Novel Process For Detecting Freshness And Quality of Milk At Dairy

Prathviraj[1], Nischitha E[2], Nishchit[3], Nithya Jain[4], Joseph Michael Jerard V[5]
[1, 2, 3, 4, 5] Dept of Information Science and Engineering.
[1, 2, 3, 4, 5] Mangalore Institute of Technology & Engineering , Moodabidri, India

Abstract- *In the present generation the demand for the milk and the milk products has been increasing significantly. Due to this, the numbers of milk dairies in various regions are increasing day by day. Milk is one of the most important sources of nutrition for everyone. The maintenance of the quality and freshness has become the challenge .Due to some of the adulterants, the consistency of the milk may get affected badly. Adulteration of milk has been a major social problem in recent years. Consumption of such milk can lead to severe health issues. Therefore the freshness of the milk must be detected in the early stages, and consistency of the milk should be ensured. To do this we have used pH sensors. This implementation is designed to make the process more convenient to all people who deposit milk. Along with the PH Sensor we have used The Arduino Uno in this framework. The entire system is regulated by this Arduino Uno. The Controllers of the Arduino are connected to the pH sensor to detect the freshness. This is one of the easy-to-use methods.*

Keywords- Arduino, PH sensor, Freshness.

I. INTRODUCTION

Milk is considered as one of the main sources of nutrition. The dairy products are rich in protein, carbohydrates, vitamins, sugar and other enzymes. Quality of nutrients in milk can vary as per the breed, food habit, season, and other factors.The contamination of milk may occur during unsanitary processing, packaging, and distribution. Water is the most common adulterant used in milk. This will lead to the lowering of milk quality. The consistency of milk is also affected by various environmental factors such as temperature, humidity, and darkness.

As per the survey, approximately 68.4% of the milk samples failed to meet the standard requirements. Thus, it is important to monitor the quality of the milk along with its freshness.

The proposed system is designed to check the freshness of milk using a pH sensor and Arduino Uno for sending data to the database. This system is going to detect whether the milk meets the standard quality or not. The Milk quality is decided by measuring milk's pH value, density, and solid contents. According to quality, payment is done to the milkman.

In this system, freshness has been monitored with the help of Arduino Uno and the pH sensor is mainly used to check the consistency of milk by checking its PH value. According to quality, payment is done to the milkman. Initially, each milkman is provided with a unique ID and passcode. The process starts when the milkman pours the milk into a small container where a quality check of milk is done. The microcontroller board that is Arduino Uno is used to link the pH sensor to analyse the freshness of milk by measuring its pH value. Once these values are obtained, it is compared with standard values to check if milk is good or not. If the milk is good, then the user can pour the milk into a large container, else the user is asked to carry back the milk. After this process, the user is notified with the summary of data through SMS and all the data is added to the database. Milk man can access the data through the mobile phone. This design is well suited for discovering the contamination by obtaining the rate of pH value, and SNF rate. User and dairy managers will be able to generate a weekly, monthly or annual report. The foremost goal of this design is to contribute a system to society that gives accurate results at a low costand in an efficient way.

II. LITERATURE SURVEY

To analyze the problem in the current system, we visited the Dairy where milk from various regions will be collected and stored for packing. Initially, we visited uppor dairy and discovered the procedure of analyzing the parameters of the milk. Afterward visited the Manipal dairy and discussed how to calculate the milk parameter such as fat. Studied the article written by Engr Fahad on pH sensors. There it has been given the use and working of pH sensor. It also explained how pH sensors can be connected to software devices. Studied article on the Arduino Uno on the Wikipedia and acquired knowledge on how Arduino works.

III. COMPONENTS

A) PH sensor:

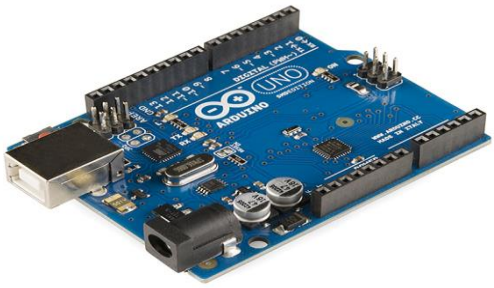
A pH sensor determines the concentration of hydrogen ions in liquid. The acidity or baseness of milk is measured using pH scale.

PH = – Log [H+]

The rate of pH of pure milk ranges from 6.5 to 6.8 based on various factors like cattle's breed, geographical location, and feed. The pH of milk changes from the frequent and quick change of temperature and may generate lactococci and lactobacilli batteries. If the concentration of lactic acid is more then acidic concentration will also increase. As acidic property increases pH will decrease due to which milk gets spoiled. This affects the taste and flavour of the milk and makes it unsafe for utilization.

To use the pH sensor to calculate freshness, we need to attach it with a BNC connector, PH2.0 interface will be plugged into the analog of the input port of any Arduino controller. In order to maintain the accuracy, we need to calibrate the pH sensor in a standard solution frequently. In general, the duration is twice a year.

B) Arduino:

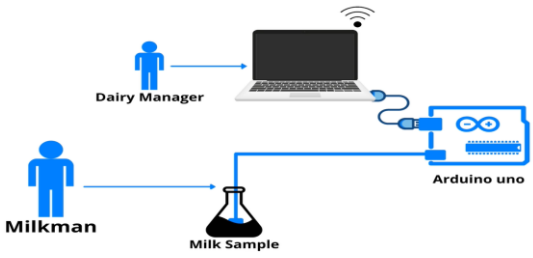


A microcontroller is the Arduino UNO. In Italian, the word UNO means 'one.' The Arduino Uno was the company's first USB board. It is a powerful tool that is utilised in a variety of applications. The Arduino UNO board was created by Arduino.cc.

The ATmega328P microcontroller is quite similar to the Arduino UNO. It's easy to use, especially when compared to comparable boards like the Arduino Mega. Digital and analogue input/output pins (I/O), shields, and other circuits make up the board. Six analogue input pins, a USB connector, a power jack, 14 digital pins, and an ICSP (In-Circuit Serial Programming) header are all found on the Arduino UNO. It consists of a 5 volt DC operating voltage. It is a cost-effective microcontroller board that manages the entire device and provides faster and more definite results.

The Arduino Uno can be charged using either a USB cable or an external power supply. The selection will be done automatically. The delivery of External power or an AC-to-DC adapter (wall-wart) or a battery can provide non-USB power. The adapter can be linked to the board's power port using a 2.1mm centre-positive socket. The battery is placed in the ground pin and the power header is connected to Vin. The board may run on a power supply ranging from 6 to 20 volts. If the voltage supplied is less than 7V, then the board will become unstable. At the same time usage of more than 12V, may cause the board to overheat and cause damage. 7 to 12 volts is the preferred range.

IV. WORKING



This system can be mainly set up in dairies or milk vendors where farmers drop off their milk. This device can be used as a primary milk analyser. This system can be appropriately mounted and initiated with a 5-volt dc power supply. It begins when Milkman pours milk into the small container where a quality check is done. Initially, the pH sensor is connected to a low-cost Arduino Uno and used to detect the density and pH of the milk in the container. Once the values are obtained, then those values are compared with standard values to determine the quality. If milk meets the standard then it is considered good. The pH of fresh milk can be in the range of 6.5 to 6.8. Once detecting these parameters a user can pour milk into a large container else he has asked to carry back the milk. After this process, the user is notified with the summary of data through SMS and all the data is added to the database. This technique is a useful tool for detecting milk adulteration based on differences in the pH and SNF content of milk from their standard values. User and dairy managers will be able to generate a weekly, monthly or annual report. The primary goal of this system is to provide low-cost, high-efficiency milk parameter measurement.

V. RESULT

Initially, we analysed the freshness by taking four milk samples using this current system. We took the samples in different formats like fresh milk, water added milk, spoiled milk, and soap adulterants in milk for a water sample. The analysis result of these milk samples is represented in Table 1.1. We have referred to numerous research works and also visited so many milk diaries to know the working process. The proposed System is an Arduino-based system for data monitoring and for the analysis of freshness. In this, the pH sensor is used to determine how acidic or alkaline milk is. A lactometer is used to determine CLR. The FAT % and CLR value are used to determine the SNF value. The goal of this design is to create a system that is both efficient and inexpensive. System users can keep track of their daily transactions. Initially, each and every user is provided with a unique Id and passcode. Data collected by the Milk master will be stored in the database and from that database, with the help of servers the particular data will be sent to the milkman's registered mobile number through SMS. He can view that message on his cell phone. This model is very quick and accurate in analysing the freshness of the milk. The communication between the system and server is wireless. Mainly we used IoT and a database to build a dairy automation System. Along with producing accurate results, this system cut down the cost. This system can be used to collect and maintain all information about all milkmen for future reference. This System examines the quality of milk using different parameters and presents the tested result on the computer screen of the dairy manager or dairy master. This kind of system helps in maintaining the quality of the milk and also avoids the spoilage of the milk in large quantities initially. The dairy Automation System is very simple and easy to install in all the diaries. The main outcome of this system is to maintain the quality and avoid the adulteration of milk.

Table 1.1: Result of samples

Samples	**pH**
fresh milk	6.8
Water + milk	6.4
Spoiled milk	4.5
Water	7

VI. CONCLUSION

The currently proposed system is an Arduino-based microcontroller system to estimate milk quality and freshness. It also delivers faster and more accurate test results than the formerly developed systems. This system can primarily be used to analyse the freshness of milk in dairy farming. In addition to this, the customers/ milkman can analyse their daily data on their cell phones. The Arduino Controller is attached to the pH sensor to collect the pH value and then it is connected to the system of the dairy manager. That system is connected to the database to store all the details of the milkman and from that, the data will be sent to the user's cell phone. The dairy vendor will keep track of the milk analysis data for the entire month and he can also generate a weekly, monthly or yearly report. Milkman can also view the parameter of the milk of the System mounted on the dairy. The dairy Automated System is easy to use and gives accurate information. This is also environment friendly, low cost and stable system. We have used Data Base Management System to store the user's data and to access them later. All details of the milkman are stored in SQL. From the collected information billing can be done.

REFERENCES

[1] Aware, A.M. and Belorkar, U. 2017 Design of Milkotester for Fat and CLR Measurement using Arduino Microcontroller.I. Adv. Res. J. Sci. Engi. Tech.,

[2] Aware, A.M. and Belorkar, U. 2017. Design of Milk Analysis System for Dairy Farmers Using Embedded System. Int. J. Innov. Re. Ele. Electro. Instrument. Control Egg.

[3] Unnikrishnan, A., Ravindran, A., Sreedhar, A. and Kuruvila, S.V. 2015. Electro-Milktestera Novel Method for Analysis of Milk Quality. Int. J. Innov. Res. Sci. Eng. Technol.,

[4] Borecki, M., Szmidt, M., Paw, M., K, Beb, M., Niemiec, T. and Wrzosek, P. 2017. "A method for testing the quality of milk using optical capillaries. Photonics Letters of Poland,

[5] Brennan, D., Alderman, D., Sattler, L., Connorb, B. and Mathunaa, C. 2003. Issues in development of NIR micro spectrometer system for on-line process monitoring of milk product. Measurement,

[6] Brown, J.V., Ranjith. H.M.P. and Prentice, G.A. 2018. Comparative shelf-lives of skimmed, semi-skimmed and whole milks. Int. J. D. Tech.,

[7] Chavan, R. and Patil, U.V. 2019. Comprehensive Assessment of Various Milk Parameters Using Embedded and IoT Based Systems. Int. J. Sci. Adv. Res. Technol.,

[8] Bhade, Dobariya, S.J., Landge, S.S., Babhale, P.D. and Atmande, V.M. 2019. Implementation of IoT based Milk Quality Analyzer using AVR Microcontroller. J. Emerg. Technol. Innov. Res.,

[9] Mahale, S., Deshmukh, S., Nakhate A., Ambure A. and Chavan K. 2018. Smart Milk Quality Detection System. Int. J. Res. Engi. Applic. Manag. ICRTET180 : 918-919.

[10] M Sujatha, P. Nagarjuna, A. Bala Sai Ram, A. Hemanth Venkata Sai, K. Tarun, Sk Hasane Ahammad. 2019. Visible Spectroscopy Analysis of Fat Content in Milk using Lab View. Int. J. R. Tech. Eng., 7(5S4): 746-750.

[11] Khera, N., Kumar, A., Fajr, F. and Khajwal, T.N. 2019. Microcontroller Based Parametric Data Monitoring and Quality Analysis of Milk. 2019 International Conference on Issues and Challenges in Intelligent Computing Techniques, Ghaziabad, India.

[12] Rajakumar, G., D.A. Kumar, D.T. Samuel, E. Muthu and Kumaran. 2018. IoT Based Milk Monitoring System for Detection of Milk Adulteration. Int. J. P A. Math.,

[13] Mukhopadhyay, S.C., Gooneratne, C.P., Demidenko, S. and Gupta, G.S. 2005. Low-Cost Sensing System for Dairy Products Quality Monitoring. 2005 IEEE Instrumentation and Measurement Technology Conference Proceedings.

[14] .Thanedar, P., Pol, S., Shinde, A., Mayekar, A. and Shinde, S. 2018. Enhanced Automation of Milk Analyzer Using Internet of Things (IoT) and Data Mining. Int. J. I. I. Res. Dev.,

[15] Yadav, S.N., Kulkarni, V.A. and Gholap, S.G. 2012. Design of Milk embedded system for dairy farmers. Int. J. Elec. C. Engi. Tech.,

[16] Bhamre, Y.R., Matsagar, M.B. and Bighavkar, C.G. 2016. Quantitive and Qualitative Analysis of Milk Parameters using Arduino Controller. Int. J. A. Res. Comp. Comm. Eng.,

[17] T. Abraham, "IDDM: Intrusion Detection Using Data Mining Techniques Laboratory", Australia Technical Report DSTO-GD-0286, 2001.

[18] C. C. Aggarwal and P. Yu, "Outlier Detection for High Dimensional Data", Proceedings of the ACM SIGMOD International Conference on Management of Data, May 2001

[19] A. lactating data, [online] Available:http.7/www.airdefense.net/products/index.html. 2004_.

[20] J. Allen, A. Christie, W. Fithen, J. McHugh, J. Pickel, E. Stoner, et al., "State of the Practice of dairy management", Technical Report CMU/SEI-99-TR-028, 1999

[21] E. Amoroso, Fundamentals of dairy cow Security Technology, Prentice-Hall:PTR, 1994

[22] D. Anderson, T. Lunt, H. Javitz, A. Tamaru and A. Valdes, "Detecting Unusual Program Behavior Using the Statistical Component of the Next-Generation Expert System (NIDES) Computer Science Laboratory", Technical Report SRI-CSL-95–06.

[23] J. P. Anderson, "Computer Security Threat Monitoring and Surveillance", 19034 Technical Report Contract 79F296400, April 1980.

[24] Intelligent Network Management with Peakflow Traffic, 2003.

[25] M. Asaka, S. Okazawa, A. Taguchi and S. Goto, "A Method of Tracing inference by Use of Agents", Proceedings of the 9th Annual Conference of the Internet Society (INET99), June 1999.

[26] T. Aslam, "A Taxonomy of Security Faults in the UNIX Operating System", Master's thesis, August 1995.

[27] C. R. Attanasio, P. W. Markstein and R. J. Phillips, "Penetrating an Operating System: A Study of VM/370 Integrity", vol. 15, pp. 102-116, 1976.

[28] T. Aslam, "A Taxonomy of Security Faults in the UNIX Operating System", Master's thesis, August 1995.

[29] C. R. Attanasio, P. W. Markstein and R. J. Phillips, "Penetrating an Operating System: A Study of VM/370 Integrity", vol. 15, pp. 102-116, 1976.

[30] S. Axelsson, "Intrusion Detection Systems: A Survey and management of dairy cow", Technical Report 99–15, March 2000