IJCRT.ORG ISSN : 2320-2882

INTERNATIONAL JOURNAL OF CREATIVE RESEARCH THOUGHTS (IJCRT)

An International Open Access, Peer-reviewed, Refereed Journal

Power Meter Billing And Load Control Using GSM

SowmyaG[1],DivyaMN[2],MahadevaswamyB[3],ArikeriKarthik[4],BhoomikaS[5]

AssistantProfessors[1],Students[2,3,4,5]

DepartmentOfElectricaland ElectronicsEngineering1[1,2,3,4,5]

VidyaVikasInstitute ofEngineeringandTechnology[1], Mysore,Karnataka,India.

Abstract: In our daily life, a meter reader has to collect the meter readings physically from all on-sites. This involves a lot of manual work and the process is regarded as tedious. Power is necessary to operate the electrical appliances which is been used in our day today life widely around the world. It is a need of every individual and its demand would keep on increasing, so regulating it based on the use case is an adequate measure to be undertaken. The main objective of this project is to build an automatic system to take meter reading without involving much human intervention. This can also abide various other use cases like limiting the usage by specifying certain limits of load, setting a remainder to pay the bill within the specified time, or take actions accordingly if paying the bills are delayed beyond a specified time. This project recommends the use ofGlobal SystemforMobile(GSM)module fortransmitting necessary information fromtime totime with the help of microcontroller to automate the system of meter reading as it seems cost efficient and effective in range. Themicrocontrollercanalsobeprogrammed tolimit theloadsupply totheappliance based onthelimit theuser specified.

I. INTRODUCTION

Power Meter reading is a necessary procedure and as it's been a manual task, it seems to be difficult for both the provider, consumer and the intermediary persons who work for them. The provider has to send a person to on-sites for taking meter readings in specified intervals of time. As the reading is taken by human, it might seem to have some fluctuations and will not necessarily be accurate. Also, the consumer must be available when the reading has to be taken. The availability of human and their intervention is quite a tedious task as it is time consuming and traveling is also involved. For the sake of removing manual intervention, it is necessary to automate the process [1]. This can also be used to control the load which would limit the energy usage to a specified limit depending on the use case. Also, while considering the future residential growth the traditional way of billing might find it difficult as it would require a lot of manual intervention and it would be inefficient. By automating this process, the electricity department and the consumer will get the reading via SMS. Hence it is foundbeneficial to both consumer and the producer as human intervention is minimized [2]. This system can also be designed to receive messages which would imply to stop supplying electricity beyond a specified limit or any other specified conditions like during non-payment of bill fora specified duration. This would solve the crisis of fluctuations of reading taken physically and also the user can be notifiedabout paying the bill if the system is programmed accordingly [7]. Automatic meter reading will be beneficial for residential, industrial and commercial sectors as each of these is definitely dependent on power. This saves cost and time for both providers and consumers, so it would be mostly preferred in present conditions [8]. This project aims at using Global System for Mobile (GSM) to send a message to the concerned individual. GSM is considered as the second-generation cellular system standard. A wireless communication module based on GSM is connected to the energy meter which records the energy usage and sends it to the GSM receiver which collects the

data and act as a billing unit. As GSM is cost effective and has capability of good area coverage, it is considered as an effective means of transmitting information as Short Messaging Service (SMS). Though this systemrequiresthe supportofmanagement controltofully implement itacrossallresidential, industrial and commercialsectors, once implemented the proposed system can facilitate,Collecting the meter reading and sends it to both provider and the consumer.Sendingalertstotheconsumeriftheloadexceedsbeyondthespecifiedlimit.Sendingnotificationabout paying the bill in time if paying the billis not done ontime power supply would be shut by the system itself [5]. This is done by facilitating GSM with loaded SIM which would receive messages and take action as programmed. The project can be interfaced with keyboard in order to change the mobile number linked to the GSM. For any reason if the consumer wants to change the mobile number in future, this feature will come in handy

II. PROBLEMSTATEMENT

Accurate electricity billing and efficient load control are critical challenges in manyregions due to outdated infrastructure and manual processes. Traditional power metersrequire manual readings, leading to potential errors, inefficiencies, and delayed billing.Additionally, manual load control during peak periods can cause power outages andequipment damage.

III. OBJECTIVES

a) TogenerateAutomaticBillusingGSMtechnologytoensuresaccuracybyeliminatingmanualefforts.
b) ToenableRemoteMonitoringandFacilitateLoadControlinreal-timeviaSMSinhelpingthemmanageconsumption effectively.

IV. BLOCKDIAGRAM

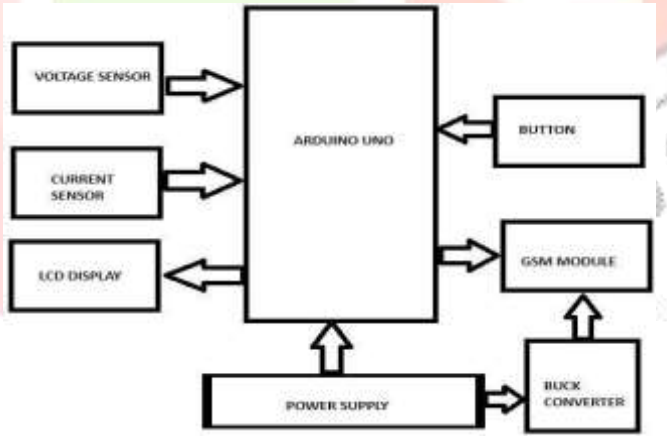


Fig1:Blockdiagram

V. COMPONENTS&DESCRIPTION

1. ArduinoUno

Central Microcontroller: The Arduino Uno acts as the central processing unit of the system. It collects data from the sensors (voltage and current) and processes this information to calculate the power consumption. It also interfaces with the GSM module for communication and other components like the LCD display and button for user interaction.

2. VoltageSensor

MeasuresVoltage:Thevoltagesensorisusedtomeasurethevoltagelevelofttheelectricalload.ThisdataissenttotheArduino Uno for processing.

3. **CURRENTSENSORMEASURES CURRENT:**

Thecurrentsensormeasuresthecurrentflowingthroughtheelectricalload.Likethevoltagesensor,itsendsthisdatato the Arduino Uno for further processing.

3. LCDDisplayDisplaysInformation:

TheLCDdisplayisusedtoshowimportantinformationsuchasthecurrentvoltage,current,powerconsumption,andbilling details. It provides a user-friendly interface for monitoring.

4. ButtonUserInput:

Thebuttonallowstheusertointeractwiththesystem. Itcouldbeusedtoresetthe system, sendamanualrequestforbilling information, or control the load.

5. GSMModuleCommunication:

TheGSM module is responsible forsending and receiving dataoveraGSM network. Inthe context ofpowermeter billing, itcan send the consumptiondatatoaremoteserver ormobilephone forbilling purposes.Itcanalsoreceive commandsfor loadcontrol, such as turning off a load if the user has exceeded their credit or for other control purposes.

6. PowerSupplyPoweringtheSystem:

Thepowersupplyprovidesthenecessaryelectricalpowertotheentiresystem,includingtheArduino,sensors,display,and GSM module.

7. BuckConverterVoltage Regulation:

ThebuckconverterstepsdownthevoltagefromthepowersupplytoalevelthatissuitablefortheArduinoandothercomponents. This ensures that all parts of the system receive the correct voltage.

VI. ADVANTAGESANDAPPLICAT

VII. IONS ADVANTAGES

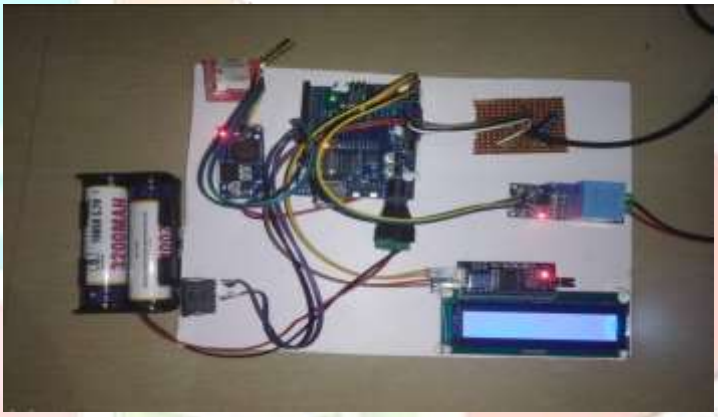
- AccurateBilling:Minimizeserrorswithautomatedreadings.
- ConvenientUpdates: Deliversinstantbillingand consumptioninfo via SMS.
- RemoteControl:Allowsforefficientload managementandmonitoring.
- Cost Savings:Reducesmanuallaborandadministrativeexpenses.
- ImprovedEfficiency:Aids inmanagingandreducingenergy use.

APPLICATIONS

- Residentialmonitoring,commercialefficiency,andutilitymanagementenablehomeownerstotrackenergy,businessesto optimize consumption, and utilities to automate billing and load control.
- EnergySystems:Integrateswithbroaderenergymanagementsolutions.
- Smart Grids: Enhances grid managementwithreal-timedataandcontrol

VIII. RESULTANDDISCUSSION:

GSM technology effectively transmitted power usage data, generated accurate real-time billing via SMS, and allowed reliable remote load control.However, the system's performance was dependent on network coverage, and security risks such as potential unauthorized access were identified. While the system enhanced power management, improvements in security and network reliability are necessary for broader implementation.



IX. CONCLUSION

GSM based energy meter is easy to installation and beneficial for both energy Provider and Customer. This reduces the manual cost and also reduces the errors done by the humans. This also reduces the problems faced by customer like over running of the meter, over load, and also reduces thefts. Whenever fault occurs it indicates to the customer. Then customer can inform to the company then energy Provider Company can cut the power easily by sending the SMS to that particular ID number which is connected to the SIM number. The statistical load used and profile help the customer to manage their energy consumption. This helps them to reduce their outstanding dues. This system can be used even in the remote areas by changing the type of the modem, and its range of frequency for communication. This device reduces all cases of revenue problems to the country and helps us to improve our usage.

X. ACKNOWLEDGMENT

We express our thanks to all our staff members of Electrical and Electronics Engineering department and all those who have directly or indirectly helped us during the project work. We thank our parents for the immoral support and encouragement throughout this work.

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