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Real Time Parameter Monitoring and Protection of Transformer by Using Arduino

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***Abstract*— the aim of the project is to monitor the real time parameters of transformer by using Arduino and to protect the transformer from disfunctioning due to the overloading currents, voltage fluctuations and over-heating of transformers oil. Faults and excessive increase in load can lead to the malfunction, insulation breakdown and complete failure of transformer that can cause the blackout.**

***Keywords*— Voltage, Temperature and oil level monitoring of a transformer, Transformer protection by using arduino,**

I. INTRODUCTION

In power system network transformer is electrical equipment which distributes power to the low-voltage users directly and its operating condition is a vital part of the operation of distribution network. Operation of transformer under rated condition guarantees their long life. However, their life is significantly reduced if they are subjected to overloading condition, resulting in unexpected failures and loss of supply to a large number of customers thus affecting system reliability. Overloading and rise in oil & winding temperature of transformer are the major causes of failure in distribution transformers. The GSM based monitoring of distribution transformer is quite useful as compared to the manual operating system. In case of manual monitoring system, it is not possible to monitor the oil level, rise in oil temperature, rise in ambient temperature, load current regularly. After receiving the message of any abnormality, we can easily take action immediately to prevent any failure of transformers. In a power system there are many transformers and associating each transformer with such system can easily figure out faulty transformer from the message sent to mobile, thereby no need of checking all transformers phase current and voltage and thus we can recover the system in less. .

II. BLOCK DIAGRAM

Methodology of purposed protection scheme is shown in figure with the help of block diagrams. A 230V, 50Hz AC supply is given to transformer. A transformer converts 230V AC to 12V AC. As Arduino works on 5V DC supply, this 12V AC is converted into DC by using bridge rectifier. To get smooth DC output from bridge rectifier capacitors of rating 10 and 1 microfarad are used. This 12V DC is regulated to 5V DC by using voltage regulator 7805. A potentiometer of 1kΩ is used to vary the voltage. The output of voltage regulator is given as an input to Arduino pin A0.

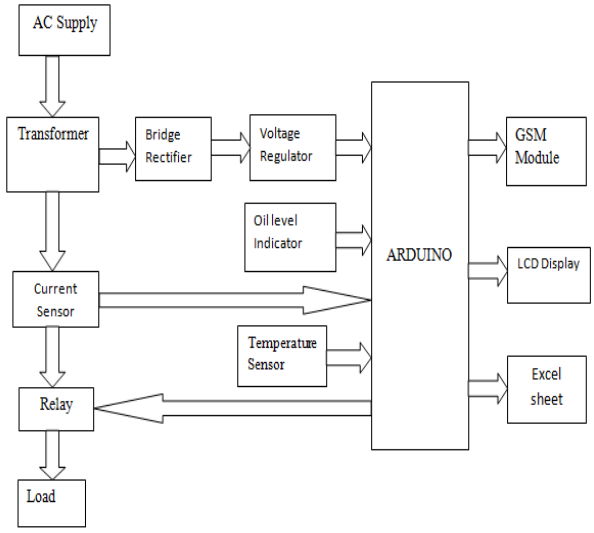

Fig.1 Block diagram

Purpose of relay is to disconnect the load in abnormal condition. The relay circuit is connected to Arduino Board through pin PD2.As the Arduino output pin become high, the relay circuit will operate and trips the load. LM35 is used to measure the temperature of transformer. When the voltage changes by 1mV, the temperature will change by 1deg.cls and temperature value is calculated as per scaling of voltage.

For measurement of the oil level, 3 wires are connected to PD3, PD4 and PD5 pins of Arduino, a single ground wire is provided for occurrence of these wires like

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switches and as per the closing of these switches with respect to ground we get, the outputs like medium, high and low.

III. SYSTEM FLOWCHART

Firstly, we made configuration of Arduino ports. Arduino will sense the transformer parameters and compare with the given specified conditions in program.

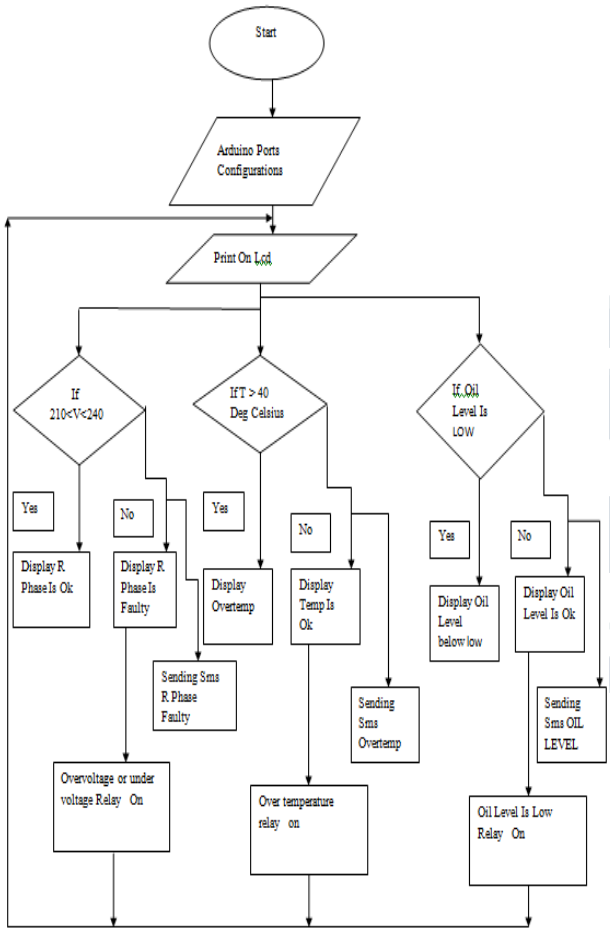

Fig.2 Flow chart

If voltage is greater than 240 V or less than 210 V then overvoltage or undervoltage respectively conditions will be displayed on LCD and message of "R phase faulty" will be delivered to mobile and load will be isolated , else "R phase ok" will be displayed on LCD. If temperature is greater than 400C, then overtemperature will be displayed on LCD and message of "overtemperature" will be delivered to mobile, else "temperature is ok" will be displayed on LCD. If oil level is low then message of "oil level below low" will be sent on mobile.

IV. HARDWARE AND SOFTWARE DESIGN AND IMPLEMENTATION

A 230/12 V transformer is used which will step down the line voltage for measuring purposes to 12V ac and for sensing the line current a ACS712 current sensor is used. The 12V ac is converted to 12V dc by using W04 bridge rectifier. A voltage regulator 7812 keeps the output of rectifier to 12v dc constant. LM 35 is used to measure the temperature of transformer oil. Relays are used to perform the tripping of load. By using Arduino software a code is designed which contains some preset values. The Arduino monitors, compares and display the real time parameters of transformer on 16*2 LCD . If the measured parameters are not according to specified conditions in program, relay will isolate the load. The message of fault will also be automatically displayed on mobile by using GSM. The no. of units consumed by the load is also calculated and displayed on LCD.

Monitoring and transmitting the transformer parameters using Arduino with proteus software

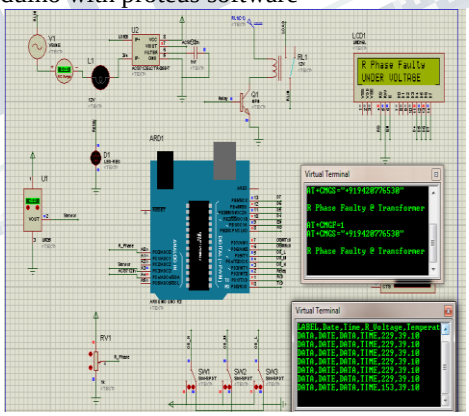

Fig.3 Simulation of phase fault

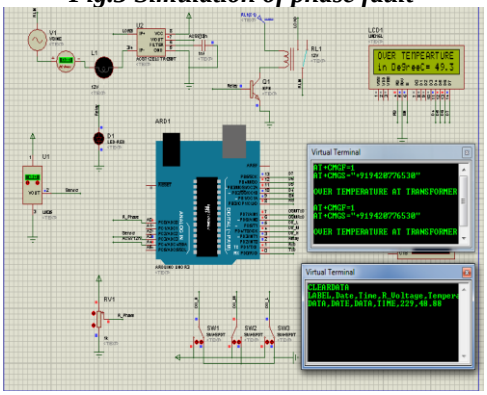

Fig.4 Simulation of temperature fault

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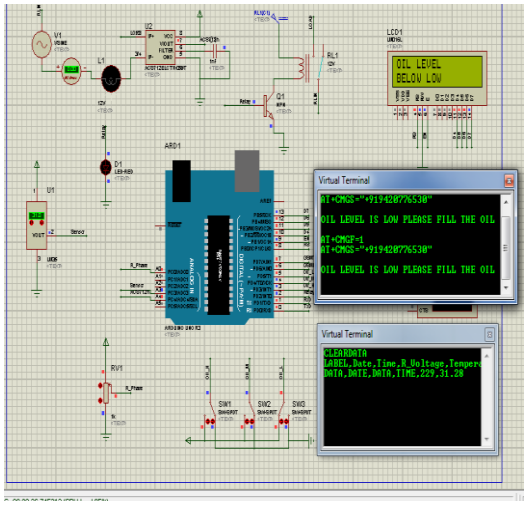

Fig.5 Simulation of oil level fault

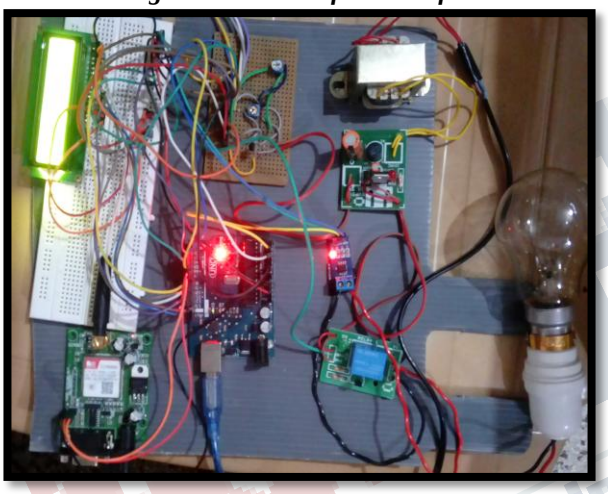

Fig.6 Complete Hardware Implementation

V. RESULT

Sr.no.	Parameter	Range	Condition	Load status
1.	Voltage	<210 V	Under voltage	Off
		210 to 240 V	Normal	On
		>240 V	Over voltage	Off
2.	Oil Level	-	Low	Off
			Medium	On
			High	On
3.	Temperature	>40^0 C	Over temperature	Off

VI. CONCLUSION

The proposed technique with results has shown that this protection scheme works properly with accuracy. Sensitivity of this scheme is very high for the abnormal and faulty conditions, as this protection scheme operates within the fractions of seconds when fault or abnormal condition occur. This protection scheme is fully automated.

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