SMART APPROACH TO ELECTRICITY BILLING SYSTEM

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ABSTRACT
Electricity is one of the basic requirements of human beings, which is widely used for domestic, industrial, commercial and agricultural purposes. There is great demand for electricity and it is increasing day by day, but now a day what happened actually the method for accessing the data from the energy meter and billing is not up to the mark as well as it is time consuming. It is also required a huge manpower to complete this process. Because of that to reduce this huge manpower as well as complications, we exists this system. Our system provides the electricity readings on an LCD screen as well as can SMS this reading and cost in rupees to the user. A GSM modem is also integrated along with the meter to send alerts to the particular consumer regarding their energy consumption. In case of failure of payment by a consumer the controller can disconnect the power supply of the consumer. A PC with a GSM receiver at the other end, which contains the database acts as the billing point.
KEYWORDS: Short Message Service (SMS), GSM, energy meter, visual basic .

I. INTRODUCTION

The energy meter reading is a difficult job where the meter reader has to travel on foot and take the readings from each consumer manually to generate the bill. Also this method of collecting the data becomes problematic and costly when readings have to be collected from vast and often scattered rural areas. So the traditional meter reading is inefficient and there are chances for missing the bills, absence of consumer etc. The picture of traditional energy meter is as shown in figure 1

Figure 1: Traditional Energy Meter

If we automate this process of collecting consumed energy, it will also help to reduce the difficult task. A wireless system will be incorporated with electronic energy meter to have the remote access over usage of electricity. Automatic reading system is an effective way of data collection that allows greater accuracy, frequent reading, improved billing and reduced tempering.

This paper presents a mobile communication technology which enables energy Provider Company to read the meter reading regularly without the person visiting each house by using GSM communication technology. This is very useful for remote area or small villages. This system can be very swift, accurate and efficient. In this system we are also providing the facility of E-mail. The reading which is send to the consumer by SMS this will also send to consumer's E-mail ID through the web based system software. As it is web oriented once the data is updated, the authority can monitor and analyze the generated bill of any month by sitting anywhere in the world.

In this paper, following is the brief introduction of latest Automatic Meter Reading Systems described and summarized. The existing problems and future research directions are also discussed.

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Novateur Publication's
International Journal of Research Publications in Engineering and Technology (ISSN No: 2454-7875)
Conference Proceedings of A National Conference on "Modern Trends in Electrical Engineering"
(NCMTEE-2K17) 27th March 2017

II. LITRATURE SURVEY

With improvement of national power and country's demand and requirements also increases of various entities like power and proper management is also necessary for that the conventional energy metering systems are available. For this work existing meter reading techniques in India are analyzed and conducted an extensive study on different energy measuring instruments available now.

In existing system either an electronic energy meter or an electro-mechanical meter is fixed in the premise for measuring the usage. The kWh units used then still have to be recorded by meter readers monthly, on foot. The recorded data need to be processed by a meter reading company. For processing the meter reading, company needs to firstly link each recorded power usage statement to an account holder and then determine the amount owned by means of the specific tariff in use.

Many systems built on various platforms have been proposed by different research groups all over the world for Automatic Energy Meter. There are two types of AER systems, wire-based and wireless. The GSM channel is a very useful means of communication as sending data as SMS turns out to be a very handy tool, due to its good area coverage capability and cost effectiveness. Different state electricity boards in INDIA started using GSM facility for fault management and so there is increased demand for this method.

III. DESIGN OF ENERGY METER

Figure 2 shows a block diagram of automatic energy meter which is continuously monitor and record the energy units. This can be achieved by using microcontroller. Figure shows that the IC is interface with ADC0804 and LCD. In this GSM is also interface to IC which is used for data transmitting and receiving. In this the current transformer is used for the current measurement. The block diagram also shows the other side which is utility side. The power supply is used to give 5V supply to the microcontroller.
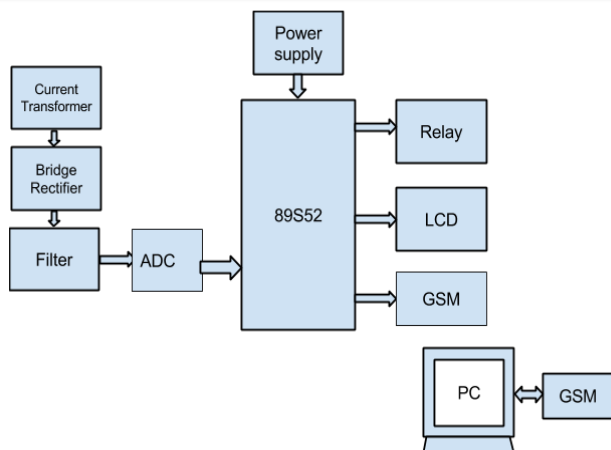

Figure 2: Block diagram of automatic energy meter

A. MICROCONTROLLER

The microcontroller unit in figure 3 is used for controlling of complete AMR system. The AT89S52 is a low-power, high-performance 8-bit microcontroller with 8K bytes of programmable flash memory. The AT89S52 provides 256 bytes of on-chip RAM 8K bytes of flash Memory, 32 I/O lines, two 16 bit timer/counters a full duplex serial port, Six Interrupt Sources, on-chip oscillator, and clock security.
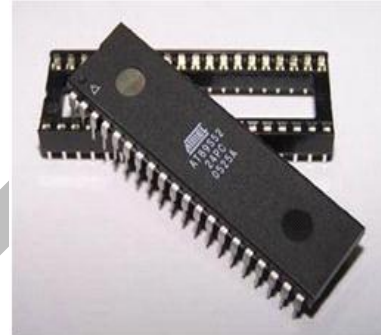

Figure 3: Microcontroller

B. ADC (ANALOG TO DIGITAL CONVERTOR)

In our daily life, anything we deal like sound, pressure, voltage or any measurable quantity, are usually in analog form so what if we want to interface any analog sensor with our digital controllers? There must be something that translates the analog input to digital output, and so analog to digital converters come to play. Usually we call them ADC.

C. LCD (LIQUID CRYSTAL DISPLAY)

A LCD as shown in figure 4 is interfaced to microcontroller that is used to display the meter reading, date, time etc. The 2x16 bit LCD interface card with supports both modes 4-bit and 8-bit interface, and also facility to adjust contrast through trim pot. Liquid crystals do not emit light directly. It is one type of flat panel display.

Figure 4: Liquid Crystal Display

D. GSM

This is a plug and play GSM Modem with a simple interface to the serial interface. Use it to send SMS, make and receive calls, and do other GSM operations by monitoring through simple AT commands to micro controllers and computers. It uses the very popular SIM300 module for all its operations. This Modem has a standard RS232 interface that can be easily connected to any microcontrollers and computers. The modem will include all required external circuitry needed to start experimenting with the SIM300

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International Journal of Research Publications in Engineering and Technology (ISSN No: 2454-7875)
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module as the power control, external antenna, SIM Holder, etc

Figure 5: GSM

E. PC SIDE

From the PC side the authority can analyze as well as control the automatic energy meter which is at the consumer premises. In this the authority can take the data which is consumed units and etc. at any time by using software which is used in this system

F. RELAY

A relay is an electrical switch that uses an electromagnet to move the switch from the off to on position instead of a person moving the switch. It takes a relatively small amount of power to turn on a relay but the relay can control something that draws much more power. A relay is used to control the air conditioner in your home.
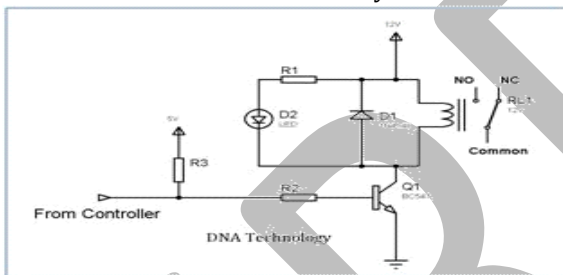

Figure 6: Circuit Diagram of Relay

G. CURRENT TRANSFORMER

Here we have made an electric meter to measure the amount of consumption of electric power. Here the measurement is made by using a current transformer. The current transformer is used to measure the amount of current drawn by the load. At the output of current transformer we have connected shunt resistor so as to convert the current into equivalent voltage. And this reading is gives to the ADC which converts the analog quantity to digital quantity.
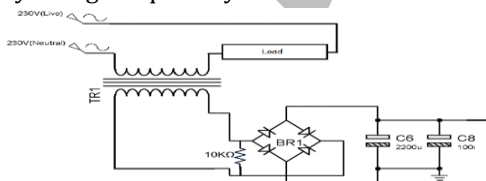

Figure 7: Current Transformer

IV. CIRCUIT DESCRIPTION

The figure 8 shows detailed circuit diagram of energy meter. Here we have made an electric meter to measure the amount of consumption of electric power. In this the measurement is made by simple power circuit i.e. by using a current transformer. The current transformer is used to measure the amount of current drawn by the load. At the output of current transformer we have connected shunt resistor so as to convert the current into equivalent voltage. This voltage is then given to the ADC 0804.

The ADC will perform analog to digital conversion so as to interface the current information to the microcontroller. Here we are using the AT89S52 microcontroller. The AT89S52 provides the following standard features: 8K bytes of Flash, 256 bytes of RAM, 32 I/O lines, two data pointers, two 16-bit timer/counters, a six-vector two-level interrupt architecture, a full duplex serial port, on-chip oscillator, and clock circuitry. In addition, the AT89S52 is designed with static logic for operation down to zero frequency and supports two software selectable power saving modes.

This microcontroller will receive the data information from ADC and will then give it to the PC where the PC will log the data details into PC. On the other side of PC is connected to GSM modem which continuously tracks the received message. The LCD is also interfaced with the microcontroller. The LCD is used to show the consumed units as well as the rate per unit to the consumer.

The PC will keep the data of the current consumption of the loads and previous consumption and then will transmit the data to other GSM modem when requested i.e. when the message is received from the other GSM modem, it will forward the details of the consumption to the requested number.

To power up the circuit we have used the power supply PCB which consists of rectifier to convert the 12 V AC from transformer secondary into pulsating DC. This pulsating DC is then given to the Filter capacitor of 2200uf value so as to filter out the pulsating DC into pure DC voltage. This filtered output is then given to the input of 7809 regulator which will provide +9V regulated output to the circuit. A relay is an electrical switch that uses an electromagnet to move the switch from the off to on position instead of a person moving the switch. It takes a relatively small amount of power to turn on a relay but the relay can control something that draws much more power. A relay is used to control the air conditioner in your home. The AC unit probably runs off of 220VAC at around 30A. That's 6600 Watts! The coil that controls the relay may only need a few watts to pull the contacts together. The +9V regulated output is then given to the microcontroller PCB which has a 7805 regulator to provide +5V regulated power supply and we are driving all the integrated chips through this +5V.
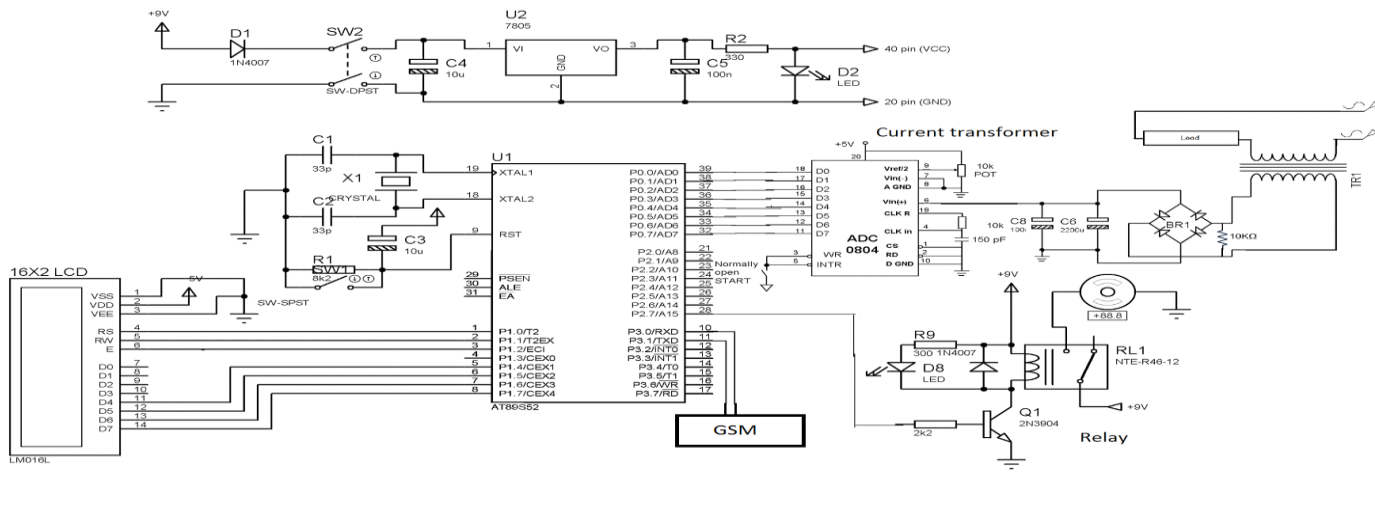
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Figure 8: Detailed Circuit of energy meter

V. RESULTS

figure 9 shows the another feature of this system the system will send the energy bill to the consumer's email ID, this is done by using visual basic software which is totally depends on the web.
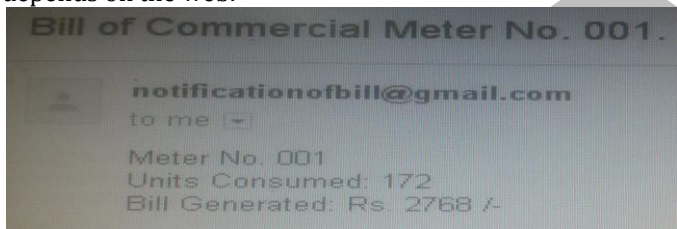

Figure 9: Energy bill sent to consumer's mail ID

Figure 10 shows the SMS sent to the consumer mobile, the consumer mobile no. is saved in the database of the utility. In this SMS the total consumed units as well as billing information.
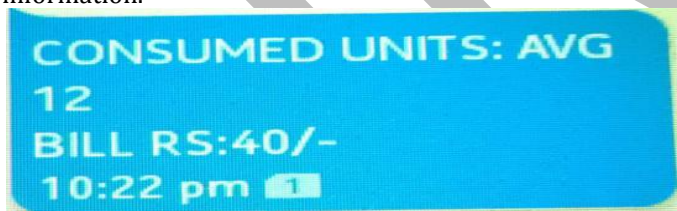

Figure 10: Energy bill sent to consumer's cell phone

Figure 11 shows the database detail of this system which is at utility side on PC. By using this database the utility can generate the bill and automatically block and unblock the meter when the consumer's bill is not paid.
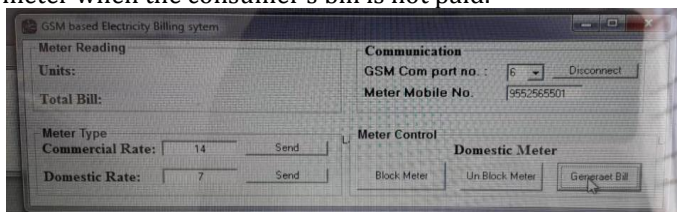

Figure 11: Database details

Figure 12 shows the generated the bill of particular consumer by taking the consumer meter mobile number. By clicking on to generate bill it will gives the information about that consumer. This is all about done by using GSM.
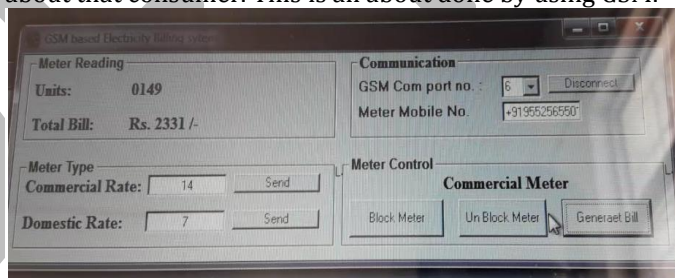

Figure 12: Energy bill generated from PC side

VI. CONCLUSION

In this paper, we are maintaining the greater accuracy and stability in our system. Energy distributers are generating instant billing and even controlling of loads if the dues are not cleared by using GSM. We can control our energy meter for both domestic purpose and industrial purpose from the utility side.

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