AUTOMATION OF TRANSFORMER SWTICHING USING PROGRAMMABLE LOGIC CONTROLLER

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ABSTRACT: *This paper is based on automation of transformer line switching using PLC (Programmable Logic Controller). The switching is important for industrial purpose to switching the transformer line without interrupt the supply. Thus, overage outage time is reduce to the time required located the fault and do necessary switching the service. In this paper switching with the help of automation using PLC and switching is perform automatically with the help of software.*

KEYWORDS: *PLC, relays, power grid system, fault isolation, switching transformer*

I. INTRODUCTION

Automatic switching has been a very rapidly growing area of electronics with a good potential for future development. The switching is refers to the conversion of AC main power to DC output voltage. The voltage thus generated last for the longer durations and therefor are sever and more dangerous to the system. The switching over voltage depends on the normal voltage of the system and hence increases with increased system voltage.

The switching is necessary because of the replacing the manual switches with help of automated PLC type power flow can be altered much faster and cheaper. The greater benefits of the automated approach is that the need for new substation and all of its associated cost are eliminated until future load are much longer. The switching is very useful to the detect and overcome the fault of the over voltages and transmission on the line. The transformer switching transient and its severity depend on the difference between the supply and the line voltages at the instant energization. Thus, using the automation of PLC to reduce switching overvoltage. Line switching using PLC it is very reliable and due to the use of automation it much easier to access the system and maintain it.

II. METHODALOGY

The design and implementation is done with the help of automation using PLC. Thus, the switching of transformer perform this conversion efficiently providing effective power from the mains to the end load. When the power is turned it ON the AC main power get filtered through a capacitor which converted AC voltage to unregulated DC voltage.

Module is design for switching of transformer when there is a fault in working transformer. In the hardware the components are installed accordingly. The PLC is connected between both the transformer. Former transformer is in working condition and while lateral one is standby mode of transformer. The PLC automation software is done such that when the over voltages occur in the working transformer and the complete load is automatically shifted to the standby transformer and it continuously supply power to the feeder. At the time over voltage the fault is detect immediately and inform the information about the same, until the fault get neutralize and the load is shifted again the first transformer.

Transformer is transitioning from the device is transitioning from the blocking state to the conducting state and vice-versa. This interval is characterized by a significant voltage across its terminals. If input voltages found greater than the refrence voltage then output voltage of the comparator is high and if the input voltage lower than the refrence voltage output is low. The switching of the transformer work automatically with help of software and the unnecessary loads which are connected in transformer are automatically off.

The switching is use to connect the two nodes that are not is direct proximity to each other. This is the ability to quickly and accurately distribute the power supply to the end user with the help of switching.

III. AUTOMATION OF PLC

This is the block diagram of PLC based switching control for industrial automation in repetitive nature of work. The block diagram of PLC based switching control for industrial automation for repetitive nature of work is as below. There are three modes of operation set mode, Auto mode and Manual mode. When switch one is pressed set mode is operated and according to predefined time in the PLC program relay turn ON sequentially. When switch two is pressed Auto mode is operated and according to default time saved in the PLC relay will operated. When switch three is pressed Manual mode is operated and relay will operate according to user's choice. PLC plays an very important role in this project because all programming is placed in PLC.

For a manufacturing industry, there continuously the machines are working to manufacture the product. If the power supply is interrupted due to the fault in transformer or due to various reasons. We have designed PLC ladder logic to switch this faulty transformer to the working transformer. The PLC which is used is Allen Bradley MicroLogix 1100 series B programmable logic controller.

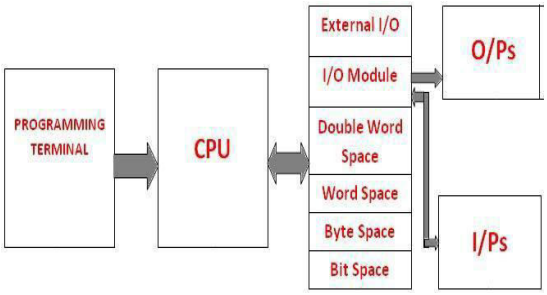

Fig.1. Basic Block Diagram of PLC

PLC's designed for multiple analogue and digital I/O and O/P arrangements, extended temperature ranges causes to electrical noise and resistance to vibration and impact. The functionality of PLC elaborate over the years to include sequential relay control, motion control, process control, distributed control system and networking. The main dissimilarity from other computer is that PLC's are used for severe condition's [such as dust, moisture, heat, cold] and have a facility for extensive I/O arrangements.

PLC programming is based on the logic demands of input devices and the programs implemented are predominantly logical rather than numerical computational algorithms. Thus, PLCs offer a flexible programmable alternative to electrical circuit relay-based control systems built using analog devices. The programming method used is the ladder diagram method. The PLC system provides a design environment in the form of software tools running on a host computer terminal which allows ladder diagrams to be developed, verified, tested, and diagnosed. First, the high-level program is written in ladder diagrams. Then, the ladder diagram is converted into binary instruction codes so that they can be stored in random-access memory (RAM) or erasable programmable read-only memory (EPROM). Each successive instruction is decoded and executed by the CPU. The function of the CPU is to control the operation of memory and I/O devices and to process data according to the program. Each input and output connection point on a PLC has an address used to identify the I/Obit.

IV. NECESSITY OF SWITCHING

- Switching probably is the most overlooked and undervalued part of system design.
- Automation is a necessity in industries because it not only seeks improve the quality of life for humans at both home and work, it allows the distribution of both quality products and services to be made available at faster rates, and reduces down time and human error.
- Transformer switching is the most commonly performed operation in any power delivery system and most of the times this operation can be performed without any undesirable consequences.
- Thus, given the right combination of system parameters, switching can result in a violent interaction between the circuit breaker and the transformer.

V. LADDER LOGIC AND IMPLEMENTATION

The design and implementation is done with help of PLC module The switching waveform oftransformer behaviour has been obtain with the help of digital storage oscilloscope, shown in fig.2

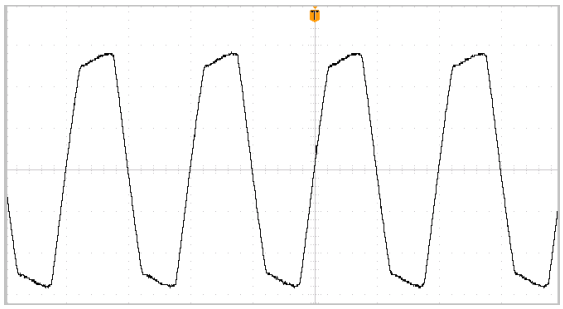

Fig.6. Output waveform during switching

In the above fig.2, the X-axis and Y-axis are denoted by time and voltage respectively. In fig.2, the waveform shown is during switching. This denotes the voltage rise to 2-3 times more i.e. 3V and drops to normal voltage after transformer 1 is switched to standby transformer.

VI. CONCLUSION

This system is totally based on the switching of the transformer using PLC that is use to control and monitor the switching industrial load is done by using RS logic software. The overall system is not only design for switching but also unnecessary load is shut down because of this system industries and other large consumer working on high voltage will gate more reliable and highly efficient and continuous supply.

REFERANCES:

[1] S.A.Oyetunji,"Usingsubstation automation system for faults management and analysis in electric power distribution system", International journal of engineering and technology, vol. 3 No. 9, September2013.

[2] M. M. Ahmed, "Automated fault isolation system on low voltage distribution automation system'', IEEE, UTEM, Malaysia,2008. A. M. Epemu and K. O. Enalume, "An efficient phase fault monitoring system for distribution transformer", IJAREM, volume 3, Issue 5, 2017.

[3] Santosh B. Belekar, "PLC SCADA based distribution monitoring and control'', Multidisciplinary journal of research in EngineeringandTechnologyvolume1,issue1, Pune, India, April 2014.

[4] Dr. S. P. Shukla, SatyakumarBehera and Ravi Masand, "A review of transformer protectionbyusingPLCsystem'',International journal of digital application and contemporary research, volume 3, issue 2, September2014.

[5] Musse Ahmed, "Novel Automated fault isolation system on low voltage distribution Automation system", IEEE, IIUM, Malaysia.

[6] T. Vignesh, J. Kirubakaran, "automation of power transmission control station using PLC &SCADA",Internationaljournalofinnovative science, engineering & technology, vol. 2 issue 2, Feb. 2015.