ISSN (Print) : 2320 – 3765
ISSN (Online): 2278 – 8875

International Journal of Advanced Research in Electrical, Electronics and Instrumentation Engineering

(A High Impact Factor, Monthly, Peer Reviewed Journal)

Website: www.ijareeie.com

Vol. 8, Issue 2, February 2019

Milk Products Monitoring System Using PIC Micro Controller

S.Mahendran, C.Meenakshi L.Deepika

Assistant Professor, Department of ECE, Builders Engineering College, Tirupur, Tamilnadu, India

Department of ECE, Builders Engineering College, Tirupur, Tamilnadu, India

ABSTRACT: Food safety in rural and urban areas is a very important topic, as it closely related affects the health of the citizens. Recent studies highlight that raw milk pathogenic organisms that results in illness if consumed which can increase the incidence of diseases and reduce the quality of life. Hence, it is necessary to develop tools for real-time and smart sensing quality monitoring system.

Milk is the ideal environment for microbial growth and also dairy processing plants full of areas where “foot traffic” from employees can be accompanied by microbes. Some of the milk borne diseases are diarrhea, fever and abdominal cramps.

FOOD	**SPOILAGE MICROORGANISMS**
Butter	Psyshrotrophs,enzymatic degradation
Cultured Buttermilk, Sour Cream	Psychotrophs,coliforms,Yeasts, Lactic acid Bacteria.
Yogurt,Yogurt based drinks	Yeasts
Fermented dairy products	Fungi,Coliforms
Cream Cheese, Processed Cheese	Fungi,Spore-Forming Bacteria
Soft, Fresh Cheeses	Coliforms, Fungi, Lactic acid bacteria
Dried Milk	Microbial enzymatic degradation
Concentrated Milk	Spore-forming bacteria,Osmophillic Fungi
Raw Milk	A wide variety of different microbes

Table 1 shows the milk products and its compounds

ISSN (Print) : 2320 – 3765
ISSN (Online): 2278 – 8875

International Journal of Advanced Research in Electrical, Electronics and Instrumentation Engineering

(A High Impact Factor, Monthly, Peer Reviewed Journal)

Website: www.ijareeie.com

Vol. 8, Issue 2, February 2019

As the raw milk is stored for many days the growth of bacteria will be more which results in undesirable smell, tastes and toxic substances. Hence there is a need for monitoring system to detect microbes and produce a healthy product. So, this work helps in early detection of toxic substance in milk to avoid complications.

The proposed prototype is PIC controller based monitoring system which monitors the unwanted ingredients present in tested milk with the help of TCG gas sensors. The raw milk obtained has some bacteria which does not have ill effects. But as it is refrigerated and stored for many days will increase the rapid growth of bacteria which leads to spoilage of milk.

I. INTRODUCTION

Recent innovations in the field of science and engineering have led to growth in food products.Certainly in the present environment there is significant need of monitoring system to define the quality of the perishable diary products.

The basic necessity of human is milk which has high calcium and carbohydrates which provides much strength to the body. Some of the milk products are butter, cheese, yogurt, cream etc. The assessment of food products is an essential need to the society as it leads to development of urbanization.

Rapid processing and development of milk products requires a cost effective tool in order to assess final milk product. Various sensory systems were proposed ,but its accuracy is not up to the mark.Therefore, spoilage of milk can be predicted earlier by measuring the gas released by bacteria in milk. The ageing of milk can be identified by the presence of dimethyl sulphide and pentanal produced by bacteria. which spoils the milk by microbial activity.

The PIC microcontroller PIC16f877a is one of the most renowned microcontrollers in the industry and it stands for Pheripheral Interface Controller.It is 40 pin package, consists of 256 bytes EEPROM, self programmable and software control.The Thermal Conductivity Gas Sensor(TCG) are used to gases.

II.EXISTING SYSTEM

The existing system is based on ARM7 based monitoring system with spectrometer and mass chromatograph instruments do not provide high portability, feasibility while handling which results in to high costs and creates more complex situation.A/D conversion takes much more time therefore the continuous monitoring of data is not possible.There is also a need for separate ADC and it causes more expenses.The size of the circuit is larger.

III.PROPOSED SYSTEM

The proposed framework deals with Peripheral Interface Controller (PIC) is used with TCG gas sensors.These sensors gathers the information about the quantity of gas molecules and it is equated to voltage level. Then the voltage is compared with threshold. When the variation is large,then raw milk is spoiled otherwise the raw milk is good to use.The TCG sensors are connected to PIC controller which presents the processing of data values in the form of voltages and it is displayed in LCD module at transmiiter and receiver side.

ISSN (Print) : 2320 – 3765
ISSN (Online): 2278 – 8875

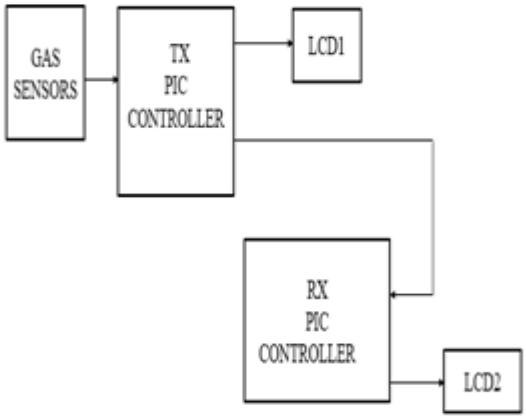
International Journal of Advanced Research in Electrical, Electronics and Instrumentation Engineering

(A High Impact Factor, Monthly, Peer Reviewed Journal)

Website: www.ijareeie.com

Vol. 8, Issue 2, February 2019

BLOCK DIAGRAM OF PROPOSED SYSTEM:



IV. COMPONENTS USED

1.TCG GAS SENSOR:

The TCG is a thermal conductivity gauge (TCG) made using silicon technology. The sensor chip consists of a silicon rim of 2.50 × 3.33 mm,
0.3 mm thick, in which a silicon-nitride membrane
is created. In the center is a heater, with a sensor element measuring its temperature.

The chip measures the thermal conductance between the ambient and the center of the membrane, and this depends on several parameters, such as pressure, gas type, and material depositions on the membrane. This dependence upon physical parameters allows the TCG to measure such quantities as absolute pressure, gas mixture composition, and material properties.Two gas sensors are used,they are:

a.TGC 813-

This type of gas sensors is made from tin dioxide (sno2) semiconductor which produces a low conductivity in clean air.TGS 813 sensor is much sensitive in nature to propane,Methane and also butane. This type of sensor is suitable for monitoring LPG Gases and also it suitable in detecting wide range of gases for industrial applications. The significant advantage of this sensor is it is of low cost. TCG 813 sensor immediately finds the concentration in air where it's simple electrical circuit converts the conductivity charge in to an output signal and its gas concentration corresponds in turn.

ISSN (Print) : 2320 – 3765
ISSN (Online): 2278 – 8875

International Journal of Advanced Research in Electrical, Electronics and Instrumentation Engineering

(A High Impact Factor, Monthly, Peer Reviewed Journal)

Website: www.ijareeie.com

Vol. 8, Issue 2, February 2019

b.TGC 822-

This type of gas sensors is made from tin dioxide (sno2) semiconductor which produces a low conductivity in clean air. TGS 813 sensor is much sensitive in nature to propane, Methane and also butane. This type of sensor is suitable for monitoring LPG Gases and also it suitable in detecting wide range of gases for industrial applications. The significant advantage of this sensor is it is of low cost.TGS 813 sensor immediately finds the concentration in air where it's simple electrical circuit converts the conductivity charge in to an output signal and its gas concentration corresponds in turn.

2.PIC MICROCONTROLLER-

PIC-Pheripheral Interface Microcontroller which was developed in the year 1993 by the General Instruments Microcontrollers. It is controlled by software and programmed in such a way that it performs different tasks and controls a generation line. PIC microcontrollers are used in different new applications such as smart phones, audio accessories and advanced medical devices.

There are many PICs available in the market ranging from PIC16F84 to PIC16C84. These types of PICs are affordable flash PICs. Microchip has recently introduced flash chips with different types, such as
16F628, 16F877 and 18F452. The 16F877 costs twice the price of the old 16F84, but it is eight times more than the code size, with more RAM and much more I/O pins, a UART, A/D converter and a lot more features.

1. Memory Structure

The PIC architecture consists of two memories: Program memory and the Data memory.

Program Memory: This is a 4K*14 memory space. It is used to store 13-bit instructions, or the program code. The program memory data is accessed by the program counter register that holds the address of the program memory. The address 0000H is used as reset memory space and 0004H is used as interrupt memory space.

Data Memory: The data memory consists of the
368 bytes of RAM and 256 bytes of EEPROM. The
368 bytes of RAM consists of multiple banks. Each bank consists of general purpose registers and special function registers.

The special function registers consists of control registers to control different operations of the chip resources like Timers, Analog to Digital Converters Serial ports, I/O ports, etc. For example, the TRISA register whose bits can be

ISSN (Print) : 2320 – 3765
ISSN (Online): 2278 – 8875

International Journal of Advanced Research in Electrical, Electronics and Instrumentation Engineering

(A High Impact Factor, Monthly, Peer Reviewed Journal)

Website: www.ijareeie.com

Vol. 8, Issue 2, February 2019

changed to alter the input or output operations of the port A.

The general purpose registers consists of registers that are used to store temporary data and processing results of the data. These general purpose registers are each 8-bit registers.

Working Register: It consists of a memory space that stores the operands for each instruction. It also stores the results of each execution.

Status Register: The bits of the status register denote the status of the ALU (arithmetic logic unit) after every execution of the instruction. It is also used to select any one of the 4 banks of the RAM.

File Selection Register: It acts as a pointer to any other general-purpose register. It consists of a egister file address, and it is used in indirect ddressing.

r a

Another general purpose register is the program- counter register, which is a 13-bit register. The 5 upper bits are used as PCLATH (Program Counter Latch) to independently function as any other register, and the lower 8-bits are used as the program counter bits. The program counter acts as a pointer to the instructions stored in the program memory.

EEPROM: It consists of 256 bytes of memory space. It is a permanent memory like ROM, but its contents can be erased and changed during the operation of the microcontroller. The contents into EEPROM can be read from or written to, using special function registers like EECON1, EECON2, EEDATA, etc.

2. I/O Ports

PIC16 series consists of five ports, such as Port A, Port B, Port C, Port D and Port E.

Port A: It is a 16-bit port, which can be used as input or output port based on the status of the TRISA register.

Port B: It is an 8-bit port, which can be used as both input and output port. 4 of its bits when used as input can be changed upon interrupt signals.

Port C: It is an 8-bit port whose operation (input or output) is determined by the status of the TRISC register.

Port D: It is an 8-bit port, which apart from being an I/O port, acts as a slave port for connection to microprocessor bus.

Port E: It is a 3-bit port that serves the additional function of the control signals to the A/D converter.

3. Timers

PIC microcontrollers consist of 3 timers out of which the Timer 0 and Timer 2 are 8-bit timers and the Time-1 is a 16-bit timer, which can also be used as a counter.

4. A/D Converter

The PIC Microcontroller consists of 8-channels, 10- bit Analog to Digital Converter. The operation of the A/D converter is controlled by these special function registers: ADCON0 and ADCON1. The lower bits of the converter are stored in ADRESL (8 bits), and the upper bits are stored in the ADRESH register. It requires an analog reference voltage of 5V for its operation.

ISSN (Print) : 2320 – 3765
ISSN (Online): 2278 – 8875

International Journal of Advanced Research in Electrical, Electronics and Instrumentation Engineering

(A High Impact Factor, Monthly, Peer Reviewed Journal)

Website: www.ijareeie.com

Vol. 8, Issue 2, February 2019

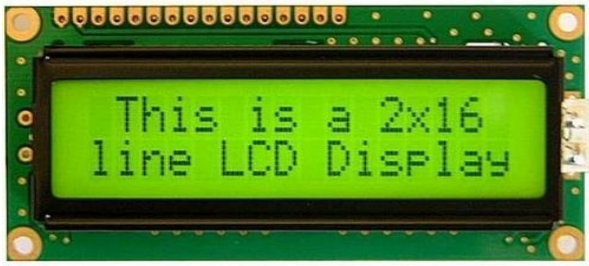
5. Oscillators

Oscillators are used for timing generation. PIC microcontrollers consist of external oscillators like crystals or RC oscillators. In case of crystal oscillators, the crystal is connected between two oscillator pins, and the value of the capacitor connected to each pin determines the mode of operation of the oscillator. The different modes are low-power mode, crystal mode and the high-speed mode. In case of RC oscillators, the value of the Resistor and Capacitor determine the clock frequency. The clock frequency ranges from 30 KHz to 4 MHz.

V. LCD DISPLAY

A liquid crystal display or LCD draws its definition from its name itself. It is combination of two states of matter, the solid and the liquid. LCD uses a liquid crystal to produce a visible image. Liquid crystal displays are super-thin technology display screen that are generally used in laptop computer screen, TVs, cell phones and portable video games. LCD's technologies allow displays to be much thinner when compared to cathode ray tube (CRT) technology.

Liquid crystal display is composed of several layers which include two polarized panel filters and electrodes. LCD technology is used for displaying the image in notebook or some other electronic devices like mini computers. Light is projected from a lens on a layer of liquid crystal. This combination of colored light with the grayscale image of the crystal (formed as electric current flows through the crystal) forms the colored image. This image is then displayed on the screen.



SOFTWARE USED TO SIMULATE:

a.PROTEUS-

Proteus is a Virtual System Modelling and circuit simulation application.Proteus also has the ability to simulate the interaction between software running on a microcontroller and any analog or digital electronics connected to it. The micro- controller simulation in Proteus works by applying either a hex file or a debug file to the microcontroller part on the schematic. It is then co-simulated along with any analog and digital electronics connected to it.

The Proteus Design Suite is a Windows application for schematic capture,simulation and PCB layout design.

ISSN (Print) : 2320 – 3765
ISSN (Online): 2278 – 8875

International Journal of Advanced Research in Electrical, Electronics and Instrumentation Engineering

(A High Impact Factor, Monthly, Peer Reviewed Journal)

Website: www.ijareeie.com

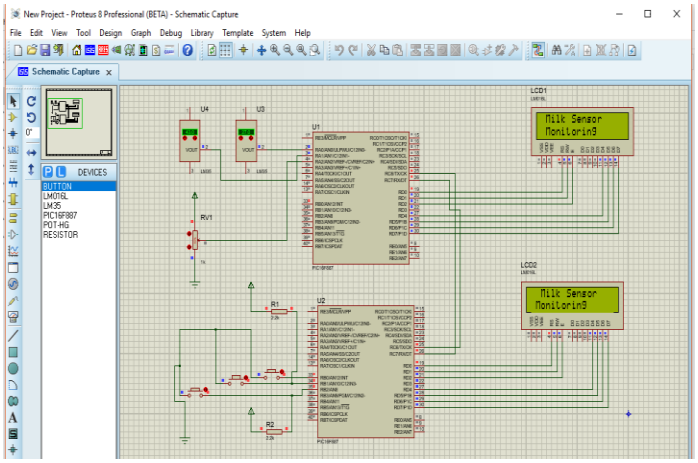
Vol. 8, Issue 2, February 2019

b.PIC C COMPILER-

This integrated C development environment gives developers the capability to quickly produce very efficient code from an easily maintainable high level language. The compiler includes built in functions to access the PIC hardware such as READ_ADC to read a value from the A/D converter. Discrete I/O is handled by describing the port characteristics in a PRAGMA. Functions such as INPUT and OUTPUT_HIGH will properly maintain the tri-state registers. Variables including structures may be directly mapped to memory such as I/O ports to best represent the hardware structure in C. The microcontroller clock speed may be specified in a PRAGMA to permit built in functions to delay for a given number of microseconds or milliseconds.Serial I/O functions allow standard functions such as GETC and PRINTF to be used for RS-232 like I/O.

VI. RESULT

The proposed model was evaluated to define the efficiency of raw milk. For doing this milk samples were collected from local farms without adding any preservatives into it. These milk samples were directly exposed to the sensor array at 3cm distance from milk surface and the response of each sensor is collected.



VII. CONCLUSION

It is the best suitable model for raw milk quality analysis in real time with low cost and more flexibility. This model is portable and simple to use.It can be easily adapted because as it provides appreciable selectivity and improved response when compared with existing methods.

REFERENCES

[1] Brudzewski, k., osowskl, s., Mickiewicz, t.: sens. Actuators b 98 291-298 (2004)
[2] Ampuero,. S et.al. Sens. Actuators b 941-12 (2003)
[3] Hettinga, et.al. int. Dairy j. 18 506-513 (2008) [4]. Magan, n., pavlou, a., chrysanthakis, l., sens.Actuators b 72 28-34 (2001)
[5] Marsalis, r.t.: j agric food chem 47 648-654(1999).
[6] Marsalis, r.t.: j. Agric food chem 48 3470-3475 (2000).
[7] http:/lwww.figarosensor.com/productsl813pdf., figaro (tgs 813).
[8] Deguo wang et.al.," Rapid and sensitive detection of Escherichia coli 0157in raw milk by loop medicated isothermal amplification combined with chemo sensor" from Milchiwissenchaft 67(4)2012.
[9] Durgajanani siva lingam and John Bosco Balaguru Rayappan"Development of E-nose prototype for Raw milk quality discrimination".
[10] S.Asif Hussain, et.al- " Accurate Face Recognition system based on ARM 9 processor using HAAR wavelets" International Journal of EngineeringResearch(IJER),2014,March,PG.N0:15 7 -161e-ISSN NO: 2319-6890 p- ISSN 2347-5013.