MILK ANALYZING AND BILLING SYSTEM

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ABSTRACT

Today the modern world has become faster & faster and other daily requirements goods are become more luxurious. So we are making a system which will be going to change the lifestyle of Indian farmer and milk collection system. Agriculture is backbone of our country and dairy farming is joint business of Indian farmer. Dairies collect milk from farmer everyday & payments for this milk are done according to the rates per liter. This rate depends on various factors like weight, FAT, CLR, alcohol & SNF of the milk. We are developing a system that will measure these parameters and accordingly calculate the payment automatically. The system consists of two units; one unit is placed at milk collection Centre (MCC) that consist of several sensors, microcontroller, LCD, buzzer, keypad, GSM & PC as main elements. This unit collects data according to the ID, which is given to farmer. The other unit which is at cash counter (CC) also consists of microcontroller for reading the data & sending it to the PC. Using VB software on PC calculation of bill can be made for calculating daily payment. The details of milk such as: quantity, payment will be viewed on PC and LCD. The same message will also be sent to the farmer using GSM system

Keyword : - *SNF milk , MCC, .microcontroller , GSM,LCD*

1. Introduction

Agriculture is backbone of our country and dairy farming is joint business of Indian farmer. 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 more number of 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 & meets the quality norms specified and make payments based on quality and quantity of milk. This rate depends on various factors like weight, FAT, CLR, alcohol & SNF of the milk. We are developing a systemthat will measure these parameters and accordingly calculate the payment automatically. Standard ranges of fat content and CLR of milk are specified by the government. User has to pour its milk sample in the beaker which is attached to the systemand also place his milk CAN on weighing machine attached to system. Then systemwill display different parameters measured from the sample on the display, viz;

1. Fat present in milk.
2. CLR present in milk.
3. Temperature of milk.

4. Weight of milk.
5. Alcohol content

The fat content in milk is detected with the help of beer's lamberts principle which state that when light is pass through the liquid small amount of light is absorbed by it depending on the liquid density. This change in light intensity can be detected by LDR. So as fat increases in milk, variation in light intensity is observed so voltage across LDR changes which in turns decide fat of milk. For SNF measurement there is standard formula given by Indian Standard Institute,

SNF= (CLR/4) + (0.2*FAT) + 0.50

Where, CLR is correct lactometer reading.

The weight of milk is measured with the help of load cell, which convert weight change into resistance change. Load cell is electronic device used to convert force into an electrical signal.

With the help of these parameters system will calculate price of milk.

Price of milk is given by following equation,

Price of milk = amount of milk * Rate of milk per degree fat
(In liters) (In Rs)

In this way automation process system will display: -Fat present in milk, SNF present in milk, Temperature of milk & Weight of milk.

2. SPECIFICATION:

2.1 Hardware Requirements

1. Power Supply:-

+5v DC Regulated Power Supply
Input Voltage: - 230V, 50Hz, AC
Output Voltage: - +5V, +3.3V, DC
Regulator IC Used: - IC7805 & LM317

2. Sensors:-

FAT Sensor: - LDR
Weight Sensor: - Load Cell
Alcohol Sensor: - MQ3
Temperature Sensor:-LM35

3. Microprocessor IC:-

ARM7 (LPC2138)

4. Display:-

16*2 LCD Display (2 Lines, 16 Characters)

2.2 Software Specifications:-

1. Visual Basic
2. Flash magic
3. Keil uV4
4. Diptrace (PCB Design)

3. Literature Survey:

In "Development of Milk Analysis Reliable Embedded System for Dairy Farmers" clearly gives the information regarding milk analyzing. It explains clearly, the working principle used in the Milkometer reading which is used to measure the quality and quantity of the milk. The working principle is amount of light scattered by the milk sample is a measure of the fat content in the milk. High intensity LED is used as a light source. Correct

lacto meter reading also explained in this paper. By this correct lactometer reading, the specific gravit of the milk and the temperature deviation of the milk is measured. The milk collection parameters such as weight, FAT & CLR are measured by this system is also explained.[1]

With the initiatives of National Dairy Development Board (NDDB), out of 70,000 dairy cooperative societies in the country, around 26000 are using Electronic Milko-Testers (EMT) and around 2500 are using the PC connected electronic milko-tester machines. These systems introduced very satisfactory milk collection methods and facilitated immediate payments to farmers based on the quality and quantity of milk delivered.

In [2] it is clearly explained that the basic components needed for the milk analysis done by low cost and billing system has done by using election card. We came across block diagram of milk collection centre in this paper, it consists of sensor block and a microcontroller, an LCD, a signal conditioner, a keyboard etc., now a days, the date is stored in smart cards. User can go any time to collect his payment. By using this election card the billing system was explained in this paper.

In [3], the various methods of current or potential use for detecting and determining them in dairy products are reviewed.

Methods:-

Under direct methods, they have used Kjeldahl method in which the protein content can be measured.

Under indirect methods, they have used dye-binding method and infra-red method for protein content testing. This review concerns all types of analysis dealing with proteins in milk, dairy and a few non-dairy products. Only the methods that are in current use, or those which have been recently published and might become of general use, will be considered. For all of them, the reader will be supplied with basic principles, schematic descriptions, references and critical evaluations.

In [4] we came across different materials and methods for the milk analysis. The different materials tested in the milk are Fat, Protein and Water.

Methods used:-

(a) Gerber method in which fat can be determined.

(b) Kjeldahl method in which protein can be determined.

(c) AOAC method in which water and ash can be determined. Hydrogen peroxide detection and

Carbonate and bicarbonate detection was done in this particular analysis. Starchy material detection was also done. Finally it concludes the results of percentage of proteins, water ,fat and ash available in the milk sample. The collected milk samples were analyzed for various adulterants i.e. carbonate, flour and hydrogen peroxide. All the five samples evaluated at regular intervals showed no sign of the adulterant.

In [5] calculation for CLR & SNF measurement is given which is as follows:

CLR measurement:-

Another parameter CLR is measured using lactometer, we can find water content present in the milk. Pure milk has a specific gravity of 1.026 to 1.032 grams per ml. The lactometer mainly contains glass tube containing mercury or lead shots at bottom side of it. The Auto CLR is instrument incorporating electronics to observe the lactometer reading.

Calculation of SNF:-

Once we got values of FAT and CLR, We can calculate SNF by equation (1),

SNF = (CLR reading/4) + (Fat x 0.21) + 0.36 ….equation (1)

Billing System:-

According to the parameters the price of milk is calculated and added to database. This System for billing is automatic without any human intervention and farmer and dairy can directly get payment data. Each farmer is provided with RFID Card Farmer have to show this card whenever they want to deliver his milk. Farmer's account is opened from database is opened from database and after calculation of bill payment receipt is also viewed on PC and print of payment receipt can provide to famer.

4. BASIC BLOCK DIAGRAM & DESCRIPTION

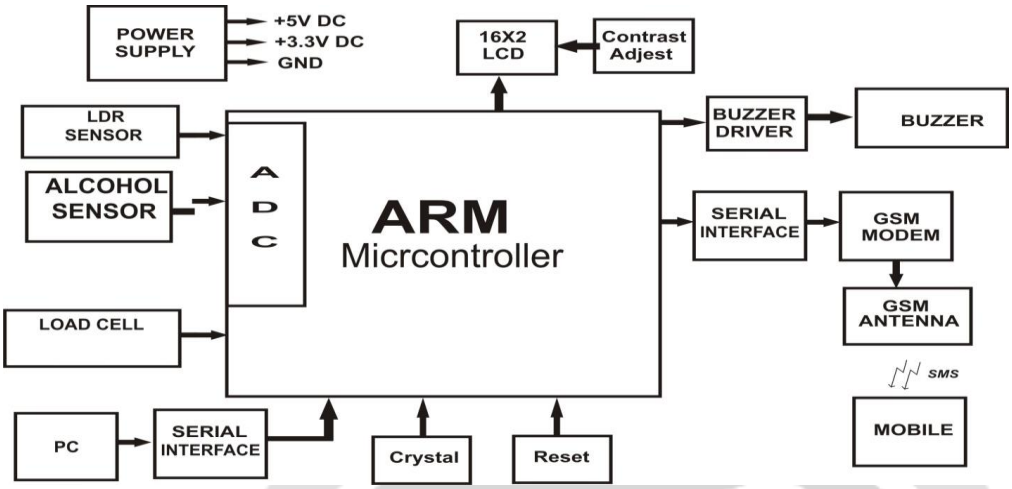

Fig -1: block diagram and description

Aim of this project is to make complete automation of fat detection process in milk. A micro controller based system is used for performing many functions like ADC control, display control this system is an important part of the project. To make system more users friendly we are using separate read / write assembly for write assembly we are using LCD display and for read assembly we are using cash counter, which will content a computer. The LCD used is 16 X 2. For measurement of the weight will be done using load cell. The microcontroller we are using is ARM which has ADC in built. The Data will be further send to PC for analysis. Also the SMS will sending to mobile.

4.1 ARM: LPC2138:

LPC2138 microcontrollers are based on a 16-bit/32-bit ARM7TDMI-S CPU with real-time emulation and embedded trace support, that combine microcontroller with embedded high speed flash memory ranging from 32 kB to 512 kB. A 128-bit wide memory interface and unique accelerator architecture enable 32-bit code execution at the maximum clock rate. For critical code size applications, the alternative 16-bit Thumb mode reduces code by more than 30 % with minimal performance penalty. Due to their tiny size and low power consumption, LPC2131/32/34/36/38 are ideal for applications where miniaturization is a key requirement, such as access control and point-of-sale. Serial communications interfaces ranging from a USB 2.0 Full-speed device, multiple UARTs, SPI, SSP to I2C-bus and on-chip SRAM of 8 kB up to 40 kB, make these devices very well suited for communication gateways and protocol converters, soft modems, voice recognition and low end imaging, providing both large buffer size and high processing power. Various 32-bit timers, single or dual 10-bit ADC(s), 10-bit DAC, PWM channels and 45 fast GPIO lines with up to nine edge or level sensitive external interrupt pins make these microcontrollers suitable for industrial control and medical systems.

4.2 LCD Display:

In recent years LCD is finding wide-spread use replacing LED's (Seven Segment LED's or multistage LED'S).This is due to prices of LCD's, the ability to display numbers, characters & graphics. This is in contrast to LED's, which are limited to numbers & a few characters.

Incorporation of a refreshing controller into the LCD, thereby relieving the CPU of the task of refreshing the LCD. In contrast, the LED must be refreshed by the CPU to keep displaying data.

4.3 LDR (LGHT DEPENDENT RESISTOR):

LDRs or Light Dependent Resistors are very useful especially in light/dark sensor circuits. Normally the resistance of an LDR is very high, sometimes as high as 1000 000 ohms, but when they are illuminated with light resistance drops dramatically.

4.4 Load Cell:

A load cell is a transducer that is used to convert a force into electrical signal. This conversion is indirect and happens in two stages. Through a mechanical arrangement, the force being sensed deforms a strain gauge. The strain gauge measures the deformation (strain) as an electrical signal, because the strain changes the effective electrical resistance of the wire. A load cell usually consists of four strain gauges in a Wheatstone bridge configuration. Load cells of one strain gauge (quarter bridge) or two strain gauges (half bridge) are also available.

4.5 GSM Module:

GSM (Global System Mobile) is a digital communication system which has rapidly gained acceptance and market sheared worldwide. GSM also pioneered low-cost implementation of the short message service (SMS), also called text messaging, allow users to send and receive point to point alphanumeric messages up to few tens of bytes.

5. CIRCUIT DIAGRAM & MODULE WISE DESIGN:

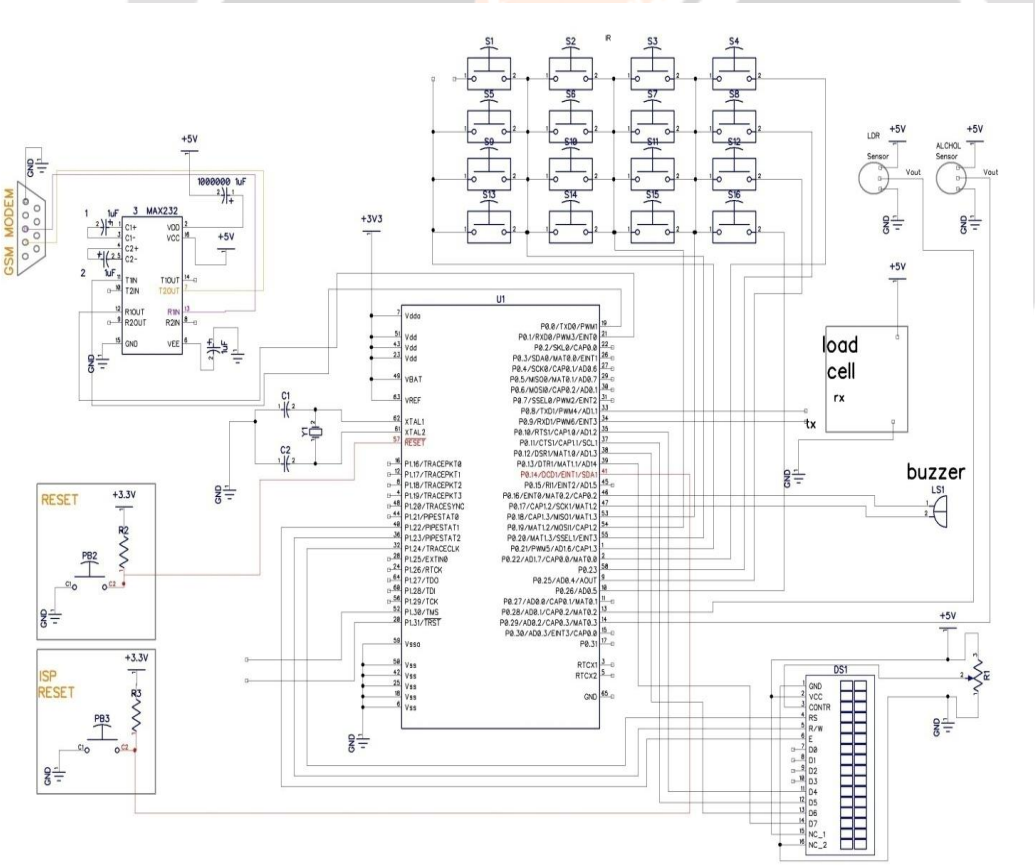

Fig - 2:detailed circuit design

5.1 Oscillator circuit:-

Any micro controller requires circuitry that generates the clock pulses by which all internal operations are synchronized. In LPC2148 two pins viz. pin no 13 & 14 (OSC1/CLKI & OSC2/CLKO) are provided for connecting a resonant network to form an oscillator.A quartz crystal is used with ceramic capacitors as shown in above circuit diagram. The crystal frequency is basic internal frequency of the microcontroller. The crystal that can be connected to the microcontroller is 32.768 KHz.

5.2 RESET Circuit:-

A Power-on Reset pulse is generated on-chip whenever VDD rises above a certain threshold. This allows the device to start in the initialized state when VDD is adequate for operation. To take advantage of the POR circuitry, tie the MCLR pin through a resistor (1 kΩ to 10 kΩ) to VDD. This will eliminate external RC components usually needed to create a Power-on Reset delay. A minimum rise rate for VDD is specified (parameter D004), for a slow rise time. When the device starts normal operation (i.e., exits the Reset condition), device operating parameters (voltage, frequency, temperature, etc.) must be met to ensure operation. If these conditions are not met, the device must be held in Reset until the operating conditions are met. POR events are captured by the POR bit (RCON<1>).

The state of the bit is set to '0' whenever a Power-on Reset occurs; it does not change for any other Reset event. POR is not reset to '1' by any hardware event. To capture multiple events, the user manually resets the bit to '1' in software following any Power-on Reset.

5.3 Power Supply Design:-

The +5 volt power supply is based on the commercial 7805 voltage regulator IC. This IC contains all the circuitry needed to accept any input voltage from 8 to 18 volts and produce a steady +5 volt output, accurate to within 5% (0.25 volt). It also contains current-limiting circuitry and thermal overload protection, so that the IC won't be damaged in case of excessive load current; it will reduce its output voltage instead.

The advantage of a bridge rectifier is you don't need a centre tap on the secondary of the transformer. A further but significant advantage is that the ripple frequency at the output is twice the line frequency (i.e. 50Hz) and makes filtering somewhat easier.

The use of capacitor c1,c2,c3 and c4 is to make signal ripple free. The two capacitor used before the regulator is to make ac signal ripple free and then later which we are using is for safety, if incase there is a ripple left after regulating, then c3 and c4 will remove it.

6. PCB DESIGN & LAYOUT/ARTWORK:

6.1 Introduction of PCB:-

PCB means printed circuit board PCB is one of the most important elements in any electronic system. They accomplish the interconnection the between component mounted on them in particular manner PCB consist of conductive circuit pattern which is applied to one or both sided of an insulating base copper is most widely used for conductor material. Aluminum nickel, silver, brass is used for same special application.

The thickness of conducting material depends upon the current carrying capacity of circuit. Thus a thicker conductor layer will have mare current carrying capacity once the PCB is manufactured the current carrying capacity is depends on which of conductor track.

6.2 Function of PCB:-

1 The printed circuit board usually serves there distinct functions are as follows:

- It provides mechanical support for the component mounted on it.
- It provides necessary electrical interconnections.
- It acts as a heat sink i.e. it provides a conduction path leading to removal of most of the heat generate in the circuit.

7 .APPLICATIONS:

1. Food processing industries.
2. At milk collection center.
3. In the dairy industry where user database is essential.
4. It can be used in instruments like milk tester, milkanalyser.

8. FUTURE SCOPE:-

As we have used simple RS-232 communication for interface, it takes up a lot of wiring to connect to the Main PC. This can be avoided by using any of the Wireless communication mediums like RF, Zigbee etc.

In future by adding the additional sensors & advance programming we can test other parameters of milk like Water, Urea etc. In future we can develop this system using PLC and touch screen .

9. CONCLUSIONS

We are designing a system that will save and conserve electricity by manually controlling the electronics appliances from a remote area. The main objective of this project is to preserve electricity. It meets the requirement of hotels hence designing of this system enables us to get better service and proper placement of the order making the staying experience a pleasure. We are used a keypad instead of regular switch boards for a sophisticated design. Though the keypad technology contains some limitations it's very user friendly, fast, accurate, easy for the novices & fun to operate. It has been widely accepted. And now by just modifying a little it can replace the mouse and key board completely in near future.

10. ACKNOWLEDGEMENT

This work is completed under the guidance of Prof. Dabhade R.G.. We express our gratitude towards them for their continuous support on this research. We would also like to thank the reviewers for their suggestions to improve this paper.

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