PROJECT REPORT

ON

SMART ENERGY METER USING GSM

Submitted

In partial fulfilment of the requirements for the Degree of

Bachelor of Technology
In
ELECTRICALENGINEERING



By

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Final B.Tech. Electrical Engineering

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CANDIDATE DECLARATION

This is to certify that project report which has been presented here entitled "Smart Energy Meter Using GSM" in partial fulfilment of the requirements for the award of the Degree of Bachelor of Technology and submitted in the Department of Electrical Engineering of H.B.T.U. Kanpur is an authentic record of our own work carried under the guidance of Dr. Yaduvir Singh, Department of Electrical Engineering, H.B.T.U. Kanpur.

The matter embodied in this report has not been submitted by us for the award of any other degree or diploma.

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This is to certify that the Above statement is made by the candidate.

Date: 29/06/2022

(Project Guide)

ABSTRACT

Electricity is one of the fundamental necessities of human beings, which is commonly used for domestic, industrial and agricultural purposes. Power theft is the biggest problem in recent days which causes lot of loss to electricity boards. In countries like India, these situations are more often. If we can prevent these thefts we can save lot of power. This is done using Smart Energy Meter (SEM). SEM is an electric device having energy meter chip for measuring the electric energy consumed and a wireless protocol for data communication. This paper presents a smart energy meter for an automatic metering and billing system. In this meter energy utilized and the corresponding amount will be displayed on the LCD continuously and communicated to the controlling base station. The feedback from the user helps in identifying the usages between authorized and unauthorized users which helps in controlling the power theft. Communication between user/household and substation is done using Zigbee. GSM network is used for sending SMS to the local authorities regarding the theft cases. This meter can work as either prepaid or post-paid meter. 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.

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CHAPTER 1 INTRODUCTION

Electric power has become indispensable to human survival and progress. Apart from the efforts to meet the growing demand, automation in the energy distribution is also necessary to enhance people's life standard. Traditional meter reading is inefficient to meet the future residential developmental needs. So there is increased demand for Automatic Meter Reading (AMR) systems, which collect meter readings electronically and its application is expanding over industrial, commercial and of the analog and mechanical nature of the components in these meters. Collection of meter reading is also in efficient because a meter reader has to physically be onsite to utility environment. Traditional electro mechanical meters used today, are prone to drift over temperature. This method of collecting of meter readings becomes more problematic and costly when readings have to be collected from vast and often scattered rural areas. The older electro mechanical and present electronic meter readings are taken by the persons involved in the job and the amount is noted down in the EB card, this may consume lot of time and doubtlessly require many persons and the consumers may be out if station. Apart from being a boon (AMR) wipes out all the cons of conventional systems.

AMR is a sophisticated system which allows companies to note down the readings and calculate bills without visiting the site. AMR includes various techniques like GPRS, SCADA, PLC, RF, Radio frequency, GSM, etc. But among these GSM is the best technology available since it has numerous number of users and gives a good range for the data to be transmitted. It helps the consumer and energy service provider to access accurate data and updated data from the energy meter. This data is sent to the central system for trouble shooting and calculation process. This system can be a postpaid and a prepaid one. The data used for billing are stored in the server for updating and for later use. The data which is calculated and stored in the server can be accessed and analyzed very accurately. The generation of bill is done according to the set-up amount for each unit. The units which are received through the GSM modem are stored and multiplied by the amount such as 5 for each unit and multiplied and the amount is calculated and sent to the consumer through the recognized phone number. This generated bill can be paid and accessed from anywhere around the world as the GSM is widespread all over the world. This technology holds good for IT parks, commercial buildings, industries. The development of GSM over the past two decades has made the energy metering wireless. The GSM infrastructure which has nationwide coverage is used to request and retrieve power consumption notification over individual houses and flats.

CHAPTER 2 LITERATURE SURVEY

2.1 Design of electric energy meter for long distance data information transfers which based upon GPRS

With the popularization of internet in China as GPRS service improved increasingly electric energy meter transmits the data information and controlling command remotely and wirelessly based on the current electric energy meter with the well functioned ARM kernel microprocessor, it not only finishes the power data measuring and processing, but also realizes the TCP/IP by cutting .By ARM kernel microprocessor controlling GPRS module, electric energy meter could be linked to the internet by use of GPRS service. The overall system is stable and reliable because it is managed by mu C/OS-2 operating system. This is especially for some outlying areas where the cable network has not been popularized.

2.2 Automatic power meter reading using GSM network

The development of a GSM automatic power meter reading system consists of GSM digital power meters installed in every consumer unit and an electricity EB link System at the energy provider side. The GSM digital power meter is a single phase IEC61036std compliance digital KILOWATT power meter with embedded GSM modem which utilize the GSM network to send its power usage reading using short messaging system back to the energy provider wirelessly. At the power provider side an EB link system is used to manage all received SMS meter reading, compute the billing cost, update the database and to publish the billing notification to its respective consumer through SMS or email. A working prototype of the GAPMR system was built to demonstrate the effectiveness of automatic meter reading billing and notification through the use of GSM network.

2.3 Electronic meter with instant billing

It presents the design of the simple low cost wireless GSM energy meter and its associated web interface, for automatic billing and managing the collected data globally. The proposed system replaces traditional meter reading methods and enables remote access of existing energy meter by the energy provider .A GSM based wireless communication module is integrated with electronic energy meter of each entity to have remote access over the usage of electricity .A PC with a GSM receiver at the other end which contains the database acts as the billing point .live meter reading from the GSM enables energy meter is sent back to this billing point periodically and these details are

updated in a central database .net frame work and c# with proper authentication ,users can access the developed web page details from anywhere in the world .The complete monthly usage and due bill is messaged back to the customer after processing these data .

2.4 Wireless automated digital energy meter

Electricity is one of the basic requirements of human beings which is widely used for domestic, industrial and agricultural purposes. There is a great demand for electricity. Though there are very well developed alternate sources for electricity, there are lot of problems in connection with distribution and metering. The traditional electro mechanical meters still widely used today are prone to drift over temperature and time as a result of mechanical nature of the components in the meter. The problem worsens further in collecting the meter readings and generating the bill. This suggests a method where telecommunication system is utilized for automated transmission of data to facilitate bill generation and payment of the same at the customer's place.

2.5 Embedded energy meter-A new concept to measure the energy consumed by the consumer and to pay the bill

A new concept of energy meter is shown, where maximum demand of energy of a consumer will be indicated in the meter used by the consumer after exceeding the maximum demand the meter and hence the connection will automatically be disconnected by an embedded system inserted in the meter itself. According to the maximum demand the consumer will purchase a cash card of amount depending on the consumption of energy and after the full consumption the consumer again has to purchase another cash card or recharge

the same and thus the hassle related to go to the billing office to stand in a long queue and to submit the bill can be avoided. Also this system helps to eliminate the drawback of billing management system such as to take the reading from the meter to create the bill, to print the bill, to send the bill to the proper address and to collect the amount for the bill. Hence this system can effectively reduce the manpower required to a greater extent. Also a new concept of distributor has been dealt here which is used to disconnect a line if the energy consumption per day of a consumer greatly exceeds a pre demand energy consumption per day.

CHAPTER 3 SMART ENERGY METER USING GSM

3.1 OVERVIEW

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 locality 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 android 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 centralised 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.

3.2 PROBLEM STATEMENT

In the currently working system, electricity meter reading for electricity usage and billing is done by human workers from home to home and building to buildings. The purpose of this project is to develop a Smart Electricity meter using GSM. This can reduce human errors and helps to retrieve the real time meter value via GSM and send it to customer's mobile phone through GSM. This also allows electricity board to modify the variable package price in specific duration. The administrator can analyse the customer's power consumption data and generate the report from the data online. The prototype will be able to introduce the billing system to the customers, get the power consumption data from smart meter, keep the data in centralized database and generate the report.

3.3 PROBLEM SOLUTION

The smart meter shows a digital meter reading and uses a secure smart data network to automatically and wirelessly send the readings to your energy supplier at least once a month, so you will receive accurate, not estimated bills. Smart meters also come with an in-home display screen that shows you exactly how much energy you're using in pounds and pence, in near real time.

In this meter you will get accurate bills, you will get SMS of your usage in set interval of time.

CHAPTER 4 METHODOLOGY

The following diagram explains the working of system:



Figure 1

CHAPTER 5 HARDWARE DEVELOPMENT

5.1 ENERGY METER

The **meter** which is used for **measuring** the **energy utilises** by the electric **load** is known as the energy meter. The **energy** is the total **power consumed** and utilised by the load at a **particular interval** of **time**. It is used in **domestic** and **industrial** AC circuit for measuring the power consumption. The meter is less **expensive** and **accurate**.

The energy meter has four main parts. They are the

- 1. Driving System
- 2. Moving System
- 3. Braking System
- 4. Registering System

The detail explanation of their parts is written below.

1. Driving System – The electromagnet is the main component of the driving system. It is the temporary magnet which is excited by the current flow through their coil. The core of the electromagnet is made up of silicon steel lamination. The driving system has two electromagnets. The upper one is called the shunt electromagnet, and the lower one is called series electromagnet.

The series electromagnet is excited by the load current flow through the current coil. The coil of the shunt electromagnet is directly connected with the supply and hence carries the current proportional to the shunt voltage. This coil is called the pressure coil.

The centre limb of the magnet has the copper band. These bands are adjustable. The main function of the copper band is to align the flux produced by the shunt magnet in such a way that it is exactly perpendicular to the supplied voltage.

2. Moving System – The moving system is the aluminium disc mounted on the shaft of the alloy. The disc is placed in the air gap of the two electromagnets. The eddy current is induced in the disc because of the change of the magnetic field. This eddy current is cut by the magnetic flux. The interaction of the flux and the disc induces the deflecting torque.

When the devices consume power, the aluminium disc starts rotating, and after some number of rotations, the disc displays the unit used by the load. The number of rotations of

the disc is counted at particular interval of time. The disc measured the power consumption in kilowatt hours.

3. Braking system – The permanent magnet is used for reducing the rotation of the aluminium disc. The aluminium disc induces the eddy current because of their rotation. The eddy current cut the magnetic flux of the permanent magnet and hence produces the braking torque.

This braking torque opposes the movement of the disc, thus reduces their speed. The permanent magnet is adjustable due to which the braking torque is also adjusted by shifting the magnet to the other radial position.

4. Registration (Counting Mechanism) – The main function of the registration or counting mechanism is to record the number of rotations of the aluminium disc. Their rotation is directly proportional to the energy consumed by the loads in the kilowatt hour.

5.1.1 WORKING OF ENERGY METER

The energy meter has the aluminium disc whose rotation determines the power consumption of the load. The disc is placed between the air gap of the series and shunt electromagnet. The shunt magnet has the pressure coil, and the series magnet has the current coil.

The pressure coil creates the magnetic field because of the supply voltage, and the current coil produces it because of the current.

The field induces by the voltage coil is lagging by 90° on the magnetic field of the current coil because of which eddy current induced in the disc. The interaction of the eddy current and the magnetic field causes torque, which exerts a force on the disc. Thus, the disc starts rotating.

The force on the disc is proportional to the current and voltage of the coil. The permanent magnet controls their rotation. The permanent magnet opposes the movement of the disc and equalises it on the power consumption. The cyclometer counts the rotation of the disc.

5.2 ELECTROMECHANICAL METER

An electricity meter, electric meter, electrical meter, energy meter, or kilowatthour meter is a device that measures the amount of electric energy consumed by a residence, a business, or an electrically powered device. Electric meter or energy meter measures the total power consumed over a time interval.

Electric utilities use electric meters installed at customers' premises for billing and monitoring purposes. They are typically calibrated in billing units, the most common one being the kilowatt hour (kWh). They are usually read once each billing period.

When energy savings during certain periods are desired, some meters may measure demand, the maximum use of power in some interval. "Time of day" metering allows electric rates to be changed during a day, to record usage during peak high-cost periods and off-peak, lower-cost, periods. Also, in some areas meters have relays for demand response load shedding during peak load periods.



Figure 2 Arduino Board

term to refer to any modem that supports one or more of the protocols in the GSM evolutionary family, including the 2.5G technologies GPRS and EDGE, as well as the 3G technologies WCDMA, UMTS, HSDPA and HSUPA.

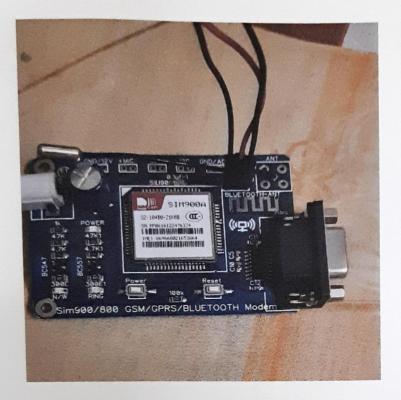


Figure 4 GSM MODULE

5.5 ARDUINO IDE

The Arduino project provides the Arduino integrated development environment (IDE), which is a cross platform application written in the programming language Java. It originated from the IDE for the languages Processing and Wiring. It includes a code editor with features such as text cutting and pasting, searching and replacing text, automatic indenting, brace matching, and syntax highlighting, and provides simple one-click mechanisms to compile and upload programs to an Arduino board. It also contains a message area, a text console, a toolbar with buttons for common functions and a hierarchy of operation menus.

5.6 ATMEGA328 MICROCONTOLLER

ATMEGA328P is high performance, low power controller from Microchip. ATMEGA328P is an 8-bit microcontroller based on AVR RISC architecture. It is the most popular of all AVR controllers as it is used in ARDUINO boards.

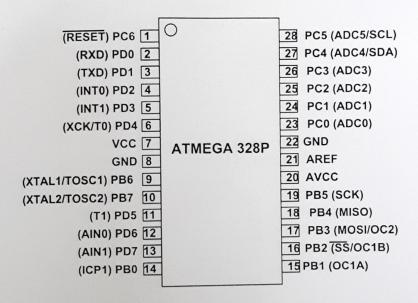


Figure 5 PIN DIAGRAM

Pin Number	Description	Function
	PC6	Reset
	PD0	Digital Pin (RX)
	PD1	Digital Pin (TX)
1	PD2	Digital Pin
5	PD3	Digital Pin (PWM)
5	PD4	Digital Pin
7	Vcc	Positive Voltage (Power)
8	GND	Ground
9	XTAL 1	Crystal Oscillator
10	XTAL 2	Crystal Oscillator
11	PD5	Digital Pin (PWM)
12	PD6	Digital Pin (PWM)
13	PD7	Digital Pin
14	PB0	Digital Pin
15	PB1	Digital Pin (PWM)
16	PB2	Digital Pin (PWM)
17	PB3	Digital Pin (PWM)
18	PB4	Digital Pin
19	PB5	Digital Pin
20	AVCC	Positive voltage for ADC (power)
21	AREF	Reference Voltage
22	GND	Ground
23	PC0	Analog Input
24	PC1	Analog Input
25	PC2	Analog Input
26	PC3	Analog Input
27	PC4	Analog Input
28	PC5	Analog Input

Table 1 WORKING OF PINS

5.7 SERIAL CONNECTION

In telecommunication and data transmission, **serial communication** is the process of sending data one bit at a time, sequentially, over a communication channel or computer bus. This is in contrast to parallel communication, where several bits are sent as a whole, on a link with several parallel channels.

CHAPTER 6 RESULTS AND DISCUSSION

6.1 RESULTS

1 This is a test message in our early stage of project.



Figure 7 RESULT

2 This is our final result successfully executed.



Figure 8 RESULT

6.2 DISCUSSION

By this technology prepaid energy meter is a concept to minimise the electricity theft with a cost-efficient manner. The users are not bound to pay excesses amount of money, users have to pay according to their requirement. Prepaid energy meter is more reliable and user friendly. This prepaid remote energy meter proves to be a boon in the power sector. It controls the usage of electricity on consumer said to avoid wastage of power. It helps to the country revenue by stopping current theft and punishing the dishonest customers. However, their design has to meet certain prepaid standards and regulations. The only concern is the security and privacy of data as they are prone to cyber-attack. However, the use of GSM in this particular system provides numerous advantages over methods that have been previously used. Data transmission is charged at standards SMS rates, thus the charges are not based on the duration of data transmission. The cost efficient of readings. Developed system also gives information about daily, monthly and yearly power usage. Details regarding daily power consumption will help consumer to manage their power usage. This developed system is reliable and secure as only authorized person can access the system.

CHAPTER 7 FUTURE SCOPE AND CONCLUSION

7.1 FUTURE SCOPE

1. A Tremendous Promise of Value

From the supplier-consumer relationship perspective, smart meters can redefine the supplier's role to that of an energy advisor. From an industry viewpoint, it can integrate new technologies and innovations across the power grid. To the users' advantage, it can drive down costs, provide transparency and flexible pricing. And from a social perspective, it can improve energy conservation, grid reliability and outage management, besides integrating the supply of renewable energy options.

Much of the business case for smart meters hinges on convincing customers to genuinely change their energy usage. A positive bias among most users toward energy conservation (for both economic and environmental reasons) is an encouraging start. What is needed is to create a positive experience, both during and after the rollout.

Customer experience during the rollout needs to be driven by timely and personalized information dissemination on schedules, status updates, tariff options, potential benefits and concerns of privacy and health.

Post the rollout, it shifts more toward an advisory engagement. Analytics, coupled with the Internet of Things (IoT), can enable companies to provide smart solutions that help customers efficiently manage their energy requirements. In-home displays can provide real-time feedback and empower customers to analyse their consumption patterns and maximize savings.

2. STRUCTURING FOR SUCCESS

IT, Customer Relationship Management (CRM) and customer service are the three business areas that will see the greatest impact from the smart meter rollout. The strategy will depend on helping customers realize the benefits. Analytics can support companies in offering variable pricing plans based on consumption patterns.

All change management programs should span both team structure and operations. It involves choosing the most appropriate field force model and training the team

for strong customer service acumen. New capability development needs to be balanced with operational priorities to maintain high service levels as significant business processes will be impacted.

7.2 DEVELOPMENT

The immediate opportunities of smart metering lie in the areas of data access, billing transparency, energy efficiency, performance and compliance. Analytics and technology unfold more exciting possibilities into the future.

IoT and big data analytics will pave the way for multiple devices to be connected. For E&U companies, it can improve grid intelligence and provide projection models that will combine historical data and weather forecasts to integrate the supply of renewable resources. Such innovations can take customer experience to new levels.

For now, let us start with the customer.

CHAPTER 8 REFERENCES

- [1] Diya Elizabeth Paul. "Smart energy meter using Android application and Gsm network." International Journal Of Engineering And Computer Science, 2016.
- [2] Himanshu K Patel, Tanish Mody, and Anshul Goyal. "Arduino based smart energy meter using GSM." 2019 4th International Conference on Internet of Things: Smart Innovation and Usages (IoT-SIU), 2019.
- [3] Mallikarjun Bhagawati, Vinod Hiremani, and Suresh M. "Smart Energy Meter Management using GSM." IJIREEICE 5, no. 2 (2017), 7-11.
- [4] S.Visalatchi, and K Kamal Sandeep. "Smart energy metering and power theft control using arduino & GSM." 2017 2nd International Conference for Convergence in Technology (I2CT), 2017.
- [5] Sneha Chaudhari, Purvang Rathod, Ashfaque Shaikh, Darshan Vora, and Jignesha Ahir. "Smart energy meter using Arduino and GSM." 2017 International Conference on Trends in Electronics and Informatics (ICEI), 2017.
- [6] Tsapalasetty Arjun. "Smart Energy Meter Reading and Billing System using GSM Modem." International Journal for Research in Applied Science and Engineering Technology 9, no. VII (2021), 2511-2516.
- [7] Tukur Gupta. "GSM Based Design and Development of Smart Energy Meter Using EEPROM, LCD, and Microcontroller." Gyancity Journal of Electronics and Computer Science 2, no. 1 (2017), 49-57.
- [8] V Rveendra Reddy. "GSM based smart energy meter using Arduino." International Journal for Research in Applied Science and Engineering Technology 7, no. 3 (2019), 2073-2080.
- [9] "SMART ENERGY METER USING IoT." International Journal of Recent Trends in Engineering and Research, 2018, 234-239.

[10] M. Prathik, K. Anitha, and V. Anitha. "Smart Energy Meter Surveillance Using IoT." 2018 International Conference on Power, Energy, Control and Transmission Systems (ICPECTS), 2018.

[11] Santosh Gadekar, Mayur Pimple, Suraj Thopate, and Avdhut Nikam. "IOT Based Smart Energy Meter Using ESP 32." SSRN Electronic Journal, 2021.

[12] Mrs. S Shinde, Y. Mr. Y Yadav, and Miss. Miss. B Zapake. "IoT Based Smart Energy Meter." International Journal of Trend in Scientific Research and Development Volume-1, no. Issue-6 (2017), 1151-1153.

APPENDIX 1 CODING

```
const int pulse = 7;
float watt=0.0,price=0,unit=0;
int pinState=0;
unsigned int i=0,j=0;
unsigned long interval=200; // For 1 hour
unsigned previousMillis=0;
 void setup() {
  // put your setup code here, to run once:
  pinMode(pulse,INPUT);
  Serial.begin(9600);
 void loop() {
  // put your main code here, to run repeatedly:
 unsigned long currentMillis= millis();
  pinState= digitalRead(pulse);
  if (pinState==HIGH)
  i++;
   delay(100);
  if (currentMillis==previousMillis>=interval)
   1
  j=1;
    previousMillis==currentMillis;
   //Method for sending the text msg in every one Hour
   if (j==1)
   1
```

```
watt=i*0.3125;
unit = watt/100;
price = unit*5;
Serial.begin(9600);
Serial.print("\r");
delay(800);
 Serial.println("AT+CMGF=1\r");
delay(800);
 Serial.println("AT+CMGS=\"+918299489551\"\r");
 delay(100);
 Serial.println("Unit");
 delay(500);
  Serial.println(unit,6);
  delay(500);
  Serial.println("Price");
  delay(500);
  Serial.println(price,6);
  delay(100);
  Serial.println("Rs.");
  delay(500);
  Serial.write(0x1A);
  delay(100);
  j=0;
    }
```

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1.1 INTRODUCTION

Electric power has become fundamental to human endurance and progress. Aside from the endeavors to satisfy the developing need, mechanization in the energy circulation is additionally important to upgrade individuals' life standard. Conventional meter perusing is wasteful to meet the future private formative requirements. So there is expanded interest for Automatic Meter Reading (AMR) frameworks, which gather meter readings electronically and its application is growing over modern, business and of the simple and mechanical nature of the parts in these meters. Collection of meter perusing is likewise in productive on the grounds that a meter peruser needs to truly be nearby to utility climate. Conventional electro mechanical meters utilized today, are inclined to float over temperature. This strategy for gathering of meter readings turns out to be more hazardous and expensive when readings must be gathered from huge and frequently dissipated provincial regions. The more seasoned electro mechanical and present electronic meter readings are taken by the people associated with the gig and the sum is noted down in the EB card, this might consume parcel of time and surely require numerous people and the shoppers might be out if station. Aside from being an aid (AMR) clears out every one of the cons of regular frameworks.

AMR is a modern framework which permits organizations to note down the readings and compute bills without visiting the site. AMR incorporates different strategies like GPRS, SCADA, PLC, RF, Radio recurrence, GSM, and so on. Yet, among these GSM is the most ideal innovation that anyone could hope to find since it has various number of clients and gives a decent reach for the information to be sent. It assists the buyer and energy with overhauling supplier to get to precise information and refreshed information from the energy meter. This information is shipped off the focal framework for investigating and computation process. This framework can be a postpaid and a prepaid one. The information utilized for charging are put away in the server for refreshing and for sometime in the future. The information which is determined and put away in the server can be gotten to and examined precisely. The age of bill is finished by the set up sum for every unit. The units which are gotten through the GSM modern are put away and increased by the sum, for example, 5 for every unit and duplicated and the sum is determined and shipped off the shopper through the perceived telephone number. This produced bill can be paid and gotten to from anyplace all over the planet as the GSM is inescapable everywhere. This innovation holds great for IT parks, business structures, ventures. The advancement of GSM throughout the course of recent many years has made the energy metering remote. The GSM framework which has cross country inclusion is utilized to ask for and recover power utilization notice over individual houses and

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2.1 Design of electric energy meter for significant distance information data moves which in light of GPRS

With the advocacy of web in China as GPRS administration further developed progressively electric energy meter communicates the information data and controlling order from a distance and remotely founded on the flow electric energy meter with the very much worked ARM bit chip ,it not just completes the power information estimating and handling ,yet additionally understands the TCP/IP by cutting .By ARM part microchip controlling GPRS module ,electric energy meter could be connected to the web by utilization of GPRS administration. The general framework is steady and solid since it is overseen by mu C/OS-2 working framework .This is particularly for a few remote regions where the link network has not been promoted.

2.2 Automatic power meter perusing utilizing GSM organization

The improvement of a GSM programmed power meter perusing framework comprises of GSM computerized power meters introduced in each purchaser unit and a power EB connect System at the energy supplier side. The GSM computerized power meter is a solitary stage IEC61036std consistence computerized KILOWATT power meter with installed GSM modem which use the GSM organization to send its power utilization perusing utilizing short informing framework back to the energy supplier remotely. At the power supplier side an EB connect framework is utilized to deal with all got SMS meter perusing, register the charging cost, update the data set and to distribute the charging notice to its separate customer through SMS or email. A functioning model of the GAPMR framework was worked to show the viability of programmed meter understanding charging and warning using GSM organization.

2.3 Electronic meter with moment charging

It presents the design of the simple low cost wireless GSM energy meter and its associated web interface, for automatic billing and managing the collected data globally. The proposed system replaces traditional meter reading methods and enables remote access of existing energy meter by the energy provider. A GSM based wireless communication module is integrated with electronic energy meter of each entity to have remote access over the usage of electricity. A PC with a GSM receiver at the other end which contains the database acts as the billing point live meter reading from the GSM enables energy meter is sent back to this billing point periodically and these details are updated in a central database .net frame work and c# with proper authentication .users can access the developed web page details from anywhere in the world. The complete monthly usage and due bill is messaged back to the customer after processing these data.

Top PDF GSM-Based Energy Meter - 1LibraryDesign and Implementation of a GSM-Based Single Phase ... ☑

It presents the design of the simple low cost wireless GSM energy meter and its associated web interface , for automatic billing and managing the collected data globally .The https://llibrary.net/subject/gsm-based-energy-meter

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Total Words	346
Ideat Works	
Total Characters:	2127
Plagiarized Sentences	1.96
Unique Sentences	12.04 (86%)

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2.4 Wireless automated digital energy meter

Power is one of the fundamental necessities of people which is broadly utilized for homegrown, modern and horticultural purposes. There is an overwhelming interest in power. However there are very advanced substitute hotspots for power, there are parcel of issues regarding circulation and metering. The conventional electro mechanical meters still generally utilized today are inclined to float over temperature and time because of mechanical nature of the parts in the meter. The issue deteriorates further in gathering the meter readings and producing the bill. This proposes a strategy where telecom framework is used for robotized transmission of information to work with charge age and installment of the equivalent at the client's place.

2.5 Embedded energy meter-A new concept to measure the energy consumed by the consumer and to

A new concept of energy meter is shown, where maximum demand of energy of a consumer will be indicated in the meter used by the consumer after exceeding the maximum demand the meter and hence the connection will automatically be disconnected by an embedded system inserted in the meter itself According to the maximum demand the consumer will purchase a cash card of amount depending on the consumption of energy and after the full consumption the consumer again has to purchase another cash card or recharge something very similar and in this way the problem connected with go to the charging office to remain in a long line and to present the bill can be kept away from, Additionally this framework assists with killing the downside of charging the board framework, for example, to take the perusing from the meter to make the bill, to print the bill, to send the bill to the appropriate location and to gather the sum for the bill. Subsequently this framework can successfully decrease the labor supply expected indeed. Likewise another idea of wholesaler has been managed here which is utilized to detach a line if the energy utilization each day of a purchaser incredibly surpasses a pre request energy utilization each day.

Suray singh 29-06-2022

Design and Development of Embedded Energy Meter - UERT [2]

[2] Subhashis Maitra, —Embedded Energy Meter- A new concept to measure the energy consumed by a consumer and to pay the bill. Power System Technology and IEEE . https://www.ijert.org/research/design-and-development-of-embedded-energy-meter-

UERTV3IS070928.pdf



GSM Based Automatic Energy Meter System with Instant Billing &

and hence the connection will automatically be disconnected by an embedded system inserted in the meter itself. According to the maximum demand ...

https://www.ijarecie.com/upload/2014/apr14-specialissue3/11_R11_E.MoniSilviya.pdf



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Total Words	457
Total Characters:	2783
Plagiarized Sentences:	0
Unique Sentences:	21 (100%)

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3.1 OVERVIEW

Power is one of the crucial necessities for sustainment of items throughout everyday life. It ought to be utilized prudently for its appropriate use. In any case, in our country, we have part of territory where we have excess stock for the power while numerous areas don't for a moment even approach it. Our arrangements of its circulation are additionally to some extent liable for this since we are as yet not ready to accurately appraise our careful prerequisite despite everything power burglary is winning. Then again, purchasers are additionally not happy with the administrations of force organizations. More often than not they have grumblings with respect to measurable mistakes in the month to month charges. With this we can screen meter and track in the event that any shortcoming is there or not. In past meter a roundabout metal strip turns and as per that revolution we compute the utilization. However, our meter chips away at beat which is made by utilization and we recently associated android board which screen the beat and as per beat the bill is produced. With the assistance of this undertaking we are intending to get the month to month energy utilization from a far off area straightforwardly to concentrated office. In this manner we can decrease human endeavors expected to record the meter readings which are till currently recorded by visiting each home separately.

3.2 PROBLEM STATEMENT

In the presently working framework, power meter perusing for power use and charging is finished by human laborers from one home to another and working to structures. The reason for this venture is to foster a Smart Electricity meter utilizing GSM. This can diminish human blunders and assists with recovering the continuous meter esteem by means of GSM and send it to client's cell phone through GSM. This likewise permits power board to change the variable bundle cost in unambiguous term. The director can break down the client's power utilization information and produce the report from the information on the web. The model will actually want to acquaint the charging framework with the clients, get the power utilization information from shrewd meter, keep the information in unified data set and create the report.

3.3 PROBLEM SOLUTION

The brilliant meter shows a computerized meter perusing and uses a protected shrewd information organization to naturally and remotely send the readings to your energy provider no less than one time each month, so you will get exact, not assessed bills. Savvy meters likewise accompany an in-home showcase screen that shows you precisely how much energy you're involving in pounds and pence, in close to ongoing

In this meter you will get exact bills, you will get SMS of your utilization in set time period.



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Total Words	817
Total Characters:	5045
Plagiarized Sentences:	4.7
Unique Sentences:	42.3 (90%)

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5.1 ENERGY METER

The meter which is utilized for estimating the energy uses by the electric burden is known as the energy meter. The energy is the all out power consumed and used by the heap at a specific time period. It is utilized in homegrown and modern AC circuit for estimating the power utilization. The meter is more affordable and exact.

The energy meter has four fundamental parts. They are the

- 1. Driving System
- 2. Moving System
- 3. Braking System
- 4. Registering System

The detail clarification of their parts is composed beneath.

1. Driving System - The electromagnet is the principal part of the driving framework. It is the transitory magnet which is energized by the ongoing course through their loop. The center of the electromagnet is comprised of silicon steel cover. The driving framework has two electromagnets. The upper one is known as the shunt electromagnet, and the lower one is called series electromagnet.

The series electromagnet is invigorated by the heap current move through the ongoing loop. The curl of the shunt electromagnet is straightforwardly associated with the stock and thus conveys the ongoing corresponding to the shunt voltage. This loop is known as the strain curl.

The middle appendage of the magnet has the copper band. These groups are flexible. The principal capability of the copper band is to adjust the transition created by the shunt magnet so that it is precisely opposite to the provided voltage.

2. Moving System - The moving framework is the aluminum plate mounted on the shaft of the composite. The circle is put in the air hole of the two electromagnets. The vortex current is prompted in the plate due to the difference in the attractive field. This whirlpool current is cut by the attractive transition. The connection of the transition and the plate prompts the diverting force.

At the point when the gadgets consume power, the aluminum circle begins pivoting, and after some number of turns, the plate shows the unit utilized by the heap. The quantity of revolutions of the plate is counted at specific time period. The circle estimated the power utilization in kilowatt hours.

3. Braking Mechanism - The long-lasting magnet is utilized for lessening the revolution of the aluminum circle. The aluminum plate actuates the vortex current on account of their revolution. The whirlpool current cut the attractive transition of the super durable magnet and subsequently delivers the slowing

This slowing down force goes against the development of the circle, consequently lessens their speed. The extremely durable magnet is movable because of which the slowing down force is additionally changed by moving the magnet to the next outspread position.

4. Registration (Counting Mechanism) - The principal capability of the enlistment or counting instrument is to record the quantity of turns of the aluminum circle. Their pivot is straightforwardly corresponding to the energy consumed by the heaps in the kilowatt hour.

5.1.1 WORKING OF ENERGY METER

The energy meter has the aluminum circle whose turn decides the power utilization of the heap. The circle is set between the air hole of the series and shunt electromagnet. The shunt magnet has the strain Sway Singh 29-66-2022 loop, and the series magnet has the ongoing curl.

The strain curl makes the attractive field due to the inventory voltage, and the ongoing loop produces it as a result of the current.

The field prompts by the voltage loop is slacking by 90° on the attractive field of the ongoing curl on account of which whirlpool current actuated in the plate. The cooperation of the swirl current and the attractive field causes force, which applies a power on the circle. In this way, the plate begins turning. The power on the circle is relative to the current and voltage of the curl. The long-lasting magnet controls their turn. The long-lasting magnet goes against the development of the plate and balances it on the power utilization. The cyclometer counts the pivot of the circle.

5.2 ELECTROMECHANICAL METER

A power meter, electric meter, electrical meter, energy meter, or kilowatt-hour meter is a gadget that actions how much electric energy consumed by a home, a business, or an electrically fueled gadget. Electric meter or energy meter estimates the complete power consumed throughout a period stretch. Electric utilities utilize electric meters introduced at clients' premises for charging and checking purposes. They are normally adjusted in charging units, the most widely recognized one being the kilowatt hour (kWh). They are generally perused once each charging period.

At the point when energy reserve funds during specific periods are wanted, a few meters might gauge interest, the greatest utilization of force in some span. "Season of day" metering permits electric rates to be changed during a day, to record use during top significant expense periods and off-top, cheaper, periods. Likewise, in certain areas meters have transfers for request reaction load shedding during top

Strong And Long Durable With High Strength Black Iron ... $\[\[\] \]$

The meter which is utilized for estimating the energy uses by the electric burden is known as the energy

https://www.tradeindia.com/products/strong-and-long-durable-with-high-strength-black-iron-squarefeet-meter-boxes-for-construction-7544399 html

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It is utilized in homegrown and modern AC circuit for estimating the power utilization. https://www.tradeindia.com/products/strong-and-long-durable-with-high-strength-black-iron-squarefeet-meter-boxes-for-construction-7544399.html

Significance of energy meters - The Best Online Business Guide $\ensuremath{\mathbb{C}}$

The middle appendage of the magnet has the copper band. https://thebestonlinebusinessguide.com/significance-of-energy-meters

Force plant transmission blackouts and energy meter - Liberty Motor ... \Box Electric utilities utilize electric meters introduced at clients' premises for charging and checking purposes. http://www.libertymotorco.com/force-plant-transmission-blackouts-and-energy-meter

Simple tips for lower Electricity Bills - Tech info They are generally perused once each charging period.

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Total Words	616
Total Characters	3929
Plagiarized Sentences	1.74
Unique Sentences	27.26 (94%)

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5.3 ARDUINO BOARD

The sheets are furnished with sets of computerized and simple infolyield (I/O) sticks that might be communicated to different ex-pansion sheets (safeguards) and different circuits. The sheets highlight sequential correspondences interfaces, including Universal Serial Bus (USB) on certain models, which are additionally utilized for stacking programs from PCs. The microcontrollers are normally modified utilizing a lingo of elements from the programming dialects C and C++. As well as utilizing conventional compiler instrument chains, the Arduino project gives an incorporated advancement climate (IDE) in view of the Processing language project.

5.4 GSM MODULE

A GSM modem is a specific kind of modem which acknowledges a SIM card, and works over a membership to a portable administrator, very much like a cell phone. From the versatile administrator point of view, a GSM modem closely resembles a cell phone. At the point when a GSM modem is associated with a PC, this permits the PC to utilize the GSM modem to impart over the portable organization. While these GSM modems are most often used to give portable web network, a significant number of them can likewise be utilized for sending and getting SMS and MMS messages. A GSM modem can be a committed modem gadget with a sequential, USB or Bluetooth association, or it very well may be a cell phone that gives GSM modem capacities, With the end goal of this record, the term GSM modem is utilized as a conventional term to allude to any modem that upholds at least one of the conventions in the GSM transformative family, including the 2.5G advancements GPRS and EDGE, as well as the 3G advances WCDMA, UMTS, HSDPA and HSUPA.

5.5 ARDUINO IDE

The Arduino project gives the Arduino coordinated improvement climate (IDE), which is a cross stage application written in the programming language Java. It started from the IDE for the dialects Processing and Wiring. It incorporates a code proofreader with elements, for example, text reordering, looking and supplanting text, programmed indenting, support coordinating, and sentence structure featuring, and gives straightforward a single tick systems to order and transfer projects to an Arduino board. It likewise contains a message region, a message console, a toolbar with buttons for normal capabilities and an order of activity menus.

5.6 ATMEGA328 MICROCONTOLLER

ATMEGA328P is elite execution, low power regulator from Microchip. ATMEGA328P is a 8-digit microcontroller in light of AVR RISC engineering. It is the most well known of all AVR regulators as it is utilized in ARDUINO sheets.

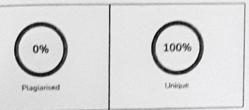
5.7 SERIAL CONNECTION

In telecom and information transmission, sequential correspondence is the most common way of sending information the slightest bit at a time, sequentially, over a correspondence station or PC transport. This is rather than equal correspondence, where a few pieces are sent all in all, on a connection with a few equal channels.

Sequential correspondence is utilized for all long stretch correspondence and most PC organizations,

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Total Words	218
Total Characters	1379
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Unique Sentences	13 (100%)

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6.2 DISCUSSION

By this innovation prepaid energy meter is an idea to limit the power burglary with an expense proficient way. The clients not will undoubtedly pay abundances measure of cash, clients need to pay as indicated by their necessity. Prepaid energy meter is more solid and easy to understand. This prepaid distant energy meter ends up being a shelter in the power area. It controls the use of power on shopper said to stay away from wastage of force. It serves to the country income by halting current robbery and rebuffing the untrustworthy clients. Be that as it may, their plan needs to satisfy specific prepaid guidelines and guidelines. The main concern is the security and protection of information as they are Inclined to digital assault. Notwithstanding, the utilization of GSM in this specific framework gives various benefits over strategies that have been recently utilized. Information transmission is charged at guidelines SMS rates, hence the charges are not in view of the span of information transmission. The expense effective of readings. Created framework additionally gives data about day to day, month to month and yearly power utilization. Insights about everyday power utilization will assist shopper with dealing with their power use. This created framework is solid and secure as just approved individual can get to the framework



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Total Words:	413
Total Characters:	2861
Plagiarized Sentences:	0
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7.1 FUTURE SCOPE

1. A Tremendous Promise of Value

From the provider purchaser relationship point of view, brilliant meters can reclassify the provider's job to that of an energy counselor. From an industry perspective, it can coordinate new advancements and developments across the power matrix. To the clients' benefit, it can drive down costs, give straightforwardness and adaptable estimating. What's more, according to a social viewpoint, it can further develop energy protection, network dependability and blackout the board, other than coordinating the stock of environmentally friendly power choices.

A large part of the business case for brilliant meters depends on persuading clients to change their energy utilization really. A positive predisposition among most clients toward energy preservation (for both monetary and natural reasons) is a reassuring beginning. What is required is to make a positive encounter, both during and after the rollout.

Client experience during the rollout should be driven by convenient and customized data dispersal on plans, notices, duty choices, expected advantages and worries of security and wellbeing. Post the rollout, it moves favoring a warning commitment. Investigation, combined with the Internet of Things (IoT), can empower organizations to give shrewd arrangements that assist customers with proficiently dealing with their energy prerequisites. In-home showcases can give continuous criticism and enable clients to examine their utilization designs and boost reserve funds.

2. Organizing FOR SUCCESS

IT, Customer Relationship Management (CRM) and client care are the three business regions that will see the best effect from the brilliant meter rollout. The methodology will rely upon assisting clients with understanding the advantages. Examination can uphold organizations in offering variable evaluating plans in view of utilization designs.

All change the board projects ought to traverse both group construction and activities. It includes picking the most fitting field force model and preparing the group areas of strength for administration sharpness. New capacity advancement should be offset with functional needs to keep up with high help levels as huge business cycles will be affected.

7.2 DEVELOPMENT

The prompt chances of brilliant metering lie in the space of information access, charging straightforwardness, energy effectiveness, execution and consistence. Investigation and innovation unfurl additional astonishing prospects into what's in store.

IoT and big data analytics will pave the way for multiple devices to be connected. For E&U companies, it can improve grid intelligence and provide projection models that will combine historical data and weather forecasts to integrate the supply of renewable resources. Such innovations can take customer experience to new levels.



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