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INTERFACING GLCD WITH AUTOMATIC MILK COLLECTION UNIT

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ABSTRACT: Milk Collection Unit is a Product of Silicon Electronics, an Ahmadabad Automatic based company, and is being used by many Milk Dairies in Ahmadabad for maintenance of Billing data of the farmers. The machine will collect the Milk quality parameter from the Fat analyzer and will take the weight of the milk using the weighing scale board (8051 processor) and calculate the amount to be paid to the farmer. This data will be stored on the machine itself and will be used to do weekly payments to the farmers. The existing unit is developed using low level embedded systems and has ADC, Seven Segment Display ,Serial Flash RAM, 20*4 LCD, PS/2 Key board, 5*4 matrix keypad, Parallel dot matrix printer, Real time clock and Thermal Printer. The project that Raayan Systems Pvt Ltd is going to work on will be to upgrade this unit to use high-end Embedded Systems using Embedded Linux, so that the unit can be interfaced to high-end devices like USB Keyboard, USB Printer, Pen drive, LAN (web interface), GSM (SMS / GPRS Service) and Wi-Fi/Bluetooth support. And Android Application will be developed to access the data from Cloud.

KEYWORDS:
GSM, Load cell, USB Keyboard &Printer, LAN, Wi-Fi/Bluetooth support.

1. INTRODUCTION

Milk production in India is quadrupled in last 40 years; this mass production makes it world's largest milk producing country. The gross production of milk in 2011 was 127 million tons [1][2]. This mass Production is achieved using power of producer – owner and well professionally Managed milk cooperative systems. The majority of farmers are illiterate or semi literate and they run very small part of this entire production.

Year	Production (Million Tones)
1991-92	55.6
2001-02	84.4
2011-12	127.9

Source: Department of animal husbandry, Dairying and fisheries, Ministry of agriculture, GOI

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More than 15 million dairy farmers belong to various local dairy cooperatives which count up to 96000; they sell their products milk producer's organizations. Cooperative unions are supported by fifteen state cooperative milk marketing federations which will manage and control state wise milk production1][2] . In 2011 everyday Amul collects around 9.10 million liters of raw milk (daily average 2009 - 2010) from over 13,328 village societies consisting of 2.9 million milk producer members. Its supply chain is easily one of the most complicated in the world. Amul is the largest food brand in India and world's Largest Pouched Milk Brand. This figure is only about Amul.he primary source for milk providing to dairy is farmers. Dairy industries s a joint business of farmer who daily provides collected raw milk to dairy, dairy will provide the money according to milk collected. This process of raw milk collection happens twice a day. This collection process is very big and requires use of IT for easier, convenient and faster operation [1][2] . Milk collection process happens as Farmer pours milk from animals like cow or buffalo and brings pour milk in variety of containers and cans. A unique farmer ID number is given to each farmer. At MCC, The operator enters the farmer ID in the milk collection software & takes a small sample of milk for quality evaluation. It is evaluated by Milk Analyzer. It analyses parameters like SNF, FAT, added water & Temperature. The evaluated values are automatically taken by software for calculation and also displayed on the seven segment digital display so that farmer can view. Now Farmer will put milk into the Milk Can placed on weighting Scale. The weight is also displayed on the Digital seven segments Display. It is also automatically taken into the milk collection software. According to the rate chart based on various parameters, software calculates the rate for bring milk & finally a regional language printed receipt with all details like total amount ,total milk given with date and time is given to the farmer for reference and the payments. This complete operation requires use of Computer at MCC and software to do the collection and billing process. The collected data are stored at MCC can be transmitted to Zone head office by using of Email or using Pen Drive.Milk Collection Unit is a Product of Silicon Electronics an Ahmadabad Automatic based company, and is being used by many Milk Dairies in Ahmadabad for maintenance of Billing data of the farmers. The machine will collect the Milk quality parameter from the Fat analyzer and will take the weight of the milk using the weighing scale board (8051 processor) and calculate the amount to be paid to the farmer. This data will be stored on the machine itself and will be used to do weekly payments to the farmers. The existing unit is developed using low level embedded systems and has ADC, Seven Segment Display ,Serial Flash RAM, 20*4 LCD, PS/2 Key board, 5*4 matrix keypad, Parallel dot matrix printer, Real time clock and Thermal Printer.

What is AMCU?

- Embedded Device used by Milk Dairies in villages.

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- Vastly under use in Gujarat and Maharashtra area.
- Automates & Eases the below activities :
    - Rate Calculation using Fat, SNF & CLR
    - Weekly Billing
    - Customer Data Maintenance
    - Milk Collection Data Maintenance
    - Configuration of sell and buy rates etc
- Can be interfaced to Weighing machine, Milk Analyzer, Keyboard etc.

1.1 MOTIVATION

As dairy industry is a joint business of farmer, so farmers took more interest in it & because of this in India more number of Cooperative dairies are formed. Time required for processing this milk is more as after procuring the milk from farmers at village cooperative societies it is then tested for the quality by measuring the FAT content, density of milk & quantity of milk. As this process is time consuming hence farmers has to stay in a line for an hour or more. Secondly, some milk collection centers do not have the costly milk analyzing equipments so the sample of milk for testing was stored in plastic bottles & tested only after milk collection process was over, this means that a sample was examine after a one or two hours. This led to unhygienic conditions & fear of contamination at the center. Since all the measurement is done manually & the values are also noted manually in farmers membership card hence chances of errors in manual calculation of quality & quantity by cooperative staff. Hence to reduce above manual work & to speed up the operation of milk collection the Automatic Milk Collection Unit was developed by Silicon Electronics, Ahmadabad.However there are few limitations in the initial product which is in use. In order to overcome these limitations, a new design was proposed and this up gradation project was thus started.

2. LITERATURE SURVEY

2.1 EXISTING SYSTEM:

AMCU is a embedded device used by Milk Dairies in villages. Vastly under use in Gujarat and Maharashtra area Automates & Eases the below activities:

- Rate Calculation using Fat, SNF & CLR
- Weekly Billing
- Customer Data Maintenance
- Milk Collection Data Maintenance
- Configuration of sell and buy rates etc can be interfaced to Weighing machine, Milk Analyzer, Keyboard etc.

AMCU was manufactured by Silicon Electronics from Ahmadabad. Almost 1000 devices are produced by the company and are in use in various milk dairies. Due to some limitations, the company decided to upgrade the product and given to Raayan Systems Pvt Ltd, a Hyderabad based Startup.

2.1.1 Existing AMCU

- AMCU was manufactured by Silicon Electronics from Ahmadabad.

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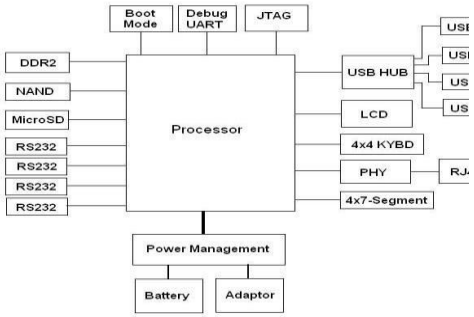
- Almost 1000 devices are produced by the company and are in use in various milk dairies.
- Due to some limitations, the company decided to upgrade the product and given to Raayan Systems Pvt Ltd, a Hyderabad based Startup.

2.1.2 How AMCU is Used

- Every day Farmers bring milk to the dairy. Each farmer has a unique customer Id in AMCU database,
- Milk is weighed and the weight is given to the AMCU device via Keypad or directly via ADC.
- Parameters like FAT,SNF and CLR are calculated using a Milk Analyzer and are given to AMCU device.
- The rate of the milk is calculated based on these parameters.
- The data is stored with customer data and is used for weekly or monthly payments.
- Receipt is provided to customer using Thermal Printer.

2.1.3 Old AMCU Block Diagram



Existing Components

- Weighing Scale Board(8051 Processor)
  - ADC
  - Seven Segment Display
  - Four keys for Parameters
- Mother board
  - Serial Flash RAM
  - LCD – 20 X 4
  - PS/2 Key board
  - 5 X 4 Matrix keypad.
  - Parallel Dot Matrix Printer
  - RTC
  - Serial Thermal Printer

Limitations of Old AMCU

- Memory was limited
- Not more than 300 customers were possible
- Not user friendly
- Not possible to interface with bigger display
- USB devices connectivity was not possible
- There was no proper web interface
- Data was limited to only one unit. Integration of data from multiple centers was not possible.

2.2 PROPOSED SYSTEM

2.2.1 New AMCU

- USB Keyboard
- USB Printer
- Pen Drive
- LAN – Web Interface
- GSM – SMS /GPRS - Cloud
- Wi-Fi/Bluetooth
- Android App
- Graphical LCD

2.2.2 Purpose of the project

- To enhance the device with latest hardware to overcome the limitations.

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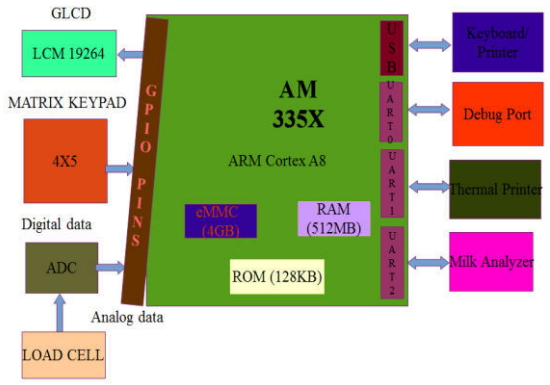
- To interface with display and USB devices for user friendly experience.
- To add Web Interface, cloud storage to integrate multiple centers data, to monitor the milk collection from multiple centers.
- To increase the data storage capacity.

3. BLOCK DIAGRAM OF THE PROJECT

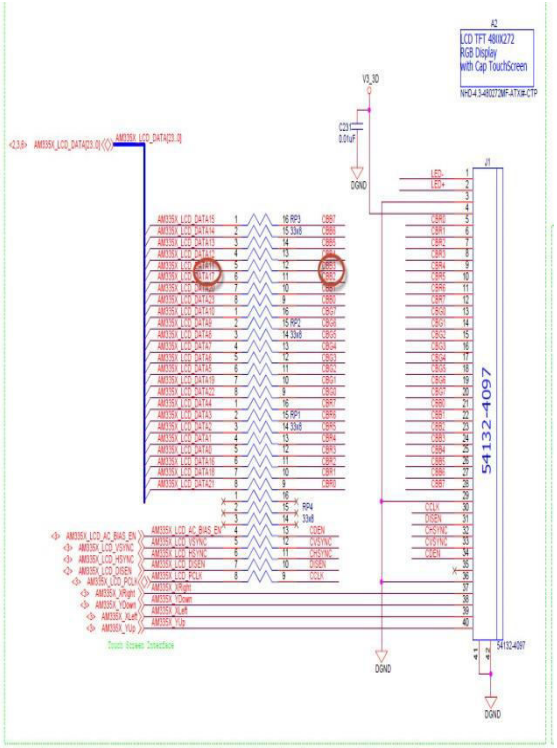


3.1 DESCRIPTION:

The block diagram of the project consists of the following components.

- Beagle bone black
- AM335X
- ARM Cortex A8
- eMMC 4GB
- RAM 512MB
- ROM 128kb
- GPIO Pins
- GLCD LCM 19264
- Matrix Keypad 4 * 5
- ADC
- Load Cell
- Keyboard / Printer
- Thermal Printer
- Milk Analyzer
- Debug Port
- USB
- UAR

4. SCHEMATIC AND FLOW CHART



4.1 Schematic Explanation

	TPS65217x				TPS65910x		TPS650250
	A	B	C	D	A	A3	
Battery Charger	Yes				No		No
Boost	WLED backlighting				5V Boost		No
AM335x OPP	OPP50, OPP100	OPP50, OPP100, OPP120, Turbo, Nitro			OPP50, OPP100, OPP120, Turbo, Nitro		OPP50, OPP100
Power	3 DCDC @ 1.2A 4 LDO				2 DCDC @ 1.5A 1 DCDC @ 1A 9 LDO		1 DCDC @ 1.6A 2 DCDC @ 0.8A 3 LDO
Input Voltage Range	2.7 - 5.8 V				2.7 - 5.5 V		2.5 - 6.5 V
DVFS / SmartReflex	Yes				Yes		No
RTC-only mode	Yes				Yes		No
DDR	DDR2, LPDDR1		DDR3	DDR3L	DDR2, LPDDR1	DDR3	DDR2, LPDDR1, DDR3
Package	48pin QFN, 6mm x 6mm				48pin QFN, 6mm x 6mm		32pin QFN, 5mm x 5mm
T_A	-40°C to 105°C				-40°C to 85°C		-40°C to 85°C

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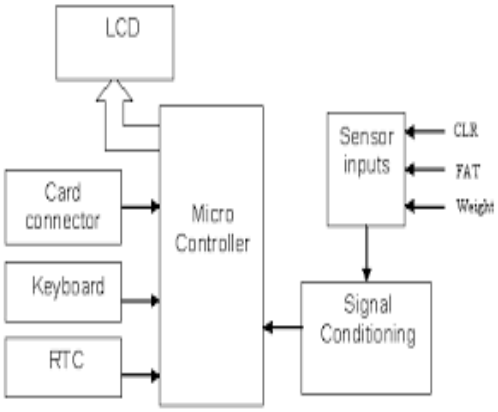
4.2 Flowchart:



4.3 Flow Chart Explanation

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 connecter: 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.

5.SNAPSHOTS OF THE PROJECT

Figure 5.1 Final Output

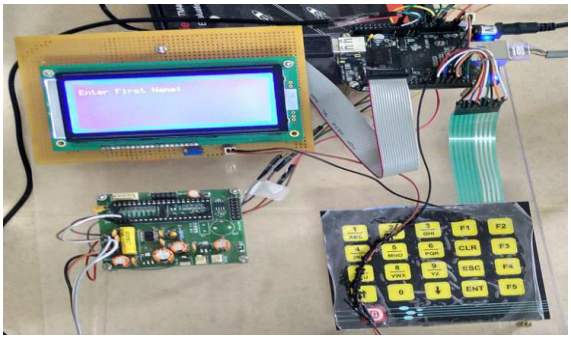


Figure 5.2 Complete Snapshot

Figure 5.3 Power on Screen

We can see the below components in the snapshot:

- Beaglebone Black
- Graphic LCD
- ADC
- Matrix Keypad
- Load Cell

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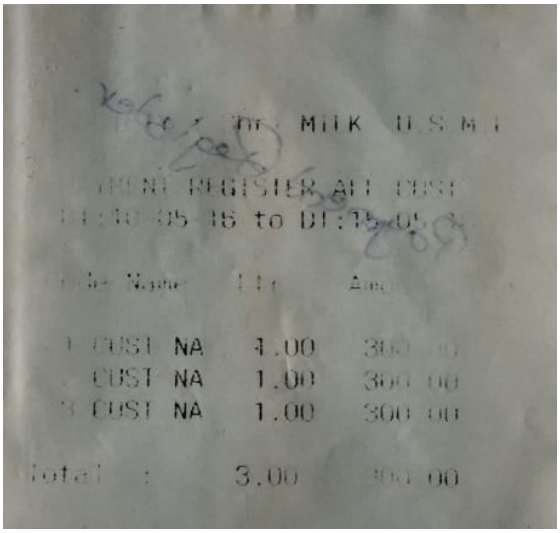

Figure 5.3 Bill generated by Thermal Printer

6.ADVANTAGES AND APPLICATIONS

6.1 ADVANTAGES

- In-built Storage
- Easy to operate (Even a laymen can use)
- Role based Security
- Instant printout of amount payable
- Fast & economical
- Centralized testing & payment
- Reduce human errors
- Wastage is reduce
- Reduce time
- Transparency in activities
- Shift end summary
- Spot payments for farmers
- Operational integration
- Detailed Milk Collection Reports
- USB Data Transfer
- External Printer Interface

5.1 APPLICATIONS

- Automatic Milk Collection Units can be used in independent Milk Dairies in villages as well as by Milk Societies in all the dairies managed by them, for a centralized data management.

6.CONCLUSION & FUTURE SCOPE

6.2 CONCLUSION

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.

6.2FUTURE SCOPE

Cloud integration of all the units of a milk dairy company and thus analyzing all the data through a common database.

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