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Title: **LIFE CYCLE OPTIMIZATION OF RESIDENTIAL AIR CONDITIONER REPLACEMENT**

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Paper Authors

MR. MOHD AUSAF FAROOQUI, MR . KONDALA RAO

Farah Institute Of Technology(TS),INDIA



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LIFE CYCLE OPTIMIZATION OF RESIDENTIAL AIR CONDITIONER REPLACEMENT

¹MR. MOHD AUSAF FAROOQUI , ²MR . KONDALA RAO_(P.HD)

¹PG Scholar, Dept of Mechanical, Farah Institute Of Technology(TS),INDIA. Email:

²Assistant Professor, Head of the Department of Mechanical, Farah Institute Of Technology(TS),INDIA.

¹ausaf366@gmail.com. ²mech.hodvvit@gmail.com.

ABSTRACT: Refrigeration structures have condenser that gets rid of unwanted warmth from the refrigerant and transfers that warmth outside. The primary thing of a condenser is typically the condenser coil, via which the refrigerant flows. Since, the condenser coil consists of refrigerant that absorbs heat from the encompassing air, the refrigerant temperature need to be better than the air. In this thesis warm temperature switch by way of manner of convection in refrigeration through diverse the condenser period are decided with the useful resource of CFD and thermal analysis. The assessment is out on an air-cooled tube condenser of a vapour compression cycle for refrigeration tool. The materials considered for tubes are Copper and Aluminum alloys. The refrigerants severa can be R 12. CFD assessment is finished to determine temperature distribution and warmth transfer charges thru severa the refrigerants. Heat transfer assessment is completed on the condenser to assess the higher cloth. Three-d modeling is completed in CREO and assessment is completed in ANSYS.

Keywords: Life Cycle Cost (LCC), Inverter System, Evaporative Condensing System

I INTRODUCTION

Introduction To Air Conditioner

An air conditioner (regularly called AC) is a domestic system, tool, or mechanism designed to dehumidify and extract warmth from an area. The cooling is executed the use of a smooth refrigeration cycle. In creation, a whole machine of heating, air go along with the go with the flow and aircon is called "HVAC". Its reason, in a building or an automobile, is to provide consolation within the course of both heat or cold climate.

Air Conditioning System Basics And Theories REFRIGERATION CYCLE

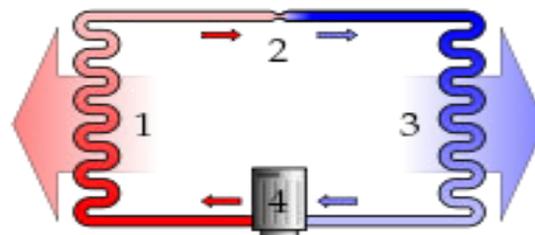


Fig 1: A simple stylized diagram of the refrigeration cycle: 1) condensing coil, 2) expansion valve, 3) evaporator coil, 4) compressor.



In the refrigeration cycle, a warm temperature pump transfers warm temperature from a decrease-temperature warmth deliver proper into a better-temperature warmth sink. Heat could glaringly go along with the drift in the contrary course. This is the maximum common sort of air con. A refrigerator works in masses the identical way, because it pumps the warmth out of the interior and into the room wherein it stands. This cycle takes benefit of the way segment modifications paintings, in which latent warmth is released at a ordinary temperature throughout a liquid/fuel segment alternate, and wherein various the pressure of a natural substance moreover varies its condensation/boiling component. The maximum commonplace refrigeration cycle uses an electric powered motor to stress a compressor. In an automobile, the compressor is pushed by the usage of a belt over a pulley, the belt being pushed via the engine's crankshaft (just like the using of the pulleys for the alternator, strength guidance, and so on.). Whether in a car or constructing, each use electric powered powered fan cars for air motion. Since evaporation occurs at the same time as warm temperature is absorbed, and condensation takes place at the identical time as warm temperature is launched, air conditioners use a compressor to reason strain changes among cubicles, and actively condense and pump a refrigerant around. A refrigerant is pumped into the evaporator coil, positioned inside the compartment to be cooled, where the low strain reasons the refrigerant to evaporate proper right into a vapor, taking

warm temperature with it. At the other side of the cycle is the condenser, this is located outside of the cooled compartment, wherein the refrigerant vapor is compressed and forced via any other warmth alternate coil, condensing the refrigerant proper right into a liquid, for that reason rejecting the warm temperature formerly absorbed from the cooled location.

II. LITERATURE SURVEY

Utilizing greater inexperienced remarkable aircon gadget is one technique to decrease residential energy intake. The common performance of aircon gadgets sold has a tendency to growth regularly over time, so changing vintage devices can reduce strength intake at some stage in operation, but the ones strength financial savings should be weighed in competition to the strength related to the advent of a modern-day unit and disposal of the present unit. A model primarily based totally on the lifecycle inventories for each version one year of a regular 3 ton primary air conditioning unit become advanced to discover substitute schedules that lessen the (1) electricity intake, (2) greenhouse gasoline emissions and (three) price to the proprietor of a house over a duration from 1985 through 2025 for 6 towns at some point of the USA. Dynamic variables which include changes in raw material energy intensity, refrigerant marketplace share, and charge of strength over the years have been taken into consideration. Over the forty one 12 months time horizon, power minimization required 7 to 15 devices, greenhouse gas (GHG) minimization required 3 to 5 replacements, on the equal



time as fee minimization required three gadgets for the diverse cities tested. The price of changing consistent with an energy first-class time table modified into amongst eleven to 57% extra than the price top of the line time table for the same town. Locations with the most updated climates required the most replacements. Financial incentives have been delivered as poor costs into the model to align the maximum superb fee time table with electricity and GHG great schedules. These incentives were sizeable. Often, they were within the form of \$a thousand to \$2000 in line with alternative. The version demonstrates the blessings of most beneficial alternative below numerous eventualities consisting of an increase in the federal performance fashionable in 2016, the adoption of a community overall performance giant, and the artificial of gift essential air conditioners with Energy Star gadgets in preference to devices at the federal minimal performance elegant.

III SOFTWARE USES

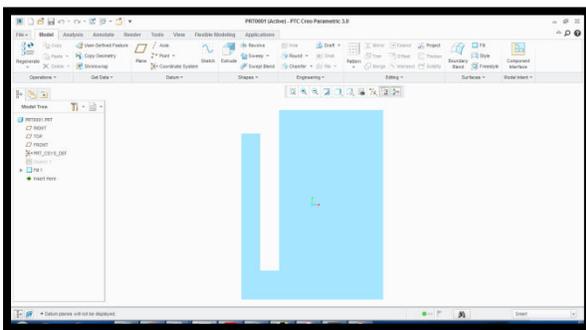
INTRODUCTION TO CAD

Computer-aided format (CAD), additionally called laptop-aided layout and drafting (CADD), is the use of pc era for the technique of design and layout-documentation. Computer Aided Drafting describes the way of drafting with a computer. CADD software application, or environments, provide the individual with enter-tools for the purpose of streamlining layout techniques; drafting, documentation, and production techniques. CADD output is frequently within the shape of digital documents for print or machining operations. The development of CADD-

based totally software program software is in direct correlation with the strategies it seeks to save cash; employer-primarily based absolutely software software (introduction, production, and masses of others.) typically makes use of vector-primarily based absolutely completely (linear) environments while photo-based software software makes use of raster-based definitely (pixelated) environments. CADD environments frequently contain extra than just shapes. As in the manual drafting of technical and engineering drawings, the output of CAD need to keep information, which includes substances, processes, dimensions, and tolerances, consistent with utility-specific conventions. CAD may be used to design curves and figures in -dimensional (2D) area; or curves, surfaces, and solids in 3-dimensional (3-d) devices. CAD is an important enterprise art work considerably utilized in loads of applications, collectively with car, shipbuilding, and aerospace industries, industrial agency and architectural design, prosthetics, and many more. CAD is likewise broadly used to provide laptop animation for computer pictures in films, marketing and advertising and technical manuals. The current ubiquity and power of pc structures way that even fragrance bottles and shampoo dispensers are designed the use of strategies unprecedented through way of engineers of the Nineteen Sixties. Because of its giant financial importance, CAD has been a high the use of pressure for research in computational geometry, pc images (each hardware and software), and discrete differential geometry.

INTRODUCTION TO CREO

PTC CREO, formerly called Pro/ENGINEER, is 3D modeling software program application program implemented in mechanical engineering, layout, production, and in CAD drafting provider businesses. It have become one of the first 3-D CAD modeling packages that used a rule-based totally parametric device. Using parameters, dimensions and talents to capture the behavior of the product, it could optimize the development product in addition to the format itself. The call have become modified in 2010 from Pro/ENGINEER Wildfire to CREO. It end up introduced via the commercial enterprise company who evolved it, Parametric Technology Company (PTC), at some diploma in the release of its suite of layout products that consists of packages together with assembly modeling, 2D orthographic views for technical drawing, finite detail evaluation and more.



INTRODUCTION TO FEA

Finite element assessment is a way of fixing, generally about, positive troubles in engineering and technology. It is used in particular for problems for which no authentic answer, expressible in a few

mathematical shape, is available. As such, it's far a numerical in place of an analytical technique. Methods of this kind are wanted because analytical strategies can't cope with the real, complex issues which might be met with in engineering. For example, engineering strength of materials or the mathematical concept of elasticity may be used to calculate analytically the stresses and contours in a dishonest beam, but neither can be very successful in finding out what is happening in a part of a car suspension tool in the course of cornering.

INTRODUCTION TO ANSYS

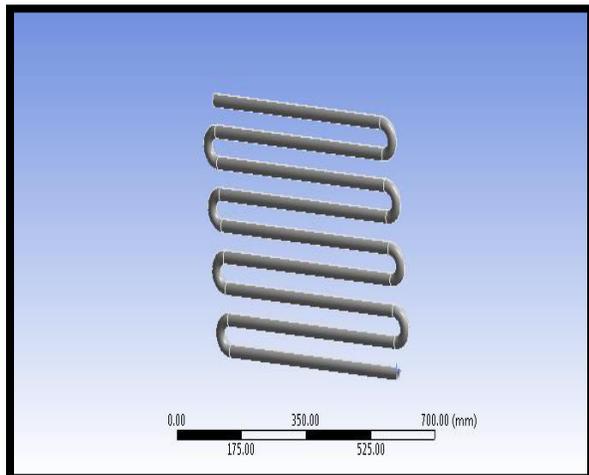
ANSYS is popular-reason finite element evaluation (FEA) software program package deal. Finite Element Analysis is a numerical approach of deconstructing a complex system into very small portions (of character-special period) referred to as elements. The software program software implements equations that govern the behaviour of these elements and solves them all; developing a entire clarification of tactics the tool acts as a whole. These consequences then may be offered in tabulated, or graphical office work. This sort of evaluation is typically used for the format and optimization of a system an extended way too complicated to analyze thru hand. Systems that may fit into this magnificence are too complicated because of their geometry, scale, or governing equations. ANSYS is the same vintage FEA training device inside the Mechanical Engineering Department at many schools. ANSYS is also utilized in Civil and Electrical Engineering, further to the Physics and Chemistry departments

IV SYSTEM ANALYSIS THERMAL ANALYSIS OF CONDENSER

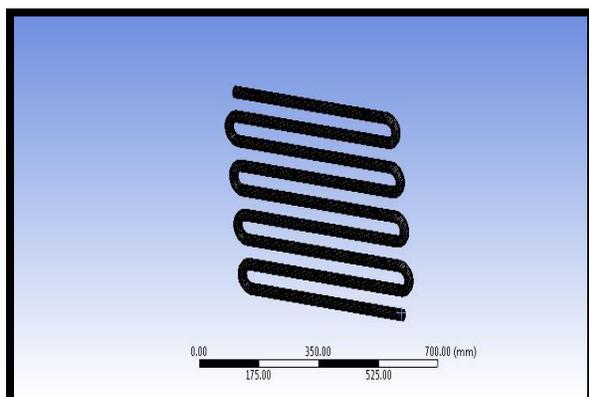
condenser length-345mm material-
aluminum alloy

Open work bench 14.5>select **steady state thermal** in analysis systems>select geometry>right click on the geometry>import geometry>select IGES file>open

IMPORTED MODEL



MESHED MODEL



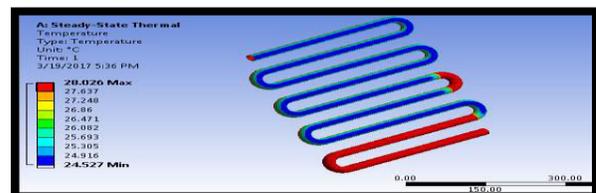
Finite element evaluation or FEA representing a actual challenge as a “mesh” a sequence of small, frequently long-established tetrahedron related factors, as proven in the above fig. And then installing place and fixing massive arrays of simultaneous equations. The finer the mesh, the greater correct the effects however more computing energy is needed.

BOUNDARY CONDITIONS

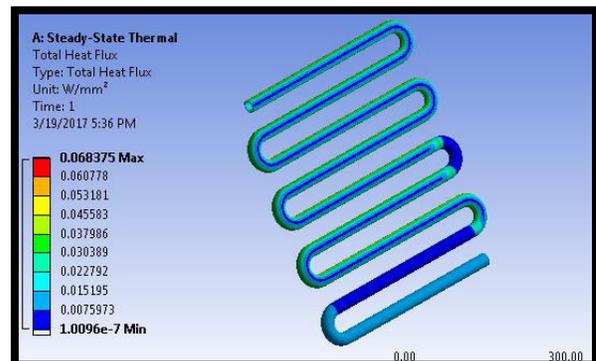
$T = 278K$

Select steady state thermal >right click>insert>select convection> enter film coefficient value Select steady state thermal >right click>insert>select heat flux Select steady state thermal >right click>solve Solution>right click on solution>insert>select temperature

TEMPERATURE

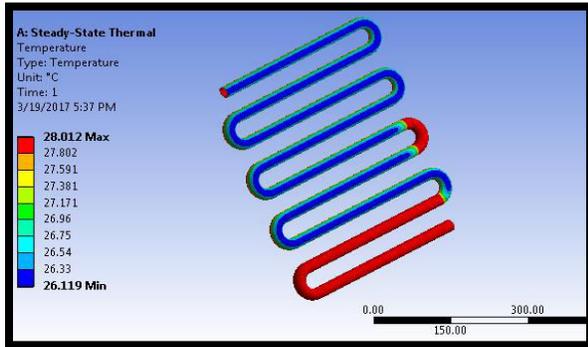


HEAT FLUX

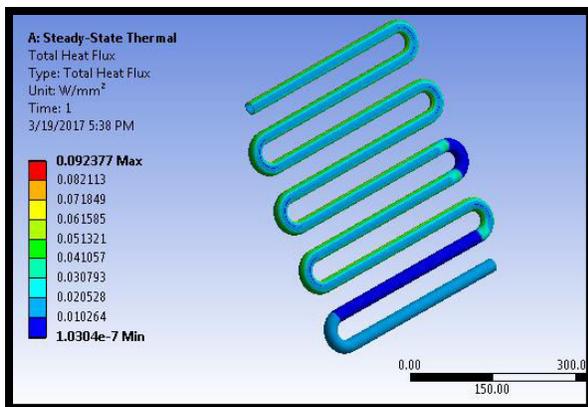


MATERIAL -COPPER

TEMPERATURE



HEAT FLUX



V RESULTS

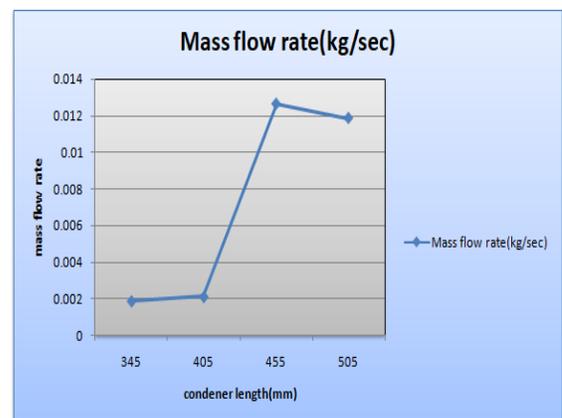
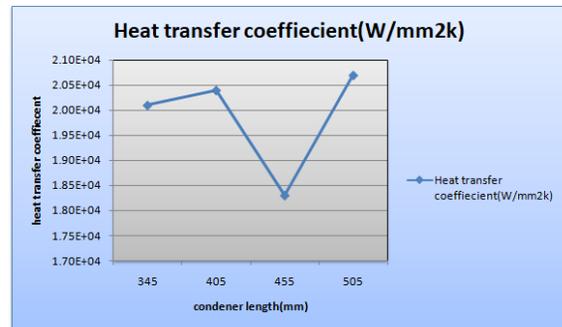
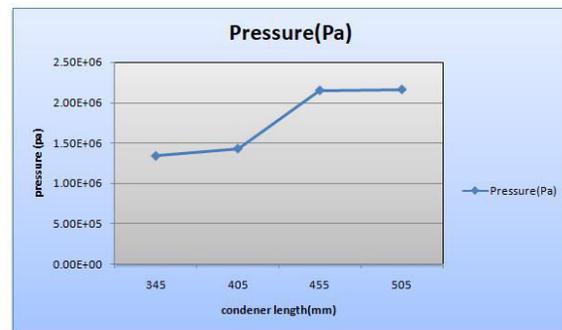
Thermal analysis

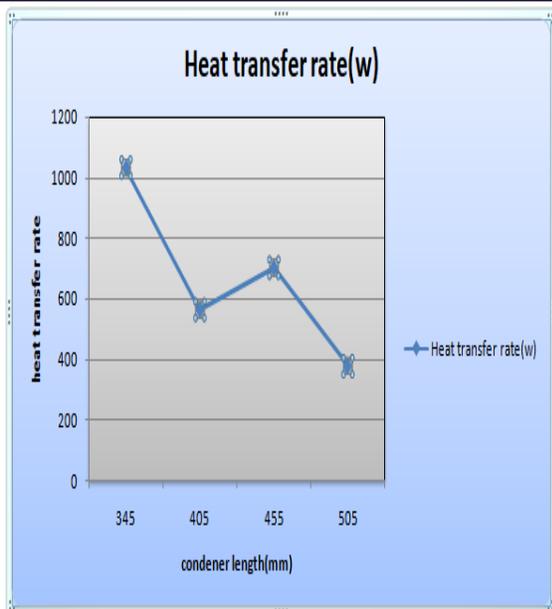
Material	Condenser length(mm)	Temperature (k)	Heat flux (w/mm ²)
Aluminum alloy	345	28.026	0.068375
	405	28.023	0.073415
	465	28.024	0.069784
	505	28.025	0.069883
Copper	345	28.012	0.092377
	405	28.01	0.098348
	465	28.011	0.093316
	505	28.015	0.093398

Cfd analysis

Condenser length(mm)	Pressure(Pa)	Temperature (K)	Heat transfer coefficient(W/mm ² k)	Mass flow rate(kg/sec)	Heat transfer rate(w)
345	1.34e+06	3.05e+02	2.01e+04	0.001848208	1033.40
405	1.43e+06	3.05e+02	2.04e+04	0.002087713	564
455	2.15e+06	3.05e+02	1.83e+04	0.01262311	702.95
505	2.16e+06	3.05e+02	2.07e+04	0.011846066	377.89

CFD ANALYSIS GRAPHS





VI CONCLUSION

In this thesis warmth transfer by way of convection in refrigeration thru numerous the condenser length are determined via CFD and thermal evaluation. The evaluation is out on an air-cooled tube condenser of a vapour compression cycle for refrigeration tool. The materials taken into consideration for tubes are Copper and Aluminum alloys. The refrigerants numerous may be R 12. CFD evaluation is done to determine temperature distribution and heat switch costs. In cfd assessment, the warm temperature switch coefficient greater at condenser period 505mm. In thermal evaluation, the warm temperature flux is greater for copper cloth at condenser period 405mm. So we will finish that the higher material is copper.

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AUTHORS



Mr. Kondala Rao (P.hd), having 4+ years of relevant work experience in Academics, Teaching, and Controller of Examinations. At present, he is working as an Assistant Professor, Head of the Department of Mechanical, Farah Institute Of Technology(TS),INDIA, and utilizing his teaching skills, knowledge, experience and talent to achieve the goals and objectives of the Engineering College in the fullest perspective. He has attended seminars and workshops. He has also guided 25 post graduate students.



Mr. MOHD AUSAF FAROOQUI ,PG Scholar, Dept of Mechanical, Farah Institute Of Technology(TS),INDIA.



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