Development of Eco Friendly Air Conditioning System with the Help of Table Fan

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Abstract

The goal of this paper is to present the details to develop a homemade air conditioning system with the help of table fan. Use of air conditioning is increasing day by day by which the environment is affected. In order to reduce the bad effect of conventional air conditioning system, it is required to develop an air conditioning system ecofriendly. This article shows that how we can develop an air conditioning system with the help of table fan and other related equipments. This paper will be beneficial for young researchers working in this area and this technique opens the door for further investigation for improving the quality of this type of air conditioning system.

Keywords- Air Condition, Copper Tubing, Insulation, Table fan

I. INTRODUCTION

Air conditioning is the process whereby the condition of air, as defined by its temperature and moisture content, is changed. Note that in practice other factors must also be taken into account especially cleanliness; velocity & distribution pattern. Human comfort inevitably 'comfort' is a very subjective matter. Outside air is quite likely to be at a different condition from the required comfort zone condition. In order to bring its condition to within the comfort zone we may need to do one or more of the following: - heat it; cool it; dehumidify it; humidify it; or mix it. The essential ingredients in an air conditioning system are a fan to blow air around, a cold surface to cool and dehumidify the air, a warm surface and a source of water vapour. In a large system there will also be a tangle of tubes to distribute the air and collect it again. Notice that the cold surface has two independent jobs to do: it is used to cool the air and it is also used to dehumidify, by condensing water from the air. This means that the air is cooled more than is necessary for temperature control, so that it must be heated again afterwards.

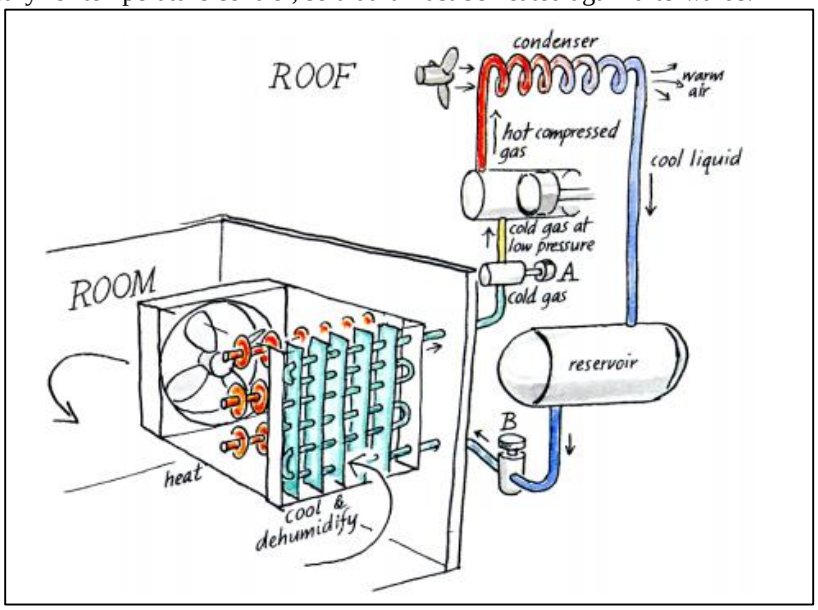

Fig. 1: Basic sketch of Air conditioning system

II. DEVELOPMENT OF ECOFRIENDLY AIR CONDITIONING SYSTEM

The detail descriptions of the parts to be used in development of air conditioning system and development steps are discussed in this section of the report. The developed setup has following major parts.

1) Table Fan
2) Copper Tube
3) Submersible Water Pump
4) PVC flexible tube
5) Insulated Box for Cold Water

A. Table Fan

Electric Table Fan is one of the common electric appliances used in houses, offices, shops and business establishments to provide air circulation and to cool down temperature. Fan circulates the air, which enhances the evaporation rate of sweat from body, due to which body is cooled. Table Fans are manufactured 200 mm, 300 mm and 400 mm sweep sizes, but the one, which is most commonly used, is of 400 mm sweep size.

Table Fan has become necessity in summer season in houses, schools, colleges, factories, hospitals and business establishments. Further Table Fan is extensively used in rural areas especially when:

1) There is no ceiling overhead.
2) Portability of this fan is better in comparison to ceiling pedestal and exhaust fans. Minimum 50% of table fans used in this area are from standard brands such as Usha, Orient, Crompton, GEC, rest 50% are from SSI Units located in different parts of state.

Fig. 2: Table Fan which is used in this work

B. Copper Tube

Copper tubing used for air conditioning and refrigeration work is called ACR (Air Conditioning and Refrigeration) tubing. It differs from copper tubing used for general plumbing work. When ACR tubing is manufactured, the inside of the tubing is dehydrated to remove all moisture. The tubing is then charged (filled) with low-pressure nitrogen gas and sealed with a cap at each end to keep the tubing safe from contamination by oxygen and moisture in the air. If oxygen atoms were to combine with copper atoms (a process called oxidation), a layer of copper oxide would form inside the tubing. The caps also keep out dirt and other foreign matter that could contaminate a refrigeration system. Caps or plugs should be replaced after cutting a length of tubing. Plumbing copper tubing is cheaper than ACR copper tubing, but plumbing copper is not used in refrigeration systems because it is not protected against contamination. Plumbing copper also differs from ACR copper in size. Plumbing copper is measured by its nominal inside diameter (ID), while ACR copper is measured by its outside diameter (OD).

1) Features of Tube

- Seamless Copper tube. Available in sizes 4.76mm up to and including 104.78mm, in various wall thicknesses.
- The internal cleanliness of air conditioning, refrigeration and medical gas tube is critical in order to prevent contamination to the components in the piping system.
- Tube wall thickness will determine which refrigerant is suitable, depending upon temperature range.
- The full range of straight lengths and annealed coils are listed overleaf.
- Half Hard tube can be bent using bending tools without applying additional heat.

2) Hand Bending

Soft copper greater than 1/43 in diameter can sometimes be bent successfully by hand. (Smaller tubing is easily bent by hand without kinks or flats, unless the bend is very sharp.) Bending is done carefully, a little at a time, to avoid developing severe flats or kinks that must be removed. Hand bending requires skill and should be done only by experienced technicians.

Fig. 3: Hand Bender

3) Spring Benders

Provide an efficient, low-cost method to bend soft copper tubing. Spring benders are available in a variety of sizes to fit tubing from 1/43 OD to 3/43 OD. These springs slip over the tubing to completely cover the area of the bend. After each bend is made, the spring is slid along the tubing to the next section to be bent. When a bend is sharp, spring benders have a tendency to bind, or stick, to the tubing. This tendency to bind can be overcome by bending the tubing a little farther than needed, then bending it back to relieve pressure on the spring. Push; do not pull, on the spring to remove it from the tubing. Pulling can permanently separate the spring coils, making the bender unfit for further use. If the bend is still too tight to slide the spring off the tubing, simply twist the spring to "unscrew" it. Very little practice is needed to accomplish proper

Bends in smaller tubing with a spring bender. Larger tubing, however, requires more physical force to bend so spring benders are used on larger tubing primarily to accomplish slight bends or curves. Although the spring bender is designed for use on the outside of tubing, a smaller spring is sometimes inserted into the tubing to make a bend at the tubing end.

Fig. 4: Spring Bender

C. Submersible Water Pump

Submersible Water Pump Cooler Pump Motor is important equipment in the system by which the cold water is supplied in the copper tube. Special Features of the pump motor are as follows:

1) Copper Winding

2) Compact Size
3) Easy to Install
4) Rust Proof
5) Multiple Usage
6) Easy to Clean submersible pump
7) Low Electricity Consumption

Fig. 5: Submersible Water Pump

4) Specifications

1) 220-240V
2) AC Ph-1 50Hz
3) 14W
4) Max Lifting Height: 1.85Meters(6 Feet)

D. PVC Flexible Tube

Here PVC flexible tube is used to connect the inlet port of water jacket heat sink which supplies the cold water in it to cool the peltier unit. From the outlet of water jacket heat sink the PVC tube connect the inlet of Gram ax 300 heat sink inlet and drain the outlet from the Gram ax 300 heat sink to the storage tank. The PVC tube is used here is transparent and 5mm in diameter. (PVC flexible pipe)

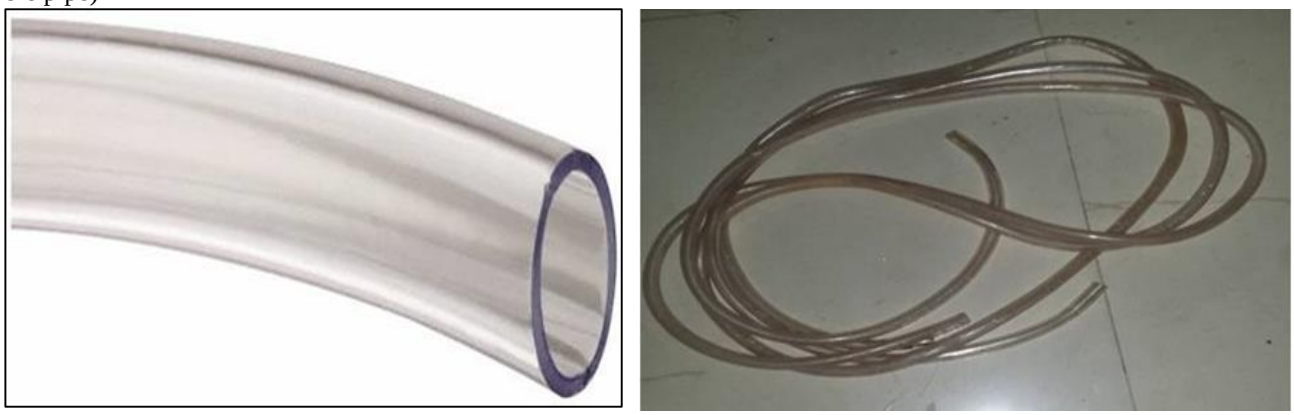

Fig. 6: Poly vinyl chloride flexible tube

E. Insulated Box for Cold Water

These Icebox Are Made Of High Quality CFC Free Polymers Using A Highly Sophisticated Manufacturing Technology To Provide Them With The Best Thermal Insulation And Are Made With Strong Hinges And Handles To Withstand Rough Handling.

Fig. 7: Insulated Box for Cold Water

F. Developed Air Conditioning System

All the equipments discussed above are arranged in a manner so that the final developed air conditioning system is obtained. Here the final developed air conditioning system is shown. The working model of the air conditioning is checked and working properly in the hostel room and overcome the hotness of the room.

Fig. 8: Developed Air Conditioning System

III. TESTING AND APPLICATION

The summer of 2016 was an extremely hot one for Lucknow. The students were living in a cramped student house at the time, with no air conditioning. Eventually ended up constructing a homemade air conditioner which happened to work quite well, allowing the students to get to sleep easily during one of the hottest summers on record.

All testing was done over the period of a few hours in the afternoon of APRIL 22/2016. The testing location was located outside where the ambient temperature ranged from 38 to 42°C. Relative humidity ranged from approximately 41 to 45%. The

location was sheltered from wind, but recorded wind speeds ranged between 1.5 and 2.0 m/s. After starting the air condition the temperature down to 5-7°C and no change in humidity while in conventional cooler there are more humid atmosphere.
There are some applications of developed air conditioning system.

1) To use the cooling of room.
2) To decrease the room temperature.
3) It is not release the humidity factor.
4) It is comfortable for human being.

IV. CONCLUSIONS

It was found that the heat removal capacity of the ecofriendly air conditioning system is good. A model was proposed to describe the response of heat removal capacity to changing flow rate, seen below. Based on the model for variation of heat removal capacity with flow rate, a model was constructed to describe the variation of efficiency with flow rate, seen below.

Economic analysis of the system was conducted to determine the long term feasibility of operating the unit. Net present worth calculations were undertaken based on typical usage patterns at flow rates ranging from 0.25 L/min to approximately Rs 1900 to Rs3000, below the cost of purchasing and operating a commercial air conditioning unit 2.00 L/min. It was found that the total cost of operation (measured by net present worth) varied from approximately Rs2500 to Rs 3500, below the cost of purchasing and operating a commercial air conditioning unit.
The total cost of developed air conditioning system is as under:

Table 1: Cost Chart

ITEM	*COST*
Table Fan	*700*
Copper Tube(9 meter)	*850*
Clips (75pc.)	*100*
PVC water tube (2 meter)	*20*
Insulated cold water box	*150*
Water pump	*100*
Total cost	*1920*

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