RESEARCH ARTICLE OPEN ACCESS

Home Made Air Conditioning

D. Edukondalu [1], A. Hemanth Kumar [2], Sk. Sultan [3], U.Ramu [4], B. Santhi [5]
Under Graduate Student [1], [2], [3], [4], Assistant professor [5]
Department of Mechanical Engineering
Narayana Engineering College, Gudur
Andhra Pradesh – India

ABSTRACT
Most of the homes in warm climates have air conditioning. Now a days for some people air conditioning may be luxury, but for many it is necessary. Conventional air conditioners are efficient but their initial and maintenance costs are very high due to high electric power consumption. In this project the pedestal fan is wound with copper tube by plastic clamps. First plastic tube (vinyl tube) is connected with one end of the copper tube and other end of plastic tube is connected with pump. Pump immersed in the cooling chamber. Second plastic tube is connected with another end of copper tube other end plastic tube is immersed in the cooling chamber. Fan and pump connected with electricity and pump is sucks the cool water from the cooling chamber.

Keywords:- AC

I. INTRODUCTION

World is always trying to invent new one. Somebody tries to find new one and tries to modify an ordinary one to implement a technology. Energy plays an important role in the material, social and cultural life of mankind. This is the result of population growth and increase in the standard of living which is directly proportional to energy consumption. In practice air conditioner and air cooler are widely used in the world. These electrical devices consumed more electrical power and it is not benefit for the poor people. In practice power storage is also occurred. These problems are rectified by modification of ordinary pedestal fan.

In summer season, the ordinary pedestal fan gives small amount of cold air in the room. So the pedestal fan is modified by using copper tube and special design cooling chamber. In this project the cooling of air by using cold water which is circulated in the copper tube for the purpose of reducing the heat in the surrounding environment is of great importance in widely distributed villages with little or no rural electrification and also in the urban areas where power storage is often in practice.

II. HISTORY

In the most general sense, air conditioning can refer to any form of technology that modifies the condition of air (heating, cooling, (de-)humidification, cleaning, ventilation, or air movement). In common usage, though, "air conditioning" refers to systems which cool air. In construction, a complete system of heating, ventilation, and air conditioning is referred to as heating, ventilation, and air conditioning (HVAC – as opposed to AC).We take the air conditioner for granted, but imagine what life would be like without it.

Once considered a luxury, this invention is now an essential, allowing us to cool homes, businesses, hospitals, data centers, laboratories and other buildings vital to our economy and daily lives. In fact, air temperature is so important to us that 48 percent of all energy consumption in American homes is a result of cooling and heating, according to the Energy Information Administration.

III. WORKING

In this project the pedestal fan is wound with the copper tube by plastic clamps. First plastic tube (vinyl tube) is connected with one end of the copper tube and other end of the plastic tube is connected with pump. Pump immersed in the cooling chamber. Second plastic tube is connected with another end of copper tube other end plastic tube is immersed in the cooling chamber. Fan and pump connected with electricity and pump is sucks the cool water from the cooling chamber.

The components are arranged according to the photos shown in figure. The cooling system contains

refrigerant like water whose temperature decreases as time passes. This refrigerant (i.e cold water) passes into the copper coil which wounded on the front panel of the exhaust fan with help of aquarium pump. In this process the air coming from the exhaust fan passes on the surface of copper coil.

The heat transfer takes place from low temperature to high temperature that is copper coil absorb the heat from air and given to the refrigerant which is following in the coil. After that the heated refrigerant collected in the cooling chamber (i.e pot) and recirculated in the coil. The specification of cooling chamber is that the temperature of refrigerant decreases with help of clay pots and sand. The sand is used that leveling sand has a property, is the decrease the temperature as time passes and every 8 hours water will need to be replaced to ensure constant coolness.

FORMULAS

- ✓ Relative Humidity(Ø) = $\frac{P_V}{P_S}$
- ✓ Specific Humidity(w)= $0.622\times\frac{P_V}{P-P_V}$
- ✓ Mass flow rate = air flow × density of air
- ✓ Heat removed = $m(h_1-h_2)$

CALCULATIONS

Room area = 10×12 feet

Air flow of fan = 300 cmh or m^3/hr

Outdoor conditions:

DBT = 36^0 C
WBT = 29^0 C
From psychrometric calculator
Relative Humidity = 60%
Dew point temperature = 26.93^0 C
Enthalpy = 94.37 kj/kg
Density of air = 1.12 kg/m^3
Specific volume = 0.91m^3/kg
Atmospheric pressure =101.10kpa
Humidity ratio = 0.0227 kg of moist air /kg of dry air
Partial vapour pressure = 3.55 kpa
Saturated vapour pressure = 5.947 kpa

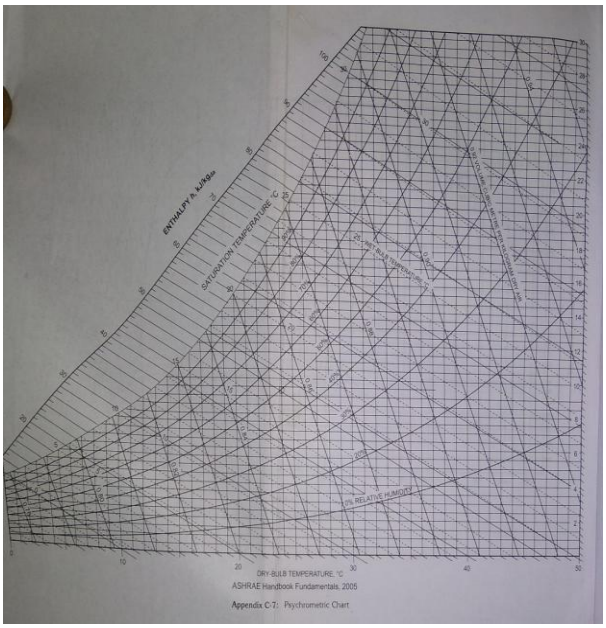


FIG: PSYCHROMETRIC CHART

Indoor conditions:

DBT = 33^0 C
WBT = 26^0 C
From psychrometeric calculator
Relative Humidity = 58%
Dew point temperature = 23.57^0 C
Enthalpy = 80.36 kj/kg
Density of air = 1.14 kg/m^3
Specific volume = 0.895m^3/kg
Atmospheric pressure = 101.1 kpa
Humidity ratio = 0.0184 kg of moist air/kg of dry air

Partial vapour pressure = 2.908 kpa
Saturated vapour pressure = 5.03 kpa

Capacity of Home Made Air Conditioner:
Air flow quantity = 300 cmh or m^3/hr
Enthalpy at outdoor condition = 94.37 kj/kg
Enthalpy at indoor condition = 80.36 kj/kg
Mass flow rate of air = air flow (m^3/hr) × density of air (kg/m^3)

=300×1.12 m^3/hr × kg/m^3
=336 kg/hr

Heat removed = m (h1-h2)
=336(94.37-80.36)
=4707.36 kj/hr

$= \frac{4707.36}{60}$
=78.45 kj/min
=1.3 kj/sec

Capacity of home made air conditioner = $\frac{1.3}{3.5}$

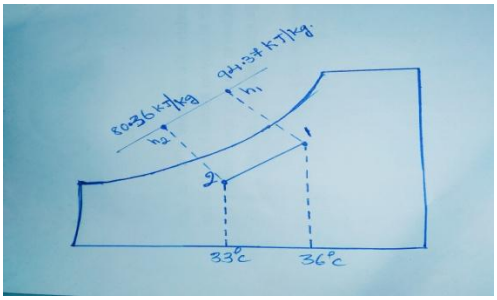
=0.37 TR

Coil efficiency :

Bi pass factor = $\frac{T1-T3}{T2-T3}$
T2 = Indoor temperature = 33^0 C
T3 = coil temperature = 21^0 C
T1 = outdoor temperature = 36^0 C
Bi pass factor = $\frac{33-21}{36-21}$
= 0.8
Coil efficiency = 1- BPF
= 1-0.8
= 0.2
= 20%

Energy analysis:
Power consumption of pedestal fan = 108 w
Pump = 18 w
Total power = 126 w
If we use this home made air conditioner for 10 hrs/day power consumption is 1.26 units.
1 unit cost is = 3/ - (approximate)
For 1 day:
1.26×3 = 3.78/-
For 1 month:
1.26×30×3= 113.4/-
For 4 years:
1.26×30×12×3 = 1360.8 /-
If we have used 1TR capacity Air conditioning machine, the power consumption will be 1.2 units approximately per one hour.
For 1 day:
1.2×10×3 =36/-
For 1 month:
36×30 =1080 /-
For 1 year:
1080×12= 12960 /-

GRAPH



1-2 process-cooling and dehumidification

IV. RESULTS & CONCLUSION

Various observations results obtained from the project work suggested new design is more beneficial and it is good advancement in the conventional design of fan . Based on the following conclusions we found that home made air conditioner having high efficiency using cool water compare to a conventional air conditioning system. This project work home made air conditioner unit is very useful for poor people which is of very low cost and carried one room to other. Observations of the psychrometeric chart shows that relative humidity is reduced. Home made air conditioner consume upto 10 times less energy than that of split air conditioners Home made air conditioners consume less amount of electricity and are possible to operate in low current consumed areas Home made air conditioners assumes very less maintainance. Home made air conditioner have significant environmental benefits with no harmful chlorofluro carbons emissions because water is refrigerant and a quality of atmosphere to the up coming generations. The capital cost of home made air conditioner is very less, when compared to air conditioner.
The required cost of air conditioner are too high when compared to our home made air conditioner the filters of air conditioners have to be cleaned and changed periodically. The parts to be maintained with ultimate care. In case of home made air conditioners water is the only maintainance raw material which is available at any time.

REFERENCES

[1] R.s.khurmi and JK.Gupta a text book of refrigeration and air conditioning, india ,1992

[2] CP Arora a text book of refrigeration and air conditioning of mechanical engineering, india ,1995 .
[3] Pakkirappa and V.Naresh a text book of refrigeration and air conditioning of diploma mechanical engineering , india ,2009
[4] Refrigeration and air conditioning by manohar prasad