Energy Meter Tempering and Power Tapping Detection System for Effective Power Theft Control

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ABSTRACT: For the effective energy management the distribution system has been improved day by day but the energy measurement and billing section does not improving in the present day which leads to lot of power theft cases. The existing method uses purely manpowered operation for calibration and detection of power theft which has lot of difficulties. This Paper limits such theft cases by using microcontroller and GSM technology which control and detects location of power theft from main control room. The method shown here is implementing an effective energy measurement with safety parameters which safeguard the energy meter, consumer loads and prevent the theft attempts. The illegal usage of electricity can be solved electronically by using SMS alert which reduces the processing time. By implementing this system large amount of electricity will be saved and it can be distributed to the more number of consumers than earlier.

KEYWORDS: Power Theft, GSM, Micro Controller, Energy Meter, Current Sensor.

I. INTRODUCTION

Electricity is one of the most useful source of energy, which is used for house hold purposes, farming and industrial purpose. Electricity theft is the major problem of the transmission and distribution losses in the supply of the electricity worldwide. Now a days in India, there are increase in the number of electricity thefts attempts across domestic and industrial electricity supply, which results in loss of electricity and its revenue to electricity supply companies and because of which we are facing the problems of load shading in rural as well as in urban areas.

Mainly the electricity is stolen by two methods; one is via bypassing the energy meter using a piece of wire and other is by tapping the transmission line. Therefore this system is utilized to overcome this type of theft of the electricity and is very beneficial for the authorized agency to control its revenue loss. The existing energy meter does not detect the input and output current differences so that if the consumer bypasses the line, then the energy meter does not have ability detect the power theft.

This system uses current sensors at input and output of the energy meter which measures input and output current levels and are compared at differential amplifier. Depending on the difference between input and output current level power theft is going to be detected. Microcontroller detects the power theft attempts and sends signal to the GSM modem which sends message of power theft attempt to the control room.

II.   BLOCK DIAGRAM

A.   Input and output current sensing unit

The method shown here detects the input current before energy meter and also detects the current after energy meter. The Hall Effect sensor is used as current sensor. Current sensor measures from 5V to high voltages like 230V AC and output analog voltage proportional to current measured on the sensing terminals.
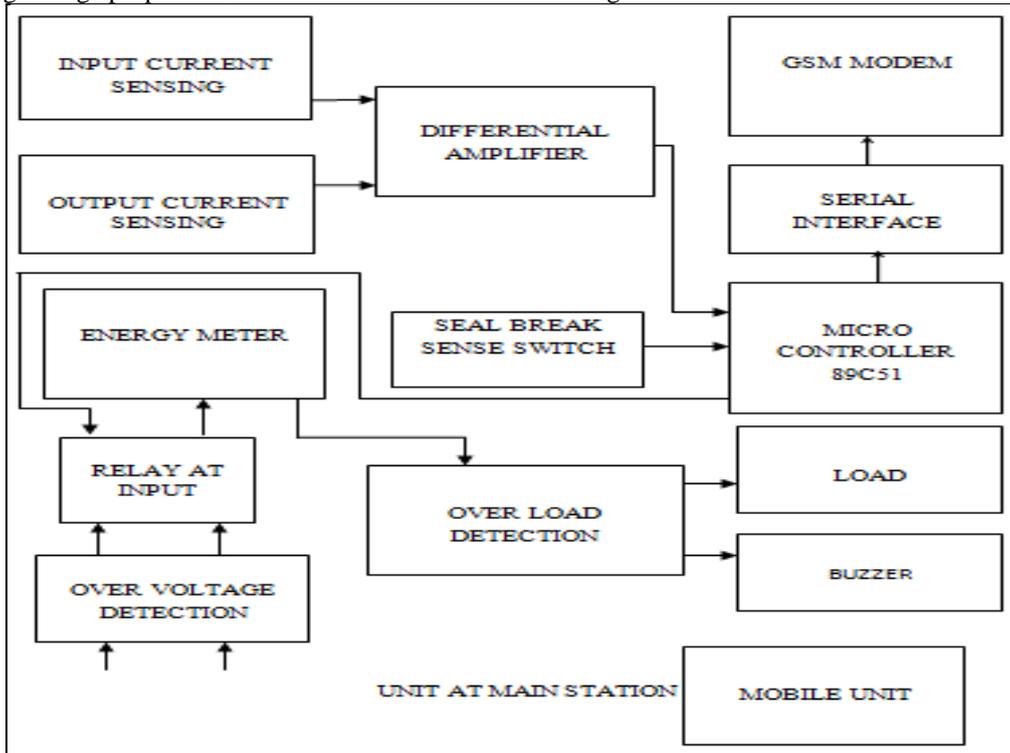

Fig. 2.1 Block diagram

A.   Differential amplifier

The differential amplifier is designed with op amp circuit. The two outputs from current sensing devices are connected to the differential amplifier input terminals. It compares both the values, depending on difference between these values it generates logical output.

B.   Seal break sense switch

During energy theft consumers trying to break the seal of energy meter, this attempt can be detected using seal break sensor switch which is placed down side of the seal. If the person trying to break and open the cover then switch closes and sends a control logic signal to microcontroller. The microcontroller further sends this information to the electricity board along with the complete details of consumer with the help of GSM modem.

C.   Microcontroller

The role microcontroller here is to pick the abnormal conditions like energy meter tapping attempts or meter seal break detection and sending an alert message to authority regarding the theft attempt and displaying the complete information of consumer. And also in case if the authority wants to disconnect meter through the monitoring station it is possible   disconnect meter as well as to connect meter. For this operation a GSM modem is interfaced to the microcontroller.

D. GSM Modem and serial interface RS-232

GSM modem is used for the communication with microcontroller 8051 and control room. The modem interface to microcontroller through MAX 232 IC which is a level converter from TTL to the standards of GSM modem.
The roles of GSM here is build up a communication between user electricity board and microcontroller like receiving requests and pass it to microcontroller and pick the data from controller and send it back. And also perform certain functions like disabling meter etc.

B. Over voltage detection

For the safety of the energy meter and the loads which are connected from the energy meter can be possible to safeguard with the help of over voltage detection circuit. The circuit is designed with zener diode based transistor switching. The bias voltage is with respect to the input AC voltage only, as the input voltage increase abnormally the zener bias voltage also varies and triggers the transistor which further activate the electromagnetic relay which disconnect the input which prevents damage both to energy meter and loads.

C. Over load detection

The over load circuit is designed with current sense circuit which detects the overload condition of loads and sounds the buzzer to alert the user. The optocoupler is used to isolate the ac mains part from the rest of the circuit physically.

III. HARDWARE DESIGN

The hardware part of power theft detection by using GSM technology and microcontroller is shown in fig 3.1 in which input and output current sensor measured values are compared in differential amplifier depending on the logical output of differential amplifier the power theft is detected.
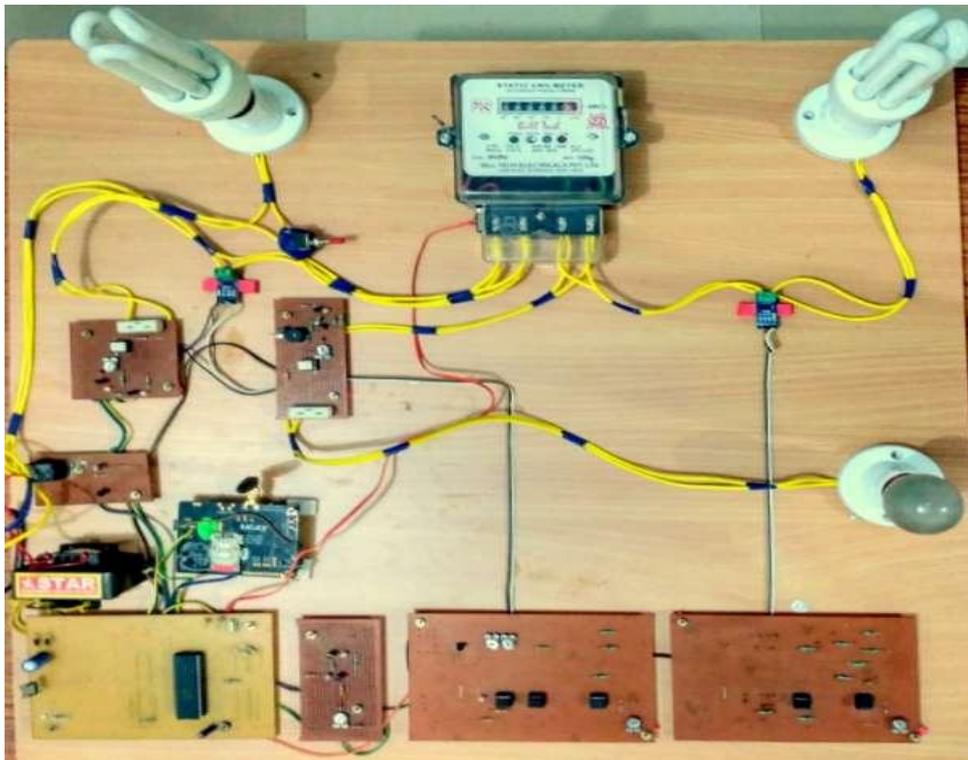

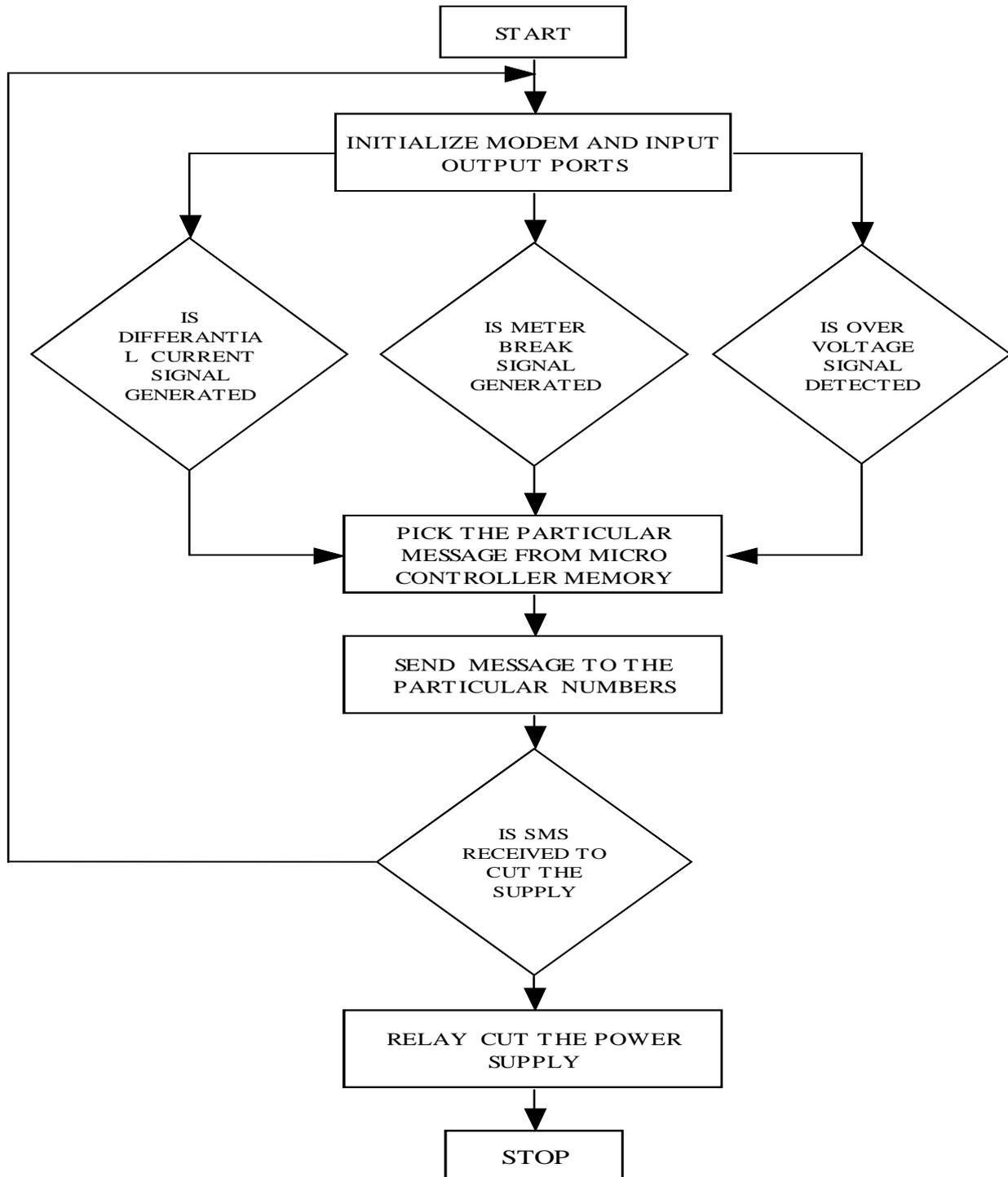Fig. 3.1 Hardware model

IV.   FLOW CHART

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                        ┌─────────────┐
                        │   START     │
                        └─────────────┘
                               │
                               ▼
              ┌────────────────────────────────────┐
              │  INITIALIZE MODEM AND INPUT         │
              │  OUTPUT PORTS                       │
              └────────────────────────────────────┘
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Fig. 4.1 Flow chart

V.   EXPERIMENTAL RESULT

Experimental results can give the information about how we are using microcontroller and GSM technology for controlling the power theft and over voltage. Here for each action we are sending the SMS to connect and disconnect the supply as shown in the following figures.
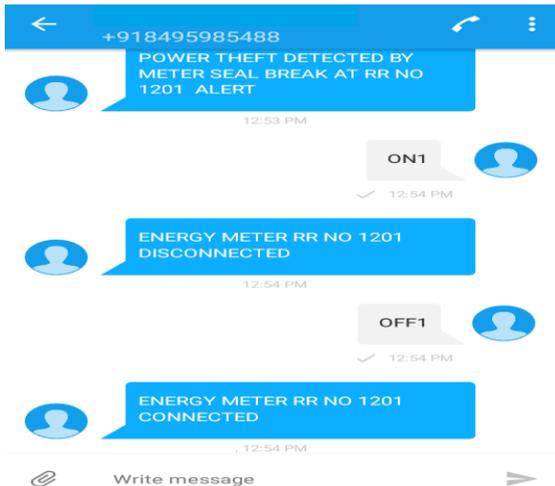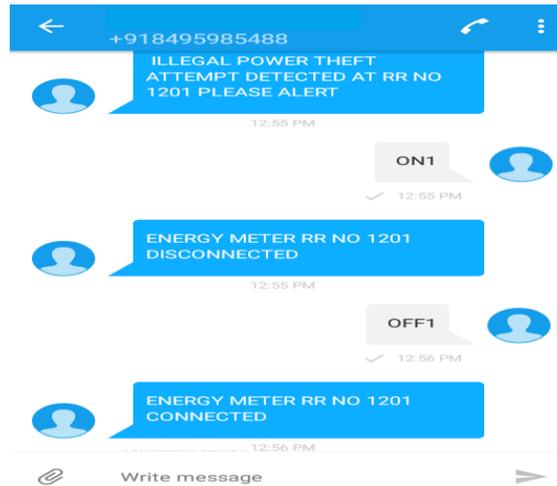

Fig. 5.1 Seal break detection & control   Fig. 5.2 Power tapping detection & control

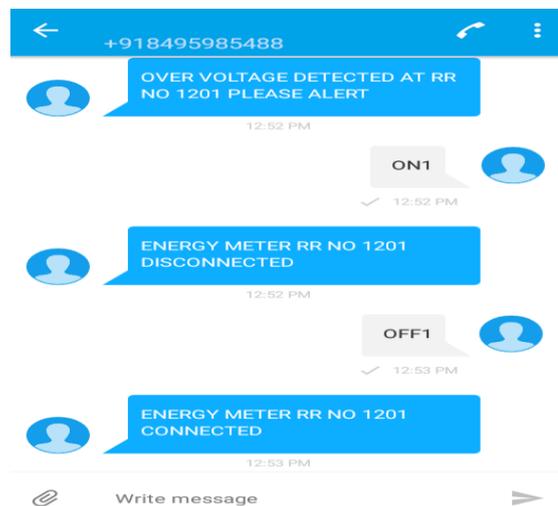Fig. 5.3 Over voltage detection and control

VI.   CONCLUSION

The theft of electricity causes revenue loss to electricity supply companies which will indirectly affect economic growth of country. This project avoids such theft cases by detecting the power theft and also location of theft by using microcontroller and GSM technology. Here we are also considering the safeguard parameter for safety of energy meter and consumer load. This project has advantage that power supply can be connected and disconnected from the main control room in case power theft attempts and over voltage level without using any man power.SMS alert reduces the

processing time. This method can implemented effectively just by replacing existing energy meters by new technology energy meters.

REFERENCES

[1] Nilesh Mohite, Rinkuraj Ranaware, Prakash Kakade "GSM Based Electricity Theft Detection", IJSEAS Volume-2, Issue-2, February 2016. ISSN: 2395-3470

[2] Mr.K.Rajendra Ms. V. Anusha chand, "Controlling Of Power Theft And Revenue Losses By Using Wireless Techniques", February, 2016 ISSN 2091-2730 395 ,

[3] Abdollahi, A. Dehghani, M. Zamanzadeh, "SMS- based Reconfigurable automatic meter reading system" in control applications,2007

[4] P. Rakesh Malhotra et al. / IJET "automatic meter reading and theft control system by using GSM", 2013.

[5] Dr. Pramod Sharma, Himanshu gupta, Megha Sharma, Rohit singh, Ashish Khan "Wireless Electricity Theft Detection And Monitoring", ISSN: 2278 - 909X IJARECE Volume 5, Issue 4, April 2016.

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