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Determination of Cheese Quality Using RFID Sensor Tag

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Abstract: ***In dairy products, cheese is one of the main products consumed by all human beings all over the world. During manufacturing, proper management and maintenance are mandatory to produce quality cheese for human use. This could be achieved through proper monitoring by human resources. Hence manpower consumption is high and mishandling takes place which affects the quality of cheese production. This proposed system by utilizing sensors and its advantages leads to the cheese quality monitoring process. Temperature, gas and humidity sensors are used to monitor the cheese storing environment; these details are easily viewed through an RFID tag. Through this tag cheese, the current environment status is monitored easily and if any change in the temperature, carbon dioxide and humidity will be intimated through a buzzer. Therefore proposed system supports heavily maintaining cheese quality and monitoring its process in an efficient way with less human resource consumption.***

Keywords: cheese quality monitoring, temperature, gas, humidity, buzzer notification and RFID tag.

I. INTRODUCTION

Today's food industry necessitates the development of new smart technologies that can deliver information regarding food deterioration without the need for physical involvement. During transit and storage, RFID (Radio Frequency Identification) devices may be used to verify that food goods such as meat, fruits, and dairy products remain within a safe range of environmental variables such as temperature, humidity, and pressure. RFID chips have recently been upgraded with sensing capabilities, allowing them to monitor ambient conditions, store product data, and then communicate the acquired data upon request. Previous research [1] created RFID tags that can monitor the shelf life of a variety of food goods in both the HF and UHF bands. Humidity, temperature, and light intensity sensors, as well as energy harvesting modules for powering the system, were added to these tags.

Currently, there is no method in place in the cheese manufacturing industry that ensures complete traceability across all phases of the manufacturing process. The key issue is the ripening of cheese, which is carried out in particular chambers as indicated in Fig. 1. The variables in these chambers, such as humidity, temperature, product handling (turning), and mould growth, prevent the items from being individually labelled. Because of this, production and quality control is done in batches, and data storage is done manually by business employees [2].



Fig. 1: A traditional ripening chamber

Obviously, using smart cards in this sort of product provides the benefits that come with equipping the product with a certain kind of intelligence, such as

1) Being able to communicate with his environment effectively.
2) Be capable of collecting and storing information about itself.

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In this paper, we offer a system that uses RFID tags as the physical support for storing the data needed to execute full traceability in the cheese sector. We recommend that the amount of data obtained related to the process circumstances be increased (humidity, temperature, pressure). The traceability will then be allowed, both on cheese batches and on individual cheeses, thus cheese batch and individual tags will be provided, allowing for automatic traceability management.

II. RELATED WORK

Patrizia Papetti et. al(2012), depicts the following and quality data are joined on a web stage to get a total technique to foster what we characterize as an & quot; information following framework & quot; Two typologies of RFID labels were tried. The RFID framework turned out as viable, solid and viable with the creation cycle apparatus. A decent assessment of development degree by the ghastly and compound investigation is gotten. In addition, a data following online framework was intended to get and connect essential data that can be made accessible to the last purchaser or to various pecking order entertainers previously or subsequent to buying, utilizing the RFID code to distinguish the single and explicit cheddar item. The projected online following framework could further develop the items trade by expanding the data straightforwardness for the customer [3].

Vivek Kumar (2018), portrays Radio Frequency Identification (RFID) as an innovation which assists with working on the administration of data stream inside the store network and security in the agri-food area. RFID is now being utilized for a really long time in creature recognizable proof and following and in the well-established the pecking order for discernibility control. The advancement of RFID sensor labels has further developed checking of the virus chain of transient food items, natural observing, water system, speciality yields and ranch hardware. Notwithstanding, significant utilization of RFID innovations are as yet restricted. Subsequently, this audit gives the far-reaching outline of the ongoing advancements of RFID innovation inside the agri-food industry and simultaneously talks about its likely mechanical and strategic improvement in various areas of the creation/dispersion chain [4]. Jeff Lindsay and Walter Reade (2004), examine a strategy that is accommodated following the newness or lapse dates of food items put away. The food items put into capacity are furnished with shrewd labels, the brilliant labels containing food item data in regards to the newness or lapse date of the food item. The food items are checked with a savvy label scanner preceding putting the items into capacity, the scanner is designed to recover the food item data from the brilliant labels. The client might be cautioned assuming the recovered data demonstrates that the food item being put into capacity has lapsed or is presently not new. The food items are set away, and the client might be alarmed when any of put away items have terminated or are at this point not new [5].

III. PROPOSED SYSTEM

Cheese manufacturing is one of the important product productions in dairy products. Manufacturing cheese needs more attention and its quality maintenance need much more attention. To make these processes easier with accuracy sensor based cheese quality monitoring is implemented. Once the cheese is produced its temperature, carbon dioxide and humidity will be monitored continuously through sensors and information are collected through RFID tag. By utilizing this tag room of cheese storage is monitored. If any change in these parameters value it will affects the quality of cheese products. Similarly if any parameter value is abnormal then it will be intimated through buzzer for further step processing.

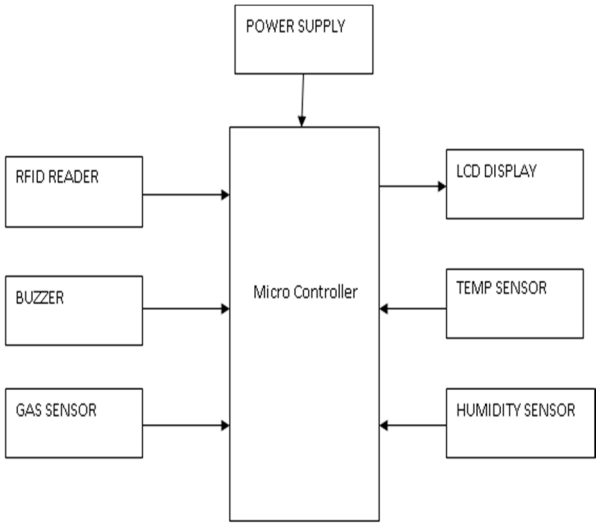


Figure 2: proposed system block diagram

A. Power Supply

A Breadboard Power Supply Module takes a barrel jack input from a battery, a 12V adaptor, or any other source and gives a 5V or 3.3V voltage to our circuit, according to on our demands. We'll be incorporating Arduino into our circuits shortly, and all of our Arduino circuits will be compatible with those voltage levels.

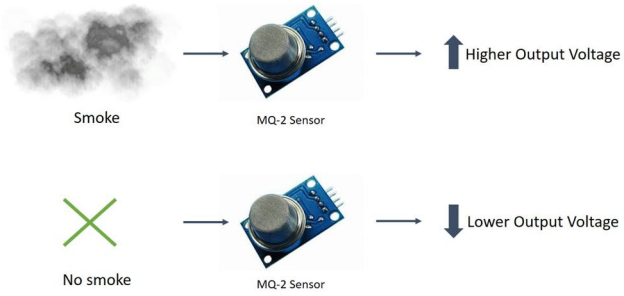
B. RFID Tag

A transponder/tag affixed to an item to be recognised and a transceiver, also known as an interrogator/reader, are the two primary components of an RFID or Radio Frequency Identification system. A radio frequency module and an antenna create a high-frequency electromagnetic field in a reader. The tag, on the other hand, is often a passive device, meaning it lacks a battery. It instead features a CPU for data storage and processing, as well as an antenna for receiving and delivering signals. A tag must be put close to the Reader in order for the information encoded on it to be read (does not need to be within a direct line of sight of the reader). A reader creates an electromagnetic field that causes electrons to flow via the tag's antenna, powering the chip. The powered chip within the tag then replies by sending another radio signal to the reader with the information it has saved. Backscatter is the term for this phenomenon. The reader detects and interprets the backscatter, or change in the electromagnetic/RF wave, and then delivers the data to a computer or microcontroller.

C. Gas Sensor

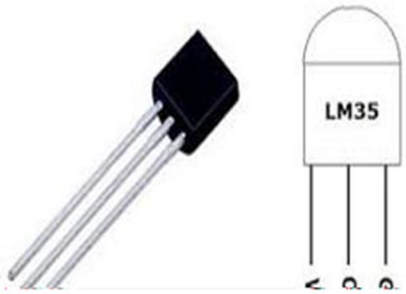
The output voltage of the sensor changes in response to the amount of smoke or gas in the surroundings. The voltage generated by the sensor is proportional to the amount of smoke or gas present. In other terms, the following is the connection between voltage and gas concentration:

1) The output voltage rises as the gas concentration rises.
2) The output voltage decreases as the gas concentration decreases.



D. Temperature Sensor

The LM35 family of temperature sensors are precision integrated-circuit temperature devices with an output voltage that is directly proportional to the temperature in degrees Celsius. In comparison to linear temperature sensors calibrated in Kelvin, The LM35 device has the benefit of not requiring the user to remove a large constant voltage from the output to get easy Centigrade scaling.



E. Humidity Sensor (DHT22)

The DHT-22 (also known as the AM2302) is a temperature, relative humidity, and digital output sensor. It measures the ambient air with a capacitive humidity sensor and a thermistor and outputs a digital signal to the data pin.

F. Buzzer

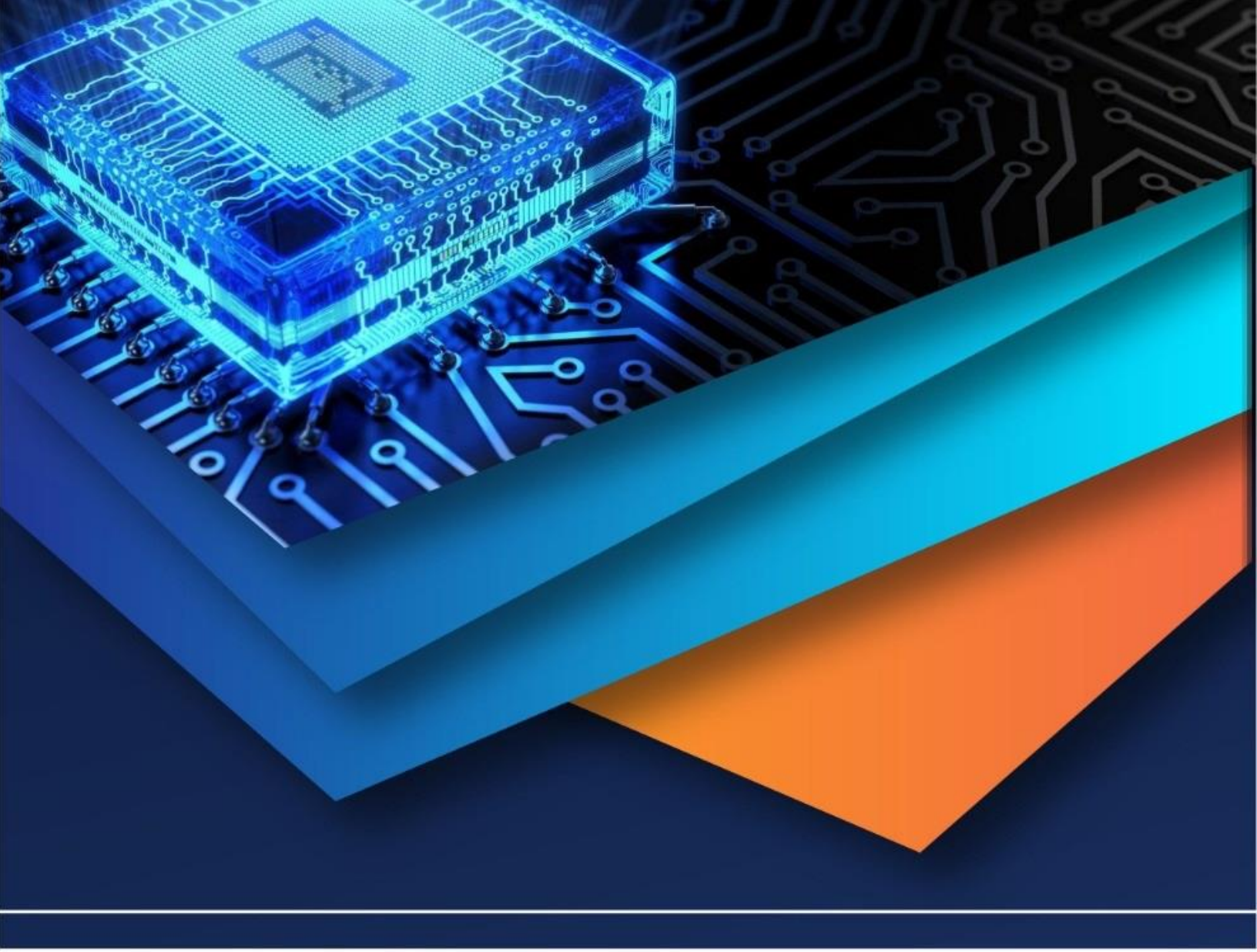
It's a basic gadget that can make beeps and tones. The piezoelectric effect is the device's working principle. A piezo crystal is a particular material that changes shape when a voltage is applied to it and is the device's principal component.

IV. CONCLUSION

The primary variables that change throughout the ripening of Swiss-type cheese, such as carbon dioxide concentration, temperature, and humidity, were investigated and examined in this research. First, the carbon dioxide fluctuation was measured, demonstrating the feasibility of using carbon dioxide as a cheese ripening sensing parameter. RFID designs based on stretch and pressure sensors were also successfully employed in ripening chambers to monitor cheese level maturity. The findings demonstrate the use of RFID sensor tags for food monitoring in real-world settings.

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