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Consumer Interface Smart Energy Meter

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Abstract: ***It is realized that one of the defective subsystems adding to the tremendous budgetary loss in Power Supply Company is the conventional metering and charging framework. Mistakes get presented at each phase of charging the energy rates, similar to blunders with conventional meters, reading errors by human while noticing the consumed energy; and blunder during the preparation of paid and the due bills. The solution for this downside is a prepaid charging or billing framework of consumed energy. Most of the developing countries are shifting their conventional energy management practices to the modern one by replacing the old and conventional energy meters with the smart meters outfitted with the prepaid facility to quantify the power consumption so as to decrease the income deficits looked by utilities because of customer unwillingness to make consumed energy payments on time. Our proposed design embedded with Arduino and GSM technology is advancement over conventional energy meter, which enables consumer to effectively manage their electricity usage. The system performance is good with the acquired results. An earlier charging will undoubtedly get rid of the issues of unpaid bills and human mistakes in meter readings, along these lines guaranteeing justified income for the utility.***

I. INTRODUCTION

Electricity is one of the vital requirements for sustainment of contents 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 requirement 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 the monthly bills. with this we can monitor meter and track if any fault is there or not. In previous meter a circular metal strip rotates and according to that rotation we calculate the consumption. But our meter works on pulse which is created according to consumption and we previously connected an- droid board which monitor the pulse and according to pulse the bill is generated. With the help of this project we are aiming to receive the monthly energy consumption from a remote location directly to 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.

II. LITERATURE SURVEY

1) "Design Ashna.K "GSM Based Automatic Energy Meter Reading System with Instant Billing" proposed the design of a simple low-cost wireless GSM energy meter and its associated wave interface, for automating billing and managing the collected data globally.
2) Vivek Kumar Sehgal "Electronic Energy Meter with Instant Billing" introduced the concept of Postpaid Energy Meter which automatically sense the energy used in the home and when it reaches value which is initially fed in the hardware it will disconnect the power line. A user interface given in the hardware for user which will interact with the hardware, through user interface user can set a value.
3) Ms. Prajakta B.Murmude, Mr. Sachin G. Jagdale, Ms. Sunita D. Giri "GSM based Prepaid Energy Meter" proposed the design and implementation of a GSM based remote operation of an energy meter which gives the solution to power theft, consumption control, auto billing and payment, data logging and Manpower reduction in power distribution and management.
4) The major disadvantage of the present systems is these systems are postpaid base service, Electricity board gives the service before collecting the payment from the customers and it is difficult for electricity board to collect the payable amount from the customers and at the same Electricity board cannot stop to providing the service. So there is need of a system service after payment.

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III. PROBLEM STATEMENT

As we mentioned above several advantages of digital energy meters, but always there are chances of innovation or modification in different instruments for ease of consumer and supplier. Following are some problems observed in those energy meters which should be rectified:

1) Meter reading and other related tasks like bill payment are performed by a large number of staff i.e., large number of employees are required.
2) An expansive number of staff is utilized for meter reading and other related assignments like bill payment.
3) Billing errors due to carelessness of meter readers during meter reading and sometime billing estimation.
4) Consumer has to stand in queue for hours for bill payment.
5) Careless usage of electricity by consumer who is unaware of its cost. • Consumers are not bound to pay bill on time.

IV. PROPOSED SYSTEM

T This layout of Fig3.1 yields the idea behind prepaid energy meter scheme. It shows different hardware components incorporated, their connections and the data flowing in this scheme. In this layout, the energy meter is supplied by the service provider (WAPDA) and supplying the energy to the load through an electromechanical relay, which operates under certain conditions. Energy meter is also connected to the Arduino UNO in order to obtain the objective of automatic measuring the consumed energy and to perform the suitable action depends upon the current units valuable. Arduino UNO is additionally associated with the GSM Module for sending or receiving the SMS to the client for the status of their connection and to recharge the energy meter if it is required to do so. LCD is connected to the Arduino UNO board to display the current status of the connection so the costumer remains in touch with the information about the load and their purchased units.

This mechanism requires the consumers to pay for the electricity before its consumption. On that way, users hold credit and then use the electricity until the credit is ended. If the available credit is ended then the electricity supply is cut-off by a relay. Readings made by operators are prone to errors. This project shows the above-mentioned problems. This system will first register the user. For making recharge the consumer must have to login to the system. The username and password must create to login then it will check for the user is valid or not through server. It can able to recharge through user phone app only if the user is authorized user. As recharge ends it will cut off the electricity. The 230V AC power supply is given to operate the loads. A 20V adapter is used to provide

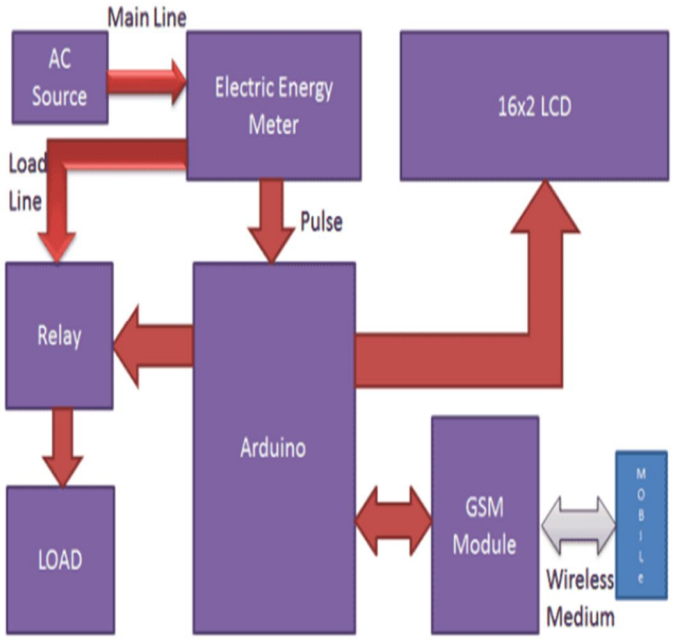


Fig 1: Proposed system architecture

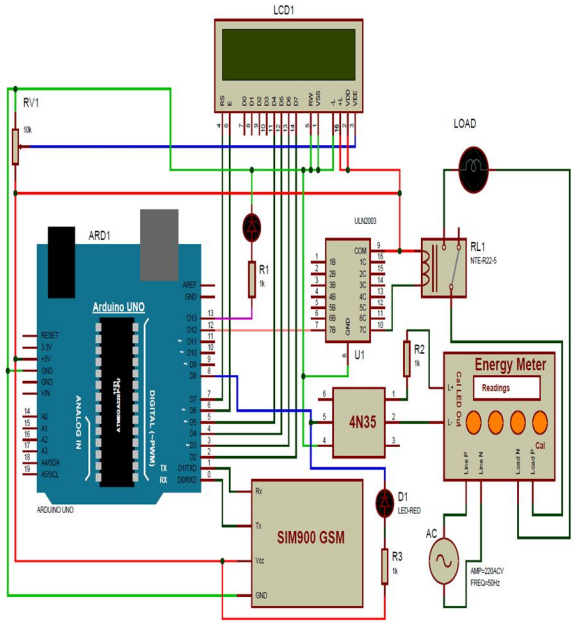


Fig 2: Hardware design

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V. RESULT & DISCUSSION

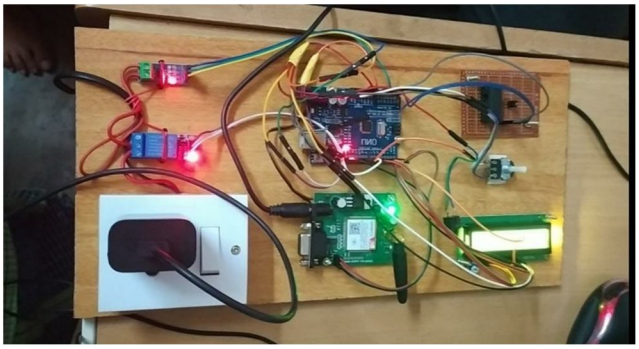


Fig 3: Complete model

The above Fig.3 shows the flow diagram of processes involved in prepaid energy meter scheme. When there is no balance in energy meter as it would be at initial state or it can be when all the purchased units are consumed, the microcontroller will display zero units and zero balance as shown in Fig.4. At the same time, it will inform the customer regarding no balance by sending an SMS through GSM module as shown in Fig. 5.

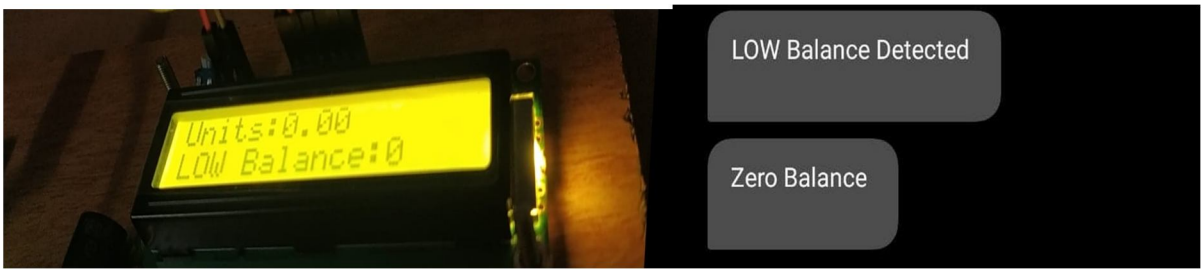


Fig 4: Display zero units and zero balance.

Fig 5: No balance by sending an SMS through GSM module

When the customer recharges a certain amount by sending a message to the GSM module, it delivers that specific data to the microcontroller (i.e. Arduino UNO) so it can decode it and fetch the amount that customer wants to recharge his account. The recharged amount is displayed on LCD which is shown in Fig.6..

After a certain process the microcontroller commands to connect the load to the supply as the balance in customer's account is sufficient to get the connection back, for this regard an SMS is sent back to the customer to inform him that their connection is restored as shown in Fig.7.

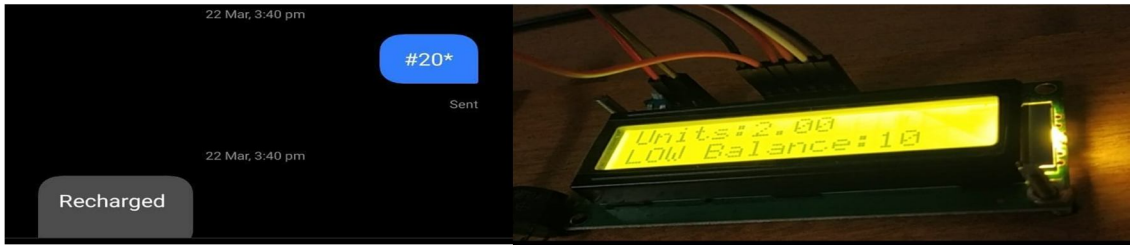


Fig 7: An SMS is sent back to the customer.

Fig 6: Show credit

When energy meter cut off the load due to insufficient balance The customer is bound to use as much amount of electrical energy as the balance he has in his account. As the balance in his account reaches zero value then it becomes insufficient to continue the electric supply to the load; that is why the microcontroller commands to disconnect the load from supply. A message about this disconnection of load is displayed on LCD and also sent by SMS to inform the customer regarding the status of their connection as shown in Fig.8.

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Fig 8: When energy meter cut off the load due to insufficient balance

VI. CONCLUSIONS & FUTURE SCOPE

The advancement in power distribution system is non-stop process and new technology is always in progress. In this paper, an Arduino and a GSM based smart prepaid energy meter has been proposed. Units are purchased by using GSM technology and those units are deduced according to electricity usage. This project presents a single-phase energy meter for domestic consumers with prepayment billing method. The significant preferred standpoint is the capacity of this system to update the current conventional meters into smart prepaid meters with a connection of Arduino and GSM (Prepaid Module). This kills the need of totally supplant the energy meters. Cost is the main important factor of this work which is quite high but will reduce from 3 to 4 times after implementation of this project. Nowadays as power supply companies need labor for meter reading after implementing this, there will be no need of so many meter readers and lots of money will be saved.

The idea of prepayment electricity bill prior its usage is being gradually accepted around the world, and that's why the market for prepaid energy metering is growing. After having many advantages, this project still needs more safety check and modification especially the GSM module for the network coverage of SIM which is being used, should be strong so that the GSM can work properly.

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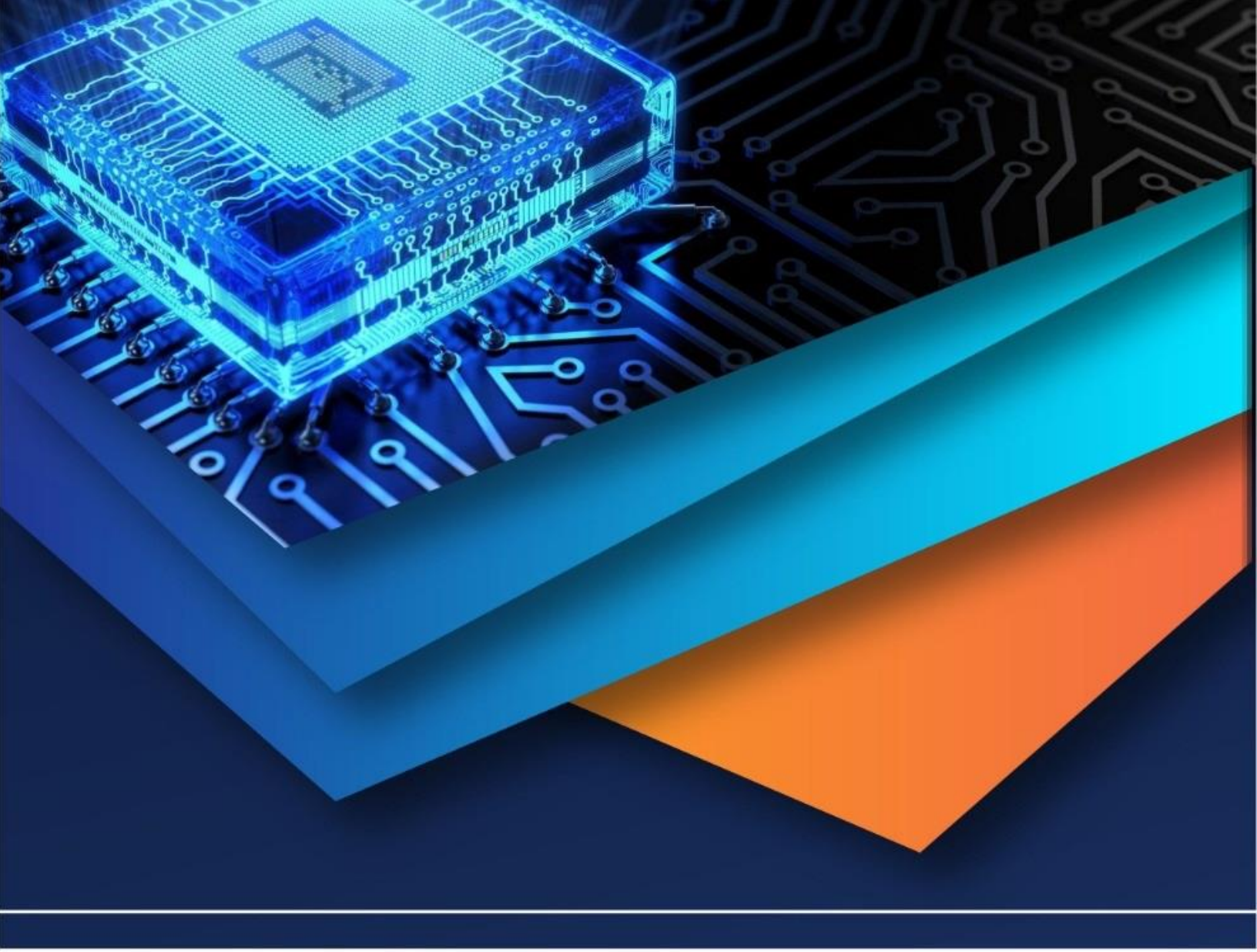
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