

# **MONITORING THE MILK PARAMETERS AND HEALTH OF THE CATTLE FROM A REMOTE LOCATION**

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## **ABSTRACT**

*In many dairy farms computer aided control of physiological and sanitary parameters are already used which leads to productivity increase and elimination of tedious operations. For milking the automatic milking machines are already available in market but there is need to work on generating the system which will measure the milk parameters accurately, compare it with standard parameters and with this system enables to find out the health of the cattle, as well as helps to mitigate the milk theft (by addition of water) and send all these notifications on owners mobile devise who is supposed to be at different location from the cattle shed. The same requirements are expected to be fulfilled in this project.*

*The goal of the project is to build automated system that will be consist of*

- a. FAT measuring system / sensor.*
- b. Somatic cell concentration (SCC) measuring system / sensor.*
- c. Volume/ weight measuring system / sensor.*
- d. GSM modem.*

**Keywords:** *FAT, Mastitis, SCC-Somatic Cell Count*

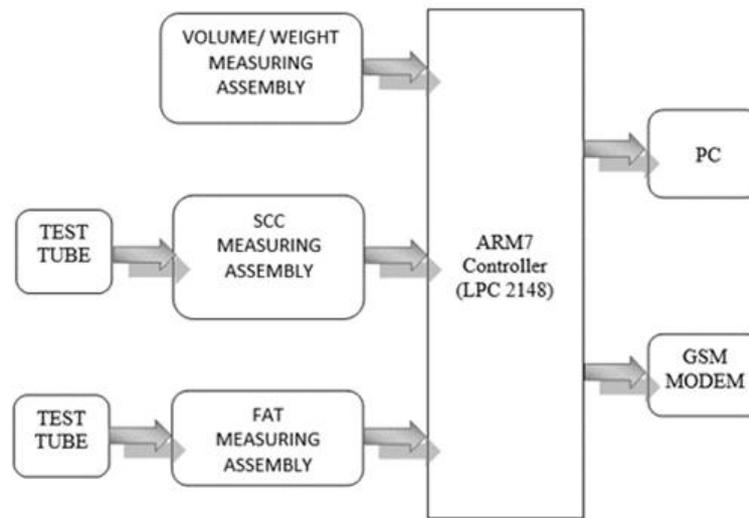
## **I.INTRODUCTION**

In recent years the milk production in India is substantially increased, as it gives higher profit to both farmers and dairy farms. For the cost efficiency, accuracy and easiness in monitoring milk production as well as the quality of the milk, the automation has been introduced recently in this field. For the farmers who lives away from his farm / cattle-shed and the milk is collected by the workers there is need of a system which can facilitate him to supervise the quality (e.g. FAT), quantity (volume/ weight) of milk as well as monitoring the health of cattle. The current project is to develop the system which consists of the sensors that are able to find out important milk parameters like FAT, Volume and Somatic Cell Concentration (SCC), and creates its data base and gives its notification through SMS by using the GSM MODEM, on the owner's mobile who is at another location away from his farm. The system should be able to give SMS on daily basis as well as the notification if the standard quality parameters are not met. The system enables the farmer to keep watch on the milk production as well the health of the cattle on basis of the data base of FAT, volume/weight and somatic cell

concentration (SSC). Also enable to mitigate the milk theft (by addition of water) by observing the milk parameters database and taking necessary actions.

## II. BLOCK DIAGRAM AND WORKING

The Fig.2.1 shows a block diagram of proposed system.



**Fig. 2.1 Block diagram of proposed system**

The tasks are divided in following steps

1. Measurement of milk parameters like FAT, VOLUME/WEIGHT & SCC.
2. Obtaining the notifications on owner's mobile device

### 2.1 Measurement Of Milk Parameters Like Fat, Volume & Scc

#### 2.1.1 MEASUREMENT OF FAT

This milk parameter can be determined by MILKOTESTER [1], VIS-NIR spectrometry with partial least square method (PLS) [2], and low cost short range infrared scatter sensors[3]. A milk sample is taken into test tube. High intensity light beam is made to pass through a milk sample present in test tube. On exactly opposite side of the test tube LDR is placed to detect the amount of light scattered by milk sample and the FAT content is found out. The same principle is also used in MILKOTESTER [1]. To ensure the customers nutrition value, government have fixed the range of FAT content for different cattle's, for Cow's milk FAT must be between 3.5% to 4.5% & for Buffalo it is between 6% to 7%. So if milk sample does not satisfy these values, a notification is sent on owners mobile. In this system the LED has given 5V supply then the readings that are taken for calibration purpose of FAT are included in Table 1.

Table 1. Measurement of Fat

Liquid Samples	Reference Voltages
Milk of 2.1 FAT	1.90V
Milk of 4.0 FAT	1.75V
Milk of 6.4 FAT	1.65V
Milk of 7.8 FAT	1.55V

## 2.1.2 Measurement Of Somatic Cell Concentration (Scc)

Mastitis disease in cattle's can be diagnosed out from somatic cell concentration present in milk. This disease causes considerable loss to cattleman because of lesser milk quality as well as quantity. So its early detection is required. Dairy industry has set up certain thresholds for checking the health of the cattle on the basis of SCC present in the milk. Cattles with SCC measurement under 200000 SCC/ml of milk are considered healthy, and cattle's who are giving milk of SCC more than 200000 SCC/ml are considered to be infected by mastitis [4]. So SCC is very important parameter to be checked out for checking the health of the cattle. SCC can be measured by measured by electrical permittivity method [5], low cost sensor system using Bioluminescence analysis [4] & Electrical conductivity sensor system [6]. Also it can be measured by California Mastitis Test (CMT), Direct Optical Microscopy (DOM). On-line electrical conductivity (EC) measurements have recently been introduced commercially with the goals of predicting mastitis and adulteration of the milk. Mastitis causes changes in the EC of milk, by damaging the mammary epithelium, and thus altering the balance of sodium, potassium and chloride ions. If the cow suffers from mastitis, the concentration of  $\text{Na}^+$  and  $\text{Cl}^-$  in the milk increases and the concentration of  $\text{K}^+$  decreases, which leads to increase EC of milk. On the other hand, if the milk is adulterated with water, the EC is being changed because the quantity of ions decreases so the resistance is higher. In summary, measurement of changes in milk conductivity has been used in many ways. The electrical conductivity sensor was elaborated with a pair of electrodes and an amplification stage.

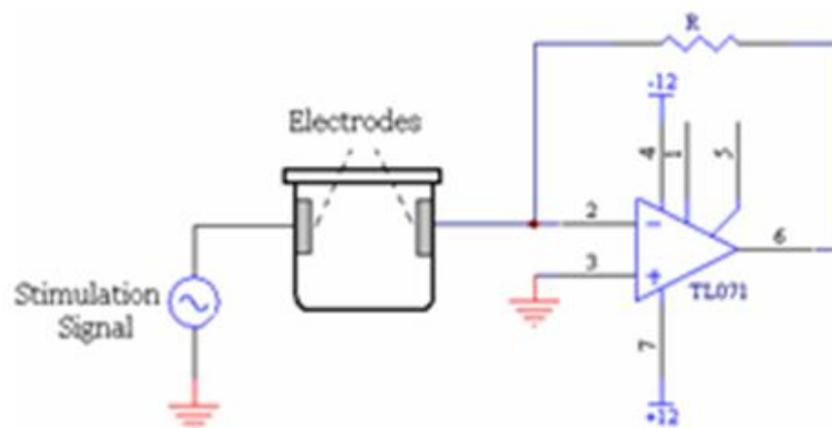


Fig. 2.2 Designed sensor to measure the conductivity of milk

Its essential function is explained below: A sample is poured into a container (which has the pair of electrodes). One of the electrodes is stimulated by an electrical signal producing an electrical current through the liquid, whose magnitude depends on the sample electrical conductivity. Then, this electrical current and the gain resistance of the amplification stage determine the output signal amplitude. In summary, the signal amplitude is proportional to the sample electrical conductivity [6].

The stimulation parameters were specified after several experiments and these are:

a) Wave form: square.

b) Amplitude signal: 500 mV.

c) Frequency: 3 kHz.

Thus based on the output amplitudes of different samples we are deciding three levels which are “normal” for healthy, “caution” for subclinical mastitis and “warning” for clinical mastitis.

### **2.1.3 Measurement Of Volume**

Volume/weight of milk can be measured by lots of ways. It can be measured by measuring relative density through light dependent resistor (LDR) [8], by measuring specific gravity through Lactometer [1], by using total weight measuring systems/sensors, fluid level measuring sensors and volumetric sensors.

### **2.1.4 Obtaining Notification On Owners Mobile Device**

A low cost microcontroller and GSM MODEM can be used for remote monitoring and controlling the different parameters. The remote monitoring system which will keep a track of the current status of appliances by locally (LAN) or remotely (Internet) to manage, monitor and control the appliances as well as send an alert SMS via GSM network automatically, on owners mobile device if the conditions are not satisfied. The concerned authority can control the system through his mobile phone by sending commands to GSM MODEM [7]. After measuring all required parameters ARM7 will compares them with the standard parameter values set in it and creates a data base of obtained readings. If any one of all parameters are not satisfying the standard quality parameter values then it will send SMS on owner's mobile device. Interfaced GSM modem can used for the same. GSM modem can be interfaced to ARM 7. GSM is an open, non-proprietary system that is having international roaming capability. GSM satellite roaming has extended service access to areas where terrestrial coverage is not available. Thus, owner may be at any remote location, he will get the notification of the milk parameters daily. It will facilitate him to effective and economic supervision of the milk parameter and cattle health. On the basis of the same the milk theft (by addition of water) can be mitigated.

## **III.CONCLUSION**

This paper has presented a system for monitoring the milk parameters and the health of the cattle from a remote location. The proposed paper include the measurement of fat, somatic cell concentration and volume of milk. It also includes obtaining notification on owner's mobile device if the measurement of parameters is not to the mark. This system is low cost system for measurement of milk parameters and it facilitates the supervision for the owners and creates a database of it.

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