Protection Of Power Transformer Using Microcontroller Based Relay

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ABSTRACT-Protection of power transformers is a very challenging problem in power system relaying. Since it is very important to minimize the frequency and duration of unwanted outages, this is a high demand imposed on power transformer protective relays. Various relaying principles have been proposed and used to protect transformers against different types of faults. Relays that use over current, over flux and overheating principles protect the transformers against overloads and externally applied conditions. Differential relays protect the transformers against internal fault. In this research, software and hardware of microcontroller-based relay system has been explained and designed. The design implementation and testing of the system are also presented.

I.INTRODUCTION

The main aim of this project is to design a tripping system which helps the power transformer from damage due to over loading. the tripping of the transformer is done through a relay switch automatically with the help of the intelligent device "microcontroller". If the current flowing through that instrument is more than the rated current, then immediately the System may burn because of over load, through this project we are going to protect the transformer from over load condition. The controlling device of the whole system is a Microcontroller. The tripping is done through a Relay switch. To perform the intelligent task, Microcontroller is loaded with intelligent program written using embedded 'C' language.

II. LITERATURE SURVEY

Abubakar, I. N. et al., [1] "Development of a Microcontroller-Based Power Transformer Overload Protection Scheme" Over the years the power systems of developing countries, specifically, Nigeria is becoming more unstable due to several factors among which is the continuous faults developed by power system components and of particular interest is power transformers, providing a solution to this challenge is the motivation behind this research work. This paper presents the development of a microcontroller-based power transformer overload protection system, with a communication capacity to notify the utility staff a case of abnormalities caused by overloading. The protection system consists of a GSM Module, Voltage sensor, Buzzer, Relay and a microcontroller programmed in C-Language. The system was designed to intelligently senses a situation wherever the transformer is overloaded using the voltage sensor. A relay is triggered to disconnect the primary side of the transformer from the load and also send an SMS message to the utility staff, that a certain transformer is overloaded. The results obtained from the test carried out on the system shows that the SMS was sent to the utility company as overload condition occurred and similarly, the relay disconnected the load to isolate the transformer from service thereby securing it from damage.

Kajal salunkhe et al., [2] "Transformer protection using microcontroller-based relay and monitoring using GSM technology" Transformers are very important device for transfer electrical energy. To protect transformer against different types of faults, various methods are used like differential protection, microprocessor-based relay etc. In this paper, overload and overheating protection is established for protection of transformer. Microcontroller based relay is used for protection of transformer. Simulation circuit is designed in proteus software and programming is done in KEIL software. In this research, hardware and software of microcontroller-based relay has been explained and designed.

W.Z. Wan Hassan et al., [3] "Protection of Power Transformer Using Microcontroller-Based Relay" introduced a design and implementation of the micro controller-based system for protecting power transformer. The system includes facilities for discrimination between intimal fault current and magnetizing inrush current, differential protection, over current protection, over voltage protection and under voltage protection. In this paper, software and hardware of micro controller-based system have been explained and designed. The design implementation and testing of the system are also presented.

S.M. Bashi et al., [4] "Protection of Power Transformer Using Microcontroller-Based Relay", Protection of power transformers is a very challenging problem in power system relaying. Since it is very important to minimize the frequency and duration of unwanted outages, this is a high demand imposed on power transformer protective relays. Various relaying principles have been proposed and used to protect transformers against different types of faults. Relays that use over current, over flux and overheating principles protect the transformers against overloads and externally applied conditions. Differential relays protect the transformers against internal fault. In this research, software and hardware of microcontroller -based relay system has been explained and designed. The design implementation and testing of the system are also presented.

III. PROPOSED METHODOLOGY

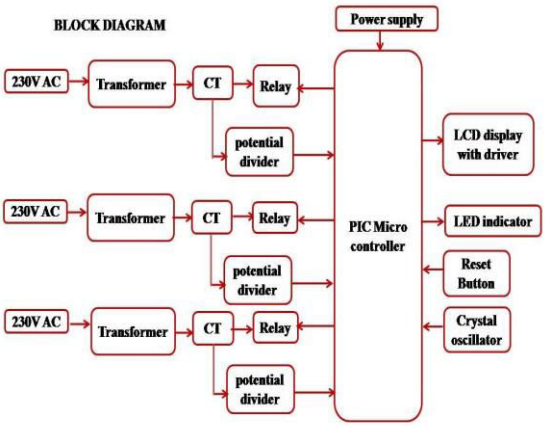

Figure 1: Block Diagram

In this project, we are using three 1:1 transformer of 230AC supply of R Y B phase which is fed to current transformer. The current transformer measures the current which is present in the main transformer and sends the measured current to the relay as well as the potential divider. The potential divider takes the power from the current transformer and sends the required power to the microcontroller. For normal loads, the status of three phases will display normal where as for heavy loads, overload status is displayed.

A. Regulated Power Supply:
Every embedded system requires DC voltage which is 5V. The supply we get in our houses is 230v, 50Hz. Here, RPS is used to ensure the condition that the output remains same even if the input changes as it converts AC to pulsating DC.

B. Transformer:
It is a device which transfers the AC current from one voltage to another by stepping up or stepping down the voltage. The input voltage 230v is given at primary side and the output of the transformer is 9v (AC) as shown in fig (2).

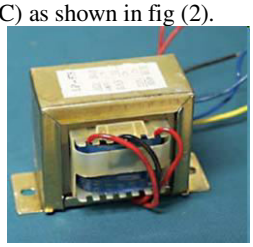

Figure 2: Transformer

C. Microcontroller:
Microcontrollers are "special purpose computers". The microcontroller includes a CPU, RAM, ROM, I/o ports, timers etc.., like a standard computer, but on a single silicon chip. Microcontroller based systems are designed to perform a specified task. The microcontroller used in the project is pic microcontroller developed by microchip incorporation.

Figure 3: PIC Microcontroller

D. Current Transformer:
A current transformer also isolates the measuring instruments from what may be very high voltage in the monitored circuit. current transformers are commonly used in metering and protective relays in the electrical power industry. It produces a reduced current accurately proportional to the current in the circuit, which can be conveniently connected to measuring and recording instruments.

E. LCD (liquid crystal display):
Liquid crystal display is very important device in embedded system. it offers high flexibility to user as he can display the required data on it. These are used in a wide range of applications, including computer monitors, television, instrument panels, aircraft, cockpit displays, signage, etc. The status of the hardware is displayed on the LCD as shown in fig(4).

Figure 4: LCD Display

F. Relay:
It is a simple electromechanical switch which consists a set of input terminals for a single or multiple control signals. Relay is used to make or break the circuit by sensing faults.

Figure 5: Relay

G. Load(bulb):
It produces light from electricity. For normal loads, 20w bulb is used in our project. For heavy loads, 60w bulb is used as shown in fig(6).

Figure 6: LED Bulb (60w,20w)

IV. WORKING

The controlling device of the whole system is a microcontroller. the load connected to transformer is continuously monitored by the microcontroller with the help of CT (current transformer) input to it. the microcontroller takes the decision of tripping the transformer according to the load value given in the program. the tripping is done through a relay switch. to perform the intelligent task, microcontroller is loaded with intelligent program written using embedded 'c' language.

V. HARDWARE AND RESULTS

Here, in this project, when 230V AC supply is given to normal load, the status in the LCD display is shown as "NORMAL". When 230V AC supply is given to heavy loads, the relay trips the load which is in the overload condition and the supply remains the same. In case of any inappropriate tripping conditions, reset button is used to put the microcontroller in known condition and reset the hardware.

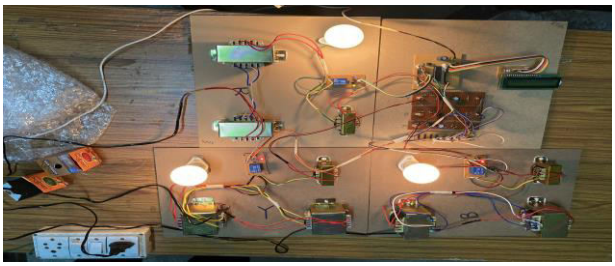

Figure 7: Normal condition before tripping

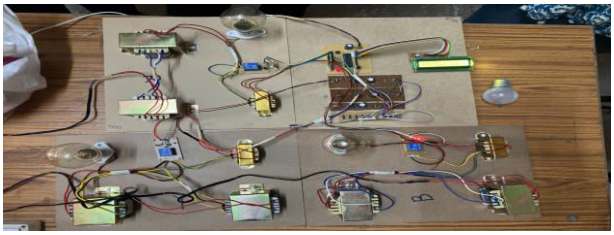

Figure 8: Overload condition after tripping

VI. CONCLUSION

Integrating features of all the hardware components used have been developed in it. Presence of every module has been reasoned out and placed carefully, thus contributing to the best working of the unit. Secondly, using highly advanced ICs with the help of growing technology, the project has been successfully implemented. Thus, the project has been successfully designed and tested.

VII. REFERENCES

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