Automatic Controlling and Monitoring of Continuous Fermentation for Tea Factory using IoT

Karuppusamy P[1] Monisha G[2] Senthilkumar R[3] Naveen Kumar M[4]
[1,2,3,4]Department of Electrical & Electronic Engineering
[1,2,3,4]SNS college of Engineering, Coimbatore

Abstract— The continuous fermentation machine had a major role in the tea factory regarding the quality of the tea smash. In the existing method the monitoring and controlling is done manually. There are much possibilities to have a human error. The system is designed to assist and provide support in order to fulfill the needs of the industry through automated manure. In this project, it is intended to propose an arudino based control with IoT to maintain the humidity level using continuous fermentation machine which is essential for good quality of tea. IoT module is used for displaying the required data for the users through the web page. When the humidity level of the tea leaves is measured used humidity sensor, the microcontroller controls the sprayer by solenoid valve with respect the set value of humidity. The temperature across the fermentation bed is also monitored through the display. The system intended to maintain the humidity of the continuous fermentation machine in tea factory. As humidity increases, the hot air is blown and humidity level is reduced to 94% rH (which gives better quality). If the humidity goes low the desired value the water sprinkling is done automatically using the processor. This method is proposed in order to have the better quality of the tea product.

Key words: Internet of Things, Relative Humidity

I. INTRODUCTION

The Tea Manufacturing is the Process in which the Leaves from farm are dried for Brewing tea. Tea plants can be categorized by leaves of the plant, the appearance of the dry leaves, or the colour of the tea's liquor. From one tea plant, it is possible to derive six types of tea are green tea, yellow tea, white tea, oolong tea, black tea and post-fermented tea. The Various Steps for brewing tea are as follows:

- Plucking
- Withering process
- Rotor Vane
- Cut Tear and Curl
- Continuous Fermentation Machine
- Drying
- Grade Separations
- Packing

II. PROPOSED SYSTEM

The relative humidity (rH) is being monitored in all the three layers of the continuous fermentation machine (CFM) at three various positions in each of the lower and middle layers. The top layer is being divided into three equal areas and each area will be having two relative humidity (rH) sensors. The top layer is monitored and controlled the middle layer and lower layer is only monitored with the sensor. The target value of 94% will be maintained using water particle spraying for increasing the rH when it is low. The blower fan is used to reduce the rH in case the rH is above the target value of 94%. In case the main rH sensor fails the backup sensors will monitor.

III. BLOCK DIAGRAM

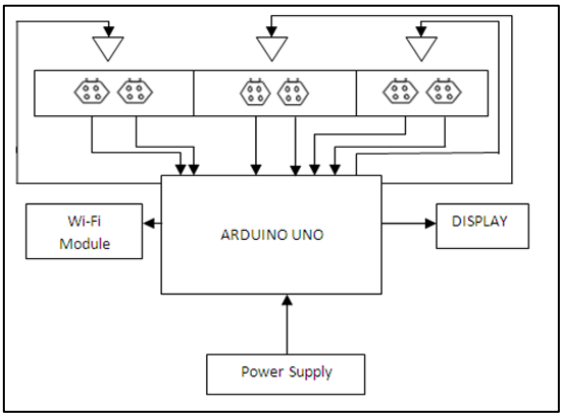

Fig. 1: Block Diagram

IV. HARDWARE

A. Arduino UNO

Arduino is a fast prototyping tool. It will adapts to the new challenges based on the needs of the user. Arduino boards are used in the development of products based on IOT, 3D printing and other embedded products. It is inexpensive comparing to other microcontrollers. The limitations of other microcontrollers are they mainly support only Windows. But Arduino software runs on Linux operating systems, Macintosh OSX, and Windows.

Fig. 2: Arduino Uno Schematic Diagram

B. Humidty Sensor

The DHT22 is a basic, low-cost digital temperature and humidity sensor. It uses a capacitive humidity sensor and a thermistor to measure the surrounding air, and spits out a digital signal on the data pin (no analog input pins needed). Its fairly simple to use, but requires careful timing to grab data. The only real downside of this sensor is you can only get new data from it once every 2 seconds, so when using our library, sensor readings can be up to 2 seconds old.

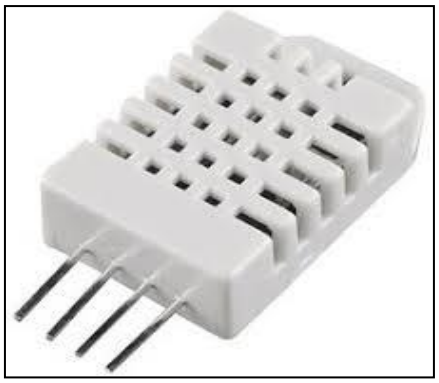

Fig. 3: Dht22 Humdity Sensor

C. Temperature Sensor

LM35 is a precision IC temperature sensor with its output proportional to the temperature (in °C).With LM35, the temperature can be measured more accurately than with a thermistor. It also possess low self heating and does not cause more than 0.1 °C temperature rise in still air. The operating temperature range is from -55°C to 150°C.The LM35's low output impedance, linear output, and precise inherent calibration make interfacing to readout or control circuitry especially easy.

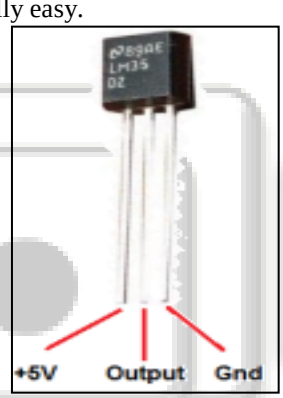

Fig. 4: LM 35 Temperature Sensor

D. Solenoid Valve

Thesolenoid valve is electromechanically operated valve. The valve is controlled by an electric current through a solenoid: in the case of a two-port valve the flow is switched on or off; in the case of a three-port valve, the outflow is switched between the two outlet ports. Multiple solenoid valves can be placed together on a manifold.

Fig. 5: Solenoid Valve

V. IMPLEMENTATION

In this chapter the hardware implementation and both the results were said to be discussed. This system has simple features and less cost. The controlling and monitoring should do automatically.

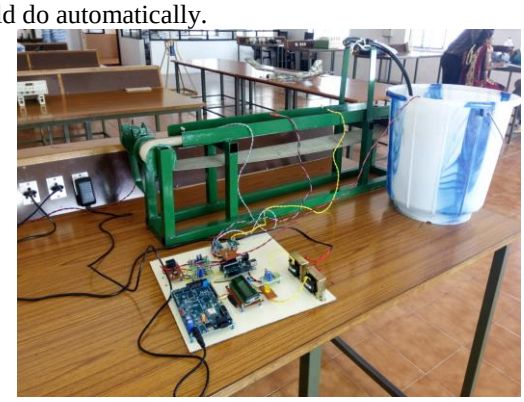

Fig. 6: Hardware Implementation

- The temperature sensor has the connection to the Arduino controller.
- The Humidity sensor has the connection to the Arduino controller.
- Now the temperature and humidity is displayed in the screen.

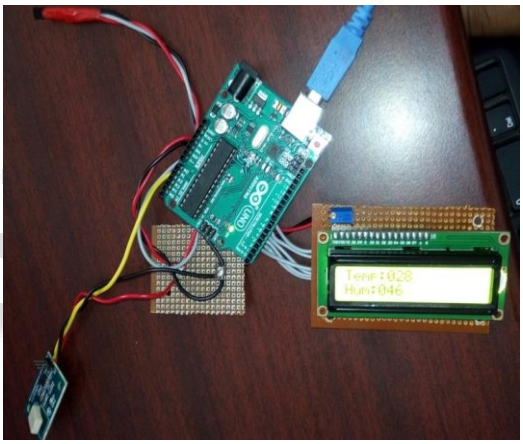

Fig. 7: Temperature And Humidity Displaying

The temperature and humidity are sensed and the data are transferred to the IoT module using serial communication port. Thus, the temperature and moisture value are displayed through the web link with the help of the IoT module

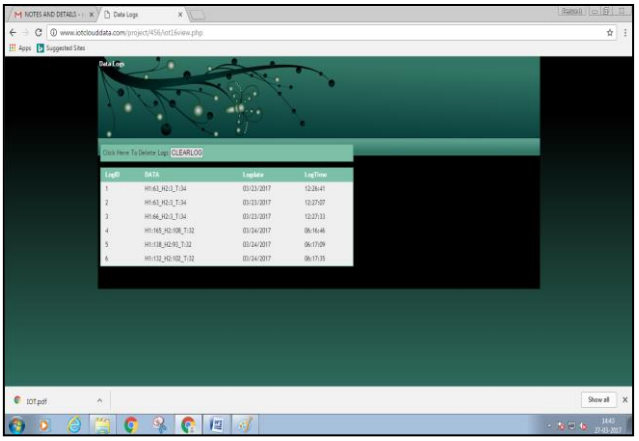

Fig. 8: Monitoring Using Iot

VI. CONCLUSION

IoT is a revolutionary invention of the century. It was primarily designed for monitoring and controlling through the web link and in order to store the data in the cloud in order to reduce the hardware equipments. The project is successfully developed and met the stated objectives. The system can automatically switch ON and OFF the water sprinkling and the hot air blowing with respect to the ambient conditions. If the humidity level reduces the 94%rH the water sprinkling is done and if it exceeds 94%rH the hot air is blown. Thus the value will be also displayed in the web link with the help of the IoT module.

A. Future Scope

We have discussed a simple prototype in this project but in future it can be expanded to many other industries. The prime objective of the project is to assist the industry members to have the automatic control and to have better quality of the product. So the overall implementation cost is very cheap and it is affordable by an industry person.

REFERENCES

[1] M Bhuyan(1996) 'Application of electronics in tea Industry' journal of electric drives and control.
[2] M Bhuyan(1997) 'An Integrated PC based Tea Process Monitoring and Control System' Journal of Computer Integration.
[3] S Borah and M Bhuyan (2003) 'Quality Indexing by Machine Vision during Fermentation in Black tea Manufacturing', journal of SPIE Vol.5132.
[4] Andrew Chen (2014) 'Use of Temperature and Humidity Sensors to Determine Moisture Content of Oolong Tea', journal of physical sensor.
[5] Pandey R.K., Manimehalai (2014) 'Production of Instant Tea Powder by Spray Drying', International Journal of Agriculture and Food Science Technology ISSN 2249-3050 Vol.5.
[6] Yeison Julian Camargo Barajas (2014) 'Wireless Sensor System According to the Concept of IoT-Internet of Things', IJACSIT Vol.3.

