"WIRELESS MONITORING AND PROTECTION OF POWER TRANSFORMER USING PIC"

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ABSTRACT

Power transformers are one of the most important electrical equipment that are used in power transmission system as they perform the function of transforming the voltage levels. Hence maintenance of power transformer is mandatory; as they are located at different geographical areas periodical monitoring is not possible all the time due to insufficient man power. Due to this reason transformer failure may occur which leads to unexpected power shutdown. To overcome this shutdown due to transformer failure we proposed a system for monitoring the transformer .The aim of our project is to monitor and protect oil quality, temperature, and current, fuse open or closed and voltage level of transformer without involving man power. If any critical condition occurs the SMS will be send to the operator through GSM modem as well as any faulty condition occur then fault is directly display on the LCD .This monitoring system consist of PIC 18F4550 A microcontroller, LM35 temperature sensor, fuse ,current transformer, voltage transformer, light dependent resistor (LDR),GSM modem and LCD. We can applied this system in real time only some modifications are required.

Keywords-: *power transformer, GSM modem, voltage transformer, oil quality, temperature, fuses condition.*

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1. INTRODUCTION

Such electric power systems are unified for economic benefits, increased reliability and operational advantages. They are one of the most significant elements of both national and global infrastructure, and when these systems collapse it leads to major direct and indirect impacts on the economy and national security. the demand of electric power for house hold purpose, commercial purpose and industrial purpose increases day by day. The existing method of management of electrical power system is complex as they are generally interconnected with many operating machine units working together. If any of the machine in this interconnected system faces failure entire power system is affected hence careful monitoring and protection of these machines are necessary. Among the interconnected machine transformer which is a static machine which plays key role of stepping up or stepping down voltage levels in power systems based on electromagnetic induction principle. In the existing system monitoring of transformer is done using wired network accompanied with temporary test unit and involving man into action, here continuous monitoring is not possible all the time which may lead to malfunction or failure of power transformer. We know the price of one transformer is how much, it is costly. Our proposed system provides effective monitoring and protection of power transformer by measuring its oil quality, temperature and operating voltage without involving human intervention. To improve the quality of power with sufficient solutions, it is necessary to be familiar with what sort of constraint has occurred. Additionally, if there is any inadequacy in the protection, monitoring and control of a power system, the system might become unstable. Therefore, it necessitates a monitoring system that is able to automatically monitor and classify the existing constraints on electrical lines. This brings up advantages to both end users and utility companies.

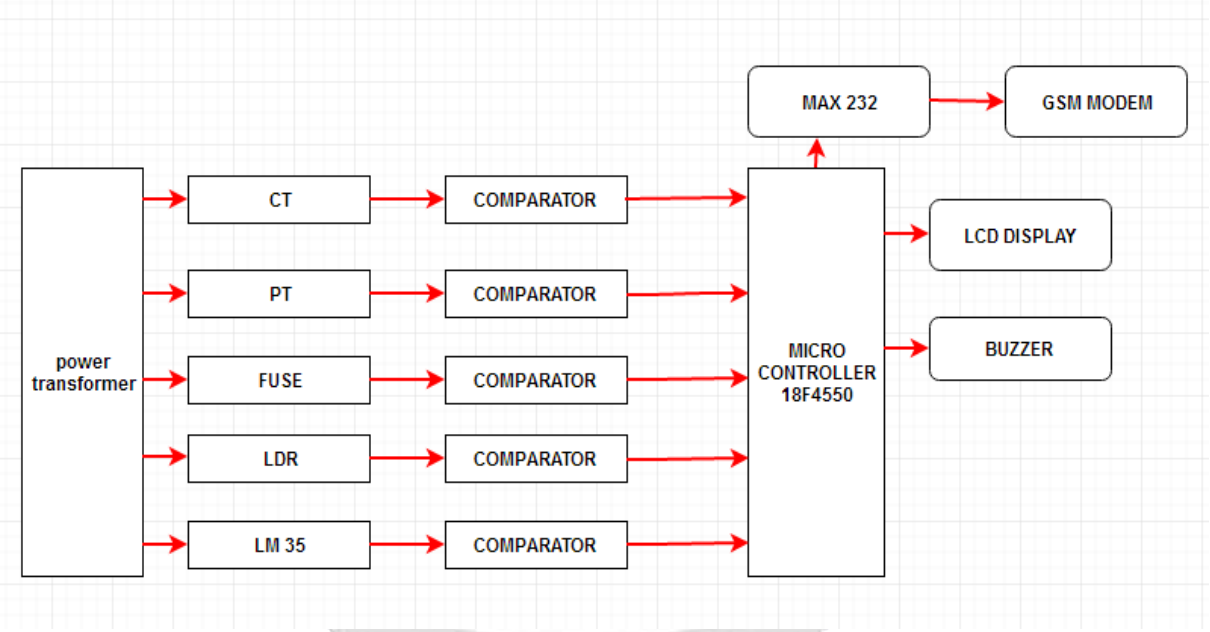
2. LITERATURE SURVEY

1) Most power companies use Supervisory Control and Data Acquisition (SCADA) system for online monitoring of power transformers but extending the SCADA system for online monitoring of distribution transformers is an expensive way of monitoring of transformer.

2) Distribution transformers are currently monitored manually where a person periodically visits a transformer Site for maintenance and records parameter of importance. This type of monitoring cannot provide information about occasional overloads and overheating of transformer oil and windings. All these factors can significantly reduce transformer life. A number of techniques are currently being used for offline as well as online monitoring of power transformers.

3) The Transformer Load Monitoring system (TLM) is a project aimed to reduce cost, increase efficiency and improve services to customers. The project was created by Metropolitan Electricity Authority (MEA) Thailand. The purpose was to build a monitoring system for medium voltage distribution transformers. These transformers have been installed on roadside electric poles around Bangkok. Transformers' data is significant to load management and research about transformers. An advanced distribution transformer load monitoring system is capable of measuring voltage, current and power.

3. BLOCK DIAGRAM



MAIN COMPONENTS IN BLOCK DIAGRAM

1) CT

2) PT

3) Microcontroller 18F4550

4) Light dependent resistor (LDR)

5) Power supply

6) Temperature sensor

7) LCD

8) GSM modem

4. CIRCUIT WORKING:

The circuit consist of various components like current transformer, potential transformer, light dependent resistor, fuse and temperature sensor LM 35 .firstly 230 volt supply given to the kit and here we use step down transformer (230/9 volt) because our kit required 5 volt DC supply. In the hardware kit supply is distributed as firstly 230 volt converted into 9 volt dc supply and further this classified for three kits this 9 volt AC again converted into 5 volt DC using full wave bridge rectifier then using smoothing reactor current getting smooth and finally using regulator desired 5 volt pure DC voltage we getting.

Here detail function of each component is given below:-

a) Potential transformer:

It is coupled with input line in order to measure the voltage input to the transformer winding output of the potential transformer is amplified and fed to microcontroller .If the value that is being monitored increases beyond the rating of the transformer SMS is send to the control room and relay trips and alarm starts functioning in the control room.

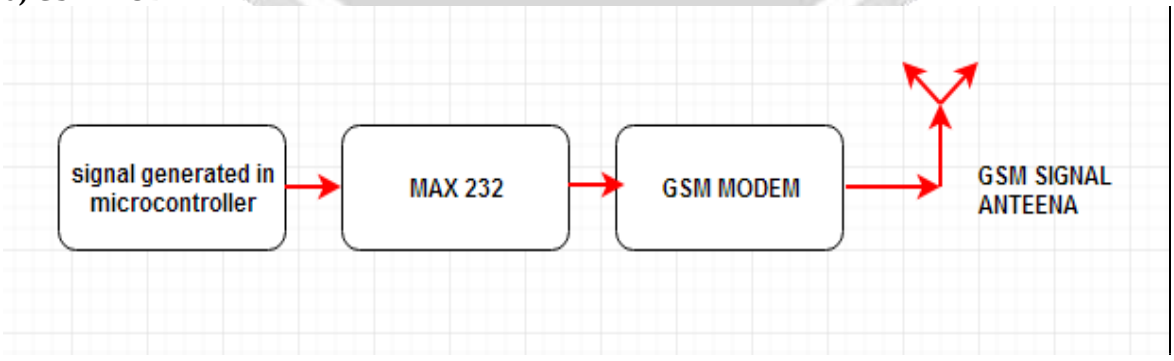
b) Light dependent resistor:

LDR is mounted inside the transformer tank it monitors the transformer oil quality. It is predicted by the intensity of light passing through oil. Its resistance varied when quality of the oil changes. The output of LDR is fed to PIC and it is continuously monitored if its value increases beyond limit SMS is sent to control room through GSM module.

c) Temperature sensor*:*

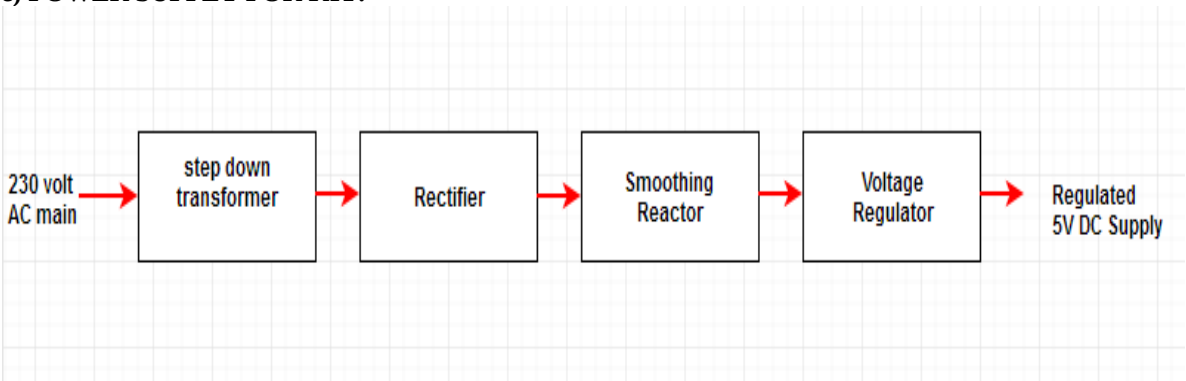
LM35 temperature sensor is kept immersed in the oil of the transformer tank. The resistance of the temperature sensor varies as the temperature of oil varies is the temperature values increases beyond 70$_{o}$c SMS is send to the control room through GSM .If the temperature reaches the critical level alarm operates at control room.

d) GSM MODEM



The figure shows the wireless GSM receiver set up at the receiver end. Here we are using GSM SIM900 within built GPRS. The signals are transmitted through GPRS which is received through SMS.

e) POWER SUPPLY FOR KIT:

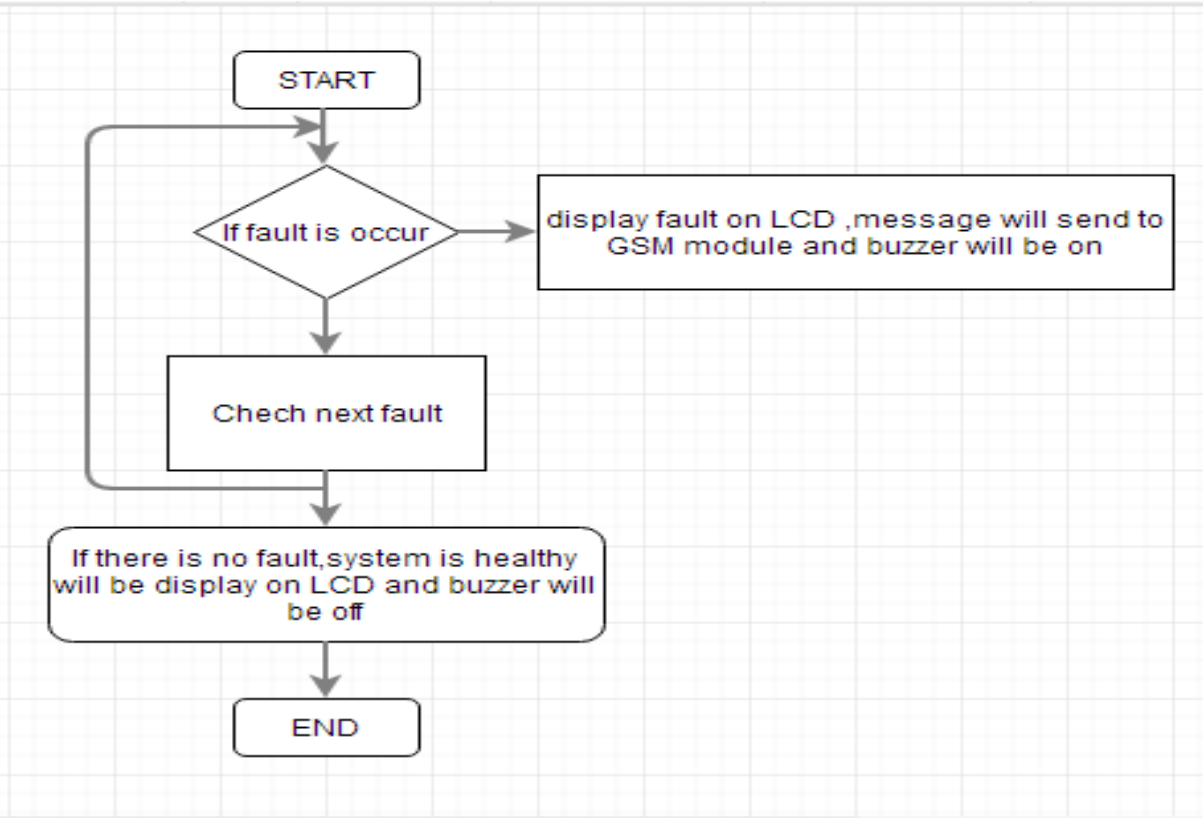


In the above block diagram we can see that power supply required for kit here firstly 230 volt AC main supply step down into the about 9 volt AC then this again converted into 5 volt and further 5 volt AC is converted into DC supply then we use smoothing reactor for smoothing purpose then using voltage regulator ic we can get 5 volt pure DC supply which is required for kit.

5. FUTURE COPE

1. For the monitoring of power transformer which is placed in rural area .
2. For MSEB purpose.

6. FLOW CHART



7. ALGORITHM

Step 1. Start

Step 2. Initialize LCD, timer, interrupt, relay, sensors, GSM modem

Step 3. Clear LCD

Step 4. Display collage name on LCD

Step 5. Wait for 4sec

Step 6. Clear LCD

Step 7. Display project name on LCD

Step 8. Wait for 4sec

Step 9. Clear LCD

Step 10. Check fault

Step 11. If fault is occur, display fault on LCD, message will send to GSM

Module and buzzer will be on

Step 12. Else if check next fault

Step 13. If there is no fault, system healthy will be display on LCD and buzzer will be off

Step 14. End.

8. ADVANTAGE

1) If any fault occur or all fault occur at a time .This system can be noticed easily all fault on scrolling LCD display. Therefore trouble-shooting is easy.
2) Even if there is nobody for monitoring the system the person can get the status on his mobile through SMS.
3) Saves money i.e. travelling allowances etc.
4) Reduces man power.
5) Easily implementable

9. APPLICATION

1) Maintenance Department for troubleshooting fault.
2) Quality Department for improvement Quality and find root cause of fault.
3) We can implement in mseb.

10. 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 IC‟s with the help of growing technology, the project has been successfully implemented. Thus the project has been successfully designed and tested.

11. REFERENCES

1) Jyotishman Pathak, Yuan Li, Vasant Honavar and James D. McCalley, "A Service-Oriented Architecture for Electric Power Transmission System Asset Management", In ICSOC Workshops, pp.: 26-37, 2006.
2) B. A. Carreras, V. E. Lynch, D. E. Newman and I. Dobson, "Blackout Mitigation Assessment in Power Transmission Systems", Hawaii International Conference on System Science, January 2003.
3) Kezunovic. M.-data integration and information exchange for enhanced control and protection of power systems-in proceedings of 36th Hawaii international conference on system science-TX 77843-3128.33p.
4) EL-saved,M.M.EL.Refaie-prediction of the characteristics of transformer oil under different operation conditions-IEEE std C57.104-1991

12. ACKNOWLEDGEMENT

We wish to express our sincere gratitude to Head of Department Prof. Shaikh N.B. of Electrical Engineering Department for providing us an opportunity for presenting project topic “Wireless Monitoring and protection of Power Transformer using PIC”. We sincerely thanks to our project guide Prof. A.L.Satav and project coordinator prof K.P. Varade for their guidance and encouragement in the completion of project work. We also wish to express our gratitude to the official and our entire faculty. Who rendered their help during the period of our project. Last but not least we wish to avail our self of this opportunity, to express a sense of gratitude and love to my friends and my parents for their manual support, strength, and help for everything.