Automation And Monitoring of Distribution Transformer

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Abstract : In normal way all the industrials or electrical machineries are controlled by the manual operation. Hence there is step by step progress but most of the time there is not actual instant co-operation between the system and the operator in case of fault type situation .Therefore, we are designing a system, where there exits communication between the system and operator. For this we are using 1kva,3phase transformer, microcontroller. As we know about distribution transformer is a major component of power systems and it is correct functioning vital to system operation. To reduce the risk of unexpected failure, real time monitoring has become the common practice to assess continuously the condition of the transformer and record key operation of a distribution transformer such as overvoltage, over current, temperatures, oil level rise or fall. Also it is important to keep an eye on transformer health when operator is not present actually at transformer site, so we are introducing a new system named as two way communication system between transformer and operator through microcontroller, In the control room, where the operator can see any related parameter value of transformer health in the control room. 25

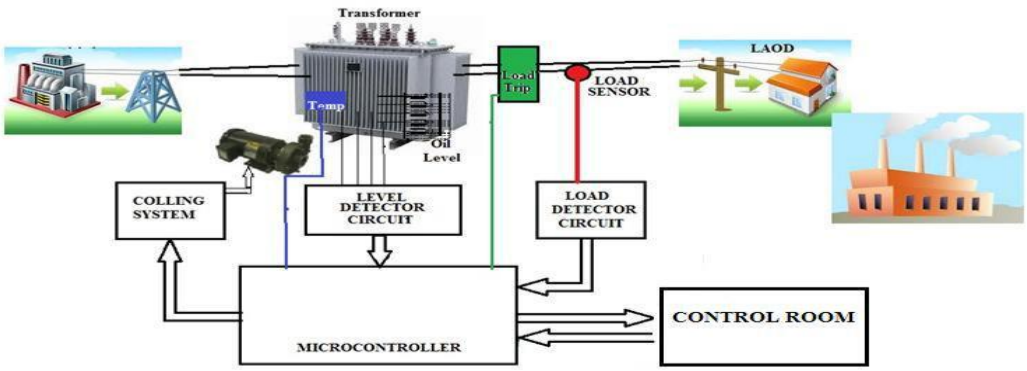
Index Terms ***: introduction, block diagram, methodology, mathematical calculation, advantages, application, future scope, conclusion, acknowledgement, reference.***

I. INTRODUCTION

Transformer is the key equipment in power system, to ensure it is safe and stable operation is very important. Transformer either raise a voltage to decrease losses or decreases voltage to a safe level. Monitoring is here defined as on-line collection of data and includes sensor development and measurement techniques for on-line applications. It's very difficult and expensive to construct the communication wires to monitor and control each distribution transformer station. Here arduino is used as a communicating and monitoring of parameters.

The failures of transformers in service are Over Load, temperature rise, low oil level, Earth grounding, improper installation and maintenance. Out of these factors temperature rise, low oil levels and over load this parameter need continuous monitoring to save transformer life. A distribution transformer networks remote monitoring system increases the reliability of the system network by monitoring critical information for oil temperature, current and oil level of transformer. Data are collected continuously and also recorded. Monitoring the transformers for problems before they occur can prevent faults that are costly to fix and result in a loss of service life.

2.Block diagram:-



3. Methodology

The system is divided into two sections:
1. Transmitter
2. Receiver

Transmitter contain sensor which are used in project like oil level sensor i.e. ultrasonic sensor, temperature sensor i.e. LM35 and current sensor i.e. ACS712 and receiver contain Adriano contain microprocessor.
The end device contains different types of sensors. The sensors are used to sense the different parameters and send it to microcontroller. Microcontroller transmits through Wireless transmitter.
The Receiver receives this data and displays it on the LED System and this whole process is real time monitoring parameters of the transformer and also automation is automatically as well manually are provided i.e. when the temperature is increases then automatically cooling system (fan) are ON and when the load is increases then automatically transformer is trip.

4. MATHOMATICAL CALCULATION

STACK CALCULATION
Formula :- (d2-r2)1/2
(452-402)1/2 = 20mm
(452-302)1/2 = 33-20 = 13mm
(452-202)1/2 = 40-33 = 7mm

L.V. Winding dimensions:-

I.D. = 50
O.D. = 65
H t = 155
Total turns = 412 (117 turns per layer) i.e. 4 layer
Conductor size = I_2/∂ = 2.30/1.5
Conductor size(AC) = 1.533mm^2
= 17 SWG
Base size = 1.42mm
Covering size = 1.52mm

HV Winding Dimension :-

I.D. = 75mm Ht = 150mm
O.D. = 90mm Turns = 1236
Conductor size (AC) = $I_L/3^{1/2}\div\partial$ = 1.32/$3^{1/2}$÷1.5 = 0.50mm^2 = 21SWG
Base size = 0.81mm
Covering size 0.91mm
No. of turn per layer = 174
No. of layers = 8 layer.

5. RESEARCH METHODOLOGY

The methodology section outline the plan and method that how the study is conducted. This includes Universe of the study, sample of the study, data and Sources of Data, study's variables and analytical framework. The details are as follows;
The research methodology is that when we are study in 2nd year of engineering that timing our college conduct transformer workshop is conducted that timing we are know very well about distribution transformer . from 2nd year to up to final year we collect the information by using old ieee paper , guide concept , some own concept and make the analytical framework of the project.

6. Data and Sources of Data

For this study secondary data has been collected about transformer fault from the ". IEEE Transactions on Power DeliveryYo1 8, No 1 of January 1993. Also collected data about transformer status from IEEE Transactions on Power Delivery, Vol. 11, No. 3, July 1996. From the IEEE MELECON 2004, May 12-15, 2004, Dubrovnik, Croatia.
We collected wireless network about transformer connection. ECTI-Conference on Application Research and Development (ECTI-CARD 2010), Patchtaya, Chonburi, Thailand, 10-12 May 2010.
From these conference we collected information about wireless technology and ", IEEE Computer
Applications in Power, July 1998. p.36-42, CIGRE WG A2-27 2007,] IEEE PC57.143 TM/D20 2008and",CIGRE Transformer Committee A2 WG12-30, WG Presentation, 2006 from these paper we collected the information about real time monitoring of transformer

7. Theoretical framework

We know that government distribution transformer which are place in society area , if the fault is occurred in the transformer due to overloading ,improper maintenance as well as earthing , increasing temperature and oil level due to this transformer is failure that time government are not interested to repair this transformer . they directly replace new transformer because price of new transformer and repairing cost are near about same that why they direct place new transformer . so we design the system that we take the automation and monitoring of transformer . the system work are as follows . first all real data parameter like current, oil level and temperature of distribution transformer are monitor then if the fault is occurred like increasing temperature , overloading or oil level that time automation is work like if the temperature is increases then automatically fan are start for cooling purpose , if load is increases then relay sense the over current then command to microprocessor and microprocessor are get command to circuit breaker to trip the transformer and we are using ultrasonic sensor for measuring the oil level and this are automatically as well as manually from the control room and also display on control room.

Advantages:-

- Devices can be operated from anywhere in the world.
- Efficient and low cost design.
- Low power consumption.
- Real time monitoring.
- The system is very simple.
- Easy to operate.
- Data is more secure.

Saves manual labor by automatically uploading and logging attendance in any given personal computer

Application:-

. 1)This system can be implemented in industries

2) This system can be used to monitoring and controlling the home appliances

8. Comparison of the Models

this distribution transformer is more improvement version of currently used government distribution transformer .

9. RESULTS AND DISCUSSION

Due to increased load of power system it is necessary to maintain communication between transformer health and operator so that any kind of abnormality doesn't cause large harm to the system. All data transfer must be important to keep transformer healthy and power system reliability too. Use of Automation system makes such things possible very easily. Also automation system has less manual operation more accurate With modern technology it is possible to monitor a large number of parameters of distributed transformer at a relatively high cost. The challenge is to balance the functions of the monitoring system and its cost and reliability. In order to get effective transformer monitoring system to a moderate cost, it is necessary to focus on a few key parameters. WDTMS is able to record and send abnormal parameters of a transformer to concerned office. It works on Wireless technology.

11. ACKNOWLEDGMENT

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