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Real Time Transformer Monitoring & Controlling Fault Detection Using RF

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ABSTRACT

Transformers are basic design of electrical device which provide power transmission by transforming induced current from one circuit to another circuit. The induced current can be converted step up &step down of current or voltage. This application mainly concentrates on the three phase transformer which are used in between electric poles & power transformers. The real time controlling is done on the basic future like current, voltage, temperature maintained. These features are essential for effective power transmission &long life of industrial transformer. The monitoring & control of the transformer is done by using ARM7 processor, RF transmission for wireless communication & sensor which check the level of gas, overload & maintain temperature by regular observation. There are various transformer maintenance techniques, but this paper gives real time monitoring &controlling of transformer by using ARM7 processor which replace the bulky computers making it as embedded system. The design is to sense features of transformer & send the information regularly to the processor, the processor in turn will makes the transmission to the RF to the client. So this design make possible to attain real time control &monitoring of gas overload &temperature range in the transformer.

Keywords: **ARM7, RF Transceiver, Relay, Encoder.**

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I. INTRODUCTION

Wireless communication has announced its arrival on big stage and the world is going mobile. We want to control everything and without moving an inch. This remote control of appliances is possible through Embedded Systems. The use of "Embedded System in Communication" has given rise to many interesting applications that ensures comfort and safety to human life. It is very important to closely monitor the transformer in-service behaviour to avoid costly outages and loss of production. It is well known that to maintain the system reliability it is necessary to protect the transformer from different abnormality condition i.e. faults. Distribution Transformers have a long service life if they are operated under rated conditions. However, their life is significantly reduced if they are overloaded, resulting in unexpected failures and loss of supply to a large number of customers thus effecting system reliability.

Online monitoring of key operational parameters of distribution transformers can provide useful information about the health of transformers which will help the utilities to optimally use their transformers and keep the asset in operation for a longer period. This will also help identify problems before any catastrophic failure which can result in a significant cost savings and greater reliability. Transformers are a vital part of the transmission and distribution system. Monitoring transformer condition online can prevent faults that are costly to repair and result in a loss of service. In this project we designed a system in such a way that it will monitor and control the load of the

substation continuously and that information is transferred to the control room using RF Technology. You can use this system for online monitoring of transformers. You can then use information to avoid dangerous and costly failures, while optimizing maintenance schedules and extending the life of your transformers. In our system a microcontroller will continuously keep on monitoring the various parameters (Output current, Output voltage and Temperature) of the transformer and this information will be continuously be updated on your PC using a VB based software. A keypad is used to change the set points for the parameters. A 16x2 LCD is used to continuously displays the parameters. We have even provided a protection relay so if there is any problem with the transformer the power to it can be remotely disconnected.

Need for the new system:

1. Distribution Transformers have a long service life if they are operated under rated conditions. However, their life is significantly reduced if they are overloaded, resulting in unexpected failures and loss of supply to a large number of customers thus effecting system reliability.

2. Monitoring transformer condition online can prevent faults that are costly to repair and result in a loss of service.

II. LITERATURE SURVEY

We decided to do a project on Real time transformer monitoring &controlling fault detection using RF in the seventh semester. The idea came to us while searching for topics on which to do project work. We always wanted to put theory that we studied into practice. Our first inspiration in this direction was our subject embedded system in which we studied the principles governing real time application. As we mentioned earlier, we choose automatic control & monitoring system because of its advantage over other system. Another factor that tipped the balance in this direction was the fact that we, as a project group have long term goals that will support our decision to do a project in this field.

In this first couple of months we spent searching topics for project work, we came across numerous instances of the rapid advancements made in the field of Real time transformer monitoring &controlling using RF as described in various journals and magazines as well as over the internet. While searching on the various methods used for the security application, we have come across number of advance technique of monitoring &controlling.

III. PROPOSED SYSTEM

Block Diagram:

1. Substation Section:

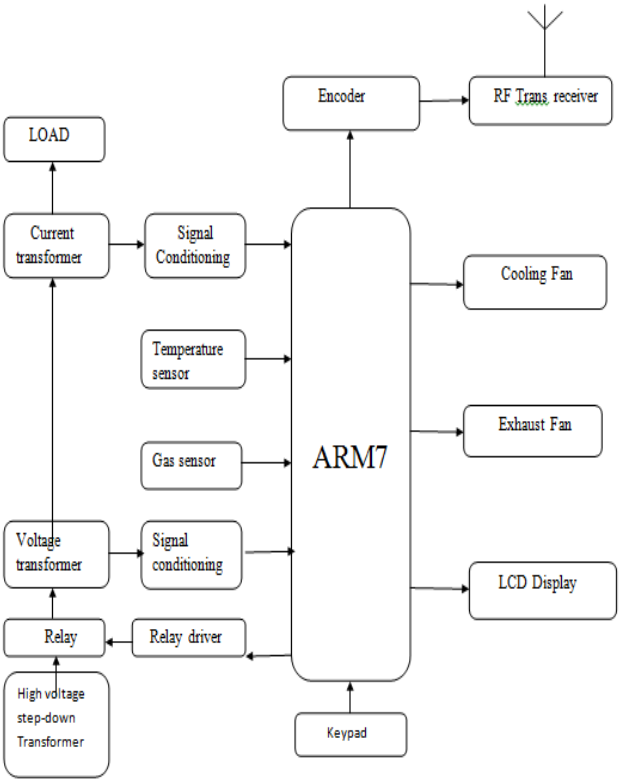

Fig 1. Block diagram of substation section

2. Control Section:

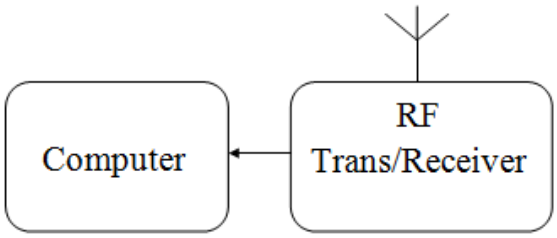

Fig 2. Block diagram of control section

Block Diagram Description:

Microcontroller ARM (LPC2148):

The LPC2148 microcontrollers are based on a 32/16 bit ARM7TDMI-S™ CPU with real-time emulation and embedded trace support, that combines the microcontroller With 32 kb, 64 kb and 512 kb of embedded high speed Flash memory.

LCD Display:

LCDs have become a cheap and easy way to get text display for embedded system Common displays are set up as 16 to 20 characters by 1 to 4 lines. Thus we have used the 16*2 LCD that means it can display the two lines containing 16 characters each.

RF Trans/Receiver:

RF Transmitter STT-433/315

The STT-433 is ideal for remote control applications where low cost and longer range is required. The transmitter operates from a 1.5-12V supply, making it ideal for battery-powered applications. The transmitter employs a SAW-stabilized oscillator, ensuring accurate frequency control for best range performance.

RF receiver STR- 433/315

The STR-433 is ideal for short-range remote control applications where cost is a primary concern. The receiver module requires no external RF components except for the antenna.

Keypad:

Keypad is used to change the set of points for the parameters i.e temperature, voltage & current range.

Signal Conditioning:

The process of performing operation on signals to convert in suitable form for interfacing with other circuits is called signal conditioning.

Temperature Sensor:

The temperature sensor used is LM35. The sensor has three pins, Vi is the input voltage pin which acts as at 5V, Vo is the output voltage gives the display provide to it. GND pin is the ground pin. The output voltage is directly proportional to the varying resistance. If the temperature rises the above the desired level, cooling fan automatically switch ON. This reduces the raised the temperature of the transformer. The output of temperature sensor is displayed in LCD display showing the detected temperature value.

Gas Sensor:

The sensor detects the different gases varying the resistance of all gases produce in industry & distribution pole. Every gas sensor detects the presence of gas by its varying resistance. This is directly proportional to the output showing gas detection by its pressure.

Voltage Transformer:

A Voltage Transformer theory or Potential Transformer theory is just like theory of general purpose step down transformer. Primary of this transformer is connected across the phases or and ground depending upon the requirement. Just like the transformer, used for stepping down purpose, potential transformer i.e. PT has lowers turns winding at its secondary. The system voltage is applied across the terminals of primary winding of that transformer, and then proportionate secondary voltage appears across the secondary terminals of the PT.

Current Transformer:

A CT functions with the same basic working principle of electrical power transformer, as we discussed earlier, but here is some difference. If a electrical power transformer or other general purpose transformer, primary current varies with load or secondary current. In case of CT, primary current is the system current and this primary current or system current transforms to the CT secondary, hence secondary current or burden current depends upon primary current of the current transformer.

Step Down Transformer:

A transformer makes use of Faraday's law and the ferromagnetic properties of an iron core to efficiently raise or lower AC voltages. It of course cannot increase power so that if the voltage is raised, the current is proportionally lowered and vice versa.

Computer:

In the main station parameters such as temperature, voltage, current displayed on the screen of computer. In the display unit we can view the continuous information of transformer i.e due to what reason the transformer has been failed, when the power is resumed etc.

Bulb:

It is used for load purposing.

IV. ADVANTAGES & APPLICATION

Advantages:

- Devices can be operated from anywhere in the world.
- Efficient and low cost design.
- Low power consumption.
- Real time monitoring.
- Improve transformer reliability and minimize downtime
- Maximize transformer life with maintenance activity to address abnormal operation
- Provides true dynamic loading capability

Applications:

- This system can be implemented in industries.
- This system can be used to monitoring and controlling the home appliances.
- This system can be implemented to monitoring and controlling Distribution Transformers located at remote areas.

V. CONCLUSION

In our project we studied design to attain real time control & monitoring of gas overload & temperature range in the transformer. In this project we designed a system in such a way that it will monitor and control the load of the substation continuously and that information is transferred to the control room using RF Technology.

REFERENCE

[1] IEEE paper on "RF: The Choice for Power Management and Efficiency" presented by RF Alliance, for the purpose of Home Automation .STSS 2002,(Karue :Norway).

[2] Luents William SA. Development of Wireless Sensor Networks for communication Purposes.In: Pointing, George, Jack N, Ethernet based systems, GSM based development of Wireless Sensor Network. Dordrecht: Karawae Technical Publishers; 1001a. p.139-45. {chapter 09} ISBN 0-3926-3632-3.

Books Refer:
1. Raj Kamal, "Embedded system", (2nd edition), Tata McGraw-hill, 2008.
2. Basic electronics , B. C. Thenaja.
3. "GSM system engineering" by Asha Mehrotra, Artech house publishers.

Websites:
1.http://www.atmel.com/literature
2.http://ieeexplore.ieee.org/xpl/freeabs_all.jsp?arnumber=4559539
3.http://ieeexplore.ieee.org/xpl/freeabs_all.jsp?arnumber=914626
4.http://ieeexplore.ieee.org/xpl/freeabs_all.jsp?arnumber=4579903