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AUTOMATIC MONITORING AND CONTROLLING OF DISTRIBUTION TRANSFORMER THROUGH GSM USING LABVIEW

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ABSTRACT: Transformers are the back bone in the electrical power transmission system and it is also an integral part of the substation. Distribution Transformers plays a pivotal role in power transmission, because of vast transformers distributed over a wide range in power network. The worst situation occurs if we not monitor transformer properly. This paper mainly deals with distribution transformer monitoring and control through mobile embedded system (GSM).Real time monitoring and controlling is done on basic features like oil aging, oil level, colour of oil and temperature maintenance. Transformers are mainly damaged due to high temperature, fire, reduction of oil in tank which causes damage in transformer windings. Here the monitor and control action is based on arduino Uno controller with help of LABVIEW software. After interfacing all components, user has to build up code in LABVIEW and controller continuously display all parameters such as temperature, oil level and colour changes in transformer oil in LCD.

The range of all these parameters for which transformer gives maximum output without any fault or damage is stored as set points externally, when these parameters goes beyond set point range then LCD displays the message and same alert message is sends to user for predefined mobile number and relay isolates fan gets on and if oil level in main tank decreases beyond set point range then the oil from secondary tank pumps oil to main tank until it completely fills.

Keywords: GSM, level sensor, temperature sensor, colour sensor

I. INTRODUCTION

The distribution transformers give maximum efficiency and have a good service life if we monitor parameters under rated conditions. The life of transformer is under serious threat when it over loaded, over heated, fire due to short circuit or any external factors such as lightning or due to reduction of oil level in tank or because of aging of transformer oil which results in transformer windings damage.

Due to these factors transformer failure occurs and there is loss of service to vast number of customers. Hence to overcome these issues it is necessary to monitor transformer under suitable conditions. Manually monitoring transformers is not suitable because we cannot obtain perfect information about occasional overload and high temperature. Our system is designed to online monitoring of parameters which provide useful information about health of transformers before any failure occurs.

This system based on GSM when ever fault occur it sends message to preloaded mobile number to rectify fault in transformer which improves over all life of transformers. SCADA (supervisory control and data acquisition) is used by most of power companies to online monitor of transformer but it is very expensive. This system provide less cost and more reliable as compared to that.

IMPLEMENTATION

HARDWARE CONFIGURATION

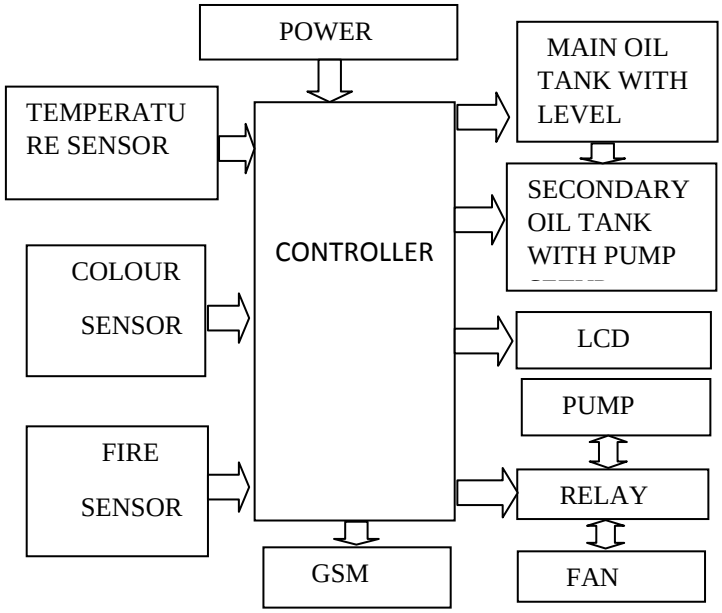

Fig 1 BLOCK DIAGRAM OF THE SYSTEM

PROPOSED METHOD

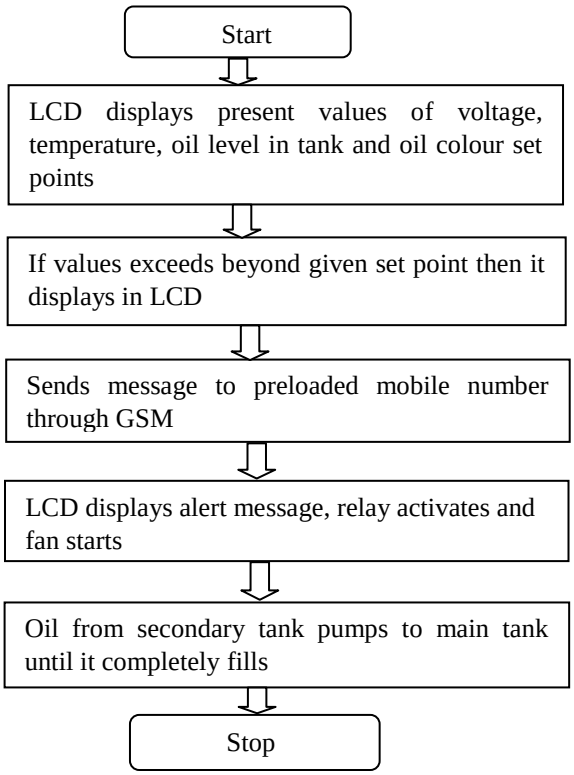

Fig 2 FLOW CHART

Following figures fig 1and fig 2 shows the block diagram and flow chart of the system. The temperature sensor, colour sensor, fire sensor, level sensor, LCD, relay and fan are interfaced to the controller as shown in block diagram. The step by step procedure is shown in flow chart.

II. DISCRIPTION

3.1 Arduino Uno: Arduino UNO is a widely used open source microcontroller board based on ATmega328P microcontroller. It contains sets of digital and analog input and output pins that can be interfaced to other circuits. It contains 14 digital pins and 6 analog pins and can be powered by USB cable. All sensors, relay, fan, GSM and other components are interfaced to controller.

3.2 Temperature sensor: For this system we use thermocouple. Thermocouple is a sensor used to measure temperature. It consists of two wire legs made of different metals. These wired legs are welded to form junction, this junction is where temperature is measured. When this junction experience a temperature change, produces voltage, we know that temperature is proportional to voltage.

3.3 Colour sensor: Normally transformer oil is used for cooling purpose. The life transformer oil is normally up to 7-8 years and it is necessary to change oil periodically because oil gets contaminated due to chemical interactions with windings thus chemical properties changes and becomes ineffective. At initially oil is white colour, after usage it changes colour to reddish yellow and finally becomes black colour.

3.4 GSM: GSM stands for global system for mobile communication.GSM modem is a device which can be either a mobile phone or modem devices which can be used to make a computer or any other processor communicates over a network. It requires SIM card to be operated over a wide range of network. Whenever the parameter values goes beyond set point values controller detects and sends message to predefined number.

3.5 Relay: Relay is an electrically operated switch. Relays are used where it is necessary to control a circuit by a separate low power signal where several circuits must be controlled by one signal. In relay there are three contactors normally open (NO), normally close (NC) and a common one (COM). When voltage applied to relay coil, it energize and changes from COM to NO or NC.

3.6 Water flow sensor: Float Sensor is an electrical ON/OFF Switch, which operates automatically when liquid level goes up or down with respect to specified level. The Signal thus available from the Float Sensor can be utilized for control of a Motor Pump or an allied electrical element like Solenoid, Lamps and Relays etc. Float Sensors contain hermetical sealed Reed Switch in the stem and a permanent Magnet in the Float. As the Float rises or falls with the level of liquid the Reed Switch is activated by Magnet in the Float.

III. SOFTWARE

LABVIEW: Laboratory virtual instrument engineering workbench commonly known as LABVIEW, is a design platform/environment as a visual programming language from national instruments. It is a graphical design platform wherein users can create a flow diagram to perform any type of mathematical, control system, measurement and data acquisition operation. LABVIEW has many in- built modules which contain blocks for design, analysis and visualization of data.

Some uses of LABVIEW are listed as

1. Instrument control

2. Automation industry

3. Data acquisition

4. Embedded control systems

LABVIEW programming environment:

LABVIEW's graphical interpretation of any model is called a virtual instrument or VI in short. Each VI contains block diagram and front panel.

Front panel: Front panel is the user interface VI which has the input and output control, indicators and graphs.

Block diagram: the block diagram panel contains the functions and graphical code. The wiring and actual modelling of a program is done in the block diagram panel.

IV. RESULT AND DISCUSSION

This paper mainly deals with two parts one is software and another one is hardware. All tests are successfully done in LABVIEW software and same implemented it on hardware and we have following results,

1. Whenever the temperature of transformer increases beyond set point range it sends temperature alert message to preloaded mobile number. Then relay isolates and fan get on for cooling purpose.

2. When colour of oil is not in range of 500nm to 800nm (i.e. white, yellow, reddish yellow) it sends colour alert message to user.

3. If fire occurs in transformer due to short circuit or because of any other external factors, it sends fire alert message to operator.

4. When oil level in main tank is decreases beyond set point range then it sends oil level alert message to user, then relay isolates and oil is pumped from secondary oil tank to main tank until it reaches requires set point range to avoid damages. Hence, transformers get protected.

5. By using LABVIEW software we can change the set points for all the parameters.

V. CONCLUSION

We have successfully built a system to protect distribution transformers from overheating, fire, damages caused in windings due to oil level reduction and aging of transformer oil.

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