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IOT Based Milk Container Monitoring System

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ABSTRACT: The project presents a modern device for quality inspection of milk based on smart sensor technology. As milk is the major food for all the infants and adults it has to be monitored for the safety of the people. The main objective of the project is to bring out the product which determines the quality and the safety of milk in the storage or in the transport. This project determines many parameters of milk by using smart sensor technology. Here, we consider parameters like temperature, fat and weight to determine the quality of the milk. The Temperature sensor is used to determine the normal temperature of milk. The lactometer sensor is used to determine the density of the milk. The load-cell sensor is used to determine the quantity of the milk. All these sensors are thus inbuilt inside the case and the output is thus shown with the help of monitoring displays (LED) externally. The output values also can be viewed from the remote location where the concerned person can monitor it on his/her laptop or smart phone with the help of IoT technology.

KEYWORDS: Lactometer, Load-cell, Internet of Things - IoT, Milk.

I. INTRODUCTION

In recent years, there are three major problems namely food safety, human safety and water safety. Our project is choose to the food safety. Now a day, the need of milk for children and adults is very important that providing good quality milk by milk quality tester. This project consists of temperature sensor can be used to measure the temperature in the milk. The lactometer sensor can be used to measure the density of the milk. LCD interfaced with arduino microcontroller to display the value of temperature, density and weight of the milk. Milk is a white liquid produced by the mammary glands of mammals. It is the primary source of the nutrition for young mammals before them able to digest other types of food. As an agricultural product, milk is extracted from mammals during or soon after pregnancy and used as food for the humans. Throughout the world, more than 11 billion consumers of milk and milk products are there and 70% of child deaths every year are attributed to malnutrition. Thus milk is a major food for the infants.

Milk testing and quality control is an essential component of any milk processing industry. Transportation and storing of the milk is also very critical. During storage or transportation, the quality and quantity monitoring of the milk is very important. During this there is very high chance of mixing of water in it by some person. They also can remove the milk from the container. To avoid this the owner should have live data of it. This can be done using the IoT technology.

II.METHODOLOGY

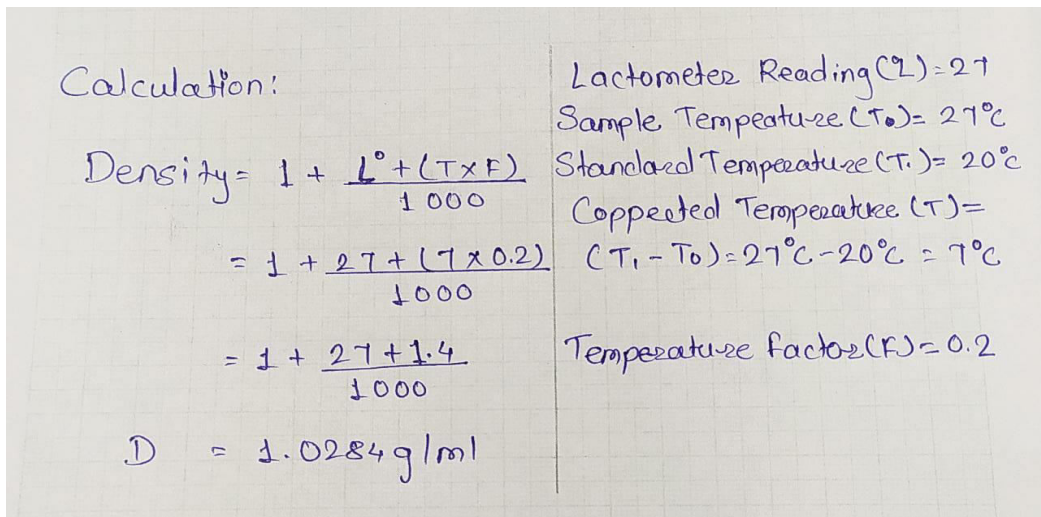
The basic components of this system mainly consist of -

- A) Milk parameter measurement.
- B) Uploading data

A. Milk parameter measurement

The Figure shows block diagram of Milk collection center & it mainly consist of following component.

- 1) Sensors
- 2) Signal conditioning
- 3) Controller board
- 4) Display
- 5) IoT module



Determination of Milk Density - formula with example

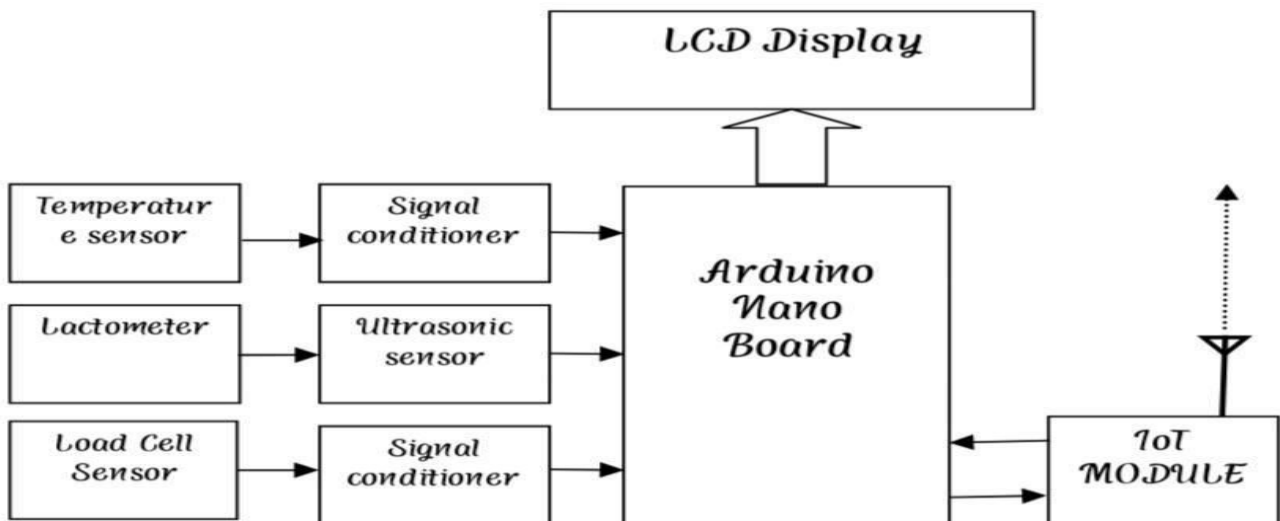


Fig 1: Design of IOT Based Milk Container Monitoring System

System Hardware Designing:

1)IoT Module – ESP8266 (ESP01)

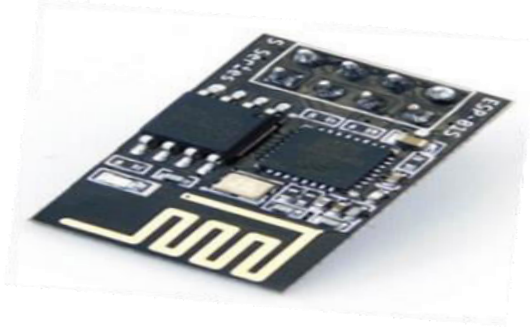


Fig 2: IoT Module – ESP8266 (ESP01)

ESP8266-01 designed with 8 pins (GPIO pins -2) The ESP8266 Wi-Fi module comes with a boot ROM of 64 KB, user data RAM of 80 KB, and instruction RAM of 32 KB. It can support 802.11 b/g/n Wi-Fi network at 2.4 GHz along with the features of I2C, SPI, I2C interfacing with DMA, and 10-bit ADC. Interfacing this module with the microcontroller can be done easily through a serial port. An external voltage converter is required only if the operating voltage exceeds 3.6 Volts. It is most widely used in robotics and IoT applications due to its low cost and compact size

3)Ultrasonic Sensor – HC SR-04



Fig 3: Ultrasonic Sensor – HC SR-04

Ultrasonic ranging module HC - SR04 provides 2cm - 400cm non-contact measurement function, the ranging accuracy can reach to 3mm. The modules include ultrasonic transmitters, receiver and control circuit. The basic principle of work:

- (1) Using IO trigger for at least 10us high level signal,
- (2) The Module automatically sends eight 40 kHz and detect whether there is a pulse signal back.
- (3) IF the signal back, through high level time of high output IO duration is the time from sending ultrasonic to returning.

Test distance = (high level time x velocity of sound (340M/S) / 2

Wire connecting direct as following

- 5V Supply
- Trigger Pulse Input
- Echo Pulse Output
- 0V Ground



4) Things Speak



Fig 4: Things Speak

Thing Speak™ is an IoT analytics service that allows you to aggregate, visualize, and analyze live data streams in the cloud. Thing Speak provides instant visualizations of data posted by your devices to Thing Speak. With the ability to execute MATLAB® code in Thing Speak, you can perform online analysis and process data as it comes in. Thing Speak is often used for prototyping and proof-of-concept IoT systems that require analytics.

You can send data from any internet-connected device directly to Thing Speak using a Rest API or MQTT. In addition, cloud-to-cloud integrations with The Things Network, Senet, the Lib elium Mesh lium gateway, and Particle.io enable sensor data to reach Thing Speak over LoRa WAN® and 4G/3G cellular connections. With Thing Speak, you can store and analyze data in the cloud without configuring web servers, and you can create sophisticated event-based email alerts that trigger based on data coming in from your connected devices.

5) Arduino IDE



Fig 5: Arduino IDE

The Arduino Integrated Development Environment - or Arduino Software (IDE) - contains a text editor for writing code, a message area, a text console, a toolbar with buttons for common functions and a series of menus. It connects to the Arduino hardware to upload programs and communicate with them.

The open-source Arduino Software (IDE) makes it easy to write code and upload it to the board. This Software can be used with any Arduino board. The Arduino software is easy-to-use for beginners, yet flexible enough for advanced



users. It runs on Mac, Windows, and Linux. Teachers and students use it to build low cost scientific instruments, to prove chemistry and physics principles, or to get started with programming and robotics.

III. EXPERIMENTAL RESULT

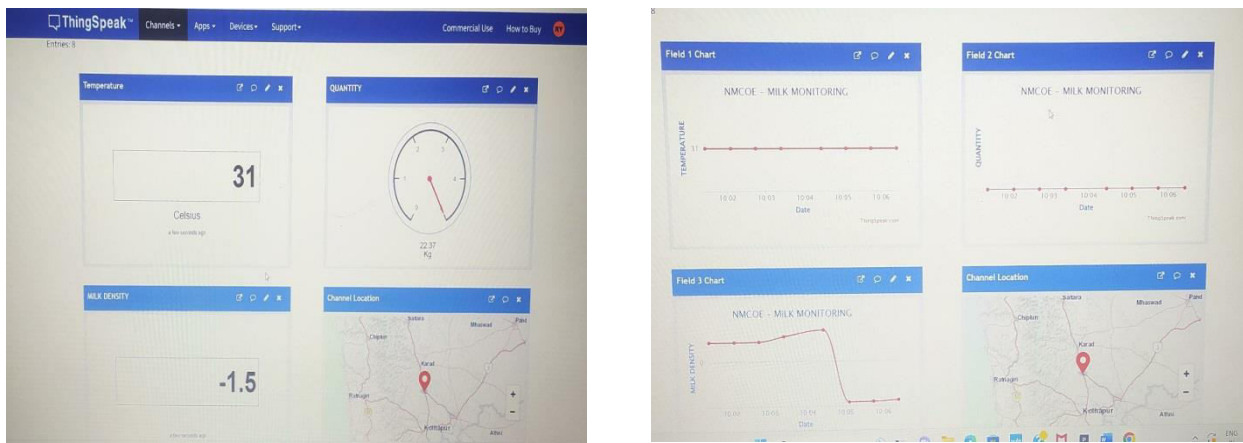


Fig 6: Probable IoT Output Form

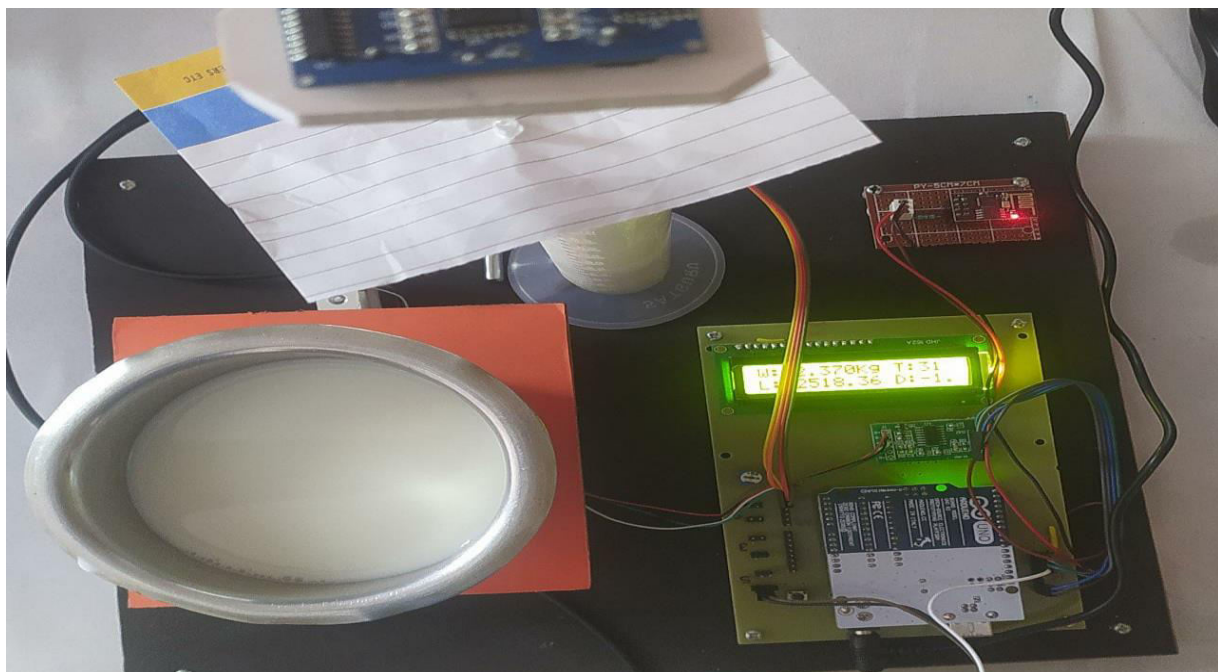


Fig 7: Prototype Model



Fig 8:Show in all parameters

IV.CONCLUSION

The owner of the milk needs to know the quality of milk while it is in the storage. Milk testing and quality control is an essential component of any milk processing industry whether small, medium or large scale. Milk quality control is the use of approved tests to ensure the application of approved practices, standards and regulations concerning the milk and milk products. The most important thing is that the owner of the milk dairy can monitor his milk quality and quantity over the internet while it is being transported or stored. It avoids any possible fraud done by the transporter or the storage supervisor

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