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Implementation of Standardized Digital Milk Quality Analyzer

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Abstract-In recent years the National Dairy Development Board, initiated cooperative movement has led to a substantial increase in milk production in India. This project focuses on the design and construction of an optimization milk analyzer digital system which is of low cost. An implemented system tests the milk quality based on the conductivity and density of the milk. This project describes one of the applications of embedded system milk tester. The device is small in size, compact, embedded in a single unit, and requires less power and measure milk parameters. On this basis, our proposal makes a twofold significant contribution. On the one hand, we aimed at designing a low cost device so it is used by a common man. On the other hand, in a fraction of seconds the milk quality is tested, analyzed and it is displayed. Thus, the implementation of the appropriate information technology described in this project is to make information symmetric in the market, thereby minimizing problems of adverse selection and tedious work.

Keywords: Milk analyzer; Density sensor;Embedded system;Conductivity sensor;

I.INTRODUCTION

Milk is a pale liquid, which is the primary source of nutrition for living beings. India is the world's leading milk producer and consumer. However, the country's dairy industry faces several hurdles in ensuring product quality and safety. The aim of this project is to develop new instrumentation methods and sensor systems for milk quality analysis to enable inspection and traceability of produce.

This system is very useful for the automatic & efficient analysis of the Milk Sample. Here the project is interfaced with the GLCD automatically collets all the data / parameters and displays it. Here there is a development of simple-to-use instrument to inspect and screen raw milk at the source, testing for multiple primary constituents notably fat and protein without significant sample preparation. In addition to indicating milk quality, this information can be used to help farmers manage their cattle's feed and health

It is a novel project in the field of automation which is proving the impact of electronics in each and every field. It helps to analyse the Milk samples for Milk Density, Conductivity etc. in laboratories and Milk Industries using electronic gadgets. This system is very useful for the automatic & efficient analysis of the Milk Sample. Here the project is interfaced with the computerautomatically collets all the data / parameters and stores them for future reference

II.EXISTING SYSTEM

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 tests are designed to ensure that milk products meet accepted standards for chemical composition and purity as well as levels of different micro-organisms.

Ultrasonic milk analyzers are in operation and they make accurate and reliable analysis of Cow, Sheep, Buffalo, UHT milk, Cream 45% and other milk liquid products. They measure milk parameters FAT, SNF, Density, Protein, Lactose, Added water, Milk sample temperature, Freezing point, Salts, and Total solids. External Printer with the capability to print out the results of the measurements; date and time; kilograms (when using electronic scale).

Disadvantages

- The one of the major disadvantage of this milk analyzer is the cost.
- Requirement of skilled personnel for its operation and data analysis
- Initial investment is more.

Fig 1. Digital device for milk analyzer.

III.MOTIVATION

Milk is essential for nourishment and sustenance of life. Adulteration of milk cheats the consumer and can pose serious risk to health in some cases. Adulteration in food is normally present in its most crude form, prohibited substances are either added or partly or wholly substituted. In India normally the contaminated/adulterated in food is doneeither for financial gain or due to carelessness and lack in proper hygienic condition of processing, storing, transportation and marketing. This ultimately results that the consumer is either cheated or often become victim of diseases. Such types of adulteration are quite common in developing countries or backward countries. However,

adequate precautions taken by the consumer at the time of purchase of such produce can make him alert to avoid procurement of such food. It is equally important for the consumer to know the common adulterants and their effect on health. The purpose of this project is to give the consumer an opportunity to detect a few common adulterants in milk. The manual compiles testing methodology for common adulterants to be tested at households.

IV. OBJECTIVES

The main objectives of the project are,

- To determine the presence of adulteration.
- To test the quality of the milk.
- To make the device Cost effective.

V. PROPOSED SYSTEM

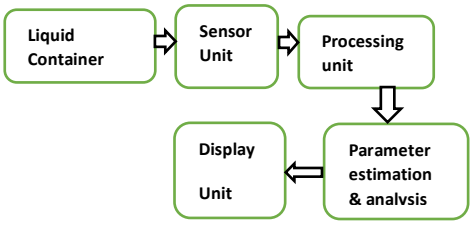


Fig2: The proposed System

A methodology of this model includes the design, planning, implementation and achievement of the project objectives. In this methodology, the project scope is a variable. Additionally, the time and the cost are constants for the project. Therefore, during the project execution, the project scope is adjusted in order to get the maximum beneficiaries.

By combining sensor systems together with enhanced processing techniques, the classification accuracy can be increased. In the proposed project work, it is planned to develop an electronic system that can be used for identification on undesired ingredients in liquids like milk. The system hardware and software will be designed and developed and an effort will be taken to identify the undesired material present in liquid.

VI. WORKING OF THE SYSTEM

The milk analysis is achieved using an ARM7 processor, GLCD, LDR and conductivity sensors. The working takes place in three stages,Firstly the milk kept in the container is analyzed with the help of two pairs of probes.one pair of probes are attached to an LDR which determines the amount of light allowed to pass through the liquid. The second pair of probes is used to detect the conductivity of the liquid.

Next these values obtained by the sensors are passed on to the microcontroller LPC2148 where they are converted into digital values with the help of A/Dconverter so that are by the readable by the microcontroller. Finally the microcontroller compares the Values collected by the sensors with the standard referencevalues set by the analyzer. And categorizes the milk into four different groups based on quality which are A B C D. The final information regarding the quality of milk is displayed with the help of GLCD.

Sensors are devices that are used to measure physical variables like temperature, pH, velocity, rotational rate, flow rate, pressure and many others. The sensors do not indicate a reading on an analog scale but rather, they produce a voltage that is indicative of the physical variable they measure. Those signals are imported into microcontroller stored in files and analyzed to death. These sensors have some sort of voltage output.

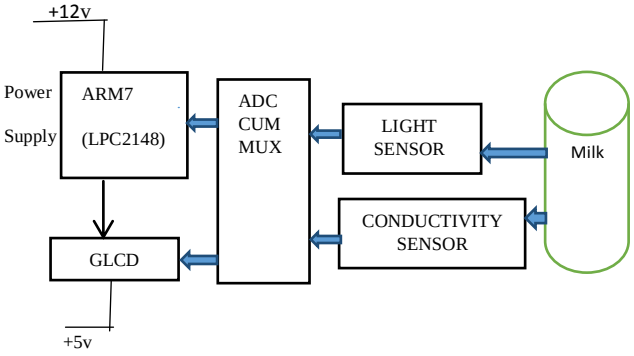


Fig 3 :Designing of the digital milk analyser device

Conductivity sensor is the ability of a material to conduct electric current. The principle by which instruments measure conductivity is simple-two plates are placed in the container and conductance is measured based on the current. Since the charge on ions in solution facilities the conductance of electric current, the conductivity of a solution is proportional to its ion concentration.

Density sensor continuously measures the density of the liquid in the container, providing a measure of even the smallest changes in product quality within the API density range. Fuel density reports can be displayed real-time on the controllers or exported to an external display. The density readings can be configured to either nominal values.

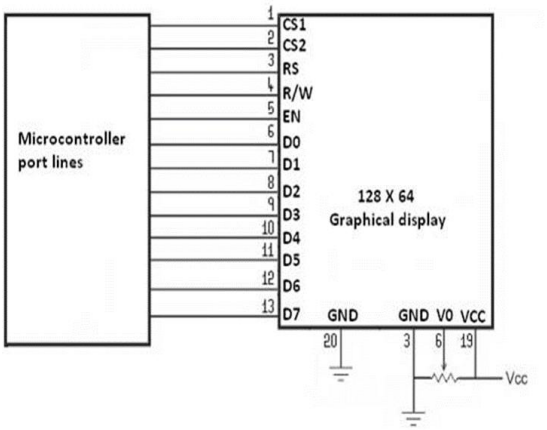


Fig 4: GLCD to Microcontroller Interfacing

The figure 3 shows the interfacing done between the microcontroller and the GLCD. This GLCD is being used to display the final result obtained after the analysis of the data collected by the sensors.

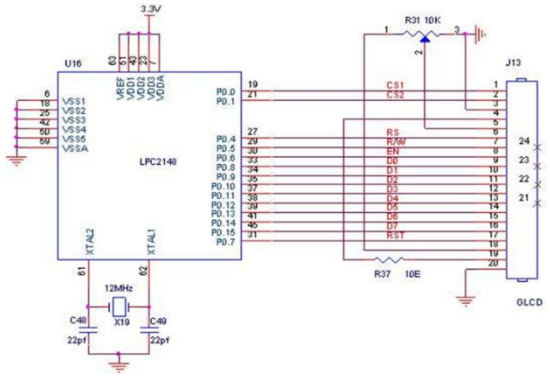


Fig 5: LPC2148 and GLCD interfacing

The 128X64 Graphical LCD interfaces to adjust contrast through trim pot. The GLCD needed to create 8-bit interface; 8 data bits (D0 – D7), three control lines, address bit (RS), read/write bit (R/W) and control signal (E), Page Select (CS).Display a text in LPC2148 Primer Board by using GLCD module. The ARM7 LPC2148 Primer board has numbers of GLCD connections, connected with I/O Port lines (P0.0, P0.1, P0.4 – P0.6 && P0.8 – P0.15) to make GLCD display. Some delay is occurring when a single command / data is executed. In C programs you cannot be sure of delay, because it depends on compiler how it optimizes the loops as soon as you make changes in the options the delay changes. The interfacing between the microcontrollers
LPC2148 and the GLCD that has been used in this project.

To compile the C code there is a need of the KEIL software. They must be properly set up and a project with correct settings must be created in order to compile the code. To compile the, the C file must be added to the project.

In Keil, in order to develop or debug the project without any hardware setup the main step is to compile the code for generating HEX file. In debugging Mode, you want to check the port output without microcontroller Primer Board. The Flash Magic software is used to download the hex file into your microcontroller through UART0.

TESTING THE GRAPHICAL LCD MODULE WITH LPC2148: Give +3.3V power supply to LPC2148 Primer Board; the Graphical LCD is connected with microcontroller LPC2148 Board. When the program is downloading into LPC2148 in Primer Board, the screen should show the image output. Check it with debugging mode in Keil.

ADVANTAGES OF THE SYSTEM

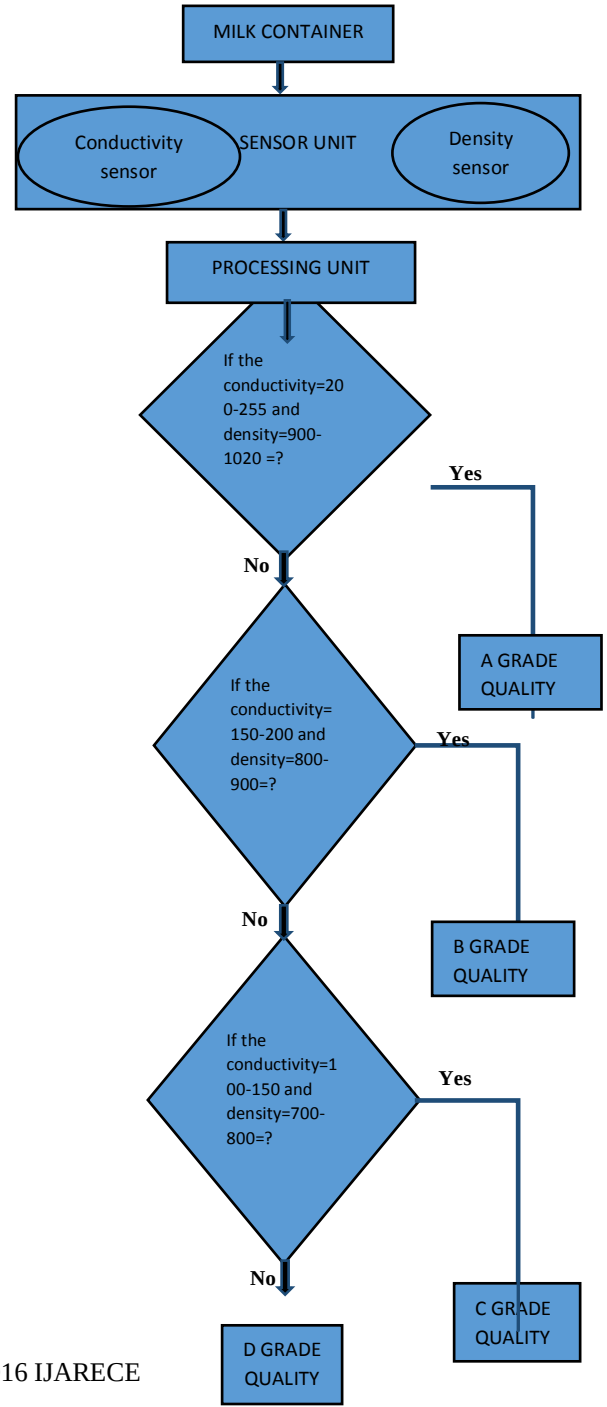
- For those with limited space this means that a smaller industries can use this digital device in the estimation of the constituents of milk.
- The power supply unit consumes less powers.
- Initial investment cost is less, hence this could be afforded by a common man and small starting up milk production industries.
- The analysis of the milk is done in fraction of seconds and tells the quality of milk in three types (i.e. best, good, bad) so that the quality of the milk can be decided easily.

DISADVANTAGES OF THE SYSTEM

- The maintenance and repairing of mechanical and electronic parts of the digital milk analyzer requires extra man power and of course extra investment.
- Once the sensors stop functioning, the detection of sensors damages is difficult.
- Since the display used in this model is GLCD, the calibrated information couldn't be used for future references.

APPLICATIONS OF DIGITAL MILK ANALYSER

- This devices are used in small and medium scale industries for analysis of quality of milk.
- Such devices can also be used in remote places, where an individual should be knowing about the quality of milk that he consumes in his daily life.
- Devices can be used in the laboratories to analyze Milk samples.
- Devices can be used in the Dairies to analyze Milk Quality.
- Used by Milk Traders for Computerized Milk Analysis



VII. RESULT

The concepts discussed in this paper were successfully Implemented and developed into a working model.The figure6 shows the final working model of the Project.

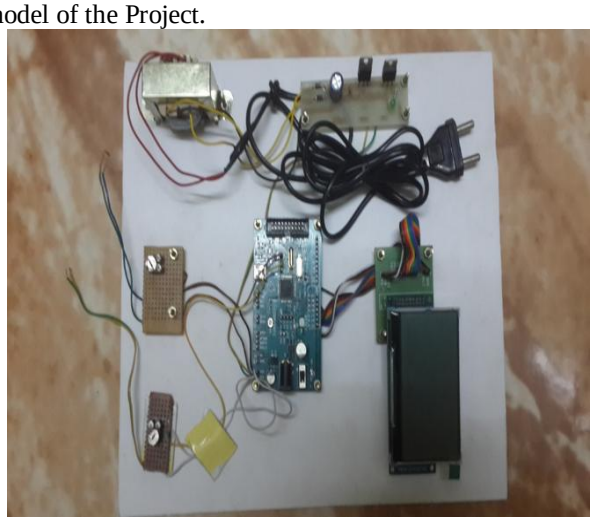


Fig 7: The final working model

The figure 7 shows the results obtained when the milk is tested and segregated on the basis of quality of milk.

Fig 8: The results obtained from the project

VIII. CONCLUSION

In this Project the milk analyzer is implemented based on ARM7 microcontroller. After examining the information obtained in the data analysis it can be said that the proposed system is a feasible method of analyzing milk. The controller circuit used to implement this system has been designed with the minimum number of components and has been integrated on to a PCB for simple assembly.

IX. FUTURE SCOPE

In future, this project can be implemented on large digital milk analyzers. It can make the system easier to use by implementing it, using a single microcontroller connected with a small module mounted using various sensors and then sending the information about the calibrations of constituents of the pale milk. And this system can be interfaced to PC and the calibrated values can be saved and can be used as referenced values. If the display unit is of PC then graphical representation of the constituents of milk can be calibrated in a graph, which makes the understanding easier. This will also result in designing a digital device which is of low cost and low power consumption, which are the main designing issues.

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