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Electricity Billing And Power Theft Identification Based On GSM Using LABVIEW

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Abstract: ***The main aim of this paper is to propose a system through which electricity billing becomes fully automated and communication is made possible via wireless networks. In our system the central EB office has immediate access to all consumer homes in locality with the help of an RF system. The EB meter present in each house is connected by wireless network with the EB office which periodically gets updates from the meter. The EB office using a backend database calculates the amount to be paid according to the number of units consumed and sends it to the user's mobile phone. The advantages of the proposed system make the existing system incompetent. It is possible to connect remote areas even when there is a power failure as it employs wireless technology. The new system is user friendly, easy to access and far more efficient than the existing system. It also reduces the work burden of electricity board members and also to eliminate last minute tension of public in paying the electricity bills. This system is very accurate and advantageous when compared to the conventional system of paying electricity bills. In any circumstances if power is being theft from the transmission line. It is indicated to EB station such that in which pole, power being theft is identified. This process is carried out by comparing the number of units in two energy meters kept at both EB side and consumer side. The microcontroller coding is written in HITECH -C COMPILER. The database is created using LABVIEW in personal computer.***

Keywords: ***Electricity Board (EB), Peripheral Interface Controller (PIC), Radio Frequency(RF),Virtual Instrumentation(VI).***

I. INTRODUCTION

Electricity metering through wireless communication and SMS billing is an adventurous measure to read the energy meter, to display the tariff and to send the bills automatically which may replace the present tradition of human dependent energy measuring system. The number of units consumed is observed by deploying RF transmitter connected with the conventional energy meters that are used. The signals are taken from the energy meter and processed by microcontroller unit. The processed signals are transmitted through a substation through GSM mobile. The signals from each consumer are separate, as each consumer has specific GSM number. The substation has a GSM modem that is interfaced to a computer through level converter, it receives the signals from all the consumers and they are stored in a database which can be used for various other calculations. The databases are created using LABVIEW such that the bill is sent to the consumer's mobile through GSM.

II. EXISTING SYSTEM

From the survey we found that the following are some of the existing methods and its drawbacks for electricity metering.

- ✓ Fixed network
- ✓ Hand held
- ✓ Wi-Fi metering
- ✓ Power Line Communication

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✓ *FIXED NETWORK*

This method requires higher values of power supply for producing increased frequency and implementation cost is high.

✓ HAND HELD

This method requires more time for metering process. There are more chances of errors while entering the meter reading. Bill payment is possible only through the registered office of Electricity Board. It is difficult to predict the future loads.

✓ WI-FI METERING

Wi–Fi technology uses too much power for long term battery powered operation. It is costlier than other methods.

✓ POWER LINE COMMUNICATION

Damages in the transmission line will cause failure of reading. Most of the villages are covered by overhead transmission line so it is difficult to implement.

III. PROPOSED SYSTEM

In this proposed system, an attempt is made to rectify the problems in the existing systems; the following are the key features of this system. The Utility billing data is automatically imported into our essential data base bulk bill management to validate and verify billing data. Future load prediction is possible. This method eliminates manual data input and keying errors and it substantially reduces administration costs. It enables us to closely track the status of all our bills at every stage.

A. MICROCONTROLLER BASED UNIT MEASUREMENT ON THE CONSUMER SIDE

The PIC microcontroller used to measure the number of units consumed by the consumer and transmits the corresponding reading to the pole which is then sent to the electricity board Centre in charge of that area. The block diagram of the measuring system on the consumer side is shown in Fig. 1.

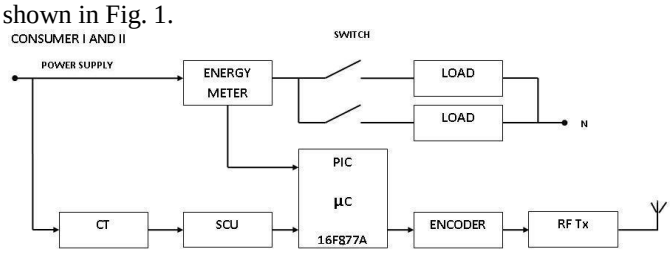


Figure 1: Block diagram of the measuring system on the consumer side

The energy meter shown is fixed in the power supply given to the consumer. When the load consumes power, the energy meter measures the units of power consumed by the load. The count of units consumed is sent to the PIC microcontroller 16F877A. The PIC microcontroller 16F877A is programmed in such a way that it sends the digital equivalent of the analog measurement, representing the number of units consumed by the consumer to the encoder. The encoder changes the signal or the measured data into a code. The code generated by the encoder is sent to an RF transmitter which transmits the code which is the power consumed to the pole. The code is then processed by the pole to its later stages. The usage of current transformer is to keep a check on power theft. It senses the current flowing to the energy meter and thus keeps a check on the energy supplied. Usually consumers plug off the wire of energy meter and directly take up the supply. This is not possible as the current transformer always knows the amount of energy supplied. The output of the CT is sent to the Signal Conditioning Unit which converts the analog measurement into its digital equivalent and sends it to the PIC microcontroller. This is then transmitted to the pole in the same fashion as above, like that done with the energy meter reading.

B. MICROCONTROLLER BASED UNIT MEASUREMENT ON THE POLE SIDE

The data which is transmitted from the consumer side is received. It compares the pole current which is supplied to each consumer and the amount of units consumed by them using PIC microcontroller. It also checks the value of pole current and sum of currents consumed by each consumer is equal or not. If the values are not equal, it sends a message to the EB station along with the number of units consumed through GSM modem. The block diagram of the measuring system on the pole side is shown in Fig. 2.

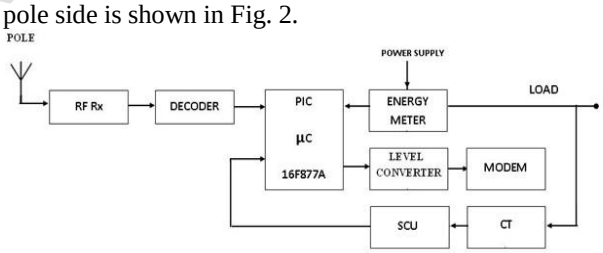


Figure 2: Block diagram of the measuring system on the pole side

In the above block diagram, consumers are considered as the loads. The energy meter is connected to the supply line in such a way that reads the amount of energy supplied to the consumers at the sending end. The count of units consumed is sent to the PIC microcontroller 16F877A.The CT is connected in the way similar to that of the consumer side and it senses the current that is given to the consumers. The Output of the current transformer is given to the PIC microcontroller through the SCU.The SCU which converts the analog measurement into its digital equivalent and sends it to the PIC microcontroller.The data which is transmitted from the consumer side is received using the RF receiver kept in the pole side. The data is then sent to the decoder for further processing with the PIC microcontroller. This gives the information about the number of units consumed by the consumers.The PIC microcontroller compares the value of pole current and the sum of the currents consumed by the consumers. If there is a difference in those values, it refers to

the power theft. Then the number of units consumed by each consumer is sent as a message to the EB station through GSM network and gets updated in the database at the EB station.

The database is created using LABVIEW software. The PC with the LABVIEW software is interfaced with the mobile through Bluetooth. Therefore, the message which is sent to the GSM modem is made to receive in the mobile that is interfaced with PC. According to the number of units consumed by the consumer, their Electricity Bill is generated and a message consists of the number of units consumed, the amount to be paid and the due date is sent to the consumers mobile.

IV. SOFTWARE DETAILS

LABVIEW is a program development application, like various commercial C or BASIC development systems, or National Instruments LAB Windows. Other programming systems use text-based languages to create lines of code, while LABVIEW uses a graphical programming language to create programs in block diagram form. LABVIEW uses terminology, icons, and ideas familiar to scientists and engineers and relies on graphical symbols rather than textual language to describe programming actions. LABVIEW programs are called virtual instruments (VIs) because their appearance and operation imitate actual instruments.

A. FEATURES OF VI

The following are descriptions of these three VI features.

- ✓ VI contains an interactive user interface, which is called the front panel, because it simulates the panel of a physical instrument. The front panel can contain knobs, push buttons, graphs, and other controls and indicators.
- ✓ VI receives instructions from a block diagram. The block diagram supplies a pictorial solution to a programming problem. The block diagram contains the source code for the VI.
- ✓ A VI within another VI is called a sub VI. The icon and connector pane of a VI work like a graphical parameter list so that other VIs can pass data to it as a sub VI.

B. FRONT PANEL

LABVIEW is programmed in EB station to collect the data and to send the bill to the consumers. It consists of dials to update the power used by the consumers, indicator to show power theft string label to message to customers mobile. VISA panel is used to interface modem and system i.e. wireless networks. The below Fig. 3 shows the front panel view of LABVIEW program.

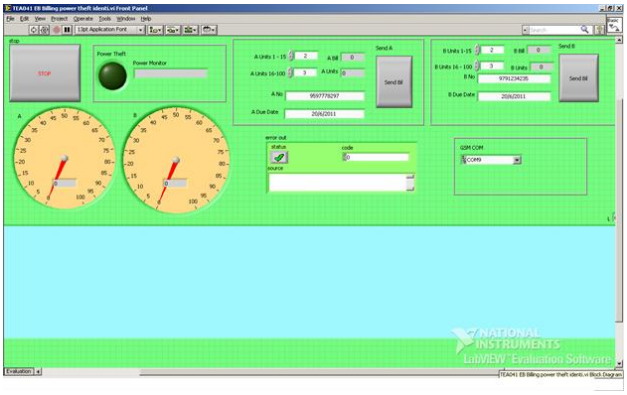
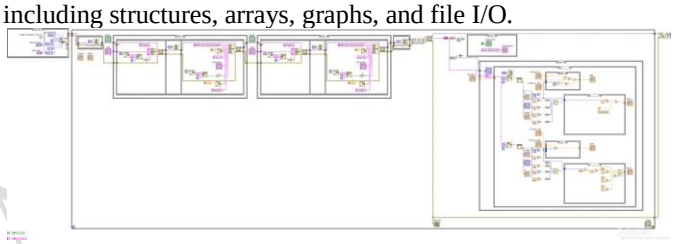


Figure 3: Front Panel of LABVIEW

C. BLOCK DIAGRAM

The second window is the place where we can create the underlying code for our program. The program can be created graphically using the inputs and outputs created in the Front Panel and objects from the Functions window. Block diagram of VI will incorporate some of the other features of LABVIEW including structures, arrays, graphs, and file I/O.



V. CONCLUSION

The amount of power consumed by the consumer is automatically sent to the EB station via wireless network and thus billing is done by the database created in LABVIEW and the required bill is sent to the customer mobile. If theft is identified in any of the poles by the EB station, the employees should take the further steps to reduce the theft.

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