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IoT Based Temperature and Humidity Monitoring System.

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Abstract

Humidity and temperature monitors have wide industrial applications in many areas such. However, most of these monitors had less uses. Hence from this paper we are learning new things. This research was used of temperature and humidity sensor DHT-22 to detect level of humidity and temperature changes inside the room. The data and information from DHT-22 sensor will be analyzed graphically on Thing Speak platform using Node MCU.The sensor which we are using in this paper is the advanced version of its type. In this paper, the value of temperature and humidity changes can be seen through graph and gauge in Thing Speak software application. As the temperature rises, the relative humidity level will drop. Humidifier triggered when the reading of temperature and humidity is less than -40% and more than 80%.

Keywords: Node MCU , Humidity and Temperature Monitoring Sensor(DHT-22) , Bread Board , Jumper Cable.

1. Introduction

Wireless communication technology appears to have low cost, convenience, ease of installation, and great portability as advantages. One of the most essential applications is to monitor the temperature and humidity of the environment while allowing the user to walk about freely.

The proposed design focuses on the development of wireless temperature and humidity monitoring prototype system with the initial emphasis on measuring the temperature and humidity of surroundings. In many industries, parts of the production and fabrication room will take place in adjustable air-conditioned clean rooms. In the food industry, storage monitoring refers to the process of keeping raw

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food for a set period of time in order to ensure food safety and quality. Legal requirements mean that specially prepared, air-conditioned rooms are essential for processes such as semiconductor manufacturing, components fabricating and electronics assembly to constantly regulate air humidity.

For comparable, consistent and functional results, those working in fabrication room, production line and clean rooms require stable, controllable atmospheric conditions. The temperature and humidity is particulars sense to influence the viscosity and properties of materials, as well performed of chemical reactions. Humidity is a primary initiator and booster of devastating effects on electronics and a constant threat to production efficiency and product qualities. The purpose of this system is to reduce the amount of people required in companies to control air temperature and humidity in order to reduce the damaging effects on electronic components. The system will send an alarm on Thingspeak through NodeMCU and activate humidifier automatically when temperature and humidity of certain atmosphere is out of the safety range even the user is out of that certain atmosphere area. Humidity and temperature of the room could be control and designed microcontroller by using a DHT-22 sensor, Node MCU and microcontroller board

Undeniably, IoT based temperature and humidity monitoring effectively decrease man power on controlling temperature and humidity and lend help in time wasting of user. In indirect way, it decreases cost of industries in fabricating new electronic components as it guarantees a stable and controllable atmospheric condition which slow down the devastating effects of electronic components.

Humidity and temperature have been a problem for many engineers in industries especially to grasp because of temperature. Some electronic components should be tested and kept under certain temperature to make sure the testing result will be accurate and ensure its lifespan. In reality life, the coldness and the heat can be felt by humans but the ideal temperature for the certain electronic components cannot be determined as it was made with different components. The second problem is because of humidity. The decasting impact of electrical component pins may be accelerated by atmospheric dampness. Therefore, it will affect the functionality of the electronic components and brings losses in terms of money and manpower.

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The moisture present in the air along with temperature has a long term and decasting effect on man, machine and material. Every industry of the mechanised world is affected by humidity and temperature both in terms of material and money.

Although the portable digital temperature and humidity meter is already existed, there is some limitation for the handheld device which is distance. The data through the device can only be obtained whenever humans are there. It means that every time the temperature and the humidity of a certain environment are needed, it requires the presence of humans to handle. Hence, it is unable to encounter any problem happened to the electronic components and gadget and take any action immediately to prevent further damage. Besides, the data obtained through the meter cannot be reviewed back graphically.

As conclusion, this research able to implement the IoT technology in monitoring and controlling the humidity and temperature for industrial fixed room storage. Any person may access the system and monitor with an apps which has been created. Thus, it enables the users to notice about the level of humidity and temperature from anywhere anytime they want.

Hence, the data can also be recorded in a database where they are collected in every hour.

2.Literature Survey:

A variety of temperature sensors are available in market which have different characteristics for different application areas. There are two types of temperature sensors: Contact Temperature Sensor and Non-contact Temperature Sensor. Different environmental parameters have to be considered while designing pollution monitoring systems.

A. Temperature and Humidity Sensor

The DHT11 sensor has three parts: a capacitive humidity sensor, a thermistor, and a chip to perform analog to digital conversion and output temperature and humidity in a digital form. That digital signal can be read using microcontroller of any form. Strictly calibration to DHT11 is needed that is extremely accurate on humidity calibration. Those calibration-coefficients. The features of each DHT11 sensors are extremely correct calibration of humidity calibration cell. The single-wire serial interface mechanism has

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been included to make things simple and quick. Small size, low power, and a signal transmission range of up to 20 metres allow for a wide range of applications, including the most demanding. The product is a single row pin bundle with four pins. Convenient connection, special packages can be provided according to the user's needs.

Specification of DHT11

• Supply Voltage: +5 V

• Temperature range :0-50 °C error of ± 2 °C

• Humidity :20-90% RH ± 5% RH error

• Interface: Digital

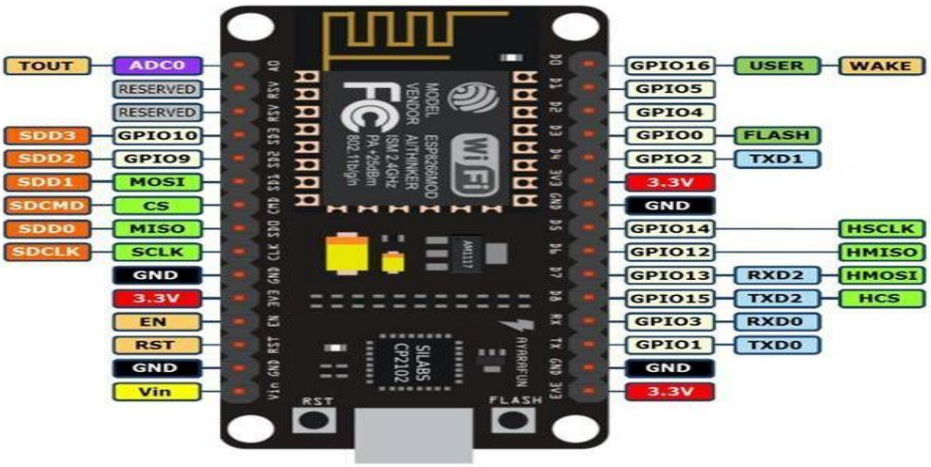
B. WIFI Module

Wi-Fi, a popular wireless networking technology uses radio waves to provide wireless high-speed Internet and network connections. Wi-Fi is short for "Wireless Fidelity". An open source IOT platform,

Node MCU includes firmware running on the ESP8266 Wi-Fi SOC of ESP Systems. That also includes module based hardware.

C. Pin Diagram of Node MCU

Node MCU in Fig.1 provides access to the GPIO (General Purpose Input / Output) and a pin mapping table is part of the API documentation.



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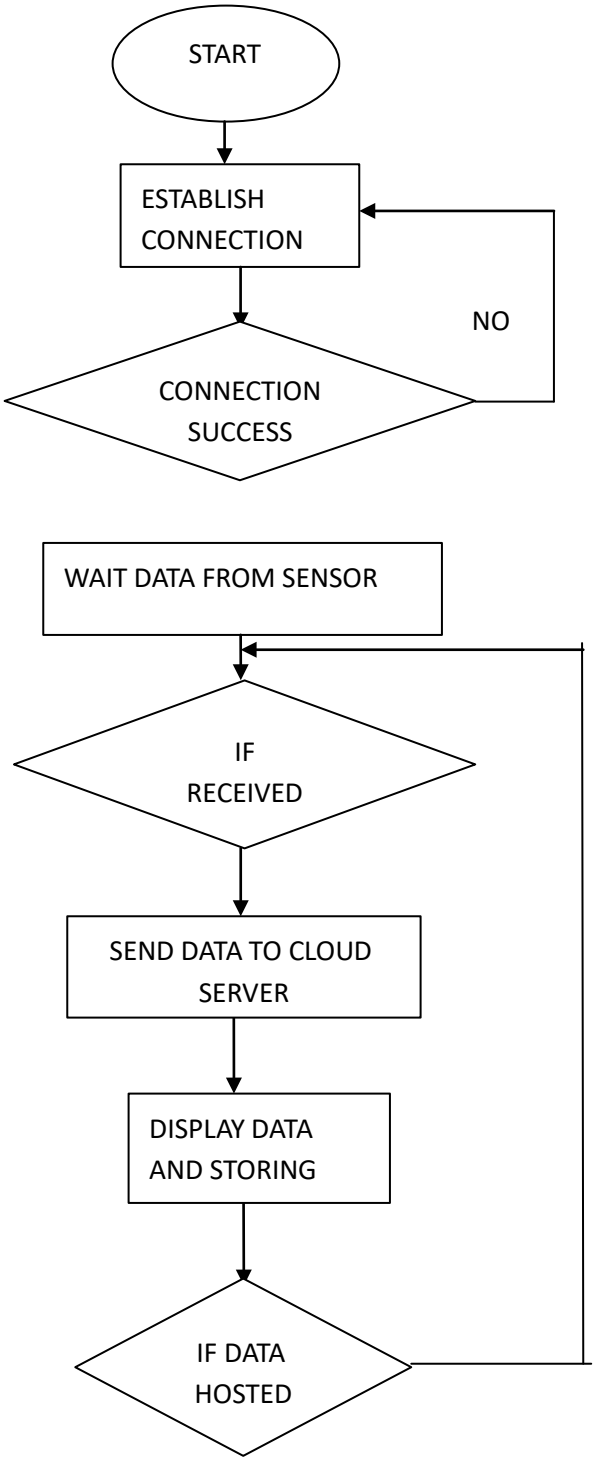
3.Existing method:

3.1. Flow Chart:



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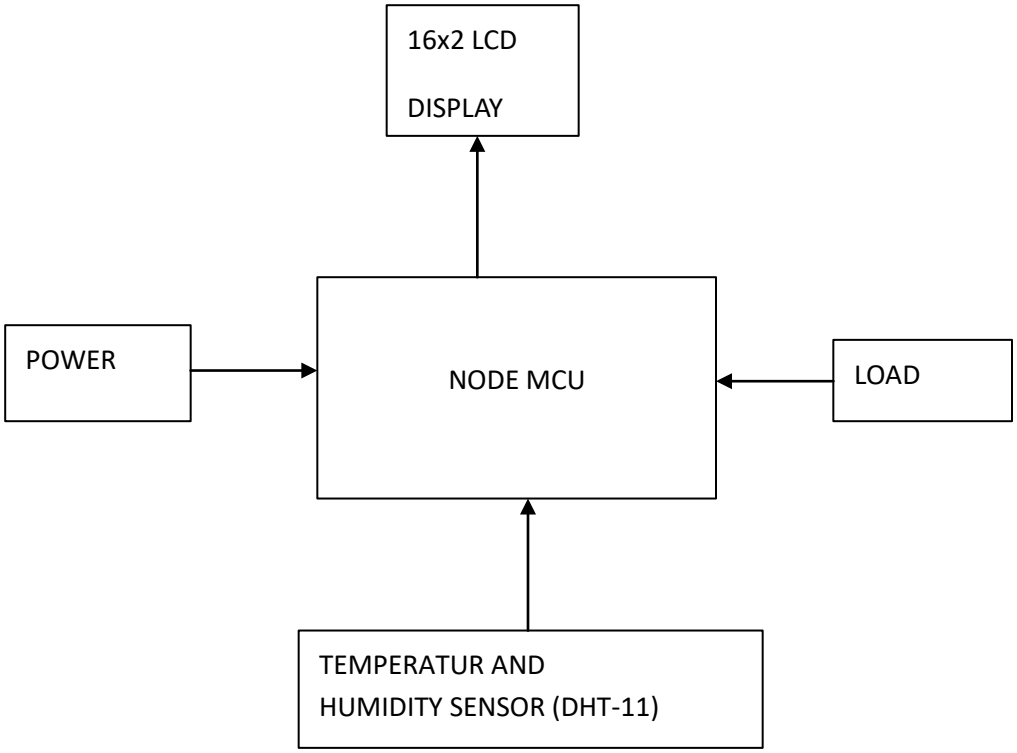
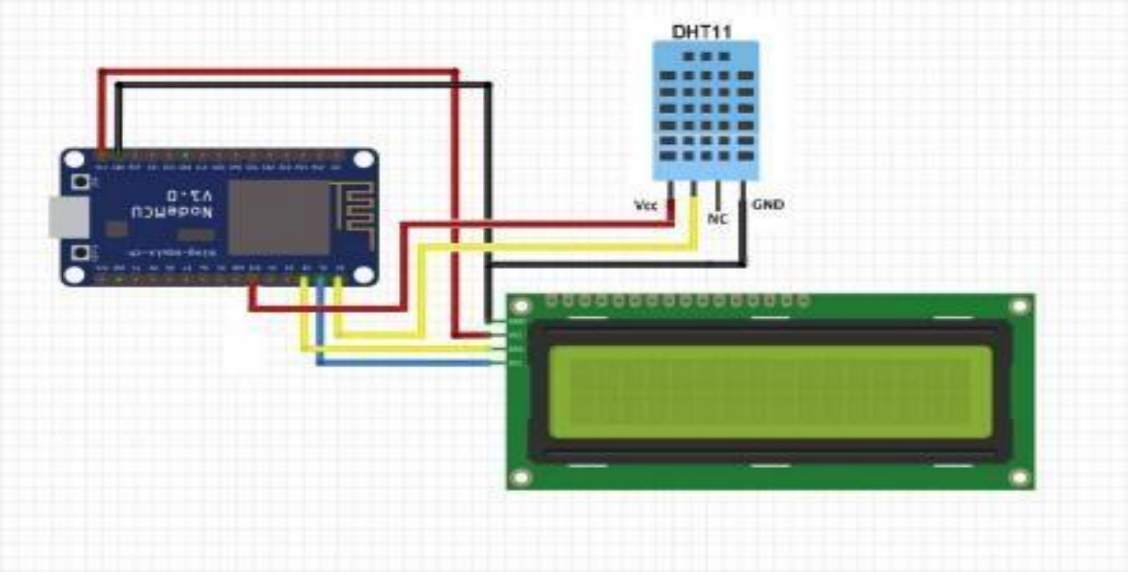
3.2 BLOCK DIAGRAM:



3.3.SCHEMATIC CIRCUIT:



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3.4.ALGORITH:

```
 #include <dht.h>


#define dht_apin A0 // Analog Pin sensor is connected to
  dht
DHT;
void setup(){

  Serial.begin(9600);
  delay(500);//Delay to let system boot
  Serial.println("DHT11 Humidity & temperature Sensor\n\n");
delay(1000);//Wait before accessing Sensor
  }
void loop(){


    DHT.read11(dht_apin);

    Serial.print("Current humidity = ");
    Serial.print(DHT.humidity);
    Serial.print("%  ");
    Serial.print("temperature = ");
    Serial.print(DHT.temperature);
    Serial.println("C  ");

    delay(5000);

}
```

4.PROBLEM IDENTIFICATION AND SOLUTION:

In the above existing method the humidity and temperature sensor (DHT-11) is having a disadvantage because the range of the DHT-11 sensor for temperature from 0^0C to 50^0C and for humidity from 20% to 80% . The Sampling Rate for DHT-11 is 1Hz(one reading every second). The operating voltage of this sensor is 3.3V to 5V. By observing the above disadvantages of the sensor DHT-11 we are going to change the sensor with the advanced version of DHT-11, which is DHT-22. The DHT-22 sensor main advantage is it has more range when compared where the temperature range from -40^0C to 125^0C with a better accuracy than DHT-11 , and the Humidity ranges from 0% to 100% which is more usable data rather than DHT-11 sensor. The voltage of both sensors are from 3.3V to 5V.

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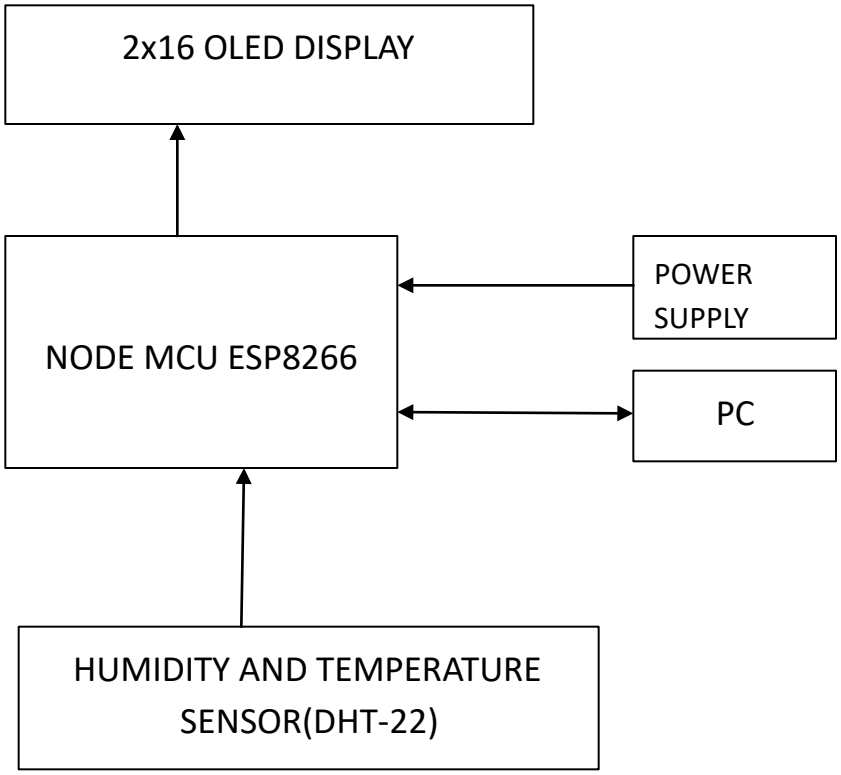
5.PROPOSED METHOD:

5.1.BLOCK DIAGRAM:



- The above block diagram shows the proposed method for the monitoring of humidity and temperature of a particular room.

- This project is useful for a close environment like a cold storage where they have to monitor the temperature and humidity to maintain the goods which are stored.

- It can be also be used as a weather monitor system for a small room.

- When we compare the existing method with the above proposed method there is a change in the temperature and humidity sensor. The existing method have DHT-11 sensor where as the proposed method has DHT-22 sensor.

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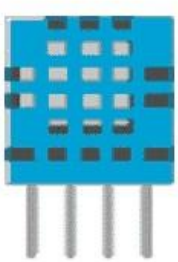
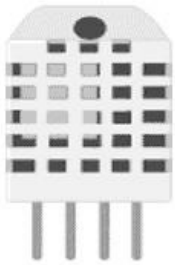
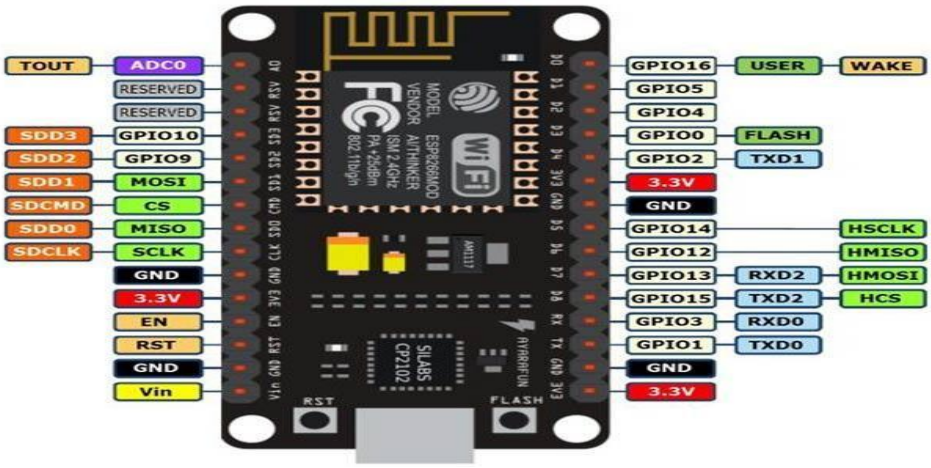
- The major difference in between this two sensors are as the following table:





	DHT11	DHT22
Operating Voltage	3 to 5V	3 to 5V
Max Operating Current	2.5mA max	2.5mA max
Temperature Range	0-50°C / ± 2°C	-40 to 80°C / ± 0.5°C
Humidity Range	20-80% / 5%	0-100% / 2-5%
Sampling Rate	1 Hz (reading every second)	0.5 Hz (reading every 2 seconds)
Advantage	low cost	More Accurate

- As we see from the above table the major difference that makes DHT11 better than DHT22 is the Accuracy, Temperature range, Humidity range, and the Sample rate. This is the block diagram and the difference table for the proposed method.



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5.2.ALGORITHM:

```
#include <DHT.h>
#include <ESP8266WiFi.h>

String apiKey = "N5ISWR0PH749PQX5";

const char *ssid =  "Ok google";     const
char *pass =  "Tagore@123";
const char* server = "api.thingspeak.com";

#define DHTPIN 0

DHT dht(DHTPIN, DHT22);

WiFiClient client;

void setup()
{
      Serial.begin(115200);
delay(10);
      dht.begin();

      Serial.println("Connecting to ");
      Serial.println(ssid);


      WiFi.begin(ssid, pass);

     while (WiFi.status() != WL_CONNECTED)
    {
          delay(500);
Serial.print(".");
    }
     Serial.println("");
     Serial.println("WiFi connected");

}

void loop()
{

     float h = dht.readHumidity();
```

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      float t = dht.readTemperature();

            if (isnan(h) || isnan(t))
              {
                 Serial.println("Failed to read from DHT sensor!");                    return;
              }

                  if (client.connect(server,80))
                {

                      String postStr = apiKey;
postStr +="&field1=";
postStr += String(t);                          postStr
+="&field2=";                          postStr +=
String(h);                       postStr +=
"\r\n\r\n";

                      client.print("POST /update HTTP/1.1\n");
client.print("Host: api.thingspeak.com\n");
client.print("Connection: close\n");
                      client.print("X-THINGSPEAKAPIKEY: "+apiKey+"\n");
client.print("Content-Type: application/x-www-form-urlencoded\n");
client.print("Content-Length: ");                          client.print(postStr.length());
client.print("\n\n");                          client.print(postStr);

                      Serial.print("Temperature: ");
                      Serial.print(t);
                      Serial.print(" degrees Celcius, Humidity: ");
                      Serial.print(h);
                      Serial.println("%. Send to Thingspeak.");
                  }
client.stop();

        Serial.println("Waiting...");

  delay(10000);
}
```

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RESULT AND CONCLUSION:

The temperature and humidity monitoring and control system will act as an alarm system. Optimal solution for all parties involved, such as storage of electrical components to upgrade their facilities, vehicle makers, and food storage divisions where these elements play a crucial role, efficiency in monitoring, controlling, and managing environmental parameters such as temperature and humidity. In terms of production and finances, they play an important role.

The system can obtain a space's temperature and humidity, allowing for real-time temperature and humidity monitoring via a smartphone app via WIFI over IoT, a system-integrated LCD display, or a computer interface.

The application mentioned above keeps track of the temperature and humidity readings as well, which helps the user to monitor these parameters in a graph. Besides that, our system is also able to send an alert to the application if either one or both of these parameters fall in the critical region; as well as making the necessary step to bring back the particular parameter to safe region such as turning on the humidifier if the humidity falls below the assigned value.

This research was built upon basic components. Further improvements can be made to this project to increase its capability and efficiency such as temperature control. With our system in place, it can eliminate the necessity of workers to manually obtain the reading of these parameters and maintaining them frequently. Many industries especially those require the controlled storages in which the temperature and humidity plays an important role to ensure the lifespan and efficiency of their products. The system will be a great help in boosting the efficiency and reducing the cost.

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