EFFICIENCY ANALYSIS OF ONLINE TRANSFORMER

HemanthKumar L M*, Janarthanan D*,Karnesh R*,KalaPriyadarshini G**

**UG student, EEE, Prince Shri Venkateshwara Padmavathy Engineering College, Tamil Nadu, India*
***Assistant Professor, EEE, Prince Shri Venkateshwara Padmavathy Engineering College ,Tamil Nadu, India*

Abstract

The technology of sensors and other control equipment installed on power transformers has improved rapidly in last few years, with the number of new solutions and measuring methods also continuously growing. Monitoring systems contain a large variety of different measurements and calculated data related to measured values and standards. Monitoring systems on power transformers are not only a new feature for users, they can also be a good tool for manufacturers during the transformer's lifetime. Transformer manufacturers are able to monitor their products through such systems using data and events recorded on the transformer. Users are able to detect events or developing faults on the transformer that could disturb its operation. This leads to more efficient asset management. Also, a visualization of such a system can be presented to the user using an innovative graphic interface.Measuring of multiple dissolved gases in transformer oil is important for better monitoring and understanding of transformer condition and better prediction of possible failures during the operation

Keywords : *Pic Microcontroller,Potential Transformer,Current Transformer,LDR,Thermistor*

I. INTRODUCTION

Transformer monitoring requires the integration of sensors, data management and analysis to turn sensor data into useful knowledge, and then an overlay of software applications to turn knowledge into actionable information. Appropriate online diagnostic tools can help utilities avoid unplanned failures, lower maintenance costs and extend useful transformer life.Science and technology is very important tool for the human. The communication technology leads the world from the day one it was invented .The real application of communications technology is very much essential for radios, TV's, networks SCADA etc. An essential and heart of the world "electricity" transmission, distribution, control system does not use wireless technology as on date. The most essential element of electrical distribution is step up and step-down transformers till date that are not well automated with latest developments. But once if the distribution transmission transformer fails, the entire area will go in to dark. This is happening irrespective of the area like village, urban, city. Because we cannot provide manpower to all the transformers. But with the help of latest technological trend, we can overcome the above said problem and we can able to save the life of the transformer along with assured power line quality

II. PROPOSED SYSTEM

The hardware capabilities of PIC devices range from 6-pin SMD, 8-pin DIP chips up to 144-pin SMD chips, with discrete I/O pins, ADC and DAC modules, and communications ports such as UART, I2C, CAN, and even USB. Low-power and high-speed variations exist for many types. These devices feature a 14-bit wide code memory, and an improved 8-level deep call stack. The instruction set differs very little from the baseline devices, but the two additional opcode bits allow 128 registers and 2048 words of code to be directly addressed. On the older cores, all register moves needed to pass through W, but this changed on the "high-end" cores.

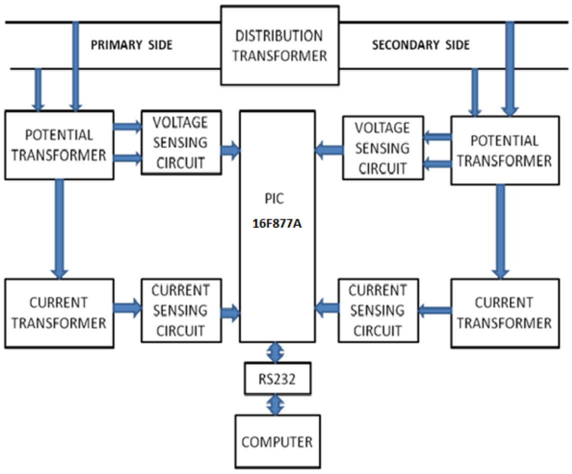

Figure 1 Block diagram of monitoring system

PIC cores have skip instructions, which are used for conditional execution and branching. The skip instructions are "skip if bit set" and "skip if bit not set". Because cores before PIC18 had only unconditional branch instructions, conditional jumps are implemented by a conditional skip (with the opposite condition) followed by an unconditional branch.

III. HARDWARE IMPLEMENTATION

To perform the various operations and conversions required to switch, control and monitor the devices a processor is needed. The processor may be a microprocessor, microcontroller or embedded controller. In this project an embedded controller has been preferred because it has built in ADC, RAM, ROM, ports, USART, DAC. This leads to lesser space occupation by the circuit and also the speed of embedded controllers are more compared to other processors. The embedded controller selected for this project is PIC16F877A due to its various features.

VOLTAGE SENSING UNIT

Bridge rectifier can be used to convert AC to DC. But a single conducting diode drops the voltage of 0.6v.During each cycle, 2 diodes are in conduction mode. So, totally 1.2V is dropped across it. This is undesirable because the voltage (iOL.e.) to be measured is about 5V. Hence, as mentioned above full wave rectifier designed using op-amp is used, due to the drawbacks faced in using bridge rectifier. OP-AMPS are devices, which have high input impedance and low output impedance. Hence they are used for rectification purpose, as they do not any device

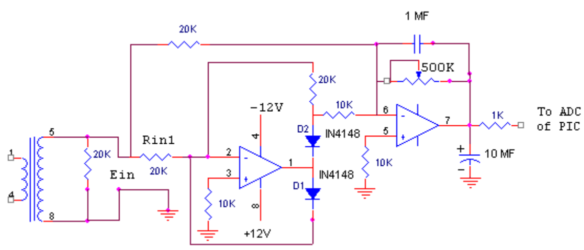

Figure 2 Voltage sensing circuit

In the rectifier circuit, A1 is an inverting unity gain amplifier. The output from A1 is added to the original input signal in A2 (inverting summing mixed gain amplifier). In this circuit, the diode is always in conduction mode and D1 is kept at virtual ground .E_{in} feds A2 through a 20KΩ resistor and A1 through a 10Ω resistor.

In this circuit diagram, there is a potential divider to divide the potential so that a sample of only 0.454V is given as an input to a rectifier. The gain of Op-amp (A1) is –1.the op-amp (A2) has two parts having the gain of –1and –2 respectively.During positive half cycle the op-amp A1 produces an output of 0.454V.Op-amp A2 produces an output of 0.908v across the path having gain of –2 and an output of –0.454V across the path having a gain of –1.thus, the resultant output voltage is 0.454V.It can be amplified to the required voltage by varying the trim pot.During negative half cycle the op-amp A1 produces an output of 0.454V.hence the diode does not conduct .The input of path2 of A2 is 0V,hence the output voltage is 0V.But the input of path1 of A2 is 0.454V.and hence the across path1 is 0.454V.it can be amplified to require voltage by varying the 500k trim pot. The 500K trim pot is adjusted so that a full-scale output voltage of 5V is produced for a primary voltage of 230V.A capacitor is connected to A2 so that it acts as an integrator. Hence the output voltage is a pure DC voltage it is then given to ADC. The 1K resistor is used to limit the current of 5mA.

CURRENT SENSING UNIT

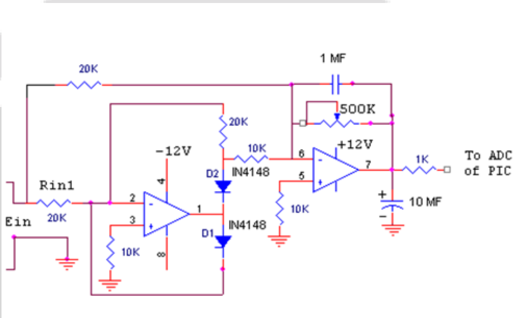

Figure 3 Current sensing circuit

In the rectifier circuit, A1 is an inverting unity gain amplifier. The output from A1 is added to the original input signal in A2 (inverting summing mixed gain amplifier). In this circuit, the diode is always in conduction mode and D1 is kept at virtual ground. E_{in} feds A2 through a 20KΩ resistor and A1 through a 10Ω resistor.In this circuit diagram, there is a potential divider to divide the potential so that a sample of only 0.454V is given as an input to a rectifier. The gain of Op-amp (A1) is –1.the op-amp (A2) has two parts having the gain of –1and –2 respectively.During positive half cycle the op-amp A1 produces an output of 0.454V. Op-amp A2 produces an output of 0.908v across the path having gain of –2 and an output of –0.454V across the path having a gain of –1.thus, the resultant output voltage is 0.454V.it can be amplified to the required voltage by varying the trim pot.During negative half cycle the op-amp A1 produces an output of 0.454V.hence the diode does not conduct .The input of path2 of A2 is 0V,hence the output voltage is 0V.But the input of path1 of A2 is 0.454V.and hence the across path1 is 0.454V.it can be amplified to require voltage by varying the 500k trim pot. The 500K trim pot is adjusted so that a full-scale output voltage of 5V is produced for a primary voltage of 230V.A capacitor is connected to A2 so that it acts as an integrator. Hence the output voltage is a pure DC voltage it is then given to ADC. The 1K resistor is used to limit the current of 5mA

IV. CONCLUSION

Thus hardware of our project has been successfully implemented without any issues and it is monitoring the transformer parameter under various situations.For controlling purpose 24V DC relay is used to controlling action during any fault condition.In near future it can employed in disturbution transformer for monitoring and controlling can be implemented.Predetermination of fault in the transformer can be analysed. Due to this prediction consumer get less affected.

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