
Design and Implementation of Low Cost Air Cooler with Automatic Control of Water Level and Speed

Mrs. Sushmita Deb
(Asst. Prof.), SJMIT,
Chitradurga, Karnataka

Divya.M.D
(student), SJMIT, Chitradurga,
Karnataka

Ajaykumar.G.R
(student), SJMIT,
Chitradurga, Karnataka

Mr.Sanjay Kumar
(Asst. Prof.), SJMIT,
Chitradurga, Karnataka

Harish.S.P
(student), SJMIT, Chitradurga,
Karnataka

ABSTRACT:

Air Cooler is one of the appliances that keeps the atmosphere cold. The basic concept of water cooling is to find a medium that can handle and transport heat more efficiently than air. Water has a very good ability to retain heat, in the mean time stay in a liquid form. This project is to design and develop a low cost air cooler which can be used in houses and office. Secondary researches have been carried out to collect data regarding the present design of air cooler. Various types of air cooler available in the market have been identified. Ethnographic study and questionnaire survey has been done for understanding the user product interface. The issues related to current air cooler have been found out. Concepts of an air cooler with addition of a separate fan to spread the water in to the air for cooling. Air cooler with a separate fan is selected as the final concept through weighted ranking method. Colours are chosen according to its applications to make it aesthetically good. An working model of the final concept is made using thermocol along with automatic water level indicator and speed controller.

KEYWORDS: Air cooler, Exhaust fan, Submersible motor & thermocol, Transistors, Buzzers, ECS

INTRODUCTION:

An Air cooler (also swamp cooler, desert cooler and evaporative cooler) is a device that cools air through the evaporation of water. Evaporative cooling differs from typical air conditioning systems, which use vapor-compression or absorption refrigeration cycles. Evaporative cooling works by exploiting water's large enthalpy of vaporization. The temperature of dry air can be dropped significantly through the phase transition of liquid water to water vapor (evaporation). This can cool air using much less energy than refrigeration. In extremely dry climates, evaporative cooling of air has the added benefit of conditioning the air with more moisture for the comfort of building occupants.

The cooling potential for evaporative cooling is dependent on the wet bulb depression, the difference between dry-bulb temperature and wet-bulb temperature. In arid climates, evaporative cooling can reduce energy consumption and total equipment for conditioning as an alternative to compressor-based cooling. In climates not considered arid, indirect evaporative cooling can still take advantage of the evaporative cooling process without increasing humidity. Passive evaporative cooling strategies offer the same benefits of mechanical evaporative cooling systems without the complexity of equipment and ductwork.

BLOCK DIAGRAM:

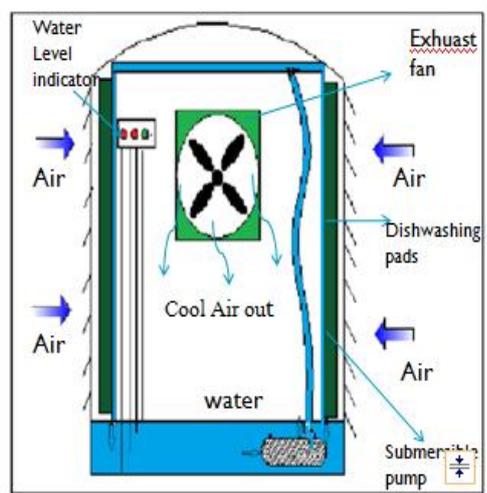


Fig.1 Theoretical view



Fig.2 Practical view

COMPONENTS REQUIRED:

-) Thermocol
-) Exhaust fan-12v
-) Submersible pump-9v
-) Plastic tray
-) Dishwasher as coolant
-) Digital thermometer
-) Pvc pipe

THERMOMETER:



Fig.3 Thermometer

Digital Thermometer (Safety thermometer) has a built-in sensor, thermometer determines the number of indicators and displays them on the display, which is equipped with the thermometer. With home electronic thermometer safe temperature measurement is fast and simple. The principle of operation of the thermometer is recording the changes of electrical resistance of a conductor and converts it to a numeric value, demonstrate safe electronic thermometer. The method of operation determines the price of the device.

Electronic thermometer monitors temperature fluctuations; when the figures are stabilizing, the thermometer beeps and the digital display shows the results. The procedure depends on the method of measurement: using the e-safe thermometer to determine the temperature in the armpit, orally and rectally. The digital thermometer operates through the contact method, as the mercury thermometer. To obtain accurate results, it is necessary to ensure close contact of the electronic thermometer with the device. The price is set in accordance with all peculiarities of operation.

PVC PIPE:



Fig.4 pvc pipe

Regular PVC (polyvinyl chloride) is a common, strong but lightweight plastic used in construction. It is made softer and more flexible by the addition of plasticizers. If no plasticizers are added, it is known as uPVC (unplasticized polyvinyl chloride), rigidPVC, or vinyl siding in the U.S .Here PVC pipe is used to circulate the water from the submersible pump to inner surface of an air cooler.

THERMOCOL:



Fig.5 Thermocol

It is a synthetic aromatic polymer made from the monomer styrene. Polystyrene can be solid or foamed. General-purpose polystyrene is clear, hard, and rather brittle. It is an inexpensive resin per unit weight. It is a rather poor barrier to oxygen and water vapor and has a relatively low melting point Polystyrene is one of the most widely used plastics, the scale of its production being several million tones per year. Polystyrene can be naturally transparent, but can be colored with colorants. Uses include protective packaging (such as packing peanuts and CD and DVD cases), containers (such as "clamshells"), lids, bottles, trays, tumblers, and disposable cutlery.

As a thermoplastic polymer, polystyrene is in a solid (glassy) state at room temperature but flows if heated above about 100 °C, its glass transition temperature. It becomes rigid again when cooled. This temperature behavior is exploited for extrusion (as in Styrofoam) and also for molding and vacuum forming, since it can be cast into molds with fine detail. Polystyrene is very slow to biodegrade and is therefore a focus of controversy among environmentalists. It is increasingly abundant as a form of litter in the outdoor environment, particularly along shores and waterways, especially in its foam form, and also in increasing quantities in the Pacific Ocean.

EXHAUST FAN:



Fig.6 Exhaust fan

An exhaust fan is a fan which is used to control the interior environment by venting out unwanted odors, particulates, smoke, moisture, and other contaminants which may be present in the air. Exhaust fans can also be integrated into a heating and cooling system. Common locations for exhaust fans include bathrooms and kitchens, and these fans are usually very easy to install, so they can be situated in many other locations as well. For installation, people do need a few tools, and they must be comfortable working with electricity to wire the fan in place.

A classic use for an exhaust fan is in an environment like a kitchen or a bathroom. These locations tend to get filled with steam, and steam can promote the development of mold, which is not desirable. An exhaust fan can be used to vent the warm, moist air to the outside, where it can disperse harmlessly. Exhaust fans can also vent cooking odors outside so that they do not linger indoors, and when people cook smoky foods, the fan can help keep the air in and around the kitchen clear.

DISH WASHING PADS:



Fig.7 Dishwashing pads

A sponge is a tool or cleaning aid consisting of soft, porous material. Usually used for cleaning impervious surfaces, sponges are especially good at absorbing water and water-based solutions.

SUBMERSIBLE PUMP

-) **Operating Voltage : 2.5 ~ 6V**
-) **Operating Current : 130 ~ 220mA**
-) **Flow Rate : 80 ~ 120 L/H**
-) **Driving Mode : DC, Magnetic Driving**
-) **Material : Engineering Plastic**



Fig.8 submersible pump

A submersible pump (or sub pump, electric submersible pump (ESP)) is a device which has a hermetically sealed motor close-coupled to the pump body. The whole assembly is submerged in the fluid to be pumped. The main advantage of this type of pump is that it prevents pump cavitations, a problem associated with a high elevation difference between pump and the fluid surface. Submersible pumps push fluid to the surface as opposed to jet pumps having to pull fluids.

Electric submersible pumps are multistage centrifugal pumps operating in a vertical position. Liquids, accelerated by the impeller, lose their kinetic energy in the diffuser where a conversion of kinetic to pressure energy takes place. This is the main operational mechanism of radial and mixed flow pumps. Here pump lifts the water from bottom surface to various parts of an air cooler.

WATER LEVEL INDICATOR

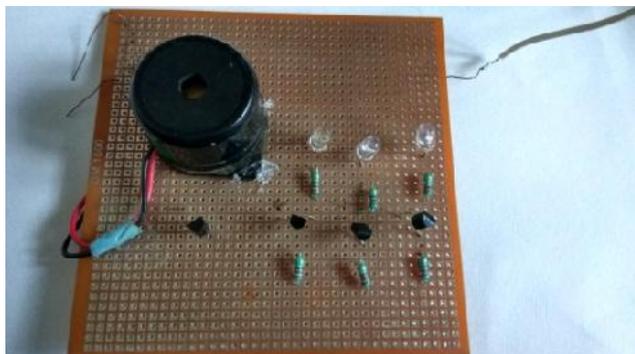


Fig.9 Practical view of water level indicator

CIRCUIT DIAGRAM:

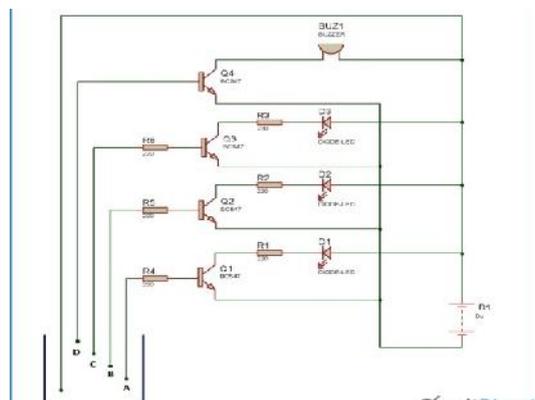


Fig.10 Theoretical view of water level indicator

CIRCUIT COMPONENTS

4 - BC547 transistors, 6 - 220 ohm resistors, 3 - Colour led 1 – Buzzer ,9v battery + battery clip

- ❖ Created 4 levels (low, medium, high and full), we can create alarms for more levels.
- ❖ We have added 3 LEDs to indicate initial three levels (A, B, C), and one Buzzer to indicate FULL level (D).
- ❖ In this Aircooler we used This simple transistor based water level indicator circuit is very useful to indicate the water levels in a tank of cooler. Whenever tank gets filled, we get alerts on particular levels. Here we have
- ❖ When cooler tanks gets filled completely we get beep sound from Buzzer.

SPEED CONTROLLER

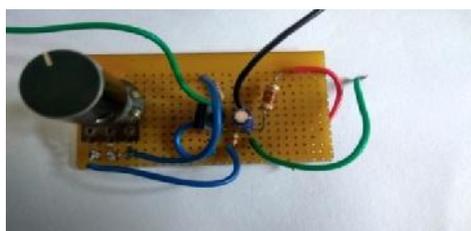


Fig.11 Practical view of speed control

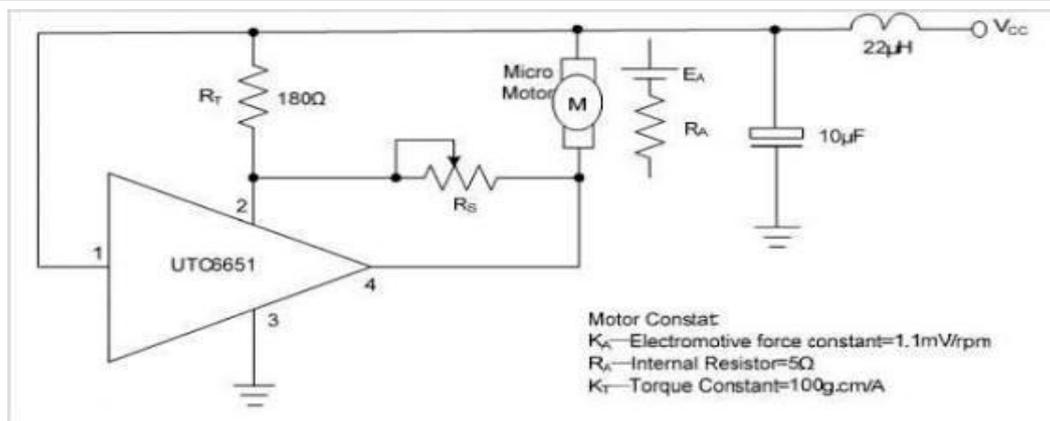


Fig.12 Theoretical view of speed control

An electronic speed control or ESC is an electronic circuit with the purpose to vary an electric motor's speed, its direction and possibly also to act as a dynamic brake. ESCs are often used on electrically powered radio controlled models, with the variety most often used for brushless motors essentially providing an electronically generated three-phase electric power low voltage source of energy for the motor

An ESC can be a stand-alone unit which plugs into the receiver's throttle control channel or incorporated into the receiver itself, as is the case in most toy-grade R/C vehicles. Some R/C manufacturers that install proprietary hobby-grade electronics in their entry-level vehicles, vessels or aircraft use onboard electronics that combine the two on a single circuit board.

TABULAR COLUMN:

Sl.no	Time in hrs	Room temperature in Celsius	Air cooler temperature in Celsius
<u>1</u>	10am-1pm	24° -30°	18° -20°
<u>2</u>	1pm-4pm	30° -20°	18° -20°

Table 1

RESULT AND CONCLUSION:

From the above table we concluded that using of thermocol air cooler air get cools less then the room temperature and also if the water level increases or decreases suddenly get the sound with help of buzzer along with speed can be control for exhaust fan depending on temperature.

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BIOGRAPHY



Mrs. Sushmitha Deb presently working as Assistant Professor EEE Dept., SJMIT College Chitradurga Karnataka, India Completed B.Tech (EEE) in the year 2006 from Sikkim and M.Tech (Power Electronics) in 2011 SMIT, Sikkim. Areas of interest is Power Digital Electronics, Power System



Mr. Sanjay Kumar K presently working as Assistant Professor EEE Dept SJMIT College Chitradurga Karnataka, India Completed B.E (EEE) in the year 2011 from SJMIT Chitrdurga and M.Tech (Power system Engg) in 2014 From Acharya Institute of technology Bangalore Areas of interest in Power Electronics, Power system High voltage Engg.



Divya M.D,7th Sem Student, EEE dept., SJMIT college, Chitradurga,Karnataka.



Harish S.P,7th Sem Student, EEE dept., SJMIT college, Chitradurga,Karnataka.



Ajay kumar G.R,7th Sem Student, EEE dept., SJMIT college, Chitradurga,Karnataka.