



SMART TELEMETERING, TELEBILLING AND TELE- CONDITIONAL ACCESS CONTROL FOR ELECTRICAL SYSTEM

L.SheikAnvar Ali¹, V.Nanthagopal², M.Gokul³, M.Raghu⁴, V.Chandra⁵, V.Revathi⁶
U.G.Student, Department of EEE, Kamaraj College of Engg and Tech, Virudhunagar¹
U.G.Student, Department of EEE, Kamaraj College of Engg and Tech, Virudhunagar²
U.G.Student, Department of EEE, Kamaraj College of Engg and Tech, Virudhunagar³
U.G.Student, Department of EEE, Kamaraj College of Engg and Tech, Virudhunagar⁴
Assistant Professor, Department of EEE, Kamaraj College of Engg and Tech, Virudhunagar⁵
Assistant Professor, Department of EEE, Karpaga Vinayaga College of Engg and Tech, Chennai⁶

Abstract- Automatic meter reading (AMR) is the technology of automatically collecting data from energy meter and transferring to a central database for billing. The embedded microcontroller is interfaced with the GSM module. The controller reads data from the meter output and transferring to GSM module through a serial port. The embedded microcontroller gives the automatic commands to initiate and send message to mobile phones through the GSM module. Mobile is placed in EB office which is the authority office. When they send unit request SMS to the system inside the home, the unit value will be sent to the EB office mobile phone through GSM module. According to the reading output the authority officer sends the bill value and last date of the bill payment. If the customer won't pay the bill, off the corresponding home power unit through the SMS and alarm will be initiated. GSM modem provides full functional capability to serial device to send SMS and data over GSM network. The complaint button is used for customer in house to register their complaint about power supply failure or any faults in their supply line. If any fault occurs at home, the customer will push the button. It will send the signal to the microcontroller. Then the microcontroller sends SMS to the EB office mobile phone through GSM module. Electrical power theft is also identified through GSM.

I. INTRODUCTION

Telemetry is an automated communication process by which measurements and other data are collected at remote or inaccessible points and transmitted to receive equipment for monitoring. Systems that need external instructions and data to operate require the counterpart of telemetry, it also encompasses data transferred over other media such as a telephone or computer network, optical link or other wired communications like power line carriers. Many modern telemetry systems take advantage of low cost and ubiquity of GSM networks by using SMS to receive and to transmit telemetry data. Telecommunications billing is the group of processes of communication service providers that are responsible to collect consumption data, calculate charging and billing information, produce bills to customers, process their payments and manage debt collection. Telecommunications billing is a significant component of any commercial communications service provider regardless specialization: telephone, mobile wireless communication, mobile virtual network operators, internet service providers, transit traffic companies, cable and satellite TV companies could not operate without billing, because it creates an economic value of their business. Hence the application of tele-communication in electric billing system has been well depicted in this proposed work.



Electricity plays a vital role in growth of our country. Even though power production corporations focusing highly on generation, transmission and distribution, they are meeting power loss due to illegal consumption of Electricity board through GSM network. It also deals about the remote monitoring of an energy meter in the proposed system. [7] discussed about a project, in this project an automatic meter reading system is designed using GSM Technology. The embedded micro controller is interfaced with the GSM Module. This setup is fitted in home.

In the field of electrical or electronics current and energy consumption, which may effect on stabilization of the components, are playing an important role. The units are measured by implementing Analog to Digital Conversion (ADC) techniques of the PIC (Peripheral Interface Controller) microcontroller, if any invariance is found tripping device takes the charge there by removing the excess load and invariance. Microcontroller is giving control signals to tripping various equipment provides controlling feature. Output can then be displayed in the LCD (Liquid Crystal Display).

The difference with other existing system is that even transmission line theft can also be detected apart from the meter bypassing. The additional feature of this system is that there is no need of manual interface as the entire system is fully automated and also meter reading also accurately calculated in this system, which overcomes the traditional manual meter reading. requires lot of time.. If any consumer did not pay the bill, the operator needs to go to their houses to disconnect the power supply. These processes are time consuming and difficult to handle. Moreover, the manual operator cannot find the unauthorized connections or malpractices carried out by the consumer to reduce or stop the meter reading/power supply. The human error can open an opportunity for corruption done by the human meter reader. So the problem which arises in the

electrical power from the transmission lines by the consumers. Power theft has become a great challenge to the electricity board. This research paper identifies the power theft and indicates it to

billing system can become inaccurate and inefficient.

II. LITERATURE SURVEY

S.Sukhumar[1] the paper titled as, "GSM BASED AUTOMATIC TRIP CONTROL SYSTEM FOR ENERGY MANAGEMENT". This research paper demonstrates the concept and implementation of automatic trip control system for energy management using Embedded controller and GSM. It mainly focused on industrial purpose. The similar idea can be implemented for domestic areas for avoiding the illegal usage of electricity. It facilitates for vigilance squad to control theft quickly and easily. This proposed work will help in conserving energy so that our nation will be improved.

A.Vijayarajetal [2] the paper titled as, "Automated EB Billing system using Ad-Hoc wireless routing". In this system the central EB office has immediate access to all consumer homes in a locality with the help of the RF system. The EB meter present in each house is connected by wireless network with the EB office which periodically gets updated from the meter. The EB officer using a backend database calculates the amount to be paid according to the number of units consumed and sends it back to the meter for display and also to the users mobile phone.

AbhinandanJain[3] "Smart and Intelligent GSM based Automatic Meter Reading System". Entirely automated energy meter which can be remotely monitoring and controlling, is developed. It continuously monitors the energy meter and sends the data on request of the service provider through SMS. The data received from an energy meter has been stored in data base server

which was located at electricity board station by SMS gateway. Energy provider sends electricity bills either by email, SMS, or post. This system allows the customer to pay bill online either by credit card, debit card or by net banking.

III.METHODOLOGY

A.Flow Diagram

The flow diagram of Smart telemetering, tele-billing and tele-conditional access control for electrical system is shown in the Figure1.

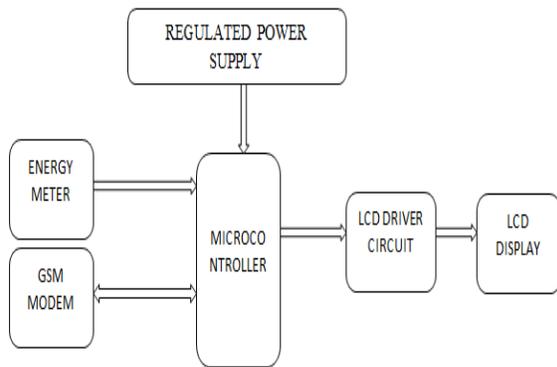


Fig.1 Flow Diagram

B.Block diagram

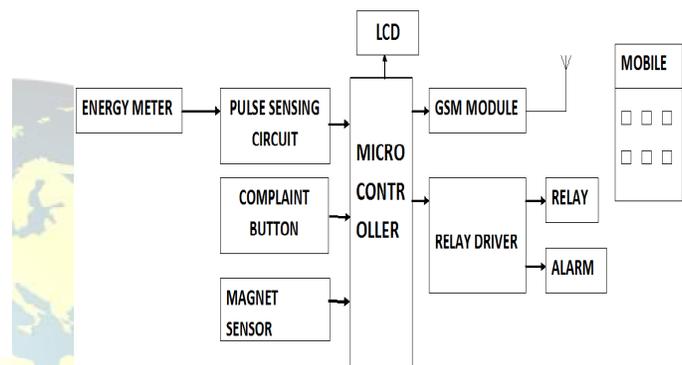


Fig.2 Block Diagram of proposed system

C.Pulse Sensing Circuit

Digital meter output is fed to this circuit. The purpose of this unit is to sense the number of revolutions of the disc rotation. For each rotation, the sensing unit has to produce a pulse. This signal is given to the MCT2E. This block consists of an MCT2E based optocoupler to provide isolation between control circuits and power circuits. An optocoupler allows signal transfer without coupling wires or capacitor. It transducers input voltage to proportional light intensity by using LEDs. This output is fed to the microcontroller as shown in Fig 2.

D. Microcontroller

Here we are using PIC 16F877A micro controller. The PIC 16F877A is a low-power, high-performance 8-bit microcomputer with 4K bytes of Flash Programmable and Erasable Read Only Memory (PEROM).

E.LCD Display:

LCD is mainly used for display the information. Here we are using 2x16 LCD. Operation of the LCD is the declining prices of LCDs. The LCDs are light weight with only a few millimetres thickness. Since the LCDs consume less power, they are compatible with low power electronic circuits, and can be powered for long durations. display. By using backlighting, reading is possible in the dark. The

F.Magnet Switch:

Magnet switch is fitted on the energy meter. It is used to detect the power theft. Normally the reed is 'open' (no connection between the two wires). The other half is a magnet. When the magnet is less than 13mm (0.5") away, the reed switch closes. They're often used to detect when a theft is detected by this system. Then the signal is fed to the microcontroller.



G. GSM MODEM :

Modem (Modulator-Demodulator) is a device that modulates an analog carrier signal to encode digital information, and also demodulates a carrier signal to decode the transmitted information. The goal is to produce a signal that can be transmitted easily and decoded to reproduce the original digital data. Modems can be used over any means of transmitting analog signals, from fault detector circuits. The most familiar example is a voice band modem that turns the digital 1s and 0s of a personal computer into sounds that can be transmitted over the telephone lines of Plain Old Telephone Systems (POTS), and once received on the other side, converts those 1s and 0s back into a form used by a USB, Ethernet, serial, or network connection. Modems are generally classified by the amount of data they can send in a given time, normally measured in bits per second, or "bps". They can also be classified by Baud, the number of times the modem changes its signal state per second.

H. Energy Meter:

The smart energy meter give a consumed units to the user and indicate the units to the user before reaching reference units that reference unit is fixed by the server of main pc at that reference unit .unit rate will be increase so before reaching that point smart meter indicates to the user for this purpose in this system energy meter and GSM network are using. In the power supply unit we used power supply circuit which required to convert AC signal to DC signal and also to reduce the amplitude of the signal. The available voltage signal from the mains is 230V/50Hz which is an AC voltage, but the required is DC voltage with the amplitude of +5V and +12V for various applications.

I. Optocoupler with Relay Driver:

This block consist IC MCT2E based opto coupler to provide isolation between control circuits and power circuits. An opto coupler allows signal transfer without coupling wires or capacitor. It transducers input voltage to proportional light

intensity by using LEDs. Optocoupler not only separates the high voltage input side and the microcontroller but also prevents damage to the microcontroller due to the line voltage transistor. It also reduces the effects of electrical noise common in industrial environments, which cause erratic operation of the microcontroller.

J. Relay:

Relays are switching devices. Switching devices are the heart of industrial electronic systems. When a relay is energized or activated, contacts are made or broken. They are used to control ac or dc power. Electromagnetic relays are forms of electromagnets in which the coil current produces a magnetic effect. It pulls or pushes flat soft iron armatures or strips carrying relay contacts. Several relay contact can be operated to get several possible ON/OFF combinations.

K. Alarm Driver Circuit:

The relay section contains relays and ULN2003driver. The ULN2003 is comprised of seven high voltage, high current NPN Darlington transistor pairs. All units feature common emitter, open collector outputs. To maximize their effectiveness, these units contain suppression diodes for inductive loads and appropriate emitter base resistors for leakage. The ULN2003 has a series base resistor to each Darlington pair, thus allowing operation directly with TTL or CMOS operating at supply voltages of 5.0V. The microcontroller gives a logic high output when required and this logic high output has to drive the alarm.

IV. PROPOSED WORK

The proposed system replaces traditional meter reading methods and enables remote access of existing energy meter by the energy provider. The electricity consumption billing of energy meter along with load control using wireless GSM technology. This is a microcontroller based wireless energy meter PIC16F877A



microcontroller is used for controlling the entire system. This microcontroller based wireless energy meter consists of major components such as GSM modem, microcontroller, relay, load, energymeter, LCD display, power supply circuit, and magnet switch as shown in the fig.7.

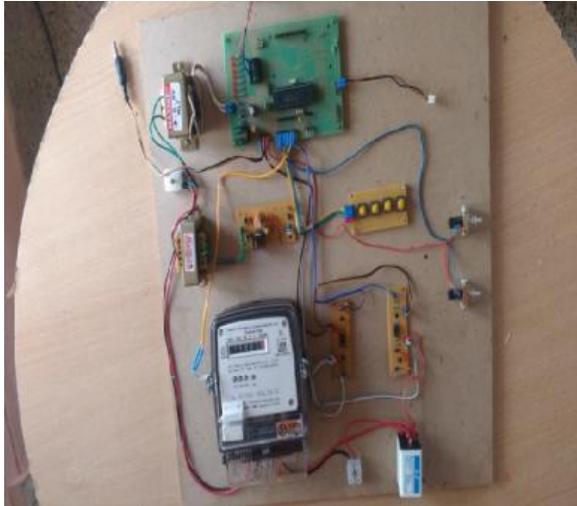


Fig.7 Hardware Implementation

Fig.7 shows the overall block diagram of the proposed work. Energy meter is connected to the pulse sensing circuit which is used to detect the disc rotation. Depending upon the disc rotation generated pulses will go to the PIC (Peripheral Interface Controller) microcontroller. Relay driver circuit is used to connect number of relays. GSM modem is used to interface EB side and consumer side. It is used for sending and receiving SMS. SMS will be sent through the smartphone telemetry. It is also connected with the alarm circuit to indicate about fault condition. It works only after the consumer intimating the message to the EB. If they accept the consumer's request then they send the message to the consumer's GSM and then this message will be sent to the PIC micro controller. This will be indicated in the PIC micro controller. If there is any misuse of programmed PIC microcontroller takes place automatically that information also send to the EB server via GSM network and also by this system we can measure the accurate amount of electricity consumed by the consumer,

which sends automatically to the EB server via GSM network at monthly once. This circuit consists of magnet sensor which is used for detecting theft of electricity.

V. CONCLUSION

A normal electric system comprising of a smart energy meter involving the indication of meter reading has been developed using Global System for Mobile Communication (GSM). This methodology proves to help consumer in a better way for billing and maintaining reduced bill payment and it reduces manual payment of bills. This can be further extended in Industries by interfacing three phase meters

References:

- [1] S.Sukhumar, P.MukeshAravind, L.Manivannan, P.Naveen Kumar and N.SuthanthiraVanitha. GSM BASED AUTOMATIC TRIP CONTROL SYSTEM FOR ENERGY MANAGEMENT Vol. 2, Issue 12, December 2013
- [2] A.Vijayarajetal "Automated EB Billing system using Ad-Hoc wireless routing" published at International Journal of Engineering and Technology Vol.2 (5), 2010, 343-347
- [3] AbhinandanJain "Smart and Intelligent GSM based Automatic Meter Reading System" International Journal of Engineering Research & Technology (IJERT) Vol. 1 Issue 3, May - 2012 ISSN: 2278-0181
- [4] Bharath P, Ananth N, Vijetha S, JyothiPrakash K. "Wireless automated digital Energy Meter", ICSET 2008.
- [5] P.K. Lee and L.L. Lai, "A practical approach to the wireless GPRS on-line power quality monitoring system", Power Engineering Society General Meeting, 2007.
- [6] SubhashisMaitra, "Embedded Energy Meter-A new concept to measure the energy consumed by consumer and to pay the bill", Power System



technology and IEEE Power India Conference, 2008.

[7] Christo Ananth, Kanthimathi, Krishnammal, Jeyabala, Jothi Monika, Muthu Veni, "GSM Based Automatic Electricity Billing System", International Journal Of Advanced Research Trends In Engineering And Technology (IJARTET), Volume 2, Issue 7, July 2015, pp:16-21

[8] Li Kaicheng, Jianfeng, YueCongyuan, Zhang Ming. "Remote power management and meter-reading system on ARM microprocessor", Precision electromagnetic Measurements Digest,2008. CPEM 2008.Conference on Digital Object Identifier.

[9] M.P Praveen, "KSEB to introduce SMS-based fault maintenance system", The Hindu News on 26/06/2011.

[10] Ashna.k PG Scholar, Electronics & Communication Dept. "GSM Based Automatic Energy Meter Reading"IEEE 2013.

[11]ZahidIqbalRana,MuhammadTahirMahmood Waseem,"Automatic energy meter reading using smart energy meter",2014.

[12]A.SaiSuneel,"Telemetry system for utility metering application through GSM network",2013.

[13]M.Leelavathi,K.Ashwin,"Smart energy meter with reading indication using GSM"

