

GSM Based Automated Meter Reading With Bill Payment Facility

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Abstract: The prime objective of the project is to design a digital energy meter using GSM and card reading technologies for collection, communication and integration of the data. The main objective of ours is to integrate the GSM module and the debit card reading console with the digital energy meter so that the electricity bill delivery and the same bill payment is made easier. In order to integrate the various parts together we must first properly understand the working of the different parts to be integrated together. A brief study is done on the components and the technology which we are going to use in our project.

Keywords: GSM modem, Microcontroller, Digital energy meter

I. Introduction:

The underlying aim of every technology is to ease human efforts as far as possible, so with that objective in mind we set off to achieve another such goal. With the help of this device of ours, in addition to the electricity bill delivery, the electricity bill payment becomes easier and time saving, as for in this busy world of ours time plays a crucial role.

An electricity meter or energy meter in simple terms would be a device that measures the amount of electric energy consumed by a residence, business houses, or an electrically powered devices or appliances. Electricity meters are typically calibrated in billing units, the most common one being the kilowatt hour [kWh]. Periodic readings of electric meters establish billing cycles and energy used during a cycle, the cycle generally extending for a month.

The kind of Energy Monitoring System which we are making is appropriate for Industries, manufacturing plants, commercial Buildings or any situation where an electrical system is used. The system provides the centralized Power Monitoring and Control for the electricity department and easy bill payment for the customers. The Energy Management System leads to savings in the overall cost. These savings may be from better utilization of manpower, no data tampering and time saving both for the customers as well as for the energy providers.

II. Digital Energy Meter

The Indian power sector faces a serious problem of revenue collection for the actual electric energy supplied due to tempering of energy and network losses. One of the reasons is the traditional billing system which is inaccurate many times, slow, costly, and lack in flexibility as well as reliability [1]. The upcoming digital energy meters are aimed at rectifying this particular problem of data tampering.

A Postpaid Energy Meter extracts power data and sends electricity bills to the consumers within duration of a month. The meter has the capability of Automated Meter Reading along with the ability to exchange information with the suppliers and consumer pertaining to customer's consumption details. A paper suggests the designing of an Energy meter using ATmega32 to which the input is given by using an energy meter IC [2]. Another article suggests a design of a system which can be used for automatic power meter reading using GSM [3]. Yet, another report suggests making of an energy meter using PIC microcontroller integrated to a GSM module [4].

Digital power and energy meters in recent times are capable of frequency analysis, redefining the old metering concepts and uncertainty due to the inability of old metering equipment. They can be overcome only if the measured quantities are defined for the prevailing non-sinusoidal conditions. The separation of fundamental power components from the other parts of the apparent power causes some advantages and disadvantages in a metering [5].

III. Transmission Module

The technology used for the transmission of data is GSM which has a higher data rate transmission and is more secure. There are various benefits of GSM which includes wide network coverage, lower power consumption, cost effectiveness and reliability [6]. The digital energy meter reads the energy consumed and after a period of time generates a bill and sends it to the customer as well as to the energy provider [7].

Wi-Fi, ZigBee and 3G technologies can also be used for transmission of metering information but has not been widespread because of the well known disadvantages like the installation of such facilities and access points to cover the designated areas and thus does not provide a cost effective solution in the present practical world [8, 9].

The microcontroller, in energy meters also has to take care of parameters which have to be set on to the modem before

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connecting to their GPRS network as every mobile network has its own set of parameters which include Access Point Name (APN) and Access Number. The AT+CGDCONT command is used to set the APN and Packet Data Protocol (PDP) type as IP on the modem [10]. After that, ATDT*99# command is sent finally to connect with network.

IV. Reception Module

The information sent by the GSM module can be easily received by the customer on his cell phone but for the service provider it cannot be done in the same way as for the service provider has to keep track of all the data logs of different customers. For this reason it becomes necessary to keep a digital record of all the data so the information has to be stored in the computer system. In order for the GSM module to send the information to the computer an interface system is necessary which will receive the information sent from the energy meter and provide it to the server computer. Working of the interface system is to collect data and send it to the server using GSM and each interface system is capable of two-way communication [6].

The transmission of data from the energy meter can also be done with the help of the internet with help of an interfacing module which will extract the data from the energy meter and send it to the energy providing company without the tampering of the original data [11].

V. Proposed methodology

The proposed technique would be of a digital energy meter which can send the bill of the customer directly to the cell phone of the customer as an SMS and also when he has to pay the bill he can pay it via the meter itself with the swiping of his debit card against the card reader followed by his secret code.

Based on the review, it was found that integrating the GSM module is a complex process as for the output of the energy meter has to be transferred to the GSM module and not only that, a real time counter has to be maintained which triggers the GSM at the end of every month to send the message to the customer as well as to the energy providing corporation. This whole process is taken into care by the microcontroller. Having the GSM integrated with the energy meter, we then shift our entire focus onto integrating the meter with the card reader and a number pad having keys via which we can enter the debit card information.

A card reader has to detect the debit card by which the customer will pay the bill. The card reader will then be connected in such a way that when a card is swiped against the swiping console and the secret pin being entered, the card reader sends the card information to the microcontroller which then sends the data along with the secret pin being achieved from the number pad, to the revenue department via GSM. And once the card information is received by the electricity department server the card information is then verified with the respective banks and the required fund is transferred to the revenue department of the energy provider

accompanied by an SMS to the customer acknowledging the payment. Thus the customer can pay up the electricity bill from his comfort zone without having to stand in the long queues.

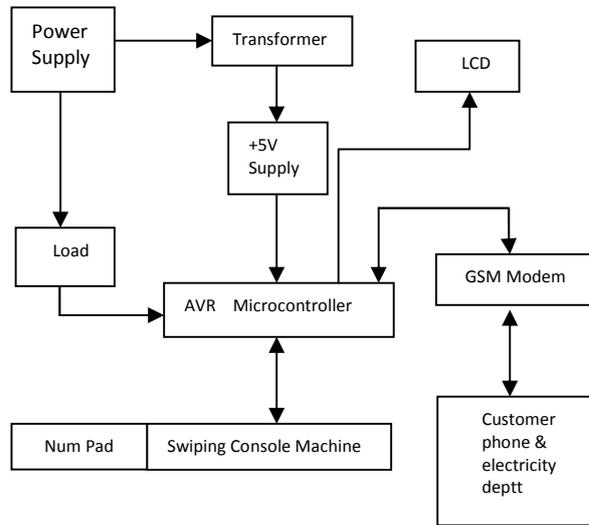


Fig 1: Block Diagram of digital energy meter with bill payment facility

One thing which has to be kept in mind is the encryption of the card information before sending over the GSM to the electricity department. The same decryption technique has to be adopted in order to decode the information.

The overall block diagram of the proposed system has been shown in the fig 1.

VI. Conclusion

If such a technology is developed then the conventional electricity bill payment procedure in India would be made simple. As witnessed a customer has to spend long hours standing in the queue waiting for his turn to pay the bill. But with this technology the customer has to suffer no such inconvenience. The customer can easily know his bill in his mobile phone at the month's end via an SMS and can pay his bill using his debit card without having to go anywhere, using the card reader embedded energy meter from his household's perimeter. Also, this technology can be further broadened to other bill payments such as water bill, newspaper bill etc.

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VII. Reference

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