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A STUDY AND ANALYSIS OF VARIOUS REFRIGERATION SYSTEMS

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ABSTRACT

A refrigeration system is transfer heat from space to be cooled to a high temperature sink. Operating temperature and coefficient efficiency are important factors for refrigeration systems. The coefficients of the operating system work to be done works/are to be done on the system as the ratio of the refrigeration effect. The property of the refrigerator also plays an important role in the refrigeration system. This analysis is running on various refrigeration and heat pump systems. The main objective is to understand the energy of the heat, heat pump system and the power system. The overall main objective is to accomplish the thermodynamic analysis of the refrigeration and heat pump systems and study their thermodynamic viability.

Keywords: *Refrigeration system, C.O.P., Vapor compression refrigeration, Vapor absorption refrigeration, exergy*

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INTRODUCTION

A refrigeration device uses electric motor powered work to transfer heat to cool in a high temperature sink (hot water to cool). Refrigerators work on theory that at low temperature the boiling liquid absorbs thermal energy to evaporate after evaporation, so that they get cooled in the cooling region. When comparing the advantages and disadvantages of various heating systems, two important criteria e.g. operating temperature and efficiency coefficients have significant significance in these systems.

There has been extensive research on various refrigeration and heat pump systems in the current review. The main idea was to have a possible future of research.

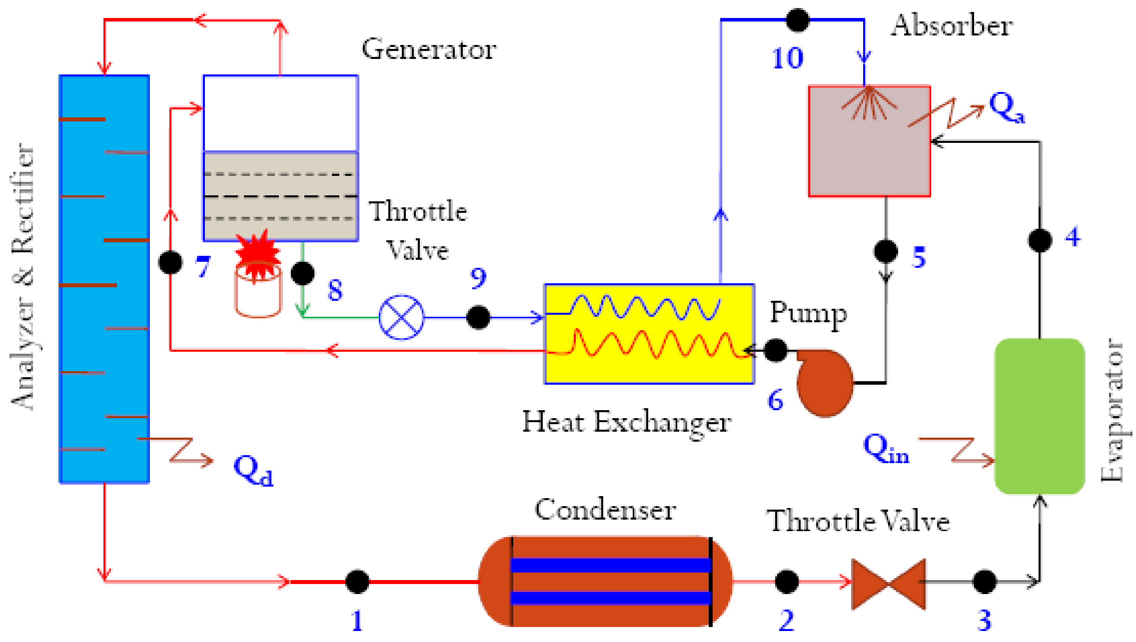
LITERATURE REVIEW

The literature review has been classified as under:

1. Vapor Absorption Refrigeration Systems.
2. Vapor Compression Refrigeration Systems.
3. Vapor Compression-Absorption Refrigeration Systems

1. Vapor Absorption System

Vapor absorption system is an attractive method to use to cool down the low-grade energy. This is an important advantage against conventional steam compression systems that works on high grade energy. Another important component of this system is that it does not use any moving components except a small liquid pump. The steam absorbent system consists of four basic components. An evaporator, a sucking (located on low pressure side), a generator and a compass (located at the high pressure side). The refrigerator flows to evaporate from the atmosphere, then facilitates the generator and returns to the condenser, from the sucking absorber to the generator and back to the absorber. For maximum efficiency, pressure differential between low pressure sides and high pressure outside is as small as possible. Nevertheless, the initial cost of these systems is currently high but their operating expenses are substantially low, which can be reduced by efficient absorption and upward movement. Since the efficiency of this process is largely determined by the thermodynamic properties of the refrigerant-subsbet composite, the extensive study of this properties are very important in the development of an effective refrigeration cycle.



(Fig. 1 Vapor Absorption Refrigeration System)

Most researchers have researched steam-sucking refrigeration using a different working pair, and the most common working pairs are LeBee-H2O and NH3-H2O.

Alizadeh et al. carried out theoretical study on design and optimization of water – lithium bromide refrigeration cycle. They concluded that the high generator temperature in the given refrigerating capacity causes low cooling heat and high cooling ratio with low cost. There is a limit for water lithium bromide cycle due to crystallization problems.

Anand and Kumar analyzed that single and double results calculate the inevitability in the system components of the syllabus flow water lithium bromide absorption system. Assuming parameters for measuring results, single-effects respectively, and double-effect system, there were 87.8 °C and 140.6 °C of condenser and absorbent temperature.

Tyagi studied aqua-ammonia VAR system in a detailed study and created the coefficient of efficiency, mass flow rate, the functioning of operating parameters such as absorption, evaporation and generator temperature. He showed that the coop and the work are done evaporation, sucking, and condenser and generator depends on the temperature and properties of the binary solution.

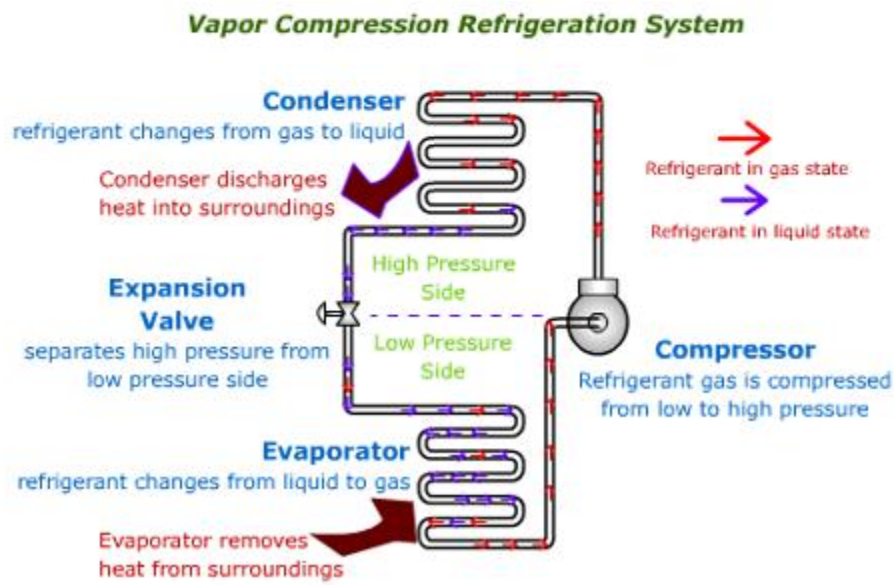
Ercan and Gogus showed the irreversibility in components of aqua-ammonia absorption refrigeration system by second law analysis. The quantity of each element is non-standard; the quality coefficient of computational performance, the coefficient of performance and the quantity of different generators, absorptive evaporation and condenser temperature is quantified. They concluded that the aqua-ammonia system needs to be cleansed for high ammonia certification but it will cause extra excise in the system. They monitor the top exergy damage and subsequent absorption in evaporation. I was also concluded that the dimensional less total exergy loss depends on generator temperature.

Oh et al. investigated a gas fired, air cooled LiBr/H20 double effect parallel flow type absorption heat pump of 2TR being used as an air conditioner. He checked the work of absorption heat pump in a heating mode through cycle simulation. They absorbed the characteristics of the system by absorbing the air inlet temperature, absorbing the solution of the working solution, the solution of satisfactory mass, the mass of the absorptive liquid, and the solution at the remaining temperature. Changing the heat components. They concluded that there exists a critical value of the solution distribution ratio that maximizes the cooling performance of the system.

2. Vapor Compression System

In vapor compression system there are four major components: evaporator, compressor, condenser and expansion device. Electricity is provided to the compressor and heat is added to the system after evaporation, whereas condenser gas discharged out. Rejection of heat and heat loss is unsatisfactory for different refrigerants. The standard vapor compression cycle has four processes. A reversible adiabatic compression from saturated vapors to compressor pressure which leads to constant pressure of D-super hitting/heating and congestion.

This is further extended to an irreversible expansion at constant enthalpy from saturated liquid to evaporator pressure and there after a reversible heat addition at constant pressure causing evaporation to saturated vapor. vapor compression refrigeration systems are the most commonly used amongst all refrigeration systems. As the name implies, these systems belong to the general class of vapor cycles, wherein the working fluid (refrigerant) undergoes phase change at least during one process. In a vapor compression refrigeration system, refrigeration is obtained as the refrigerant evaporates at low temperatures.



(Fig. 2 Vapor Compression Refrigeration System)

Keshavani and Rastogi removed the optimum inter-stage pressure in the two-phase VCR system for the refrigerant CFC 12. They do research on the minimum findings in the entire compressor work.

From the Arora and Dhar, Katz (1962), R-12 used different levels of importance for resolving the issue of pressure distribution at optimal intervals in multi-level compression systems. They concluded that the optimum inter-stage pressure is equivalent to the geometric media of convergence and evaporation pressures, but when the flash intermediate cooler was included, they found very different differences between the geometric medium and the optimum pressure values.

Prasad determined the optimum inter stage pressure in a two stage vapor compression refrigeration system for the refrigerant R-12 with a view to maximize the COP. They concluded that the inter-stage temperature of a two-stage refrigeration cycle is given by the geometric mean of the condensation and evaporation temperatures.

Kumar et al. explained a method of carrying out exergy analysis on a vapor compression refrigeration system using R-11 and R-12 as refrigerants. They presented the exergy-enthalpy diagrams to facilitate the analysis. They explained the procedure to calculate various losses in different components of the system.

McGovern and Harte presented an exergy method for compressor analysis. This is used to find and quantify defects in the use of compressor shaft power and will lead to the improvement in design of the compressor. The exergy destruction and its location are identified. As a refrigerator, they checked using refrigerant compressor R-12. He presents an instant graph of exergy destruction. It concluded that it is particularly suitable for applications for computer simulations of compositions and provides a deeper base for design optimization.

3. Vapor Compression-Absorption System

Vapor compression-absorption heat pump / refrigeration cycle shows a cycle in which the vapors are mechanically compressed, absorbed and then discouraged using a liquid solution cycle. This system can be considered as a hybrid system between conventional vapor compression and steam exploitation systems. Hybrid Vap Compression / Absorption Heat pump bicycle introduces two well-known heat pump concepts, compression heat pump and absorption heat pump. It uses a mixture of refrigerants as the working fluid, one as the absorbent and the other as the desorbent. A key advantage of the hybrid heat pump is the extended range of temperatures available for a mixture compared to pure refrigerants. This is the effect of the reduced vapor pressure obtained for a refrigerant in a mixture with less volatile component. Another advantage is that the absorbent and danger provides gliding temperatures. In the process of heat exchanges in working substances, and in improper system performance, the inelasticity of the results decreases.

Pourreza-Djourshari and Radermacher presented the performance calculation of two vapor compression heat pump cycles, one with single stage solution circuit and the other with two stage solution circuit. The selected active fluid is R22-DEGDME. He found that compared to R-22, there has been significant increase in COP in both chakras. The results indicate that there is a significant reduction in the control capacity of 7: 1, 50% and the pressure resistance compared to conventional R-22 bicycles.

Radermacher examined the performance of vapor compression heat pump cycle with desorber/absorber heat exchange working on R-22-R-113 mixture using successive substitution method. The results showed an improvement in the cooling COP by 57% and a reduction in pressure ratio by 69% compared to a conventional R-22 cycle.

Stroker and Trepp presented the first simulation model which includes the calculation of the overall heat transfer resistance. The heat transfer resistance has been measured as a large amount of flow rate for the pairing NH3-H2O running from experimental data. He also designed a compressed heat pump with solution circuits and presented experimental results. Trial plants make water chill from 40 to 15oC by 40 to 70oC of water. The COP of 4.3 has been measured and 23% is energy saving.

George et al. studied the performance of compression-absorption heat pump working on R-22-Dimethyl form amide (DMF) through thermodynamic analysis. The heating COP, concentration difference and the circulation ratio are calculated by varying compression ratio The assumption that taken is not evaporated in the observed temperature required to improve the absorption; The absorption of the balanced condition exits and exists at disarray; The efficiency of the heat exchanger is 100%; Anthropic compression in the compartment; Pressure deflagration and increased saturated gas is minimized and there is no pressure drops in different components. They concluded that the temperature of COP6 or higher is higher than 60 degrees centigrade and temperatures above 60 ° can increase.

Amrane et al. developed two simulation models, one for vapor compression cycle with single stage solution circuit and another for vapor compression cycle with two stage solution circuit utilizing NH3-H2O mixture. The analysis of heat exchangers has been carried out by using UA values as input to program.

CONCLUSION

On the Compressor-absorption system, optimization of the thermometer was carried out to find the optimum working condition for the outer condition of the literature. The temperature gradient in the absorbent is optimized. Literature shows that the costs of the systems are requisite to be reduced because this system is more traditional than VC and VA system.

Materials research in the context of vapor compression systems has shown that ammonia, propane, natural refrigerators are halogen-free and are safe for the environment. Many researchers have conducted theoretical and experimental checks on alternative refrigerators. Most things are spoken about the replacement of the R-22 but the right choice is still been searched. The literature on exergy analysis of vapor compression refrigeration system is available but the exergy analysis of such system with variable refrigerant charge is not reported.

Due to the increase in the cost of our existing resources, the advantage of reducing the loss of use of this energy is very important and necessary. Exercise analysis is a major area for effective system improvements. Analysis of existing energy and energy pump systems is used to improve the system. The main purpose of the study is to find ways to improve the system and improve the system in order for maximum indispensability. The only purpose is to complete the thermal analyzes of refrigeration and heat pump systems and to study thermodynamic viability.

REFERENCES

1. Alizadeh, S., Bahar, F., Geoola, F. (1997). Design and optimization of an absorption refrigeration system operated by solar energy. *Solar Energy, 22*, 149-154.

2. Anand, D., Kumar, B. (1987). Absorption machine irreversibility using new entropy calculations. *Solar Energy, 39*, 243-256.

3. Tyagi, K.P. (1988). Design parameters of an aqua-ammonia vapor absorption refrigeration system. *Heat recovery systems & CHP, 8(4)*, 375-377.

4. Ercan A., Gogus, O. (1991). Comparative study of irreversibilities in an aqua-ammonia absorption refrigeration system. *International Journal of Refrigeration, 14*, 86-92.

5. Oh, M.D., Kim, S.C., Kim, Y., Kim, Y. (1994). Cycle analysis of an air cooled LiBr/H2O absorption heat pump of parallel flow type. *International Journal of Refrigeration, 17*, 555-565.

6. Keshwani, H.B., Rastogi, K.V. (1968). Optimum inter-cooler pressure in multistage compression of refrigerants, All India Symposium on Refrigeration. *Air- Conditioning and Environmental Control in Cold Storage Industry, E6*. 1-13.

7. Arora, C.P., Dhar, P.L. (1973). Optimization of multistage refrigerant compressor, Progress in Refrigeration Science and Technology. *XIII International Congress of Refrigeration (IIR),* 693-700.

8. Prasad, M. (1981). Optimum interstage pressure for two stage refrigeration system. *ASHRAE Journal, 23*, 58-60.

9. Kumar, S., Bugarel, R. (1989). Exergy analysis of a compression refrigeration system. *Heat Recovery Systems and CHP, 9(2)*, 151-157.

10. McGovern, J.A., Harte, S. (1995). An exergy method for compressor performance analysis. *International Journal of Refrigeration, 18(6)*, 421-433.

11.Pourreza, S., Radermacher, R. (1985). Calculation of the performance of vapor compression heat pumps with solution circuits using the mixture R-22- DEGDME. *International Journal of Refrigeration, 9*, 245-250.
12. Radermacher, R. (1987). Vapor compression heat pumps with desorber/absorber heat exchange. *International Congress of Refrigeration, Vienna, Austria*, 1061-1066.
13. Stokar, M, Trepp, C. (1987). Compression heat pump with solution circuit part-1: design and experimental results. *International Journal of Refrigeration, 10*, 87-96.
14. George, J. M., Marx, W., Srinivasa, M. (1989). Thermodynamic analysis of R22-DMF compression-absorption heat pump. *Heat Recovery Systems & CHP, 9(5)*, 433-446.
15. Amrane, K., Rane, M.V., Radermacher, R. (1991). Performance curves for single stage vapor compression cycles with solution circuit. *Journal for Gas Turbine and Power, 113(2)*, 221-227.