International Journal of Scientific Research in Engineering and Management (IJSREM)
Volume: 05 Issue: 06 | June - 2021 ISSN: 2582-3930

Advanced Rechargeable Energy Meter

Prof. R.B. Mane (Guide) , Department Of Electrical Engineering, NMCE Peth(Sangli)

B. Sandip , Department Of Electrical Engineering, NMCE Peth(Sangli)

D. Akshay , Department Of Electrical Engineering, NMCE Peth(Sangli)

G. Aniket , Department Of Electrical Engineering, NMCE Peth(Sangli)

S. Ashitosh , Department Of Electrical Engineering, NMCE Peth(Sangli)

Abstract: In this paper, the concept of a prepaid energy meter using an AT89S52 microcontroller has been introduced. This concept provides a cost advantage manner of electricity billing. The present energy billing systems are discrete, not-correct , more costly and slow. They are also time and labor consuming. The major drawback of convention billing system is power and energy theft. This disadvantage is reduced by using a prepaid rechargeable energy meter which is based on the concept **"**Pay first and then use it**"**. Prepaid energy meter also reduces the error made by humans while taking readings to a large extent and there is no need to take reading in it. The prepaid energy meter recharge by using of SMS technology is available in various ranges (i.e. Rs. 50, Rs. 100, Rs.200, etc.). The recharge is done by using a keypad and the meter is charged with the amount. According to the power consumption, the amount will be reduced.

Key words*:* GSM (Global system Of Mobile Communication), Microcontroller, Energy Meter, Relay.

1. INTRODUCTION

The present traditional billing system have many problems like problem of payment collection, energy thefts etc. due to which the traditional billing systemis slow, costly and unreliable.The present billing system has chances of error and it is also time or abour utilizing . A paper suggests a design of digital energy meter for improved metering and billing system. prepaid energy metering system has also been proposed and

developed based on local prepayment . So it is essential to develop a billing system which solves the problem of billing manually and also reduces the manpower.

In this paper we proposed and designed a prepaid energy meter using two microcontrollers AT89S52 and from

ATMEL family. The reason for using these microcontrollers is its highly performance, power efficiency or design flexibility etc. In this paper, GSM technology is used which is useful for sending SMS to consumer and used to recharge the meter (i.e. Rs. 50, Rs. 100, Rs. 200 etc.) and the energy meter to which the no. of recharge units has to be loaded[5]. Suppose a consumer buys a recharge Rs. 50 he/she can insert this amount through the SMS so that the prepaid energy meter will be activated. According to the power consumption the amount will be reduced. An LDR circuit is used to count theam ount of energy consumed and an LCD is used to display the meter readings. When the recharge card amount is nil the relay will automatically shut down the whole system.

2.Problem Statement

The Energy metering instrument technology has come a long way from what it was more than 100 years ago. From the original bulky meters with heavy magnets and coils, there have been many innovations that have resulted in size & weight reduction in addition to improvement in features and specifications. Resolution and perfectness of the meter have seen constant improvements over the years. Introduction of the digital meter in the later part of last century has properly changed the way Electrical parameters are measured. Starting with Voltmeters & Ammeters, the digital meter has conquered the entire spectrum of measuring instruments due to their advantages like ease of reading, better resolution and rugged design . Of particular significance is the introduction of the Electronic Energy Meter in the mid-eighties. Now a days, the energy consumption and energy distribution has become a big subject for discussion because of huge difference in energy production and consumption. In this regard, energy consumers are facing so many problems due to the frequent power failures; another important reason for power cuts is due to the un-limited energy consumption of rich people. In this aspect, to minimize the power cuts and to distribute the energy equally to all areas, some restriction should have over the power consumption of each and every energy consumer, and according to that the Government should implement a policy, by introducing Autonomous Energy Meters everywhere in

domestic sector. Hence, the need has come to think on this line and a solution has to be emerged out.

Objective of the project

- To avoid more consumption of electricity.
- Reduction of man-power.

facilitates the exemption from electricity bills. Electricity coupons will be available at nearby shops. The word prepaid means "pay before use" one of the advantageous feature of this concept prepaid energy meter is used to prepaid the ongoing supply of electricity to homes, offices etc

3. Introduction to Automation System

Everything in today's world is getting automated. In fact there is a feature of auto-pilot in airplanes giving additional help to pilots during their cruise. Not only in airplanes but also in day to day electronic like washing machine, microwave oven etc. automation feature is like a blessing. Automation feature is being added in this project as well as there is no need of any man to take reading manually.

Proposed system Project Feature

-User friendly.

Can be Controlled from anywhere in the world .Daily.

–energy limit Reduce.

- Increase the accuracy of the meter reading.

Scope of the Projects: GSM & The system will provide a solution for automation in energy sector, which will helpful in decreasing the cost which is spent for billing and distribution of bills.

The proving system will also reduce cost of electricity which is consumed by meter itself. Since human efforts for taking meter reading is not required, error and corruption related with them is not happen

Project Specifications

To generate units consumed from the wireless energy meter simulator and send the values to the DES agent.To calculate the balance units of each household. The balance units are calculated as: Balance units = Total balance units after topping up- units consumed.To send a reminder to user of his balance units hits certain range .

4. Block Diagram

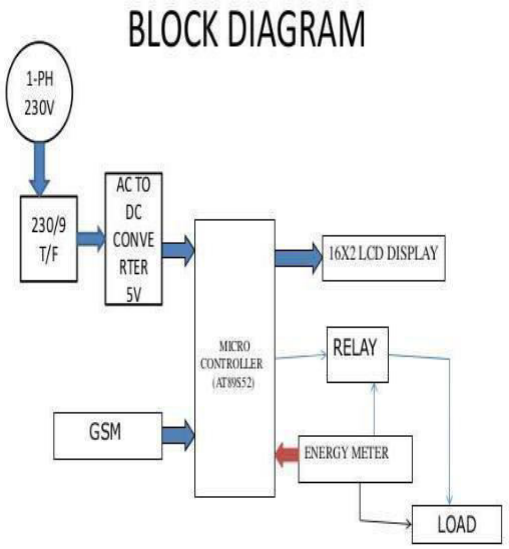

Fig.1;Block Diagram Of Rechargeble energy meter

5. Circuit Diagram -

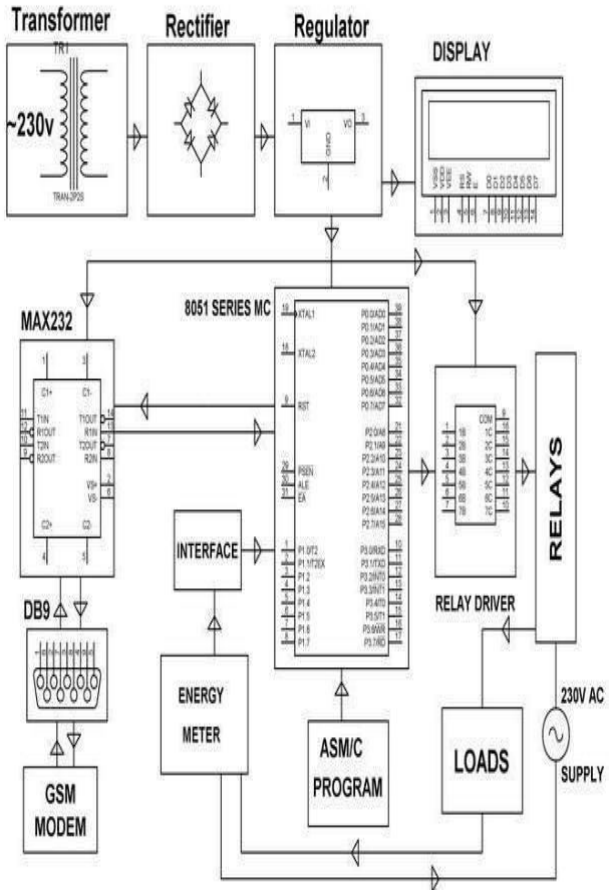

Fig.2;Circuit Diagram Of Rechargeble Energy Meter

6. Block Diagram And Circuit Diagram

The block diagram containing of GSM module, microcontroller, Power supply 16 x 2 LCD Display, Relay , Energy meter , Load . GSM (Global System for Mobile communications) is a cellular network, which means that mobile phones connect to it by searching for cells in the immediate proximity. GSM networks operate in four different frequency ranges. Most GSM networks operate in the 900 MHz or 1800 MHz bands. Some countries in the Americas use the 850 MHz and 1900 MHz bands because the 900 and 1800 MHz frequency bands were already allot. LCD Display is 16 x 2 .liquid crystal display (LCD) is a thin, flat display device made up of any number of color or monochrome pixels arrayed in front of a light source or reflector. Each pixel consists of a column of liquid crystal molecules suspended between two transparent electrodes, and two polarizing filters, the axes of polarity of which are perpendicular to each other. Without the liquid crystals between them, light passing through one would be blocked by the other. The liquid crystal twists the radiations of light entering one filter to allow it to pass through the other. A relay is an electrical switch that opens and closes under the control of another electrical circuit. In the original form, the switch is operated by an electromagnet to open or close one or many sets of contacts. A relay is able to control an output circuit of higher power than the input circuit, it can be considered to be, in a broad sense, a form of an electrical amplifier.

7. ENERGY CALCULATIONS

The Energy Meter IC(AD7751) produces an output frequency that is directly proportional to the time average value of the product of two voltage signals. The input voltage signals are applied across current channel (pin 4, 6) and voltage channel (pin 8, 7) of Energy Meter IC. The Energy Meter IC also provides an output frequency at pin 22 of Energy meter IC equal to the output power. During calibration the frequency (F=0.5Hz) we got against load=1kW.Then power (P) will be (for any value of frequency say F.

$$P = \frac{\text{Load} \times X}{0.5} \quad (1)$$

$$P = 2000 \times X (\text{as Load} = 1000 \text{watt}) \quad (2)$$

$$1\text{WattSec} = \frac{1\text{kWh}}{1000 \times 3600} \quad (3)$$

$$\text{Energy} = \frac{P \times \text{Sec}}{1000 \times 3600} \quad (4)$$

$$\text{Energy} = \frac{2000 \times X \times \text{Sec}}{3600000} \text{ Units} \quad (5)$$

8. RESULT

The energy meter was tested by using an electric light bulb of 100 watts that draws current up to A. The supply voltage was 230 V. First of all a watt meter was used to measure the power consumed by the load. Then energy consumption was measured after every 10 seconds. Total 5 pulses occurred at every 10seconds in energy meter. The computed energy consumption is read from the LCD. The test was done over a 2 minute period and measurements were taken every 10 Seconds.

Applications of Rechargeable Energy Meter:

- Water supply pump application
- Industrial application
- Commercial applications
- Residential application

9. CONCLUSION

A smart system like this can help reliable energy and also possibly suppress the foul techniques of steeling power from the power lines. The generation and linkage of electric power can be switched ON or OFF using simple techniques of recharge. It shows a much more traditional way to develop the power system and it is consumer friendly. This system is user friendly and low cost effective and can produce a large interest for the electricity supply departments for its advantages. Developments such as these provide faster payments and also reliability towards the service.

10. REFERENCE:

1. M.Anas .,N. Javed, A.Mahmood ,S .M.raza. ‘’Minimizing Electricity Theft,’’ in 2012 Seventh International Conference on P2P, Parallel, grid, Cloud & Internet Computing, Victoria, BC 2012 .

2.A.deSouza, D Gastaldello,F. Fernandes&Z.Vale “Smart meters as a tool for energy efficiency, in Industry Application” (INDUSCON).2014 11th IEEE \IAS International Conference,Juiz de For a,2014.

3.K..Ramandan,E.Zakaria& D.M. Elitigani, ‘'Prepaid Energy Meters Networks via Power System Communication,’’ in Computing, Electrical & Electronics Engineering (ICCEEE),2013 International Conference, Khoratourm,2013

4. M.W.Raad,T.Sheltmi and M.Sallout, “A SMART CARD BASED PREPIAD ELECTRICITY SYSTEM’’. In Pervasive Computing and Application, 2007 ICPCA **2007** .2nd International Conference, Birmingham,2007.

5. R.Teymourzadeh, 1M.L.S. and A.J.A. Abueida,’’RFID-BASED Prepaid Power Meter,’’ in Pervasive Conference on Research and Development (SCOReD,Putrjaya,2013.

6. Jubi.K&M.John ‘’Prepaid Energy Meter With GSM Technology,’’ American international Journal of Research in Science, Technology. pp.195-198-2013.

7. B.G.I.lghalo, ‘’Modeling of GSM Based Energy Recharge Scheme for Prepaid.’’ IOSR Journal of Electrical and Electronics Engineering ,vol, IV, no.1, pp 46-53, 2013.

11. AUTHOR DETAILS:

First Author –Mr.SandipGanpatiBorganve, Department Of Electrical Engineering,
NanasahebMahadik Collage of
Engineering, Peth(Sangli).

Second Author –Mr.AkshayPralhad Dive,
Department Of Electrical Engineering, NanasahebMahadik College of Engineering, Peth(Sangli).

Third Author –Mr.Aniket Suresh Gaikwad.
Department of Electrical Engineering,NanasahebMahadik Collage of Engineering,Peth(sangli).

Fourth Author –Mr.Ashitosh Anil Shinde.
Department of Electrical Engineering, NanasahebMahadik Collage of Engineering,Peth(Sangli).