Clever Power Meter with Specialized Capabilities

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ABSTRACT: The main objective of our project is to reduce the manual need for the collection of meter reading and to increase the automation in the electric society. Now a days, an accessor visit the house for every sixty days to note the reading from energy meter, which requires more manual power. For bill payment, consumer will have to stand in long queue for making payment. Smart energy meter automatically fed the reading into the computer by zigbee and the bill generated is to be sent to the customer using GSM. Also if any fault occur in the line due to disasters or any other natural causes through the call or by the direct registration, we can inform about the fault to the Electricity Board. The consumer did not pay the bill after the delaying time, in initiating action for non-payment is to warn them then accessor visit site to disconnect the supply.

I.INTRODUCTION

Now a days, AMR (Automatic Meter Reading) is to increase the accuracy of the meter reading. AMR is a existing project for manual collection of meter reading for every two month by visiting the site. The AMR system consists of a current transformer to identify the reading, and then the calculated reading sends to the PIC microcontroller for authentication. Then the low-power GSM connected to individual energy meters to send the reading to the customer and the Zigbee is used to send the intimation to the government for 60 days once about the meter reading.C.Nagarajan et al [2,5] studies Zigbee consist of two ports are Transmitter that transmits the reading as a signal and Receiver is connected with the EB monitoring system that receives the signal from the transmitter. And send a SMS to the owner through the GSM and the relay is used to trip the circuit for the non-payment and to connect the supply while payment.

Hyper Terminal is a communications and terminal emulation program that came with the Windows 98 and Windows XP operating systems. IT professionals and users can work with Hyper Terminal to set up a dial-up connection to another computer through the internal modem using Telnet or to access a bulletin board system in another computer. They can use Hyper Terminal to set up a connection for data transfers between two computers, such as a desktop computer and a portable computer, using the serial ports. Hyper Terminal can also allow IT to take serial-port control of external devices or systems such as scientific instruments, robots or radio communications stations. Hyper Terminal is a simple windows telnet program. It essentially can connect to a remote host and offer a command line interface. Telnet is an old protocol that has largely been replaced by secure shell. Hyper Terminal is a program that easily connects across either a phone line or a serial communications port like COM1.

GSM system is the most widely used cellular technology in use in the world today. It has been a particularly successful cellular phone technology for a variety of reasons including the ability to roam worldwide with the certainty of being able to be able to operate on GSM networks in exactly the same way provided billing agreements are in place. Zigbee is a wireless networking standard that is aimed at remote control and sensor applications which is suitable for operation in

harsh radio environments and in isolated locations. This makes zigbee technology a very attractive proposition for many applications.

II.EXISTING SYSTEM

In the most previous existing system, manually the meter reading is noted and is updated to the system. For the payment we have to stand in a long queue which requires more time. For this inconvenience the AMR (Automatic Meter Reading) is introduced to reduce the burns of officers or daily workers to pay a electricity bill in a long queue. AMR (Automatic Meter Reading) is a meter to update the reading of the meter automatically to the Electricity Board system. GSM based energy meter is automatically updated to the system and send a SMS to the owner about the amount of units they consumed and about how much amount they have to pay.
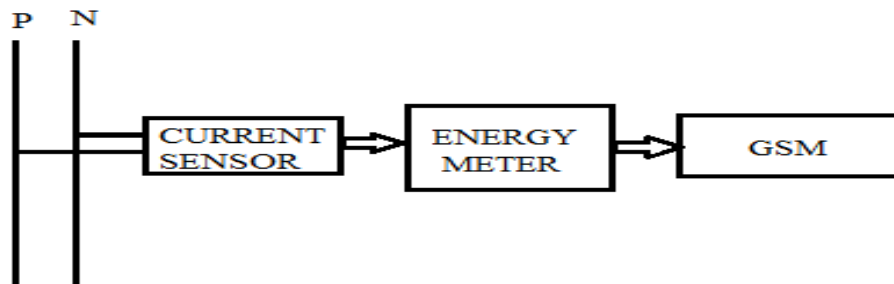

Fig.1 Automatic Meter Reading

AMR (Automatic Meter Reading) with GSM have a current sensor to sense the amount of energy consumed by consumer. Current Sensor is to sense the amount of current used by the consumer. Sensor is connected to the energy meter for sensing purpose. Global System for Mobile Communication is attached to the meter and is used for the purpose of sending SMS to the owner about the electricity billing. After receiving the message from the meter, the owner have to pay the bill in Electricity Board.

III.PROPOSED SYSTEM

In our proposed system, combined zigbee and GSM technology is also developed to communicate the data received at consumer end to the central server. Using zigbee & GSM, it's processing on mobile phone through which the concept of Automatic Meter Reading (AMR) can be implemented. AMR along with the relay circuit is used to trip the supply for the unpayment and connect the supply after making payment using zigbee transmitter and receiver. If any fault occur in the line, using the press button we can send a message to the Electricity Board.
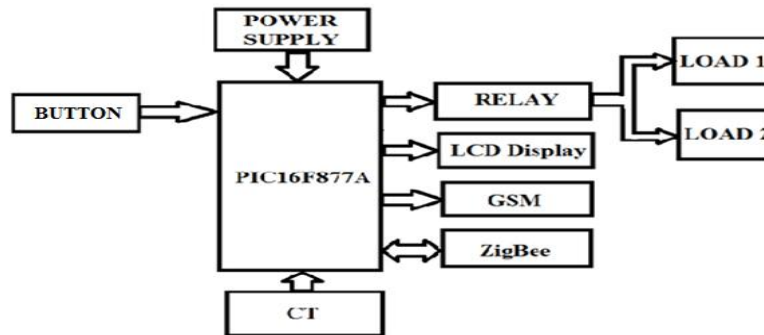
Fig.2 Smart Energy Meter

PIC16F877A Microcontroller is connected with the 16*2 Alphanumeric LCD Display. Zigbee have a two ports are transmitter and receiver for the instruction transmission. Zigbee transmitter is connected with the microcontroller to transmit the readings of meter that showed in the LCD display. The zigbee receiver is to receive the instruction that transmitted by the transmitter and is connected with the Electricity Board system for automatic reading updation using Hyper Terminal Software. GSM (Global System for Mobile Communication) is used to send the SMS of meter reading with the bill to the owner. 16*2 Alphanumeric LCD Display displayed that the current unit consumed by consumer. Relay, Zigbee transmitter, GSM and LCD Display are connected with the PIC16F877A for the instruction that instructed by the microcontroller.

IV.CIRCUIT DIAGRAM

The Current Transformer RT1 and Potential Transformer RT2 are connected in a serious connection. Potential Transformer is connected in parallel with the PIC microcontroller, Relay circuit RL11 and with the Zigbee Transmitter supplied with the variable resistor. Series connection of transformer RT1 and RT2 with the diode D1 and D2 is supplied with the rectifier circuit. Current Transformer RT1 is a stepdown transformer to stepdown the current and supplied to PIC16F877A Microcontroller with the rectifier circuit. Alphanumeric LCD Display with the microcontroller have a reset button to rest the value. Microcontroller is programmed with the specified time to reset the value. The load L1 and load L2 is connected with RT1 and RT2, PIC microcontroller. Pull button is connected to the microcontroller and to the tripper circuit to trip and release the supply. Smart Energy Meter Using Arduino and GSM of the demand for power has increased exponentially with time. One avenue through which today's energy problems can be address through the reduction of energy usage in households. This has increased the emphasis on the need for accurate and economic methods of power measurement. The goal of providing such data is to optimize and reduce their power consumption. This paper presents a smart energy meter for an automatic and superior metering and billing system. The integration of the Arduino and GSM Short Message Service (SMS) provide the meter reading system with some automatic functions that are predefined. The energy meter system can incorporate with embedded controller and GSM modem to transmit the data like consumed energy in kWh, generated bill, security services (line Cut/On) over GSM mobile network such as data can be then fed and integrated into existing energy management systems located at power companies or organizations to provide the services among the customers without man-power.
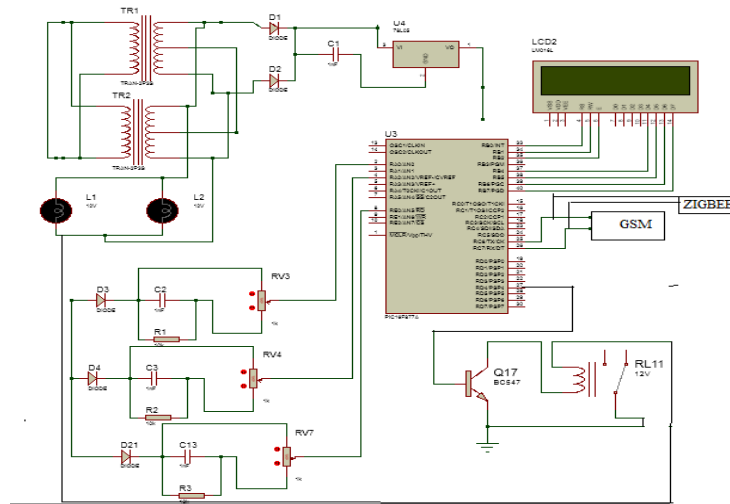
Fig 3. Circuit Diagram of Smart Energy Meter

A. Operation of Smart Energy Meter

The Current Transformer and Potential Transformer is supplied and the transformer is to step down the voltage for the circuit. The converter is convert the ac to dc voltage for controller working with the resistance of variable resistor. Global System for Mobile Communication, Zigbee Transmitter and Relay are connected to the PIC16F877A microcontroller. The controller is programmed to show the daily usage of current for every day in LCD display, also if consumption crossed the specified limit for a particuler day automatically send a warning to the owner. And also calculate the cost for the power consumption and showed in the LCD Display. For every day, controller process the GSM to send a SMS to the owner of daily consumption of current and cost for that current that shows in the display, GSM is a unidirectional, have a one way communication, which can send a Short Message Service to the owner. Zigbee which send a message through the transmitter which connected in controller for the transmission. The receiver that connected in EB system to receive the message from the transmitter and updated to the system. Using Hyper Terminal Software EB officers can disconnect the supply for the non-payment of billing and after the payment of billing they can connect the supply with the single instruction through PIC16F877A. Zigbee is a bidirectional device, which can trip and connect the supply which is instructed by the microcontroller using relay circuit.

V.HARDWARE IMPLEMENTATION

The hardware of the Smart Energy Meter with Specialized Features consists with PIC16F877A microcontroller. In this project we use our own creation of energy meter with current transformer to calculate the reading. According to energy meter we are fixing the LCD display to show the unit consumed and cost for the consumption. After the consumption of electricity for a particular day which is mentioned in controller, message sends to the controller and government electricity board by help of GSM. The digital energy connected to the controller and GSM for transmitting the energy meter reading to the government electricity board. Likewise the zigbee transmits the reading through the transmitter and receiver to the EB system. If the consumer ignores the warning message for the non-payment for further action to trip the connection supply using Hyper Terminal Software until they pay the bill. If any fault in the line then the message is sent to the higher authority of government electricity board to detect the fault line connection of power.
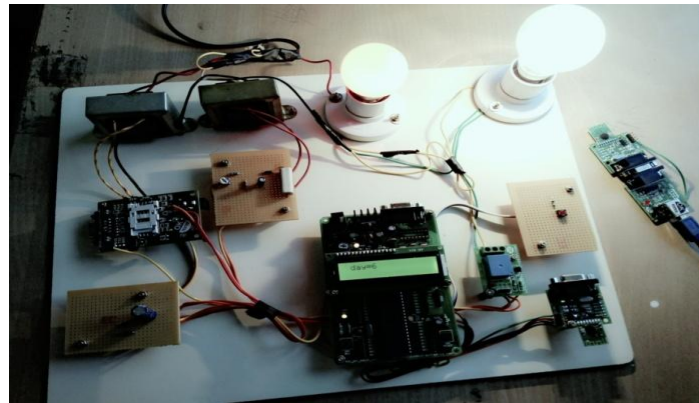
Fig.4 Hardware implementation

VI.CONCLUSION

The concept can be evaluated and completely analyzed with the software (Hyper Terminal) used and also can be implemented in every house to reduce the manual need while any fault occur in the line, and also for automatic updation of unit consumption to the system, and for the non-payment penalty like to trip the circuit. Through the LCD display we can visually notifies the meter reading and through the SMS we can intimate to the EB about if any fault occur. This project would have a complete solution with the improved efficiency and automation for the social and digital improvement of our society.

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