



International Journal of Innovative Research in Computer and Communication Engineering

(A High Impact Factor, Monthly, Peer Reviewed Journal)

Website: www.ijircce.com

Vol. 6, Issue 3, March 2018

Prototype Design and Development of Automated System for Detection of Milk Adulteration

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ABSTRACT: Milk adulteration has become a societal problem. It exists both in the developing as well as developed nations. Utilization of adulterated milk effected on human health as well as food industry. Many papers and journals are publicized on the topic of milk adulteration detection techniques. This project tries to explain a different perspective for milk adulteration. It is used to make prototype which gives different detection techniques for individual adulterant, automation of the entire process and complete study are carried out on that basis. The project gives the automatic method for the process of finding milk adulteration for sugar, urea, salt and soda.

KEYWORDS: : Arduino, Color Sensor, Solenoid Valve.

I. INTRODUCTION

We all know that for human health the milk is very essential factor. That adulterated milk is a source for serious health problems, So our project is about the automation of milk adulteration process to detect soda, salt, sugar and urea in the milk. The automation of process help to find the adulteration of the milk in a less time. It helps to remove human dependency and also helpful to reduce the manpower.

In this system we are carrying out four tests, i.e. soda, urea, sugar and salt test. From these tests we are getting information of milk adulteration. For a particular use of soda or sugar or salt or urea and also combined use of all components. In the project we are planning to use Arduino, color sensor and solenoid valve.

Literature Survey:

Siuli Das, Bhaswati Goswami and Karabi Biswas in this paper[2]milk adultration detection techniques are given. This paper tries to review from a different point of view. First it identifies different milk adulterants, methodologies adopted to adulterate the milk and the health hazards related to the adulteration. Then it provides different detection techniques for individual adulterant and a comprehensive study have been carried out on the detection technology by electrical means.

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Aditya dave, dishant Banwari,satyam srivastva in this paper[3] “Optical sensing system for detecting water adulteration in milk” optical sensor method is used to detect the water in the milk.

Intended beneficiaries:

The implementation of this project is very beneficial to the milk industries. Since the maximum amount of the milk is wasted due to adulteration. By this project the milk industries will be able to detect adulteration in milk, automation of entire process, human independency and time saving. Therefore, the similar setup can be established for the industries of type are stated below.

II. METHODOLOGY

The techniques for detection of milk adulteration are given below:-

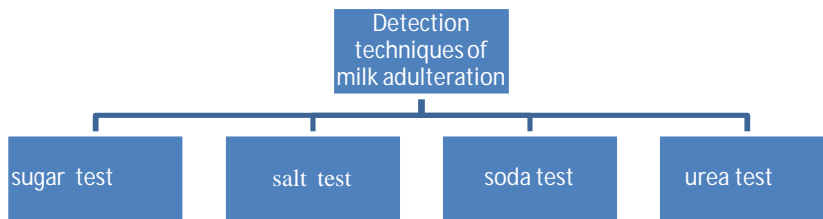


Fig 1: techniques of detection of milk adulteration

STEP NO.	SODA	SUGAR	UREA	SALT
1	4ml Sample	5ml Sample	5ml Sample	1ml sample
2	Add 4ml soda A chemical	Add 5ml Sugar reagent	Add 5ml urea reagent	Add 4ml soda A chemical
3	Add 4 drops of soda B chemical	-----	-----	Add 4 drops of soda B reagent
4	Mix Well	Boil (80 ⁰ C-100 ⁰ C)	Mix Well	Mix Well
5	Pinkish red color indicates presence of Starch	Red color indicates presence of Sugar	A dark pink color indicates presence of Urea	Brick red color indicates presence of Salt[8]
6	White color indicates no adulteration[1]	White color indicates no adulteration	yellow color indicates no adulteration[5]	yellow color indicates no adulteration

Table 1: ISO Standard chart for milk adulteration test.

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III. RELATED WORK

As shown in the below fig. we have taken milk in the milk sample box. Then this milk sample is distributed in the four beakers as per requirement and chemicals are added in the milk as per requirement through solenoid valve controlling by the Arduino mega2560. The reaction takes place in the beaker. At the end of all these tests, if the color of milk is changed which is given in chart then result is positive i.e. adulterant is present in milk otherwise there is no adulteration in milk.



Fig.2. Hardware setup

Hardware component:

It consist of

1. Microcontroller
2. Solenoid valve
3. Color sensor
4. Relay driver circuit
5. Power supply

1. Microcontroller:

The switching action of solenoid valve is controlled by microcontroller. In this project ARDUINO MEGA2560 is used as a microcontroller. The microcontroller controls the overall system.

2. Solenoid valve:

A solenoid is an electromechanically operated valve. The valve is controlled by an electric current through a solenoid, by using two ports solenoid valve the flow is switched on or off. A solenoid valve is mostly used for flow control. The output quantity of milk & chemicals are depends on opening and closing action of solenoid valve.

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3. color sensor:

The color of milk is detected by using color sensor. In this project we are using TCS3200 color sensor.

4. Relay Driver Circuit:

The relays are used to handle the large power with the help of less power. Here the relays are used to handle the power of valve through the microcontroller. The output of arduino is not sufficient to drive the further circuit. Hence driver circuit is used to convert the output of microcontroller in to standard form so that it can drive the relay.

5. Power supply:

The designed power supply provides 5V supply for microcontroller and 24v supply for solenoid valve. Here the regulated power supply is required so the IC lm7805 is used for the 5v supply and IC lm7824 is used for the 24v supply.

Block Diagram:-

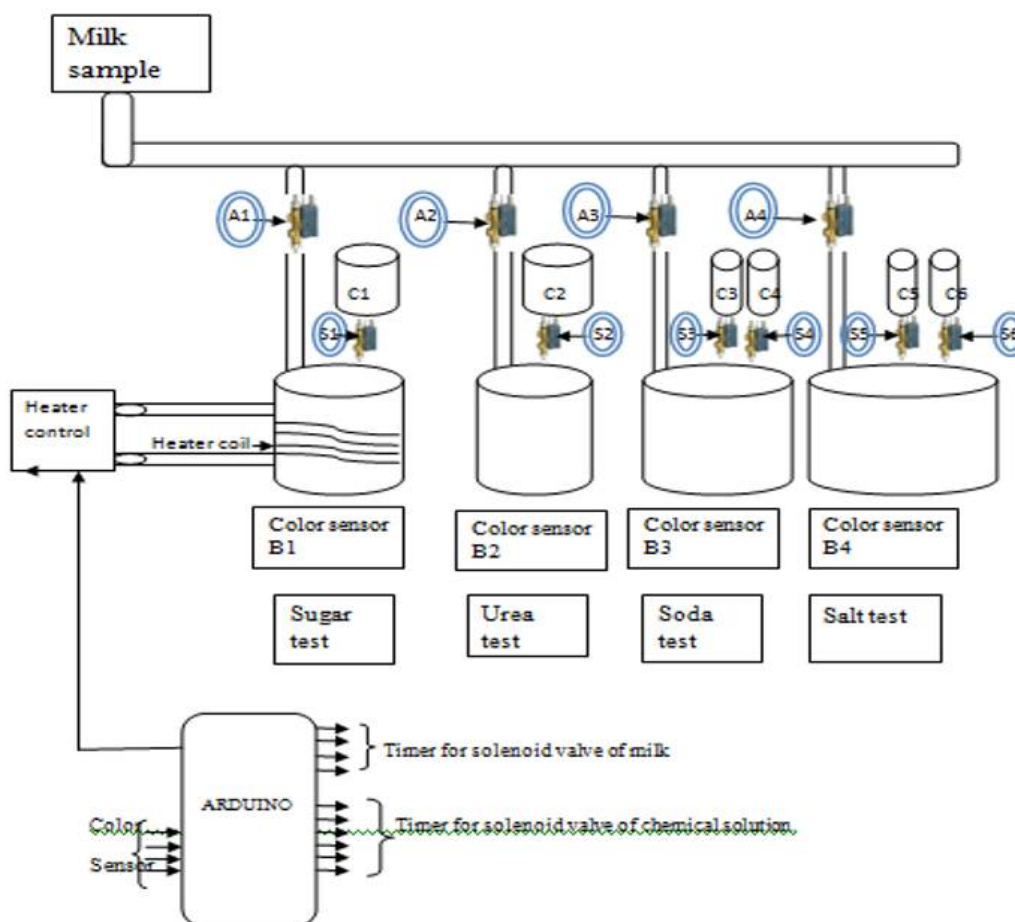


Fig.3 Block diagram of automation process of milk adulteration



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IV. RESULTS

In this project there are certain chemical tests to be performed. So accordingly we have tested the textile and we got guidance and the results related to this is as mentioned below in the table

Tests	Milk sample	Time required for milk sample	Chemical Sample	Time required for chemical	Color of Adulterated milk	Color Range		
						Red	Green	Blue
Urea test	2 ml	1000msec	2ml	800msec	Dark yellow	185- 215	225-260	180-205
Salt test	1 ml	500msec	5 ml	2000msec	Yellow	170-190	216-240	180-200
			4 drops	200msec				
Sugar test	4 ml	2000msec	4ml	1700msec	Red	205-220	265-280	199-215
Soda test	5 ml	2500msec	5 ml	2000msec	Pinkish red	145-160	180-195	135-150
			4 drops	200msec				

Table 1: Result of chemical tests

Sugar Test:

Generally in the milk sugar is added to increase the lactometer reading of milk.

Take 4ml milk in test tube. Time required for 4ml sample milk is 2000msec and boil it then add 4ml sugar reagent chemical. Time required for 4ml chemical sample is 1700msec. If we get red color then sugar is present and milk is adulterated. If color is remain white then sugar is not present in the milk.[2]

Salt Test:

Generally in the milk salt is added to increase the lactometer reading of milk.

Take 1ml milk in test tube. Time required for 1ml sample milk is 500msec add 4ml salt reagent A chemical and few drops of salt reagent B chemical. Time required for 5ml chemical sample is 2000msec and for 4 drops chemical sample is 200msec. If we get yellow color then salt is present and milk is adulterated. If the color is yellow then salt is not present in the milk.[2]

Urea Test:

Urea is generally added in the milk to raise the SNF value.

Take 1ml milk in test tube. Time required for 2ml sample milk is 1000msec then add 2ml urea reagent chemical. Time required for 2ml chemical sample is 800msec. If we get dark yellow color then urea is present and milk is adulterated. If color orange then urea is not present in the milk.[2]

Soda Test:

Take 5ml milk in test tube. Time required for 5ml sample mil is 2500msec then add 5ml soda reagent A and 4 drops of soda reagent B. The time required for 5ml chemical sample is 2000msec and for 4 drops chemical sample is 200msec. If we get pinkish red color, then soda is present and milk is adulterated. If color is not changing then soda is not present. [2]



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V. CONCLUSION

- All these four testing processes are run simultaneously.
- The atomized system is time saving.
- Accuracy is maintained.
- The system is cost efficient, the total cost is Rs 8000/- only. So the small scale dairy can be easily purchased.
- Installation and Operation of the system is very easy. So they can handle very easily.

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