MSP 430 Based Wireless Power Theft Monitoring System by Using Energy Meter

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ABSTRACT: In normal way power theft is by shorting the input and the output terminals or by placing a magnet on the wheel in case of old meters. So by sensing current flow through the energy and line feedback, another common form is by inverting the meter and bypassing the meter. These can be prevented by using a circuit breaker. In this system, a micro controller is interfaced with an energy metering circuit, GSM communication, current sensing circuit & a contactor to make or break power line, with all energy meters. In normal condition, micro controller reads energy pulses and current signals. If current is drawing and energy pulses are normal, then no power theft is being done and the output is connected. If current is drawing and energy pulses are not coming, then it indicates that power theft. So microcontroller trips the output using relay driver. This information is sent to substation using wireless GSM communication in the form of alerting SMS messages. In the substation, it receives the information in the form of SMS messages we can know that power theft occurred.

KEYWORDS: Wireless, Power, Automation, Theft Detection, Relay Driver, GSM

I.   INTRODUCTION

Power theft is the biggest problem now days, which causes huge loss to electricity boards. And to cover these losses ultimately, price are increased. So if we can prevent these thefts, we can save lot of power. By keeping track of electricity used, you determine where the greatest opportunity for energy savings lies. Becoming aware of overall energy use involves keeping track of the readings on the readings on the electric meter.

According to World Resources Institute, 27% of the generated electrical is wasted due to transmission and distribution losses. Some agencies have estimated this to be as high as 40% . The transmission and distribution energy has many operational losses whereas, losses implicated in generation can be technically defined, but T&D losses cannot be precisely quantified with the sending end information. This illustrates the involvement of nontechnical parameters in T&D of electricity. Overall technical losses occur naturally and are caused because of power dissipation in transmission lines, transformers, and other power system components.

Electricity theft can also be defined as, electricity consumed from the utility company without a contract or valid obligation to alter its measurement is called electricity theft. Electricity theft includes bypassing, tampering with the energy meter and other physical methods to evade payment. Illegal tapping of electricity from the feeder and tampering with the meter are the most identified and accounted ways of theft.
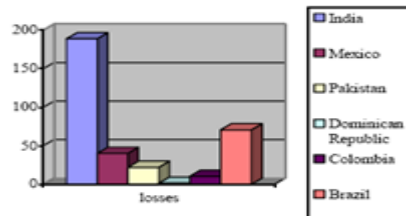
Fig1: Over all T&D

II. WIRELESS TECHNOLOGY

Embedded system is a combination of both hardware and software and by adding parts that forms a larger system and is used to perform a single or specific task. It is characterized by high reliability, restricted memory and real time operation associated with an arrowly defined group of functions. By embedded system it made the living easy and comfortable. "Technology had taken the world by storm performance ratings and exceptionally value for money prices". Our paper discuss on wireless power theft monitoring system, which is one of the application for embedded controllers. Encompasses areas itemize known as Illegal uses or by bypassing it completely.

III.HARDWARE DESCRIPTION

A.PROGRAMMING BOARD:

We are designed a programming board to program the MSP430F26xx microcontroller. This consists of powerful analog front-end to form a System on Chip(SoC). It is also Low-power and High performance. Modern 16-bit RISC CPU and also up to 192KB Flash and up to 16KB RAM.0.1µA power down/ 0.8µA standby mode.
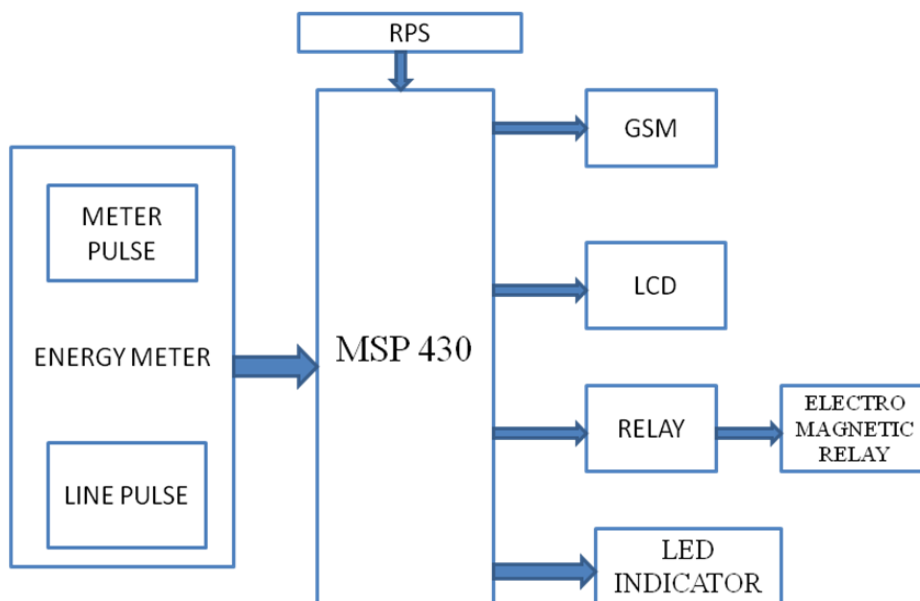

**Fig2: Block diagram of wireless power theft monitoring system**

B. ENERGY METER:

An energy meter is a device that measures the amount of electrical energy consumed by   residence or an electrically-powered device. It is mainly used in billing, the most common one being the kilo watt hour(kWh). A periodic reading of electric meters establishes billing cycles and energy consumed during a cycle. Electronic meters display the energy consumed by LCD or LED display, and also it can transmit information wirelessly to substation. In addition to measuring energy consumed, electronic meters can also record other parameters of the load and supply such as instantaneous and maximum rate of usage demands, voltages, power factor and reactive power used etc. They can also support time-of-day billing, for example, recording the amount of energy consumed during on-peak and off-peak hours.

C. GSM COMMUNICATION:

GSM stands for Global System for Mobile Communication. It is widely used in Cell Phone technology. It is accepted   standard for digital cellular communication. It has improved spectrum efficiency and also support new services. In this GSM sends a message to the authorities where power theft is occurred. By this we can know the house where power theft is occurred.

D. RELAY DRIVER:

Relay is an electromagnetic switch. The soft iron core and iron yoke gives a low reluctance path for magnetic flux and a set of contacts which surrounds the electromagnetic switches. The armature is hinged to the yoke and mechanically linked to a moving contact. It is controls high voltages by using low voltages. It takes low voltage to switch on and off a light bulb connected to the 220v mains supply. To run relay driver more current is required and it can be supplied by chips like op amps, so a transistor is usually needed.
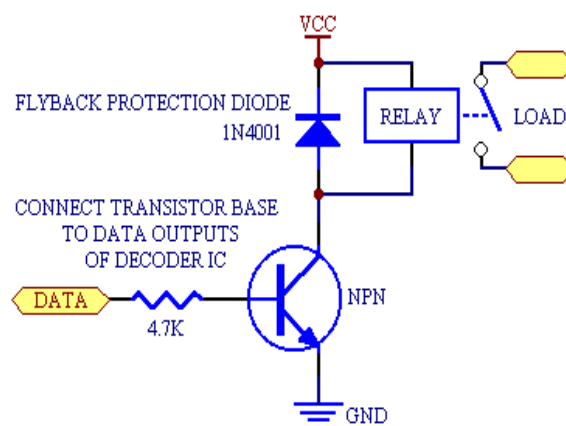

Fig3: Relay driver

E. LED INDICATORS:

A light-emitting diode is a two-lead semi- conductor light source. It is a PN-junction diode, which emits light when activated. When a suitable voltage is applied to the leads, electrons are able to recombine with electron holes within the device, releasing energy in the form of photons. This effect is called electroluminescence and it is the working principle of an LED.

F. LCD DISPLAY:

　　　The most common devices attached to a micro controller is an LCD display. The LCD's connected to the many microcontrollers are 16x2 and 20x2 displays. 16x2 means 16 characters per line by 2 lines and 20x2 means 20 characters per line by 2 lines, respectively. The LCD contains either 4 or 8 input/output lines for data bus as well as 3 control lines. To operate LCD display 4 bit or 8 bit data bus may be selected.

G.SWITCHING INPUT TO MICROCONTROLLER:

　　　As the microcontroller needs only 3.3V to operate, the board was designed for 5V operation. The inputs to the microcontroller were given through a transistor switch as shown in figure 7.
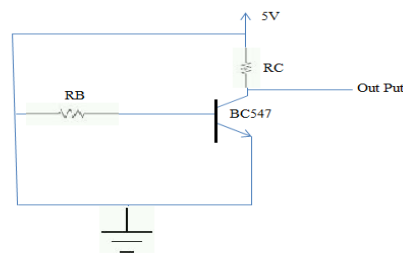
Figure 7: Transistor as a switch

III.SOFTWARE IMPLEMENTION

A. Express PCB:

　　　For designing we are using Express PCB. Breadboards are great for prototyping equipment as it allows great flexibility to modify a design when needed; however the final product of a project, ideally should have a neat PCB, few cables, and survive a shake test. Not only is a proper PCB neater but it is also more durable as there are no cables which can yank loose.

B.PIC C Compiler:

　　　PIC compiler is software used where the machine language code is written and compiled. After compilation, the machine code is converted into hex code which is to be dumped into the microcontroller for further processing. It also supports C language code.

C. Proteus 7:

　　　Proteus 7 is a software which allows only hex files. When the machine code is converted into hex file, then hex code is to be dumped into the microcontroller. By using Proteus 7 the hex file is dumped into the microcontroller. The program which is to be dumped in to the microcontroller is modified in proteus and is compiled and executed to check if any errors are there or not and hence after the successful compilation of the program the program is dumped in to the microcontroller using a dumper.

IV.RESULTS

The project "MSP 430 based Wireless power theft monitoring system by using energy meter" was designed such that the system monitors the energy meter connection with meter pulse sensor and alerts through SMS when the theft was created. And the load will be disconnected from the supply with the help of relay. The system alerts through SMS messages using wireless GSM link. By this design we can effectively and successfully know the problems occurred by the power theft from the consumers and it can inform to the higher authorities, in a completely automated, wire-free, cost effective and most importantly a reliable way.

Test environment for our project

V.CONCLUSION AND FUTURE WORK

This paper is intended to reduce the heavy power and revenue losses that occur due to power theft by the consumers. By this design it can be concluded that power theft can be effectively detect where the power theft occurs and informing the authorities. Also automatic circuit breakers may be integrated to the unit so as to cut off the power supply to the house or consumer by using relay drivers who tries to indulge in power theft. And the information send to the substation through GSM link

Future enhancements can be incorporated to suit the system for three phase electric distribution system in India. Along with all this new architectural components can be incorporated, so that the system can be completely used for optimizing the energy consumption. This will reduce the wastage of energy and save a lot of energy for future purpose.

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BIOGRAPHY

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