

A Review on Intelligent Automatic Meter Reading and E-Billing System using Power Line Communication

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Abstract: *Power is the soul of world which is related to the electricity and “electricity” is the word which now rules the world. So, proper utilization of this commodity is of immense important to us. Hence, it is necessary to measure power consumption. Though many technological innovations are taking place in this world, existing electricity consumption billing process seems in India to be very old fashion and does not meet the latest technology available. In this paper we present digital meter based on a very cheap distributed microcontroller architecture and real time clock, thus eliminating the loss of meter data during power failure. Avoiding the new methods of wireless communication, which are practically very much time consuming to install such a system, and also it is highly cost consuming method on devices interconnected by an expensive commercial bus. The means used for data communication is power line, the power lines which already exist and connect every household in a particular area as it does not require any new installation or erection for establishment of communication channels. So the system doesn't require placing other cables.*

Keywords: AMR, GPRS, GSM, PLC.

1. Introduction

Though electricity is very essential in day to day life, the proper utilization of it must be done. We can properly consume the electricity as well as calculate the electricity consumption. In most of places, particularly in areas of LT consumers, conventional method of electricity billing is carried out. The current system involves length and erroneous method. The employee working at the Electricity Board office has to note the meter readings from house to house and building to building. This requires huge number of labour operators and long working hours to achieve complete area data reading billing. This current system has some disadvantages like erroneous readings, easy manipulation, manual labor and time consuming. Also the users need to go up to the Electric Board (EB) office to manually pay his bills. The present model removes above mentioned disadvantage of the current procedures and suggests an automated system to remotely collect energy meter readings bringing in a capability to real time monitoring [1]. Not only is the billing, even the control of system fully automated by this technique i.e. when a consumer fails to pay his consumption bill within a specific period of time the supply is automatically cut off to his house and the restoration is done only when the bill is cleared. Here the energy meters are replaced by digital meters. The meter readings in the form of digital data are transferred from the customer end to the Electric Board office through power line [2]. The power line communication used here is full duplex communication enabling data transfer at a faster data rate through long distances. At the Electric board end a computer maintains a record of individual customer. Once the bill is generated the customers are provided with some time period for the payment of bill. The Consumer has to pay the bill in time, if couldn't, the supply is automatically cut off to his house.

2. Literature Survey

Smart meter billing System is the modern Power measuring device. Which is being used in measuring electricity, gas, water consumption in many countries on the world since it has a lot of advantages that the old analog meters doesn't have. A low cost AMR system is designed using GPRS [3]. But the installation charges are high and GPRS is not more reliable way. Also a huge amount of investment should be done. An easy Home Automation System based on very cheap distributed microcontroller architecture, rather than on devices interconnected by an expensive commercial bus [4]. The means used for data communication is the home power line, so that the system doesn't require placing other cables in addition to standard electrical facilities. Thus in proposed work a reliable power line will be used for communication [5].

The first AMR system was created on 1974 in USA by Mr. Paraskevagos who used a advance technology developed on 1972 by Theodore George. Automatic Meter Reading system created with the combination of PLC and GPRS, focusing on the working principle and hardware design of each component including collectors, concentrators and master station. The communication between concentrator and collectors is done using Power Line Carrier (PLC), while the concentrator is connected to master station via GPRS. accessing to internet [6]. Some practical issues of Automatic Meter Reading (AMR) based on Power Line Communication systems. It highlights different factors affecting system performance and its time and location dependent behavior [7]. A GSM automatic power meter reading was built to demonstrate an automatic power meter reading using GSM network. This system provides effective, reliable and efficient wireless automatic power meter reading, billing and notification through the use of GSM network [8]. The

broadband communication can also be provided through electricity cables to all home appliances. Anatory did analysis on channel capacity for providing broadband connection through power line [9]. Below is the step wise modification studied till today.

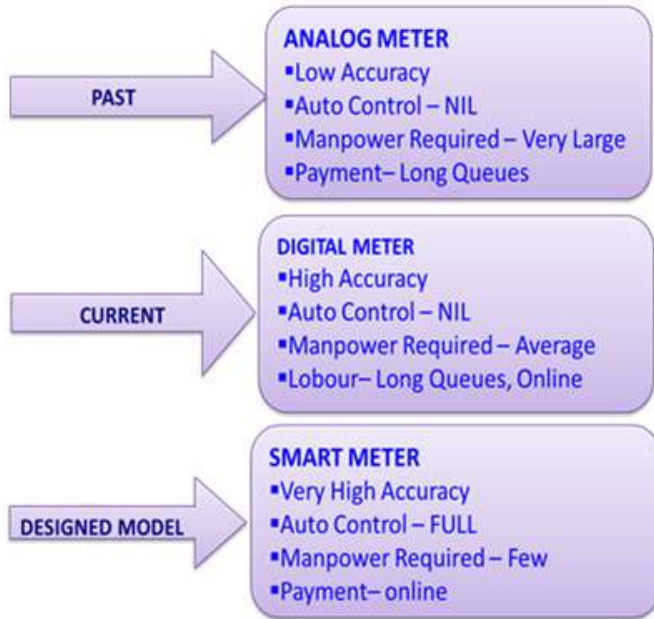


Figure 1: Step Wise Modification

3. Comparison of AMR System and Traditional Metering System

Table 1. Shows comparison between Power Line Based AMR Meter and Traditional meter reading system. Using Power Line Based AMR Meter System can access and control data usage of domestic electricity meter in specific area. Power Line Based AMR Meter provides automatic disconnection feature, power cut information. After billings is done and send to the customers a relaxation time is given to customers. Once payment period exceeds, automatically disconnect energy meter and information is given to customers. Similarly customers consuming extra load than normal, automatically discontinue the meter. This proposed system provides accurate meter reading and flexible billing. Traditional meter reading does not provide these kinds of features. Automatic energy meter reading system is accessing the data and receiving customer feedbacks to improve their service. Traditional meter reading system is more costly than automatic energy meter.

Table 1: Comparison of Power Line Based AMR Meter and Traditional meter reading system

Sr No.	Features	Power line Based AMR Meter	Traditional Meter
1	Remote Monitoring	Possible	It is Not Possible
2	Disconnection of Power Supply	Automatic Disconnection if Payment of bill is not done	Manual Disconnection If Payment of bill is not done
3	Maintenance Cost	Less as control of system is done without field person visiting houses	More because field person need to go every house and take the Reading.
4	Data Security	Avoid error meter readings	Error in meter readings

		and error calculation	
5	Man Power	Few Man power required	Huge man power required
6	Customer Service	Better and Fast	Slow and Time Consuming

Because field person need to go every houses and industries for take the meter reading. In AMR system no need of visiting every house for accessing the meter it automatically read and transferring to electricity board offices. AMR systems avoid error meter reading and error reading. It also provides increasing security of data.

4. Block Diagram

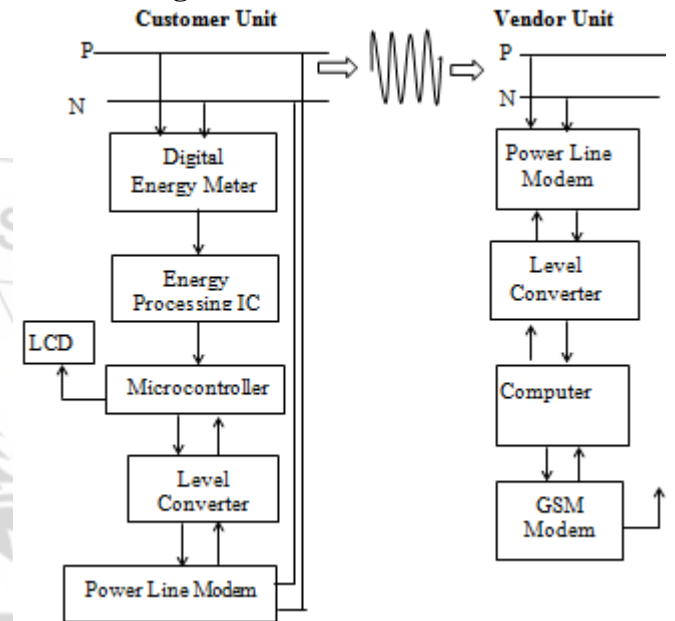


Figure 2: Block Diagram

Block Diagram Explanation

1) Power supply

- In the circuit using IC 7805, we can get +5V DC Supply.
- In the circuit, +5V DC supply is required for:
 - a) Energy Processing IC
 - b) Microcontroller
 - c) LCD Display
 - d) Power line communication.

2) Energy Processing IC: It acts as ADC, i.e. Analogy to digital converter. The decoded data is read by microcontroller. It helps in Continuous Monitoring of the Phase and Neutral Current, also Allows Fault Detection in 2-Wire Distribution Systems.

3) AT89S52 [Microcontroller]: The Microcontroller is the heart of the system. Microcontroller reads data from energy processing IC. It controls the LCD display, generates interrupts, and controls the power line communication unit.

4) LCD Display: LCD means Liquid Crystal Display. It is a display device which displays the information provided to it. Its shape and size varies from application to application.

5) Power line Modem: POWER LINE MODEM uses existing power line as a medium for electronic communication. It uses the most advanced Digital Signal Processing (DSP) techniques to enhance the signal to noise

ratio. PLM provides reliable communication even in the noisiest power line networks.

6) Computer: The final reading is display on computer and total cost of meter reading is display on computer by using serial communication. The output is display on PC using Visual Basics 6.0 version.

5. Conclusion

The designed automated system is a smart automated process instead of manual work. It increases meter accuracy & Reduced meter maintenance expenses. Remotely Connect / Disconnection of Power supply through power line communication Meter. Better network performance and cost efficiency. Also more intelligence to business planning. This proposed automated system consists of two sections. One at Electricity board office that includes office section which has a PC with its back end connected to a database. The other section is the customer home section which is present at the home this section is used to read the amount of power consumed by the customer and after a period of 1 month it sends to the PC in the EB office. This EB office section calculates the bill and sends message of bill to the consumers mobile along with due date. Also it allows the user to get updated regarding the details of power used in his house. Automatic supply tripping and restoring is done if the customer fails to pay the bill. All though there are many other modern techniques of communication. The use of existing power line seems to be the most economical one and readily adaptable system, when compared to the other methodologies. Thus this system proves to be very advantageous as precise consumption information can be easily obtained. Clear and accurate billing is done, without error. Also there is better and faster customer service because of online Payments

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Author Profile



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