



e-ISSN: 2319-8753 | p-ISSN: 2347-6710

IJIRSET

International Journal of Innovative Research in
SCIENCE | ENGINEERING | TECHNOLOGY

INTERNATIONAL JOURNAL OF INNOVATIVE RESEARCH

IN SCIENCE | ENGINEERING | TECHNOLOGY

Volume 12, Issue 4, April 2023

ISSN INTERNATIONAL
STANDARD
SERIAL
NUMBER
INDIA

Impact Factor: 8.423

9940 572 462

6381 907 438

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Design and Fabrication of Automatic Temperature Sensing and Evaporative Air Cooling System

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ABSTRACT:—An automatic evaporative air cooling system is a type of air conditioner that works by harnessing the power of evaporation to cool air temperatures. When water evaporates, it turns from liquid to gas. As it does so, the highest -energy particles leave the water first, and this leads to a drop in temperature. This is why a moist cloth on your forehead feels on a hot day it's actually helping to lower your head's temperature as the water evaporates.

The same scientific principles apply to the evaporative cooling process when it comes to your home's air. In a dry environment, the simple process of evaporation can help lower the temperature of the air. You may have felt this for yourself if you've ever misted the air around you to feel cooler on a hot summer day. An evaporative air conditioner uses the same idea, but it adds technology to make the process more efficient and less messy than just spraying a room with water.

We have use temperature sensors and PLC circuit so that manual efforts can be neglected and the system can perform its task smartly. This reduces the unusual loss of energy and hope for the best.

KEYWORDS: Air Cooling System, Temperature Sensor, Water Based Cooling System.

I. INTRODUCTION

Because of the global warming the climate of the world is facing many problems day by day. Due to which it is too hot in summer and too cold in winter. People use various apparatus like table fan, ceiling fan, water circulated cooling system etc. when temperature is hot. Similarly people use apparatus like heater when it is too cold. These apparatus are manual in nature. A person should constantly monitor the system and manually turn on or turnoff the device. These cooling and heating devices comes as different systems. Also there may be considerable wastage of power in manual operation of these devices. Therefore, an automatic air conditioning system is required to perform the function of cooling devices. Air conditioning system is the system which monitors the room temperature and controls the circulation of the fresh air inside the room. If the temperature of the room goes high sufficient enough to make one feel hot then the air conditioning system should be able to circulate cool air inside the room. If the room temperature is neither hot nor cold then the system should stay in low power mode to prevent from the considerable loss of the power. We are in the era where automation is available in each and every device. The controlling of those devices is available within our hands in the form of mobile applications. Such a way in our proposed system we are going to control our air conditioner by means of IOT. The controlling process itself the second step of innovation. People nowadays are mainly conscious on the comfort for every household devices in which they are spending their money. In our proposed air conditioning system a single air conditioning system is tried to be innovate. Air conditioning is based on sensing the room temperature and humidity in the surrounding air. Thus the device leads to maximum comfort and tends to be a portable one than existing device. A temperature control system has a programmable thermostat that keeps the environment at a desired temperature. The advantage of having an automatic temperature control system over a common thermostat is that it saves energy and cost by automatically maintaining different temperatures at various instant. It has a closed loop feedback system having a control loop, including thermal sensors, control program and

actuators/effectors, and is arranged in such a manner so as to regulate a variable temperature at a set point or reference value defined by end user. A host of analysis of temperature control have appeared in literature. These analysis employs the use of closed loop temperature control system which works according to the temperature of the environment.

It was shown experimentally by Ahmad Faris Bin Zulkifli [1] that using temperature sensor one can control the room temperature of a region without any human intervention. Temperature control and sensor systems follows a conventional pattern. The sensor device senses the temperature and passes its analog signal to the Arduino unit for the micro-controller to test and compare the temperature with the set-point. When this test fails, an effect tor system acts to correct the temperature and checks it back within the user defined range. A difference in the design of our system over any other system is that the Arduino used does not have that much current to control DC Pump and DC Motor so a separate relay unit incorporated with a different power supply is used for this purpose. In northern India, during summer season temperature is around 40°C. The maximum it reaches is 50°C. A common man in India cannot afford air conditioner and using conventional cooler incurs more cost. The Automatic Temperature Controlled Air Cooler solves this problem.

II. LITERATURE SURVEY

Mr. Jun Wei Chuah et.al. [1] “Localized Heating for Building Energy Efficiency” [April 4, 2013] Commercial and residential buildings account for a large share of any country’s energy consumption (e.g., 40% of total energy consumption in the United States). Within buildings, a major portion of the expended energy is used to provide heating and the cooling purpose. However, most buildings are heated and cooled regardless of the occupants’ locations, presenting a significant opportunity for improving their energy efficiency.

Mr Koichi Hirose, et.al. [May 2019] [2] “possibility of enhancements of cooling performance on heating surface by intermittent of jet flow”, A possibility of an improvement of cooling performance on the surface of heating elements by using an intermittent jet flow a geyser in nature. An impinging jet flow is widely used for electronics cooling such as CPU coolers and advanced mini-channel devices because the high heat transfer performance can be generally obtained.

Gavish Bhatia, et.al. [March, 2017] [3] “Room Temperature based Fan Speed Control System using Pulse Width Modulation Technique”, the design and simulation of a novel fan speed control system based on room temperature using Pulse width Modulation Technique. The duty cycle is made to vary according to the room temperature and the fan speed is controlled Vol. 6, Issue 3, and March 2017 accordingly. This paper elucidates how the autonomous speed control of fan is done based on data from the temperature sensor. The design proposed here is appropriate according to the modern lifestyle.

Mrs. AshwiniSharma,et.al. [5th April, 2018] published a paper in International Journals naming [4] “EVAPORATING AIR COOLING SYSTEM, DESIGN, FABRICATION, ASSEMBLY” here the detailed study related evaporative substances and their properties were studied and using that a new evaporative air cooling system was design, fabricated, assembled and tested.

Vijay Kumar Gupta et, al [March 2019] [5] “Automatic Temperature Controlled Air Cooler: Design, Assembly and Testing” In this research work, it was observed that the Automatic Temperature Controlled Air Cooler is cost efficient as compared to the conventional air cooler. The automatic cooler operates only whenever required while the conventional air cooler operates continuously even when there is no need. This automatic cooler minimizes the human intervention to the optimum level in comparison with the normal air cooler.

Mr. SwanandShrinivas Joshi et.al. re-researched[6] “INVEGSTIGATION OF DIFFERENT PARAMETERS OF AIR COOLER BY CFD ANALYSIS” [in June 2018] and stated various parameters that shall be considered while designing an Air Cooling System. Various Air Conditioners are available at market but have high initial and running cost, which cannot be affordable by all the people in developing country like India. Air Coolers are relatively cheap, but provides unsatisfactory results; there is a need of developing a cheaper room cooling system. Conventional air conditioning is one of the major contributors of CFCs into the atmosphere. An alternative type of cooling, which does not expel CFCs is highly desirable as one important step in the correction of this problem. 1So, this is why adiabatic cooling is environmentally friendly because it is a passive cooling method that does not expel CFCs. It is 100% fresh air-cooling which even helps to clean the air it cools. With the help of Evaporative Technology swamp coolers provide cooling at cheaper than central air or larger air conditioners.



III. METHODOLOGY

This system runs on automatic temperature sensing and air cooling system, it runs on affordable cost. We performed the fabrication of system as follows:-



Fig. no. 3.1

IV. WORKING PRINCIPLE

It is designed SMART. Temperature sensors sense the temperature and pass the signals to the control unit. Control unit is actually a PLC circuit. It is programmed specifically as per requirements. Control unit reads the signals and the system is worked. When the temperature is goes above desired temperature the system starts and inlet of chilled air increases and when the temperatures decreases to desired temperature the inlet of chilled air in lower and system works ideally on low power mode. This controlling cycle is known as **Pulse Width Modulation Technique**.

Its works on Evaporating Principle of Water. Honey-comb are used as absorbers in this cooling system absorbs the water. Humid Air passes through honey-comb. Humid Air is absorbed by the honey-comb containing water and chilled air is released with speed by fans in the system. Water from honey-comb gets heavier due to absorbed humidity. This water now gets drained away and returns to water storage and new water gets absorbed by the honey-comb.

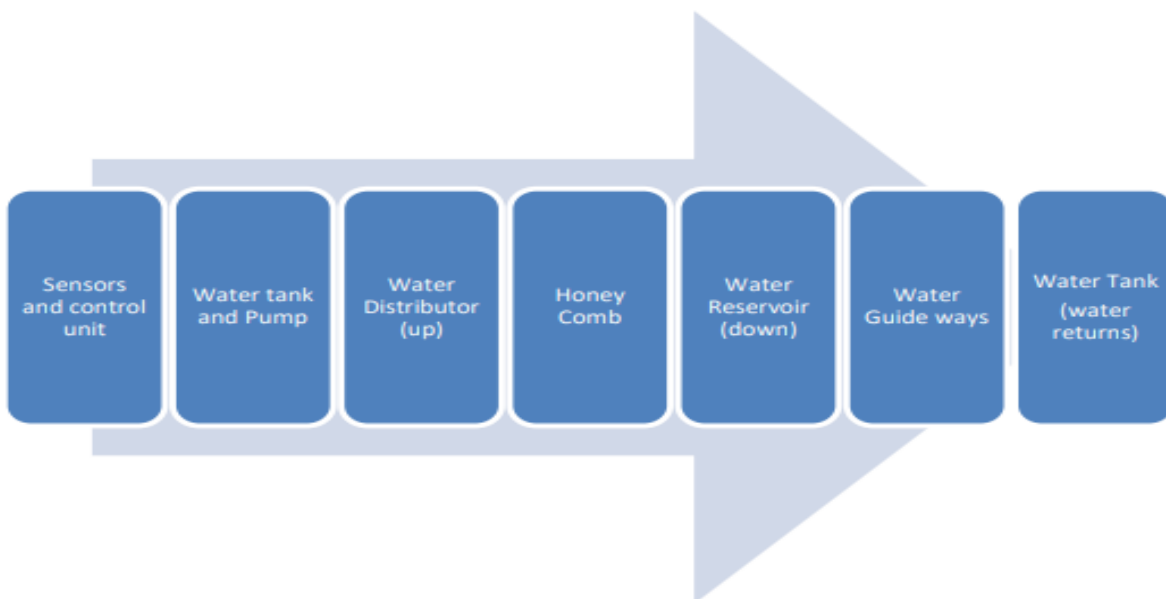


Fig. no. 4.1



|| Volume 12, Issue 4, April 2023 ||

| DOI:10.15680/IJIRSET.2023.1204118 |

V. ASSEMBLY DRAWINGS

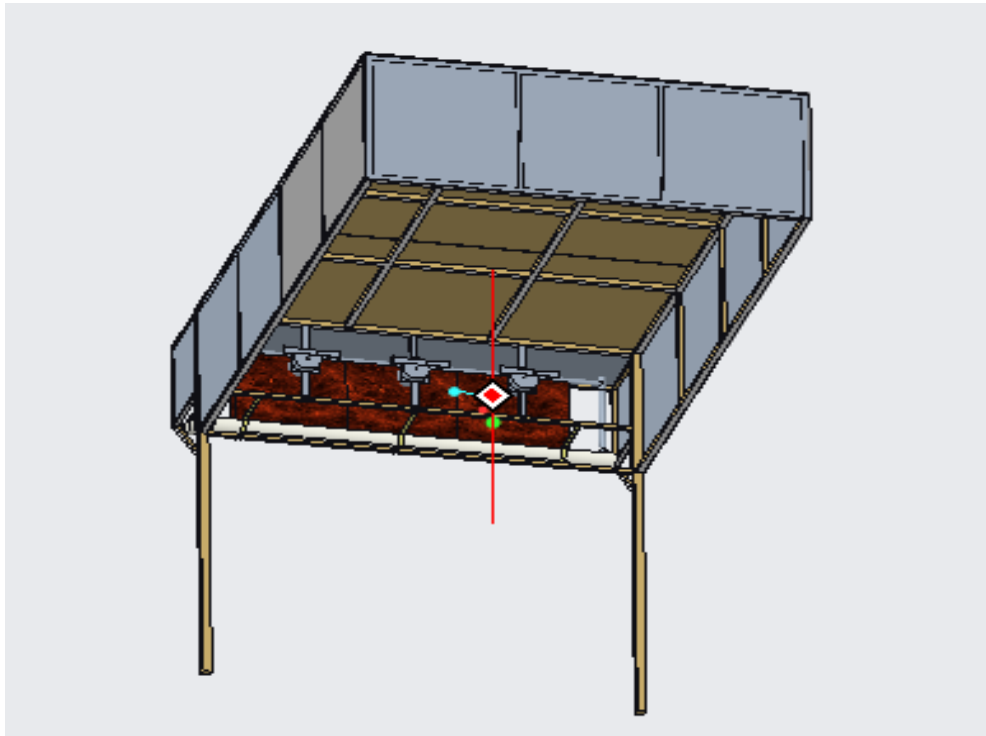


Fig. no. 5.1

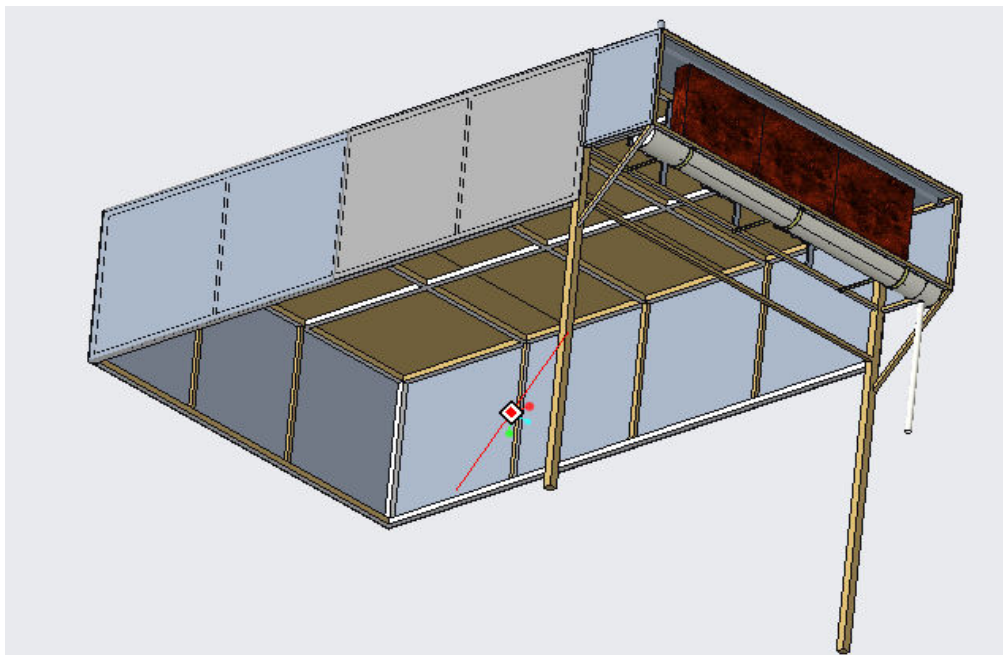


Fig. no. 5.2



VI. SCOPE OF WORK

The process and the work are done in the initial stages up to fabrication process and testing its performance on various materials and calculating its efficiency and characteristics. Its applications are also limited to packed room with regarding to its work and efficiency. Any further extension of this project will be heading in increasing its range of applications with improvement in its performance. This design can be used on a wide range at houses, laboratories, offices, workshops. It can further fabricate with taking in consideration the topic on energy saving. Using Solar Panels the cooling system can be more eco-friendly and can be recommended as a GREEN Project

VII. CONCLUSION

Here by we come to the end of our project naming “Design and Fabrication of Automatic Temperature sensing and Evaporative Air Cooling System”. This paper has presented a means of controlling temperature of a room with simple operated system. This system helps to maintain the temperature within a limit. This system is very marketable because of its simplicity, low cost, low power consumption and comparatively small size. It can also be used in various industrial as well as daily applications such as to control the temperature in House, Office, Workshops and Laboratories.

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Impact Factor: 8.423



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