

Smart Energy Meter Using GSM

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Abstract

This paper focuses on developing a smart energy meter which eases the work of human. In early days this metering technology was fully analog. Due to rapid technological developments nowadays it has become digital but not fully automatic it too needed a huge human work force. The above mentioned two techniques have a lot of drawbacks like erroneous and needed a lot of time for repair, gives faulty unit readings, the second one gives readings digitally with some accuracy but cannot be sent to the billing point directly. It needed a lot of human work force regularly to take readings. The GSM technology introduced here eliminates all the above mentioned drawbacks by fully automating the energy meter .i.e. the meter readings are taken and sensed automatically and sensed units are regularly sent to the billing point using the GSM and corresponding bills are calculated and sent to the user at the correct time. It reduces the time, it reduces the human work force, will give accurate readings. This system replaces traditional energy meter reading methods and enables remote accessing of existing energy meter by the energy provider. They can monitor the readings regularly without visiting the person's house.

Keywords: *Smart energy meter, GSM technology and Automation.*

INTRODUCTION

Electric power has become indispensable to human survival and progress. Apart from the efforts to meet the growing

demand, automation in the energy distribution is also necessary to enhance people's life standard. Traditional meter reading is inefficient to meet the future

residential developmental needs. So there is increased demand for Automatic Meter Reading (AMR) systems, which collect meter readings electronically and its application is expanding over industrial, commercial and of the analog and mechanical nature of the components in these meters.

Collection of meter reading is also in efficient because a meter reader has to physically be onsite to utility environment. Traditional electro mechanical meters used today, are prone to drift over the temperature.

This method of collecting of meter readings becomes more problematic and costly when readings have to be collected from vast and often scattered rural areas. The older electro mechanical and present electronic meter readings are taken by the persons involved in the job and the amount is noted down in the EB card, this may consume lot of time and doubtlessly require many persons and the consumers may be out if station. Apart from being a boon (AMR) wipes out all the cons of conventional systems.

AMR is a sophisticated system which allows companies to note down the

readings and calculate bills without visiting the site.

AMR includes various techniques like GPRS, SCADA, PLC, RF, Radio frequency, GSM, etc. But among these GSM is the best technology available since it has numerous numbers of users and gives a good range for the data to be transmitted. It helps the consumer and energy service provider to access accurate data and updated data from the energy meter.

This data is sent to the central system for trouble shooting and calculation process. This system can be a postpaid and a prepaid one. The data used for billing are stored in the server for updating and for later use. The data which is calculated and stored in the server can be accessed and analyzed very accurately. The generation of bill is done according to the set up amount for each unit.

The units which are received through the GSM modem are stored and multiplied by the amount such as 5 for each unit and multiplied and the amount is calculated and sent to the consumer through the recognized phone number.

This generated bill can be paid and accessed from anywhere around the world as the GSM is widespread all over the world. This technology holds good for IT parks, commercial buildings, industries.

The development of GSM over the past two decades has made the energy metering wireless. The GSM infrastructure which has nationwide coverage is used to request and retrieve power consumption notification over individual houses and flats.

OBJECTIVES AND SCOPE OF THE STUDY

1. The concept of AMR has attracted a lot of consumers since it is more advantageous and more useful one for today's life.
2. This system in future can be extended to the water and gas meter reading systems. In future this project can be extended to the wide number of states and also it can be made to work for three phase power supplies.
3. Then web portals can be added to extend the idea to the worldwide energy providers. Power factor improvements can be added.

LITERATURE REVIEW

Design of electric energy meter for long distance data information transfers which based upon GPRS

With the popularization of internet in China as GPRS service improved increasingly electric energy meter transmits the data information and controlling command remotely and wirelessly based on the current electric energy meter with the well functioned ARM kernel microprocessor, it not only finishes the power data measuring and processing, but also realizes the TCP/IP by cutting. By ARM kernel microprocessor controlling GPRS module, electric energy meter could be linked to the internet by use of GPRS service.

The overall system is stable and reliable because it is managed by mu C/OS-2 operating system. This is especially for some outlying areas where the cable network has not been popularized.

Automatic power meter reading using GSM network

The development of a GSM automatic power meter reading system consists of GSM digital power meters installed in every consumer unit and an electricity EB link System at the energy provider side.

The GSM digital power meter is a single

phase IEC61036std compliance digital KILOWATT power meter with embedded GSM modem which utilize the GSM network to send its power usage reading using short messaging system back to the energy provider wirelessly.

At the power provider side an EB link system is used to manage all received SMS meter reading, compute the billing cost, update the database and to publish the billing notification to its respective consumer through SMS or email.

A working prototype of the GAPMR system was built to demonstrate the effectiveness of automatic meter reading billing and notification through the use of GSM network.

Electronic meter with instant billing

It presents the design of the simple low cost wireless GSM energy meter and its associated web interface , for automatic billing and managing the collected data globally .The proposed system replaces traditional meter reading methods and enables remote access of existing energy meter by the energy provider.

A GSM based wireless communication module is integrated with electronic energy meter of each entity to have remote

access over the usage of electricity .A PC with a GSM receiver at the other end which contains the database acts as the billing point.

live meter reading from the GSM enables energy meter is sent back to this billing point periodically and these details are updated in a central database.net framework and c# with proper authentication ,users can access the developed web page details from anywhere in the world. The complete monthly usage and due bill is messaged back to the customer after processing these data.

Embedded energy meter-A new concept to measure the energy consumed by the consumer and to pay the bill

A new concept of energy meter is shown, where maximum demand of energy of a consumer will be indicated in the meter used by the consumer after exceeding the maximum demand the meter and hence the connection will automatically be disconnected by an embedded system inserted in the meter itself.

According to the maximum demand the consumer will purchase a cash card of amount depending on the consumption of energy and after the full consumption the consumer again has to purchase another

cash card or recharge the same and thus the hassle related to go to the billing office to stand in a long queue and to submit the bill can be avoided. Also this system helps to eliminate the drawback of billing management system such as to take the reading from the meter to create the bill, to print the bill, to send the bill to the proper address and to collect the amount for the bill.

Hence this system can effectively reduce the manpower required to a greater extent. Also a new concept of distributor has been dealt here which is used to disconnect a line if the energy consumption per day of a consumer greatly exceeds pre demand energy consumption per day

PROPOSED MODELLING

Design of AMR

AMR is a method of automating the prevailing energy metering system. It uses the components which will last long and which are less prone to temperature variations and which have a good lifetime.

The main components of this technique are as follows:

- a) Digital energy meter
- b) Current sensor.

These two components are mainly required to sense down the readings automatically for the applied load. The energy meter which works digitally will have a LCD display showing down the voltage, power, current etc., to note down all the values clearly and also they are shown on the screen for better accuracy. Then if the load is applied the current will be sensed by the current sensor which will have its own regulators. Then these sensed units of current can be sent to the billing point by the following means.

The AMR system consists of four main subassemblies namely

- a) Load
- b) Sensing point
- c) Microcontroller
- d) Printed circuit board
- e) GSM modem

The PCB controls the electrical inputs and outputs to the circuits provided. The load is applied here which consumes the current and ensures the working of energy meter for the acquired units. The sensing point includes the current sensor, voltage sensor etc to automatically sense the units acquired by the applied load.

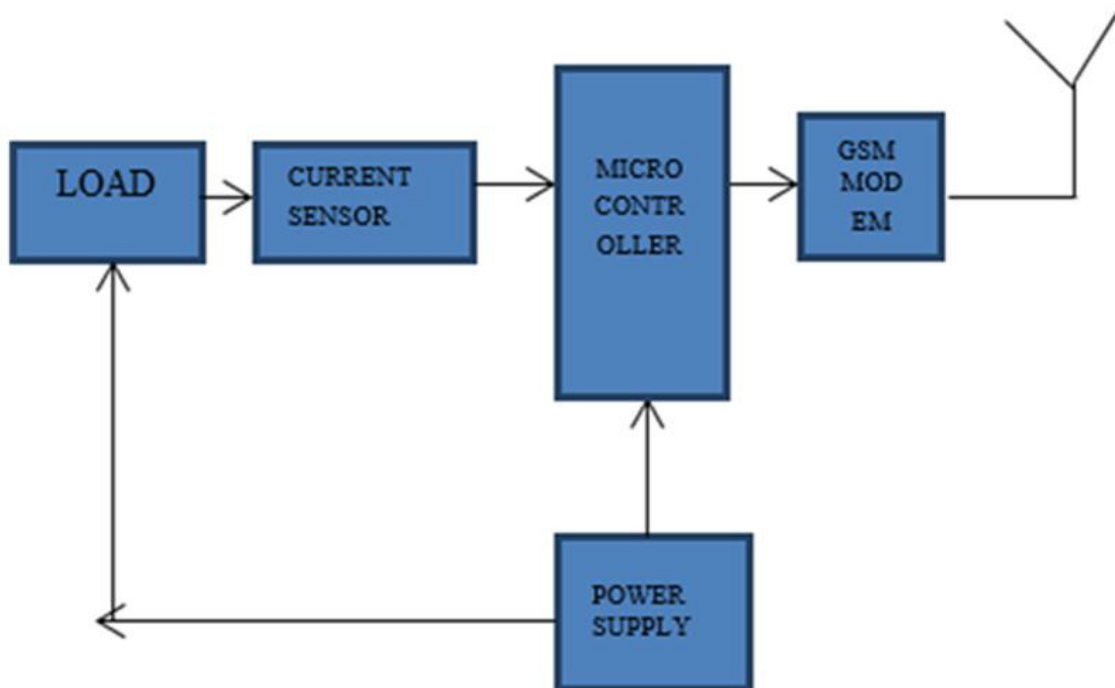
Working of AMR

The proposed system is composed of a sensing unit, transmitting unit and billing unit. The system consists of load, current sensor, PIC controller and GSM modem. The load is made to run such that it automatically consumes the current. Then current sensor is used to sense the amount of current being consumed by the load. Then this is interfaced to the billing point through the GSM modem.

The load applied consumes some amount of current this is sensed by the sensor which gets the current value from the meter, 3600 pulses per second or 16 units

of power is kept as a single unit. Then this is sent to the microcontroller unit wherein these values are used for the calculation of the bill .to calculate the bill for a particular user GSM modem and a web page is created for all of the consumers. There the microcontroller periodically collects the values from individual users and calculates the bill by the amount set for a single unit. This bill is sent to the users mobile number regarding the used units and the amount periodically and also checks the status of the consumer. By this way it eases the work of EB department and also the consumer's.

SYSTEM ARCHITECTURE



Block Diagram of AMR

This architecture consists of the components mainly needed for the automation of the already prevailing energy meter. It just needs the supplementary components circuits to support the automation .the main components.

CONCLUSION

The described system is to achieve the smart energy meter automation using GSM technology. Sensor systems are used to sense the various values. In this module current sensor is used to measure the value of the current consumed by the applied load. The PIC is used to get the values from the sensor as a digital one. The PIC is programmed in such a way that it accepts data according the time set up. Then RS232 is used for the serial communication of data asynchronously since synchronous leads to a tedious process.

This data which is carried is sent to the GSM modem which is present at the billing point and sends the information called the calculated bill to the respective consumer of that data. This reduces risk since it reduces the human intervention. And it also reduces the problems caused by Serial communication. Various

electronic meters have been developed and are still being developed. However the use of GSM in this particular system provides numerous advantages over methods that have been previously used.

Data transmission is charged at standard SMS rates. Transmission of readings to the billing point is also very much cost efficient. The system does the elimination of drawbacks like even though it miss out the message acknowledgement it does not affect the system performance. It reduces safety risks since human intervention is minimized.

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