

# Comprehensive Assessment of Various Milk Parameters Using Embedded And Iot Based Systems

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**Abstract-** This review paper is mainly focuson the analysis of milk parameters and microbial activity using Sensors and related methods for implementing automated systems. In India the dairy farming is main business of Indian farmers. In dairy Industries, the milk quality is important concern and it is being tested at various collection centres as well as in large dairy industries. The collection centers and dairy industries are located in rural as well as urban areas.

In Milk, mixing of any adulteration causes serious injuries to human health. So such adulterated milk should be rejected so that good quality of milk could be supplied. The payment of dairy farmer is dependent on milk quality factors like FAT, CLR, SNF etc. The collected milk from dairy societies is send to large dairy industry for further production purpose.

This process is being monitored continuously step by step at various stage in dairy industries and quality of milk is tested. In this paper various test setups are suggested for testing milk quality and adulteration level and their comparative analysis is done .

**Keywords-** Automated system, dairy industries, sensor

## I. INTRODUCTION

Now a days the dairy industries collect a raw milk from farmer the analysis of raw milk is essential for production and human health purpose. The Raw Milk Parameter analysis and adulteration is detected using chemical test. The Quality and Quantity are most important factors in Raw Milk. In Milk the adulteration is more harmful substance for child and pregnant women.

Using the base of electronic instrument not only the testing of quality and quantity of milk but also detecting adulteration testing is also essential [1][2]. It is done using sensors and optofludic micro viscometer and also analyses undesired substance in milk [3][8]. The temperature and protein is also essential and tested using the method suggested in [10].

To reduce time of milk collection and fasten the work, system is suggested using ultrasound wave in [6]. Thus the microcontroller and microcomputer embedded base allows things to take decisions, invoke actions and provide amazing services, accuracy and calculate financial statement to reduce human being intervention. Milk is a perishable substance and either, it is normally operate in local person

So there is an essential for real time analysis system which monitors the parameter of the milk continuously. The many old systems analyses only detects milk parameters or microbial content. This system helps in fast identification of hazardous substances in milk to maintain a quality of milk and accuracy.

## Techniques for various system Detection of Milk Parameter and adulteration in Milk and related methods.

**1. IOT Based Milk Monitoring System for Detection of Milk Adulteration:** -Dr. G. Rajkumar et.al [1] proposed method for analyzing quality and quantity of raw milk and also analyses grouping of gases in crude milk using IOT base. In this system, level of milk is measured by milk level sensor. Microbial activity is measure by gas sensor, temperature is measure by temperature sensor, fat or viscosity is measure by viscosity sensor and the adulteration of milk is measure by salt sensor.

Customer details are estimated using RFID reader. The outcome of this system was detected milk parameter and microbial activity. The system detects data at primary level.

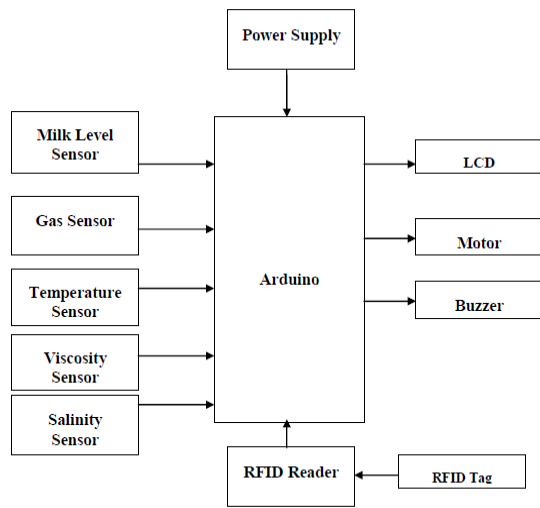


Fig.1 Proposed IOT base System<sup>[1]</sup>

**2. Rapid and Automated Measurement of Milk Adulteration Using a 3D Printed Optofluidic Microviscometer (OMV):-**

Pedinti Sankaran, et al [3] was the proposed to the technique of the Optofluidic Microviscometer is base on Stereolithography 3D technique. The working principle is on the steady state relation between its density and channel width which is obtained from the liquid flowing of two eternal fluids inner side of channel and strength between the inlets and the outlet.

This can analyses the viscosity of milk using the Principle based on Hagen–Poiseuille flow equation. The detection of adulteration in milk analysis is the complex one.

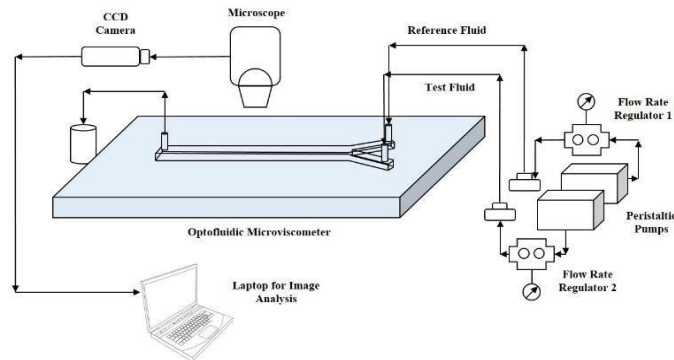


Fig.2 Experimental setup 3D printed Optofluidic Microviscometer<sup>[3]</sup>

**3. Rapid Ultrasonic Milk Analyser :-**

Aba Priev et. al [6] was proposed this method in which milk analysis using ultrasonic sensor is based on ultrasonic sound wave Principle. The ultrasonic sensor is radially oscillating in Piezoceramic tubes. In ultrasonic sensors, cylindrical standing waves of high intensity is the separation of fat globules and acoustics radiation of low intensity is SNF and other component. This

ultrasonic chamber is just a horizontal tube along with piezotube.

This Piezotube is radially polarized resonator. This Ultrasonic principle is base upon high intensity wave for separation of FAT globules. This system is in hand held portable device. In Ultrasonic Milk analyzer the first seconds sample is pumped from the sample holder into the ultrasonic chamber. Then is heated to uniform temperature. Ultrasonic pulses are transmitted through the sample in the ultrasonic chamber. After at about 90, 60, 30 seconds (in dependence of the model) after processing the measured speed and absorption of the ultrasound, processed by the microprocessor testing results are visualized on the display. The outcome is the analysis of different milk parameters using cylindrical waves

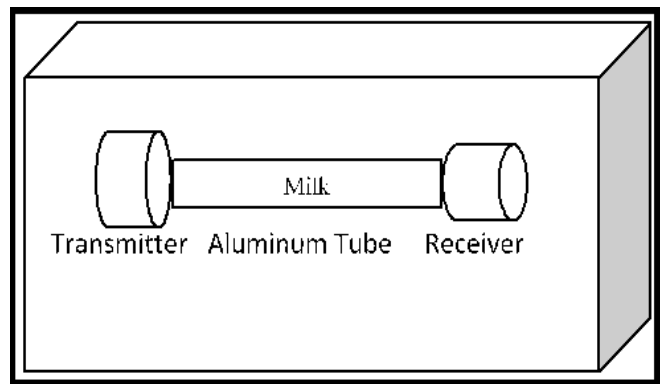


Fig.3 Experimental Setup including Milk Container<sup>[6]</sup>

**4. Digital Milk Quality Analyzer:-**

Anjali.R.Malali et al.[8] has found Ingredients in Milk using ARM7 LPC 2148 processor, GLCD, LDR and conductivity sensors. In this system, milk parameters are identified on undesired ingredients. Analysis of milk parameters and classification is done using conductivity and density of milk. The working principle is in below listed steps.

Firstly the milk is kept in the container and determines density of milk with the help of two pairs of probes. One pair of probes is connected to LDR. The second probes connected to conductivity sensor and detects the conductivity of the liquid and displayed it on LCD.

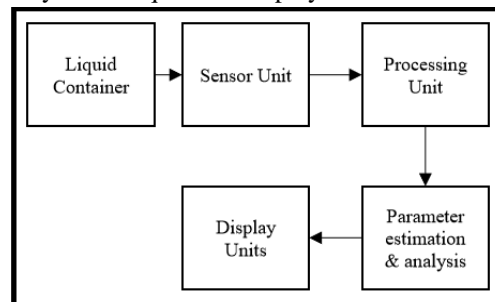


Fig.4 Proposed System<sup>[8]</sup>

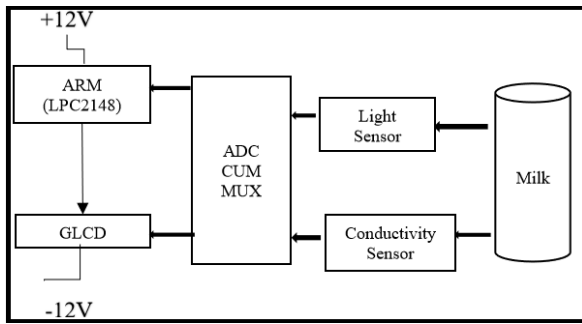


Fig.5 Designing of Digital Milk Analyser<sup>[8]</sup>

**5. Measurement of Fat contents using IOT Techniques:-**

Mahesh C Waghmare et. al [9] has proposed in this system the parameters of milk are found using optical Sensor and IOT techniques. The Optical Sensor is based on the principle of photometric where light is scattered by milk sample and analyses the milk parameter. Tested readings are sent over internet with the help of IOT. Thus the quality of milk is tested. Such systems are implemented for the analysis of milk quality which detects microbial contents.

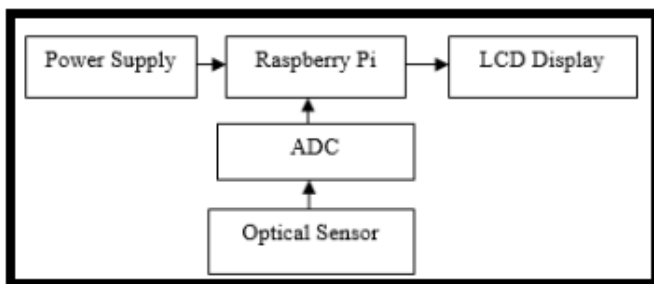


Fig.6 block diagram of Milk analyzer<sup>[9]</sup>

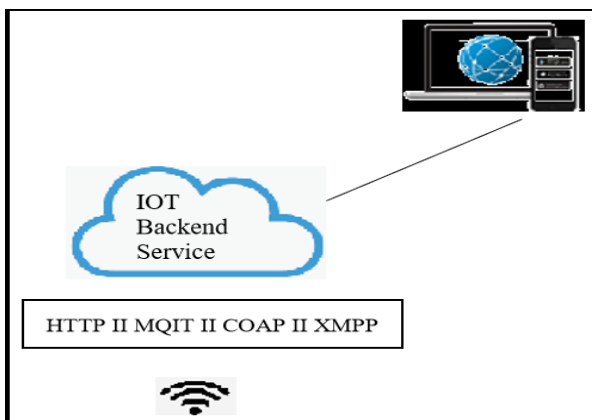


Fig.7. Proposed Framework<sup>[9]</sup>

**6. Milk Quality Tester: -** SPriya et al. [10] have discussed Milk parameters are the measurement of Temperature, PH and protein contents in the milk. In Raw milk, density of milk is dependent on temperature.

**PH Sensor: -**This sensor is used to measure PH of Milk or quality of milk.

**Temperature Sensor:-**This sensor measures temperature of milk i.e. milk is identified hot or cold using this sensors

**Nitrogen Sensor: -**This sensor identifies protein contents in milk. The protein contents is essential in milk.

These sensors are interfaced with the Microcontroller. The Bluetooth device is used to send report to the Mobile.

The Milk architecture is as below

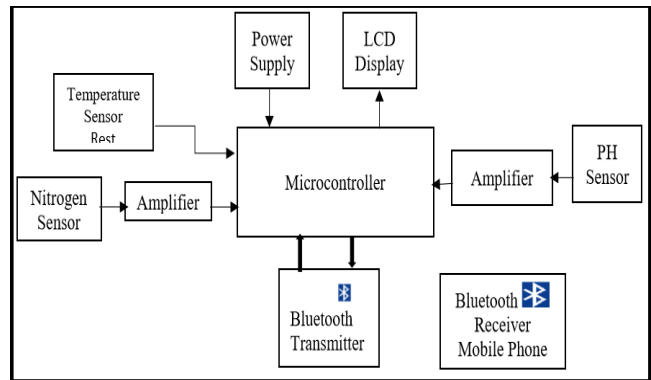


Fig.8 Proposed Block diagram of Milk Quality Tester<sup>[10]</sup>

**7. Milk quality analysis based on Novel Ultrasound Spectroscopy Method: -**

Emanuele Viviani et al. [11] have discussed Milk parameter are tested using ultrasound. The Ultrasound Spectroscopy method is based on broadband random multi sine signal techniques. At different frequencies, the system consists of analysis of sound impedance using ultrasonic spectroscopy.

The outcome of this system is the analysis of milk concentration and analysis of different types of milk using ultrasound wave attenuation

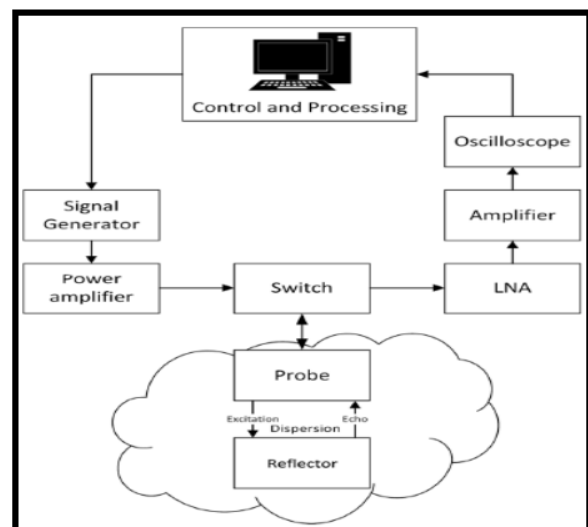


Fig.9 Proposed experimental System<sup>[11]</sup>

**8.Ultrasonic Sensing System for detecting water adulteration in Milk** :- Aditya Dave et. al[18] have analyze the Fat contents and adulteration of water in Raw milk using attenuation coefficient and time of flight. The attenuation and time of flight is measure using ultrasonic sensor, embedded system and it’s circuitry.

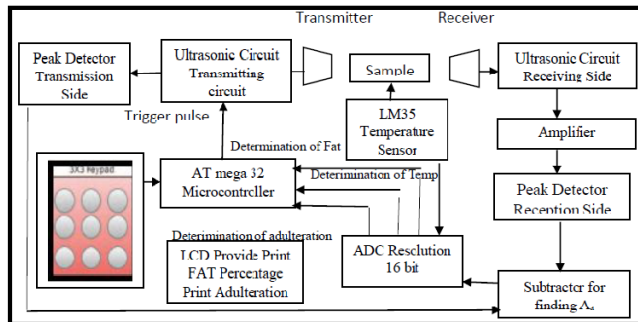


Fig 10 Components of the Embedded System circuitry [18]

**Comparison Table:**

Milk analysis Method	
IOT base Milk monitoring system for detection of milk adulteration	Detection in Microbial activity using gas sensor. Database is not Maintain
Rapid and Automated Measurement of Milk Adulteration	Detection of Adulteration in Milkbut system is in complex
Rapid Ultrasonic Milk analyser	Ultrasound Wave of cylindrical standing wave separation of fat gloubles
Digital Milk Quality analyser	Milk analysis of Conductivity and Density using LDR and Sensor
Measurement of Fat contents Using IOT	Fat contents using Photometric base
Milk quality tester	Milk PH measured by PH sensor
Milk quality Analysis using Novel Ultrasound Method	The outcomes is the analysis of Milk fat concentration using Ultrasound wave attenuation

**II. CONCLUSION**

This review paper debriefs about detestation of milk parameter and its classification using sensors and microcontroller. It also briefs about microbial activity characteristics.

This review is conducted to analyze milk parameter and adulteration level in milk. It also shows different techniques for detection of milk analysis and microbial activity over the purity of milk.Thus milk parameters are detected using various sensors and microbial activity will be detected using Gas sensor when milk is stored for long time.

In this paper, many techniques have been discussed for testing quality of milk and adulteration percentage in milk. It is observed that ultrasound technique is mostly preferred technique for the analysis of milk parameter and microbial activity in milk.

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