Arduino Based Temperature Control and Monitoring for Milk Pasteurization

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Abstract

Farming is a main occupation in India most of the farmers are dependent on Agriculture Supplementary business like Milk Production. Taking account of increasing populations of India its mandatory to preserve the milk and milk based products for long term using possible techniques, pasteurization is a well know procedure but its setup is very costly and can only be used in large scale dairy productions. In this paper we are presenting the cost effective quality milk pasteurization process by maintaining and controlling required temperature using microcontroller. This system provides super accuracy to monitor and control the temperature with safety of the operating personnel in dairy units and it also provide effective solution for detection of errors if any accidents occurs in dairy plant by using embedded control system.

Keywords—Arduino; pasteurization; control valve; sensors;

I. INTRODUCTION

The Pasteurization is necessary processes in the treatment of milk and other dairy Products in dairy plant In the posterization attempt, the same milk is cooled by taking the milk at high temperature. And then it is later sealed in the bottle. By going through all these processes, milk and milk products can be kept fresh and fresh for a long time.. Today the process of pasteurization is comanly used in the food industries. But In this Treatment slowly spoils caused by microbial growth. Unlike sterilization, microorganisms are not killed in the posterization process, however efforts are made to reduce their numbers so that they cannot make anyone sick(Assuming that the pasteurized product is stored as indicated and used past its expiration date) Commercial disinfection of food is not common as it adversely affects the taste and quality of the product. Some foods, such as dairy products, can be overheated to ensure that pathogenic microorganisms are eliminated.

Pasteurization is treatment with one of the following methods:

Holding method - Milk or dairy products are heated rapidly but to a temperature not less than 63ºC and not higher than 66C, it takes no less than 30 minutes at that temperature..

(a) immediately and rapidly reduced to 5 °C or less in the case of milk and milk products and then further to 7 °C or less in the case of cream.

(b) maintained at a temperature lower than that until the milk or milk product is removed from the premises for delivery. High temperature short time method - milk and

The milk product is rapidly heated to a temperature of at least 72°C, held at that temperature for not less than 15 seconds, and then cooled according to method (a) and (b) above.

The temperature and time is very important during the process of pasteurization since this must be exact in order to guarantee the product quality. The milk is pasteurized at 75°C for 30 minutes approximately and thus it is guaranteed that the proteins don't get lost. In small dairy's, control and measurement of the temperature during the pasteurization stage presents some risks for the personnel who carry out said process, the personnel often have contact with mechanical elements and steam of milk at elevated temperatures, consequently can cause accidents . Based on the previous problem on the quality & cost of the product, the implementation of an automatic temperature monitoring & controlling system during the pasteurization process. The objective of this project is design a low-cost architecture that performs automatically the temperature control & measurement preventing the workers are exposed to high temperatures. On the one hand it seeks to improve the quality of the product and on the other hand guarantees the occupational safety of the operating personnel of the plant. The proposed architecture will be applied in a prototype, the which will be evaluated in a small dairy's of India.
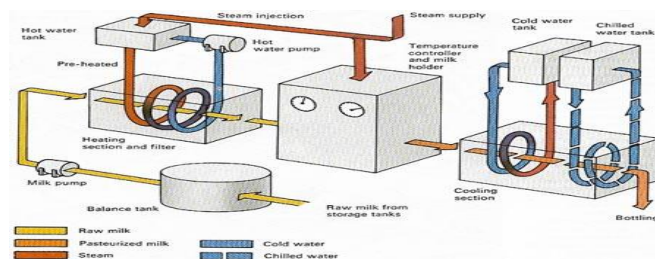

Fig.1 *Pasteurization process*

II. LITRATURE SERVEY

The dairy industry is in needed for cost-effective, highly reliable, very accurate, and fast measurement system to monitor the quality of dairy products. This is describes the design and fabrication works undertaken to develop such a system. The techniques used center around planar Electromagnetic sensors operating with radio frequency excitation. Computer-aided computation, being. fast, facilitates on-line monitoring of the quality

The two main reasons for increases the efficient and profit of the in producers sick, both of which have to some degree been influenced by information technology. The appropriate information technology described in this helped to make information symmetric in the market, thereby minimizing problems of adverse selection and tedious work. It is the only reason automation has been introduced into the agriculture recently. In many dairy ARM processor s, computer aided control of physiological and sanitary parameters are already used and lead to a productivity increase and the eliminated the 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 day to day life, even though they might not necessarily be visible

For Water-Bath system, it is necessary to the attain desired temperature within a specified period of time to avoid the overshoot and absolute error, with better temperature tracking capability, else the process is disturbed. Water-Bath temperature control is one of the most important and widely used applications of nonlinear control system in process if control industry and its applications, In the production of a variety of drinks products such as chocolate drink, strawberry milk products etc. The process industries which use Water- Bath temperature control are Nestle, Yeoh Hiop Seng, F&N, etc. If the temperature is out of the given range, the final product is badly affected

Perishable goods could be monitored while they are in transit to check that they are not subject to unsafe temperatures, and fragile goods could be monitored to detect unsafe accelerations that may cause breakage. Other applications include the detection of ARM processor full agents and non-invasive biomedical monitoring .

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

. Beekeeping is a production branch of the agriculture. Honeybees are very important economical insects not only for pollination of crops, but also for their valuable products. Bees are gathering nectar and pollen from plants and trees. A part of it bees are using to maintain their own life, but the other part is used for production of beekeeping products, like wax, propolis, queen milk, bee venom, apilarnil, etc. These products are used either directly as human food (honey) or as a raw material for an impressive number of medicinal, cosmetic, pastry produces, etc.
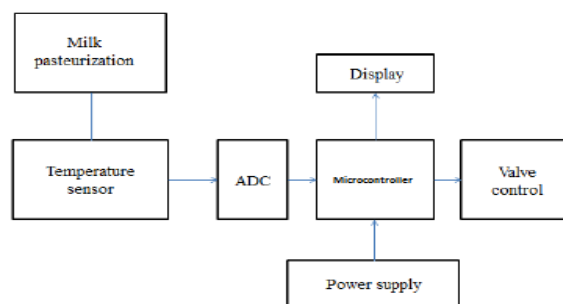
III. METHODOLOGY

Fig. 2 *Block Diagram of Automatic milk pasteurization Unit*

A. Description of proposed method:

Dairy goods made from pasteurised and unpasteurized milk, as well as a small number of unpasteurized dairy products. It implies that the danger of contracting a food-borne illness from such a product is relatively high. When sickness arises after consuming a pasteurised milk product, it is nearly often due to post-pasteurization contamination or a failure of the pasteurisation process. Alternatively, pasteurisation with lower heat treatments,

which is considered as desirable due to the better characteristics imparted to cheese and other dairy products, does not provide the same level of protection against foodborne pathogens by definition.

The risk presented by such alternative treatments will have to be assessed on a case-by-case basis. An ATmega328 Microcontroller is used to effectively distribute temperature monitoring and control. The temperature is taken with a temperature sensor and then sent to the signal processing unit, where filtering and amplification are completed.

The microcontroller receives the signals. The ADC transforms all analogue signals into digital signals. The measured value and reference value are compared using a microcontroller, and if the measured value is greater than the specified value, the valve is immediately closed. This sensing method has the potential to be used to successfully inspect the quality of dairy products such as milk, butter, cheese, curd, and yoghurt.

The goal of this proposed technique is to design and create a high-performance, low-cost, and real-time smart sensing system for temperature control and monitoring using Microcontrollers..

B. software

The suggested system was developed with Arduino compiler development tools, which are used to monitor and control the applications as they evolve according to the software architecture.
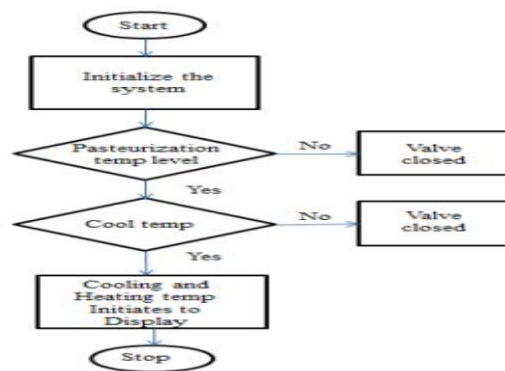
C. Flow Chart

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Fig.3 *flow chart of Pasteurization Process*

CONCLUSION

A functional architecture has been Studied and implementing the temperature monitoring & controller prototype,which is portable and low cost. The goal of this paper is to automate the pasteurization process in low cost to improve the quality of the product with high accuracy.

Finally, it was concluded that the proposed prototype in this paper is useful as it automates temperature monitoring and alert the change of stage of the pasteurization process with required value controlling & accuracy which leads to a positive impact on improving and homogenizing the quality of the final product with low cost setup and improve the conditions of operator safety .

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