A Review on Prototype design of Distribution Automation for 11kV/0.415kV Substation

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Abstract –The electric power distribution network it is an essential section of the electric power system. It supplies electrical power to the customer. Automating the distribution network allows for better efficiency, reliability, and level of work through the installation of distribution control systems. In this paper we design real time visualization, monitoring and controlling of electrical distribution system using MATLAB. All the equipment must be visible, all the parameters must be measured and if any fault or abnormal condition occurs in distributed feeders then it should be categorize from healthy part of power system. It increases reliability of power system. Presently, research and development efforts are focused in the area of communication technologies. An electric energy is an essential ingredient for the industrial and all around development of any country

Index terms –Distribution Substation, Circuit breaker, Relay, MATLAB.

1. INTRODUCTION

The distribution of electric power and its protection is a dare for engineers, due to the complex environment of the networks. The major role of protection is to safeguard the whole system to maintain continuity of source by identifying faults and to reduce destruction to equipment. A good protection system must ensure system reliability through the operation of the protection system for all types of faults in all locations in the network. The system must be steady and secured. In a power distribution network, fault can occur due to overloading, overvoltage, power swings, etc. When a fault occurs, protection equipment initiates operation of circuit breakers, to reenergizes the faulted part. Generally, circuit breakers work for one of the primary devices in the network protection scheme against faults. This protective action must be done before excessive currents and voltages cause damage to connected equipment, such as transformers. Fault detection and location and classification have been a goal of power system engineers since the creation of distribution and transmission systems. Quick fault detection can help to protect equipment by allowing the disconnection of faulted lines before any significant damage is done. Fault location in electric power distribution systems still presents many challenges due to its varied topological and operational characteristics. The traditional methods used for tracing faults in a distribution network consist of visual inspection by power line circuit. In relation to underground cable system, fault is also located by a special cable test van. However, these traditional fault location methods are unable to locate faults quickly. The increasing necessity on electricity calls for high demand of reliability in power supply. Nowadays, utilities companies are now under obligation, demanded by regulatory bodies to system performance benchmarks. This demand among others is driving the need for making the power distribution system intelligent and smart A circuit breaker is one of the critical components of the power system that automatically detect faults and protect the power system by isolating the faulty point of the circuit. Circuit breakers provided have inherent fault detection and isolation capabilities. These protection interventions are not adequate due to protection integrity on the distribution transformer at distribution substation which is damaged by undifferentiating use of copper links to replace blown High Rapturing Capacity (HRC) fuses and high ground resistance and on the transmission line; the power system uses voltage and current signals to learn the hidden relationship existing in the input patterns. It was observed that the radial basis function neural ability to identify the precise fault direction and more rapidly. This makes it suitable for the real-time purpose. In this, a data collecting device would be suitable for fault detection and isolation. Fault detection indicates the occurrence of a fault in a monitored system; fault isolation establishes the type and/or location of the fault identification determines the magnitude of the fault. After a fault has been detected and diagnosed, in some applications it is required that the fault be self-corrected, usually through controller reconfiguration.

2. LITRATURE SURVEY

Xuesong Zhou, Pengda Xiang, et. al.[1] has describe as With the rapid development of distribution grid, the construction of distribution automation system has become an inevitable trend in the development of electric power industry. It reflects the application of intelligent power distribution and management in power distribution. The fundamental objective of applying the distribution automation system is to improve the reliability

of power supply and improve the power quality. The development of distribution automation system depends on the progress of many technologies, such as computer technology, communication technology and so on, so the innovation of different kinds of science and technologies will play an important role in the development of distribution automation system.

Mohammad Jawad Ghorbani, Ali Feliachi,[3] has described the main distributed approach for FLI while using higher level agents with learning capabilities for service restorations. In this framework, agents communicate fewer messages and use their learning knowledge for decision making which can reduce the computational burden significantly and improve both cost and speed of distribution automation. The design was illustrated through a few case studies and the validity and effectiveness of the proposed design have been demonstrated by applying it to a practical distribution network (WVSC).

Sushma Am, Usha P,et.al. [5] Described a design of a system based on PLC that is used to monitor and control the voltage, current and temperature and oil level of a distribution transformer in both sides. 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, oil level 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 SCADA system. This claims that the proposed design of the PLC system makes the distribution transformer more robust against some key power quality issues which make the voltage, current or temperature to peak. Hence the distribution is made more secure, reliable and highly efficient by means of the proposed system.

Daniel Ogheneovo Johnson,[9] presented "Reliability Evaluation of 11/0.415kv Substations A Case Study of Substations in Ede Town" has described A standard way of reporting fault and outages at the consumers end should be devised rather than the method of individual customer coming to utility office to complain. This method will never give accurate time the fault or the outage occurs. The electric service provider should employ modern and better technology (intelligent monitoring device) to achieve this . Equipment and materials needed for maintenance should readily be available. Electric poles, fuse, jumper wires, distribution cables, cross-arm and others materials should be available in store. It is good for at least two or three spare transformers to be available at every business district. A situation where the community has to provide these when needed prolong down time which affect reliability Immediate response by technical staff to clear fault is highly recommended as this will significantly reduce down time. It is also important to adequately remunerate electricity staff, particularly those in technical department of repairs and maintenance. Their condition of service should be improved. Good compensation in case of any hazard should be ensured.

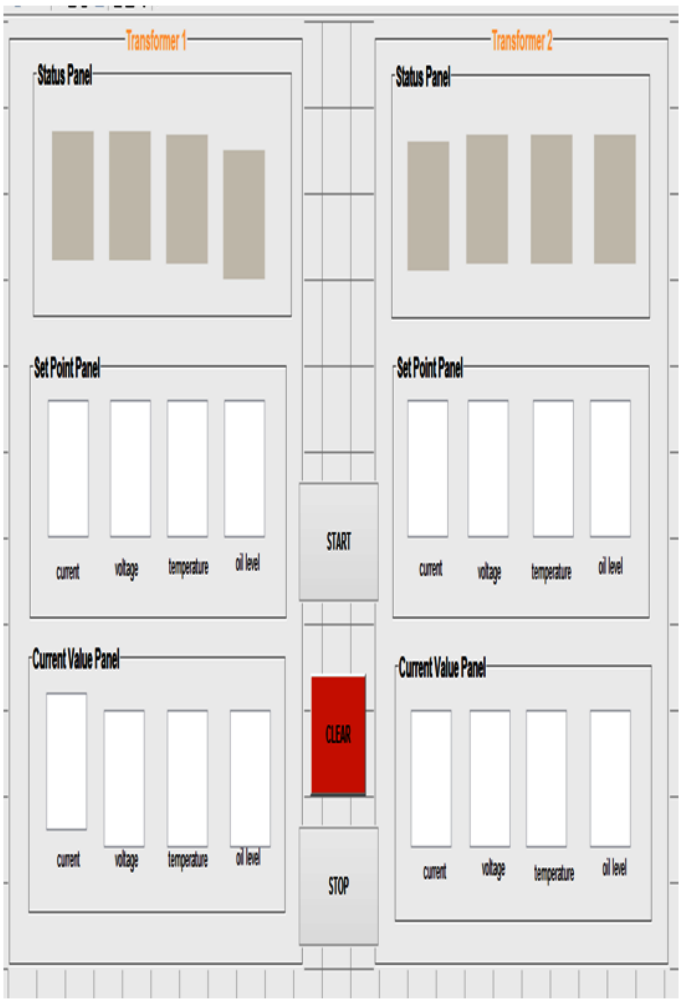
Neha Gaur, Priyanka Gaur,[14] has described power utilities have realized the need for full scale distribution automation to achieve on-line system information and remote control system. This is required in order to fully accomplish the restricting (GENCOs, TRANSCOs, DISCOs, and ESCOs) of the power system to the level of retail wheeling . On the other hand, the main motivation for accepting the distribution automation in developing countries such as India is to improve operating efficiency of distribution system. This indicates worldwide interest for distribution automation at present. Looking at the interest of power utilities for distribution automation, academic institutions are now taking interest to introduce courses and R& D activities in the field of DA in the regular academic curriculum. A list ofpossible research areas and activities for future is also proposed for power distribution automation.

Jürgen Heckel, [19] has presented Currently distribution networks are subject to changes, which result in a shift from a rather static approach to a dynamic operation mode. In particular the increasing occurrence of decentralized generation (DER) is influencing this trend. Ever-growing cost pressure adds to the requirements on operation and maintenance. Due to this shift of paradigm new requirements are arising on automation, monitoring and control of distribution substations and ring main units (RMUs). These requirements are most suitably supported by consistent and flexible system solutions, which are scalable for the different applications. Consistent use of standards, e.g. in communication (IEC), ensure seamless and interoperable systems.

3. PROPOSED METHODOLOGY

The proposed system will incorporate all the features which is the requirement of DA system, on the other hand a graphical user interface needs to be developed at the substation side to monitor, control and supervise the system. If a DA system is to be built then MALTAB GUI would inadverantly be an important part of the system around with all the components and their specifications would be decided. Proposed Work are given in the GUI created in Matlab, it consists of two main panels , one is the set point panel and other is the current value panel . As soon as the value in current value panel exceeds the values in the set point panel, a warning message is displayed to the operator by means of the status blocks changing its color, for the purpose of simulation the current value panel has been given pseudo random numbers which are generated as per the system clock from Matlab itself, in actual

practice it is very convenient to build a hardware that can send the actual status of voltages and current at the distribution transformer.



4. CONCLUSION

In this paper, a comprehensive approach toward distribution automation has been taken. Several methods were studied on the basis of cost and performance. In addition to that a new system based on MATLAB has also been discussed. The proposed system is under development and GUI (graphical user interface) for the same has to be developed. Also all the technological solutions have been discussed keeping in view Indian scenario . Moreover the system proposed could be extended to incorporate many other important parameters of a distribution transformer such as oil temperature, the amount of level of oil in transformer etc.

REFERENCES

[1] Xuesong Zhou, Pengda Xiang, Youjie Ma, Zhiqiang Gao, Yanjuan Wu, Jinliang Yin, Xiaoning Xu, "An Overview on Distribution Automation System" Key Research Laboratory for Control Theory & Applications in Complicated Systems, 978-1-4673-9714-8/16/$31.00© 2016 IEEE .

[2] Maunel Chiumarlo,Sasa Z.Djokic ,Roberto Langella, "Supply Interuptions and Voltage dips in Smart Distribution System with Feedre Automation and Reconfigaration", 978-1-5090-1970-0/16/$31.00© 2016 IEEE

[3] Mohammad Jawad Ghorbani, Ali Feliachi, "A Multiagent Design for Power Distribution Systems Automation", IEEE TRANSACTIONS ON SMART GRID, VOL. 7, NO. 1, JANUARY 2016

[4] Neethu NM, Anil Das, Sarath S, Nithin Premsy, Anagha VJ, "Smart transformer using PLC and SCADA", International Journal of Multidisciplinary Research and Development, Volume 3; Issue 6; June 2016; Page No. 149-155.

[5] Sushma Am, Usha P, Prapulla R, Vinay Kumar M K, Sharath D N, " Monitoring and Controlling of Distribution Transformer using PLC", International Journal of Emerging Research in Management &Technology ISSN: 2278-9359 (Volume-5, Issue-5)May 2016.

[6] Ruchita R. Katkamwar, Shweta K. Nyahare2"A REVIEW ON DIFFERENT TYPES OF PROTECTION OF TRANSFORMER USING PLC" International Journal of Research In Science & Engineering,Volume: 1 Issue: 2, 2016.

[7] Kowshik Sen Gupta, "Transformer Fault Detection and Protection System" Innovative Systems Design and Engineering ,Vol.6, No.7, 2015

[8] Ravi Prakash Saini, Vijay Kumar, J. Sandeep Soni, "Real-time Visualization, Monitoring and Controlling of Electrical Distribution System using MATLAB", International Journal of Advanced Research in Electrical, Electronics and Instrumentation Engineering, Vol. 4, Issue 6, June 2015

[9] Daniel Ogheneovo Johnson, "Reliability Evaluation of 11/0.415kv Substations A Case Study of Substations in Ede Town", International Journal of Engineering Research & Technology (IJERT),Vol. 4 Issue 09, September-2015.

[10] Rachi Yadav, Nisheet Soni, "VNT Based Distribution Automation System", IOSR Journal of Electrical and Electronics Engineering (IOSR-JEEE),Volume 9, Issue 1 Ver. I (Jan. 2014).

[11] B.A. Anand, Dr. Y.R. Manjunatha, "Distribution Automation System: India's Prospects" International Journal of Advanced Research in Electrical, Electronics and Instrumentation Engineering, Vol. 3, Issue 7, July 2014

[12] A.Merlin Sharmila 1, S.Savitha Raj, A Smart Distribution Automation using Supervisory Control and Data Acquisition with Advanced Metering Infrastructure and GPRS Technology" International Journal of Engineering Research and General Science Volume 2, Issue 5, August-September, 2014.

[13] Zhou Jun*, Cao Ke-Zheng and Zheng Hong-Xia "The Study of Fault Location Method Based on FTU Feeder Automation Technology", The Open Electrical & Electronic Engineering Journal, 2013.

[14] Neha Gaur, Priyanka Gaur, "AUTOMATION IN POWER DISTRIBUTION SYSTEM: PRESENT STATUS",Journal of Engineering Research and Studies, JERS/Vol. III/ Issue II/April-June, 2012.