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Recent Trends of Power System Protection by MATLAB and Data Management

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ABSTRACT- Power flow is the very important issue to ensure an efficient yet affordable system. To maintain low failure, there are appropriate safety settings, because the breakdown of power or blackout analysis of defects, which can be calculated to select suitable fuse, circuit breaker size and type of relay.

To study and detect these defects it is necessary to ensure that the reliability and stability of the system of electricity does not suffer due to a significant event such as a mistake resulting from a mistake. This project will analyze an electrical power system under the faulty conditions.
The latest trend in security of power system is a shift towards Numerical Protection Techniques, thanks to the development using a single-chip digital signal processor with high crunching capacity, which has made it possible to design digital filters in real-time. In the conservation area, numerical techniques have got the first application for line protection, and other complementary functions such as fault locator, disturbance recorder and auto-recording. Numerical generators, transformers and bus protection have also been developed.

KEYWORDS: MATLAB, Protection, Data Management, Relay, Simulator etc.

I. INTRODUCTION

Various types of protection are set up to protect the devices in an electric power system. Their work is to disconnect failed or overloaded equipment or parts of the system to avoid unconditional losses on equipment and personnel. Its aim is to limit the effects of failures on those parts of the system which have not failed. Special types of protection are "system protection". They have to stop the collapse of their work system or parts of the system.
Intensive development of security based on modern technology is going on both software and hard ware. The application of micro controller on the hardware is used for very long time to use different functions and with modern developments, it's a very complicated tasks can be implemented reliably. Significant methods like signal processing, state estimation and "artificial intelligence" are being integrated into security. In common tasks, which were previously handled with different relays, are being integrated with other functional units for faster control and supervision.
The safety streams and voltage measurements of the power system should be determined by whether the power system is working correctly. Three elements are important for protective relay to be effective: measurement, data processing and control.
The safety streams and or voltage measurements of the power system should be determined by whether the power system is working correctly. Three elements are important for protective relay to be effective: measurement, data processing and control.
To prevent such an event, a power system fault analysis was introduced. Under the different types of short circuits, the process of evaluating the voltage and currents of the system is called fault analysis which can determine the necessary safety measures and the necessary security system. It is necessary to guarantee the safety of the public.

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II. LITERITURE REVIEW

Bruce G. Bailey [1] says the power monitoring system described uses microprocessor technology to provide protection, real-time status displays, event logging and power management and control for industrial AC power distribution and generation systems.

Mesut Baran and Jinsang Kim [2] developed a method for screening the Power Quality event records and estimating the protection system responded to disturbances.

Meanwhile Dr. Z Schreiner, A.J. Middleton and J. Bizjak [3] has adopted a new intelligent mobile approach for secondary systems maintenance, enabling Advanced Data Management together with access to rapid, automatic and reliable testing procedures.

Mladen Kezunovic [4] from Texas A&M University, said one issue that did not get adequate attention regarding control and protection of power systems in the past is the data integration and information exchange.

Zhang Hai Yang and Li Shan De [5] discover the key idea to make certain changes to the protection system is respond due to the load changes, such as power failures caused by switching operations or changes in the power system.

Takaya Shono, Katsuhiko Sekiguchi, Tatsuji Tanaka, Member and Shigeki Katayama [6] developed a system which can reduce the total cost of maintenance and management of protection and control equipment.

Jianxin Tang [7] studies the optimal power flow (OPF) in a power grid using the PowerWorld Simulator for an undergraduate power system course.

Fangxing LI and Rui Bo [8] present two small test systems for power system economic studies. The first system is based on the original PJM 5-bus system, which contains data related to real power only because it demonstrates results based on the linearized DC optimal power flow (OPF) model. Fangxing LI and Rui Bo suggests some modification to the original data, as well as new parameters related to reactive power such AC-model-based simulation is possible.

III. METHODOLOGY

Power world Simulator Network Case

Power World is a modern power system visualization, simulation and analysis tool. This case study contains information such as bus data, generator data and branch data which this information is useful to complete power flow diagram of power system. There is a certain information need to fill up without information given in the study case such as transformer rating that connects to every bus.

Power Flow Analysis and Voltage Control using Simulator

In the Power Flow Analysis, the formulation of the power flow problem is using the Newton's method for solving the power flow. In the Power World Simulator, the simulator actually uses three nested loops to solve the power flow.

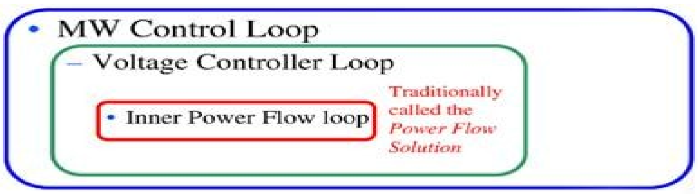

Figure 3.1 Simulator Solution Methodology

IV. MODELLING AND SIMULATION RESULTS

Model discription

The Multifunctional relay model, which is developed using MATLAB simulink, is tested under different fault condition at generator end. A three-phase system shown below consists of 15 kV, 50 Hz transmitting power from a synchronous generator with 250 MVA rating inter-connected to an 2500 equivalent source (substation) through a 200 km transmission line. The transmission line is split in two 100 km lines connected between buses of single generator and equivalent source.

Fault detection technique

We have developed fault detection technology in which the model will calculate the voltage and current RMS value and then compare these values with preset values to detect the defect.

Over voltage relay: - If the rms value of voltage after fault exceeds 260 volt the over voltage relay will issue a trip signal

MODELLING AND SIMULATION

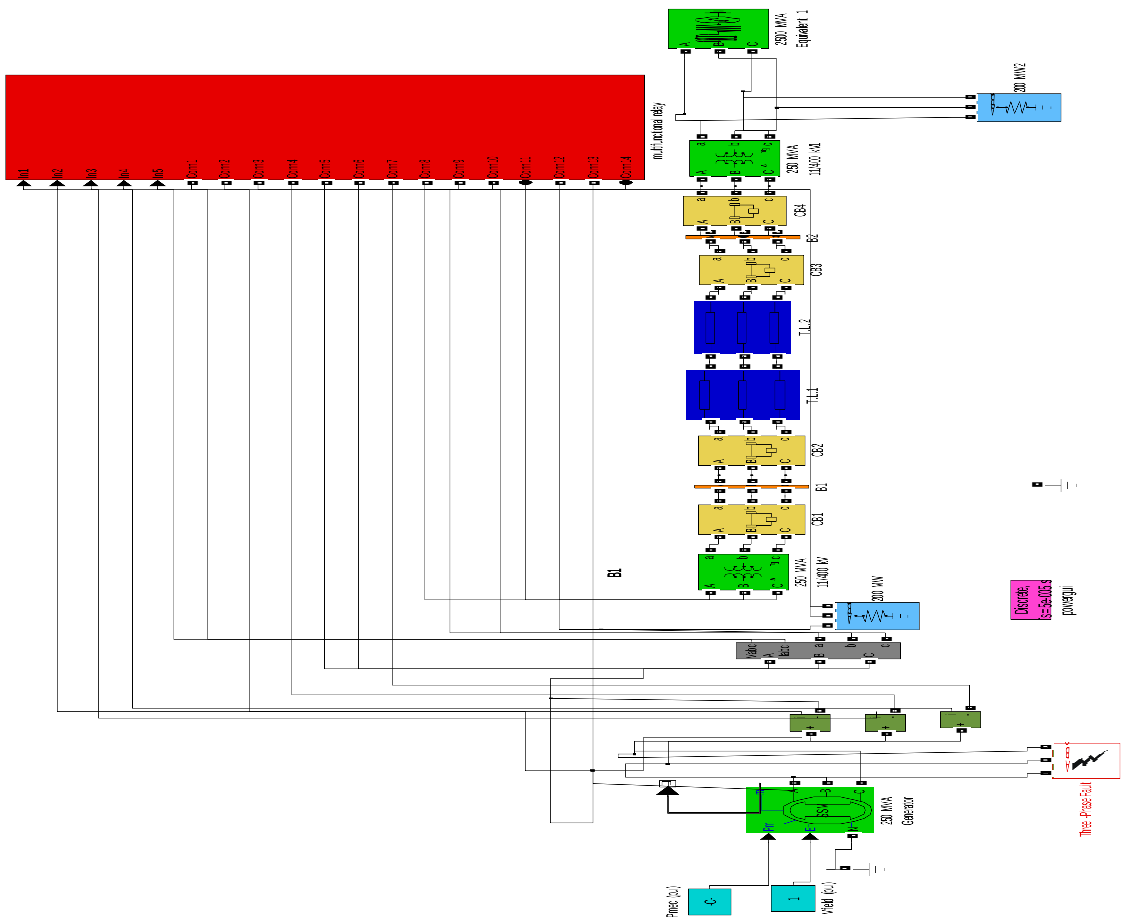

Figure 4.1 – Model of used system

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Modeling of undervoltage relay

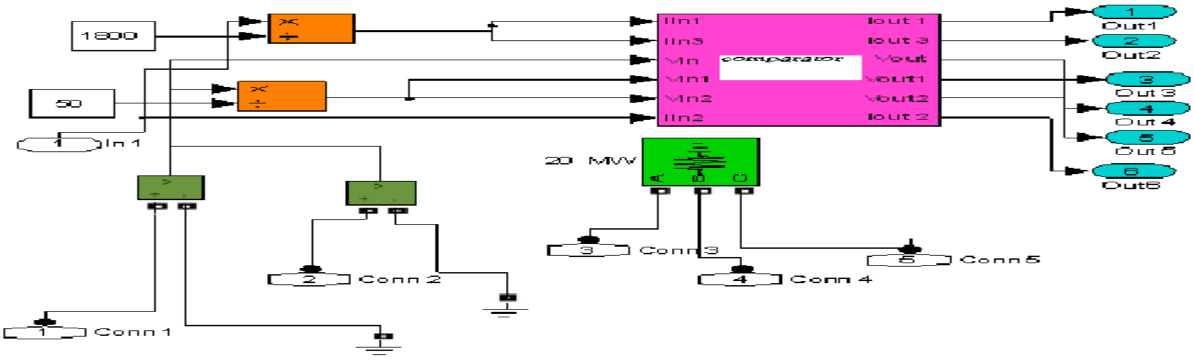

Figure 4.2 – Model of under voltage relay

Figure 4.2 is showing the modeling of under voltage relay. In this model a comparator is used to compare the rms values of the signal with the standard values.

Modeling of overvoltage relay

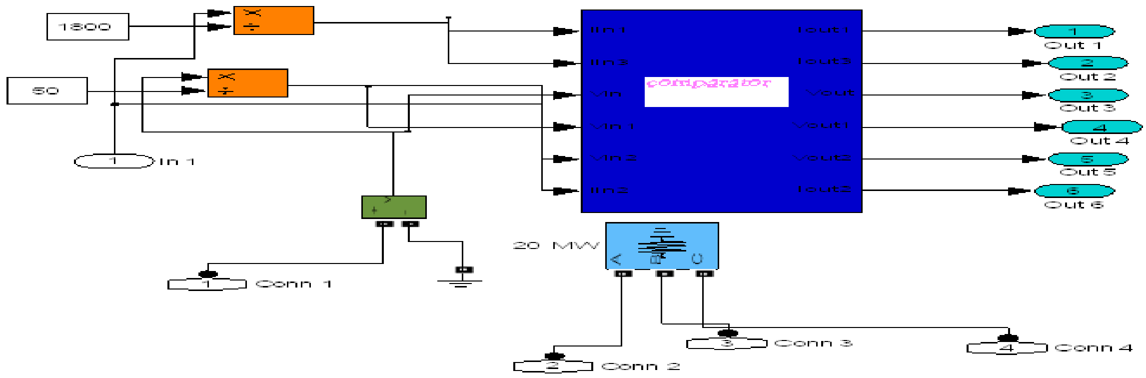

Figure 4.3 – Model of over voltage relay

Figure 4.3 is showing the modeling of over voltage relay. In this model a comparator is used to compare the rms values of the signal with the standard values.

Modeling of over current relay

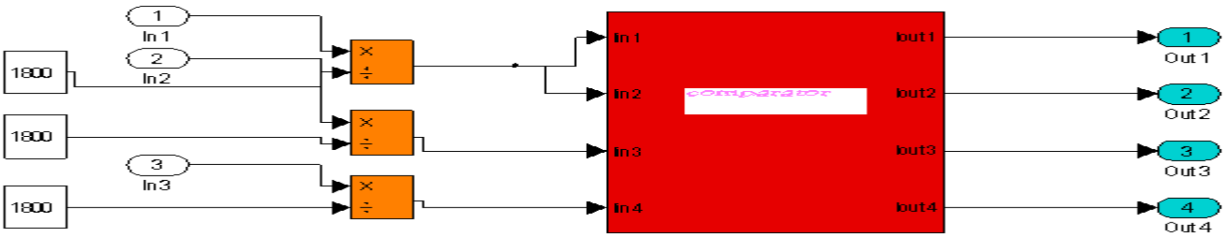

Figure 4.4 – Model of over current relay

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Figure 4.4 is showing the modeling of over current relay. In this model a comparator is used to compare the rms values of the signal with the standard values.

Simulation and Results:-

We have simulated the discussed model under phase faults, abnormal conditions (under voltage and over voltage) and Negative sequence current conditions and found successful results of used relays. The results are as follows.

When fault occurs in only one phase (phase A):-

We have introduced a fault on phase A and in this condition the performance of used relays are as follows.

(a) Under voltage relay:-

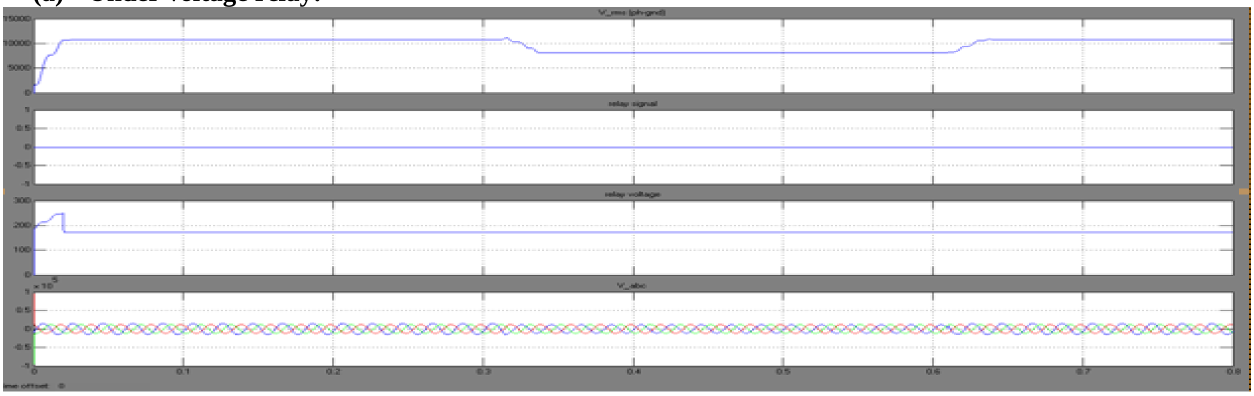

Figure 4.5 – Waveforms of under voltage of power system

(b) Over voltage relay:-

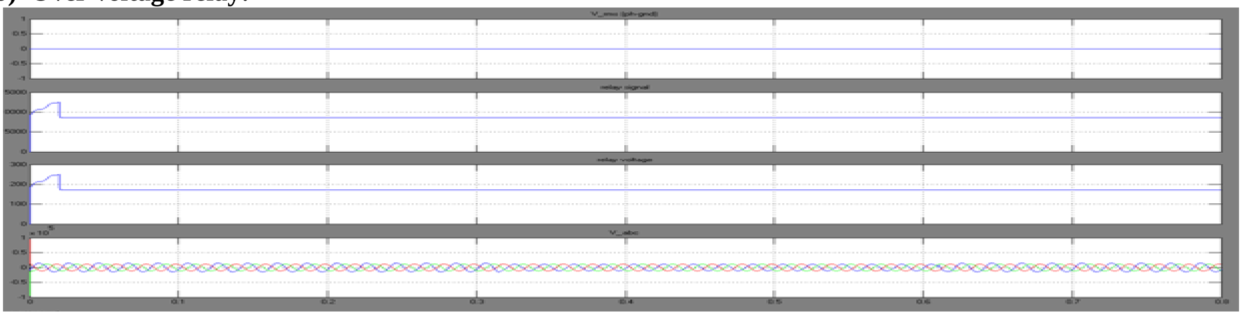

Figure 4.6 – Waveforms of over voltage of power system

(c) Over current relay:-

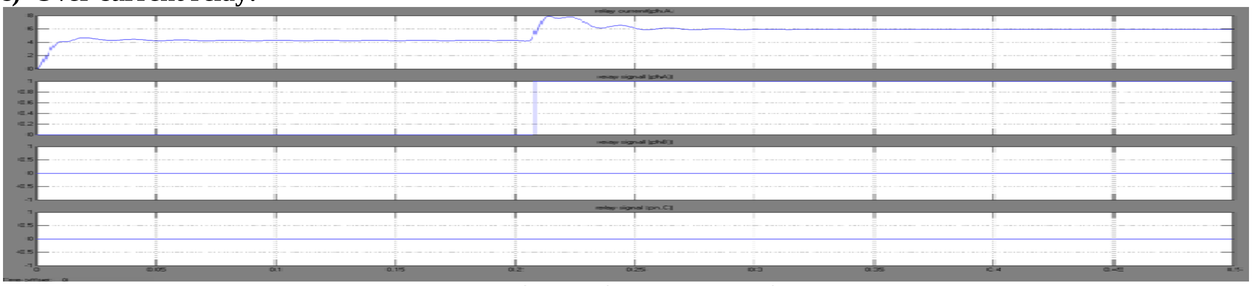

Figure 4.7 – Waveforms of over current of power system

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(d) Negative sequence current relay:-

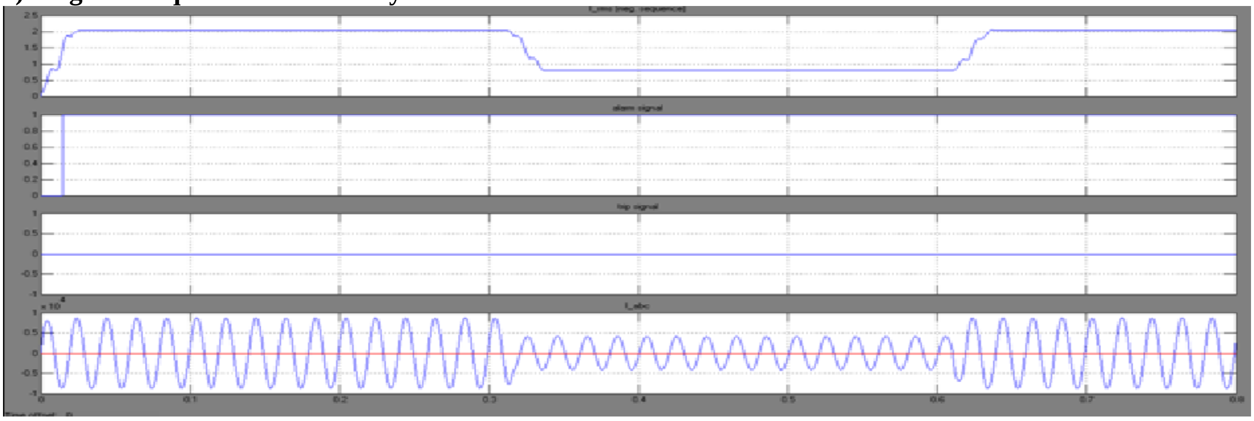

Figure 4.8 – Waveforms of Negative sequence current of power system

When fault occurs in two phases (phase B and phase C):-

We have introduced a fault on phase B and phase C and in this condition the performance of used relays are as follows.

(a) Under voltage relay:-

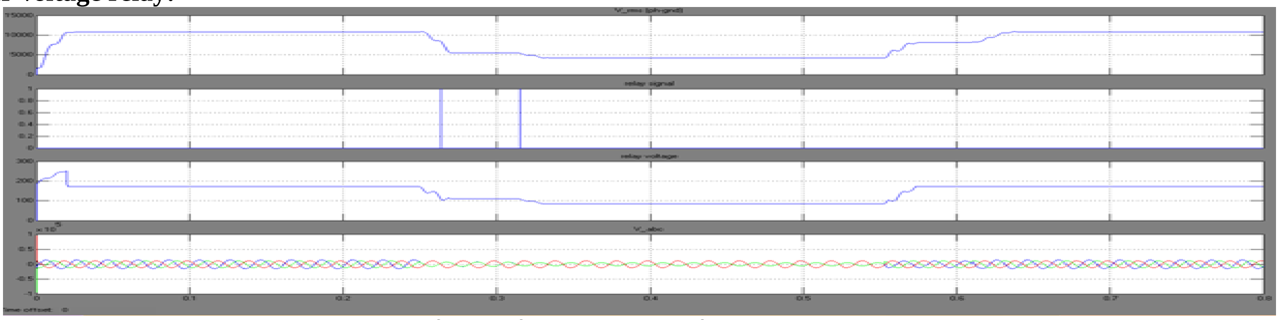

Figure 4.9 – Waveforms of under voltage of power system

(b) Over voltage relay:-

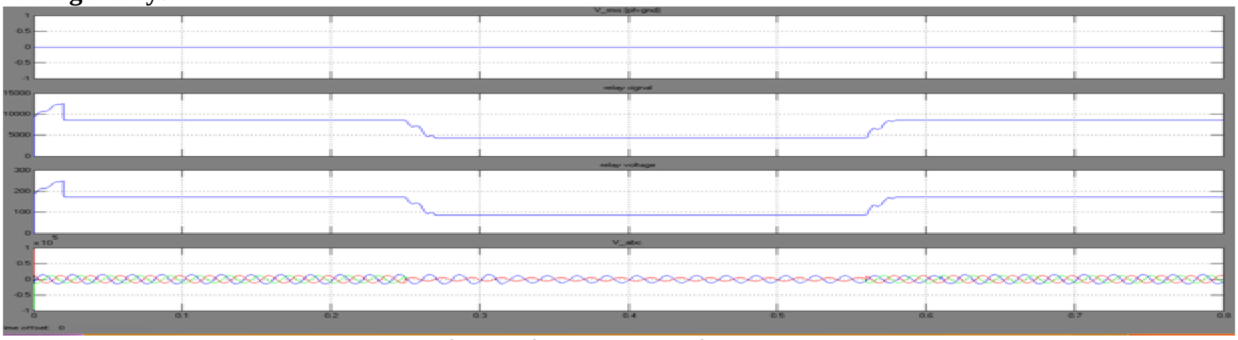

Figure 4.10 – Waveforms of over voltage of power system

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(b) Over current relay:-

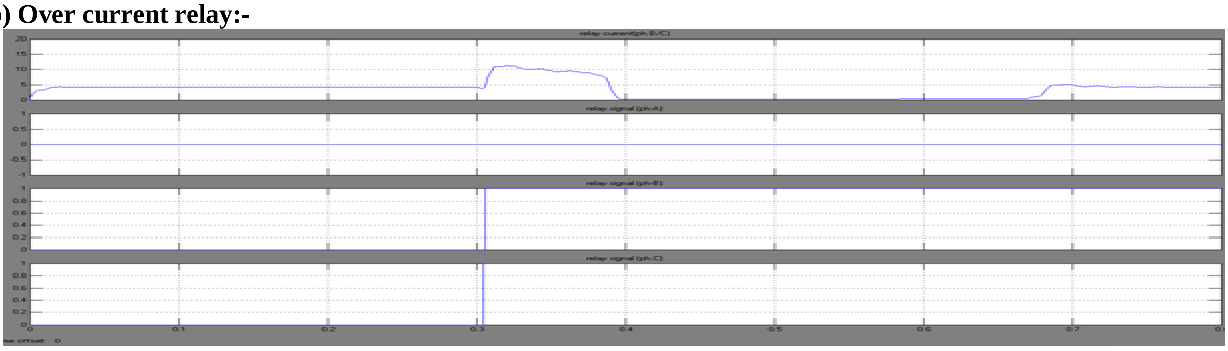

Figure 4.11 – Waveforms of over current of power system

(d) Negative sequence current relay:-

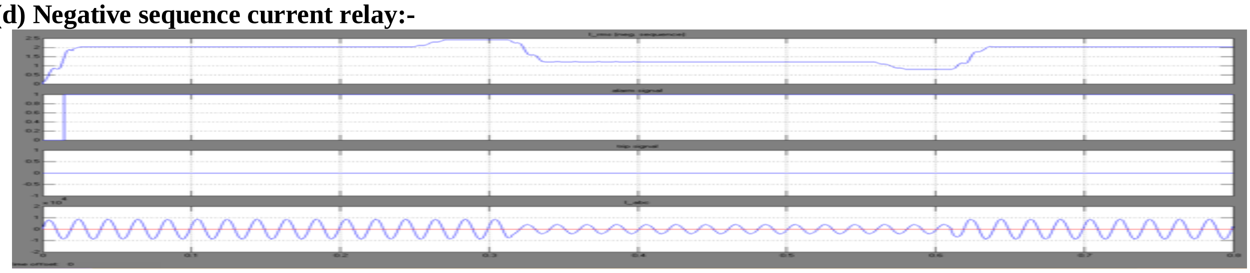

Figure 4.12 – Waveforms of negative sequence current of power system

4.6.4 When fault occurs in all phases (phase A, phase B and phase C):-

We have introduced a fault on phase A phase, B and phase C in this condition the performance of used relays are as follows.

(a) Under voltage relay:-

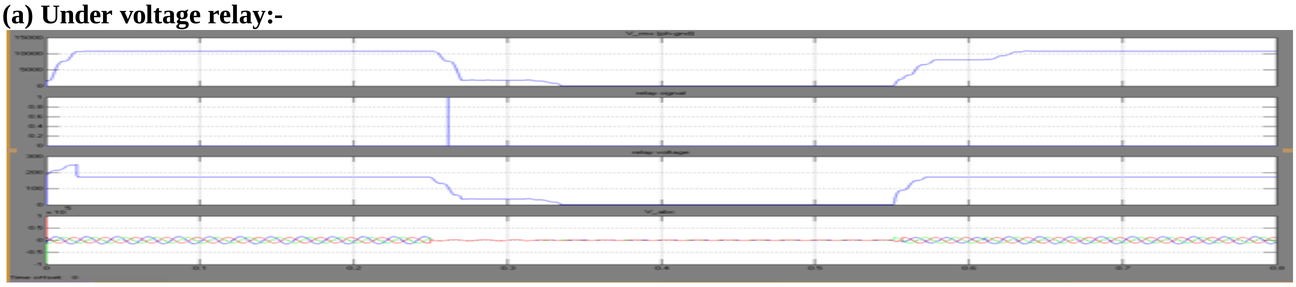

Figure 4.13 – Waveforms of under voltage of power system

(b) Over voltage relay:-

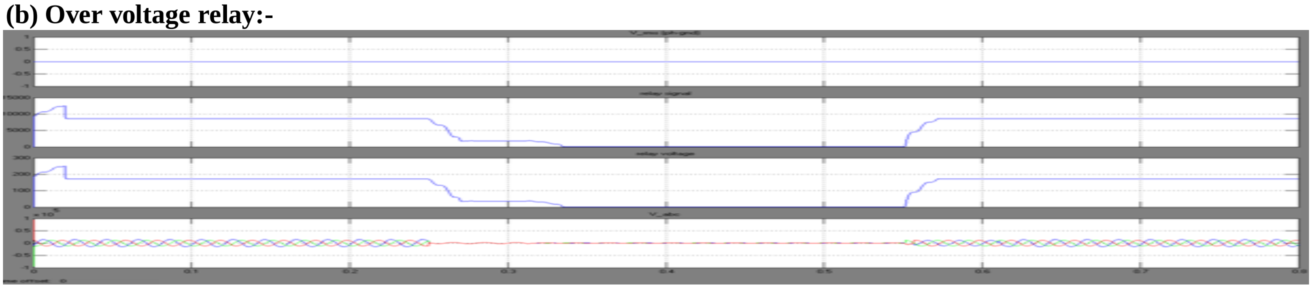

Figure 4.14 – Waveforms of over voltage of power system

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(c) Over current relay:-

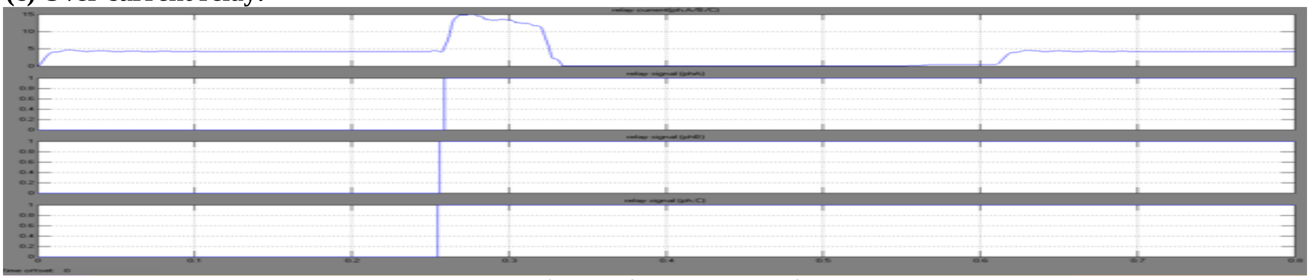

Figure 4.15 – Waveforms of over current of power system

(d) Negative sequence current relay:-

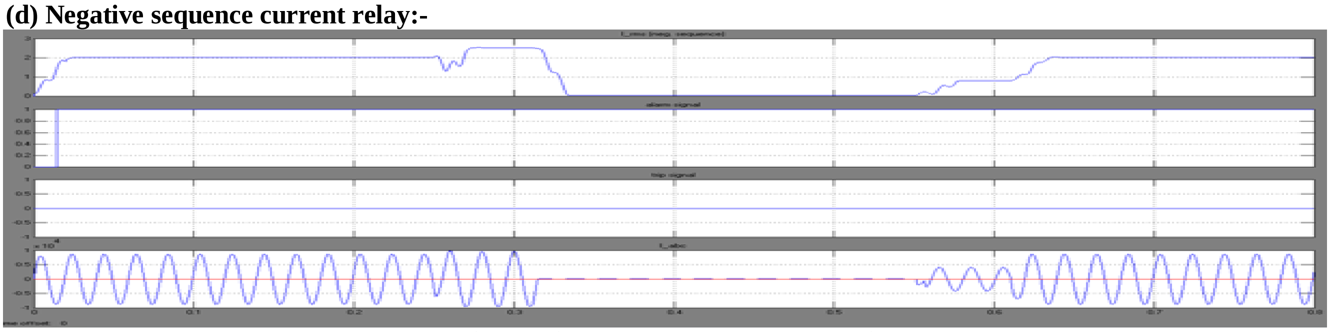

Figure 4.16 – Waveforms of negative sequence current of power system

V. CONCLUSION AND FUTURE SCOPE

Conclusion

This study can be concluded that joint relay should be used for safety and control. In transmission type substations, separation is still preferred in independent hardware units, whereas a trend can be seen towards higher function integration at the distribution level. Here, joint feeder / line relay monitoring, monitoring and control are on the march. With the development of digital technology, modern protective relay supports both stand-alone and joint solutions based on single hardware and software platforms. Users can make decisions within a wide range of controls on the line and on the configuration of security tasks, without compromising the reliability of security tasks.

Future scope for next generation

Today the need for continuous and reliable power supply has increased. So, with low cost and easy handling, security is very important for the power system. Now the age of multilayer protective relay has come. It can monitor the entire security of an instrument.

By using MATLAB simulation link, a power system has been created for multifunctional relay scheme which protects the generator against the stator phase faults, overvoltage, under-voltage and negative sequence current condition. This protective relay system can be further used for the development to multi-fictionalizations of the bus-bar, transformer and distance protection of power system.

Besides the modern switchgear with vacuum circuit breaker is also being developed. This will be very interesting and important area to be studied further.

REFERENCES

1. Bruce G. Bailey, *Power System Protection – Power Monitoring – Data Logging – Remote Interrogation System.* IEEE. 2005
2. Mesut Baran and Jinsang Kim, *Protection Device Monitoring Using Data from Power Quality Monitoring Devices*, IEEE.2008
3. Dr. Z Schreiner, A.J Middleton and J. Bizjak, I*nnovative Technique for Intelligent Power System Mobile Data Management.* pg 459-464
4. Mladen Kezunovic, *Data Integration and Information Exchange for Enhanced Control and Protection of Power System*, Proceedings of the 36th Hawaii International Conference on System Sciences. 2002.

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5. Zhang Hai Yang and Li Shan De, *Design of Adaptive Line Protection under Smart Grid*, The International Conference on Advanced Power System Automation and Protection 2011, pg 599-603.
6.Takaya Shono, Katsuhiko Sekiguchi, Tatsuji Tanaka and Shigeki Katayama, *A Remote Supervisory System for a Power System Protection and Control Unit Applying Mobile Agent Technology*.pg 148-153, IEEE-2002.
7. Janaka Ekanayake, Kithsiri Liyanage, JianzhongWu, Akihiko Yokoyama and Nick Jenkins, *Smart Grid Technology And Applications.*
8.Anthony J. Pansini, *Guide to Electrical Power Distribution System. 6th edition*. Lilburn GA. The Fairmont Press. 2005.
9.Turan Gonen, *Electric Power Transmission System Engineering, Analysis and Design*, Crc Press Taylor and Francis Group.
10. Paul M. Anderson, *Analysis of Faulted Power Systems.* The Institute of Electrical and Electronics Engineers, Inc. 1995.