INTRODUCING VCRS IN DESERT COOLER

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ABSTRACT

Now a day, energy consumption all over the world is increasing rapidly and there is a pressing need to develop way to conserve energy for future generation. Researcher is forced to look for renewable source of energy and way to use available sources of energy in more efficient way. Conventional refrigeration-based vapor compression air conditioning system consume large portion of electrical energy produce mostly by fossil fuel.

A novel due point temperature of evaporative cooler (DPEC) can sensibly cool the incoming air close to its due point temperature. In this type of air conditioning is therefore neither eco friendly nor sustainable. Selection of proper air conditioning system for building cannot only help the country save electrical energy but also reduces the green house emissions.

This direct evaporative cooling adds moisture to room air which is unpleasant to the occupant also outlet air temperature by this type of air conditioning

Keyword: - *Compressor, Condenser, Expansion valve, Evaporator, Desert Cooler.*

1.0 INTRODUCTION

In summer season most of the people refers the cooler to cool the temperature. But the most efficient equipment is air conditioner to cool and maintain the temperature. The cost this equipment is very high. Common man cannot afford it.

Its function is to maintain temperature as per the comfort. The human comfort temperature is 200 degree 24 degree Celsius and humidity is 25% to 60% RH.

In our project we have maintain the temperature and humidity with the help of device thermostat. Our project works on vapor compression refrigeration system (VCRS) and it is very economy to a common man that it can offer easily.

1.1 Literature Review

Latent heat thermal energy storage could be installed in an AC system, either in a chilled water circuit, ventilation system, or in the thermal power generation of desiccant cooling and absorption system. Shortly, the benefit for using the thermal energy storage can be summarized as: reducing the loading capacity with respect to peak load, operating the system at constant load during the partial load, shifting the usage of the electrical energy, reducing the air conditioning size and capacity at the terminal units due to the high difference in temperature. Kurt W. Roth says overall, the net energy impact of TES depends upon the amount of energy storage shifted to off-peak period. A simplified study suggests that night operation of a TES-chiller system sized such that the chiller could meet the integrated cooling load of an office building in Atlanta via 24-hour operation at or near full capacity could meet at least 40% of the peak period cooling demand. Using this value, PCM-or water-based TES reduces annual cooling energy consumption by approximately 10% for water-cooled system3, 4 and 20% for air cooled chillers relative to chillers without TES. Applied to the 0.3 and 0.1 quads of energy consumed by water and air-cooled chillers 5, respectively, TES could reduce cooling energy consumption by about 0.05 quads. In all cases, the ice-based cooling appears to increase energy consumption because the decreases chiller efficiency outweighs other saving.

1.2 Maintenance

To ensure all compressor types run efficiently with no leaks, it is imperative to perform routine maintenance, such as monitoring and replacing air compressor fittings. It is suggested that air compressor owners perform daily inspections of their equipment, such as:

- Checking for oil and air leaks
- Checking the differential pressure in the compressed air filter
- Determining whether or not the oil in the compressor should be changed
- Verify safe operating temperature to avoid overheating the unit

2.0 VCRS

The vapor-compression uses a circulating liquid refrigerant as the medium which absorbs and removes heat from the space to be cooled and subsequently rejects that heat elsewhere. All such systems have four components: a compressor, a condenser, a thermal expansion valve (also called a throttle valve or metering device), and an evaporator. Circulating refrigerant enters the compressor in the thermodynamic state known as a saturated vapor and is compressed to a higher pressure, resulting in a higher temperature as well. The hot, compressed vapor is then in the thermodynamic state known as a superheated vapor and it is at a temperature and pressure at which it can be condensed with either cooling water or cooling air flowing across the coil or tubes. This is where the circulating refrigerant rejects heat from the system and the rejected heat is carried away by either the water or the air (whichever may be the case).

The condensed liquid refrigerant, in the thermodynamic state known as a saturated liquid, is next routed through an expansion valve where it undergoes an abrupt reduction in pressure. That pressure reduction results in the adiabatic flash evaporation of a part of the liquid refrigerant. The auto-refrigeration effect of the adiabatic flash evaporation lowers the temperature of the liquid and vapor refrigerant mixture to where it is colder than the temperature of the enclosed space to be refrigerated.

The cold mixture is then routed through the coil or tubes in the evaporator. A fan circulates the warm air in the enclosed space across the coil or tubes carrying the cold refrigerant liquid and vapor mixture. That warm air evaporates the liquid part of the cold refrigerant mixture. At the same time, the circulating air is cooled and thus lowers the temperature of the enclosed space to the desired temperature. The evaporator is where the circulating refrigerant absorbs and removes heat which is subsequently rejected in the condenser and transferred elsewhere by the water or air used in the condenser.

To complete the refrigeration cycle, the refrigerant vapor from the evaporator is again a saturated vapor and is routed back into the compressor.

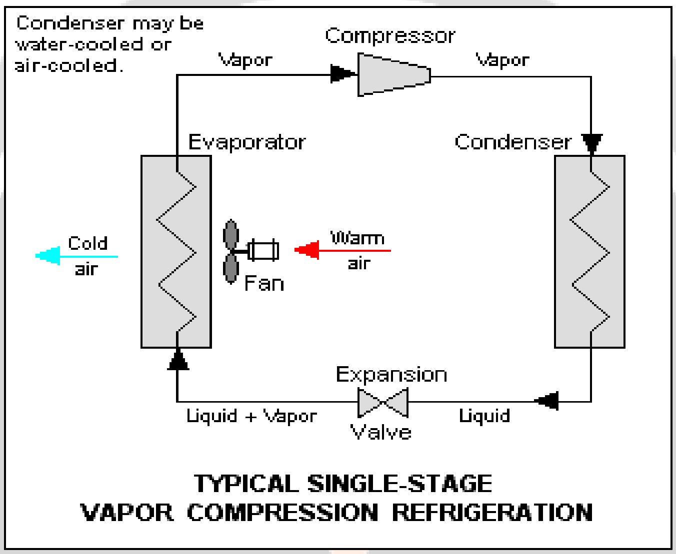

Fig-1: **VCRS**

2.1 Body=95*35 cm

Vapor-Compression Refrigeration or vapor-compression refrigeration system (VCRS), in which the refrigerant undergoes phase changes, is one of the many refrigeration cycles and is the most widely used method for air-conditioning of buildings and automobiles. It is also used in domestic and commercial refrigerators, large-scale warehouses for chilled or frozen storage of foods and meats, refrigerated trucks and railroad cars, and a host of other commercial and industrial services. Oil refineries, petrochemical and chemical processing plants, and natural gas processing plants are among the many types of industrial plants that often utilize large vapor-compression refrigeration systems.

2.2 Description of VCRS system

The vapor compression system is used to cool the system or surrounding. It normally provides temperature from 16 degrees Celsius to 22 degrees Celsius. It has been mounted on desert cooler to increase efficiency of it. VCRS is mainly consisting of 4 parts i.e. compressor, condenser, expansion valve, evaporator.

2.3 Refrigerants

These refrigerants were commonly used due to their superior stability and safety properties: they were not flammable at room temperature and atmospheric pressure, nor obviously toxic as were the fluids they replaced, such as sulfur dioxide. Haloalkanes are also an order(s) of magnitude more expensive than petroleum derived flammable alkanes of similar or better cooling performance.

3.0 SPECIFICATION

3.1 Motor specification

- Fan Motor: -500 mm sweep cooler fan. Three speeds (high*medium*low with metallic blade). Input capacity 200 approx.
- 2300 rpm, 230v, 50HZ. Air delivery 4500 cubic meter per hour
- Rated output- 18 v

3.2 Size of cooler

- Length= 41 cm
- Height= 60 cm
- Width= 41 feet

3.3 Cooler tank capacity

- Length= 45.5cm
- Width= 41cm
- Height= 18cm
- Total volume= 30 liters
- Water consumption per hour= 5 liters
- Room temperature in summer=32 degree Celsius to 35 degrees Celsius
- Temperature of air delivered by cooler=25 degree Celsius

3.4 Compressor specification=1 tone

- Voltage input=220v
- Frequency input=50 HZ
- Power consumption=118 watt
- Refrigerant= R 134a
- Capacity=250 liters
- Cooling Capacity= 3500 watt

3.5 Condenser specification=25*25 cm

- Tones=14
- No of horizontal turns=26

- Diameter of coil=6mm
- Actual length of coil=1040 mm

3.5 Evaporator specification

- No of horizontal turns=16
- Actual length of coil=640 mm

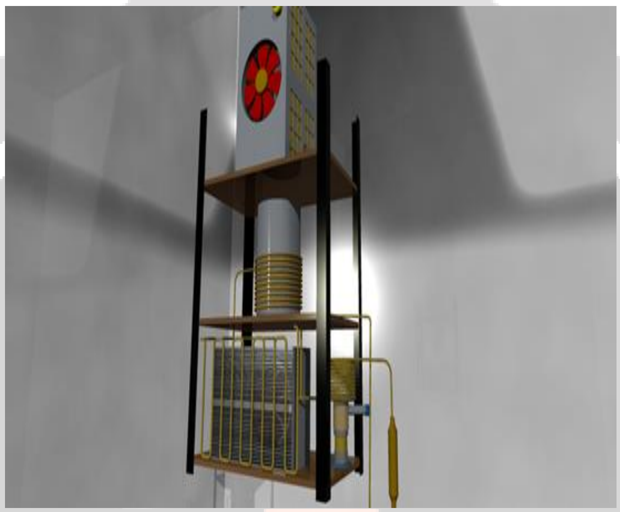

Fig -2: Desert Cooler With VCRS

4.0 CALCULATIONS

4.1 Cooler calculation

Room size: - 10*12*12 feet

- 10 feet=3.048 m
- 12 feet=3.6576 m

Total volume=40.77 cubic meter

4.2 Air conditioner assisted cooler

- Ambient temperature=41 to 45 degrees Celsius
- Final temperature achieved in the cabin=18 degree Celsius to 22 degrees Celsius
- Power consumed by our project=318 watt
- Wet bulb temperature obtained=16 degree Celsius
- Dry bulb temperature obtained=20 degree Celsius
- Humidity = 60%

4.3 Power consumed by our project=318 watt

- Kw.hr per day consumption or unit consumption=0.318 kw*8hr=2.544 unit/day
- Operating cost of our project=2.544 * 8 rupee=20.352 rupee
- Monthly operating cost = 20.352*30 = 610.56 rupees

4.4 POWER CONSUMED BY A/C

- Kw hr consumption of 1.5 tone AC =12 unit/day
- Operating cost of 1 tone AC = 12*8= 96 rupees
- Monthly operating of 1 tone AC = 96*30 =2880 rupees

5.0 COSTING

Cost is the amount by which one thing or any object is purchased to the something. The cost of the object should be affordable and reasonable otherwise the things which are the things which are the purchased will not be make something, the cost of the object should be considered with respect to their use. For completing the project we just tried to reduce the manufacturing cost as far as possible. The following data shows the costs of all components or parts.

Cooler body	2000
VCRS system	3500
Frame of VCRS system	1000
Copper coil	500
Temperature controller	1000
Insulation material	500
Fabrication charge	1500
Total	10,000

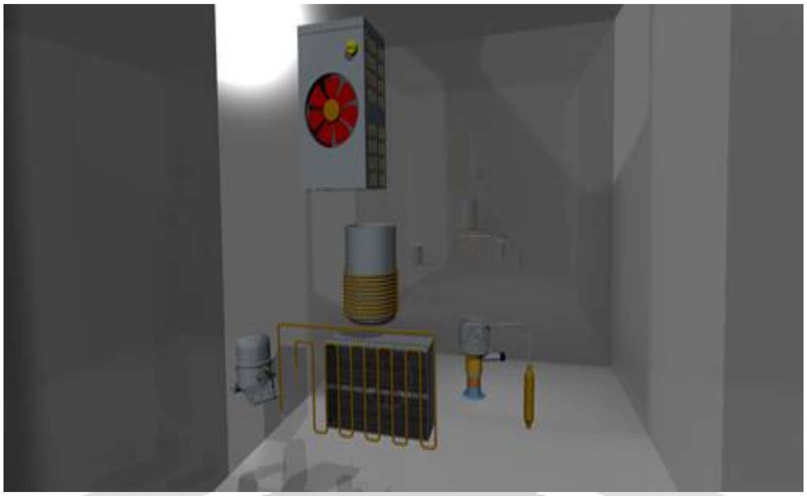

Fig -3: Setup of VCRS

6.0 CONCLUSION

- Actual cooling effect of cooler is 15-18 degree Celsius
- Actual time to cool the water temperature is 2 hours
- We are maintaining the temperature of water near about 2 to 4 degrees Celsius
- We are using copper tube for vaporization

7.0 REFERENCES

7.1 Website

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