PC Based Oil Transformer Health Monitoring

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Abstract— Distribution transformer being the most vital asset in any electrical statistical dispersion network needs special care and attention. In major power systems, distribution transformer is electrical equipment which distributes power to the low voltage users directly, and its surgical operation condition is an important factor of the entire distribution network operation. Operation of distribution transformer under rated condition warrantees their long animation. However their life is significantly reduced if they are subjected to overloading, resulting in unexpected bankruptcy and departure of supply to a large number of customers thus effecting system reliability. The fault free operation of transformers gives more impact on financial and security in power supply to utilities and industrial and domestic consumers. A sudden breakdown in a power Transformers will influence surprising creation intrusion, down time of the equipments in industries and the repair/replacement of the transformer; it might prompt tremendous speculation and costs. The insulating oil in a transformer can tell a lot about the actual state of transformer and its longevity. This proposed work mainly focuses on monitoring of transformer and transformer oil by using microcontroller (8051) and relay with suitable sensors for sensing parameters such as oil level, vibration, temperature, gas leakage, voltage and current and by controlling it with one key press of keyboard of PC.

Keywords: Distribution Transformer, System Overloading, Controlling

I. INTRODUCTION

The project has two major functionalities: First it precisely measures the major parameters of the transformer which can affect the functionalities of it and the life of transformer. It controls the transformer functionalities if parameters such as temperature of transformer, current, voltage, gas, vibration etc., exceeds the transformer threshold. The main objective of this project is to acquire real-time data of transformer and transformer oil remotely over the computer and controlling it. From our observations, we will not only get to prevent transformer deterioration in the long term but also get to know when we should replace the oil of the transformer same level would show similar characteristics..

II. RELATED WORK

In 2003, Ali Reza made a structure which depended on advanced differential transfers for transformer insurance utilizing Walsh arrangement and Slightest Square Estimators. The Two estimators were produced utilizing the Walsh arrangement and Slightest Square calculations. In their task, the computerized differential handing-off plan involved filter, pre-process, data acquisition and a decision making. The defensive transfer plays out the obligation of settling on choice about the faulted or non faulted circumstances.

It was seen that both estimation calculations played out their activity effectively, however the Walsh arrangement acts superior to Slightest Square calculation estimation.

In 2007 S.M. Bashi, structured a microcontroller based framework for power transformer assurance. The framework included facilities for segregation between internal fault current and charging inrush current, differential protection, over current protection.

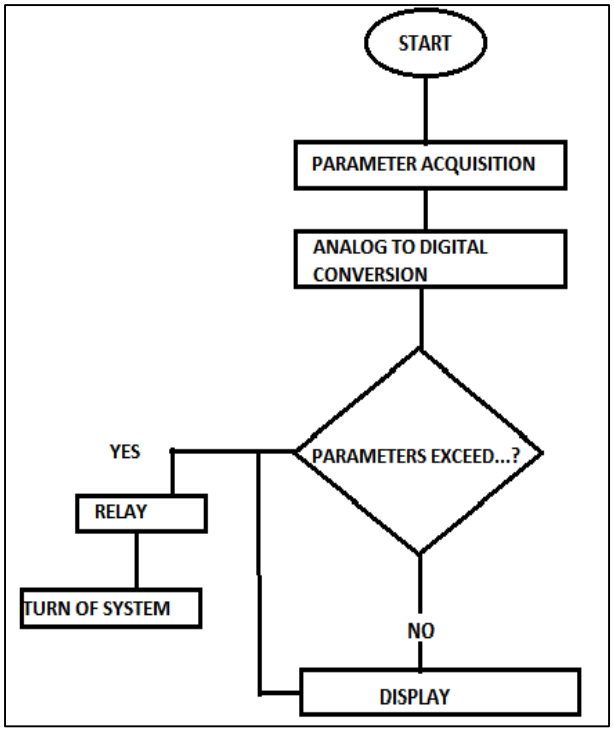
The execution of the proposed framework was inspected and from the test readings and perception, it was comprehended that the proposed framework screens and controls the transformer when there is any fault.

At last, in 2000 Vaccaro proposed a neural demonstrative framework for transformer warm over-burden insurance. The examination was directed on the grounds that the IEEE control framework transferring board of trustees was deficient with regards to error in the forecast of most extreme winding problem area temperature of a power transformer within the sight of over-burden conditions. The proposed technique depended on a spiral premise work arrange (RBFN) which considered the heap current, the best oil temperature ascend over the encompassing temperature and other meteorological parameters, that grants acknowledgment of the problem area temperature design.

A. Problem Definition:

Transformers suffer life deterioration, damaging as well as aging whenever there is fault in the transformer. Due to overload and externally applied conditions including over current and external short circuit causes rise in temperature of both transformer oil and windings. This continuous rise in the temperature weakens the insulation of the transformer and may prompt decay of life of transformer. Just a few percent increase in voltage results in a vast increment in current. These large currents can pulverize the unit if they are not decreased quickly. This rise in current, external overload and external short circuit causes rise in winding temperature of transformer. Hence, the high cost in the transformer system becomes essential concern whenever relative long outage time that occurs when a large transformer fails. Thusly, the Engineers are constantly putting down their endeavors for the assurance of the transformer from multiple points of view remembering the expense and one of such routes is by utilizing a hand-off. Along these lines, with the end goal to secure the transformer utilizing hand-off, a control framework thought is produced using microcontroller. With the aim of reducing the cost of system, Protection of transformer and accurate measurement of the parameters the project is designed to fulfill some objective of industries.

III. FLOW DIAGRAM



A. Parameters Measured:

- Current
- Voltage
- Oil level
- Humidity and Temperature
- Gas leakage
- Vibration

B. Hardware Used:

1) Microcontroller 8051
2) ADC MPC3208
3) Gas leakage sensor MQ6
4) Oil level Sensor P43
5) DHT11
6) LCD 16X2
7) PC
8) Transformer

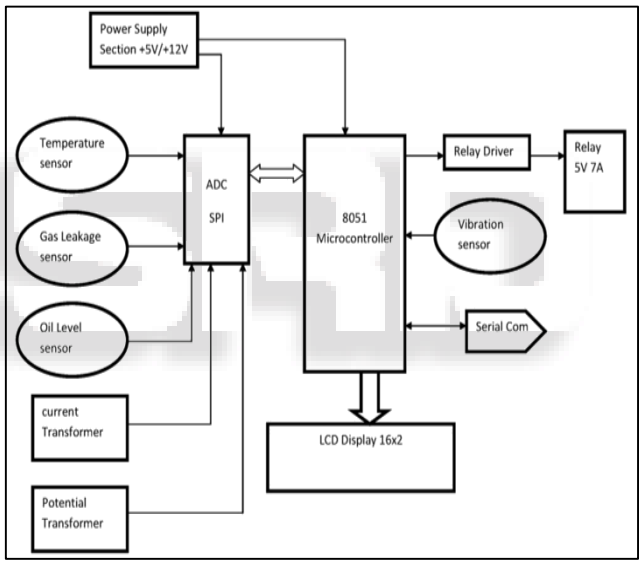
C. Project Planning:

Work Breakdown structure of the project would start with first deciding the title name for the project. There are various topics we could have done with the microcontroller which were interesting to us but we chose to do health monitoring of oil transformer. After that, we did research based on various web articles, books and literature surveys to find out how the health of the transformer can be improved and which parameters are most important to the transformer. Next step was to make note of the sensors needed to monitor the parameters and see if they are available in the market. Once that was done, we started implementing the program code and circuit design for the system. Programming the code was one of the most challenging aspects of our project as we not only had to set various thresholds for the sensors but we also had to set up the ADC and LCD as well as the relay circuit. This would have been much easier with Arduino Uno or Raspberry Pi but we were so accustomed with 8051 that with decided to go with it. The final step was designing the PCB for hardware and making sure the code runs flawlessly without any errors. After that, hardware implementation for our final working model was done. Once all was done, we were finally able to run the output and achieve our desired goals.

IV. PROPOSED SYSTEM

From literature survey our system will use microcontroller as brain for controlling, ADC for conversion of analog parameters to digital. Various sensor such as oil level, vibration, current, voltage, Gas leakage and temperature sensor for sensing the physical parameters, PC for continuous displaying the transformer health in forms of various parameters and at last it will consists of relay for controlling the transformer on click basis of laptop keyboard. Here our proposed system is capable of providing easy control of transformer which can be controlled if any key of the keyboard is pressed if the any parameters from the above mentioned parameter exceeds.

V. BLOCK DIAGRAM



VI. CONCLUSION

It can be thus concluded that using a microcontroller based health monitoring will allow us to measure different parameters easily with more efficiency and accuracy. Additionally, we will use a PC based terminal for better observations. Also, by continuously monitoring various parameters of the transformer and transformer oil, we can improve the life expectancy of the transformer by 5-10 years.

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