

GSM Based Prepaid Energy Meter

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ABSTRACT

In the present time, intelligent management is adopted in each field like communication, home appliance, medicine etc. Unfortunately, the service suppliers of electricity are still using the traditional methods for obtaining the data of energy consumed by the consumer. The traditional method of energy meter billing is a obsolete, inefficient and time consuming one. Technology of e-metering (Electronic Metering) has undergone through technological advancements and there is hyperbolic demand for a reliable and efficient system i.e. Automatic Meter Reading (AMR). The design of a simple low cost dual mode wireless GSM based energy meter and its associated features will make the metering job easier. The proposed system replaces conventional meter reading methods and enable remote access of existing energy meter to the energy provider. It also enables the energy provider to monitor the monthly meter readings without visiting each house. A GSM based wireless communication module allows the consumer for the pre purchase of electricity which is done by the means of recharge. The balance get updated on the consumer account then as the energy is being consumed the amount gets deducted from the account balance. This system also stores the data on cloud and provide real time consumption of energy. Hence this system has been designed keeping in view the system which is of paramount importance. This mode of the system provides flexibility to the customer to pay his bills and helps the energy provider by removing the problems of unpaid bills and human error in meter readings which ensures the justified revenue for the utility.

Keywords : Energy meter, Microcontroller (Arduino Uno), GSM module, Wi-Fi module

I. INTRODUCTION

From the past several years electric meters which are the billing interface between utilities and consumers have undergone several advancements. The conventional electro-mechanical metres are being replaced by new electronic meters to enhance the accuracy in meter reading. In the existing system, electricity meter reading for electricity usage and billing is done by human operators by moving from home to home and building to buildings. This requires large number of workers and long working time to achieve complete area data collection and billing. The readings collected by human operator are prone to reading error as in some houses electric meter is placed where it isn't easily accessible. Sometime the billing job is also restricted and slowed down by bad environmental condition. Paper billing has the tendency of losing within the post box. The increased development in residential housing and industrial buildings in the developing country such as India require more human workers and longer working hours to complete the usage reading task. To reduce such problem the GSM based smart energy meter is being designed. Through the prepaid based smart energy meter the consumer can pre-purchase the electricity by means of recharge. This mechanism requires the user to pay for the electricity before its consumption. The consumer can recharge its SIM card with a certain amount then as the energy is being consumed the amount gets deducted from the account balance.

The electricity meters are being calibrated in billing units, the most common one is the kilowatt hour[kWh]. The amount gets calculated from the number of units which is being consumed with the price set for the one unit. This system also stores the data on cloud and provides the real time consumption of the energy. Through this the consumer can monitor its real time data from anywhere. The kind of Energy Monitoring System which we are making is appropriate for production plants, industries, commercial buildings, residential houses or any situation where an electrical system is used. The Energy Monitoring System leads to savings in the overall cost. These savings could be used for better utilization of manpower, no data tampering and time saving both for the customers as well as for the energy providers. This system has features in it which can prove helpful to the consumer as well. Therefore, this proposed system will be a boon to the electricity department and the consumer. It will bring a high level of automation and will improve the overall efficiency of the energy metering system which suffers from various drawbacks.

II. LITERATURE REVIEW

Vishal Devaliya, Ajaysinh Chauhan, Feni Faldu, Kapishawar Mishra, Sourav Choubey (Dec 2018). This paper present a new concept of energy meter where maximum demand of energy of a consumer will be indicated in the meter used by the Consumer. After crossing the limit, the meter and the connection will be automatically disconnected by embedded system inserted in the meter itself. The system proposed mainly focus on the usage of the electricity by consumer. The system provides restriction on the usage of electricity when the consumer reaches its limited usage. The limitation on the usage is been set on the system and the limit can be changed accordingly [1].

Mitalee Nagvekar, Megha Mane, Sandip Zade (March 2018). In this paper the authors discuss the concept where the meter reading can be displayed on the VB Application to the service provider and for consumer Android App is designed through which the bill is calculated and a message is sent to the user. In this system the user can monitor only monthly reading from the Android application and can track the monthly bill through message only. This system does not provide any bill payment method through the application. The system uses two different applications for the consumer and service provider [2].

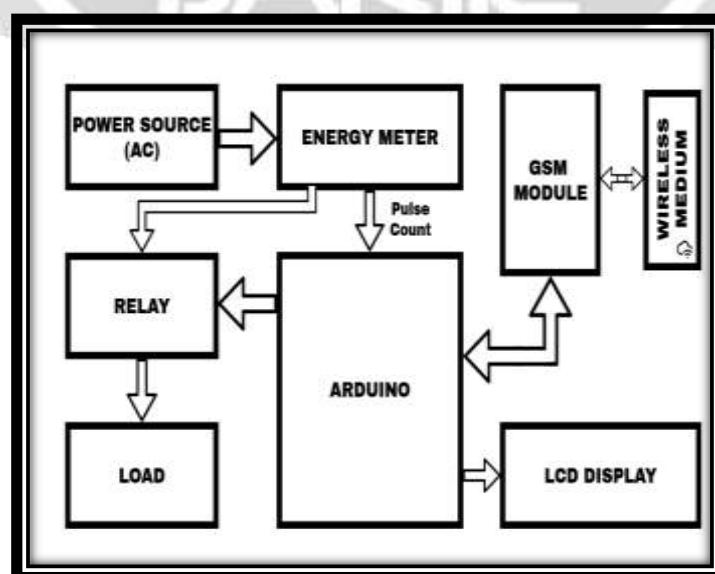
Gopal, Devendra Kumar Pandey, Brijesh Kumar Dubey (March 2019). In this paper the authors discuss about the Global System for Mobile (GSM) technology in which the consumer would receive messages about the consumption of power (in watts) and if it reaches the minimum amount, then it will automatically alert the consumer to recharge for further usage. This automated billing system for smart energy meter leaves a little scope for disagreement on the consumption and billing [3].

Mishra Annapurna, Avinash Kumar, Gautam Kamran, Chetan Chaturvedi, Ravi Kumar (2018). In this paper the authors discussed about the GSM modem that utilizes the GSM network to deliver the equivalent unit for the recharged amount to the Arduino and alerts the consumer about low balance. In this system if the balance goes below the threshold value then relay cut off the power supply [4].

III. EXISTING SYSTEM

The present meter reading is done manually by moving towards the consumer location. Due to this method large number of labour operators are required and they require long working hours to accomplish the required task. Manual billing is restricted sometimes and delayed due to bad weather conditions. The printed billing can also get misplace by the consumer. The traditional method requires more cost for accomplish the task and this method is outdated, inefficient and time consuming. The present system which is used is too complicate. Man power is also required for cutting off the electricity of those customer who has not paid the bill.

IV. PROPOSED SYSTEM



Working:

- The Microcontroller (Arduino UNO) reads the data i.e unit consumption in run time.
- The Pulse is counted from the energy meter with the help of Arduino UNO.
- With the help of optocoupler the connection between Energy meter and Arduino UNO is established.
- In Energy Meter for 1 unit of energy (kWh) consumption, it generates 1000 pulses in LED, i.e. 1 Pulse is equal to the 1 watt of energy.
- The Load is Connected with the help of relay.
- The energy Consumption unit is displayed on the LCD display.
- All the Data is Collected and it is Stored on the cloud.
- The User can monitor the real time data anytime.
- With the help of GSM module, the consumer can recharge its SIM card with a certain amount and as the energy is being consumed the amount gets deducted from account balance .
- Authority can log in for bill analysis of any collected data.

V. SYSTEM REQUIREMENT

1. Energy meter: The meter which is used for measuring the energy utilization by the electric load.
2. GSM Module: A GSM module is a circuit or chip that is used to establish the communication between a mobile device or a computing machine and a GSM system.
3. WiFi Module: It is a module by which we can easily connect a wireless internet access interface to any microcontroller based design on its simple connectivity through Serial Communication.
4. Display Unit (16x2 LCD): Display the energy unit consumption.
5. Arduino UNO: The Arduino Uno board is a microcontroller based on the ATmega328.
6. Relays: Relays are switches that open and close circuits electronically.
7. Transistors: It can work either as an amplifier or a switch.
8. Optocoupler 4n35: Optocoupler is an electronic component that transfers electrical signals between two isolated circuits by using light.
9. Resistors: It is used to reduce current flow, to divide voltages, to adjust signal levels, bias active elements and terminate transmission lines among other uses
10. POT: A potentiometer is a manually adjustable variable resistor with 3 terminals which is used to Control display brightness
11. Connecting Wires: It provides medium to an electrical current so that they can travel from one point on a circuit to another.
12. Power Supply: It is an electrical device that supplies electric power to an electric load.
13. Electric Bulb: A bulb is an electric light with a wire filament heated until it glows.
14. Bulb Holder: It is a device that holds the bulb
15. SIM card: It is an integrated circuit that is intended to securely store the IMSI number and its related key which are used to identify and authenticate subscriber on mobile telephony devices.
16. Cloud Platform: It is a part of cloud computing service which includes applications that let the users to create and manage their own accounts.

VI. CONCLUSION

The conclusion has been proposed that a smart meter which takes advantage of the GSM/ GPRS network that has virtually access to every household and area across different countries can be used as a smart solution for reducing human efforts and maximizing the efficiency for an energy provider. GSM based energy meter is easy to install and beneficial for both energy provider and consumer. AEBGS not only solve the problem of manual meter reading but also provide additional feature such as automatic generation of energy bill, informing customer when and how summary of the energy consumption by him/her. This can help energy provider to use manpower in other needed areas. Now, energy provider would not have to worry about the bill generation and meter reading process. Everything will be done automatically. This will also make sure that there is no hampering in the units consumed at the time of reading as it may happen in case of human involvement. Moreover, with some additions, this system is designed with a feature of automatic cut off, if the balance goes below the threshold value then the power supply gets automatically cut. The service provider don't have to worry about the older dues as prepaid process is used in the system. Also it can facilitate the customer with information about current bill details, status of line, current meter readings and many more. The consumer and service provider can monitor the real time consumption on the cloud. Let's conclude with that in this rapid growing world of technology this device will play a very important role in coming future.

VII. REFERENCE

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