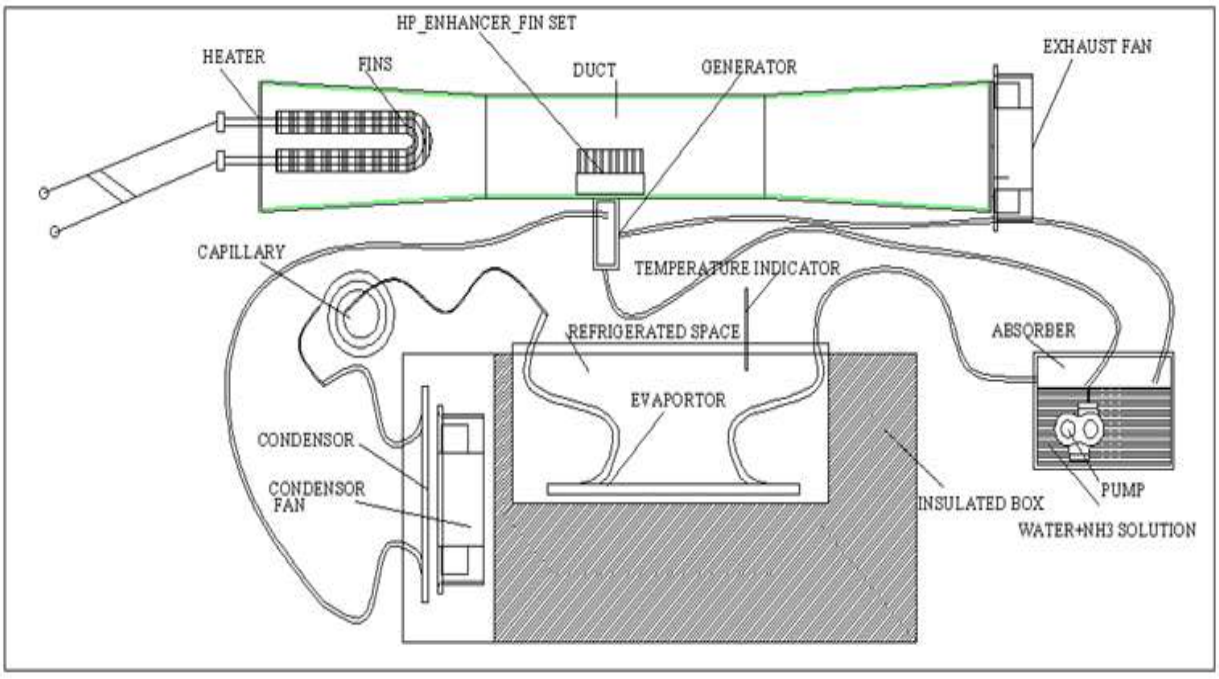

Fig1: Model Preview

$$COP = \frac{Q_e}{Q_g + W_p}$$

where,

Qe = Refrigerating effect,

COP = coefficient of Performance

Qg + Wp = Sum of work done by pump and generator

II. LITERATURE SURVEY

Various research papers has been reviewed for present work done in the field of Vapour Absorption syatem.

A- Trial on Vapour absorption refrigeration system by taking various proportion [1]

Harish Shingane,Arpitsingh Kanpuriya,Darshan Ranekar,Sachin Hakdale,AshishJumnake and Prof. Saurabh Rathod presented a paper on Experimental set up of vapour absorption refrigeration system by using NH3-H2O refrigerantwith various proportion. They observed that performance of NH3-H2O pair is good by maintaining proportions of ammonia and water. The range of C.O.P. for the aqueous ammonia system is (0.5 to 0.8) when the generator temperature is upto 60 ^{0}c. The range of minimum evaporator temperature is (25 ^{o}c to 30 ^{0}c). They increased quantity of ammonia step by step and decreased the quantity of water for each reading.

B-Trial of Cooling of a truck cabin by vapour absorption refrigeration system using exhaust gases heat [2]

Shekhar D Thakre, Prateek D Malwe, Rupesh L Raut, Amol A Gawali. They f ocused towards design and development of an air cooling system for cabin of truck using waste heat from exhaust. It means exhaust gas heat has so much potential that by using this heat we can cool truck cabin without any disturbance on engine performance of truck.

By reviewing above two papers and referring with reference book i found following research gap.

2.1 Research Gap

From study of above literature some points found that,maximum work were done by many authors regarding of experiments vapour absorption syatem using aqua amonia solution. Here main refrigerant is amonia and water as absorbent. We can set proper mass flow of absorber volume to circulate through syatem to get maximum coefficient performance.In my work i have not taken proportion of ammonia and water istead of I adjusted the mass flow of absorber volume and cop is calculated which will be benificial for society and young Engieers.

III. CONCLUSION

From literature review following conclusions can be drawn

1. Vapour absorption can be run on low grade energy.
2. This system is noiseless and pollution free.

3. For better working of vapour absorption system, the concentration of solution should be carefully studied because concentration difference is the main cause for mass transfer while temperature difference is the main cause for heat transfer.

IV. FUTURE SCOPE

In future we can use MINITAB software and optimization can be done for coefficient performance.

REFERENCES

JOURNAL PAPERS

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[2] Shekhar D Thakre, Prateek D Malwe,Rupesh L Raut, Amol A Gawali,Cooling of a truck cabin by vapour absorption refrigeration system using engine exhaust, *IJRET,eISSN:2319-1163IpISSN:2321-7308*

BOOK

[3]A course in Refrigeration and Air-Conditioning by Domkundwar, Arora.

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Dr.V.H.Patil has received his Ph.D.degree from Amaravati University in 2018. His title of Ph.D thesis was **"Failure analysis and performance evaluation of boiler Tube in Thermal power Station."** His specialization is Tribology and Maintenance Engineering. Today he is working as Associate Professor and Head of Mechanical Engineering Department in Godavari College of Engineering, Jalgaon which is affiliated with North Maharashtra University, Jalgaon in Maharashtra State (India).