

SMART METER: A GSM BASED PREPAID ENERGY METER

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Abstract: This paper proposes an idea about the development and designing of a prepaid GSM based energy meter system by which we can monitor the consumption of electricity at domestic level and if the electricity bill is not paid on time, this system will automatically restrict the supply of electricity. The proposed system also helps in reduction of usage of electricity and minimizes the power thefts. This system uses GSM technology to send information about power consumption through message on phone. An automatically alert message will be sent to the consumer if the power consumption reaches the minimum amount. In our system we have used digital meter in place of analog meter. The digital energy meter used here is of single phase power meter, high accuracy, and low cost. As humans are more prone to errors so this automated system helps to reduce huge amount of human work.. This system works with more versatility, more accuracy, and with least error. This paper contains the construction and implementation of a system involving hardware to control electrical and electronics systems. This system can be used in electricity distribution companies for good energy conservation and management.

Keywords: GSM, MICROCONTROLLER, ENERGY METER, LCD

I. Introduction

The GSM based energy meter system is much efficient than the present system of electric energy billing system which is very time consuming. The electricity department officials need to go to every household to measure energy consumption, note down the meter readings and then calculate the billing amount. But in the proposed system, this issue is resolved. The consumer can make the advance payment for electricity consumption without the need of visiting the department. A smart card is issued to the consumer which keeps a track of the electricity consumption. As soon as the amount reaches a specific limit, the system alerts the consumer that the meter has reached the maximum limit. If the consumer doesn't recharge the system, the electric supply for the particular household will be cut off. This solves the problem of electricity wastage and thefts[1].

II. Advantages of the system

The present electrical system requires the power department officials to move to the individual houses, take the readings, prepare the bills and then distribute the bills. This requires a lot of labor and long working hours. The proposed system of billing is an innovative solution to the problem. This mechanism requires the customer to pay for the electricity before consuming it. In this way, the customer holds the credit amount and then uses the electricity until the credit expires. Before the credit expires, the consumer gets an alert and if the consumer doesn't recharge the amount, then the electricity supply is cut off. [2] Thus paying a way to electricity conservation by reducing the unnecessary usage of the power and reduction of the power thefts. This makes the prepaid system more efficient and innovative than the current power system.

III. Procedure

The system consists of an LCD, a microcontroller, a GSM module and the energy meter as the key components. The microcontroller is connected with the GSM module on one side and the energy meter on the other side. A prepaid card or a smart card is used in the GSM module. The card is recharged with the required amount. It is given as an input to the microcontroller.[2] The microcontroller is programmed in a way that as soon as the recharged amount gets consumed, the power supply gets cut off using a relay. Using a GSM module, a message is sent to the consumer about the number of power units consumed and the total cost. At the same time, the LCD will display the information regarding the power consumption.

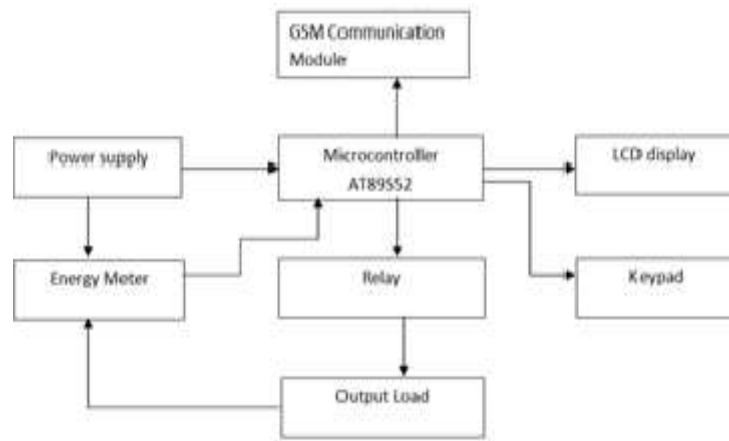


Fig 1 Block Diagram

The various steps to be taken into consideration are:

1. The smart card is inserted into the programmer.
2. The current bill is calculated using unit per watt and consumed units.
Current bill= Unit per watt* consumed units
3. The calculated bill is then deducted from the total balance present.
4. The power supply is stopped as soon as the recharged amount is used up.

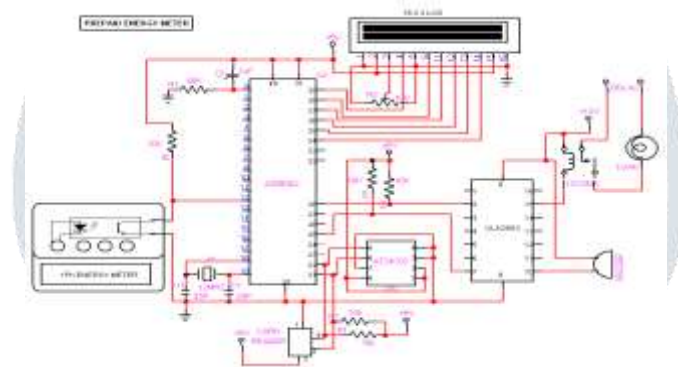


Fig 2 Circuit Diagram

IV. Working

The microcontroller At89S52 is the main controlling component. The micro-controller is interfaced with the energy meter as well as the smart card. The smart card used here acts as a switch. It is inserted in the GSM module and gives the information about the number of units consumed. The energy meter also gives the reading of the number of units consumed. [3] The smart card reading and the energy meter reading is compared to each other using the microcontroller. The microcontroller will act in two ways depending upon the result. If the credit is low, then it will activate the alert buzzer and simultaneously trigger the relay if the credit goes very low. The relay used here acts as a switching device which controls the on and off of the power supply. If the power supply is cut, it will be supplied again only when the card is recharged again. The microcontroller is also interfaced with the LCD using parallel port connection. The main function of the GSM module is to establish the communication with the user or consumer. It is serially connected with the micro-controller. The GSM AT command is used in the programming which helps to recharge the smart card.



Fig 3 Project Design

V. Conclusion

A prepaid GSM based energy meter system can help to conserve energy and reduce the power thefts. The switching ON and OFF of the power supply depends upon the simple technique of recharging the smart card.

It is consumer friendly system and cost effective.

Its installation is easy and benefits the consumer and the energy providing department as well.

Such innovations provide faster payments and create awareness regarding the wastage of power and will eventually tend to reduce it.

It doesn't include any human interference, provides accurate meter readings and decreases the cost.

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