Distribution Transformer Monitoring and Controlling Using GSM Module

Kamble Supriya S.(B.tech Scholar)[1]
Narkhedkar Geetanjali S.(B.tech Scholar)[2]
Sutar Satish S.(B.tech Scholar)[3]
P.S. Tanurkar (Asst.Prof.)[4]
Department of Electronics &Telecommunication
Government College of Engineering, Karad- 415110, India

Abstract- *This project is about design and implementation of a system to monitor and record key parameters of a distribution transformer like load currents, load voltage, oil level and ambient temperature. The idea of on-line monitoring system integrates a global service mobile (GSM) Modem, with AVR microcontroller and different sensors. It is installed at the distribution transformer site and the above parameters are recorded using AVR microcontroller, obtained parameters are processed and recorded in the system memory. If any abnormality or an emergency situation occurs the system sends SMS (short message service) messages to the mobile phones containing information about the abnormality according to some predefined instructions programmed in the controller. This system will help the transformers to operate smoothly and identify problems before any catastrophic failure.*

Keywords - Distribution Transformer, GSM System, Sensor, Abnormality, Parameters, Monitoring, Controlling System.

INTRODUCTION

In power systems, distribution transformer is electrical equipment which distributes power to the low-voltage users directly, and its operation condition is an important component of the entire distribution network operation. Operation of distribution transformer under rated condition(as per specification in their nameplate) guarantees their long life .However, their life is significantly reduced if they are subjected to overloading, resulting in unexpected failures and loss of supply to a large number of customers thus effecting system reliability. Overloading and ineffective cooling of transformers are the major causes of failure in distribution transformers. We have designed a module which constantly monitors the parameters such as over voltage, over current, temperature, oil level of distribution transformer. If any difficulty arises message will goes directly to the monitoring centre with the help of GSM module.

I. OBJECTIVE

Abnormality in distribution transformer is accompanied with variation in different parameters like ambient temperature, Load current, over voltage, Oil level. However, we are dealing with oil level, temperature and load current and voltage. Online monitoring system consists of embedded system, GSM modem, mobile-users

and GSM networks and sensors installed at transformer site Sensors are installed on transformer side which reads and measures the physical quantity from the distribution transformer and then it converts it into the analog signal. The Arduino board is located at the transformer site. It is utilized to acquire, process, display, transmit and receive the parameters to/ from the GSM modem. The second is the GSM module. It is the link between the arduino and the public GSM network. The server is attached to GSM modem and received transmits SMS from/to the transformer site via the GSM module.

II. LITERATURE AND SURVEY

1. Distributed Transformer Monitoring System Based On Zigbee Technology

Rakesh Kumar Pandey , Dilip Kumar has developed a system based on zigbee module which monitors the two parameters i.e temperature and oil level of distribution transformer using microcontroller. Zigbee is a wireless technology. It works on Zigbee technology that supports multiple network topologies such as point-to-point, point-to-multipoint and mesh networks. It has low duty cycle provides long battery life.

2. Microcontroller Based Power Transformer Protection System

OCHIENG' ALLAN OMONDI -The objective of this project has been to design and implement a system that uses a microcontroller to protect a power transformer. The relay is able to operate and isolate the transformer in case of an over current fault. The admirable fact about it is the accuracy with which it closes and recloses during either normal operation or fault occurrence.

3. Fault Detection and Protection of Transformer by Using Microcontroller

Karpe S R, Sandeep Shelar, Shraddha Garkad, Shruti Lakade. This paper presents a digital technique for transformer protection. Proper protection is needed for economical and safe operation in electrical power system

.Transformer protective relay should be sense the fault occurs in transformer and trip the circuit during internal fault measuring. This study describes the design and implementation of microcontroller based system for protecting transformer.
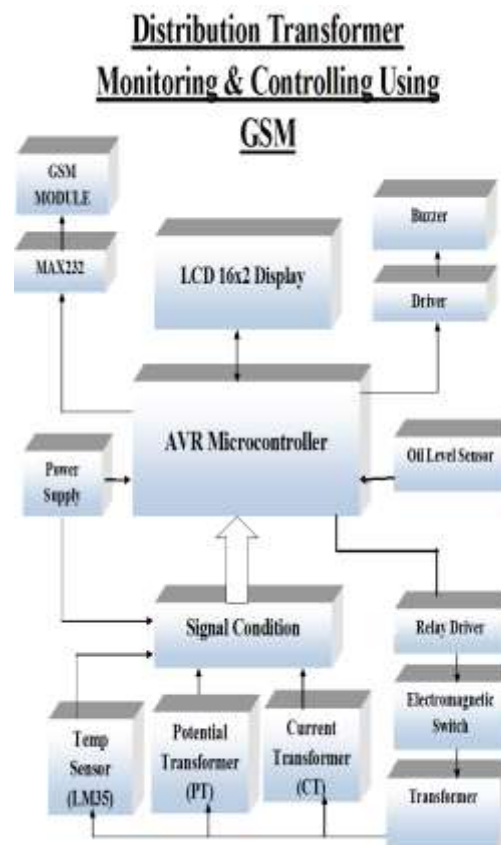
III. PROJECT INTEGRATION

Fig. 1 Block Diagram of Proposed Method

A] Hardware Implementation

Sensor

Sensor takes input from environment and output it as electrical quantity. Here we have monitored four parameters voltage, current, temperature and oil level. Sensors required for them are current sensor , potential transformer, LM35,oil level sensor.

Current Sensor

A current transformer (CT) is an electric device that produces an alternating current (AC) in its secondary which is proportional to the AC in its primary.

Potential transformers: Potential transformers are also known as voltage transformers and they are basically step down transformers with extremely accurate turns ratio. Potential transformers step down the voltage of high magnitude to a lower voltage which can be measured with standard measuring instrument. These transformers have large number of primary turns and smaller number of secondary turns.

Temperature Sensor

The LM35 is an integrated circuit sensor that can be used to measure temperature with an electrical output proportional to the temperature (in ^{o}C).

Oil Level Sensor

Oil is used in transformers to insulate and cool the windings. since heat reduces the efficiency of every electrical machine, oil is used in transformer for example to cool and maintain the efficiency level of the transformer .

Relay and Buzzer

When any one-parameter crosses its level then micro-controller turn on relay and buzzer and through relay , and cutoff main 230 volt supply so that system is trapped.

GSM Module

Here we use GSM module to transmit message to monitoring centre. A GSM modem is a wireless modem that works with a GSM wireless network. A wireless modem behaves like a dial-up modem.

Arduino

Arduino is a microcontroller board based on the ATmega328P . It has 14 digital input/output pins (of which 6 can be used as PWM outputs), 6 analog inputs, a 16 MHz quartz crystal, a USB connection, a power jack, an ICSP header and a reset button. It contains everything needed to support the microcontroller; simply connect it to a computer with a USB cable or power it with a AC-to-DC adapter or battery to get started.. You can tinker with your UNO without worring too much about doing something wrong, worst case scenario you can replace the chip for a few dollars and start over again.

Power Supply

For our all IC we require 5 v d.c. Supply, which can be generated by step down transformer, full wave bridge rectifier, and filter condenser and voltage regulator IC 7805.

16 X 2 Dot Matrix Liquid Crystal Display

In our project we use alpha numeric display instead of 7 segment led display because on 7 segment reading and writing alphanumeric such as X,Q W,M is quit difficult, so we use directly readymade.

B] SOFTWARE IMPLEMENTATION

Here, we used Arduino software(IDE) for programming. Arduino software contains a text editor for writing a code, a message area, a text console, a toolbar with buttons for common functions and a series of menus. It connect to the arduino and genuine hardware to upload programs and communicate with them.
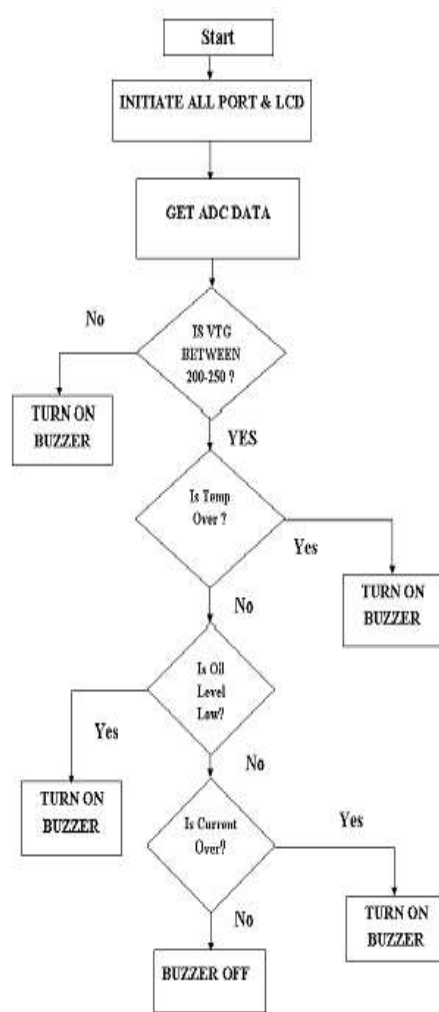

Fig.2. Flowchart of Proposed Method

V. CONCLUSION

The GSM based monitoring of distribution transformer is quite useful as compared to manual monitoring and also it is reliable as it is not possible to monitor always the oil level, ambient temperature rise, load current manually. After receiving of message of any abnormality we can take action immediately to prevent failures of distribution transformers. In a distribution network there are many distribution transformers and associating each transformer with such system, we can easily figure out that which transformer is undergoing fault from the message sent to mobile. We need not have to check all transformers thus we can recover the system in less time.

VI. REFFERENCE

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