Gsm Based Automatic Energy Meter Reading with Load Control & Theft Protection

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Abstract— The main objective of project is to develop a prepaid energy meter with load control and meter theft protection. Present system still uses the conventional methods for getting the data of energy consumed by the customer which cannot accurately measure the energy consumed by customer and theft occurs and the data need to be collected manually for billing purpose on consumption of power which increases the overall cost of power consumption of consumer and makes system uneconomical and system is not optimized.

Key words: GSM- Global system for mobile, Automatic meter reading (AMR) System, Radio Frequency

I. INTRODUCTION

Electricity is one of the vital requirements for sustainment of comforts of life. It should be used very judiciously for its proper utilization. But in our country we have lot of localities where we have surplus supply for the electricity while many areas do not even have access to it. Our policies of its distribution are also partially responsible for this because we are still not able to correctly estimate our exact requirements and still power theft is prevailing.

On the other hand consumers are also not satisfied with the services of power companies. Most of the time they have complaints regarding statistical errors in their monthly bills. Thus we are trying to present an idea towards the minimization of technical errors and to reduce human dependency at the same time. With the help of this project we are aiming to receive the monthly energy consumption from a remote location directly to a centralized office. In this way we can reduce human efforts needed to record the meter readings which are till now recorded by visiting every home individually.

This results in considerable loss of human hours and also provides considerable details regarding the average consumption of a locality so that power supply can be made according to these data. This will help the officials in deciding the specifications of transformers and other instruments required in power transmission.

This idea is economically efficient as well because we can get the meter reading at a very low cost. The implementation is done in such a way that a SMS is delivered to the Modem whose reading is to be noted and the load is controlled by the electricity department. LCD is connected with microcontroller, microcontroller sends a message to the GS module and system is not optimized.

A. Working

In the older day's electro mechanical type of energy meter are available and now a day's digital energy. The energy meter records the amount of 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 through the program. The load is also controlled by sending the message to the GSM modem, it decodes the message and load is controlled by the electricity department. 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, in case of non-payment of electricity bills a dedicated modem with SIM card is required for each energy meter.

II. BLOCK DIAGRAM

Fig. 1: GSM based energy meter reading with load control

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preset mobile number if the customer fails to pay the bills. If the meter is tampered immediately the GSM modem sends SMS to the control station of the electricity department to avoid power theft.

III. POWER SUPPLY FOR MICROCONTROLLER
The circuit diagram of power supply is shown in the figure. The function of each circuit component is explained below. The circuit consists of following circuit components.
1) Transformer
2) Rectifier
3) Filter and
4) Regulator
A. Transformer
In this project we are using 12V-0-12V. The output of the transformer is 12V AC which is connected to the diodes for rectification purposes.
B. Rectifier
It converts AC voltage signals into DC voltage signals. The output of rectifier circuit is not a pure DC sign wave signal, these signal having small amount of harmonics in it.
C. Filter
output of the rectifier containing harmonics present in the line this is filter by the filter circuit, these circuit employs electrolytic capacitors.
D. Regulator
In this project we are using the three terminal Voltage regulators IC of 7805 is used for providing output DC voltages.

IV. CIRCUIT DIAGRAM

Fig. 2: GSM based energy meter reading with load control. The working circuit is explained in detail at the block diagram.

V. SOFTWARE USED
A. Keil Compiler
KEIL Micro Vision is an integrated development environment used to create software to be run on embedded systems. It allows software to be written either in assembly nor in C programming languages and for that software to be simulated on a computer before being loaded onto the microcontroller unit. We are using the C programming software.

μVision3 is an IDE (Integrated Development Environment) that helps write a program, c compile and run embedded programs. It encloses the following components:
- A project manager.
- A make facility.
- Tool configuration.
- Editor.
- A powerful debugger.

VI. COMMUNICATION INTERFACE
To send SMS we need communication interface between the energy meter and database server. So we have GSM Network technology for communication.
A. GSM (Global System for Mobile Communication)
GSM has been the backbone of the phenomenal success of mobile communication in the previous decade. Now at the dawn of true broadband services, GSM continues to evolve to meet new demands. GSM is an open, nonproprietary system with international roaming capability. GSM is a cellular network which means that compatible devices connect to it by searching for cells in the immediate vicinity. There are five different cell sizes in a GSM network: Macro, Micro, Pico, Fenton and Umbrella cells. The coverage area of each cell varies according to the implementation environment. Macro cells can be regarded as cells where base station is installed on a mast or building above roof top level. Micro cells are those in which base station is installed below the average roof top level. These are typically used in the urban areas. Pico cells are the cells whose coverage area is a small and mainly used indoors. Fenton cells are cells designed for use in residential or small business environment and connect to the service provider’s network via a broadband internet connection. Umbrella cells are used to cover shadowed reasons of smaller cells and fill in the gaps in coverage between those cells. The modulation used in GSM is Gaussian Minimum Phase Shift Keying (GSMK), a kind of continuous phase frequency shift keying. In GMSK the signal to be modulated on the carrier is first smoothed with a Gaussian low-pass filter prior to being fed into a frequency modulator which greatly reduces the interference to nearby channels.

VII. APPLICATIONS
Electricity board persons able to communicate with the energy meter through the GSM modem. Try to do the Energy theft in the meter it send an message to electricity board GSM unit, If Payment due disconnect of the supply at the consumer end through the energy meter. It reduce the man power, Consumer can get the Exact unit consumed by the meter. This system will be helpful for remote area where requirement of power is in certain time of day and the power wastage is very low as fixed required power is supplied on demand the meter is protected using electromagnetic alarm system.
VIII. CONCLUSION

This project is designed to make the billing procedure less time consuming and cost effective. Its highly accurate and fully automated with theft protection of meter. This project requires low maintenance and reduces the cost of the manpower.

The main objective of project is to develop a prepaid energy meter with load control and meter theft protection. Present system still uses the conventional methods for getting the data of energy consumed by the customer which cannot accurately measure the energy consumed by customer and theft occurs and the data need to be collected manually for billing purpose on consumption of power which increases the overall cost of power consumption of consumer and makes system uneconomic and system is not optimized.

The reading on energy meter is send to the cell phone of the user by message through GSM Modem. Our proposed method will automatically send the data of the digital energy meter to the service provider with the help of the GSM modem once in a day or changes can be made using coding as per requirements and hence the system will generate a report and send to the service provider once in a day through SMS.

REFERENCES


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