SMART WAREHOUSE FOR STORING ONIONS UNDER CONTROLLED CONDITIONS

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Abstract— ***Onions are a major part of the vegetables that are found in most kitchens. It is an important ingredient in Indian dishes and adds more to their taste. India being an agricultural country and the second largest cultivator of onions with a production of 31.7 million metric tons (FY2022), we mainly face price fluctuations due to loss of this cultivated yield. This problem arises due to poor storage conditions and exposure to extreme climatic conditions. The traditional storage techniques have failed to eliminate these losses of the crop after harvesting. These losses occur due to loss of moisture in the bulbs due to extreme temperature or due to exposure to very humid conditions leading to sprouting. We mainly focus to improve the storage conditions by the use of modern technology and help reduce crop loss. Warehouse storage conditions such as temperature and humidity are monitored and controlled with an automated algorithm when they exceed beyond the favorable conditions required for storing onions for a long time. We have introduced the concept of Internet of Things (IOT) to monitor and control the conditions by using sensors and actuators to match the ideal ones. Also, various data related to the stock like the warehouse temperature, humidity, amount of stock will also be stored on the cloud server and can be retrieved for real-time analysis. Thus, this makes an integral part of the decision-making process for the stakeholders to import or export the stock and also plays a major role in the distribution process. This entire model is designed specially to harness the maximum out of the cultivated yield of onions and help them keeping stored for a longer time and reduce the crop loss.***

I. INTRODUCTION

Onion (Allium cepa) is the largest produced crop in India. Indian onion has worldwide demand because of their pungency. They are cultivated and are available throughout the year. It is mainly cultivated in two cycles in India i.e from November to January and January to May. The onion-producing states include Maharashtra, Madhya Pradesh, Gujarat, Bihar, Karnataka, Rajasthan, Andhra Pradesh, Haryana and Telangana. From these states, Maharashtra is the largest cultivator of onions holding a share of 39%. These onions of Indian origin have a great demand worldwide and thus they are exported to other countries in huge numbers. The parameters which are to be focused on are temperature and humidity. They play an important role while maintaining storage conditions. The ideal conditions stated by NABARD for storing onions require temperatures ranging from 25 degrees to 30 degrees Celsius. Any temperature beyond this range increases the risk of the rotting process. The relative humidity while storing onions should be in the range of 65% to 70%. When these conditions are satisfied, we can store the yield for a longer time without compromising on its quality. Thus, we aim to artificially improve on these conditions by designing a system that can monitor as well as control the conditions ideal for the storage. Automation is the technique used in this project to control the temperature and humidity when they fail to meet the appropriate conditions

1. MOTIVATION BEHIND THE PROJECT

Agriculture is the primary occupation of the people living in India. Despite of advancements in technology, farmers in India still rely on traditional practices and techniques for farming. There is a need of revolution in this field by introducing technologies such as IoT, Cloud computing, Automation in order to yield better results and improve the economy of the country. Also, it would be easier for farmers in the decision-making process as well as the supply and distribution of goods to various locations. Information such as the availability of stock and to improve their conditions

can be achieved by the use of these technologies. Farmers have to bear great losses when the climatic conditions change. Factors like these are uncontrollable without the use of modern technology. IoT enables the farmers to monitor the conditions remotely as well as control them. Cloud computing stores the data on a cloud server where it can be accessed, processed and analyzed with great ease.

2. NEED OF THE PROJECT

There needs to give a technical solution to the problem of creating a buffer stock for the storage of onions and storing them for a period of at least six months from the date of storage. In 2017, the government was struggling to keep prices of the essential vegetable affordable as retail prices had crossed Rs 60 per kg in Delhi. Then Union Food Minister had expressed his helplessness in controlling onion prices and blamed reduction in cultivation and hoarding by traders for the shortage. The government was forced to take measures such as procuring onions from local markets and discouraging exports to bring the prices down. To keep a watch on the hoarders, the government has roped in various agencies to keep a check on the hoarding activities over the period. All these problems were faces due to traditional techniques used in the storage and supply process. Therefore, this system is proposed to overcome these difficulties and provide the society with an affordable and effective solution.

II. OBJECTIVES

- To improve the storage structures which specifically store onions
- To reduce the losses that occur due to improper storage conditions and mechanisms
- To precisely monitor environmental variables such as temperature and humidity within the onion storage facility using sensors
- To control the appropriate conditions required by the use of technology and make smart decisions based on the inputs generated by the sensor networks.
- To achieve real-time surveillance of critical storage facets via an intricate network of sophisticated sensors.
- To dynamically control the thermal regulation within the proposed warehouse adaptive to the environmental fluctuations.
- To provide an intelligent, automated control algorithm, tasked with the judicious synthesis of sensor-derived data and the modulation of thermoelectric modules.

III. METHODOLOGY

In this methodology, a central focus is placed on enhancing the design of onion storage facilities. The key components employed in this endeavor include the Raspberry Pi Pico W, equipped with onboard Wi-Fi capabilities, which serves as the control hub for various elements within the facility. These elements comprise a 5V DC humidifier, a USB spray system, a temperature sensor, an OLED display, and a thermoelectric module. By integrating these components, the overall design of the warehouse is significantly improved, leading to enhanced conditions for preserving onions.

Within this setup, the DHT22 sensor plays a pivotal role. It functions by providing precise temperature measurements through electrical signals. Additionally, the system incorporates a thermocouple, a device composed of two dissimilar metals that generate electrical voltage proportional to temperature fluctuations. The humidity sensor, operating within a voltage range of 3.3V to 5V, is capable of measuring humidity levels ranging from 20 percent to 95 percent with an error margin of approximately +-5 percent. Similarly, it can measure temperatures within the range of 0 to 50 degrees Celsius with an error margin of around +-2 degrees Celsius.

The DHT22 digital temperature and humidity sensor module are instrumental in this setup, providing calibrated digital outputs for both temperature and humidity levels. An automated alert system is integrated into the configuration, promptly notifying users when the humidity and temperature levels within the onion storage facility deviate from the preset thresholds. This ensures that timely corrective actions can be taken by the system owner to maintain optimal storage conditions and preserve the quality of the onions

IV. BLOCK DIAGRAM

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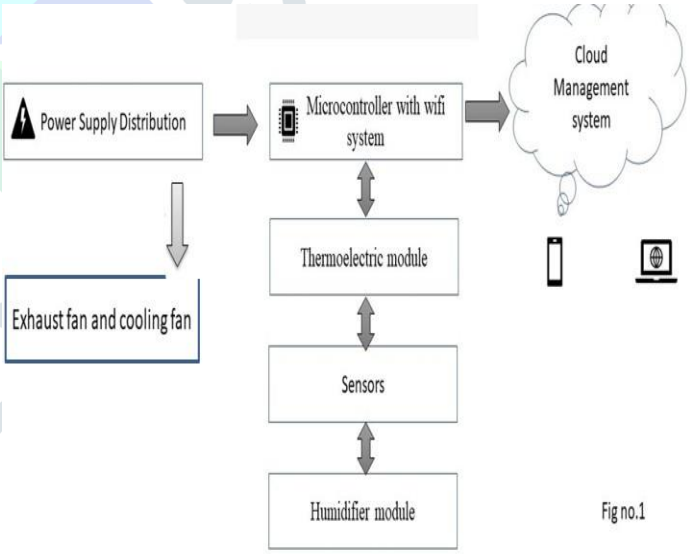
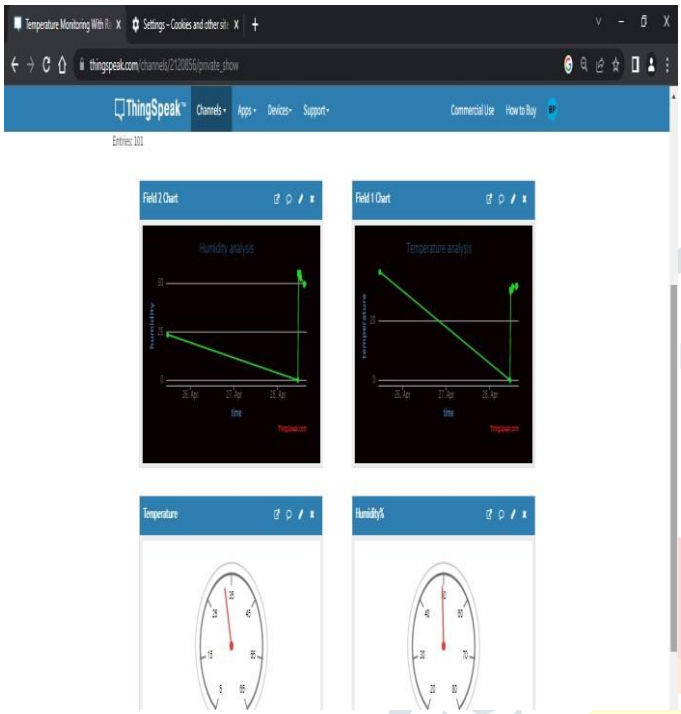


Fig no.1

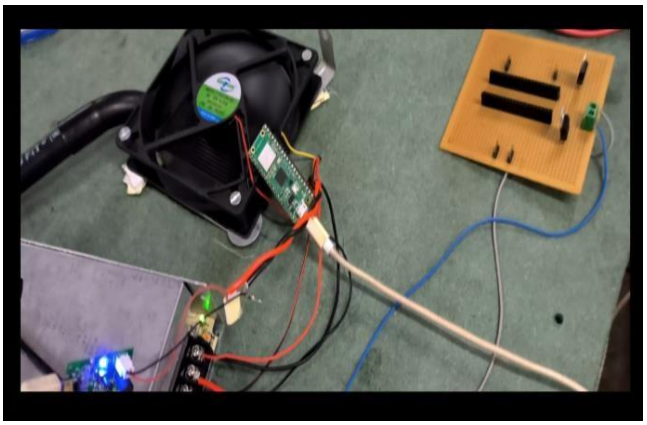
V. RESULT

A successful smart onion warehouse project with temperature and humidity control can result in improved onion quality, extended shelf life, reduced losses, energy efficiency, enhanced operational efficiency, and data-driven insights. These outcomes contribute to higher-quality onions, cost savings, improved sustainability, and streamlined warehouse operations.

REAL-TIME MONITORING:



Hardware system:



VI. REFERENCES

1. International Journal of Engineering Research & Technology (IJERT) ISSN: 2278-0181 | May-2020: The International Journal of Engineering Research & Technology published a journal issue in May 2020. Unfortunately, the specific topic or content covered in this issue is not mentioned.

2. International Journal of Scientific Research in Engineering and Management (IJSREM) Volume: 06 Issue: 06 | June – 2022: The International Journal of Scientific Research in Engineering and Management released a journal issue in June 2022. However, the specific subject matter of this issue is not provided in the citation.

3. CNBC-TV18 Ground report: Onions bring tears to Maharashtra farmers from YouTube: This is a video report available on YouTube by CNBC-TV18. The report discusses the challenges faced by farmers in Maharashtra, particularly related to onion cultivation. It highlights the difficulties and issues surrounding onion production in the region.

4. Bikrant Sarmah and G. Aruna "Detection of food quality and quantity at cold storage using IoT" IEEE, 2017: In 2017, Bikrant Sarmah and G. Aruna published a paper in the IEEE (Institute of Electrical and Electronics Engineers) that focuses on utilizing IoT (Internet of Things) technology for the detection of food quality and quantity in cold storage facilities. The paper explores how IoT can be applied to improve monitoring and management processes in cold storage environments.

5. Manali Michal and Seneca Jagtap, (2018) "Onion Storage System Using IoT", Department of IT, JSPM College, Pune, India, Volume-VIII, Issue-V, May 2019: In 2018, Manali Michal and Seneca Jagtap, affiliated with the Department of IT at JSPM College in Pune, India, published a research paper. The paper was published in Volume-VIII, Issue-V of an unspecified publication in May 2019