

# Universal Automatic Meter Reading

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**Abstract-** It is a difficult job for the electricity board officials to manually take meter readings and calculate bill as it is time consuming and requires man power. Hence it is possible to design an energy meter which supports automatic metering and billing system. One can pay bill on the basis of the consumption. PIC controller can count the amount of energy on the LCD. Everyday consumption will be uploaded to the cloud storage using GSM/GPRS module. After period of one month, bill will be sent in the form of message as well as email to notify the consumer about the consumption.

**Keywords-** Automatic meter reading, PIC 18F4520, Electricity meter, Gas meter, Water meter, Flow meter.

## I. INTRODUCTION

Energy meter billing is an important part of energy distribution. Each time a person from the authority side comes and collects the meter reading and produce the bill to the consumer. The problem with this system is that it requires man power, time consuming and causes error. So there comes the scope of a "SMART ENERGY METER".

## II. WORKING AND BLOCK DIAGRAM

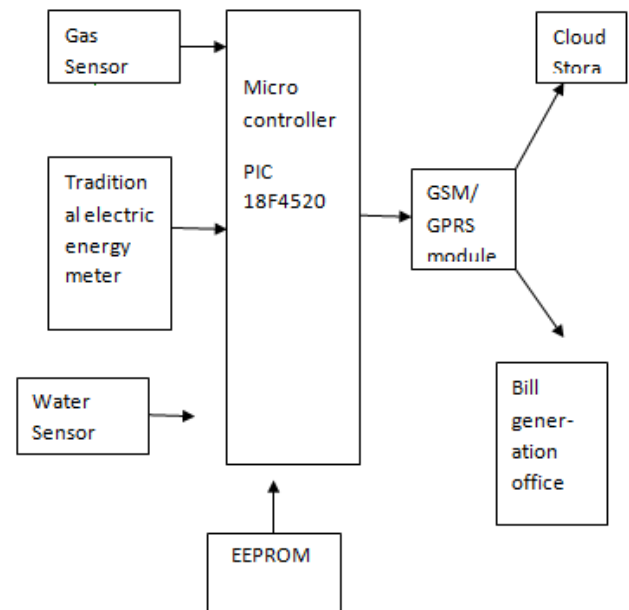
Automatic reading meter system using GSM, consist of sensors which sense the consumption of 1. Water 2. Gas 3. Electric. It provides Automatic Meter Reading (AMR) system.

By interfacing the sensors which are used to sense the consumption to the controller the working of three individual meters can be made to function as only one system which is AMR. Controller uses ADC to convert the analog output from sensors to digital form. It also use EEPROM to store the units of consumption and prevent from any data loss due to power cut.

The system provides efficient meter reading and usage notification to the customers on demand by using GSM network.

GSM technology is used so that the consumer would receive message as well as email about the consumption of power and generated bill. This technology holds good for all

distribution companies, private communities, IT parks and self-containing housing projects.



Block Diagram of Universal

### Automatic Reading Meter

#### 1. Sensors-

Water sensor, gas sensor, and pulse generator is used to detect and calculate the consumption of water, gas and power respectively. The output of the sensor is analog. Sensors are interfaced with the microcontroller PIC 18F4520.

#### 2. Microcontroller-

The output of sensors which is given to the controller is converted to digital by using the 10 bit internal ADC. The converted digital output of the sensors is stored in the internal EEPROM to avoid any data loss. The calculated and stored value is sent to billing office and the cloud storage by using the GSM module which is configured by the PIC microcontroller using UART communication.

#### 3. GSM Module-

GSM module utilizes the GSM network to send the unit of consumption to the cloud storage as well as billing office for the purpose of bill generation using the PIC microcontroller and send message to the customers end. The message contain details like consumption and billing amount. GSM technology is used so that the consumer would receive message as well as email about the consumption of power and generated bill.

4. Cloud Storage-

Cloud storage is virtual storage which can be easily accessed through internet. Without carrying physical storage system, information can be stored. The information in the cloud storage can be access by only user through internet. GSM module uses GPRS protocol to upload the daily consumption of user/consumer to the cloud storage. Cloud use the crone to send message of consumption to the billing office after month delay.

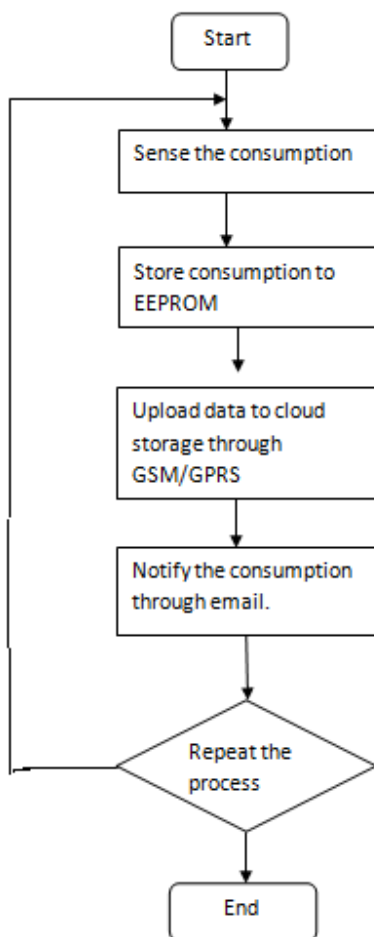


Fig. Flow chart

HARDWARE

1. PIC 18f4520

PIC microcontroller is used as the main processing unit. PIC has 16-bit wide instructions, 8-bit wide data path which is helpful while programming and data storage. 33 I/O pins with individual direction control and 40 pin DIP provide enough pins for interfacing input and modules. PIC takes input from sensors. If input detected from sensors, inbuilt ADC are used to convert analog value to digital and then given to GSM module.

Features

- High performance RISC CPU
- Source code compatible with the PIC 16 and PIC 7 instruction sets
- 16-bit wide instructions, 8-bit wide data path
- Priority levels for interrupts
- 16kBytes Flash Program Memory
- Two 16-bit timer/counter (TMR1,TMR3)
- One 8-bit/16bit timer/counter with prescaler One 8-bit timer/counter with 8-bit period register
- Eight channel 10-bit Analog-to-Digital converter
- Power-on reset
- Watchdog Timer (WDT) with its own ownOn-chip RC oscillator
- Programmable code Protection
- Power saving sleep mode
- In-circuit Debug(ICD)
- Wide operating Voltage Range (2.0V to 5.5V)

2. Water Sensor and Gas Sensor (YF-S201 model)

Features

- Working voltage 5V to 18V DC
- Hall effect sensor type
- 15mA at 5V maximum current draw
- 5V TTL output type
- 1 to 30 liters/minute working flow rate
- Temperature range -25 to 80 degree celcius
- 35% to 80% RH humidity range
- Maximum water pressure 2.0 MPa
- Output rise time 0.04us
- Output fall time 0.18us
- Output duty cycle 50% +/-10%
- 450 pulses per liter
- Minimum durability 300,000cycles
- Size 205”x1.4”x1.4”

- 1/2” nominal pipe connections, 0.78” outer diameter, 1/2” of thread
  - [3] Bhavna Patel, ShrikantMhaskar, "Voucher Based Prepaid Electricity Supplier with Auto Cutoff" July 2013-2014.
3. GSM Module (SIM800)

GSM (Global System for Mobile Communication, originally Groupe Special Mobile). A GSM modem is a specialized type of modem which accepts a SIM card and operates over a subscription to a mobile operator, just like a mobile phone. From the mobile operator perspective, a GSM modem looks just like a mobile phone. A GSM modem can be a dedicated modem device with a serial, USB or Bluetooth connection,

#### Features

- Rating;1A at 120VAC
- Electrical life: 50,000 cycles typical
- Contact Resistance:10m ohm
- Insulation resistance: 1,000M ohm min
- Dielectric strength: 1,000 V rms at sea level
- Operating force: 200+-50gf

### III. CONCLUSION

This project work exposes the purpose of consumption monitoring and controlling by implementing Universal Automatic Meter Reading using cloud storage. It is hoped that this work helps the service, to provide better energy management.

### IV. APPLICATIONS

- Easy bill production
- Easy bill distribution
- No need to chase payments
- Flexible payment solution
- Show true unit of consumption and cost of consumption
- Unmanned and reliable meter system
- Effective data collection
- Saves time as well as human efforts

### REFERENCES

- [1] JaychandUpadhyay, Namita Devadiga, Alrina D'mello, Glenie Fernandes, "Prepaid Energy Meter with GSM Technology", IJRCE/Issue III, March 2015.
- [2] Dr.Boyina.S.Rao,BGnanasekaranathan, 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.