

ECONOMICAL ANALYSIS OF MILK AND BILLING WITH ELECTRONIC CARD

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Abstract: This system is designed in order to change the lifestyle of milk collection unit. Dairies collect milk from dairy farmer everyday and payments for milk are done according to the rates per litre. This rate depends on various factor like weight, FAT, CLR & SNF of the milk. Our system will measure these parameters and calculate the payment automatically.

Keyword: microcontroller , lcd , card connector

The system consists of two units, one unit is placed at milk collection centre (MCC) that consists sensor , microcontroller, LCD, card connector & keypad as main elements. This unit collects data & store it in a smart card give to the farmer. The other unit is at cash counter(CC) also consists of microcontroller which reads the data from smart card & send it to PC where calculation of bill is made for making payment to the farmer this data is also viewed on PC and print of receipt is also provided to the farmer.

As payment for the milk of farmer"s are based on the quality of the milk which they delivered to the dairy & the quality is decided on Fat, CLR, SNF & Weight of milk. Hence their are various methods existing to measure Fat, CLR & Weight which are described below.



Electronic Milk Tester has been adopted as an essential instrument for measurement of milk fat. Percentage of fat content is displayed quickly and accurately on a digital readout. Several thousand small/large Dairies and Village Milk Collection Centers are being benefited with its use.

“Automatic Milk Analyzing & Billing System” is developed which is simple in construction, easy to operate & which measures the parameters such as Fat, CLR, SNF & total weight of the milk and displays it on LCD display. For the billing purpose mainly a smart card is used. This card is supplied to every farmer who brings their milk to a particular milk collection center. The data displayed on the LCD display is simultaneously written on this card. By using data on the smart card payment is to be calculated. User can take printouts of the payment.

We can use PC interface also to maintain the year-by-year record.

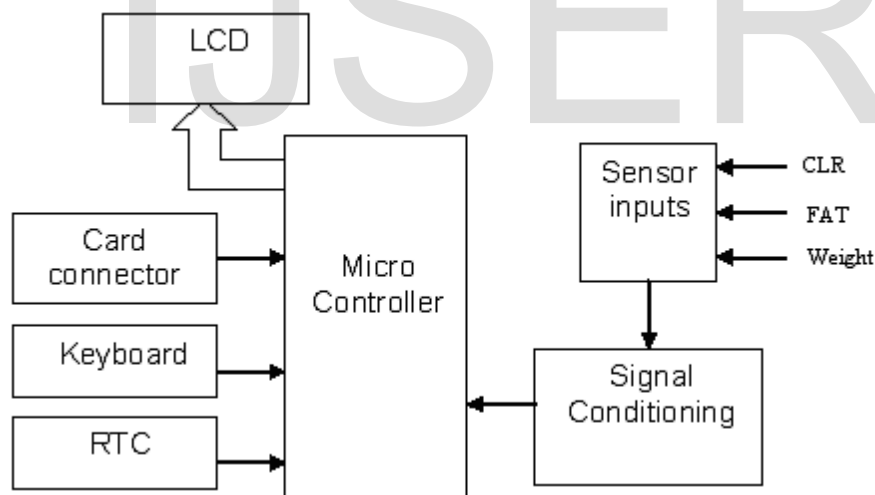
The basic components of this system mainly consist of -

- 1) Milk collection center.
- 2) Cash counter.
- 3) Electronic Card

A. Milk Collection Center

The Figure shows block diagram of Milk collection center & it mainly consist of following component.

- 1) Sensor
- 2) Signal conditioning
- 3) Microcontroller
- 4) Keyboard
- 5) LCD
- 6) Card connector
- 7) RTC

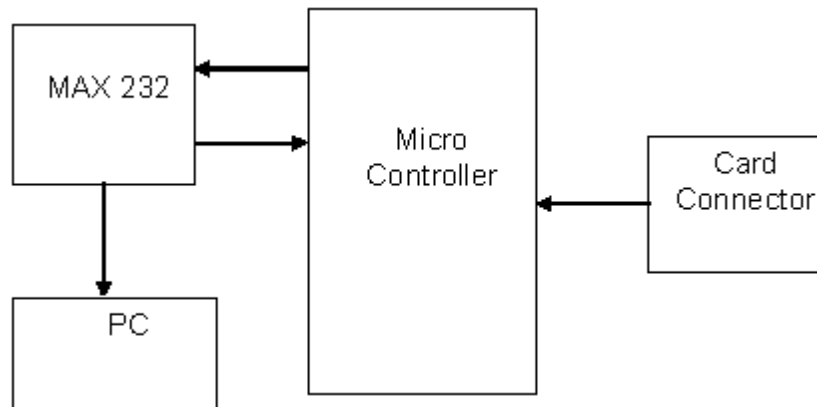


Block diagram description

- 1) Sensor block: The sensor block contains sensor assembly, which includes sensor for measuring weight, Fat and CLR of the milk.
- 2) Signal Conditioning: Signal conditioning circuit convert sensors output into standard form so as it is acceptable by microcontroller.
- 3) Micro controller: All the processing of the signal, storage, billing, and display is done by the microcontroller. The microcontroller used is PIC16F877, which is having RISC architecture.
- 4) LCD and keyboard: LCD and keyboard are connected to the microcontroller to display the result and to enter the data respectively.

- 5) Smart card connector: Here a card is inserted to write the data on the smart card.
- 6) Real Time Clock: The real time clock is used to log the data with respect to time & date.

B. Cash Counter



This section will totally based on the microcontroller. At cash counter when user insert the smart card in the slot provided on the card connector, microcontroller will read data from smart card and send it to PC, where the payment is calculated according to the predefined rate and data from the smart card. Simultaneously, this total data can be displayed on the PC or we can take the printouts of the payment. The user can go anytime to collect his cash & once the payment has been given to the farmer the data from the smart card can be erased or next data can be overwrite on the smart card. The same data can be stored on the computer. We have to make the database in the computer for the particular parameter. MAX 232 is used for the serial communication between microcontroller & PC.

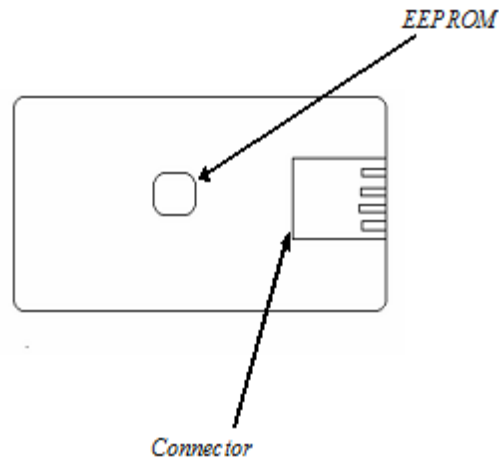
MAX 232

Since the RS232 is not compatible with today's microcontrollers, we need a line driver (voltage converter) to convert the RS232's signals to TTL voltage levels that will be acceptable to the microcontrollers TxD & RxD pins. MAX232 from Maxim Corp. [18] is a example of such converter. The MAX232 converts from RS232 voltage levels to TTL voltage levels & vice versa. One advantage of MAX232 is that it uses a +5V power supply which is same as the source voltage for PIC16F877. There are two sets of line drivers for transferring & receiving data. Here we use only one set only, that is T1 & R1 are used together for TxD & RxD of PIC16F877. The T1IN is the TTL side & is connected to TxD of the microcontroller while T1OUT is the RS232 side that is connected to the RxD pin of RS232 DB connector. The R1IN (pin13) is the RS232 side that is connected to the TxD pin of the RS232 DB connector, & R1OUT (pin12) is the TTL side that is connected to the RxD pin of the microcontroller.

Electronic Card

Smart card is simple memory card shown in the figure below mainly used for the billing purpose. The day-by-day data will be stored on the smart card. User can go any time to collect his payment. After giving payment we can vanish the total data on the smart card or we can overwrite the next record on the previous as per our requirement. Due to this memory can be used efficiently. This card mainly contains flash memory AT24C04A for the data storing purpose. It stores the different parameters of the milk such as fat, CLR, SNF, total weight of the milk etc. for the particular user. Each user will have his own card. The AT24C04A provides 4096 (4K) bits of serial electrically erasable and programmable read only memory (EEPROM) organized as 512 words of 8 bits each. The

device is optimized for use in many industrial and commercial applications where low power and low voltage operation are essential. The AT24C04A is available in space saving 8-pin PDIP, 8-pin, 14-pin SOIC, and 8-pin TSSOP packages and is accessed via a 2-wire serial interface. In addition, the entire family is available in 5.0V (4.5V to 5.5V), 2.7V (2.7V to 5.5V), 2.5V (2.5V to 5.5V) and 1.8V (1.8V to 5.5V) versions. Here for our application we use 8-pin SOIC AT24C04A.[10] Figure 10 below shows electronic card on which a serial EEPROM is mounted.



EQUATION

.SNF measurement

Once we got the values of CLR & FAT, easily we can calculate SNF by using following formula. [2]

$$SNF = (CLR \text{ reading} / 4) + (FAT \times 0.21) + 0.36$$

DATE	TIME	LITER	FAT	CLR	SNF	RATE	TOTAL
12/7/13	6:00 A.M	7.6	3.4	29	8.6	19.5	148.2
12/7/13	2:00 P.M	12	3.6	30	8.8	19.5	234
13/7/13	7:30 A.M	34	3.2	30	8.5	21	714
14/7/13	8:30 A.M	45	3.1	30	8.8	22	990
15/7/13	7:50 A.M	38	3.8	31	8.7	20	760
16/7/13	3:43 P.M	92	2.9	29	8.6	21	1932
17/7/13	4:30 P.M	33	3.5	30	8.3	19.5	643.5

With the help of this system we are able to judge quality of milk accurately, as well as farmers gets daily updating of record & immediate payment status for the milk delivered. Also farmers get the proper benefit according to quality of milk and customer get the good quality milk. The cheap and credible technology implemented in this dissertation improves the delivery system by ensuring prompt payment to the farmers and instilling their confidence in the dairy industry, and also minimizing the problem of adverse selection and defeating corruption. The elimination of manual registers for all kinds of information and data storage is an additional benefit of this dissertation. The milk collection parameters such as weight, FAT & CLR are measured by this system gives results same as the existing systems which are more costly than the developed one.