International Journal of Research in Engineering, Science and Management
Volume-1, Issue-11, November-2018
www.ijresm.com | ISSN (Online): 2581-5792

Transformer Winding and Oil Temperature Monitor and Control

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Abstract: **This paper presents the design of a system of controlling and monitoring the temperature of transformer coil winding and oil with the help of microcontroller. To control precisely use PID algorithm. Sensor used is a K-type thermocouple (MAX 6675) for temperature measurement. This sensor is interfaced with microcontroller ATMEGA328. PID algorithm is present in microcontroller library. Setting P,I, D value we can control the temperature of Transformer. Temperature can be monitored through LCD display interfaced with microcontroller.**

***Keywords*: K-type thermocouple, ATMEGA328 Microcontroller, PID controller.**

1. Introduction

In power generation transformer plays an important role. With the help of transformer the power can be step up or step down. When load is increased on transformer the winding of transformer gets heated and so is the oil. Oil is used for the insulation of coil. For temperature indication Oil temperature indicator (OTI) and Winding Temperature indicator (WTI) is used. There are some other ways also by which this temperature is controlled. A temperature indicator of power transformer is specially designed for protection of transformer in addition to its temperature indication and cooling control features. That means, this device performs three functions.

- These instruments indicate instantaneous temperature of oil and windings of transformer.
- These also record maximum temperature rise of oil and windings.
- These instruments operate high temperature alarm at a predetermined value of allowable temperature limit.

But these works are being done manually at present scenario. So here comes the idea of monitoring and controlling the temperature of transformer automatically. In this project we are not only monitoring the temperature of transformer but also controlling it with the help of PID controller. Since we are controlling the temperature with the help of Microcontroller we get precise control over transformer temperature. This can reduce various hazardous accident which happen just because transformer catches fire because of overheating. Temperature from thermocouple is fed to the Microcontroller ATMEGA328. We set the maximum desired temperature in the microcontroller for transformer. In microcontroller there is P, I, D algorithm running. P stands for Proportional, I stands for Integral control and D stands for Derivative control. This PID control plays a vital role even in controlling any process industries. Numerical values for P, I, D is chosen according to set point. Temperature controlling fan is interfaced with microcontroller. So as the temperature rises above set point fan speed increases because of PID controller and vice versa, logic in ATMEGA328 is fed with the help of computer.

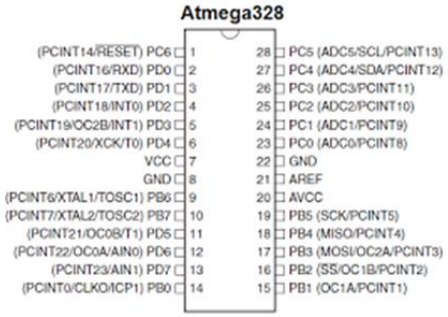

Fig. 1. ATMEGA328


Fig. 2. K-type thermocouple

2. Working

It has Thermocouple as main temperature sensing element. To cool the transformer we are using high speed PWM (Pulse Width Modulation) fan. To set our control signals we are using microcontroller. Thermocouple is inserted in the oil of transformer. This thermocouple is interfaced with microcontroller. We set some temperature limit for transformer which should not be crossed that we are calling here set point. The sensed temperature is compared with the set point value. If the measured temperature is higher than the set point value than a control signal is sent to the cooling fan to increase its speed.

Since we are using P, I, D controller so as the measured temperature move towards set point fan speed also increases to control the temperature. If temperature is below set point fan will be also moving at lower speed.

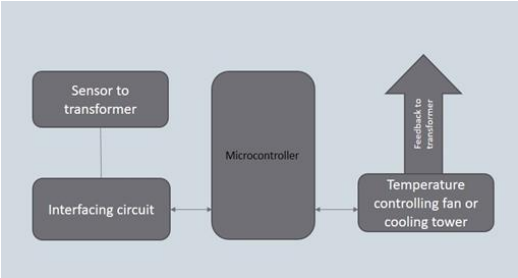

Fig. 3. Block diagram of transformer oil and winding temperature control

3. Result

Use of PID controller for fan controlling increases the accuracy of temperature control. The result of this control system is that it don't require a lot of manpower. Accidents caused due to overheating also reduces. We get uninterrupted power supply without any power loss.

4. Conclusion

Transformer oil and winding temperature control system has been designed and constructed. The prototype of the system worked according to specification and quite satisfactorily. The system components are readily available, relatively affordable and they operate quite reliably. The system helps to control the temperature of Transformer. Improving this control system reduces power loss also

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