International Journal of Advanced Technology in Engineering and Science
Vol. No.5, Issue No. 06, June 2017
www.ijates.com
ijates
ISSN 2348 - 7550

# GSM BASED AUTOMATIC ENERGY METER READING WITH LOAD CONTROL

**Divyashri D A[1], Farheen Taj[2], Keerthi S[3], Mallaana Gowda[4], B Dodda Basavanagoud[5]**

[1,2,3,4] *8th Sem Students, Dept. of EEE, RYMEC, Ballari (India)*

[5]*Assoc. Prof., Dept. of EEE, RYMEC, Ballari (India)*

## ABSTRACT

*Electrical energy is very important form of energy source in present day to day life. It should be used very practical expediency for its proper utilization. But in India we have lot of position where we have a more than necessary of production of supply for the electricity; still many areas do not have the electrical supply for utilization. Distribution of electrical energy are also responsible for encouragement of utilization because we are still not able to correctly estimate our exact requirements of load by consumers and still power theft existing at a particular time. Most of Consumers have complaints regarding Energy meter errors in their monthly bills. Energy theft is a major problem for the Electricity board, by this Technology implementation the energy Theft completely eliminated. Through GSM metering we can get the Energy consumed every weekly. The Electricity Department (KPTCL) has the authority to read the meter readings whenever they need without a human being visiting each and every house. This type of energy meter reading is done by the microcontroller unit; the micro controller continuously monitors and records the Energy Meter readings in its non-volatile memory location in the micro controller unit. In this Project we are using of a GSM modem for remote monitoring and control of Energy Meter by sending a SMS to the unit.*

**Keywords: -** ***Global System for Mobile (GSM), Digital energy meter, PIC Microcontroller.***

## I. INTRODUCTION

In present scenario the human operator from the electric utility will visit the consumer's houses to take the readings from the energy meter and produces the electricity bill for that particular month manually. If in case the consumer or any of his family members are not available at home then he will keep the produced bill near the meter or he will give the bill to the neighbor, therefore there will be chances of misplacement of the bill. If the customer forgets to pay the bill then the operator will come and cut the power. An operator going to each consumer's house and producing the bill is an effortful work and consumes a lot of time. Especially during the rainy season the work will get more difficult than other days. Therefore to reduce the effort of operator and misplacement of the bill, new technology can be incorporated that is, the GSM based Energy Meter Reading and billing application. Where the data of energy consumption is automatically collected and transferred to a central data base. Central data base server will look after the billing of the consumption, if in case any trouble or malfunction the data can also be analyzed.

An operator should be appointed to visit each customer's house to collect meter reading and produce the bill manually. There will be possibility of misplacing the bills therefore data security will be less. In case consumer does not pay the bill then operator should visit his home and cut the power therefore remote monitoring is not possible. Operational cost will be more because this system needs more man power. Real time meter reading is not possible.

This technology mainly helps the service utility to reduce the expenditure on the workers who will have to visit the customer's place every month and reads meter to produce bill. In this project there will be a process where the energy consumption readings are automatically collected and transferred to a central server database. The collected data later used for billing and troubleshooting if any problem occurs. This data can also be used for analyzing the annual consumption of consumer. Main advantage of this system is to reduce expenses of a service provider company on the persons who should be visiting periodically to the consumer's place for getting meter readings and produce the electricity bill. Another important advantage is that the energy consumption billing is purely based on the real time power consumption by the consumer and not based on past or predicted power consumption. This kind of information which also can be analyzed can help both service provider and customer to have better control and use of electrical energy. Basic idea of this system is to reduce the maintenance costs for service providing organization and creating awareness in consumers regarding their consumption of power, so that if they find anywhere they can save on payment (which also saves electrical energy) they can plan or practice to save money.

## II. BLOCK DIAGRAM OF THE SYSTEM

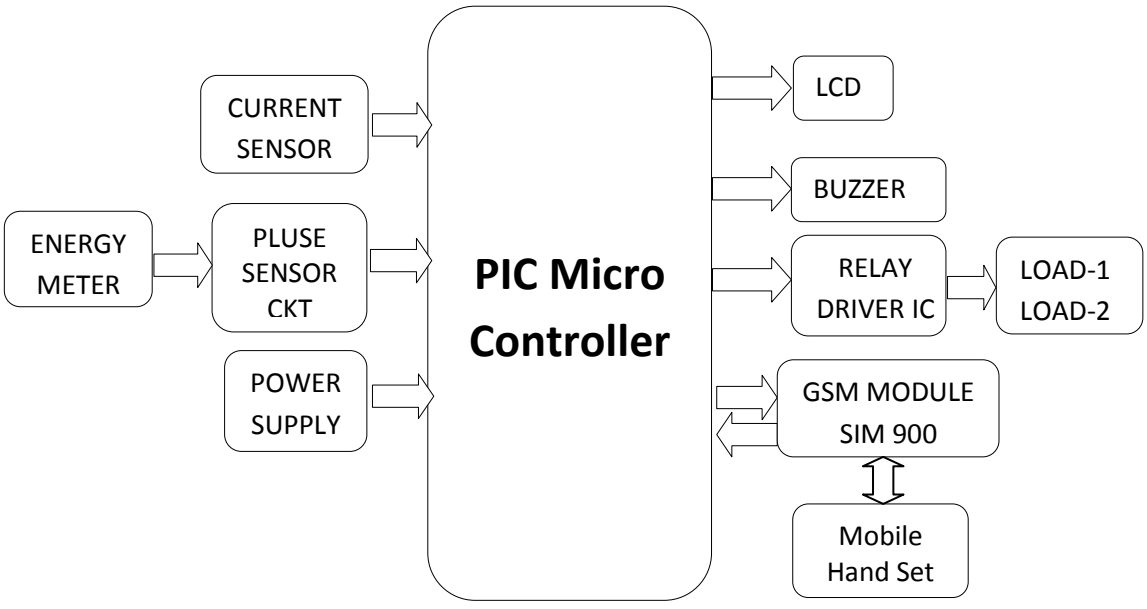


**Fig. 1 Block Diagram of the Module**

**PIC Microcontroller**: Micro Controllers is the Heart of the Circuit. In this circuit we are going to use the PIC16F877A. Microcontroller is programmed to generate automatic EM meter bill and send the bill to the consumer through GSM SIM900 module.

**Power supply:** It is the main part of the circuit; the circuit needs the 12V DC supply. But in our home 230 AC supply is available. So it has converted it to 12V DC and 5V DC by Rectifier circuit by using regulator IC 7812 and 7805 respectively.

**LCD***:* Liquid Crystal Display screen that is RG1602A is an electronic display module and find a wide range of applications. A 16x2 LCD display is very basic module and is very commonly used in various devices and circuits. These modules are preferred over seven segments and other multi segment LEDs. The reasons being: LCDs are Economical; easily programmable; have no limitation of displaying special & even custom characters (unlike in seven segments), animations and so on.

**Relay Driver:** Relay is an electromagnetic device used to separate two circuits electrically and connect them magnetically. They are often used to interface an electronic circuit, which works at a low voltage to an electrical circuit which works at a high voltage. We are using Q3F-1Z 12Volts Electromagnetic relay for load switching operation by using ULN2003AN IC.

**Current Sensor:** A current transformer is defined as "as an instrument transformer in which the secondary current is substantially proportional to the primary current (under normal conditions of operation) and differs in phase from it by an angle which is approximately zero for an appropriate direction of the connections." This highlights the accuracy requirement of the current transformer but also important is the isolating function, which means no matter what the system voltage the secondary circuit need be insulated only for a low voltage.

The current transformer works on the principle of variable flux. In the "ideal" current transformer, secondary current would be exactly equal (when multiplied by the turn's ratio) and opposite of the primary current. But, as in the voltage transformer, some of the primary current or the primary ampere-turns are utilized for magnetizing the core, thus leaving less than the actual primary ampere turns to be "transformed" into the secondary ampere-turns. This naturally introduces an error in the transformation. The error is classified into two-the current or ratio error and the phase error. Thus by considering all these parameters we program micro controllers to calculate the amount of power actually consumed.

**GSM module:** A GSM modem is a specialized type of modem which accepts a SIM card, and operates over a subscription to a mobile operator, just like a mobile phone. From the mobile operator perspective, a GSM modem looks just like a mobile phone.

When a GSM modem is connected to a computer, this allows the computer to use the GSM modem to communicate over the mobile network. While these GSM modems are most frequently used to provide mobile internet connectivity, many of them can also be used for sending and receiving SMS and MMS messages.

This GSM Modem can accept any GSM network operator SIM card and act just like a mobile phone with its own unique phone number. Advantage of using this modem will be that you can use its RS232 port to communicate and

develop embedded applications. Applications like SMS Control, data transfer, remote control and logging can be developed easily.

The modem can either be connected to PC serial port directly or to any microcontroller through MAX232. It can be used to send and receive SMS or make/receive voice calls. It can also be used in GPRS mode to connect to internet and do many applications for data logging and control. In GPRS mode you can also connect to any remote FTP server and upload files for data logging.

This GSM modem is a highly flexible plug and play quad band SIM900A GSM modem for direct and easy integration to RS232 applications. Supports features like Voice, SMS, Data/Fax, GPRS and integrated TCP/IP stack.

The application program for the microcontroller will be written in embedded 'Embedded C'/Assembly and will be stored in the flash memory of the microcontroller.

## III. WORKING PRINCIPLE

The energy meter records the amount of energy consumed by the load. In the older day's electro mechanical type of energy meter are available and now a day's digital energy meter are available. The energy meter mainly works on the current increment in amount of current flow through circuit causes the disc to rotate, means that the rotational speed of disc is directly proportional to the amount of current flowing through circuit. Old type rotation effect of disc type meter causes the gear mechanism to work accordingly and in similar way power consumption by the load is recorded by the micro controller the blinking rate of LED integrated within the meter. Present type of energy meter also had a blinking led for the counting the pulses from this LED are fed to microcontroller for count operation i.e. these pulses are sent to the microcontroller and these readings are stored into external memory of the micro controller. External memory is an EEPROM. This memory is able to store previous Energy consumed as well in case one needs to check present Energy consumed status.LCD is connected with microcontroller, microcontroller sends a message to LCD display unit so that we can view the status of GSM Modem. GSM communicate over wireless systems, GSM modem is connected to the microcontroller unit through MAX 232 IC.GSM modem communicates at RS232 standard voltage levels while µC understands TTL logic levels so MAX 232 serves as voltage level converter. MAX 232 converts the Rs232 voltage levels into TTL voltage levels and MAX 232 converts the TTL voltage levels into RS232 voltage levels. Whenever a message is sent to the GSM modem, it communicates the message to the micro controller and micro controller is responded back as the preset mobile number through the program. At every end of the month energy meter will sends the information about energy consumption details to Central data base server controlling station and station can also seek the status whenever required. From the received data bill is prepared and sent to user from central data base server station. Load is turned off by the electricity department if the customer fails to pay the bills. If user wants to know the status of his current usage of power can also be checked by sending unique code sms to the energy meter and user can also control the loads turn and off by sending sms.

## IV. ADVANTAGES

- Easy billing and remote monitoring of energy consumption can be done by energy department.
- Easily any load can be controlled
- Human metering is avoided
- If bill payment is failed connection is disconnected automatically.

## V. FUTURE SCOPE

The concept can further be extended by integrating a RFID smartcard wherein each card is provided to automatically recharge the amount and send the same information via GSM module to the respective phone number stored.

## VII. CONCLUSION

In this project we are using GSM technology which broadly used worldwide and reliable in nature.

The GSM technology can be used in remote areas also. As the network and communication technology goes on increases our project implementation will be more effective.

In this automatic energy meter reading system is designed to continuously monitor the meter reading and It avoids the human intervention, provides efficient meter reading, avoid the billing error and reduce the maintenance cost.

## REFERENCES

[1]. Ashna.K and Sudhish N George, "GSM based automatic energy meter reading system" IEEE 2013.

[2]. A. Abdollahi, M. Dehghani, and N. Zamanzadeh , "SMSbased reconfigurable automatic meter reading system," IEEE International Conference on Control Applications (CCA 2007),Oct, 2007, pp. 1103 – 1107

[3]. E.g., Minnkota Power's Load Management System, accessed 22 August 2009.

[4]. Eugenii Katz. "Blathy". People.clarkson.edu. Archived from the original on June 25, 2008. Retrieved 2009-08-04.

[5]. W. Bernard Carlson, Innovation as a Social Process: Elihu Thomson and the Rise of General Electric, Cambridge University Press, 2003 ISBN 0-521-53312-0, pages 1 and 258.

[6]. Shallnberger integrating watt meter, with illustration, retrieved 2010 Sep 29.

[7]. "Price comparison website". Retrieved 2010-12-15.

[8]. "Uswitch comparison website". Retrieved 2010-12-15.

[9]. "Residential — Home Energy Audit — Watts Up". Austin Utilities. Retrieved 2009-08-04.

[10]. "Portable Energy Meter". Mge.com. Retrieved 2009-08-04.

[11]. Electronic Energy Prepayment Meter Overview, Nigeria Technology News,http://www.nairaland.com/electronicenergyprepaymentoverview6486487/hrfh

[12]. http://en.wikipedia.org/wiki/electricenergymeter.

[13]. Abhinandan Jain, Department of Electronics &Electrical Communication, PEC University of Technology, Chandigarh, India, Dilip Kumar, Department of Academic and Consultancy Services Division C-DAC, Mohali, India. Jyoti Kedia, Department of Electronics & Electrical Communication PEC University of Technology, Chandigarh, India. Design and Development of GSM based Energy Meter, International Journal of Computer Applications (0975 – 888) Volume 47– No.12, June 2012

[14]. H.G.Rodney, Tan IEEE, C.H.Lee and V.H.Mok, (2007), Automatic Power Meter Reading system using GSM Network. The 8th International Power EngineeringConference, pp. 465 -469

[15]. PHCN: BENEFITS OF THE NEW PREPAYMENT METERS http://www.naijatechguide.com/2012/11/phcn-benefits-of-new-prepayment

[16]. A. Abdollahi, M. Dehghani, and N. Zamanzadeh, "SMS-based reconfigurable automatic meter reading system, IEEE International Conference Control Applications., Oct. 2007.

[17]. Md. Ashiquzzaman, Nadia Afroze, Taufiq Md. Abdullah, Design and Implementation of Wireless Digital Energy Meter using Microcontroller, Global Journal of researches in engineering, Electrical and electronics engineering, Stamford University Bangladesh, Dhaka, Volume 12 Issue 2 Version 1.0 February 2012

[18]. Mr.Rahul Ganesh Sarangle, Prof.Dr.Uday Pandit Khot, Prof. Jayen Modi, GSM Based Power Meter Reading And Control System, International Journal of Engineering Research and Applications (IJERA) ISSN: 2248-9622 www.ijera.com Vol. 2, Issue 4, June-July 2012, pp.664-671

[19]. O.Homa Kesav , B. Abdul Rahim, Automated Wireless Meter Reading System for Monitoring and Controlling Power Consumption, International Journal of Recent Technology and Engineering (IJRTE) ISSN: 2277-3878, Volume-1, Issue-2, June 2012