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HYBRID AIR CONDITIONING FOR BETTER ENERGY ECONOMIC CONSUMPTION

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ABSTRACT

On the planet situation the most concerning issue is dependably join with vitality. We are confronting an extensive shortage of vitality and for that it will constantly useful to minimize the vitality utilization. So for that this paper contain a trial technique by which we can perceive how much vitality we can spare by applying three distinctive vitality hotspot for building up a ventilating framework. While in three vitality source one is ordinary vitality source and another two is nontraditional vitality source.

The traditional vitality source is connected to basic vapor pressure cycle and non-customary vitality source is connected to concentrate vitality from peltier impact and earth heat exchanger. This paper likewise contain a major part of warmth pipe which is utilized to transport vitality from on indicate other.

This paper likewise contains the pressure of vitality utilization with three unique conditions which are:

1. *When just vapor compression cycle is utilized.*
2. *When vapor compression cycle is utilized with earth heat exchanger.*
3. *When vapor compression cycle is utilized with earth heat exchanger and in addition peltier module.*

Keywords: V.C.C, Peltier module, Air-conditioner, Earth heat exchanger, Thermal Analysis.

I. INTRODUCTION

Test and Trial on created aeration and cooling system decide, temperature slope, cooling capacity (tonnage) and COP of framework, under given conditions. Framework will be tried both independently furthermore in different blends viz, VCC with Ground coupled warmth exchanger or VCC with Thermoelectric module and so on and similar review will be exhibited in postulation to assess the viability of individual frameworks or mixes over each other.

A ventilation system is a home apparatus, framework, or component intended to dehumidify and remove warm from a territory. The cooling is done utilizing a straightforward refrigeration cycle. In development, a total arrangement of warming, ventilation, and aerating and cooling is alluded to as "HVAC". Its motivation, in a building or a vehicle, is to give comfort amid either hot or icy climate.

Residential or business aeration and cooling system is essentially classified as Window AC or Split Ac framework relying on the technique for mounting and position. The traditional AC frameworks utilize the Vapor Compression cycle for operation.

Aeration and cooling system gear power is frequently depicted regarding "huge amounts of refrigeration." A "huge amount of refrigeration" is characterized as the cooling force of one short ton (2000 pounds or 907 kilograms) of ice liquefying in a 24-hour time frame. This is equivalent to 3517 watts. Private focal air frameworks are for the most part from 1 to 5 tons (3 to 20 kilowatts (kW)) in limit. The utilization of electric/compressive aerating and cooling puts a noteworthy request on the electrical power lattice in hot climate, when most units are working under overwhelming burden.

The impact of ventilating interest makes the vitality utilization has been expanding rapidly. The examination report demonstrates that of the aggregate vitality utilization in structures in Metro city, the vitality sum utilized via aerating and cooling framework is 46.1% in eatery building, 40.5% in business building, 49.7% in office building, and 30.3% in healing center building. The continually expanding vitality prerequisite puts an awesome weight on the further conservative advancement as India is poor in vitality assets. Step by step instructions to lessen the vitality utilization by utilizing new vitality sparing advancements and gear is an imperative assignment now days. With a specific end goal to diminish the vitality utilization in aerating and cooling building, device dew-point air supply is generally utilized as a part of ventilating frameworks. In any case, as the soggy air leaving the cooling curl is typically too high in relative moistness (around 95% Rh) and too low in temperature to be utilized as a part of possessed spaces straightforwardly, individuals more often than not feel uncomfortable. Furthermore, if the relative moistness in possessed spaces and low-speed channels and plenums surpasses 70%, parasitic pollution, for example, form, mold, and so on., can happen and debilitates general wellbeing. In this way, from the necessity of keeping great indoor warm solace and air quality, and of lessening the danger of coming down with malady, it is a solid suggestion to keep the supply air dampness beneath 70%. This implies relative mugginess control noticeable all around supply is vital angle. Be that as it may, if traditional cooling curls are utilized to enhance the indoor warm solace and air quality, outer vitality will be utilized to warm the air stream from the device dew-indicate the required air supply state. To take care of this issue, a Peltier Module and Earth warm Exchanger air-taking care of curl can be utilized.

II. RELEVANCE

The increasingly worldwide problem regarding rapid economy development and a relatively shortage of energy, for residential homes, some countries set minimum requirements for energy efficiency. In the some countries, the efficiency of air conditioners is often rated by the seasonal energy efficiency ratio). The higher the SEER rating, the more energy efficient is the air conditioner. The SEER rating is the BTU of cooling output during its normal annual usage divided by the total electric energy input in watt hours (W·h) during the same period.

In the present age with depleting sources of energy there is always a target to get the best energy ratios so that there will be minimum electric power consumption in operation of the air conditioning units. Many methods and ideas from evaporative cooling, thermoelectric cooling etc have been tried to keep the electricity consumption to a minimum in air conditioning applications. Individually these ideas do not stand good but by combination of two or more concepts in a collaborative manner stands a possibility to develop an energy efficient method of air conditioning. Thus there is a proposal to use the conventional vapor compression cycle in conjunction to thermoelectric cooling and earth heat exchanger technique to reduce the power consumption of the air conditioner and thereby increase the COP of system.

III. THERMAL ANALYSIS

3.1 Thermal Analysis of Rectangular Fins

Thermal analysis of Rectangular fin structures using ANSYS of Test Model Rectangular Fins is given in that Geometry, IGES file of the model imported to ANSYS work bench 14.5 meshing is carried out using free meshed by tetrahedron elements the number of elements and nodes is given below for each fin structure. Meshing done with Nodes are 23650 and Elements are 3402 then, we applied boundary condition to Rectangular fin of all four test models like Convection at 46W/m^2°C and Temperature at 28°C which is given in following diagrams, finally thermal analysis for finding different parameters like Total Heat Flux, Directional heat flux in x-direction and Temperature gradient as shown in figure.

1. Geometry

Geometry of Test Model-I of Rectangular fins is done in ANSYS of work bench 14.5

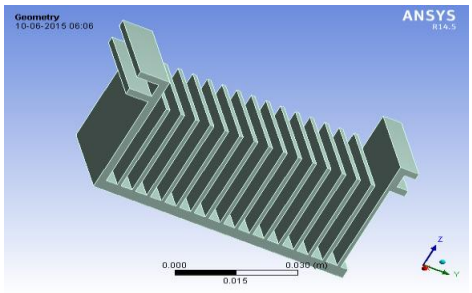


Fig. No.1 Geometry of Test Model-II

2. Meshing

Meshing of Test Model of Rectangular Fins is done with Nodes are 23650 and Elements are 3402.

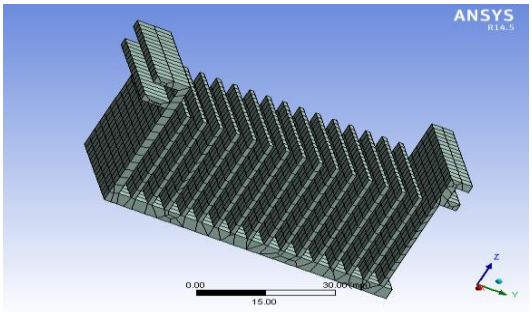


Fig. No.2 meshing of Test Model-II

3. Applying Boundary Conditions

Now, we applied the boundary conditions to the given Rectangular fin structure convection at 46W/m^2°C and Temperature at 28°C.

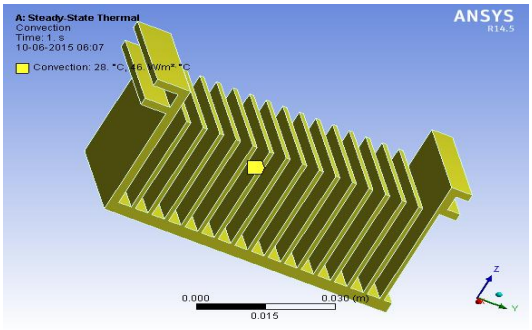


Fig. No.3 Boundary Condition Temperature at 28°C

4. Temperature at 80°C

Boundary condition temperature at 80°C of Test Model of Rectangular Fins

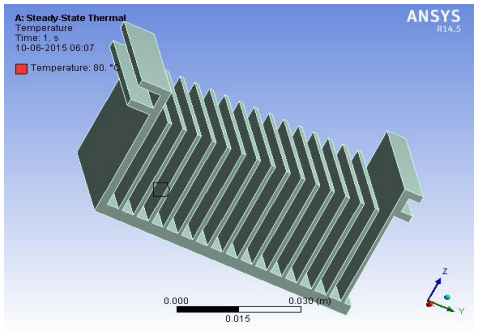


Fig. No.3 Boundary Condition Temperature at 80°C

5. Analysis Results

Now, after applying the boundary condition we find the analysis results with following points like maximum Total Heat Flux at 102610 W/m^2, maximum Directional heat Flux in x-direction at 3235.6 W/m^2 and Maximum Temperature Gradient at 80°C.

6. Total Heat Flux

Figure shows Maximum Total Heat Flux at 102610 W/m^2

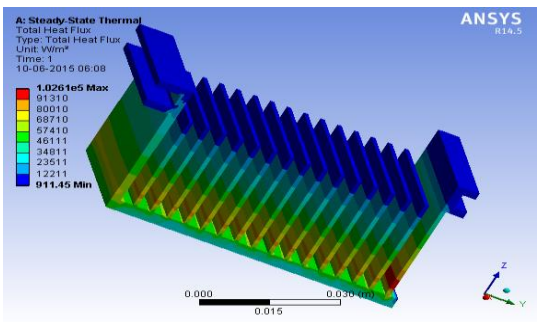


Fig. No.4. Total Heat Flux of Test Model-II

7. Directional Heat Flux in x-Direction

Figure shows maximum Directional heat Flux in x-direction at 3235.6 W/m^2

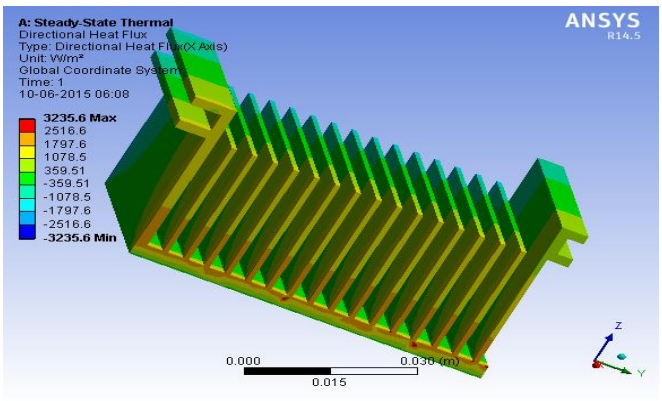
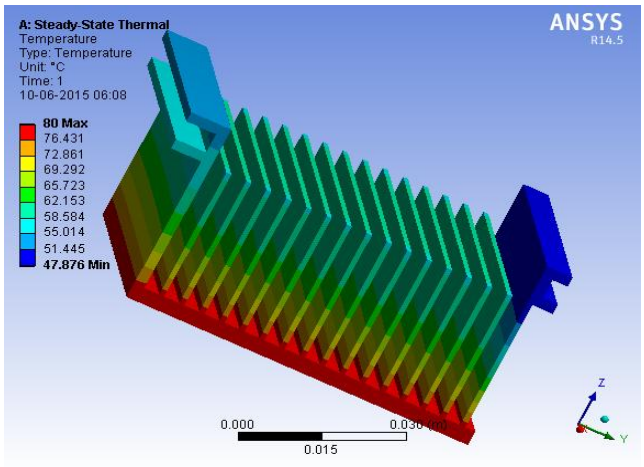


Fig. No.5 Directional heat Flux in x-direction of Test Model-II

8. Temperature Gradient

Figure shows maximum temperature Gradient at 80°C.



IV. OBJECTIVE

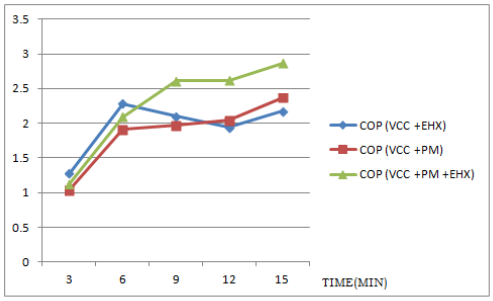
1. The main objective of this investigation is to study the performance of the Hybrid Air Conditioning System. The proposed work includes the determination of Determination of heat load, to maintain 22 to 25ºC temperature in the cabinet of volume close to 1800 liters.
2. Determination of compressor power and specification of parts of conventional Vapor compression cycle to take 100 % of rated load
3. Determination of Peltier modules 12 V dc , to take 30 % of heat load
4. Selection of heat pipe system for earth heat exchanger module to take 20 % of heat load
5. Design and development of cabinet space with the evaporator coil of conventional AC with integrated with peltier modules Design & Development of improvised spiral fin heat exchanger with heat pipes for heat transfer enhancement with peltier modules

Test & Trial on hybrid peltier air conditioner determine temperature gradient , cooling ability (tonnage) and COP of system, under given conditions

1. Vapor Compression Air Conditioning unit and derive performance characteristic
2. Vapor Compression Air Conditioning unit with Earth heat exchanger unit and derive performance characteristic
3. Vapor Compression Air Conditioning with Peltier module unit and derive performance characteristic.
4. Vapor Compression Air Conditioning with Earth heat exchanger and Peltier module unit and derive performance characteristic.

V GRAPHICAL RESULT & CONCLUSION

5.1 GRAPH RESULT-I

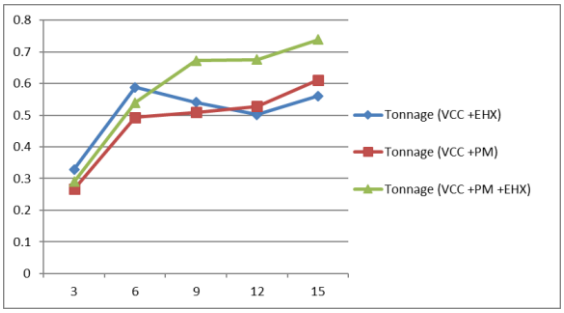


Graph No. 1 Comparison of COP

5.2 Result

1. COP of (VCC+PM+HEX) is maximum and thus most effective of the three combinations hence it is recommended that all three modifications of the hybrid system be used for best results.
2. Comparison of the COP of (VCC+ PM) & (VCC +EHX) shows that (VCC +PM) shows better COP as compared to the (VCC +EHX)over delayed duty cycle ie, from 12 to 15min , hence will be recommended if the temperature cycling is to done over a range above 12minutes time.
3. Comparison of the COP of (VCC+ PM) & (VCC +EHX) shows that (VCC +EHX) shows better COP as compared to the (VCC +PM)over short duty cycle ie, from 0 to 12min , hence will be recommended if the temperature cycling is to done over a range below 12minutes time.

5.3 Graph Result



Graph No. 2 Comparison of Tonnage

5.4 Result

1. Tonnage of (VCC+PM+HEX) is maximum and thus most effective of the three combinations hence it is recommended that all three modifications of the hybrid system be used for best results.
2. Comparison of the Tonnage of (VCC+ PM) & (VCC +EHX) shows that (VCC +PM) shows better Tonnage as compared to the (VCC +EHX)over delayed duty cycle i.e., from 12 to 15min , hence will be recommended if the temperature cycling is to done over a range above 12minutes time.Comparison of the Tonnage of (VCC+ PM) & (VCC +EHX) shows that (VCC +EHX) shows better Tonnage as compared to the (VCC +PM)over short duty cycle ie, from 0 to 12min , hence will be recommended if the temperature cycling is to done over a range below 12minutes time.

VI. RESULT

1. Cop of the hybrid system increases with application of the Peltier module and Earth heat exahanger arrangement to upto 10 %
2. Tonnage of the hybrid system increases with application of the Peltier module and Earth heat exahanger arrangement to upto 11 %

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