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MONITORING OF DISTRIBUTION TRANSFORMER AND ITS THEFT PROTECTION BY USING PLC

P.B. PATIL[1], K.T. GODAGE [2], V.S. PINGALE[3], S.S. GADE[4], S.D. PAWAR[5]

[1,2,3,4]BE Student, Electrical, SND COE & RC, Yeola, Maharashtra, India
[5]Asst. Prof., Electrical, SND COE & RC, Yeola, Maharashtra, India

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Abstract - *Main aim of studying this paper is to design and implementation of PLC (programmable logic controllers) automation to monitor as well as to diagnose condition such as load, currents, transformer temperatures and voltages of the Distribution transformers of substation which is one of the most important equipment in the power system network. The Data acquisition, condition monitoring, automatic controlling are important issues as there are large no of transformers and various components over a wide area in power system.*

In proposed system with PLC, relays and sensors are used to detect the faults of transformer such as overloading, overvoltage, under-voltage, phase to phase fault and over temperature faults. Probability of faults on distribution transformers is undoubtedly more and hence protection of transformer is highly essential.

Automation control is used for various systems for operation of equipment. Some processes are completely automated. Benefit of automation is it saves labor and saves energy and material; improve quality, accuracy and precision. Reduces dependency on human presence and decision making for any process.

Key Words: PLC automation, Distribution transformer, Relays, sensors.

1. INTRODUCTION

Automation control is used for various Control systems for operating equipment such as machinery, processes in factories, boilers and hatter at in governs ,switching in telephone networks, steering and stabilization of ships or aircraft and other applications with minimal or reduced human intervention .Some processes have been completely automated.

1.2 Literature Survey

In rural area distribution transformer is not maintain as per maintenance schedule. They repair it after fully damaged transformer and they takes more time to repair, it causes the interruption in power supply to consumer and efficiency of transformer is reduced. If we able to monitor the parameters of the transformer day by day and maintain it then efficiency of transformer can be increases. Hence in this project we are trying to monitor the various parameters continuously by using programmable logic controller (PLC).

We are measuring the voltage and current of transformer by using Potential Transformer (PT) and Current Transformer (CT) which will interface with analog input of the PLC. Wear also trying to measure the temperature of the transformer by using RTD temperature sensor which will immersed in transformer oil and this sensor connected to the RTD controller which shows the temperature of oil. Controller is connected to PLC

2. METHODOLOGY

The block diagram and circuit diagram for that project is as follow

2.1 Block-Diagram

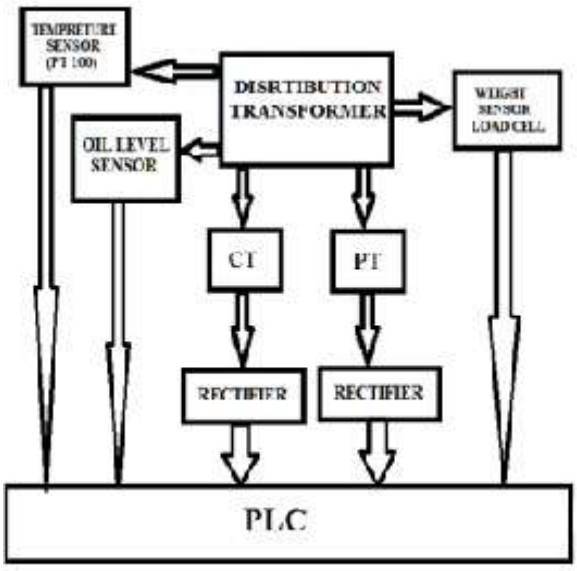

Fig.1: Block diagram of Monitoring of distribution transformer and its thefts protection by using PLC

Block diagram shows the block diagram of transformer monitoring and theft protection using PLC . In this project we can used no sensors for different purpose .we used PLC (Allen Bradley micrologix 1400) the all sensors are

connected to the PLC for the sensing all the parameters and feed their outputs to the PLC. The PLC and other system can be monitor and control from the control room. In control room the system can be installed.

Start the project by using push button ON .if the oil level is full transformer is in its actual position then and then only project is start. Then load 1 is ON by using PLC input switch .Then vary potentiometer so that the current is varies and if the current and power factor value is above the predetermined value then capacitor 1 is ON and power factor is improved. Then load 2 is ON by using PLC input switch. Then further vary the potentiometer so that current and power factor decreases, due to this capacitor 2 is ON and power factor is improved. Temperature of oil is measured by RTD and if the temperature of oil is above the set limit then cooling fan is ON. If the oil level of transformer is below the limit and transformer is stolen then project is turned off and buzzers will ON.

2.2 CIRCUIT DIAGRAM

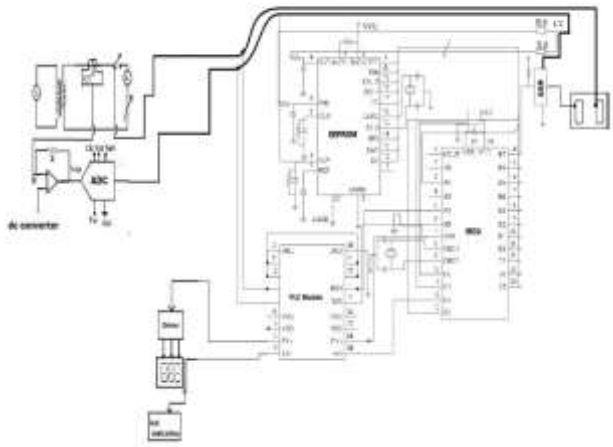

Fig. 2: Circuit diagram of monitoring of distribution transformer and its thefts protection by using PLC

2.3 Working Steps

1. Start the project by using push button ON [I: 0/1].

2. If the oil level is full, transformer is on its actual position then and then only project is start.

3. Then load 1 is ON by using PLC i/p switch.

4. Then vary the potentiometer, so that current will vary and if the current and power factor value is above the predetermined value then capacitor 1 is ON and power factor is improved.

5. Then load 2 is ON by using PLC I/p switch.

6. Then further vary the potentiometer so that current and power factor decreases, due to this capacitor 2 is ON and power factor is improved.

7. Temperature of oil is measured by RTD and if the temperature of oil is above these limit, then cooling fan is ON.

8. If the oil level of transformer is below the limit and if transformer is stolen, then project is turned off and buzzer will ON.

3. CONCLUSIONNS

In this project, we have presented a design of a system based on PLC that is used to monitor and control the voltage, current, temperature, oil level, power factor and thefting of a distribution transformer. The proposed PLC system, which has been designed to monitor the transformer's essential parameters continuously, monitors the parameters throughout its operation. When the PLC recognizes any increase or decrease in the

Level of voltage, current or temperature values, the unit has been made shutdown in order to prevent it from further damages with the help of relays in three phase system. The system not only controls the

Distribution transformer in the substation by shutting it down, but also displays the values throughout the process for user's reference in PLC system. Hence the distribution system is made more secure, reliable and highly efficient by means of the proposed system. And if maintenance work is done with planning at least 5000 units (0.3%) can be saved.

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BIOGRAPHIES

Pradipkumar B. Patil, Department of Electrical Engineering, SND COE & RC, Yeola, Pune University.

Kiran T. Godage, Department of Electrical Engineering, SND COE & RC, Yeola, Pune University

Vishal S. Pingale, Department of Electrical Engineering, SND COE & RC, Yeola, Pune University.

Sandesh S. Gadhe, Department of Electrical Engineering. SND COE & RC, Yeola, Pune University

Sonali D. Pawar Department of Electrical Engineering. SND COE & RC, Yeola, Pune University