

## GSM-BASED ENERGY METER

<sup>1</sup>Prof.S.P.Kuchekar, <sup>2</sup>AKASH HARIRAM KALE, <sup>3</sup>LAHU GOVINNDRAO,

<sup>4</sup>HEMBALE MAHESH LAXMAN

<sup>1,2,3,4</sup> Department of Electrical Engineering, & Navsahyadri Education Society's Group of Institutions Faculty of Engineering, Naigaon, Pune

\*\*\*

**Abstract** - Previous methods of storing electricity caused unnecessary damage and wasted time. Therefore, this project represents a prepaid electricity meter using a GSM module to facilitate energy consumption and reduce operating costs. Prepaid energy meters can be used to monitor and control home energy meters from scratch. The technology provides information on how much the customer has paid and stops power when the balance drops below a threshold. The GSM network transmits and receives data from the respective power supply companies. The company offers products that can be read in seconds without the need to visit the customer. Prepaid electricity meters reduce the number of regular visits. Prepaid electricity meters not only reduce energy costs but also improve meter readings and save time. Ordinarily, failure is inevitable at all stages of the certificate of deposit. Some of the glitches are human errors in saving measurements and making payments. This research project explains and explains electricity usage before customers pay their electricity bills, which is useful in managing energy consumption, reducing blasts and lights, and increasing prices.

**Key Words:** GSM, Prepaid, CKT, EEPROM, SMS

### 1. INTRODUCTION

The prepaid electricity meter concept is driving energy to the enhancement of electricity meters. In the past year, many efforts had been made to the energy meter with improved billing methods but till now the invented energy meters are not up to the mark. 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 the consumer's house and produces the bill as per the meter reading. 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 generate 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 is difficult to handle. The manual operator cannot find the Unauthorized connections or malpractices carried out by the consumer to reduce or stop the meter reading/power supply. The energy meters which were invented in the past required smartcard for their proper functionality. The demerit of that method is that it needs in the Internet and a computer interface. In this project, we propose a method that uses the GSM Network which eliminates the need for the internet. "A Prepaid Energy Meter" system consists of Energy Meter and the GSM network. GSM modem utilizes the GSM network to deliver an equivalent unit for the recharged amount to Adriano and alerts the consumer about the low balance. On the energy

provider side, this system is used to update the consumer account and the database. A 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 of only limited units of energy as per recharge and then cuts 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 consists of a GSM module that allows the operator to revitalize the meter with the help of an SMS message. This puts forward innovative electricity billing and eliminates the need for manual electricity meter reading tasks.

### LITERATURE SURVEY:

Automatic Power Meter Reading and Distribution Control Using GSM Networks, mainly focused on the measurement of power from the consumer side that has been consumed by them. It is an integration of single phase class T, IEC61036 Standard Compliance Digital KWh Power Meter, Power to Communication (P2C) interface board, and a GSM modem which utilize the GSM network to send the power usage reading back to the energy provider wirelessly. The system mainly focuses on taking to account of power consumed by the user. The digital power meter is used to measure the power consumption drawn from the energy provider substation to the consumer in KWh unit. A single phase digital Watt Hour Meter ATEC12 and ATEC was chosen for GSM Power meter implement the system consists of opto coupler instead of Electromagnetic Relay which may require a step down transformer to transfer the amount of power consume and will also, result in complexity in circuit. The Power to Communication (P2C) is used to interface the impulse and synchronization count from the power meter optocoupler circuit and to store the power meter reading into the internal non EEPROM memory at single impulse count interval. In the case of power failure the last meter reading will be stored in EEPROM. During the time of power restoration the microcontroller circuitry used here retrieves back last meter reading and to continuous synchronous with the digital power meter. At the time of normal operation the Power to Communication interface board used to retrieve the last meter reading from the EEPROM memory. Here the GSM Power Meter and SMS Gateway uses normal SIM card phone number. The billing notification to customer send by SMS, E-mail and hardcopy printing for postal. The complete demonstration of GPMDC from meter reading, notification, payment, distribution control of power cut-off and power restoration are being done.

## Related Work:

Mr. Nazir Bin Abdullah [1], developed an automatic meter reading system (Automation of Residential Electricity Cut off Using Embedded Controller). In 2012 for domestic user. In this project he used GSM modem for transmitting and receiving information, both sides means user side and energy provider side.

Mr. Hung Cheng Chen [2] proposed a wireless automatic meter reading system in 2012. In this project he used ZigBee module on both sides. This technology is chip and low cost. Mr. Alauddin Al -Omary[3] develop an automatic meter reading system using GPRS technology. In 2011. MR.LI Quan Xi [4] design an automatic meter system based on ZigBee and GPRS system.

In 2010. Mr. H.G.Rodney Tan [5] develop an automatic power meter reading system using GSM network. In 2007. In this system GSM digital power meter installed in every consumer unit and electricity billing system at the energy provider side. Mr. MejbaiiHaque [6] develop a microcontroller based single phase digital prepaid energy meter for improved meter and billing system. Amit Jain [7], proposed a prepaid meter using mobile communication in 2011. In this system he used controller unit, prepaid card and communication module. Fawzi Al-Naina and Bahaa Jalil[8]. Built a prototyping prepaid electricity meter system based on RFID. This system is divided into two parts such as client and server. The client consists of a digital meter based on microcontroller and an RFID reader and the server consists of a PC with MySQL database server. The client is installed in each house and the server is installed in local substation.

## PROBLEM DEFINITION:

The power meter has come a long way since over 100 years ago. From a large product with heavy magnets and coils, it has evolved into a new variety that reduces size and weight while improving performance and features. Over the years, the resolution and accuracy of the displays have greatly improved. The advent of the digital counter in the last century completely changed the measurement of electrical parameters. Starting with voltmeters and ammeters, digital meters conquered all meters with the advantages of easy reading, better resolution, and good construction. This was particularly important with the introduction of the electronic counter in the mid-80s. Electricity consumption and electricity distribution are now major topics of discussion, due to the large difference between electricity generation and consumption another important reason for electricity is that rich people use unlimited electricity. In this case, in order to reduce loss and distribute electricity equally to all areas, has to impose some limits on electricity usage per user, and accordingly, the government has to comply with the law by launching industrial electricity meters. special. - you ruled everywhere. Therefore, one should think along these lines and find a solution.

## EXISTING SYSTEM:

In existing system either an electronic energy meter or an electro-mechanical meter is fixed in the premise for measuring the usage. The meters currently in use are only capable of recording kWh units. The kWh units used then still have to be recorded by meter readers monthly, on foot. The recorded data need to be processed by a meter reading company. For processing the meter reading, the company needs to firstly link each recorded power usage datum to an

account holder and then determine the amount owed by means of the specific tariff in use.

## OBJECTIVE:

The main goal and purpose of this future project is to use and develop a digital power or power meter for home appliances. The energy meter will measure electricity digitally and send messages to individual users so that users can easily check how much energy they use at a time.

## BLOCK DIAGRAM:

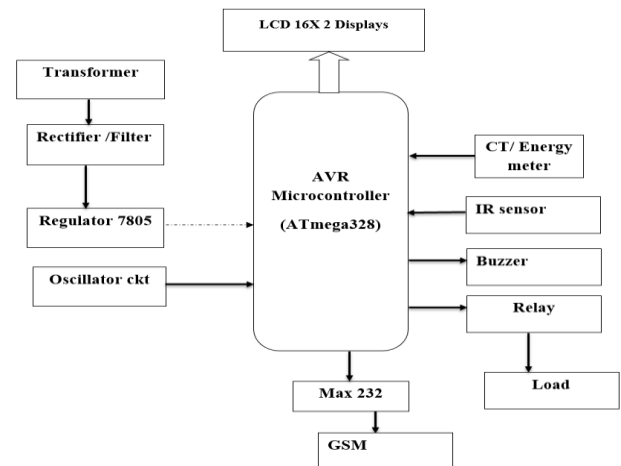


Fig 1 Block Diagram

## FLOW CHART:

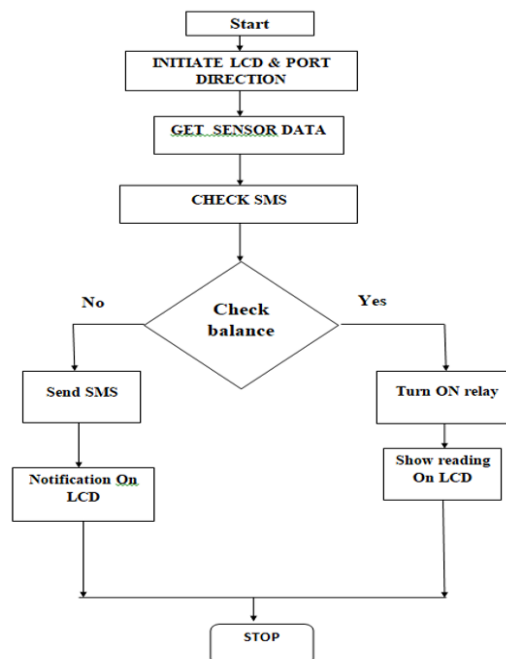


Fig 2 Flow Chart

**WORKING:**

The proposed model uses a microcontroller as the operating system. The whole system is associated with a microcontroller. The GSM modem is connected in series with the controller, whose main communication module is between the user and the service provider. GSM uses its own network to transmit data. Special coding in embedded C is used to program AVR microcontrollers using programmer hardware and Arduino IDE Software. Relays act as switching devices to cut off and restore power suppose if the user's meter recharge is over the relay stops the working of the microcontroller once the recharge is done again it will restart. The LCD display is used to display the status of the balance. In this project, the microcontroller-based system collects continuous readings and can be sent to the timer electrical department on request. This system can also be to cut the electricity of the house without paying the electricity bill. Each meter must have a GSM modem with a SIM card. The microcomputer alone pulls the text from the mobile phone, decrypts it, and identifies the mobile phone number. Then turn on the relay connected to the port to control the equipment. After the process is complete, the controller will send the confirmation back to the user's mobile phone in text. Coding refers to the fact that reduces labor but increases the efficiency of computing power. The user will be one.

**ALGORITHM**

- 1) Start.
- 2) Initiate all Ports.
- 3) Set threshold.
- 4) Get sensed data from CT.
- 5) Check balance .
- 6) Display reading on LCD.
- 7) Repeat 4.
- 8) Stop.

**ADVANTAGES:**

Prepaid energy meters that utilize GSM (Global System for Mobile Communications) modules offer several benefits. Here are some of the advantages of using prepaid energy meters with GSM modules:

1. **Cost Management:** Prepaid energy meters allow users to manage their electricity consumption effectively. By prepaying for energy, individuals can monitor their usage and make informed decisions about their energy consumption, which can lead to better cost management.
2. **Real-Time Balance Monitoring:** With a prepaid energy meter connected to a GSM module, users can access real-time information about their energy balance. They can easily check their remaining credit and track their energy usage patterns. This enables better control over energy expenditure.

3. **No Bill Shock:** One significant advantage of prepaid energy meters is the elimination of bill shocks. Since users pay in advance for the electricity they consume, there are no surprises or unexpectedly high bills at the end of the billing period. This helps users budget their expenses effectively.

4. **Remote Recharge:** GSM-enabled prepaid energy meters offer the convenience of remote recharge. Users can top up their energy balance from anywhere using their mobile phones. This eliminates the need to visit a physical location or make manual transactions, providing a seamless experience.

5. **Theft and Tamper Detection:** Prepaid energy meters with GSM modules often come equipped with advanced features to detect theft or tampering attempts. They can send alerts to utility providers when irregularities are detected, allowing for prompt action to be taken.

6. **Improved Energy Efficiency:** The prepaid metering system encourages energy efficiency as users become more aware of their consumption patterns. By having a real-time view of their energy usage and the associated costs, individuals are motivated to adopt energy-saving habits, leading to reduced wastage.

7. **Enhanced Revenue Collection:** For utility providers, prepaid energy meters can significantly improve revenue collection. The upfront payment system reduces the risk of non-payment and the need for extensive debt recovery processes. This helps utility companies maintain stable cash flows.

8. **Simplified Billing Process:** Prepaid energy meters eliminate the need for traditional billing cycles and manual meter readings. This streamlines the billing process for utility companies and reduces administrative costs, making operations more efficient.

Overall, prepaid energy meters using GSM modules offer benefits such as cost management, real-time balance monitoring, convenience, theft detection, energy efficiency, and improved revenue collection. These advantages make them an attractive option for both users and utility providers.

**PROJECT SPECIFICATION:**

Generate output from the radio simulator and send the value to the DES register. Calculate the index for each family. The balance is calculated as follows: Invoices =total balance after payment - equipment. Send a notification to the user that his balance has been reached.

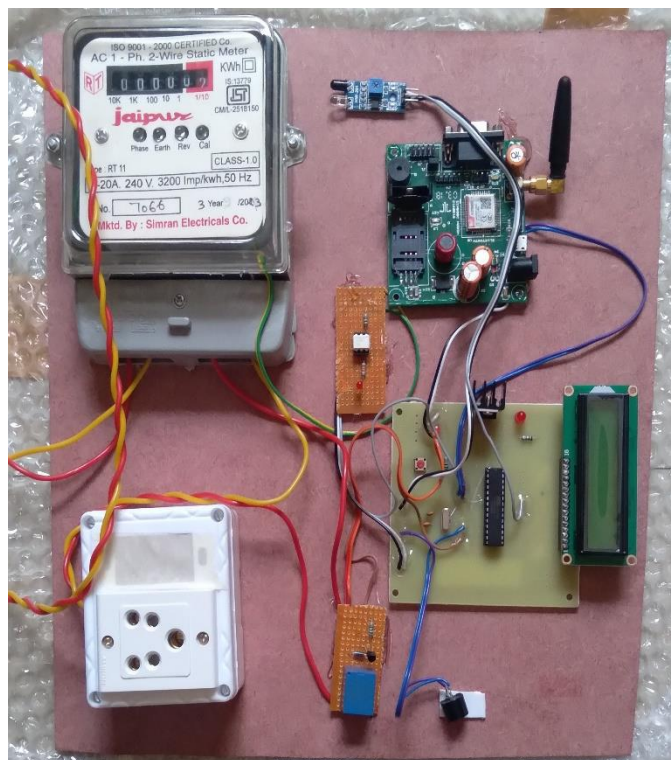
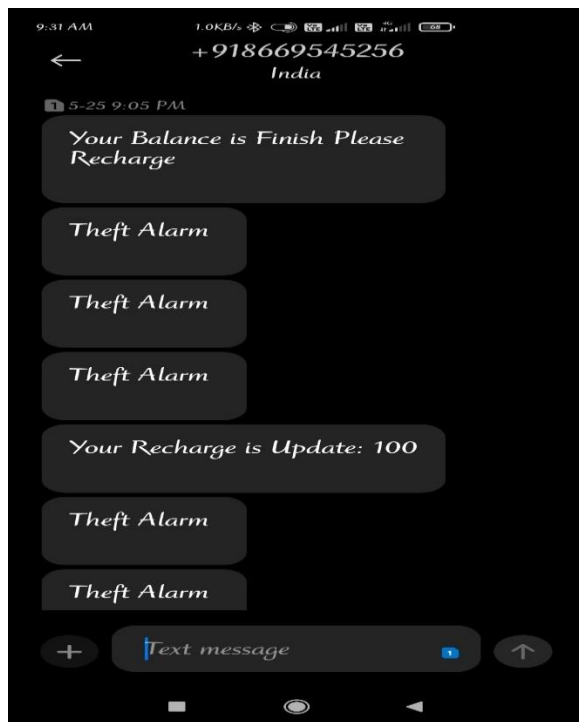
**FUTURE SCOPE:**

The concept of a "Prepaid electricity meter" gives a smooth and better flow of capital processing and administration of energy utilities. It can reduce the hurdles which are associated with users living in areas in which access to 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, Rs30.As it recharges the account of users all over Asia so it also reduces 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 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.

Result :



## CONCLUSION:

This design helps us measure power/power, potential and current flow in a single-phase environment. At the heart of the device is the ARM Cortex M4 processor. All readings and measurements are done in a digital area, so we use ADC, and the measurement is displayed on the LCD. The calculated information is sent as SMS over the GSM module. A power meter is also sometimes called a power meter and vice versa.

## REFERENCES:

- [1] Jubi.K, MareenaJohn, “PrepaidEnergy Meter with GSM Technology”, AIJRSTEM, pp. 195-98, June-August, 2013.
- [2] “SIM300 Hardware Interface Specification”, 2006-04-05,SIM300\_HD\_V2.02
- [3]Dr.Boyina.S.Rao, B. Gnanasekaranathan, M. Raguram, S. Pravinkumar,P. Kamalesh, “Domestic Prepaid Energy Distribution System for saving of Power Consumption”,IJAET/Vol.III/ Issue II/April-June, 2012/26-29.
- [4] Bhavna Patel, ShrikantMhaskar, “Voucher Based Prepaid Electricity Supplier With Auto Cut Off”, IJIIT|Volume-II|Issue-I|2013-2014 July |Project-03.
- [5] Dr. K. Sheelasobanarani1, S. Dinesh Raja2, B. Dhanaraj3, K. Manickam4, K. KarthickRaja5. “A Prepaid Energy meter for efficient Power Management”, International Journal of Emerging Technology and Advanced Engineering,Volume 4, Issue 3, March 2014
- [6] Bharat Indorey, M.Lokhande, “ZigBee Based Advanced Energy Prepaid Meter”,International Journal of Innovations in Engineering and Technology (IJJET),Volume 3 Issue3 February 2014