DEVELOPING A NEW MODEL OF EXISTING SPLIT AIR CONDITIONER

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ABSTRACT - *Predominantly an air conditioner is used to regulate two worst issues: the temperature and the humidity. Nowadays an air conditioner outdoor unit occupied more space on the external floor or wall means massive size (860 x 630 x 310) of the outdoor unit, which spoils the external view of buildings. Due to ample size of it, the manufacturing cost escalates as well as handling is sweaty & hellacious. Therefore, it is hardened to handle the outdoor unit during the installation and positioning. It also spoils the exterior look of the construction or building. Therefore, one of the promising options is to reduce the huge size of the current design. For which the solution is to construct a new design of the outdoor unit. We design a new outdoor unit by replacing the major parts of the outdoor unit which has currently. We change and rearrange the condenser coil and made a 3-stage condenser fitted in a small size duct. For the better and more efficient working of the system, we implemented new components in the outdoor unit. Hence by applying all this modification the new design becomes more convenient to handle (800 x 380 x 395), saves time of manufacturing and repairs, flexible for installation and bunched in size with the same price of approx. ₹35,000.*

KEY WORDS **- Air conditioner, Blower, Condenser, Modification, Refrigerant, R-22**

I. EXISTING DESIGN OF AIR CONDITIONER

An air conditioner is designed to regulate both the temperature in a room and the humidity taking care of summer's two worst issues. If only the outside could be as comfortable. We are starting our work on the Split Air Conditioning System. This type of Air Conditioning System is called a split air conditioner because it has an inside and an outside part. The reason for the split is that it keeps the hot outside and the cool inside. The compressor and the condensing coils are on kept on the outside of the house and the evaporator coils and blowers are on the inside of the house. Nowadays in air conditioners outdoor unit require more space on the external floor or wall means large size of outdoor unit, which spoil the external looks of buildings. Due to the large size of the outdoor unit, the manufacturing cost increases and outdoor unit handling is also increased.

II. IDENTIFY, RESEARCH AND COLLECT IDEA

As we discussed earlier about the outdoor unit of the Air Conditioning System that the size of the outdoor unit is huge. Therefore, hard to handling of the outdoor unit during the installation of it. In addition, of this, the manufacturing of ample size of the outdoor unit is complex, costly and also difficult to move. When we study about the Split Air Conditioning System, we found one common and main problem of the outdoor unit. The problem is the size of the outdoor unit. Therefore, we try to reduce the size of the outdoor unit. Then we get knowledge about the components of the outdoor unit from web searches & faculties and get three different ideas to reduce the size of the outdoor unit. First idea is to reduce the outlet pressure of the compressor. However, practically it is not possible because if the outlet pressure of the compressor is low than the heat transfer rate is minimized. Hence, the overall COP decreases. Second idea is to make a new design of condenser. In the new design of the condenser, we reduce the length of the copper pipe by 15-20%. Therefore, at the end, we all come to one conclusion of using a new design of condenser and also use the blower instead of a fan. As per our design of the outdoor unit, first of all, the air is sucked by the blower and then from the outlet of blower it passes through the three layers of the copper tubes which cools the refrigerant inside it. On the other side of the blower, there is the same size of the compressor.

Use of Simulation software

There are numbers of software available, which can mimic the process involved in your research work and can produce a possible result. One of such type of software is AutoCAD and SolidWorks.

III. CONCEPTUAL OVERVIEW OF NEW DESIGN OF CONDENSER

Considering the current design of the condenser of L shape in the ample outdoor unit of Split Air Conditioning System with 35m of copper tube, it is difficult to change its design and place it into 800 x 380 x 395 size outdoor unit. To meet the technical results of old condenser we have to create efficient and small size design condenser.

The concept initiated as a strategy for developing small in size and less in copper tube utilization.

Consequent to the fact that the tube must be of some minimum length for generating cooling effect in the Air Conditioner System. Therefore, by some calculation finally, one design finds efficient and as per our objective of reduction in size. [See fig-1]

Figure – 1. Schematic Layout of Condenser

The condenser is a combination of three different condensers. As per the calculation of duct size and require cooling effect these three are of different sizes. Out of them, the first one is of 13 tubes, second is with 21 tubes and the last condenser contains 42 tubes.

IV. CONCEPTUAL OVERVIEW OF CONCENTRIC HEAT EXCHANGER AND DUCT WITH BLOWER

If any Air Conditioner System works properly and efficiently then there will be water drain out from the indoor unit which is about 16.5 ºC cool and for gaining more cooling effect by pre-cooling of refrigerant R-22 before entering into a condenser, the concentric tube type heat exchanger is used for cooling down it. [See fig-2

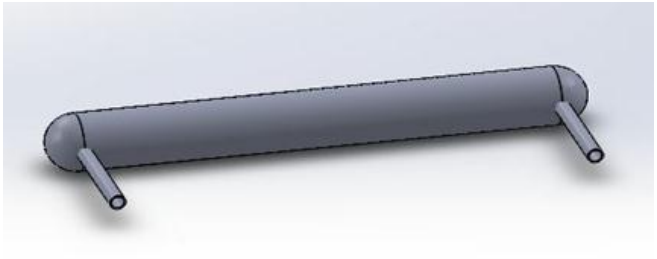

Figure - 2. Concentric Heat Exchanger

Another modification is of a fan of the outdoor unit, which is replaced by blower of 250 CFM for getting essential airflow over the three condenser which cools the refrigerant inside the copper tube. The complete assembly of the Air Conditioner System outdoor unit after placing a newly designed condenser, compressor of R-22 and blower will appear like below figure. [See fig-3]

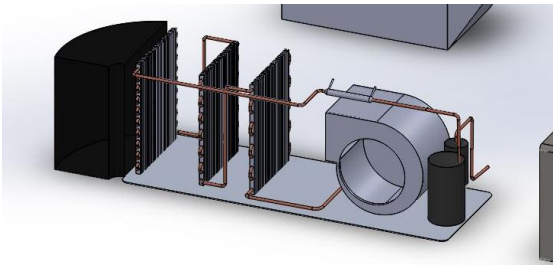

Figure – 3. The Final Assembly

V. COLLECTED DATA

We collecting the data of old traditional AC for reference. Then after collecting the data of newly designed outdoor unit and make relevant comparison. The data includes the temperature of air inlet/outlet, inlet/outlet tube temperature and CFM of air flow at indoor/outdoor.

The first graph depicts the line graph comparison of old AC and new design (after modification) different temperatures for indoor unit. It clearly shows that new data are not as per the standard vales as in old one but are slightly less cooled. [See fig-4]

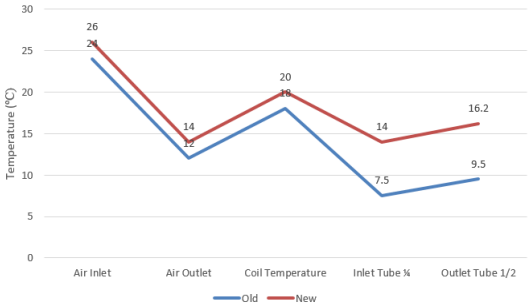

Figure – 4. Graph of Indoor Unit

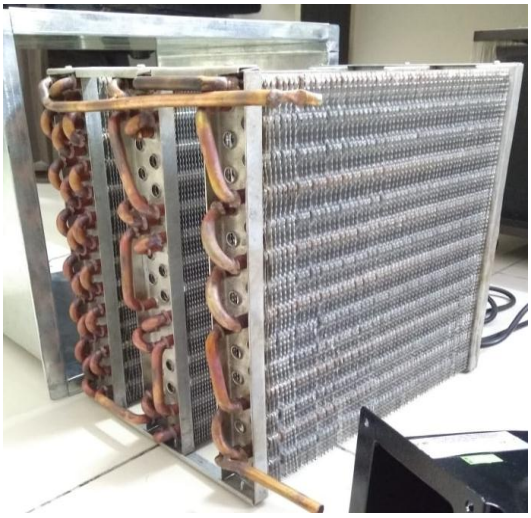

Figure – 5. Condenser New Design

The airflow speed (in CFM) at the newly designed outdoor unit is reduced by 50% and reaches nearly 500 CFM than the older standard data of the outdoor unit. On the other hand, after modifying the outdoor unit there is no significant change in the airflow speed (in CFM) at the indoor unit and remains unchanged. [See fig-6]

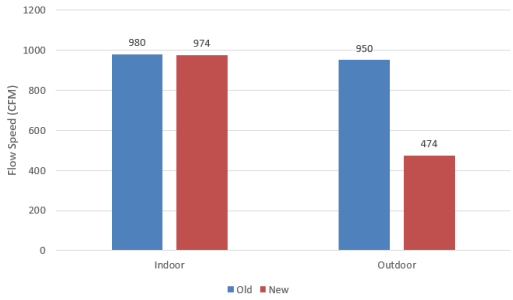

Figure – 6. Flow Speed in CFM

Figure – 7. New Design of Outdoor Unit

VI. CONCLUSIONS

It is indeed necessary to modernize the construction of the Air Conditioning System Outdoor Unit for achieving size reduction and movement flexibility. The primary necessities would be:

1. It should primarily be compliant with the older design of the outdoor unit.
2. The existing design of the outdoor unit is huge and sweaty to install, therefore, it should be flexible enough so that it can replace the conventional designed outdoor unit, which can be easily installed on the wall.
3. Three different condensers in series, which work as same as the L-shaped conventional condenser.
4. The blower is used (as in the indoor unit) in the outdoor unit that substitutes the fan for getting for air for cooling of refrigerant in the condenser.
5. The water draining out from the indoor unit is used for cooling down the refrigerant with the help of a concentric heat exchanger, which was draining out in the conventional design of AC.

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