International Journal of Scientific Research in Engineering and Management (IJSREM)
Volume: 07 Issue: 04 | April - 2023 Impact Factor: 8.176 ISSN: 2582-3930

IoT BASED ONION STORAGE MONITORING AND AUTOMATION CONTROL SYSTEM

Sanket Lende[1], Pallavi Mutrak[2], Tejas Pawar[3], Pradnya Sangale[4] , Prof. Dr. R. P. Labade[5]

[1,2,3,4,5]Dept of Electronics & Telecommunication Engineering
[1,2,3,4,5]Institute of Amrutvahini College of Engineering, SPPU University
Tal.Sangamner-422605, Dist.Ahmednagar, State. Maharashtra, India

---***---

Abstract - Onion is very important and valuable crop for Indian farmers, after harvesting the onion it is necessary to store it properly because rotten onion results in huge loss to the farmers. It is essential to develop the system that can helps to store the onions without rotten. In this paper we have proposed an IoT based Onion storage monitoring and automation control system which controls the environment of onion's in the onion storage place. This system enables real-time climate monitoring, identifies early wastage, and alerts the farmer based on the analyzed data; which helps to reduce wastage of onion and helps to store onion up to eight months. In this system we have used temperature, humidity, and gas sensors and these sensors accurately detected the micro - environment change and all real - time values. Information within the onion warehouse is controlled by IoT system to standard values to store the onion. Simultaneously relevant information is communicated to the farmer via mobile application and web server.
.

Key Words: Harvesting, Rotten, IoT, Dehumidifier, Warehouse.

1.INTRODUCTION

The Internet of Things (IoT) is a computing concept that describes the idea of everyday physical objects being connected to the internet and being able to identify themselves to other devices. Internet of Things focuses on connection of different sensors to physical object and transmits information to internet. It has a significant role in the field of agriculture in terms of control and protection, providing real time information and communicating with the physical world. Onion storage methodology to reduce its degradation.[1] Focuses on studying various monitoring systems that have been designed and implemented in the field of agriculture. Internet of Things plays a important role in smart agriculture monitoring system. Smart farming is an emerging concept, because IoT sensors can provide information about their fields. The main feature is monitoring temperature and humidity in agricultural field.[2]

Monitoring of the temperature and humidity in the agricultural field is the major feature. With a share of 10 percent in output and 16 percent of the global area, India is the second-largest producer of onions after China. 4.30 million tonnes of bulbs are produced annually on 0.39 million hectares of land in India (FAO,1995). Production for the present year is predicted to be 4.7 million tonnes. It is one of the most significant vegetable crops in our nation and is consumed every day in practically every family. Over 43 million tonnes of onions are produced worldwide. China, the United States, the Soviet Union, the Netherlands, Spain, and Turkey are notable producers.[3]

The states of Maharashtra, Gujarat, Uttar Pradesh, Orissa, Karnataka, Tamil Nadu, Madhya Pradesh, Andhra Pradesh, and Bihar account for the majority of India's onion production. With 20% of the area and 25% of the production, Maharashtra is the leading producer.[4] Onion currently has a storage capacity of approximately 4.6 lakh tons. In comparison to the entirety of our production, this is extremely inadequate. Even the majority of the available structures are conventional and unscientific.[5] However, the Expert Committee on Cold Storage and Onion Storage has predicted that in the next five years, approximately 1.5 lakh tons of capacity will be required on farms in production areas and 3.0 lakh tons will be required at APMCs (Agricultural Produce Market Committee) and other markets.[8][9]

2. BLOCK DIAGRAM

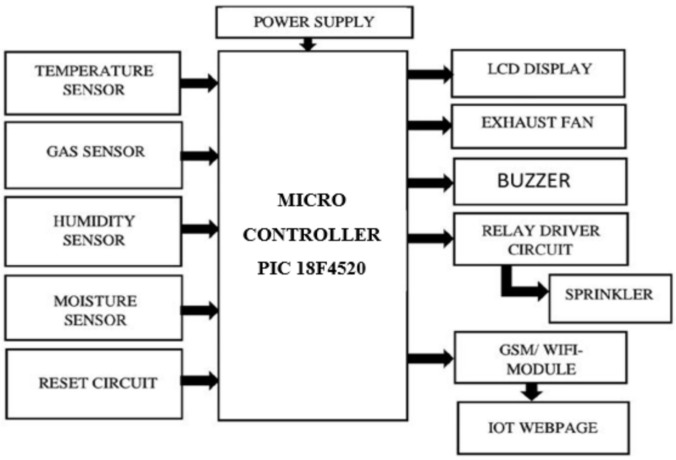


Figure 1: Block Diagram of System

WORKING OF PROJECT

This system Contains power supply, microcontroller (PIC 18F4520), Gas sensor (MQ-6), temperature sensor (LM35), humidity sensor (HR202), moisture sensor, reset circuit, LCD Display, exhaust fan, relay driver circuit, buzzer, sprinkler, GSM/WIFI module, IoT web page. Temperature sensor (LM35) is used to sense the temperature and send the signal or the data to the microcontroller then the microcontroller reads the data from the sensor and process the data received from sensor then it gives output to the sprinkler through relay driver circuit. when the temperature exceeds above 30degree Celsius then the LCD display shows reading and the data will send to the IoT server after that sprinkler get ON and it will help in reducing temperature to protect onions.

Gas sensor (MQ-6) is used to sense the strong odour of rotten onions and send the data or signal to the microcontroller then microcontroller reads the data from the sensor and process the data received from sensor and then buzzer gives alert. After that the data will be display on IoT web server through GSM module. Humidity sensor (HR202) is used to detect the humidity and send the data to the microcontroller then microcontroller reads the data from the sensor and process the data received from sensor. When the humidity level exceeds above certain level then buzzer gives alert. After that the data will be display on the IoT web server through GSM module.

Moisture sensor is used to detect the moisture and send the data to the microcontroller then microcontroller reads the data from the sensor and process the data received from sensor. After that it gives the output on LCD display in form of message i.e., YES or NO. The readings of the sensors will continuously display on LCD. Through the IoT web server we can monitor our system and access the data for the prevention of onions.

POWER SUPPLY

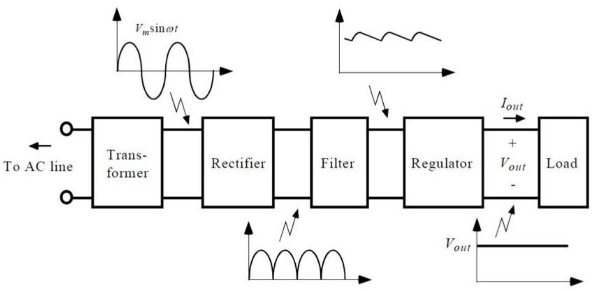


Figure 2: Power Supply Design

A DC power supply typically produces direct current (DC), which implies that electrons only flow in one direction. Alternating current (AC), in which the electrons flow in different directions at various times, can also be produced by some DC power supply. Typically, a transformer steps down the ac input line voltage to a lower ac voltage (although it may be stepped up when higher voltages are needed or there may be no transformer at all in rare instances). A transformer modifies ac voltages according to the ratio of turns between primary and secondary.

DESIGN EQUATION

The maximum current that can be drawn from this IC is 1A.

But our circuit requires maximum current of Imax, which is summation of all the current required to drive individual IC,s.

Im = 100 mA

For safety purpose, we consider the maximum current limit exactly double of the circuit requirement

Imax = 2 Im.

Therefore, Imax = 200 mA.

We know that,

$$Q = CV \quad \ldots\ldots\ldots\ldots (1)$$

Where,

Q = charge on capacitor.

C = capacitance.

V = voltage applied to capacitor.

Also,

$$Q = It \quad \ldots\ldots\ldots\ldots (2)$$

Where,

I = Imax.

t = period of output voltage of rectifier.

Equating equations (1) & (2), we get

$$CV = It.Max \quad \ldots\ldots\ldots\ldots (3)$$

Now, at input of transformer, applied voltage frequency is 50 Hz.

As we have used step down transformer of 9-0-9 V, we get output voltage having same frequency of 50 Hz but amplitude step down to 9V (rms).

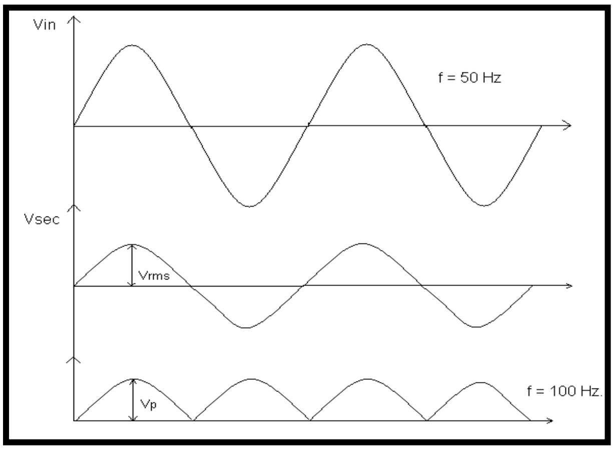
After rectification, frequency doubles & amplitude becomes Vpeak, as shown in figure.

Vin(rms) = 230 v.

Vsec(rms)= 9v.

Therefore, Vpeak = Vp = Vsec / 0.707.

Vp = 12 v.



And,

t = 1 / 2f.

= 1 / 100.

= 0.01 sec.

From equation (3),

CV = I t.

Therefore,

C = Imax t / V.

= 200 * 0.01 / 12

= 166.66 uF.

Select, C1= 470 uF.

Design of C2:

We know that, due to internal circuitry of IC 7805 and load connected at the output of power supply; various types of noises are generated at its output, such as thermal noise, flicker noise, shot noise, white noise etc. Hence in order to bypass all these noises, we have to connect a capacitor C2.

It can take value between 0.1uF to 100uF.

Here we have connected C2 = 100 uF.

FLOWCHART

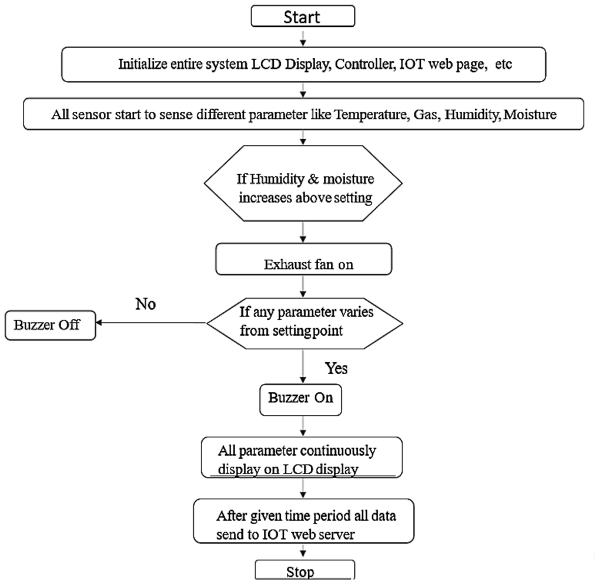


Figure 3: Flowchart of Proposed System

We begin our system as it is depicted in the flow chart above. LEDs, controllers, and IoT are initialised once the system is started. All sensors then sense characteristics, including temperature, gas, humidity, and wetness. Exhaust fans turn on if humidity and moisture levels rise beyond the predetermined level. Buzzer activates if any parameter rises above predetermined levels. In the LCD panel, every parameter is continuously displayed. All data are sent to the IoT server after the specified time period. The system then shuts off.

SIMULATION

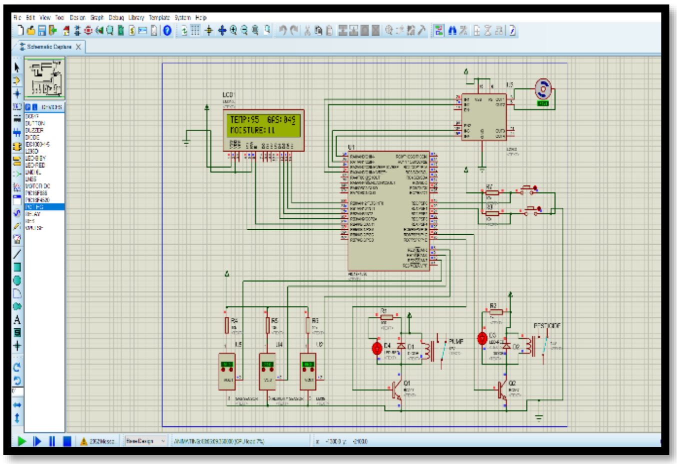


Figure 4: Simulation of system

In our project we did the simulation by using Proteus design suite 8.11 software. We used Proteus because it has inclusive support for all the microcontrollers and large collection of sensor libraries.

IoT WEB SERVER RESULT

Figure 5: Web Server Result

In the above images, you can see the result obtained by the IOT Web server. LM35 temperature sensor senses temperature and sends data to microcontroller. Microcontroller processes data and sends output to sprinkler via relay driver circuit. LCD display shows temperature above 30°C. Data is sent to IoT server to help lower temperature and protect onions.MQ-6 gas sensor detects rotten onion odour and sends data to microcontroller. Microcontroller processes data and sounds buzzer alert. Data is displayed on IoT web server using GSM module. HR202 humidity sensor sends data to microcontroller. Buzzer sounds alert when humidity exceeds threshold. Data is displayed on IoT web server via GSM module. Moisture sensors detect and send data to microcontroller, which displays output on LCD. Data accessible via IoT server.

PROTOTYPE OF PROPOSED SYSTEM

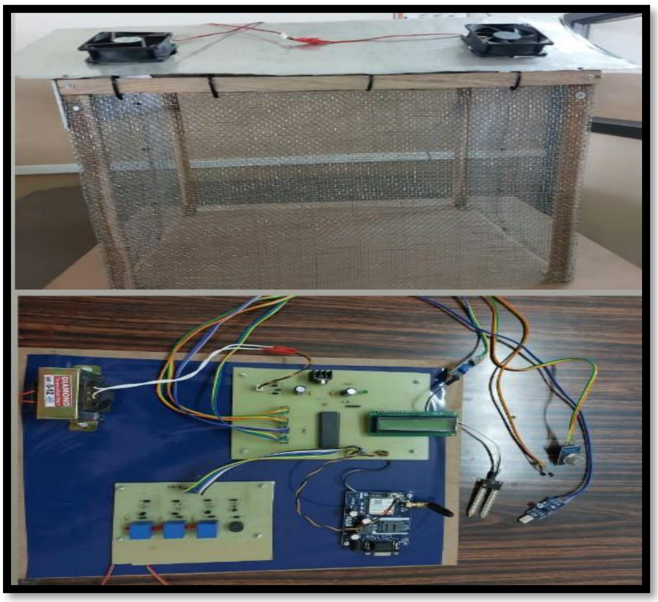


Figure 6: Prototype of Proposed system

CONCLUSION

The IoT based onion storage monitoring and automation control system is an effective way to monitor and control onion storage. It is also a convenient way to monitor and control the storage of onions because it does not require manual intervention. The system can also help reduce the cost of onion storage by automating the storage process. In this system we can monitor a temperature by using temperature sensor i.e., LM35. We also monitor humidity, moisture and odour by using humidity sensor (HR202), moisture sensor and gas sensor i.e. (MQ-6) respectively.

REFERENCES:

[1] Reed, M. G., Syverson, P. F., & Goldschlag, D. M. (1998). Anonymous connections and onion routing. *IEEE Journal on Selected areas in Communications*, *16*(4), 482-494.

[2] Mythili, M., and P. Vasanthi Kumari. "Internet of Things enabled Onion Growth Monitoring System using Cloud." *2021 2nd International Conference on Smart Electronics and Communication (ICOSEC)*. IEEE, 2021.

[3] Mohan, M. Saravana, D. Abishek, J. Hem Chander, sS. Mayukha, Mohit Kangotra, and N. K. Soundarya. "IOT Based Onion Farming Solar Powered Hydroponics Monitoring System." In *2021 International Conference on Advancements in Electrical, Electronics, Communication, Computing and Automation (ICAECA)*, pp. 1-5. IEEE, 2021.

[4] Kodali, Ravi Kishore, Jeswin John, and Lakshmi Boppana. "IoT Monitoring System for Grain Storage." *2020 IEEE International Conference on Electronics, Computing and Communication Technologies (CONECCT)*. IEEE, 2020.

[5] Eugene, Febri, Melli Suryanty, and Nyayu Neti Arianti. "Risk analysis of onion farming." *Journal of Agri Socio-Economic and Business* 1.1 (2019): 45-51.

[6] Dewi, Christine, and Rung-Ching Chen. "Decision making based on IoT data collection for precision agriculture." *Asian Conference on Intelligent Information and Database Systems*. Springer, Cham, 2019.

[7] Srinivasulu, Pamidi, M. Sarath Babu, R. Venkat, and K. Rajesh. "Cloud service-oriented architecture (CSoA) sfor agriculture through internet of things (IoT) and big data." In *2017 IEEE international conference on electrical, instrumentation and communication engineering (ICEICE)*, pp. 1-6. IEEE, 2017.

[8] Jha, Ram Krishna, Santosh Kumar, Kireet Joshi, and Rajneesh Pandey. "Field monitoring using IoT in agriculture." In *2017 International conference on intelligent computing, instrumentation and control technologies (ICICICT)*, pp. 1417-1420. IEEE, 2017.

[9] Akpalu, Larry Elikplim Kodjo, Et Al. "A Novel Soil Moisture, Temperature and Humidity Measuring System-

An Iot Approach." *Journal Of Theoretical and Applied Information Technology* 99.5 (2021).
[10] Ananthi, N., Divya, J., Divya, M., & Janani, V. (2017, April). IoT based smart soil monitoring system for agricultural production. In *2017 IEEE Technological Innovations in ICT for Agriculture and Rural Development (TIAR)* (pp. 209-214). IEEE.