Design and Fabrication of Smart Cooler

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Abstract- *This research paper is regarding the Design and Fabrication of Smart Cooler, the development of a system which can be used for cooling as well as heating purpose. The reduction of the water evaporation rate so that water consumption can be decreased, The regulation of the speed of fan to maintain the temperature of heating coil according to room temperature. The reduction of the power consumption as compared to the existing system so it will be more economical. Two system are combined so that space required is less rather than conventional system. Cooler is used for cooling purpose and it manually operated for some task. For example on or off the water pump according to need and to regulate the speed. As per project title smart cooler, it operates automatically with the help of some electronic components. With the addition to these it is also used for heating purpose in winter season by using a heater coil. we control the speed according to room temperature and control the water flow rate on grill according to requirement*

Keywords- Cooling, Heating, Automatic Temperature Control, Humidification And Dehumidification

I. INTRODUCTION

Generally cooler is used for cooling purpose and it is manually operated for some task. For example on or off the water pump according to need and to regulate the speed as per project title smart cooler, it operates automatically with the help of some electronic components. It is also used for heating purpose in winter season by using a heater coil. We can control the speed according to room temperature and control the water flow rate on grills according to requirement. We can regulate the heating coil temperature as per our requirement. In general Air Coolers are used for cooling small area and desert coolers are used for large area.

The resulting cold but moist air is used for providing cooling. Thus the desert cooler is the system which consist of various components consist of blower, wood wool and water pump for dry air and hot air over the wet surface and arrangement for Keeping the surface wet. Evaporative cooling works by employing water's large enthalpy of vaporization.The temperature of dry air can be dropped significantly through the phase transition of liquid water to water vapour (evaporation), which can cool air using much less energy the air conditioner. In dry climate condition, cooling of air has been added benefits of conditioning the air with more moisture for the comfort.

II. OBJECTIVES

a) To develop a system which can be used for cooling as well a heating purpose.
b) To reduce the water evaporation rate so that water consumption can be decreased.
c) To Regulate the speed of fan
d) To maintain the temperature of heating coil according to room temperature.
e) To reduce the power consumption as compared to the existing system so it will be more economical.
f) Two systems are combined so that space required is less rather than conventional system.

III. COMPONENTS OF SMART COOLER

The various components used in smart cooler are as follows

1. AIR COOLER

Air cooler is a mechanical system which consist of aerodynamically shaped blade. And it is also called as evaporative cooler. Air coolers are based on the principle that when unsaturated air comes in contact with water, then the water gets evaporates. In this process, the moisture content of air increases, as well as the temperature of air decreases. The resulting cold air is used for providing cooling effect.

Fig.1. Air Cooler

2. HEATING COIL

A glass heater coil is produce a high temperature, which transfers energy to the lower temperature through electromagnetic radiation. There is No contact or medium between the two bodies is needed for the energy transfer. Infrared heaters can be operated in atmosphere or vaccum the heating coil is used 300 watt power to operate it.

Fig.2. Heating Coil

3. MOISTURE SENSOR

Moisture sensors are measure the volumetric water content in air. Since the direct gravimetric measurement of free soil moisture requires removing, drying, and weighting of a sample, soil moisture sensors measure the volumetric water content indirectly.

Soil moisture sensors refer to sensors that estimate volumetric water content. Another class of sensors measure another property of moisture in soils called water potential; these sensors are usually referred to as soil water potential sensors and include potentiometers and gypsum blocks.

4. TEMPERATURE SENSOR

A temperature sensor is a component or a device which helps in measure the temperature it requires a thermocouple or Resistance temperature detector. The measurement of the temperature sensors, isall about the hotness and coldness of an object. The working of the sensors is the voltage that read across the diode. If there is a increase in voltage then temperature is also increased, and if there is a voltage drop between transistor terminals of base and emitter, they are recorded by the sensor.

In this project we use LM35 sensor. LM35 is a sensor which is precision IC temperature sensor and its output is proportional to the temperature. Its range is from -55 to 150 degree Celsius which is sufficient range for our calculations.

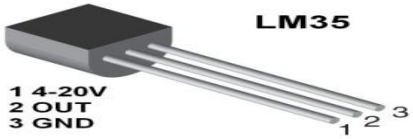

Fig.3. Temperature Sensor

5. CIRCUIT BOARD

The working of PCB circuit board work on simple concept, the resistor, rectifier, filter capacitor, microcontroller are mounted on circuit board. The AC current supply from the power source get rectified by rectifier, the conversion of AC to DC is done by rectifier. The require voltage can be achieved by step down transformer. The DC current then pass through the capacitive filter, which filter the current, then by regulator regulates the current.

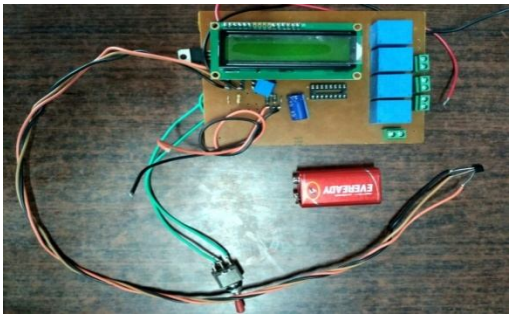

Fig.4. Circuit Board

IV. SPECIFICATION

1. Traic as phase controller
2. Traic BTA12- 280v, 10Amp
3. Transformer-220to12V step-down 2Amp
4. Cooler fan – 0.25 HP
5. Heater coil –300 watts
6. Temperature sensor : LM 35 (-55 to 150) degree Celsius
7. Net Weight – 12 kg
8. Water tank capacity-30 litre
9. Cooling area – 120 sq. Feet
10. Blower speed – 1300 rpm
11. Air throw distance – 10 feet

V. WORKING

First set the temperature with the help of knob or relay. If temperature is set below 28 degree Celsius then cooling process is start. If temperature is set above 28 degree Celsius then heating process is start.

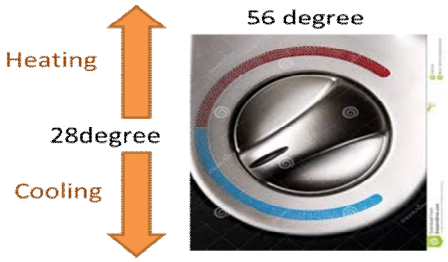

Fig.5.Temp .Setting Knob

FOR HEATING PROCESS

In winter atmospheric air flow through wood wool having temperature between 8-12 degree .Heating coil is there, air flow from it, get heated limit upto desired temperature (22-30 deg).Blower spread the air to room, the sensor installed on blower sense the temp. and give feedback to the microcontroller ,whatever the temp. set ,by means of feedback we can achieve the desired temperature.

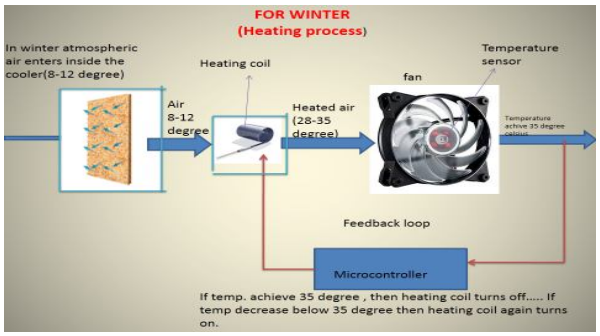

Fig.6. Heating Process

FOR COOLING PROCESS

For summer, we require cooling process for that, while atmospheric air (35-40 deg) flow through wood wool, which is wetted by means of water distributer. The cooling is done by evaporation of water. After achieving the temp as per the set temperature, the temperature sensor give the feedback to microcontroller, the pumping of water will be cut off. The microcontroller will also gives signal to the triac (triode alternating current), it will decrease the speed of rotor. If temperature may increase then triac will increase the speed of rotor.

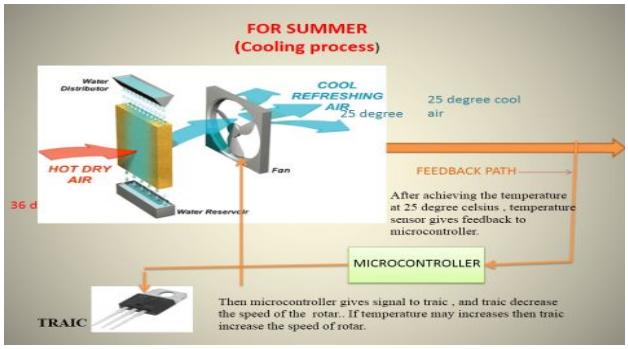

Fig.7. Cooling Process

VI. CONCLUSION

The compact system of heating and cooling unit is futuristic. The requirement of space is also less. Power consumption and water required for wetting the wood wool are less. User friendly by means of infrared remove controller or by means of Bluetooth. Humidification and cooling can be maintain as per the requirement of the individual by use of electronic circuit board.

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