GSM Based Energy Meter Information And Load Control

Vivek V. Giri[1], Gopal K. Trivedi[2], Muralidhar N. Ilame[3], Mangesh B. Kolhe[4], Amol S.Kshirsagar[5], Prof. Yogesh P. Sushir[6]

Dept of Electrical Engineering
[1,2,3,4,5] Dr.V.B.K.C.O.E.Malkapur,Maharashtra,India
[6] Assistant Prof, Dr.V.B.K.C.O.E.Malkapur,Maharashtra,India

Abstract- *The technology of electronic -metering (electronic metering) has gone through rapid technological advancements and there is increased demand for a reliable and efficient automatic meter reading (AMR) system. This paper presents the design of a simple low cost wireless GSM energy meter and its associated web interface, for automating 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. Also they can monitor the meter readings regularly without the person visiting each house. A GSM based wireless communication module is integrated with electronic energy meter of each entity to have remote access over the uses of electricity. A Computer with a GSM receiver at the other end, which contains the database acts as the billing point.

Keywords- smart meter, load control, GSM module, Automatic Meter Reading (AMR)

I. INTRODUCTION

The Electrical 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 accuracy of the meter have seen substantial improvements over the years. Introduction of the digital meter in the later part of last century has completely 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 construction. 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 became 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.

Electrical Metering Instrument Technology

Today the metering instrument technology grown up significantly, such that the Consumed energy can be calculated mathematically, displayed, data can be stored, data can be transmitted, etc. Presently the microcontrollers are playing major role in metering instrument technology. The present project work is designed to collect the consumed energy data of a particular energy consumer through wireless communication system (without going to consumer house), the system can be called as automatic meter reading (AMR) system.

The Automatic Meter reading system is intended to remotely collect the meter readings of a locality using a communication system, without persons physically going and reading the meters visually.

II. MODEL DESCRIPTION AND WORKING

Transformer

A transformer is a device that transfers electrical energy from one circuit to another through inductively coupled electrical conductors.

Basic principle

The transformer is based on two principles: firstly, that an electric current can produce a magnetic field (electromagnetism) and secondly that a changing magnetic field within a coil of wire induces a voltage across the ends of the coil (electromagnetic induction). By changing the current in the primary coil, it changes the strength of its magnetic field; since the changing magnetic field extends into the secondary coil, a voltage is induced across the secondary. A simplified transformer design is shown below. A current passing through the primary coil createsa magnetic field.
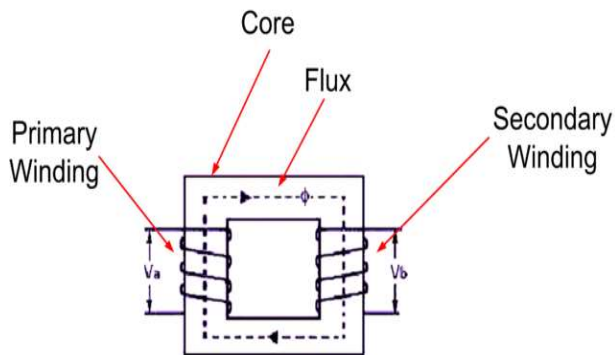

Figure1. TRANSFORMER

Bridge Rectifier

A diode bridge or bridge rectifier is an arrangement of four diodes in a bridge configuration that provides the same polarity of output voltage for any polarity of input voltage. When used in its most common application, for conversion of alternating current (AC) input into direct current (DC) output, it is known as a bridge rectifier.

Output smoothing (Using Capacitor)

For many applications, especially with single phase AC where the full-wave bridge serves to convert an AC input into a DC output, the addition of a capacitor may be important because the bridge alone supplies an output voltage of fixed polarity but pulsating magnitude.
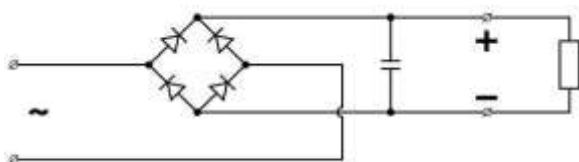

Figure2.Bridge rectifier using capacitor

The function of this capacitor, known as a reservoir capacitor (aka smoothing capacitor) is to lessen the variation in (or 'smooth') the rectified AC output voltage waveform from the bridge. One explanation of 'smoothing' is that the capacitor provides a low impedance path to the AC component

of the output, reducing the AC voltage across, and AC current through, the resistive load. In less technical terms, any drop in the output voltage and current of the bridge tends to be cancelled by loss of charge in the capacitor.

MICRO CONTROLLERS:

The 8052 microcontroller is the 8051's "big brother." It is a slightly more powerful microcontroller, sporting a number of additional features which the developer may make use of 256 bytes of Internal RAM (compared to 128 in the standard 8051) and it is having 8k bytes of ROM. A third 16-bit timer, capable of a number of new operation modes and 16-bit reloads.

AT89S52:

Features:

- Compatible with MCS-51 Products
- 8K Bytes of In-System Programmable (ISP) Flash Memory
- Endurance: 1000 Write/Erase Cycles
- 4.0V to 5.5V Operating Range
- Fully Static Operation: 0 Hz to 33 MHz
- Three-level Program Memory Lock
- 256K Internal RAM
- 32 Programmable I/O Lines
- 16-bit Timer/Counters
- Eight Interrupt Sources
- Full Duplex UART Serial Channel
- Low-power Idle and Power-down Modes
- Interrupt Recovery from Power-down Mode
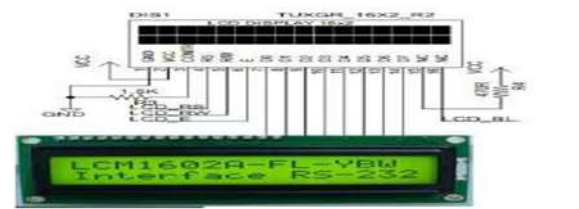- Watchdog Timer

LCD (Liquid Cristal Display)

Figure3 : LCD

A 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 polarization of light entering one filter to allow it to pass through the other.

GSM (Global System for Mobile communications)

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 vicinity. 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 allocated. The rarer 400 and 450 MHz frequency bands are assigned in some countries, where these frequencies were previously used for first-generation systems.

+2.7 POWER SUPPLY DESIGNING

Power Supply:

Power supply is a reference to a source of electrical power. A device or system that supplies electrical or other types of energy to an output load or group of loads is called a power supply unit or PSU. The term is most commonly applied to electrical energy supplies, less often to mechanical ones, and rarely to others

This power supply section is required to convert AC signal to DC signal and also to reduce the amplitude of the signal. The available voltage signal from the mains is 230V/50Hz which is an AC voltage, but the required is DC voltage(no frequency) with the amplitude of +5V applications.

In this section we have Transformer, Bridge rectifier, are connected serially and voltage regulators for +5V and +12V (7805 and 7812) via a capacitor (1000µF) in parallel are connected parallel as shown in the circuit diagram below. Each voltage regulator output is again is connected to the capacitors of values (100µF, 10µF, 1 µF, 0.1 µF) are connected parallel through which the corresponding output(+5V or +12V) are taken into consideration.
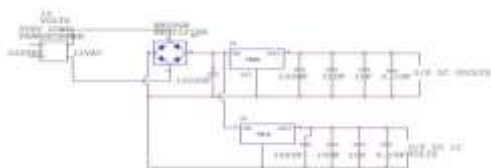

Figure 4. Power Supply For the System

RESULT

/UNIT RATE=26.66

SR. NO.	UNITS	E BILL
1	0.01	0.266
2	0.1	2.66
3	1.0	26.26

Table : Result &Observation table

The screenshot of project model while taking the output is given by:-

Figure – 5 System When Load is On (If Message as #load on
*)

Figure 6 – System when load is off (If Message as #load off
*)

III. CONCLUSION

The monopolistic power distribution market in Asia is gradually transforming into a competitive marketplace. Differentiation in service is going to be the key competitive factor to the improve market share in the deregulated power markets prepaid meters with their advantages over conventional ones are likely to help power distributors to differentiate and offer value–added services to consumers. Encourage consumers to opt for prepaid meters on a voluntary basis and offering tariff or non-tariff incentives to those consumers who prepaid their power changes would help the utilities to implement this system.

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