Smart Transformer Protection and Monitoring By Using IOT

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Abstract- *The aim of developing, transformer protection system to manage in such a way that we introduce the Internet of things and microcontroller to give not only an automatic protection scheme to the transformer but also real-time monitoring to the transformer action. There are various types of fault regularly happened on transformer such as over current, undercurrent, over-voltage, under-voltage, over-temperature, smoke formation, etc.The proposed system consist of microcontroller, IOT module, various sensors, etc. to protect the transformer from any disastrous failure. The system display, real-time information on a personal computer or any smart mobile at the operating station.[2] This system can be used for identifying problems before they occur due to this The proposed system is design to develop a system for examining the current, voltage, smoke, oil, temperature parameter of the transformer in a station or in the field. This system will be a help, the transformer to control the functioning of the transformer properly and determine the problems before any serious failure in the system.[4]*

Keywords- Microcontroller, Transformer, Controlling and Protection, monitoring, Internet of Things(IoT) module, Protective relay, Over-current, Faults, Protection kit

I. INTRODUCTION

The transformer is an important equipment in electrical power system. That's why it is mandatory to protect them from different kinds of faults happen in the power system due to some natural and unnatural fault, for reliable performance it is compulsory to protect the transformer against various faults that occurs in the system. The system is said to be faulty when an unwanted situation happened in the system. The unwanted condition may be over-voltage, over-current, smoke formation around the transformer short circuit, etc. the rating of the transformer may be different.

The main objectives of the proposed system are :-

- To determine faults in the minimum time interval.
- To examine current, voltage, temperature and oil levels in a substation.
- It connected with wireless communication through the use of the internet of things.
- The system parameter will be displayed on the screen of the operator.
- The system will have a thin film transistor display which will show the online state or condition in tabular or graphical format.
- It consist of all required main protection scheme to protect the transformer, with some backup power supply.

The Internet of Things is a system of association of computing devices, digital and mechanical machines, animals or people, objects, the place that are provided with some distinctive identification and they will be able to transfer data over a network without requiring human to human or human to PC interconnection. There was an increase in the human population, economic growth and technological development. This has continuously made the demand for electrical power to go high because as technology, human population and economy grow; there is an increase in demand for power as many more electrical loads are introduced into the supply line. The transformer is a very important device in an electrical power system as the distribution of electrical power to consumes is more efficiently effected. Every transformer is designed to comfortably supply given load cases of overload or short circuits that can lead to the transformer being damaged. To combat such occurrence, an elaborate system that monitors these excesses in supply parameters needs to be built. Such a device controls the flow of electrical power to the load so that the transformer is not overloaded. Overcurrent relays and over-voltage relays have been used for along period of time and have been electromechanically controlled. In this system, a microcontroller is used to monitor cases of electrical faults and communicate to a switch to separate the transformer from the system.

II. EXPERIMENTAL SET UP

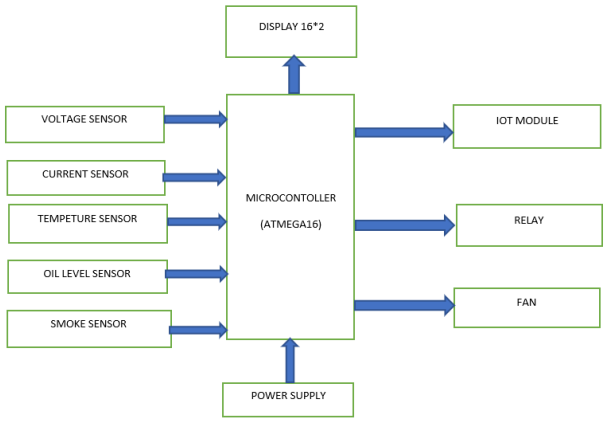

Fig. 1. Block diagram

Fig 1 shows the experimental setup for the proposed system. In this system various sensor to sense different parameters are connected to transformer. The Internet of Things module for real-time monitoring. It is also used to identify fault location and fault type so it can help to reduce recovery time and enhance efficiency.[3]

The component used in the system is as follows:-

1) Microcontroller unit
2) Voltage sensor
3) Current sensor
4) Oil level sensor
5) Temperature sensor
6) Smoke sensor
7) Fan
8) Internet of Things(IoT) Module

The proposed system experimental transformer rating is as follows: Core type, 3phase, 440/30 V, Star-delta. Testing done on transformer are winding resistance test, transformer ratio test, O.C.and S.C.test, temperature rise test, measurement of insulation resistance, dielectric test.

III. CONCLUSION

The troubles of high-cost maintenance due to distortion of transformer winding because of destructive forces happened in transformer core and winding assembly under fault situation because of short circuit excessive current could be rectified by the developed protection system the designed kit is able of providing all the existing necessary protection scheme to the transformer which contain various protection like overvoltage, overcurrent, temperature monitoring and controlling with the help of cooling system as well as it also provides over-temperature protection the main feature includes real-time monitoring is provided to the transformer by using Internet of Things and prevent the transformer from faults by using sensors. The internet of things makes the kit capable of exchanging information at desire place or remote place with very high speed, high efficiency, and reliability with nice compatibility and connectivity.

Advantages

- Efficient and low-cost design
- Low power consumption
- Real-time monitoring
- Fast response and better isolation because of IoT
- Accurate detection of a fault
- It will provide better protection and controlling compare to other
- Easy to handle, small in size

REFERENCES

[1] Switchgear protection and power system, Sunil S. Rao, 11th Edition eight Re-Print 2005, Khanna Publishers, Delhi- 110006 INDIA.
[2] REAL-TIME MONITORING AND CONTROLLING TRANSFORMER, by S. Dharanya, M. Priyanka, R. Rubini, A. Umamakeswari, Journal of Artificial Intelligence ISSN 1994-5450/DOI: 10.3923
[3] Transformer Protection And Parameters Monitoring, By Nitesh Saroha, Anil Kumar Suthar, Mores Lalbaiknunga, Prof.S.B Patil INTERNATIONAL RESEARCH JOURNAL OF MULTIDISCIPLINARY STUDIES & SPPP's, Karmayogi Engineering College, Pandharpur Organize National Conference Special issue March 2016 Volume 2, Special Issue 1, March2016 ISSN(Online): 2454-8499 Impact Factor: 1.3599(GIF), 0.679(IIFS)
[4] Simulation of Power Transformer Protection Using Microcontroller Relay, By Arpit Rana, Jeet Shah, Anuradha Deshpande, International Journal of Scientific Engineer and Technology ISSN: 2277-1581 Volume no. 4 Issue No. 6, pp: 352-355 01 June 2015
[5] IEEE Std. C37.91-2000, "IEEE Guide for Protective Relay Application to Power Transformer"
[6] Transformers, Bharat Heavy Electricals Limited Bhopal(MP), Third Re-Print 2005, Tata Mc-McGraw-Hill Publishing Company Limited, New Delhi INDIA.
[7] Theory & Performance of Electrical Machine, J.B. Gupta, S.K. Kataria& Sons Publishers of Engineering and Computers Book New Delhi-110002 INDIA.
[8] Getting Started with Arduino, https://www.arduino.cc