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Advance Load Sharing System And Theft Detection System

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ABSTRACT

In these days, generation of power is not met up to the need of men; there is large number of power thefts from domestic and industrial supply lines. This Project is to limit such thefts, by letting the Monitoring and Control Room to know the theft and also the location of theft. Due to increasing load, on particular phase causes the breakdown of transformer which is uneconomical to install repeatedly. To overcome this situation caused due to overloading of any one phase (out of three phases), we are introducing a system to balance this overloading condition automatically along with theft detection system, which is monitored by a Microcontroller. The circuitry is installed on a pole from where the supply is given to the consumers.

Index Terms- Microcontroller, LDB

I. INTRODUCTION

According to the survey INDIAN POWER SYSTEM faces loss of about 30% of its total production of electricity. This loss is very high which takes place because of transmission losses, electricity theft, etc. Major portion of its losses is due to power theft. Power theft is done by taking tapping or hooking from transmission line or by from the meters. Generally this type of power theft is seen in residential area which can't be easily detected as this type of theft is done during night hours. Moreover, this kind of power theft causes unbalance/overloading of three phases of distribution transformer. Due to unbalance/overloading condition, the transformer is damaged due to heating of the overloaded phase. This project based on protection of transformer from overloading due to theft of power. Basically, it consists of power board where three phases enters through which the load is supplied instead of taking tapping from nearby line passing. The power board also contains meter or the current detector which will compare the outgoing current and the consumed current by the customer (power delivered and power consumed). If the both the power is different (which ultimately tells about the power theft) then, the system will send information about the area and pole immediately from where losses/theft is being carried out. Also, it will secure the distribution transformer from unbalance condition. When any of the three phases of distribution is unbalance or overloaded, this system will try to balance the three phases which ultimately save the transformer from tripping. As the transformer is tripped it takes about an hour to get restored which will affect the consumers if they are doing some important work or they are in the lift. This system tries to balance the three phases and prevent from overloading by shifting the load of loaded phase to the least loaded

phase. If all the phases are loaded then this system will send signal to the transformer for tap changing which will try to compensate the load.

II. BACKGROUND

A) FACTORS THAT INFLUENCE ILLEGAL CONSUMERS

There are many factors that encourage people to steal electricity. Of which socio- economic factors influence people to a great extent in stealing electricity. A common notion in many people is that, it is dishonest to steal something from their neighbor but not from the state or public owned utility company. In addition, other factors that influence illegal consumers are:

i. Higher energy prices deject consumers from buying electricity. . In light of this, rich and highly educated communities also steal electricity to escape from huge utility bills.
ii. Growing unemployment rate show severe.

B) METHODS OF THEFT

Methods used to commit theft fall into the Following broad categories:

i. Connection of supply without a meter Connection of supply without a meter following disconnection for non-payment or by “squatters” occupying empty properties.
ii. Bypassing the meter with a cable It coveted into the supply side of the metering installation (i.e. the meter terminals, the metering cables, the cut-out or the service cable).
iii. Interfering with the meter to slow or stop The disc, including use of electrical devices which stop the meter or cause it to reverse (so-called 'black boxes).
iv. Interfering with the timing control Equipment used for two rate tariffs to obtain a cheaper rate. Methods (C) and (D) usually involve removal of official (certification) seals and/or company seals. There effect on the customer’s economic situation.

C) EFFECTS OF ELECTRICITY THEFT

Negative effects of electricity theft are severe and dangerous. Primarily, electricity theft affects the utility company and then its customers. In addition, electricity theft overloads the generation unit. In energy market, utility companies expect their money back from the customers for the electricity supplied, most of which is lost by them due to the NTL (Non technical losses).Electricity theft is a serious concern for utility companies as they are under threat of survival because of these incurring economic losses. It is evident that some utility companies in developing countries are losing about 10 to 30 percent of their total revenue, which shows that they could not invest on measures to reduce the electricity theft. These economic losses affect the utility company’s interest in development of the devices in view of improving the quality of supply or for electrification process.

III. PROPOSED SYSTEM

The proposed system makes use of continuous scanning of the incoming and outgoing power and consisting of ADC. The WCS 2702 Hall Effect current sensor hence giving values for conversion one by one via multiplexing

to ADC. The 20x4 LCD shows the respective data. This data is then processed as per the algorithm in program of LPC2138 Arm Controller. The programming is continuous infinite loop to sort outgoing values which then help to switch the load in between the phases, to obtain the best possible balanced condition automatically.

Arm LPC2138: LPC2138 is an ARM7TDMI-S based high-performance 32-bit RISC Microcontroller with Thumb extensions 512KB on-chip Flash ROM with In-System Programming (ISP) and In-Application Programming (IAP), Two 8-ch 10bit ADC 32KB RAM, Vectored Interrupt Controller, Two UARTs, one with full modem interface. Two I2C serial interfaces, Two SPI serial interfaces Three 32-bit timers, Watchdog Timer, Real Time Clock with optional battery backup, Brown out detect circuit General purpose I/O pins. CPU clock up to 60 MHz On-chip crystal oscillator and On-chip PLL.

Microcontroller: This is the main control section. It processes all the input data, take decision and operate proper relays to control the switching. AT89S51.

Fuse Box: The three phase supply is given to the local distribution box via fuse box to provide over load protection.

Sensor unit: This unit measures the phase current of all the phases and given to the controller for further process.

LDB: The three phase supply input is given to the local distribution box from where the household consumers are connected to power line it consists of relay box, current sensor to measure the individual consumers supply current.

MUX: All the sensors with analog nature are interfaced with mux. Multiplexer select only one input sensor with ADC at given time. That means all the inputs are time shared.

ADC: We cannot interface the analog voltages directly with digital microcontrollers hence we use ADC unit. This unit converts the obtained analog voltage into digital form. So it can be interfaced with microcontroller.

User interface: This unit provides the facility to user to change certain parameter like max current, unit id, no of max load etc.

Display driver and LCD display: The display driver is used to control the LCD display. LCD display is interfaced with controller through display driver which is used to show the different parameters.

Buzzer driver and buzzer: The buzzer is used to generate different warning tones. Buzzer driver is used to drive the buzzer.

IV. BLOCK DIAGRAM

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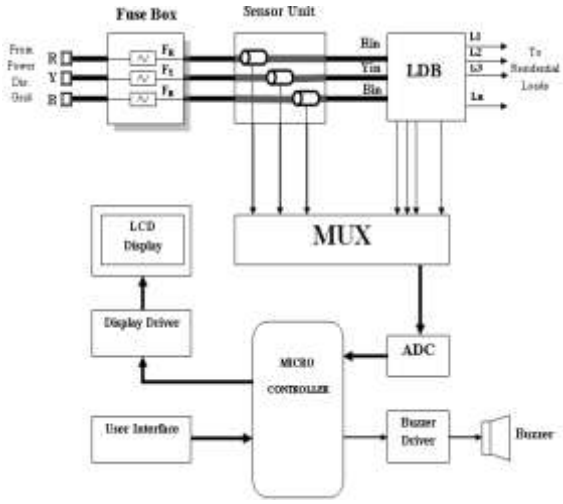

Fig No. 1 Block Diagram

To implement this project we kept focus on making the algorithm objective very clear and making the system very consistent about the precision of sensing the power values. To sense power we found various modes. Best was to sense current values and then converting them to power values of consumption using hall effect current sensing methods. The sensed values needed to feed for conversion by ADC thus LPC2138 controller did well. It sorted values and did arrange it according to the programming. To switch loads between phases it was needed to switch them without delay and without knowing the consumer that he is being shifted from phase to phase. Hence, the microcontroller AT89S51.The controller kit gives switching signals to relay board making appropriate switching for each load making resultant best possible balanced state for each phase.

V. BASIC ALGORITHM AND FLOW CHART

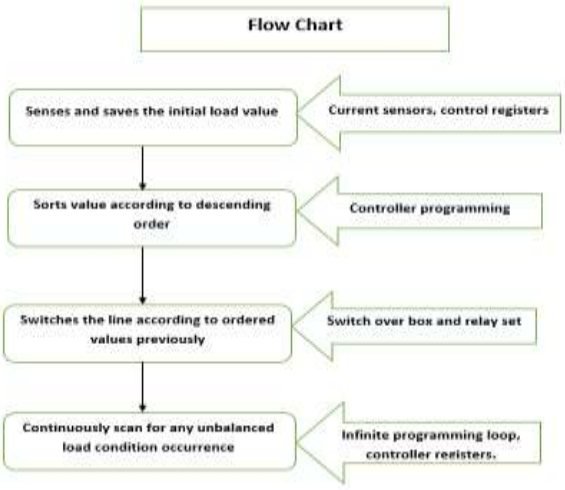

Fig No. 2 Flow chart for proposed system

The above figure shows the proposed flow of the equipment working. C-language is being used for the purpose of programming the micro controller. Firstly Hall sensors are used for the purpose of reading values for analyze. Then the controller unit sorts the values. Accordingly the controller instruct the relay driving unit for switching the loads between phases, thus making the balanced condition exist at any possibly consumption, for this continuous scanning will be made in a C programming loop.

VI. RESULT

Normal mode: Normal mode is shown in the following illustration which shows a 16x4 LCD showing all the load consumption at each phase normally. This doesn't processed by the switch over box. Thus, the summation coming out on each phase is vastly separated and not balanced as we can see:

Fig No. 3 Normal Mode output

Auto mode: When auto mode is enabled from the controller unit, it begins its processing as per the programming of scanning detecting values, and switching loads between phases to obtain the almost equalized total on each phase.

Fig No. 4 Auto Mode output

VII. CONCLUSION AND FUTURE SCOPE

It is found that overloading, due to various reasons such as power theft, unbalance condition due to loading of any phase are the prime cause of failure transformer. Most of them are caused due to low maintenance as many localities are situated at remote areas so this system will help to prevent transformers from being damaged or overload condition. This will help to tackle the problem of electricity theft and transformer damage, as the failure rate is very high in INDIA, around 25% per annum, which is not favorably comparable to international norms of 1-2%. When auto mode is enabled from the controller unit, it begins its processing as per the programming of scanning detecting values, and switching loads between phases to obtain the almost equalized total on each phase. Hence making the balancing, and preventing power thefts, this idea can be a boon to save circuits and transformers and the very prime need of us i.e. electricity.

This idea can be used in real time application but instead of using the relays we will need the contactors and the capacity of the respective may vary as per the requirement. Even the water proof assembly need to be there so

that whole switch over assembly can be inside the box on distribution pole. The Zig-Bee networking can be used to convey the control office about the power theft taking place at the corresponding locality.

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