A Comprehensive in Depth Study of Domestic Refrigerating Systems

Sumit Kumar Choudhary
M. Tech
R.K.D.F Institute of Science and Technology
Bhopal (MP), India
sumitkumarrkdf2020@gmail.com

Dr. MK Chopra
HOD
R.K.D.F Institute of Science and Technology
Bhopal (MP), India

***Abstract* –Refrigeration systems are essential in everyday life, especially when it comes to food storage and preparation, as well as safety and convenience. The primary function of a home refrigerator is to preserve the quality of perishable goods. The efficiency of the refrigerator, which is largely determined by temperature distribution and air flow in the compartments, is critical to this quality. Thus, in this paper, we are attempting to shed light on the work of investigators by experimenting on various geometries of the refrigerating system in order to improve their efficiency. In addition, we have attempted to provide an overview of the DAR cycle as well as the components of the refrigeration system, which will aid scholars in understanding the fundamental operation of cooling systems.**

***Keywords:*Refrigerating system, Gas Refrigerating cycle, Condensers, Evaporators, Compressors, DARS Cycle, Vapour compression refrigerating system.**

I. INTRODUCTION

Refrigeration systems utilizes a coolant fluid that captures heat from low-temperature areas and dismisses it at higher-temperature areas via a phase transformation. The majority of widely used coolants are toxic to the environment. The coefficient of performance (COP) in a cooling system is calculated as the proportion of the rate of heat retention in the evaporator to the mechanical power input to the compressor. It is used to evaluate the cooling procedure. An upsurge in the evaporator's heat elimination rate or a reduction in compressor work will thus contribute to enhance the cooling system's COP. Nanofluids' exceptional performance in boiling and condensation heat exchange, as well as their superlative thermo-physical characteristics, have led to their use in cooling system. The improvement of boiling properties due to the accumulation of nanoparticles existing in nanofluid plays a prominent role.

Refrigeration systems play a critical role in daily life, particularly when it comes to food preservation, general wellbeing, and convenience. A residential refrigerator's primary purpose is to preserve the freshness of perishable goods. This quality has an impact on the refrigerator's efficiency, which is largely defined by temperature distribution and air circulation in the containers. So many research for refrigerators relying on vapour compression have been conducted, with a particular emphasis on temperature distribution and air circulation in the compartments. Operation on air velocity by employing the particle image tachymeter (PIV) methodology, as well as 3D digital simulations using CFD software, is to be discussed in the literature.

The majority of research focuses on the thermos-physical characteristics of nano-refrigerants. The need for nano-refrigerants is thought to aid in the development of light, tiny, and energy-efficient cooling system. Refrigeration systems in the chemical sector are mostly made up of standard features that can be found in a variety of industries. Owing to circumstances including temperature variation demand, capacity needs, varying loads, dangerous locations, and the appearance of chemical solvents, the chemical sector requires fabrication and performance that differs from commercial establishments. The systems are typically designed by specialists, with process engineers supplying design criteria.

The temperature distribution has already been found to be influenced by the refrigerator's intrinsic configuration, specially in the areas in between cold storage cabinets and the liner's lowest part surface. We can assert from this digital simulation of a forced convection refrigerator that the refrigerated and fresh food compartments are in phase (synchronized). The study proposes a new home decorating using the modelling. In addition, in reaction to the exploration of choosing a cooling systems, some technologies are emerging, including those with thermal activation (solar, geothermal, waste heat, etc.) that, relying on the level, lead to a decrease of gases. Zero involvement to global warming and greenhouse gasses. Fluids used in the used in the workplace as they are convenient and useful, diffusion evaporative refrigeration systems are commonly used in household uses such as hotel rooms. Despite the fact that these structures can run consistently for many hours, they are only suitable for low-cooling refrigerators.

Diffusion absorption innovation investigation aims at assessing multiple combinations, implementing nano-refrigerants, analyzing trends, and boosting energy efficiency, along with other stuff.

Refrigeration systems, used for whether industrial or residential purpose, they are used frequently because they

execute the critical task of maintaining a constant temperature. Many stages go into selecting and experimenting a coolant, including identification of a suitable chemical substance based on its characteristics, measuring its effectiveness in exact cooling operations, matching desirable specifications, and so on. Furthermore, because of rising health, safety, and environmental problems, the coolants chosen for use must meet environmental, protection, and conservation requirements.

As a necessary consequence, there is now a continuing interest in developing innovative coolants that are far superior to those publicly known. In this specific instance, a computer-aided tool, such as virtual reality, that can comprehensively lead the designer by the procedure of coolant shortlisting, architecture, and proof of identity would have been extremely useful, particularly if it can instantly and dependably distinguish worthy prospects and thus minimize time and expense for coolant development relying on trials only towards the end to validate the performance of a specific cluster of suitable alternatives.

II. LITERATURE REVIEW

Hitesh Kumar et al. [1] Aircirculation and temperature distribution through such a natural convection thermal switching device in a massively moulded freezer are investigated in the present study. Three distinct layouts are investigated in the freezer and refrigerator compartments. Three different configurations are investigated inside the freezer and refrigerator compartments. A plate evaporator with a rectangular shaped finned surface is utilised in the first setup, a plate evaporator excluding a finned surface is being used in the second setup, and a plate evaporator with a perforated finned surface is being used in the third setup. ANSYS 16 Work Bench Computational Fluid Dynamics CFD software is used to run the simulations. Heat transfer between both the freezer and refrigerator compartments is ignored, and laminar air circulation is supposed.

Araştrma Makalesi et al. [2] The performance of a solar-powered diffusion absorption (DAR) cooling system is conducted in this study. The experiment employs two types of systems, including and excluding subcooling systems. Closed two-phase radiator tubes that use liquid as the working fluid are unable to use solar energy as a source of heat. From 6:00 a.m. to 4:00 p.m., ambient and hotspot temperatures of DAR systems and heat pipes, as well as DAR system pressures and radiation information, are noted, and each heat tube gathers 82.5W of solar power. At 14:40, DAR1 attained the evaporator inlet temperature of rock bottom (-14.8 ° C), while DAR2 attained -0.9 ° C after 1.55 h. DAR1 and DAR2 have COP values of 0.2362 and 0.2254, respectively.

Juan Manuel Belman-Flores et al. [3] This article evaluates the circulation and thermal behaviour of the storage area during the cooling process of a refrigerator using diffusion absorption innovation. The cooling system was modelled and simulated using CFD. The main goal was to make a comparison between the thermal behaviour of a plate evaporator involving a finned surface (reference refrigerator) and a plate evaporator with a smooth surface. Moreover, the study discussed the implications of the speed dispersion and, as a result, the temperature and velocity trajectory lines. This was also observed in the form of the grid's position within the storage area. In addition, the refrigerator's performance was measured.

A thorough and systematic computational fluid dynamics (CFD) modelling of air circulation and heat exchanging process n exchangers in an open refrigerated case (ORDC) is executed by L. C. Carrilho Gonçalves et al. [4] throughout this investigation. The physical-mathematical model takes into consideration the circulation through the interior passages as well as the heating reaction of the meals, as well as the fans and evaporators. The impact of humidity levels of air and, as a result, the heat exchanging mechanism of thermal radiation among interfaces is considered. Experiments were carried out to characterise phenomena close the physical extremities and to verify mathematical air temperature, ratio, and speed forecasts. The computer model's predictive capabilities for the optimised design and implementation of this type of device are demonstrated by comparing of experimental and numerical results.

Adnan Sozen et al. [5] The aircirculation and heat transfer in an open refrigerated case (ORDC) are modelled in this research using a comprehensive and detailed Computational Fluid Dynamics (CFD) model. The physical-mathematical model considers the flow through the inside channels, as well as the thermal reaction of the food, as well as the fans and evaporators. Humidity and heat transfer of thermal radiation between surfaces are taken into consideration. Experiments were carried out to characterize phenomena near the physical extremities and to validate numerical air temperature, ratio, and speed predictions. The ability of the pc model to predict numerical and experimental results for the optimized design and development of this type of device is demonstrated by a comparison of numerical and experimental results.

J.L. Rodriguez - Munoz et al. [6] This theory included an overview of diffusion absorption refrigeration technologies, including their primary features related to the refrigeration system, implementations, working fluids, patterns, and shortcomings. Due to higher demand for refrigerating systems and air conditioners, more than 70 journals in the profession were analyzed, and it was realized that diffusion absorption technology could be a complementary and feasible option within the field of small ability efficient technologies employed for cooling.

J.M. Belman - Flores et al. [7] An mathematical model of the bubble pump in a commercial diffusion absorption

refrigerating system is discussed in this paper. Moreover, the energy analysis is embedded into a heat exchanging model and accompanied with a thermo-dynamic model in order to determine the refrigerating performance of the refrigerators and thus the cooling system's coefficient of performance as a component of dimensional and functioning variables such as thermal input. The proportion of NH3 at the bubble pump's inlet divided by the diameter and length of the bubble tube. The findings demonstrate that geometric parameters such as the diameter ratio and length of the bubble pump tube, as well as the heat input inside the bubble pump, have the greatest impact on cooling performance and COP.

Souha Mazouz et al. [8] Investigational and thermo-dynamic research on a billboard absorption diffusion device are introduced in this report. The machine's cooling characterizations and performance are evaluated using two different methodological approaches: static and vibrant. The complete heat transfer coefficients (UA) ext and (UA) int, 0.43 WK - 1 and 0.21 WK - 1 are ascertained especially for the complete heat transfer coefficients (UA) ext and (UA) int, 0.43 WK - 1 and 0.21 WK - 1 respectively. The testing is performed in real-world settings with changeable thermal loads and ambient air. For a heat supply of 42 W and a generator temperature of 185 ℃, a COP of 0.12 is observed.

Employing the experimental observations temperature readings as boundary conditions indicated for an ongoing wall temperature, Ozgur Bayer et al. [9] aim to simulate the liquid circulation and temperature distribution throughout a single commercial cool place, considering the technical glitch of natural convection in household refrigeration implementations. Free convection is a three-dimensional (3D), turbulent, transient, and accompanied non-linear circulation issues in refrigeration implementations. The method of radiant heat transfer is also taken into consideration. Taking into account the effects of radiation does not dramatically affect the temperature distribution inside the refrigerator, which is compatible with the conclusions. The heating rates, on the other hand, are significantly affected.

Adnan Sozena et al.[10] An investigational analysis was carried out in order to improve the performance of a diffusion absorption cooling system (DARS) was developed. Three DARS cycles were discovered and researched for the laboratory activity. I The condensate is rapidly cooled prior to actually accessing the evaporator from the coupled evaporator / heating system exchanger in the initial cycle (DARS-1), that is the most widely accepted model in sector, similar to refrigeration systems produced by Electrolux Sweden. (ii) The condensate isn't super cooled prior to actually accessing the evaporator in the second session (DARS-2), so the heating system of exchanger is detached from the evaporator, as Zohar suggests. (iii) throughout he third session (DARS-1WE), using the new proposed system during this study, that also distinguishes from the DARS-1 in some ways, and in which an ejector is installed at the DARS-1's absorber inlet.

This article by Abdullah Yildiz et al. [11] discusses the thermodynamics of a DAR (Diffusion Absorption Cooling) cycle. The experimental setup is similar to an NH3-water-DAR cycle with helium acting as a noble gas auxiliary. A thermo-dynamic model with density, energy, and exergetic adjustment formulae is introduced for every element of the DAR cycle. The validity of this model is then done by comparing it to experimental evidence. Energy and energy losses are assessed and represented for each system element in thermodynamic analyses. The efficiency of the plant, as well as energy and energy losses, are investigated.

[12] Q. Wang et al. This research looked into a diffusion absorption refrigerator (DAR) that uses the binary refrigerant R23 / R134a, the absorbent DMF, and thus the extra helium noble gas. The findings demonstrate that at the necessary generation temperature, ambient temperature, and heat source temperature, the input variables have a significant impact on the coefficient of performance (COP): system pressure, abundant solution composition, rectifier rectifier effect, and helium to refrigerant blended proportion. Whenever the heat capacity ratios of the latest and cold working fluids usually correspond inside this coolant recuperator to the requisite constituents of the rich solution, the rectifier rectification effect, and thus the proportion between helium and mixture, the optimum system pressure, which coincides to the highest COP, is achieved.

N. Ben Ezzine et al. [13] This is the topic of this article. Solar-powered heat from mainstream plate collectibles or vacuum tubes as well as being the machine for copper, an easily obtainable metal and excellent heat conductor. At a cooling water temperature of 9 to 11 ° C and temperatures of -10 to +10 ° C, the cooling power is between 40 and 47 W, and cold is actually created at a pipe temperature of 120 to 150 ° C.

Kai - Shing Yang et al. [14] An in-depth computational domain of the performance of a housing fridge with a highest configuration is utilized for the study, followed by a confirmation laboratory activity with a real refrigerator. The analysis shows that the mathematical simulation's temperature distributions are quantifiably consistent with the experimental dimensions. The on/off control scheme causes cyclic temperature variations in the freezer, refrigerator, and vegetable storage containers. The temperature fluctuations in the freezer and refrigerator appear to be in phase with each other, whereas this temperature extremes in the veggie storage area appear to be slightly out of process with the other different compartments.

III. ADSORPTION

Whenever solute molecules connect with the substrate by excluding the formation of covalent bonds, this is referred to as adsorption at an interaction. The gaseous phase or the liquefied phase can both adsorb to a solid substrate. The partial pressure or substrate concentration, respectively, are the major processing variables. Since the mean kinetic energy (KE) of the molecules and there are collision frequency through the surface raises as the temperature rises. thus effect of temperature is an important aspect in adsorption procedure.

Desorption occurs whenever an adsorbed molecule ends up leaving the interaction after needing been reabsorbed here anyway. The adsorption process is the substance over which adsorption happens, and the solute is termed as the adsorptive prior to actually adsorption and the adsorbate in the adsorbed mode. The Langmuir model is the basic means to quantitatively describe adsorption at an interaction. The solute molecules are tinier than that of the neighbourhood of the adsorbent in this framework, and all adsorption sites are roughly comparable. The adsorption process is confined to a single layer, and the relationships between the solvent and the adsorbate location are recoverable. The portion of inhabited locations, characterizes the adsorption mechanism in this situation. Whenever a solute occupies a surface site, connectivity to neighboring sites is not constrained.

Due to its noise - free, non-corrosive, and ecologically friendly procedure by employing low-grade heating elements, particularly solar energy, adsorption refrigeration techniques has grown in importance over the last thirty years. Although a variety of adsorption refrigeration architectures have been established, they are still unable to stay competitive with classical vapour compression cooling systems.

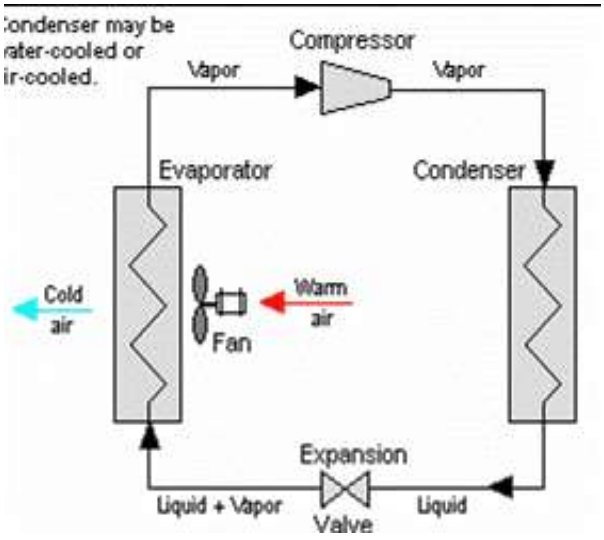


Figure 1 Simplified Vapor Compression Refrigeration System

Refrigeration is the practice of developing freezing temperatures that are lower than the ambient temperature. Unless heat is transported from a low temp region to a high temps zone is this conceivable. Undoubtedly, this is not conceivable even though heat keeps changing from high to low temperature as the flowing fluid from high pressure to low pressure, the existing keeps changing from high to low voltage, and the gas circulates from high concentration to low concentration. This implies that cooling system appears to be trying to defy both nature and the second law of thermodynamics, that also states that heat cannot be transferred from a low to a high temperature variations excluded the usage of an external entity. The compressor, that is the most prevalent refrigerating technique, is the exterior refrigeration means of communication.The compressor, condenser, and expansion equipment, evaporator, pipe work, and the coolant circulating medium are the 6 core elements of the most widely utilized closed vapor compression refrigeration system.

IV. CONDENSER

Condensers are deployed in chemical and petroleum processing for multiple reasons, such as filtration, refrigeration, and power generation. Almost every fractionating column uses a full or partial condenser to emulsify some or all of the overhead vapour stream, resulting in column reflux and (often) a liquid product stream. Condensers are employed in refrigeration to liquefy the high-pressure refrigerant vapour that exits the compressor. Surface condensers are heat transfers that condense exhaust from steam turbines that produce in-house power for plant operations.Boiling is reversed by condensation, and the condensing curve is identical to the boiling curve. As a result, several of the mathematical challenges encountered in reboiler assessment also apply to condensers. The non - linearity of the condensing curve and the fluctuation of liquid and gaseous characteristics over the condensing scope necessitate a region or accumulative assessment for strict estimations for wide-boiling combinations in special. In the condensation of combinations, mass-transfer impacts may be as important as they are in nucleate boiling.

Condensers are typically made up of a vacuum wrapper with tubes or parallel plates that are sometimes water-cooled or refrigerated. Appropriate positioning of the vapour intake and exit results in perhaps the most effective vapour caging route. The backing pump's capabilities has no bearing on the condenser's effectiveness; it simply continues to maintain the necessary low pressure. High permanent gas pressures, on the other hand, should be prevented because they encompass the entire the refrigeration area and decrease condenser effectiveness.

V. GAS REFRIGERATION CYCLE

The gas is deployed for cooling in the gas cooling system, Similarly like vapours are deployed for cooling in the vapour - compression and vapour absorption cycles. Whenever the gas is controlled from high to low pressure in the throttling valve, the temperature falls dramatically while the enthalpy

kept static. In a gas refrigeration unit, this concept was included.Without utilizing Freon or NH3 as a coolant, this system utilizes gas as the coolant. There have been no stage modifications in the gas all across the cycle, like there are in fluid refrigerants. In gas refrigeration system, air is perhaps the most frequently widely applied gas, also known as coolant in this scenario.

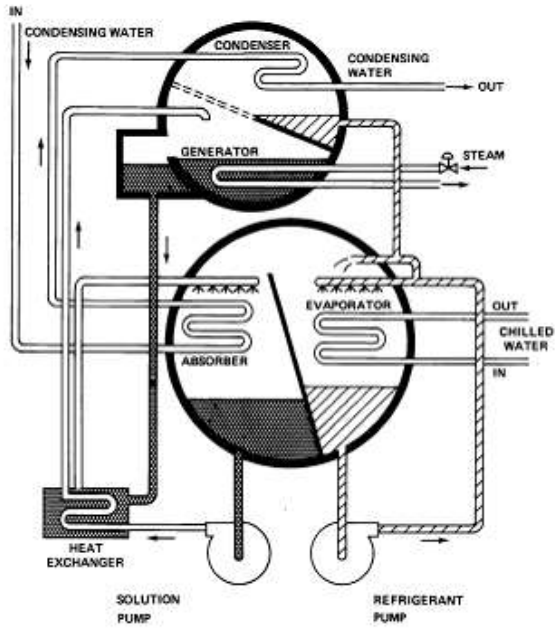


Figure 2Schematic diagram of Gas Refrigeration Cycle

The gas refrigeration cycle's elements seem to be very identical to those of the vapor compression refrigeration system. The gas passes through into the compressor at a really high temperatures and pressures. Furthermore it circulates into the heat exchanging devices, which operates similarly to the condenser in the vapour compression cycle, other than that the process of air or gas does not change. The air in the heat exchanging devices cools down but maintains its pressure.A cooling system is made up of six crucial pillars: The Condenser, The Compressor, The expansion valve or metering device, The Condenser, Materials for piping, Coolant.

Compressor

It is the cooling system's heart and soul, as it propagates the coolant all across the framework in the same way that the human heart propagates blood to the whole body. In the cooling cycle, there have been two separate pressures. The low-pressure evaporator and the high-pressure condenser. The "suction line" is the compressor's entrance. Carries vapour into the compressor at a low pressure. The compressor exit port is referred to as the "discharge line" after the refrigerant is compressed into high pressure vapour by the compressor.

Compressors are classified as reciprocating, rotary, or centrifugal. The pressure variation between the high pressure side (condenser) and the low pressure side (evaporator) of the refrigeration unit determines the compressor type. It also relies on the coolant used in the specific procedure.

Condensers

The Condenser is a device that converts water into steam. The compressor's "discharge line" connects to the condenser entrance It's high-pressure hot vapour when the coolant is compressed. The condenser fills with hot steam, which commences to circulate via pipes. From the condenser fins, cold air is ejected (usually air from a fan or water from a pump). The heat passes from the pipe to the low temperature air because the air is colder than the coolant (energy passes from hot to cold - "latent heat").

Whenever the heat from the coolant is eliminated, it achieves its "saturated temperature" and started to modify into a high-pressure liquid. The high-pressure liquid departs the condenser through the use of the "liquid line" and passes thru a filter drying system to eliminate dirt and foreign bodies before reaching the "metering unit."

Device for Expansion

Depending on the heat load of the evaporator, the meters modify the quantities of liquid coolant approaching the evaporator. Tiny, thin copper tubes known as "capillary tubes" and thermo-regulated membrane valves are commonly was using dozers.The circulation of coolant can be controlled by this valve. The valve can dynamically adjust in the evaporator's load by increasing or decreasing the rate of flow correspondingly. On the TXV, a measurement lamp is linked to the evaporator exit.

When a compressor is existent, but the fluid cannot be compressed. Compressing a fluid can result in mechanical malfunction. The compressor's valves and bearings may be damaged mechanically. This is referred to as a "liquid shot." TXVs are typically set to preserve a 10 degree superheat. This implies the gas coming back to the compressor is at least 10 degrees below the liquid risk. The dispenser tries to keep the vaporizer's exit ports at a pre - determined level of superheat. The machine liberates minimal quantities of refrigerant into the line and loses high pressure at low pressure because metering devices manage the quantity of refrigerant accessing the evaporator.

Evaporators

The Evaporator is a machine that evaporates water. At the evaporator level, heat is dissipated from the residence, corporation, or brands to be cooled. The liquid exits the distributor and emerges the evaporator at low pressure. Customarily, warm air is moved from the conditioned room to the evaporator fins by a fan. The warm air in the room is

absorbed by the colder refrigerant in the evaporator tubes. The refrigerant "flashes" or "boils" as the temperature rises, changing from a low-pressure liquid to a low-pressure cold vapour. The cycle is restarted when low-pressure steam is taken into the compressor.

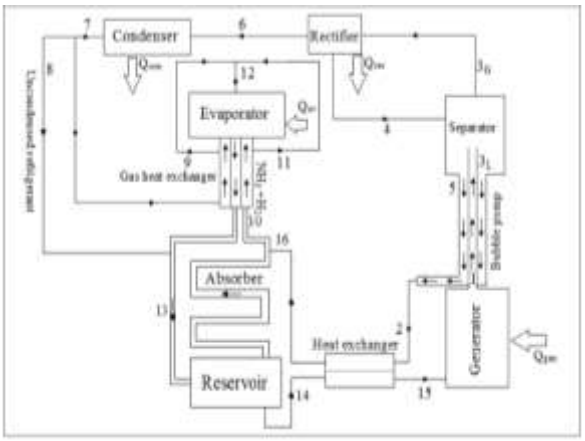
H. Flooded evaporators, which require the usage of accumulators to grant only vapour to reach the compressor, and dry expansion type evaporators. Industrial plants use flooded types, while residential as well as commercial refrigeration systems use dry expansion different kinds.

Substances for Piping

High thermal conductivity, inexpensive, ease of processing, and coolant inertness are all requirements for the pipe material. To date, soft copper has been the most widely used pipe substance for all refrigerants excluding the NH3. Even though ammonia (NH3) is very argumentative to copper, the pipe material used with ammonia (NH3) is mild steel.

VI. DIFFUSION-ABSORPTION REFRIGERATION SYSTEM

Diffusion Absorption Refrigeration (DAR) has been one of the most remarkable scientific fields in recent decades, particularly in developing countries like India. One of the main benefits of the DAR system is that it can run without electricity, lowering electricity consumption. The DAR system has low maintenance costs due to the lack of moving parts and does not contribute to ozone depletion or global warming thanks to the eco friendly refrigerant. With ammonia (NH3) as the coolant and water as the adsorbent material, the DAR cycle uses three liquids: ammonia, water, and an auxiliary inert gas, usually hydrogen. The beginning of the auxiliary inert gas plays a role in this cycle, as opposed to a traditional ammonia-water absorption cycle, by limiting the partial pressure of the refrigerant and permitting the refrigerant to drain.To offer a cooling impact, evaporate at a low temperature. Such a cooling system is utterly thermal in nature, requiring neither electrical energy nor mechanical energy.



A generator, a bubble pump, a rectifier, a condenser, an evaporator, an absorber, a gas heat exchanger (GHX), and a heat exchanger in solution (SHX) make up the DAR cycle shown above.

VII. CONCLUSION

Refrigeration systems play a critical role in daily life, particularly when it comes to storage and preparation, safety, and convenience. A home refrigerator's primary purpose is to preserve the quality of perishable goods. This quality is dependent on the refrigerator's efficiency, which is largely determined by temperature distribution and air flow in the compartments. Thus to throw the light on the work done by investigators by experimenting on several geometries of the refrigerating system to boost up their efficiency is discussed in this paper. Furthermore, we have provided the overview of DAR cycle, and the components of the refrigeration system which will be helpful for scholars to understand the fundamental functioning of the cooling systems.

References

[1] Hitesh Kumar "CFD Simulation of Velocity and Temperature Distribution inside Refrigerator Compartment" International Journal of Engineering and Advanced Technology (IJEAT) ISSN: 2249 – 8958, Volume-8 Issue-6, August 2019.

[2] Araştırma Makalesi "Experimental Study Of Diffusion Absorption Refrigeration Systems Using Solar Energy" Politeknik Dergisi, 2018; 21(2) : 291-297 Journal of Polytechnic, 2018; 21 (2) : 291-297

[3] Juan Manuel Belman-Flores, Armando Gallegos-Muñoz "Analysis of the flow and temperature distribution inside the compartment of a small refrigerator" June 2016 Applied Thermal Engineering 106.

[4] L. C. Carrilho Gonçalves, and R. A. Pitarma "Detailed CFD Modelling of Open Refrigerated Display Cabinets" Volume 2012 |Article ID 973601

[5] Adnan sozen, Engin Ozbas, Tayfun Menlik, M.Tarik Cakir, Metin Guru, Kurtulus Boran, "Improving the Thermal Performance of Diffusion Absorption Refrigeration System with Alumina Nano - fluids: An Experimental Study", International Journal of Refrigeration, vol.S0140-7007(2014) 00094-2.

[6] J.L. Rodriguez - Munoz, J.M. Belman - Flores, "Review of Diffusion Absorption Refrigeration Technologies", Renewable and Sustainable Energy Reviews, vol. 30(2014) 145–153.

[7] J.M. Belman - Flores, J.L. Rodriguez - Munoz, Rubio - Maya, J.J. Ramirez - Minguela, V. Perez-Garcia, "Energetic Analysis of Diffusion Absorption System: A Bubble Pump Under Geometrical And Operational

Conditions Effects", Applied Thermal Engineering vol. 71(2014) 1-10.

[8] Souha Mazouz, Rami Mansouri, Ahmed Bellagi, "Experimental and Thermodynamic Investigation of an Ammonia / Water Diffusion Absorption Machine", International journal of refrigeration, vol45(2014) 83-91.

[9] Ozgur Bayer, Ruknettin Oskay, Akin Paksoy, Selin Aradag, "CFD Simulation And Reduced Order Modeling of a Refrigerator Compartment Including Radiation Effects", Energy Conversion and Management, vol. 69(2013) 68–76.

[10] Adnan Sozena, Tayfun Menlika, Engin Ozbas, " The Effect of Ejector on The Performance of Diffusion Absorption Refrigeration System: An Experimental Study", Applied Thermal Engineering, vol.33-34(2012) 44-53.

[11] Abdullah Yildiz, Mustafa Ali Ersoz, "Energy and Exergy Analyses of the Diffusion Absorption Refrigeration System", Energy (2013) 1-9

[12] Q. Wang, L. Gong, J.P. Wang, T.F. Sun, K. Cui, G.M. Chen, "A Numerical Investigation of a Diffusion Absorption Refrigerator Operating With The Binary Refrigerant For Low Temperature Applications", Applied Thermal Engineering vol. 31(2011) 1763- 1769.

[13] N. Ben Ezzine, R. Garma, M. Bourouis, A. Bellagi, "Experimental Studies on Bubble Pump Operated Diffusion Absorption Machine Based on Light Hydrocarbons For Solar Cooling", Renewable Energy, vol. 35(2010) 464–470.

[14] Kai - Shing Yang, Wen - Ruey Chang, Ing - Young Chen, Chi - Chuan Wang, "An Investigation of a Top-Mounted Domestic Refrigerator", Energy Conversion and Management, vol. 51(2010) 1422–1427

[15] Xiangzhao Meng, Bingfeng Yu, "Experimental Research on Air Flow Performance at Supply - Air Openings in Frost - Free Refrigerator by DPIV", Applied Thermal Engineering, vol. 29(2009) 3334–3339.

[16] Guo-Liang Ding, Hong-Tao Qiao, Zhi-Li Lu, "Ways To Improve Thermal Uniformity Inside a Refrigerator", Applied Thermal Engineering, Elsevier, Vol. 24(2004) 1827–1840

[17] Cortella G, Manzan M, Comini G, "CFD simulation of refrigerated display cabinets" International Journal of Refrigeration, 24, 2001.

[18] Ding G, Zhang C, Lu Z, "Dynamic simulation of natural convection bypass two circuit cycle refrigerator-freezer", Applied Thermal Engineering, 24, 2004, 1312-1320.

[19] Jaramillo J, Rigola J, Perez-Segarra CD and Oliet C, "Numerical study of air inside refrigerating compartment of frost-free domestic refrigerators", International Journal of Refrigeration, 37, 2000.

[20] Christian J. L. Hermes, Marco E. Marques "A CFD Model For Buoyancy Driven Flows Inside Refrigerated Cabinets and Freezers" (2002). International Refrigeration and Air Conditioning Conference. Paper 608. http://docs.lib.purdue.edu/iracc/608

[21] Christian James, Bukola A. Onarinde "The Use and Performance of Household Refrigerators: A Review" First published: 30 November 2016 https://doi.org/10.1111/1541-4337.12242.

[22] Dr Tassos Koidis, Queen's University Belfast "A study of domestic fridges on the island of Ireland" September, 2013.