

RFID Based Electricity Billing and Cut-Off System for Energy Through GSM

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Abstract:

The aim of the paper is to minimize the queue at the electricity billing counters and to restrict the usage of electricity automatically, if the bill is not paid. The paper also aims at proposing a system that will reduce the loss of power and revenue due to power thefts and other illegal activities. The work system adopts a totally new concept of "Prepaid Electricity". The GSM technology is used so that the consumer would receive messages about the consumption of power (in watts) and if it reaches the minimum amount, it would automatically alert the consumer to recharge. This technology holds good for all electricity distribution companies, private communities, IT parks and self-containing housing papers.

The prepaid meter is important in making the consumer having sense about his/her energy consumption which is important in eliminating the difficulties facing the electrical utility employee in getting the reading of the conventional electromechanical meter and eliminating any error incurred in bills issuing. This paper is aimed at developing a prototype

of a management system for a prepaid electrical power meter. The designed energy meter consists of an RFID reader, a microcontroller, a digital meter and a wireless gateway. The proposed prototype metering system consists of two parts: clients and server. An RFID reader is used to read the ID of the credit card and a PC connected to a hardware simulated circuit which is designed and implemented to simulate the operation of the digital meter. The server is located in the local substation which receives the card's ID from clients and sends ID's information back to the client after checking and/or updating the database.

. The implementation of this paper will help in better energy management, conservation of energy and also in doing away with the unnecessary hassles over incorrect billing. The automated billing system will keep track of the real time consumption and will leave little scope for disagreement on consumption and billing

Keywords:

Energy meter, GSM technology, Microcontroller LPC 2148, RFID system

Introduction:

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about the consumption of power (in watts) and if it reaches the minimum amount, it would automatically alert the consumer to recharge. This technology holds good for all electricity distribution companies, private communities, IT parks and self-containing housing papers. The implementation of this paper will help in better energy management, conservation of energy and also in doing away with the unnecessary hassles over incorrect billing. The automated billing system will keep track of the real time consumption and will leave little scope for disagreement on consumption and billing.

About RFID:

The roots of radio frequency identification (RFID) technology can be traced back to World War II. Radio-frequency identification (RFID) is an automatic identification method, relying on storing and remotely retrieving data using devices called RFID tags or transponders. The technology requires some extent of cooperation of an RFID reader and an RFID tag.

An RFID tag is an object that can be applied to or incorporated into a product, animal, or person for the purpose of identification and tracking using radio waves. Some tags can be read from several meters away and beyond the line of sight of the reader.

The British developed the first active identify friend or foe (IFF) system. They put a transmitter on each British plane. When it received signals from radar stations on the ground, it began broadcasting a signal back that identified the aircraft as friendly. RFID works on this same basic concept. A signal is sent to a

transponder, which wakes up and either reflects back a signal (passive system) or broadcasts a signal (active system).

RFID today is the popular wireless induction system. The RFID System consists of

- ✓ At least one RFID antenna for RFID reader,
- ✓ An RFID reader,
- ✓ RFID tags.

Each RFID tag in the system is given a unique ID. The RFID tag is composed of two essential elements: designed antenna and an RFID chip. Some RFID tags also equip memory. The antenna of the RFID tag is designed and used to absorb the electromagnetic wave for the power supply of the RFID tag and communicate with the RFID reader.

In addition, according to the size and design of the antenna, the induction distance between RFID tag and RFID reader will be limited.

The Advantages of RFID Over Bar Coding

1. No "line of sight" requirements: Bar code reads can sometimes be limited or problematic due to the need to have a direct "line of sight" between a scanner and a bar code. RFID tags can be read through materials without line of sight.
2. More automated reading: RFID tags can be read automatically when a tagged product comes past or near a reader, reducing the labor required to scan product and allowing more proactive, real-time tracking.
3. Improved read rates: RFID tags ultimately offer the promise of higher read rates than bar codes, especially in high-speed operations such as carton sortation.

4. Greater data capacity: RFID tags can be easily encoded with item details such as lot and batch, weight, etc.

5. "Write" capabilities: Because RFID tags can be rewritten with new data as supply chain activities are completed, tagged products carry updated information as they move throughout the supply chain.

Existing System:

The paper is designed for reading electrical energy consumed in units and in rupees to display on an LCD screen to the user. This data is also provided to the electrical department using Zigbee technology for billing purposes. Owing to high electricity cost these days it becomes necessary for the consumer to know as to how much electricity is consumed to control electricity bill within his budget.

Proposed System:

In existing system we are using Zigbee protocol for billing purpose, it can operate on shorter distance so that to improve the performance purpose we are using GSM technology instead of Zigbee, by using GSM we can easily send the information to the users with SMS.

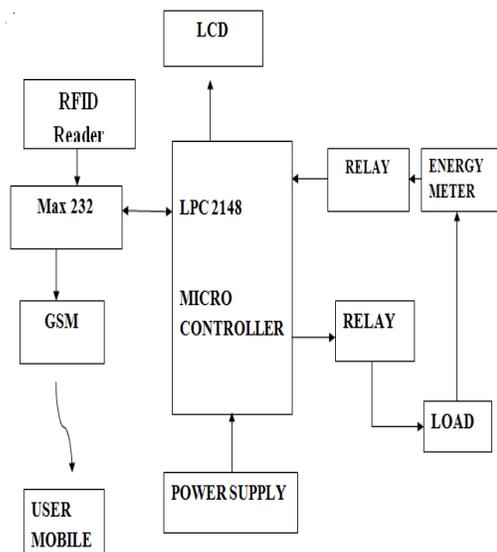
Advantages of proposed methodology over existing methodology:

The present power usage reading is made manually by moving to the consumer locations. This requires large number of labor operators and long working hours to accomplish the task. Manual billing is sometimes restricted and delayed by bad weather conditions. The printed billing also has the tendency of getting lost. Over the last few years, Smart (Prepaid) Energy Meter has been proposed as an innovative solution aimed at facilitating affordability and reducing

the cost of utilities. This mechanism, essentially, requires the users to pay for the electricity before its consumption. In this way, consumers hold credit and then use the electricity until the credit is exhausted. If the available credit is exhausted then the electricity supply is cutoff by a relay. Readings made by human operators are prone to errors. This paper addresses the above mentioned problems. The development of GSM infrastructure in past two decades made meter reading system wireless. The GSM infrastructure, which has national wide coverage, can be used to request and retrieve power consumption notification over individual houses and flats.

Apart from making readings using GSM communication, billing system is needed to be made prepaid to avoid unnecessary usage of power. The use of Prepaid Energy meter is still controversial. On the one hand, those that support the diffusion of prepaid meters claim that they benefit both consumers and utilities because they help users to consume more efficiently and to improve the management of their budget, while allowing firms to reduce financial costs.

BlockDiagram:



Description:

The paper is designed for reading electrical energy consumed in units and in rupees to display on an LCD screen to the user. The data is also provided to the electrical department using GSM technology for billing purposes. Owing to high electricity cost these days it becomes necessary for the consumer to know as to how much electricity is consumed to control electricity bill within his budget.

The proposed system replaces traditional meter reading methods and enables remote access of existing energy meter by the energy provider. Also they can monitor the meter readings regularly without the person visiting each house. A GSM based wireless communication module disintegrated with electronic energy meter of each entity to have remote access over the usage of electricity. In system, the consumer will get his energy consumption data on real time basis on a LCD display. The same data is sent through GSM modem to the electricity department via SMS. A microcontroller of ARM7 family is

interfaced to the energy meter to get the Watt Hour pulses.

The microcontroller then processes these pulses according to the program written in it, to calculate the units consumed and cost involved. Further it gives command to the SIM loaded GSM modem for sending the data to the electricity department via SMS.

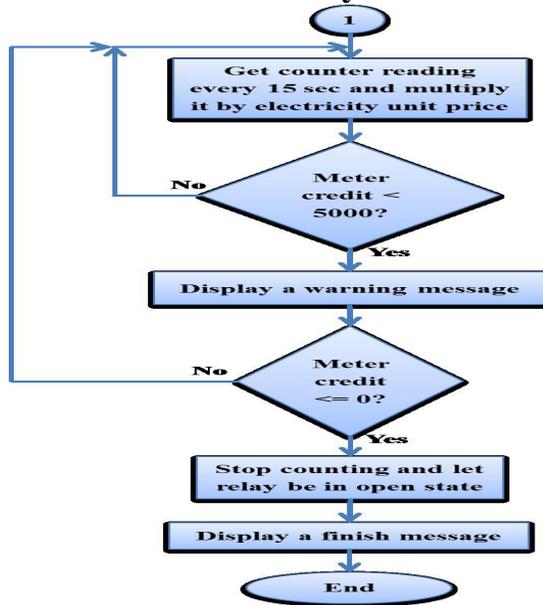
Working:

The Microcontroller LPC 2148 acts as the primary controller. The primary controller collects information from energy meter as well as from the smart card. Here, switches are used instead of the IC. Smart card, which is the switch, gives information about the limitation of units. The energy meter reading is compared with the smart card information by the microcontroller. Depending upon the result, the microcontroller will activate the buzzer if the credit is low and the Controller will trigger the Relay if the credit goes very low. The relay is the switching device to cut off and restore power supply.

The LCD is interfaced to microcontroller using parallel port connection. The microcontroller based system, continuously records the readings. The coding emphasizes the fact that it reduces human labour but.

The GSM modem is serially connected with the controller which is the major communication module between user and meter. The GSM uses its own network for the transfer of information. The programming makes use of messaging features of GSM AT command. And, once the relay is triggered, the electricity supply will be cut off. The power will be supplied again only if the meter is recharged with enough credit.

Flow Chart of RFID System:



Conclusion:

The proposed prototype electricity prepaid metering system used RFID technology as recharging method. During the design of the prepaid metering system, a PC is used to connect with RFID reader instead of a microcontroller to manage all steps of the system. A microcontroller must be used and testing for functionality, efficiency and further effects must be done carefully before introducing the system in a real-life.

The design of Smart Energy meter using GSM technology can make the users to pay for the electricity before its consumption. In this way, consumers hold credit and then use the electricity until the credit is exhausted. If the available credit is exhausted then the electricity supply is cutoff by a relay. An arrangement is also made to intimate the user with the help of GSM communication module when their credit in their balance goes low. This

system has been proposed as an innovative solution to the problem of affordability in utilities system. Since a microcontroller based system is being designed, the readings can be continuously recorded. This reduces human labour and at the same time increases the efficiency in calculation of bills for used electricity.

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