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Air Refrigeration Methods for Comparison Simulation Bench

[1]Zekeri Momoh Sabiu,
[1]Electrical/ Electronic Engineering Technology

[2]Braimah Muniru,
[3]Umar Adam Isah
[2,3] Mechanical Engineering Technology
Auchi Polytechnic, Auchi, Edo State, Nigeria.

Abstract:- This proposed research titled, Air Refrigeration Methods for Comparison Simulation Bench, is a new technique to yield coefficient of performance (COP) of refrigerants, mechanical energy, generate low heat energy with an optimal current discharge in dissimilar metals. First law of thermodynamic states that the net heat supplied from the system to the surrounding should be equal to the net work done when temperature and pressure do not change the enthalpy of the system (Hess law). The temperature, pressure as well as rate of cooling of compressed Freon 12 refrigerant or ammonia from the condenser will be metered with respect to the vapour absorption, vapour compression and thermoelectric refrigeration systems that are integrated into the simulation bench. Also, air bubble, which causes pressure system lag when the temperature increases in an expansion valve, will be addressed measurably with the help of heating cylinder. This air refrigeration comparison simulation bench yielded a highest coefficient of performance 1.63 vapour compression cycle , followed by vapour absorption cycle with 1.55 and least with 1.27 in thermoelectric refrigeration.

Keywords:- *Air, Refrigeration, Comparison, Simulation.*

I. INTRODUCTION

Refrigeration deals with the principle of heat removal from an enclosed system or space to reduce given temperature. This can be made possible through repeated cycle and the amount of heat transferred by the refrigerant to the evaporator is termed as refrigeration load. Temperature gradient of the system, pressure and density are essential parameters to be considered for this refrigeration comparison .Both vapor compression (VCR) and vapor absorption cycle (VAR). But in thermoelectric refrigeration cycle (TRC) the amount of heat absorbed alongside electromotive force (e.m.f) is critically considered. Within the junction, heat absorption and rejection sides evaluation . In this research, the type of energy to be used significantly will help to minimize ozone depletion potential (ODP), Global warming potential (GWP) and Total equipment warming index (TEWI).That is, the atom of Dichloro-difluro methane (R-12) needs to be re-arranged to enable increase of molecular speed to reduce delay in movement of the molecule which increases the temperature at critical point of the system. When pressurized air increases the critical temperature, chemical properties and condensing pressure of the system increases at the gas suction point. Perhaps, cooling effect occurs when the Dichloro-difluro methane (R-12) enters the evaporator with lower pressure from the weak absorber to form strong solution to yield optimum continuous supply of cooling (water) into the pipe with an incoming heat to the generator. The concept of this simulation bench is to design an embedded micro acoustic ship to compare vapor diffusion and critical temperature to obtain the actual coefficient of performance (c.o.p) and required power to prevent infant mortality of the refrigeration equipment. For the vapor absorption cycle a propane gas was used to generate within the exhaust pipe with a 8 revolution per minutes (r.p.m), 5 percent throttle valve. The thermo electric component (T.E.C) were calculated with limited heat flux in series connection of the heat resistance of the refrigeration load.

However, thermoelectric refrigeration involves the conversion of temperature difference into voltage vice versa. The amount of charge carriers at each junctions is very important to know produce free radical electrons and holes in metals or semi conductors which is based on See beck and peltiers Effects.

Refrigeration system is a process of lowering temperature to remove unwanted heat (Huang et al., 2000) from substances or objects by transferring the same heat to the substance or objects into space. An air refrigeration system uses air as a working fluid or refrigerant. This proposed air refrigeration system is made up of triple systems embedded in one single unit using vapour absorption refrigeration, vapour compression refrigeration and thermoelectric refrigeration systems. In this research, an evaluation was done on how to effectively study the various measurement (Vazhappilly *et al.*, 2013) conditions of a saturation point, heat interpolation summation point and enthalpy of the entire system. The main concept of this design is work on each of the coefficients of performance (C.O.P) of vapour compression cycle, thermo electric cycle and vapour absorption cycle in order to appreciate the entire air refrigeration system design. Thermoelectric refrigeration cycle converts the temperature of a system due to difference in voltage by changing the voltage back to the temperature by maintaining a current discharge through the thermo electric module. In this design, the free electron discharge will be analyzed using the Peltier principle, Thompson effect and See back effect in order to profound solution to thermal effect, ionization, width and size of the

constituent refrigerant (Desai & Bannur, 2001) at a given saturation points by varying the temperature rate. This system removes unwanted heat to a region where the heat will be maximized to yield output through the enclosed envelope of the air refrigeration system to avoid heat liberation (exothermic reaction) to the surrounding which also affects the refrigerant. The bulky nature of the refrigerant is to be considered for an air refrigeration system. When heat is generated within the simulation point, the device directs a current flow to establish two gradient temperatures for hotter and cooler junction of the module. The air refrigeration system will retain the heat and conserve the heat without affecting the crystal lattice of the internal wall valves.

➢ *The Main Components of an Air Refrigeration System for Vapor Compression Refrigeration Cycle are Listed Below:*

- Condenser
- Compressor
- Evaporator
- Expansion Valve
- Pressure Gauge

➢ *But for the Main Components of an Air Refrigeration System for Vapor Vapor Absorption Refrigeration Cycle are Listed Below:*

- Evaporator
- Analyser Generator
- Pressure Reduction Valve
- Expansion Valve
- Absorber
- Condenser

➢ *Statement of the Problem:*

Refrigerants have limit for their room temperature stability to actuate their motion within a given period due to hydrostatic motion in powering a fluid system. For natural or forced convection, heat excite the molecule and their atomicity (Gao & Rowe, 2000) either in single or multiphase by priming the valve (throttling valve) which is needed to yield coefficient of performance. Hess law states that regardless of the multiple stages of reaction, the total enthalpy change of the reaction is the sum of all changes. In absorption air refrigeration which has two binary function having refrigerant and absorbent as a working process, one of the junctions absorbs refrigerant while the other junction will decrease the absorbent pressure to excite the fluid which vapourizes at a latent heat when the heat is not well managed. It can also contaminate the system.

- *The following questions were used to aid the proper functioning of the air refrigeration system simulation bench, namely:*

✓ How specifically can the heat lost be minimized by decreasing excessive cooling rate of fluid?
✓ To what extent can the refrigerant dependence vary the temperature and pressure in an open and close system?
✓ Could thermal conductivity of materials used build up gas sink due to the pipe connection wall to slow using theoretical analysis approach?
✓ How will the tonnage capacity of air affect the expansion valve at the suction point?

➢ *Objective Of The Research:*

- *To Study the Actual Behavior of Refrigerants During Compressibility.*

✓ To compare coefficients of performance, temperatures, pressures as well as refrigerant cooling rates in thermo electric, vapour compression and vapour absorption refrigeration systems on a stimulator bench.
✓ To study the actual behavior of refrigerants during compressibility.
✓ To compare coefficients of performance, temperatures, pressures as well as refrigerant cooling rates in thermo electric, vapour compression and vapour absorption refrigeration systems on a stimulator bench.
✓ To attain a steady state stochastic process of the air passing through the expansion valves.
✓ To design a smart simulator that will be used to study the diffusion rate of refrigerants at constant volume.
✓ To learn instrumentation and control in plumbing of pipes

II. LITERATURE REVIEW

In thermo electric refrigeration system, semi conductor manufacturing is a focus point. These semi conductors still retain their theoretical values after they have been used up to form a system or cycle. Rough surfaces affect fluid vortices (a region of fluid where the flow revolve around an axis line either curve or straight line) before separating. That is, the thermal conductivity of the material will be reduced from the system due to heat lag. The law of intermediate conduction states that an absolute seback coefficient of any homogenous conduction is zero.

In absorption refrigeration system, it was found that absorber circulation (Hassan & Mohamad, 2012) changes in bent edges and choice for geometrical modeling initiated when LiBr/water (lithium bromide/water) absorber falls to trap the vortices of the fluid film before separation at each column of the gauge with an absorber actuating auxiliary solution tank in which the coolant flows (Kim et al., 2006) through aluminium tube to evenly distribute itself to the test simulation bench for results display. The pressure control system is shut down to see the efficacy of this triple design by adding iron (iii) oxide with ammonia gas from the reservoir tank to speed the air bubble in order to increase the magnetic intensity for the vapour absorption refrigeration system.

In vapor compression refrigeration system (Killon & Garmelaa, 2001), the refrigerant evaporates at a decreased temperature rate due to the usage of aluminium pipe (low thermal conductivity). The vapour compression system has a lot of issues such as output performance using high

mechanical energy in hydrocarbon and chlorofluorocarbon. These hydrocarbons have long chain carbon and mostly emit poisonous gases which affect the ozone layer compared to other air refrigeration systems. The energy from vapour absorption refrigeration system is derived from an engine exhaust pipe. It means the air will contain air particulate pollutants. The heating chamber needs nitrogen to produce high heating value. For this to be safe, the octane number (Lee et al., 2010) has to be attained by knowing what method of reaction will give the required heat of formation. Software called engineering equation solver was developed to analyze thermodynamic modeling for best feed back to improve coefficient of performance.

However, in vapor refrigeration cycle the input is based on mechanical energy will be sufficient to drive the compressor whereby the refrigerant undergoes stages of yielded output. The vapor absorption cycle runs on a low grade energy inform of waste energy and other alternative renewable source of energy. The solubility of the mixture determines how pure is the solvent and other constituent solutions at temperature equal or less than or equal to 300 ^{o}C .

III. RESEARCH METHODOLOGY

- An experimental approach will be used as a qualitative methodology to check the air refrigeration methods for comparison simulation bench alongside the following apparatus, namely:

- Sling psychrometer
- Manometer
- Capillary tube
- Aluminium/MS shell suction
- Pressure sensors
- Temperature sensors
- Humidity sensors

This research will be carried out to observe some of the ergonomic principles that are not in accordance with climatic change to detect system errors due to system poor mounting (Mical & Mical, 2010). For instance, buildings and roofs have become the primary target for green house gas emissions. The pressure level will be determined by the manometer merged with sensitive system unit (Florides, 2003) so that the zero absolute pressure, atmospheric and other related pressure variables can be metered in order to remove air within the suction valves (Karamangil et al., 2010). Understanding the concept of heat transfer which is how the heat generation is derived, converted from physical system to another state is a key factor in design engineering (Johnson & Gowda, 2015). Diffusion of air increases when the denser air rises against the cooling air (forced convection heat transfer) in order to carry air into the opening of the condenser (Tritt, 2000) unit before getting to the pore space (Bajpai, 2012) with heat within the bent valves.

Table 1 Performance Specification

Hot side temperature ^{o}C	**45.00**	**90.00**
Cold side temperature ^{o}C	**-25.00**	**46.00**
Q_{max}(watt)	**60.00**	**67.00**
Delta T_{max}^{o}C	**80.40**	**96.01**
Imax (Amp)	**12.40**	**12.40**
Vmax (Volt)	**28.30**	**30.22**
Module	**3.67**	**4.30**
Resistance (Ohms)	**2.28**	**1.10**

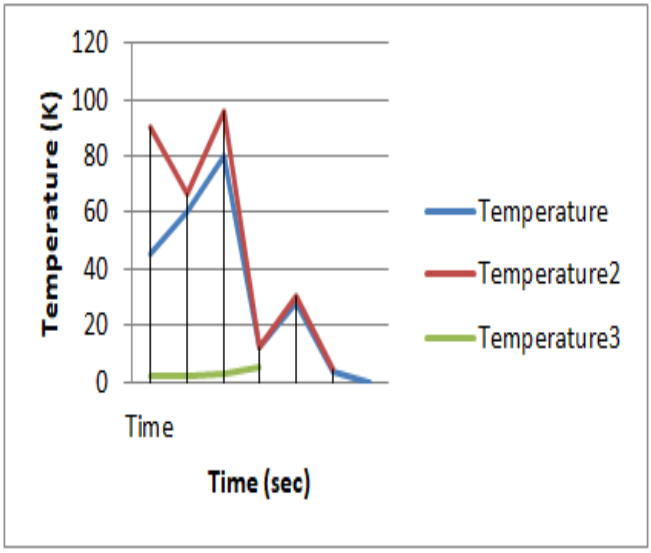

Fig 1 Graph on Time Vs Temperature Fan is Switch on

It could be seen in fig 1.0 that after at 97.60 kelvin (k) temperature operation inlet falls to 64.66 kelvin (k) at the outlet heat generated phase at the expansion valve and heat analyzer chamber using controller to avoid further lag in heat due to carbon catenation. According different diagram below fig 1.10 the test reliability show decrease of cold storage of the initial thermodynamic change of temperature from +20 kelvin (k) to -20 (k)

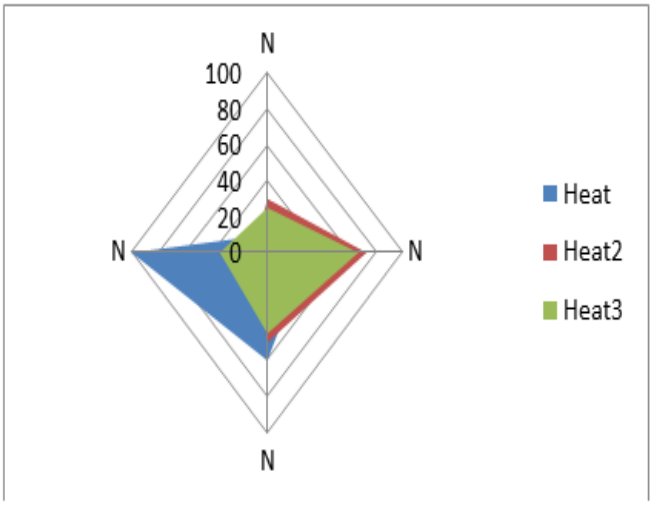

Fig 2 Graph on Time Vs Temperature of Peltiers (When Fan is off)

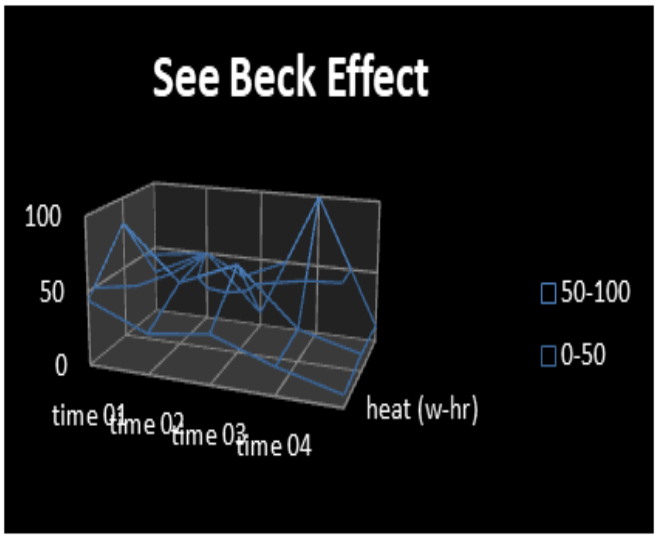

Fig 3 Graph on Unit Consumption of Thermo Electric Refrigerator

➢ *Simulation Work Flow Of Heat:*

The first step is based on calculation of amount of heat generated from low temperature reservoir that must be equal; to heat leakages from fig 1.11 at 100 (w-hr) /sec to the surrounding to the system .Second what semi conductor that prevent excessive vapor liberation to achieved better efficiency. So semi conductor made of was selected a wrapped with copper wire as a sacrificial chamber to limit bubble inclusion inside the evaporator coil to maintain stable electromotive force (e.m.f). without affecting the cryogenic condition of ammonia used in vapor absorption refrigeration system. The compressor takes the squeeze vapor to allow the pressure to enter connecting pipe to the condenser. The heat formed changes it state from vapor to liquid into the expansion valve so decreases the molecular transformation of pressure wit sudden decrease in temperature of the system. This phenomenon affects the thermodynamic properties and back flow of currents for the dissimilar materials and the enthalpy of the system.

➢ *Results And Findings:*

At this point of reference to the material properties and mixtures that were discussed by previous researchers. It was discovered that single or multi phase design material deformed rapidly by + 0.5 in this research due to poison ratio increase in tensile strength and electrostatic force imbalance. This research concept focuses on morality and acoustic behavior of the heating cylinder crystal lattice due to collision of refrigerants wavelet in the expansion valve using Huygen´s principle .In such away the head loss of the fluid and heat sink with cotton was inserted to maintain steady density and glass wall vibration if the medium is isotropic.

➢ *Expected Results:*

A few runs of the comparison simulation bench will be conducted. The temperatures, pressures and refrigerant cooling rates of the built-in triple systems (vapour absorption, vapour compression and thermoelectric refrigeration systems) will be compared upon running the designed machine through the readings of the incorporated digital display of the instrumentation section. This will be made possible with the use of the various sensing devices such as the humidity sensor, pressure sensor, temperature sensor, etc.

IV. CONCLUSION

This machine is capable of energizing the working fluid, which is through a compressor for the vapour compression refrigeration cycle. Hence the heating element were kept in a optimal temperature allowing drop in nitrogen concentration to negative value at – 0 ^{o}C for the refrigerant to be absorbed in the vapour refrigeration cycle. While the rate of cooling for each comparison are in peltier thermoelectric cooler is 10^{o} C/min,vapour compression7^{o} C/min. Lastly, cooling it is at lowest stage 10^{o} C/min, 5.5^{o} C/min.

RECOMMENDATION

Future research should be done on how the refrigerant can simply adjust it measurement synchronously rather than assumed interpolation without affecting coefficient permissibility of boundary heat flux.

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APPENDIX

Detailed Assembly drawing of Air Refrigeration Methods for Comparison Simulation Bench.

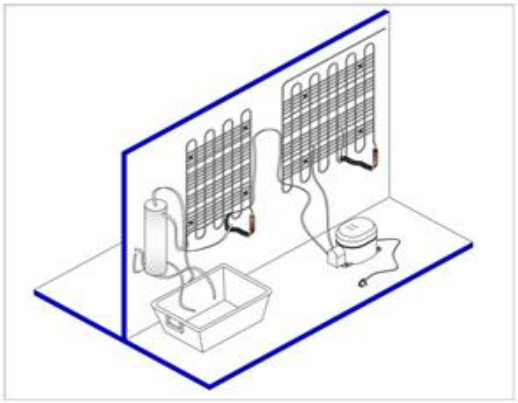


Fig 4 Front View

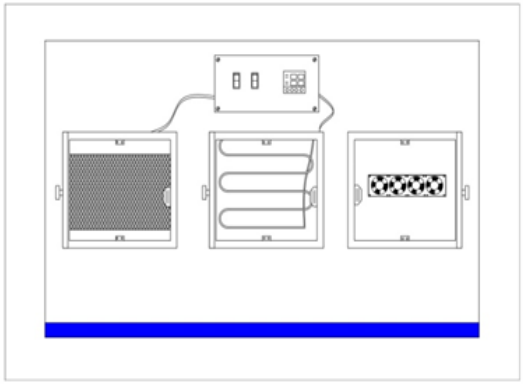


Fig 5 Plan View

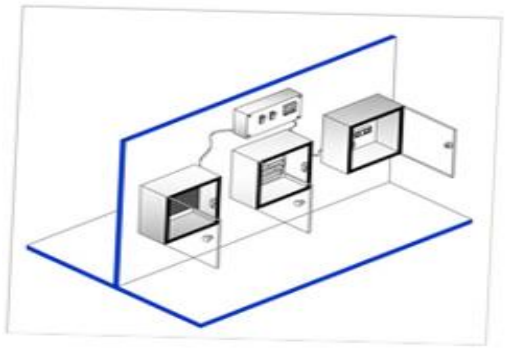


Fig 6 End View

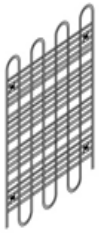
S/N	COMPONENT	NAMES
1		EXPANSION VALVE
2		COMPRESSOR
3		HEATING CYLINDER
4		CONDENSER
5		CONTROL PANEL
6		PELTIER REFRIGERATOR

Fig 7 Keynote of Components of an Air Refrigeration Methods for Comparison Simulation Bench