IMPLEMENTATION OF IOT BASED MILK QUALITY ANALYZER USING AVR MICROCONTROLLER

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ABSTRACT: The milk is the important nutrition for human being. The good quality milk should be free from the adulterants. Milk is mostly sold by local vendors as well as by super markets. However, in local areas to increase the quantity of milk certain adulterants are added which may affect the nutritional quality of milk. Milk adulteration is a social problem. The problem of adulteration is faced by both Indian and foreign countries .Utilization of adulterated milk causes severe health problems and a great concern to the food industry. The Country milk producers and consumers facing problem to find the quality of milk, accept the fair of price and consumption. So it is necessary to ensure the quality of milk by measuring the vital parameters present in the milk and the adulterants that are added to the milk. Here we are measuring the different parameters of milk such as pH, turbidity, conductivity, odor, temperature using sensors. Also with the help of IOT (Internet of Things) process the milk industry should be able to send the real time reading information of milk to the government so that it helps to overcome the illegal things such as milk quality during the production of milk packet .This proposed system is implemented using Atmega 328 microcontroller. All the sensors are combined to form compact and flexible system which analyze and classify the quality of milk into different grades and finally output displayed on LCD screen. Problem faced in small diaries and by the individuals can be prevented by detecting the quality of milk, and also prevent from causing the hazardous diseases by detecting the adulteration of milk.

Keywords: AVR microcontroller, IOT, sensors, adulteration in milk.

I. INTRODUCTION

Milk is the primary source of the nutrition for young mammals before they able to digest other types of food. In India milk production gives comparatively higher profit to both farmers and dairy farms. Throughout the world, more than 11 billion consumers of milk and milk products are there and 70% of child deaths every year are attributed to malnutrition. Thus milk is a major food for the infants. Now a day the milk adulteration is mostly detected using various tests.The quality and immunity of raw milk is essential for the dairy products. The nutritional value of milk to human health needs no introduction; it also has traditional impact on Indian society. At the same time it is alarming that many vendors adulterating it with water, detergents, caustic soda, sodium carbonate which has harmful effect on the human health especially small kids.

Moreover, keeping the milk for the storage purpose for long duration there is the rapid multiplication of bacteria. We know that, in order to make good dairy products, good quality of raw materials is needful. A milk seller and consumer will be assured of the quality of raw milk if certain basic quality tests are carried out at various stages.

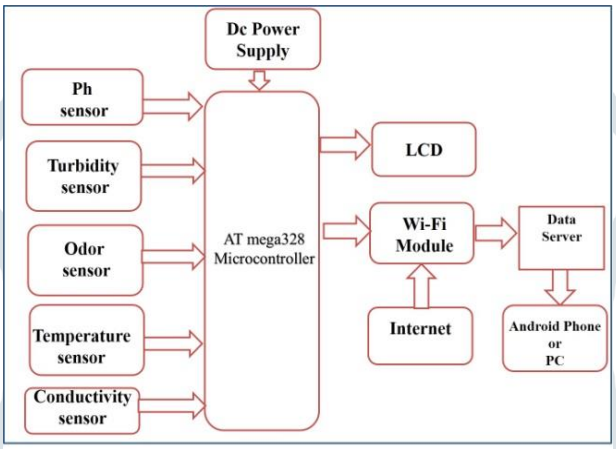
As milk infection is a growing cause for human illness and death, there is a continually increasing demand to maintain the safe milk supply. There is a need to analyze the quality of milk from getting illness especially for the small kids. So we have proposed this topic to detect the adulteration and to check the quality of milk. In this project it is going to analyze the quality of milk by detecting adulterants that are added. This project mainly has different parameters to be measured such as pH, odor, temperature, conductivity, turbidity.

II. PROBLEM DEFINITION

Today, there are three major problems namely Food Safety, Human Safety and Water Safety. In that we choose Food Safety. Now a day, milk is major food which is mostly consumed by the infants. By taking survey about milk quality, we came to know that the vendors are adulterating the milk and because of that society did not consume good quality of milk. So we have decided to do project for providing good quality milk by Milk Quality analyzer. Everyone in the society need to know the quality of milk which they are consuming it. In India, milk is sold and consumed all over the world. However; dairy industries faces several challenges and obstacles in terms of food quality and safety. This project aims to develop a device for milk quality analysis. Milk quality analyzer is use to approve the tests of milk and to ensure that the standards concerning the milk and milk products. The tests are designed in such a way which tells whether it meets the standards for the milk products or not.

III. SYSTEM DESIGN

BLOCK DIAGRAM



The block diagram of IOT based milk quality analyzer using AVR microcontroller is shown in the above figure. In this implemented system, milk adulteration is detected with the help of pH, turbidity, odor, temperature, conductivity sensors. To make the system IOT based there is an use of Wi-Fi module. Hence, it is possible to interface the system with android phone or PC. Consider different samples of milk which includes fresh milk which is processed as per the standards and milk which is contaminated by toxicity, which also includes milk which is preserved for long hours. Now the samples are accordingly monitored one after the other. In general, the test will be performed with reference to standard parameter values according to which any abnormalities found in the samples will be determining its quality. As specified earlier about the five modules involved, the working method of those is as follows:

(a) pH sensor: Every liquid has its own pH value according to temperature and other dependent parameters. So the standard fresh milk has pH of range 6.5-6.7, above and below this range is totally considered as abnormalities in its quality. Here it monitors the pH and provides a visual alert via LCD, which displays the pH level and indicates whether the tested milk is normal or abnormal, in simple words good quality or bad quality.

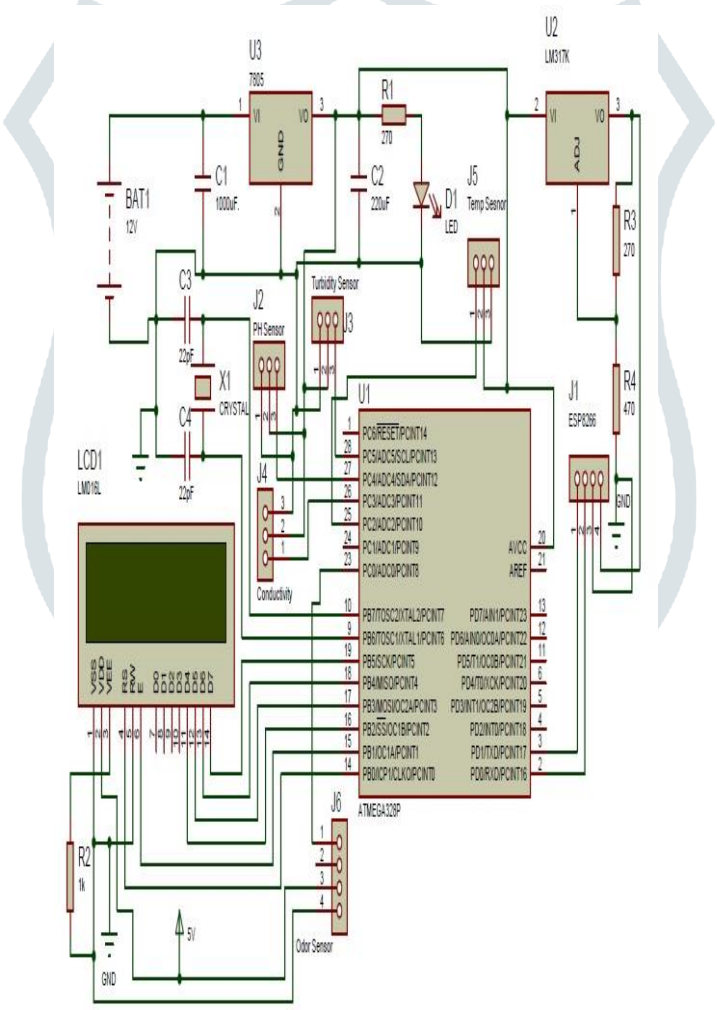
(b) Temperature sensor: Milk has its own temperature criteria which should be maintained during storage, even if the milk is mixed with water or with any toxic materials the temperature of the milk will not be in the normal range. Generally milk will be safe at the standard temperature range above or below which the formation of bacteria occurs and thus not fit for consumption. The survey will be carried out on safe temperature zone according to which the LCD will display the quality of milk.

(c) Odor sensor: The concentration of odor will vary from fresh milk to toxic milk. When the toxicity in milk is high it tends to release toxic gases which come out as bad odor from the milk when milk is preserved for a very long time or due to external contamination. So we detect the gases releasing out from sample which are nothing but bad odor in general. After any such detection of gases the quality of milk will be displayed on LCD.

(d) Conductivity Sensor: Conductivity (or Electrolytic Conductivity) is defined as the ability of a substance to conduct electrical current. It is the reciprocal of the resistance. Added water, sugar, proteins, insoluble solids then Decrease the ion's concentration. Milk conductivity decreases.

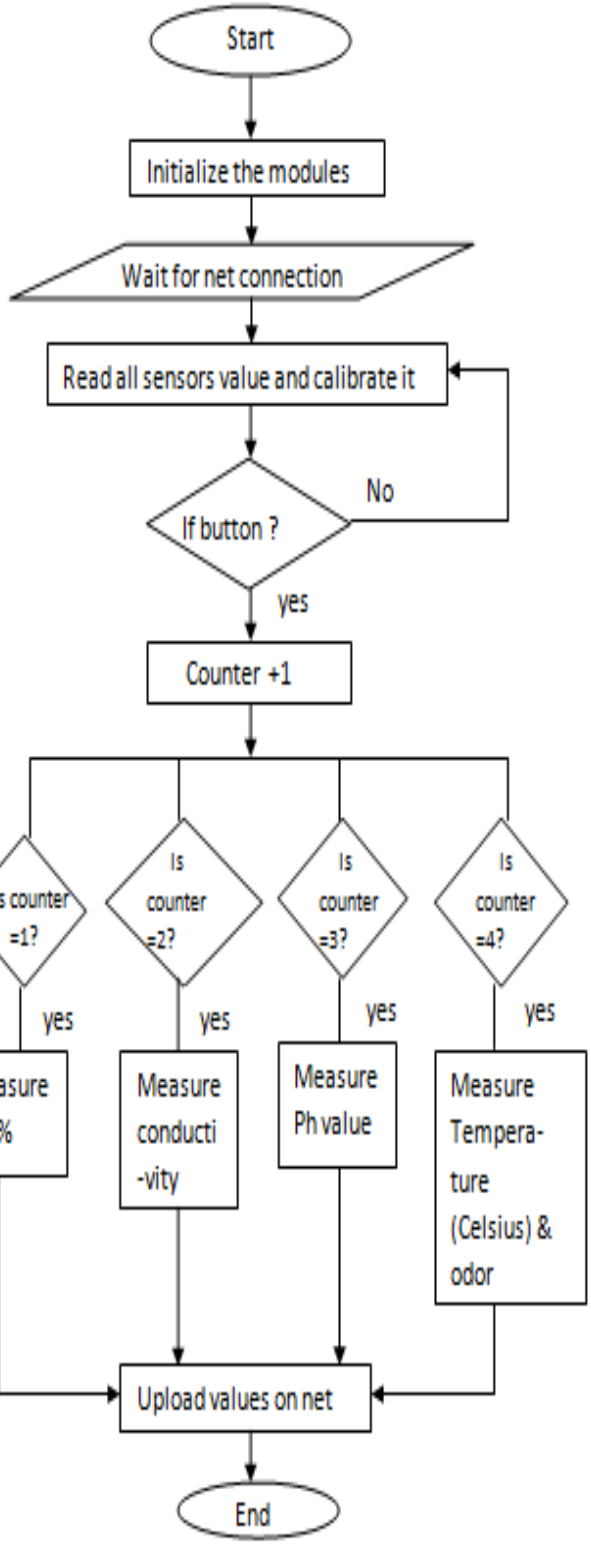
(e) Turbidity sensor: Turbidity is the phenomenon where by a specific portion of a light beam passing through a liquid medium is deflected from undissolved particles. After any such detection of impurity, the quality of milk will be displayed on LCD.

IV. CIRCUIT DIAGRAM



Above figure shows circuit diagram of IOT based milk quality analyzer using AVR microcontroller. It consists of some major blocks such as power supply, microcontroller ATMEGA 328 which is used as a heart of system, various sensors such as pH sensor, turbidity sensor, temperature sensor, odor sensor, conductivity sensor, IC's, resistors, capacitors, potentiometer. All the sensors are connected to port C of microcontroller while the data pins of LCD modules are connected to port B of microcontroller. pH sensor sense the ph value of the milk, turbidity sensor measures the fat present in the milk, temperature sensor the temperature of the milk which is necessary for storage purpose, odor sensor sense the toxic chemicals added or adulterated in the milk, conductivity sensor measures the conductivity level of the milk. All the sensors operates on 5 volt DC supply. All the sensors have three pins i.e. VCC, output and ground and is connected to the pins of microcontroller and the output is displayed on the LCD screen.

V. FLOW CHART


Start
Initialize the modules
Wait for net connection
Read all sensors value and calibrate it
If button ?
No
yes
Counter +1
Is counter =1?
Is counter =2?
Is counter =3?
Is counter =4?
yes
yes
yes
yes
Measure fat %
Measure conducti -vity
Measure Ph value
Measure Tempera- ture (Celsius) & odor
Upload values on net
End

Switch on the power supply. Connect wiFi module with the internet. Press push to on button if no then wait for the net connection and if yes add one in counter. If counter is one then it will measure the fat present in milk. If counter is 2 then it will measure conductivity. If counter is 3 then it will measure pH value. If counter is 4 then it will measure temperature and odor value. Counter value will increment by pressing push to on button. According to the loop, the values related to each sensor will be displayed in the lcd screen also on and android application.

Android Application used:

Blynk application

Blynk is a new platform that allows you to quickly build interfaces for controlling and monitoring your hardware projects from your iOS and Android device. After downloading the Blynk app, you can create a project dashboard and arrange buttons, sliders, graphs, and other widgets onto the screen. Using the widgets, you can turn pins on and off or display data from sensors. Whatever your project is, there are likely hundreds of tutorials that make the hardware part pretty easy, but building the software interface is still difficult.

With Blynk, though, the software side is even easier than the hardware. Blynk is perfect for interfacing with simple projects like monitoring the temperature of your fish tank or turning lights on and off remotely. Currently, Blynk supports most Arduino boards, Raspberry Pi models, the ESP8266, Particle Core, and a handful of other common microcontrollers and single-board computers, and more are being added over time. Arduino Wi-Fi and Ethernet shields are supported, though you can also control devices plugged into a computer's USB port as well.

VI. i) ADVANTAGES

- When the milk is adulterated with the sugar and water in exact proportions the lactometer test fails, such case this project can be used.
- Similarly the soap or salt added with the water in exact proportions the lactometer test fails, even in such situations this model can be used.
- Ease of handling.
- Output will be obtained within less response time.
- Low maintenance cost.

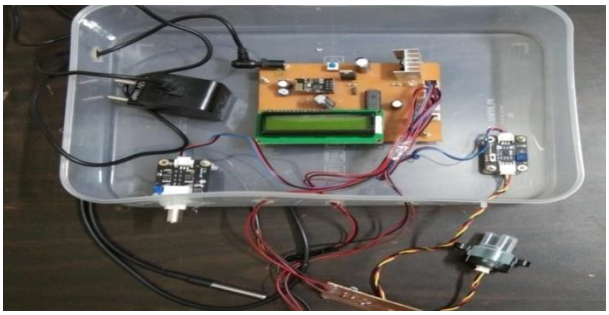
ii) DISADVANTAGES

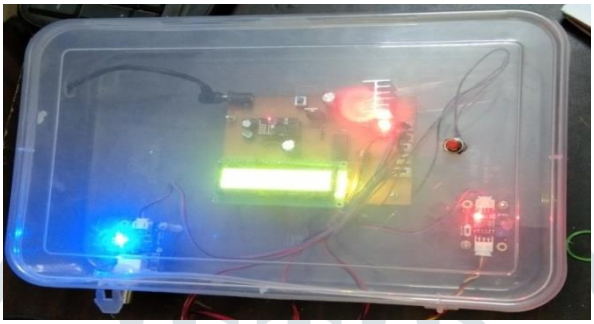
- It is not universal that is, it can be used only for the detection of milk quality.
- Calibration is required for at least every 50 tests.
- Depends on requirements of accuracy cost of the sensors will be varied.

iii) APPLICATIONS

- The project proposed is beneficial to the society by giving measure to reduce the adulteration practice in milk.
- This device is used in small diaries for the quality analysis of milk.
- It provides quality assurance for farmers and consumers.
- It can also be used by the normal people, where an individual should know about the
- Quality of milk that he consumes in his daily life.
- It can be used by Milk Traders for Computerized Milk Analysis.

VII. RESULT






Density =95.214
M-Ok Fat 4-5 %
Conduction=0.782
C Grade Milk
pH Of Milk = 8.9
Alkaline Milk
T Of Milk=30 *C
Od Taste=9 %


Milk Quality Test
PH OF MILK
0.060pH
TEMPERATURE
TURBIDITY
31
23.211
CONDUCTIVITY
0.000
ODOUR
8

Observation Table:

Samples	Turbidity	Fat	Conductivity	pH	Temperature	Odor
Pure milk	96.126	4-5%	0.957(A grade)	5.6(Normal)	29 °C	8%
Water+milk	84.986	0.5-2%	1.065(A grade)	5.1(Normal)	28°C	8%
Milk+soap	96.354	4-5%	0.791(C grade)	8.9(Alkaline)	30°C	9%
Milk+salt	95.214	4-5%	1.568(A grade)	4.8(Acidic)	29°C	10%

VIII. CONCLUSION

This proposed system is implemented using Atmega328 microcontroller. All the sensors are combined to form compact and flexible system which analyze and classify the quality of milk into different grades and finally output displayed on LCD screen and on an application. Problem faced in small diaries and by the individuals can be prevented by detecting the quality of milk, and also prevent from causing the hazardous diseases by detecting the adulteration of milk. This system is portable, easy to use and handle.

IX. FUTURE SCOPE

- Daily updating of payment and milk parameters to customer through GSM can be done.
- By using automatic system for CLR measurement, we can reduce the time to measure milk quantity.
- By interfacing milk system with compact thermal printer, we can get billing receipt on the spot

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