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Design of Milk Analysis System for Dairy Farmers using Embedded System

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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. The two main reasons for this increase are the efficient collection of milk and higher profit for the producers, both of which have to some degree been influenced by information technology. The appropriate information technology will help to make information symmetric in the market, thereby minimizing problems of adverse selection and tedious work. It is only recently that automation has been introduced into agriculture. In many dairy farms, computer aided control of physiological and sanitary parameters are already used and lead to a productivity increase and the elimination of some tedious operations. Embedded Technology is now in its prime and the wealth of knowledge available is mind-blowing. An embedded system can be defined as a control system or computer system designed to perform a specific task. Embedded systems are playing important roles in our lives every day, even though they might not necessarily be visible. Here I describes one of the applications of embedded system MILKOTESTER. It is Small compact, embedded in a single unit, requires less power and measure milk parameters like SNF (Solid but Not FAT), FAT, CLR, WEIGHT, PH, with less cost. 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 pocket.

Keywords: Fast analysis-allows a large number of measurement to be done, Simple and light weight design, Low cost, Low power consumption, Easy to operate.

I. INTRODUCTION

With the initiatives of National Dairy Development Board (NDDB), out of 70,000 dairy cooperative societies in the country, around 26000 are using Electronic Milko-Testers (EMT) and around 2500 are using the PC connected electronic milko-tester machines (known as Automatic Milk Collection Systems - AMCS). These systems introduced very satisfactory milk collection methods and facilitated immediate payments to farmers based on the quality and quantity of milk delivered.

The success of these systems coupled with inexpensive connectivity opportunity offered by Internet, motivated the CEG-IIMA to enhance the PC at the Automatic Milk Collection Systems (AMCS) into a Dairy Information Services Kiosk (DISK) and offer an extensive knowledge and service delivery mechanism through a Dairy Portal. The DISK when used with a Dairy Portal of the Union, enhances the scope of services that would benefit the farmers as well as the dairy industries.

The system I propose as a project proposal is an electronic milk tester (Milk analysis embedded system / Milkotester) which can be used to find the quality of the milk samples by measuring more than one parameters at once. The targeted beneficiaries of this project proposal would be both the milk farmers and the industries in whole. The farmers would be benefiting in the sense that they would get a just pricing and they cannot get cheated by the system, since manipulating it would be harder than manipulating a physical measuring scale. The industry would benefit because this can be used as a cheap alternative to the cost prohibitive and non-user friendly meters available abroad. This project proposal would allow for an indigenous developed tool that can be used as a complete solution for this.

II. LITERATURE REVIEW

A proof of concept application using Information and Communication Technology (ICT) in the dairy sector was developed by the Centre for Electronics Governance at the Indian Institute of Management, Ahmedabad (CEG-IIMA). The application aims at helping the dairy farmers with timely messages and educating them on the care for their milch cattle and enhance the production of quality milk. It also aims at assisting the dairy unions in effectively scheduling and organizing the veterinary, artificial insemination, cattle feed and other related

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services. The application uses Personal Computers at the milk collection Centres of the Dairy Cooperative Societies (DCS) having connectivity to an Internet Service Provider (ISP). The application includes two components - a Dairy Portal (DP) and a Dairy Information Services Kiosk (DISK). This paper presents IIMA-CEG's efforts to design and implement the DISK and Dairy Portal. [2]

This "Milk Producer Group Resource Book" is part of a series of practical field guides for people working in small-scale dairying in developing countries. These field guides are produced by the Animal Production and Health Division of the Food and Agriculture Organization (FAO) of the United Nations. Milk producers can increase their income and utilise their skills and resources better if they are working in groups. This book aims to promote the organization of small-scale milk collection and processing as a sustainable, income-generating activity for household food security. It also tries to be a means to improving the safety, quantity and quality of milk and milk products available for consumers in developing countries. The intended readers are (future) leaders of milk producer groups, extension workers, project staff and group promoters who are working to set up milk producer groups, and those developing already existing groups at village level in rural areas. Some excellent FAO booklets exist on working with small groups (see information sources and references). They complement this book which has been written specifically for milk producer groups. This Milk producer group resource book aims to play a role in poverty alleviation in developing countries in a gender sensitive and sustainable way. [5]

III. PROBLEM DEFINITION

The milk analysis embedded system is an important product for milk collection parameters such as weight, FAT & CLR. In this project proposal I will propose a new method for measuring liquid density and also a method for measuring the amount of fat in it.
A device will setup based on this method for measuring the milk quality. The device will observed to have almost negligible amount of delay for measuring and processing. The fat measurement will found to be very accurate and precise within the range of sample values.
Hence to design an embedded system with IOT is the main task of my project proposal. Various design scheme and circuit will be investigated for embedded system circuit.

IV. PROPOSED WORK

After having seen the old and implemented technologies and the current "newer technology" in dairy sciences, I came up with a completely new method for measuring the milk parameters. And here I put forward my proposed methodology for such a milk testing instrument.

So, as far as I have seen, to calculate the quality of a milk sample we need at the least two variables in the form of the specific gravity of the sample and its fat content. But the greatest problem that we would face would be the actual measurement of the CLR of the sample, due to the above mentioned fact of unavailability of affordable technology which can be used as a method. Rather than use a small improvement over a lactometer, like an "Auto-CLR", which does nothing in improving the accuracy of the system, I propose a completely new method of measuring liquid density.

To measure a physical quantity we must make use of one of the physical properties. All the previous methods use one of the properties. Ultrasonic method used the reflectance of the sound, and oscillating U-tube used the measure of natural harmonic oscillations of a body.

I plan to use a fairly unused property in measuring the density that is the gauge pressure created by a column of liquid. Mathematically, we know that the pressure exerted by a column of fluid at a particular depth is dependent only on the depth of the point, the density of liquid and the acceleration due to gravity (which is a constant).
Or,

$$P=H\times\rho\times g$$

Since we already know that acceleration due to gravity is a constant, and if we can measure the pressure at a fixed depth of the liquid, we can find the density of the liquid from the above equation by one simple calculation.

Once the density of the liquid is known the CLR can be directly calculated by dividing the density by the density of water. This will give a direct specific gravity reading and will require no temperature corrections as done in lactometers and Auto-CLRs.

The second variable to measure is the fat content. Since the existing method of the light based scattering analysis of samples is both fast and accurate. And unlike Gerber method it will not use up the sample and it can be kept for further analysis without any wastage. Here I plan to use a paired IR LED and a phototransistor as a module. The system would be set up with the receiver and transmitter separated by a small distance inside the given sample. Fat molecules tend to specifically absorb certain bands of IR radiation.

IOT:
INTERNET of Things (IoT) incorporates concepts from pervasive computing and enables interconnections of everyday objects equipped with ubiquitous intelligence, which becomes an integral part of the Internet. Thanks to rapid advances in underlying technologies, IoT is opening tremendous opportunities for novel applications that promise to improve the quality of our lives. IoT has gained much attention from practitioners and researchers around the world, and spawned a wide variety of smart automated systems, such as smart buildings, smart homes, smart milk

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dairy factories, and so on. Here we focus on one of the most traditional of sectors – dairy farming – to highlight the value creation potential of the IoT.

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 illeagal things such as milk quality during the production of milk pocket.

Two key characteristics of the dairy market are:-

Strong demand growth – Particularly from emerging markets has put increasing pressure on established producers and is driving an attractive export market.

Government protection – Concerns over food security and the sustainability of staple categories have governments prioritizing investment in dairy on their agendas. Though these trends reflect positive demand, dairy farmers are price takers and their margins are constantly being squeezed by retailers expecting ever-increasing productivity. In order to remain profitable when faced with tightening margins and countless other production challenges (extreme weather, rising input costs, and labour shortages to name a few) dairy farms are fundamentally rethinking their model.

V. CONCLUSION

In this paper we developed a system which gives faster and more accurate result .Due to system user get exact amount as per the quality and quantity of milk. Use of ID makes the system more secure for user and management Data will be stored and can be easily access.

This paper is excellent blending of bio-chemistry and electronics engineering. The milk collection parameters such as weight, FAT & CLR are measured by this system gives same results as the existing systems which are more costly than the developed one.

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