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Prepaid Electricity Meter using GSM Module

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ABSTRACT

The antiquated approach for depositing of bills for consuming of electricity results in undesirable faults and wastage of time. So this paper represents the prepaid electricity meter using GSM Module to facilitate power utility and minimize the labor work. Prepaid electricity meter can be used for monitoring of undeveloped and control household energy meter. This technique gives the data about the recharge amount of the consumer and stops the energy supply when the amount of balance goes below than the threshold value.The data gets delivered and received by concerned energy Provider Company by the GSM network. The body which gives the supply receives the reading within few seconds without visiting consumer. Prepaid electricity meter reduces the number of regular visits. Prepaid electricity meter not only decreases labor cost but also increase meter reading efficiency and save a huge amount of time.In traditional method, faults are inevitable at every stage of depositing bill. Some faults are human errors at the time of noting the meter reading and while processing the paid bill .The research paper elaborates and describes the utility of prepaid electricity meter which is advantageous for the consumer to manage energy usage, to minimize faults and bill processing.

Keyword: *GSM, Prepaid Electricity Meter, Energy.*

1. INTRODUCTION

The prepaid electricity meter concept is a driving energy to the enhancement of electricity meter.In the past year's many efforts had been made to the energy meter with improved billing method but till now the invented energy meters are not up to the mark. [1], [2] The number of energy consumers is increasing at an alarming rate. It has become typical to provide such a huge amount of energy. Maintenance of the power is an important task as the human operator goes to consumer's house and produces the bill as per the meter reading [3], [4]. The energy meter billing process is time-consuming if the user is not in the house while taking readings on energy consumption. It requires a lot of time and more labor to analyze energy consumption and generating the bill. If the consumer is unable to pay the bill then the foreman has to approach to the consumer's house. This consumes time and difficult to handle. The manual operator cannot find the Un-authorized connections or malpractices carried out by the consumer to reduce or stop the meter reading/power supply [5]. The energy meters which were invented in the past required a smart card for its proper functionality. The demerit of that method is that it needs internet and the computer interface [6].

In this paper, we propose a method which uses the GSM Network which eliminates the need for internet. "A Prepaid Energy Meter" system consists of Energy Meter and the GSM network.GSM modem utilizes the GSM network to deliver equivalent unit for the recharged amount to the Arduino and alerts consumer about the low balance. In the energy provider side, this system is used to update the consumer account and the database.Prepaid electrical meter facilitates the user to use the energy if the balance is more than the threshold value. The system first gets recharged by a certain amount and allows to use only limited units of energy as per recharge and then cut off the supply when the balance goes below the specified particular value.The Prepaid electricity meter is widely used to provide a neoteric more modified electrically billing system where the users revitalize when they intend to use the facility .It also consist of GSM module that allow the operator to revitalize the meter with the help of an SMS message .This puts forward an innovative electricity billing and eliminates the need for manual electricity meter reading task.

2. METHODOLOGY

- The program is started.
- The Prepaid number is recharged for a certain amount and can be given as input to the AURDINO UNO.
- 3.The AURDINO UNO is programmed such that power supply will be switched off by using a relay when the recharge amount gets exhausted.

- The GSM communication module is used to alert about the balance in the account of the user.
- 5.If the balance reaches the threshold amount, there will be automatic generation of low balance alert.
- 6 Display of the amount of balance is done by LCD.

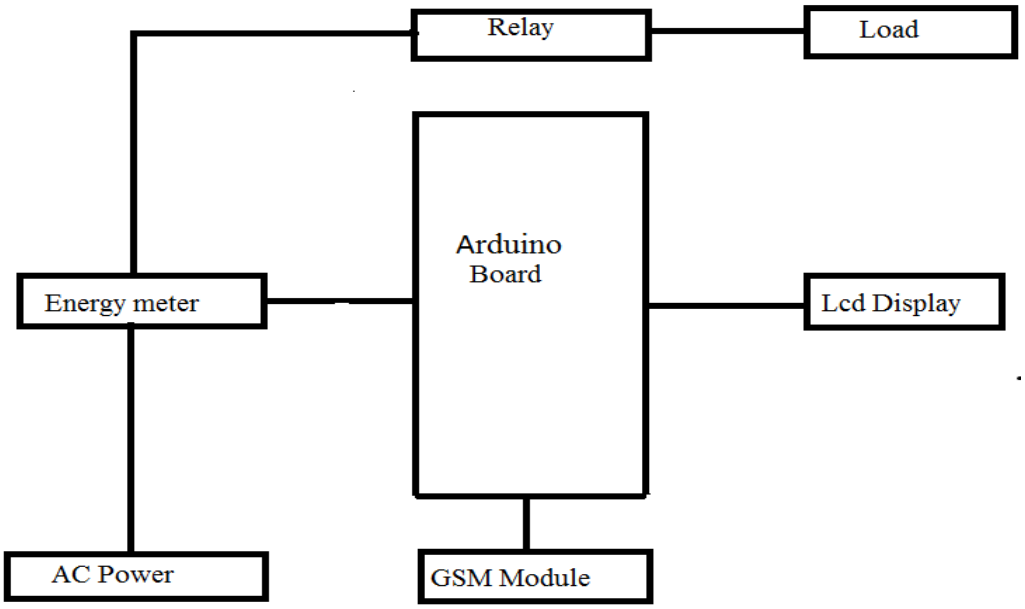

Fig.1. Basic Block Diagram of Prepaid Electricity Meter

3. CIRCUIT REQUIREMENT

The components required for the implementation of prepaid electricity meter are following:

- Analog electricity meter: It is used for measurement of the energy in watt-hour. . The energy meter reading is compared with the data in prepaid card by the Arduino.
- Arduino Uno: The Arduino UNO acts as the controller. The controller collects information from electricity meter as well as from the prepaid card. Relying upon the aftermath, the Arduino will activate if the amount of balance is below the threshold value.
- Relay: The relay is the switching device to terminate and return power supply.
- 16x2 LCD: It is interfaced to Arduino using the parallel port connection. The Arduino based system continuously records the reading.
- GSM Module: .The user can be notified about the low balance in their credit with the help of the GSM module. The GSM module is sequentially joined with the controller which is the major conversation module between user and meter. The GSM uses its own network for the relocation of data. And, once the relay is provoked, the power supply will be terminated. The electricity will be reestablished only if the balance is recharged above the specified threshold value.
- Optocoupler 4n35: This device is used to interchange signals but they remain electrically segregate. It is used to establish a connection between the pulses LED of energy meter to Arduino.
- LED: They are light emitting diodes applied at Arduino and optocoupler to make secure the right continuation of the pulse.

- Implementation
- The electricity energy meter is linked with Arduino using the pulse LED of the electricity meter.
- The LED has fine adjustment is connected to Arduino via an optocoupler 4n35.
- When the Prepaid electricity meter is derived by power up then Arduino examines the past amount of capital stored in EPROM and re-establishes them into the variables then checks the amount of the available balance with a predefined value and opts steps in consonance to it.
- If the amount of balance of consumer is more than 15rupees then Arduino activates the power with the help relay.If the amount in balance of consumer goes below than rupees 15 then Arduino delivers SMS to consumer about low balance alert and requesting to recharge as soon as possible and if the amount of balance goes below than rupees 5 then Arduino will terminate electricity supply.

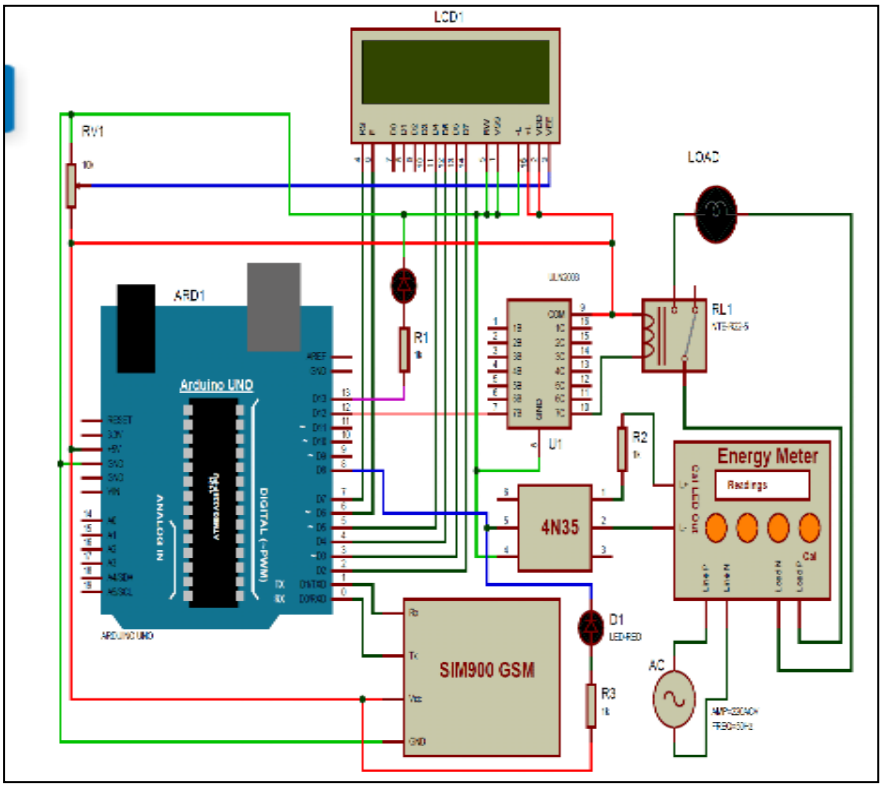

Fig. 2. Internal Block diagram of Prepaid Electricity Meter

4. RESULT

The exerted prepaid electricity meter with GSM module is depicted in the figure. The project asserts a system that will derogate loss of power and overhead due to power thefts and other unauthorized activities. The work system adopts a totally neoteric apprehension of "Prepaid Electricity". The GSM technology is used so that the user will perceive messages about the consumption of power (in watts) and if it reaches the threshold amount, it will exigently circumspects the consumer to revitalize. This technology can be used in colleges, apartments, domestic houses, MNCs, bank, hospitals etc. The exertion of this project will help in better energy administration, judicious use of energy and also in doing away with the avoidable quarrel over faulty billing. The Prepaid electricity meter system keeps the track of the power usage and will leave little space for reluctant on consumption and billing.

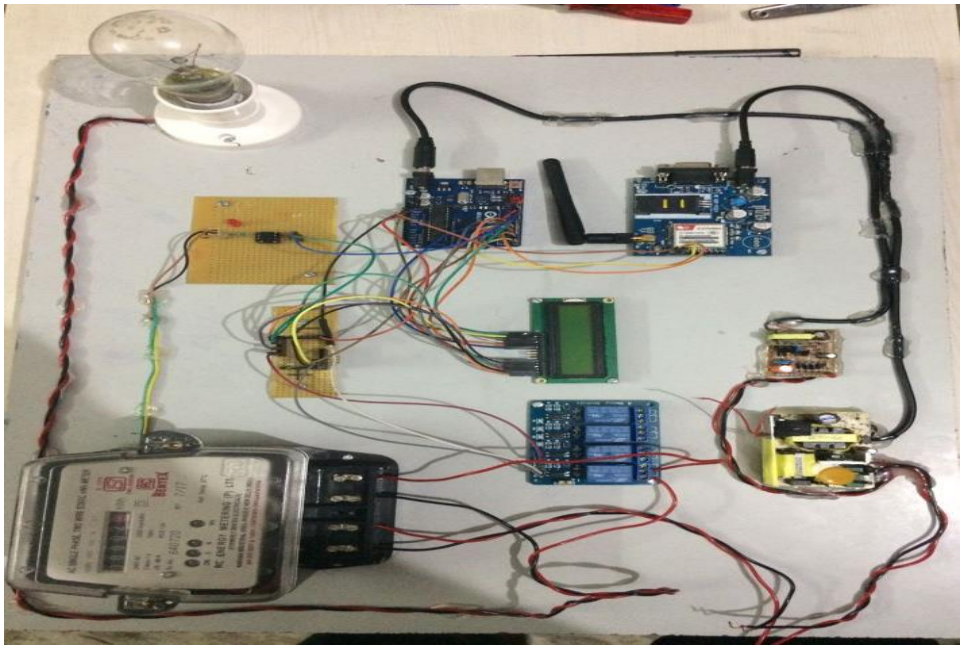

Fig. 3.Implemented Circuit Diagram of Prepaid Electricity Meter

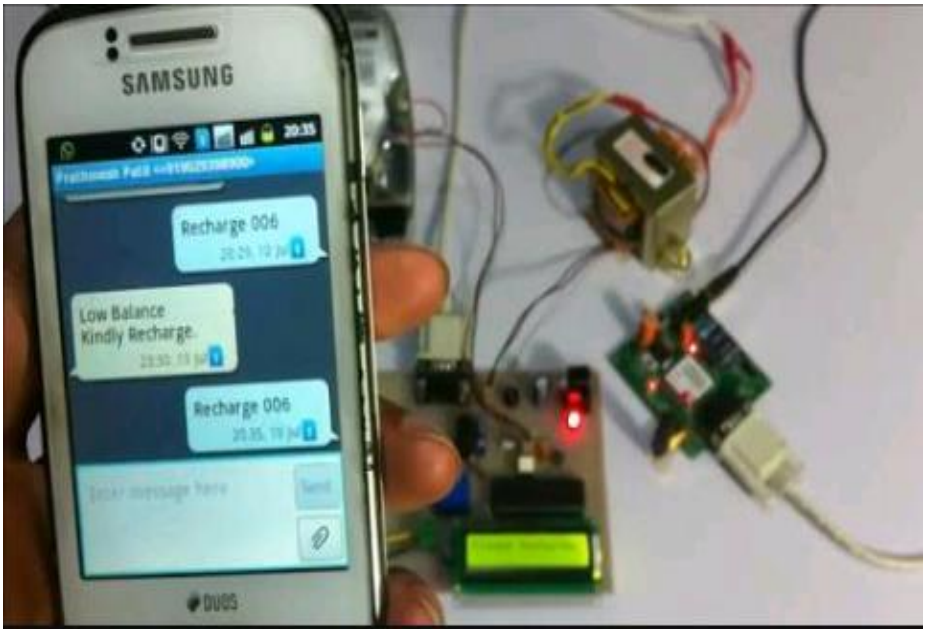

Fig. 4.Prepaid Electricity Meter Showing Message Alert

Fig.5. Fitted Prepaid Electricity Meter in Domestic Homes

5. CONCLUSION

The present power usage reading is made manually by moving to the consumer's residence. This requires a large number of labor and huge time to establish the task.If there is sudden rain or disturbed weather condition than there can be tardiness in depositing of bills due to energy consumption. The printed billing also has the ability to get damaged. Over the last few years, Prepaid Electricity Meter has been proposed as an innovative and efficient solution focusing on facilitating affordability and reducing the cost of utilities. This mechanism assists 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 project addresses the above-mentioned problems. Besides from preparing readings using GSM module billing system, there is a crucial requirement for prepaid to avoid undesirable consumption of energy.

6. FUTURE SCOPE

The concept of "Prepaid electricity meter" gives the smooth and better flow of capital processing and administration of energy utilities.It can reduce the hurdles which are associated with users living in the areas in which the access of billing and electricity is a problem.It can reduce a large amount of time and manpower for taking and noting down readings.Every consumer using the "Prepaid electricity meter" can recharge to any amount such as Rs 15,Rs 25,Rs 30.As it recharges the account of user all over the Asia so it also reduce the cost of transportation .Adding a mini printer to the "prepaid electricity meter" produces the printed bill

which the user can keep for the record .If a software is added to the "Prepaid electricity meter" by which a balance can be seen on request then a consumer's power cut can be prevented.

6. REFERENCES

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