

# Automated Milk Quantity and Quality Checking and Vending Machine



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**Abstract:** In this paper, each farmer is provided with a separate RFID tag, which has a unique code. When the RFID tag is punched against RFID card reader LCDs the code. Milk is deposited in the tank where its quality and quantity is determined. The quality of milk is examined using a pH sensor and its quantity is determined using an ultrasonic sensor. The milk is segregated into third categories depending on its quality as first quality, second quality, and rejection. Here three solenoid valves are used for segregation purposes. The milk is deposited in separate tanks according to its quality. The details such as cost, quality, and quantity of milk are fed to PC. The customer deposits the currency note. The web camera is used to capture the image of the currency note and it is compared with the database stored in PC. Here a switch is used for quality selection based on customer preference. Milk is vended based on the rupee note deposited and on the quality selected by the customer. The entire system is maintained with a refrigeration temperature of 4°C.

**Keywords-** Vending, Quantity, Quality, pH sensor, Milk

## I. INTRODUCTION

The Dairy industry in India is generally co-operative. The primary milk provided to the dairy are farmers who do not process their milk and give it in the raw form to the co-operative dairy. Since many farmers are depositing their milk in the dairy, it is a daily task of the dairy to assess the quality of milk from each farmer, verify it and meets the quality norms specified and make payments based on quality and quantity of milk. However, several tests are available for quality assessment of milk like the content of protein, water, detergent, lactose, etc. Most dairies use only the fat content test and CLR (Corrected Lactometer Reading) to judge milk quality. One of the important tests that need to be done is the quality checking using pH meter.

This test helps in identifying whether the cow has got a disease such as mastitis. Some milk collection centers do not have the costly milk analyzing equipment so the sample of milk for testing was stored in plastic bottles and tested only after the milk collection process was over, this means that a sample was examined after one or two hours. This led to unhygienic conditions and fear of contamination at the center. Since all the measurement is done manually and the values are also noted manually in farmer's membership card hence chances of errors in the manual calculation of quality and quantity by cooperative staff. Hence a request from the cooperative staff to reduce the above manual work and to speed up the operation of milk collection, motivate me to develop the automated milk quantity and quality-checking machine. A milk vending machine is a machine that is used to vend the milk to the user as per the value of the currency deposited into the machine. Once the currency inserted in the machine image processing technique is used to check its denomination, and the sensor is used to check the availability of stock. However, the above process would not be time-consuming. This process gives an efficient way of analyzing and vending the raw milk deposited.

## II. LITERATURE REVIEW

A. *Categorizing the Quality and Estimating the Quantity of the Milk by Embedded System Using Zigbee [2]*

In this system Quantity of milk is determined using a Level sensor and its Quality is examined using a pH sensor. Each customer should have their card for accessing the milk dairies. The amount is credited based on the quantity and quality of the milk, which is sent through the Zigbee. The milk is segregated according to its quality. The high-quality milk is deposited in one can and the second quality to another can. The main drawback of this system is the segregation process is done manually. If Manpower is involved in milk dairy there is a possibility of robbery.

B. *Low-cost milk analyzing and billing system using electronic card [3]*

This paper clearly explains how the quality of milk is examined using CLR. It talks about the automation of the manual CLR analyzing process. Here the milk is examined for quality using the automated CLR machine. The data is used for billing purposes with the electronic card.

C. *PLC based change dispensing vending machine using an image processing technique for identifying and verifying currency [5]*

This system uses the image processing technique along with plc for change dispensing. Counterfeit currency notes appear to be the major threat in the change-dispensing machine. This problem is sorted in this system with the help of image processing.

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The image processing technique is used to detect the counterfeit currency and to identify the denominations of the currency. Here the output of the image processing is given to the PLC and the operation of PLC is programmed using ladder logic.

## D. Automated milk quantity and quality checking and vending machine

The quality of milk is examined using a pH sensor and its quantity is determined using an ultrasonic sensor. The milk is segregated into three categories depending on its quality as first quality, second quality, and rejection. The customer deposits the currency note. The web camera is used to capture the image of the currency note and it is compared with the database stored in PC. Here the switch is used for quality selection based on customer preference. Milk is vended based on the rupee note deposited and on the quality selected by the customer.

## III. METHODOLOGY

This paper proposes a novel system to automatically analyze the quality and quantity of milk as shown in figure1, to reduce labor, save time and to make the process accurate and hygienic.

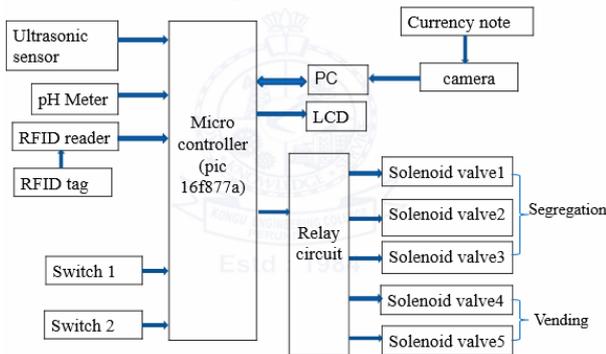


Figure 1. Automated milk quantity and quality checking and vending machine

This system consists of a microcontroller, Ultrasonic sensor, pH sensor, RFID card reader, RFID tag, LCD, Personal computer, Relay circuit, and Solenoid Valves. The first RFID tag is punched to the RFID card reader which is connected to PC. Details of the person such as name and unique code are displayed and acknowledgment is given in LCD to deposit the milk [7]. Milk is deposited in the tank where its quantity determined using the ultrasonic level sensor [4]. The pH sensor examines the quality of milk and milk is segregated based on its quality [1]. The relay is connected to the solenoid valve. Three solenoid valves are used for segregating the milk. Based on the pH value solenoid valve opens and milk is deposited in the tank. The details such as quality and quantity of milk are fed to PC using USB to TTL connector. According to the pH value and quantity of the milk, the cost is determined. The database is used to maintain the details of the person which helps in rendering the amount at the end of the month. For the process of vending, the currency note is deposited. The deposited currency is captured through a webcam. The captured image is compared with the image in the database using image processing technology. Consequently, the customer selects the switch for the preferred quality of milk. After the comparison and selection

process, the customer will receive the preferred quality milk from the tank.

It is a 16-bit microcontroller. It has only 35 single-word instructions and its operating speed is DC – 20 MHz clock input and DC – 200 ns instruction cycle. It has Up to 8K x 14 words of Flash Program Memory, up to 368 x 8 bytes of Data Memory (RAM), up to 256 x 8 bytes of EEPROM Data Memory. It also has peripheral features like timer, counter, PWM module, capture, and compare module, PSP, USART. It has Low-power, high-speed Flash/EEPROM technology. It has a fully static design. It has a wide operating voltage range (2.0V to 5.5V). It consumes low power [6].

Based on the pH value the milk was segregated into three categories. If the pH value lies between six to seven, then it comes under quality 1 (A1), if the pH value lies between five to six then it comes under quality 2 (A2) and if the pH value is less than five or greater than 7 then it is rejected by the system.

## IV. RESULTS AND DISCUSSION

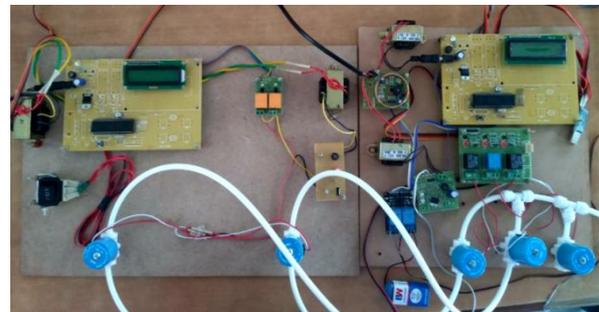


Figure 2: Experimental set-up of the entire system

Figure-2 shows the hardware setup of the project. Each farmer is given an RFID tag. He punches the tag against the RFID reader to deposit the milk in the tank. Details of the farmer are stored in the PC. The unique code of RFID is displayed in the LCD1 which is shown in Fig: 3. The details such as name, RFID tag code, pH value, quantity, and the cost are stored and maintained in the database of PC it is shown in fig:4.



Figure 3: Unique code of RFID is displayed while depositing milk

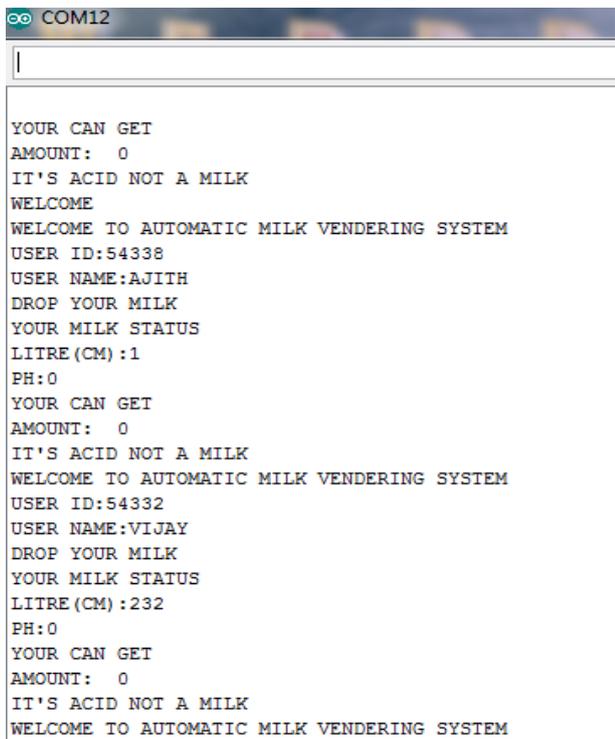


Figure 4: Milk depositor details stored in PC

This milk is stored in separate tanks. pH value for some samples on different days and their category is shown in table1.

Table 1: Milk segregation based on pH value

Source	Sample	pH value	Category
Cow	Day1	5.54	quality - A2
	Day2	5.63	quality - A2
	Day3	5.81	quality - A2
	Day4	7.20	rejection - A3
	Day5	6.52	quality - A1
	Day6	6.84	quality - A1
	Day7	7.37	quality - A0
Buffalo	Day1	5.62	quality - A2
	Day2	5.71	quality - A2
	Day3	5.94	quality - A2
	Day4	7.32	quality - A3
	Day5	6.61	quality - A1
	Day6	6.93	quality - A1
	Day7	7.43	rejection - A3

The customer deposits the currency note. The web camera is used to capture the image of the currency note and it is compared with the database stored in PC. It is shown in fig:5.



Figure 5: Currency note Recognition

Here the switch is used for quality selection based on customer preference. Based on the currency deposited

and the switch selected the milk is vended. LCD2 displays the quality selected, the quantity of milk vended to the customer. A1-Quality 2, A2-Quality 1 is shown in fig:6



Figure 6: Display of vended milk quality and quantity

### V. CONCLUSION

The milk has been segregated based on the quality concerning the above-discussed parameters and the quantity of the milk has been vended based upon the amount deposited in the vending machine and the quality chosen by the consumer.

### FUTURE SCOPE

In the future, the above mention method can be improved by including technology to overcome the counterfeit currency problem. The vending is based on Indian currency notes only, and it can be improved may by Indian currency coins as input for the vending machine.

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