Designing and Developing of Water Cooler cum Air Conditioner: A Review

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Abstract— This project "Designing And Developing Water Cooler Cum Air Conditioner System" makes the study of the development of a water cooling system using a normal air conditioner. The main aim behind developing this device is to develop a multifunctional unit which can provide cold water along with regular air conditioning cycle. The refrigerant is used as the medium which absorbs and removes heat from the space to be cooled and subsequently rejects that heat. This heat of the refrigerant is used to cool the water and heat of water is used to cool the air. The air cycle is the conventional vapor compression cycle.

Key words: Water Cooler cum Air Conditioner, Expansion valve, Compressor

I. INTRODUCTION

In India during summer season the average temperature is around 45 degree Celsius. To maintain comfortable conditions in summer season various appliances like air conditioners, coolers and fans are used. The cost of such appliances is quite high which is beyond reach of common man. Also during summer season everyone needs cool air and cold water for drinking purpose. So to be comfortable in this season we need cold water and cool air. To fulfill these requirements we need to purchase two different appliances one for cooling air and other appliance for cooling water. Also space required for installation of this appliances is more. Innovation and modification is the nature of engineering. Hence we have introduced "Designing and Developing Water Cooler Cum Air Conditioner". Main purpose of our project is to provide both of these facilities that is cool air and cold water in single unit and to provide this unit at affordable cost for common man. Due to the single unit the space required for installation is also less. This unit can be used in homes, offices, banks, auditorium halls, etc.

II. COMPONENTS

A. Compressor

- Working Pressure (minimum) 9 Kg. / Sq. Cm.
- No. of stages One (or more)
- Motor Power 200 KW (or more)
- Operating Voltage 3 Phase, 415 V

B. Condenser

Air condenser used in the residential and small offices applications

C. Expansion valve

In this process we use the Thermostatic expansion valves.

D. Evaporator

- Power supply 230 V, AC, 50 Hz
- Temperature accuracy ± 2°C
- Condenser support Yes

E. Water tank

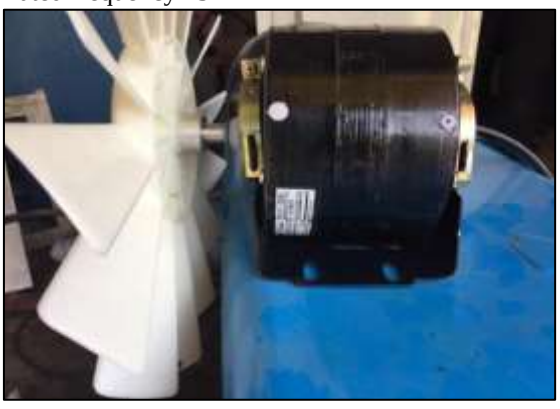
- The size of the water tank is 10 liters.
- It is non-corrosive.
- Two taps are connected

F. Outdoor unit

- Nominal Capacity: 1 ton
- Electricity in put: 230V/50Hz/Single Phase
- Outdoor unit: Less than 55 dB
- Compressor: rotary type
- Body surface finish: powder coated/high quality paint finish
- Air filtering unit: Activated carbon cartridge, dust proof and anti-bacteria filter

G. Motor

- Rated power 3hp
- Supply voltage 230volts
- Rated speed 900 rpm
- Rated frequency 45 Hz



III. WORKING

- There is a sequence of operations in the experiment the refrigerant we used in this experiment is F-22 it also called as R-22
- This refrigerant compressed in the centrifugal compressor where the friction is less since there are no sliding parts in it. There are no vibrations in these types of compressor. It compresses the refrigerant, to increase the pressure of the refrigerant which makes the refrigerant to pass all over the system.
- The F-22 refrigerant is compressed more than the remaining refrigerants. The process is based on vapour compression refrigeration cycle. The refrigerant is compressed in compressor and then moves into condenser where the heat is absorbed, then, from the condenser it moves into expansion valve where the refrigerant is going to expand.
- The phase of the refrigerant changes in this process from vapour state to liquid state. From the expansion valve it enters to evaporator and phase change occurs from liquid state to vapour state. Than the refrigerant is surrounded.
- The copper tube is surrounded to water tank through which the refrigerant passes. It utilizes the 25% of the refrigerant to cool the water and the remaining 75% of the refrigerant effect utilized by the air conditioner where the refrigerant passes through the cooling coil.
- The motor fan is placed back of the coiling coil which blows the air and gives cooling effect. Then the refrigerant goes in to the outdoor unit. This cycle keeps on continuing and it makes 50 cycles per minute.

IV. CONCLUSION

- By using a water cooler and air cooler as a room cooler you can save 80% of the energy consumed by a 1.5 ton wall AC. Besides, this experiment can be used in cooling rooms, offices and halls and also cools water becomes a universally accepted option in India too.
- Depending on specific situations, this run parallel to, compete with or even replace air conditioning system. When that happens the cost of water cooling and air conditioning devices will come down dramatically.
- On the basis of this experiment I have found that a water cooler that cools ten liters of water down to 8C in an hour can be an ideal room cooler to bring the

temperature of room air by 18C for a room of about 12 sq. feet.

- The sag is that for the present a water cooler of that capacity could cost a packet, about Rs.12,000 and its air conditioning attachment another Rs.20,000. In a specially made design the combined unit should not cost more than Rs.18,000. Since its running cost in terms of power used is only 10% of the wall AC, the common man would prefer it any day.

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