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Analysis of three phase power system network with and without fault condition

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ABSTRACT: Faults may lead to fire breakout that consequently results into loss of property, loss of life and destruction of a power system network. Faults also leads to cut of supply in areas beyond the fault point in a transmission and distribution network leading to power blackouts; this interferes with industrial and commercial activities that supports economic growth, stalls learning activities in institutions, work in offices, domestic applications and creates insecurity at night
The primary aim of this research work is to build up a MATLAB based Simulation model for 3 phase symmetrical and unsymmetrical faults. This paper ways to deal with the MATLAB Simulation in which transmission line model is composed and different issues has been reenacted utilizing tool compartment. Fault Analysis for different sorts of faults has been done and it impacts are appeared in simulation output, for example, voltage, current, control and segments of voltage and current output as far as waveforms.

I. INTRODUCTION

An electrical power network, as a whole, consists of generation, transmission and distribution. The performance of a power network is frequently affected by the transmission line faults, which give rise to disruption in power flow. Therefore, transmission of electric power and necessary protective measures are the vital issues need to be addressed properly. Distance protection is used to protect the transmission line against faults by measuring the line voltages and currents at remote end buses using digital fault recorders

Presently a-days the requests of power are builds step by step this outcomes to transmit more power by expanding the transmission line limit from one place to the next place. Be that as it may, amid the transmission a few faults are happened in the framework, for example, L-L fault (line to line), L-G fault (single line to ground) and 2L-G fault (twofold line to ground). These faults influence the power framework types of gear which are associated with it. Now –a – days due to continuous expansion of Power System Network, controlling and monitoring of Power systems is unavoidable. Solutions through advanced data communications model are in evident.

When different types of fault occurs in power system then in the process of transmission line fault analysis, determination of bus voltage and the rms line current are possible. While consulting with the power system the terms bus voltage and rms current of line are very important. In case of three phase power system mainly two faults occurs, three phase balance fault and unbalance fault on transmission line of power system, such as double line to ground fault, line to ground fault and double line fault. The transmission line fault analysis helps to select and develop a better for protection purpose. For the insurance of transmission line has been placed the circuit breakers and its rating is depends on triple line fault. The reason behind is that the triple line fault current is very high as compare to other fault current. Hence by using MATLAB simulation in computer, the analysis of transmission line fault can be easily carried out. The principle reason for this paper is to study the general fault types which are balance and unbalance faults of transmission line in the power system. Also to perform the analysis and obtain the result of various parameters (voltage, current, power etc) from simulation on those types of fault using MATLAB. A new modeling framework for analysis and simulation of unbalance fault in power system is procedure includes the frequency information in dynamical models and produces approximate non linear models that are well adopted for analysis and simulation

The transformer display incorporates saturation. The parameters have been acquired from reasonable or exploratory estimations. From the study it is seen that sags can create transformer saturation when voltage recovers. This prompts deliver an inrush current that is like inrush current created amid the transformer energizing. The study call attention to that the voltage recovery moment can take just discrete value, since the fault clearing

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is delivered if there should arise an occurrence of regular current zeros. The moment of voltage recovery compares to the moment of fault clearing. For phase to phase fault and single phase fault, a solitary point-on-wave of voltage recovery can be defined. Then again for two-phase to-ground and three-phase fault, the recovery happens in a few stages. In petrochemical industry, the establishing and ground fault security are critical factors. For that first it is essential to have the correct framework establishing for the specific framework application, and alongside this it is similarly critical to have the best possible assurance against the ground-fault.

TRANSMISSION LINE FAULTS

Normally, a power system operates under balanced conditions. When the system becomes unbalanced due to the failures of insulation at any point or due to the contact of live wires, a short–circuit or fault, is said to occur in the line. Faults may occur in the power system due to the number of reasons like natural disturbances (lightning, high-speed winds, earthquakes), insulation breakdown, falling of a tree, bird shorting, etc.

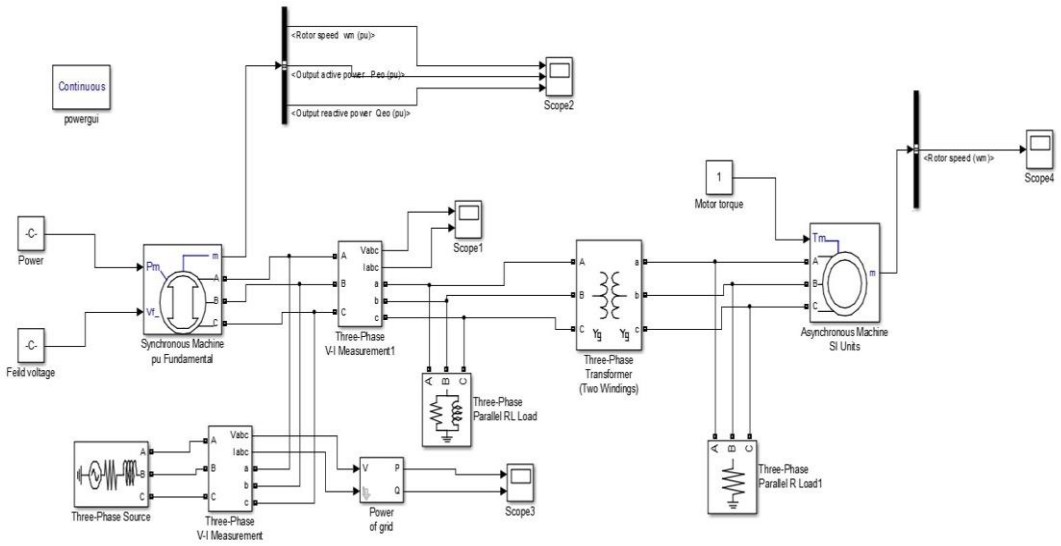
Symmetrical faults

In such types of faults, all the phases are short-circuited to each other and often to earth. Such fault is balanced in the sense that the systems remain symmetrical, or we can say the lines displaced by an equal angle (i.e. 120° in three phase line). It is the most severe type of fault involving largest current, but it occurs rarely. For this reason balanced short- circuit calculation is performed to determine these large currents

Unsymmetrical faults

Unsymmetrical faults involve only one or two phases. In unsymmetrical faults the three phase lines become unbalanced. Such types of faults occur between line-to-ground or between lines. An unsymmetrical series fault is between phases or between phase-to-ground, whereas unsymmetrical shunt fault is an unbalanced in the line impedances. Shunt fault in the three phase system can be classified as;

- Single line-to-ground fault (LG).
- Line-to-line fault (LL).
- Double Line-to-ground fault (LLG).
- Three-phase short circuit fault (LLL).
- Three-phase-to-ground fault (LLLG).



Circuit Diagram of simulation model without fault on transmission line

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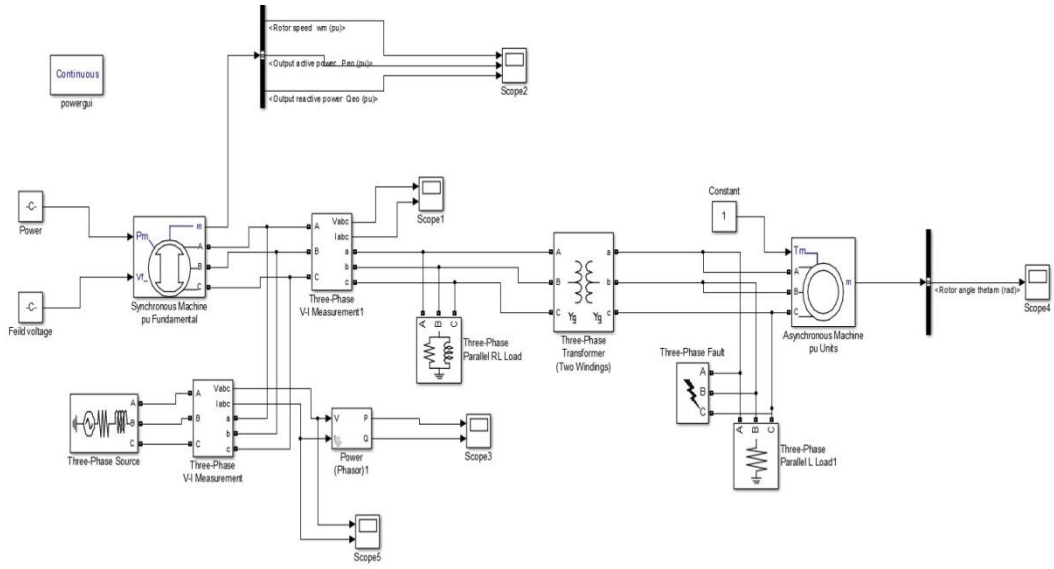
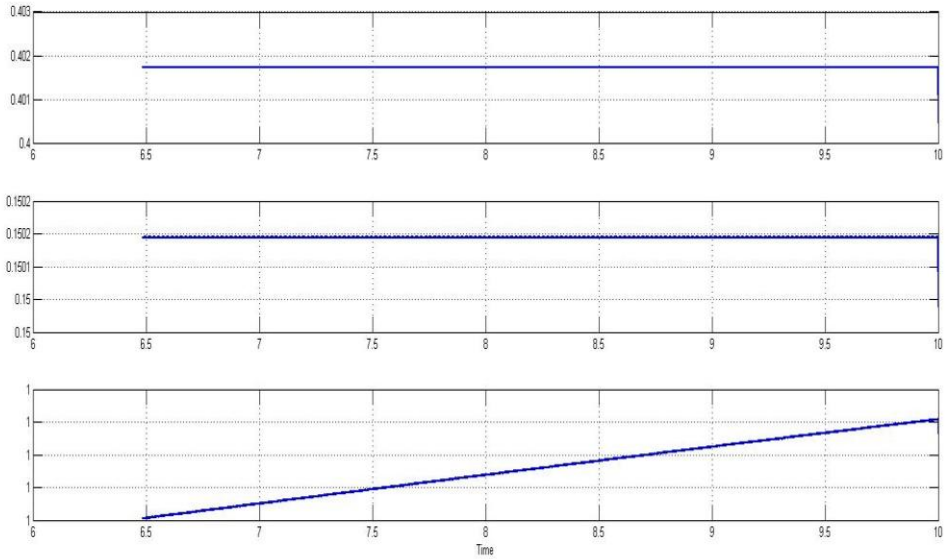


Circuit Diagram of simulation model with fault on transmission line

Simulation Results

The simulation and analysis of three phase fault to achieve results of the transmission line parameter is convenient by using MATLAB software. In this paper simulation of three phase transmission line fault analysis system is proposed. Single Line to Ground fault, Double Line fault etc in transmission line is also simulated. This system opens the way to redesign the bus system of the power system according to its results. The proposed work can able to implement for a larger power systems geographically apart



synchoronous machine parameter with swing bus

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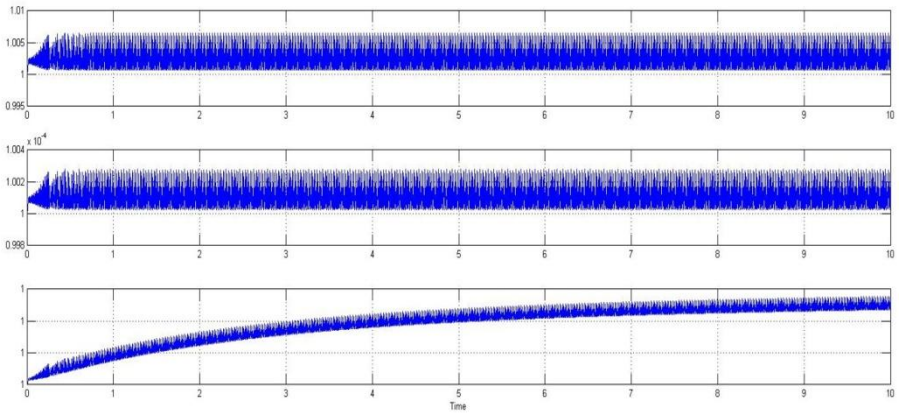
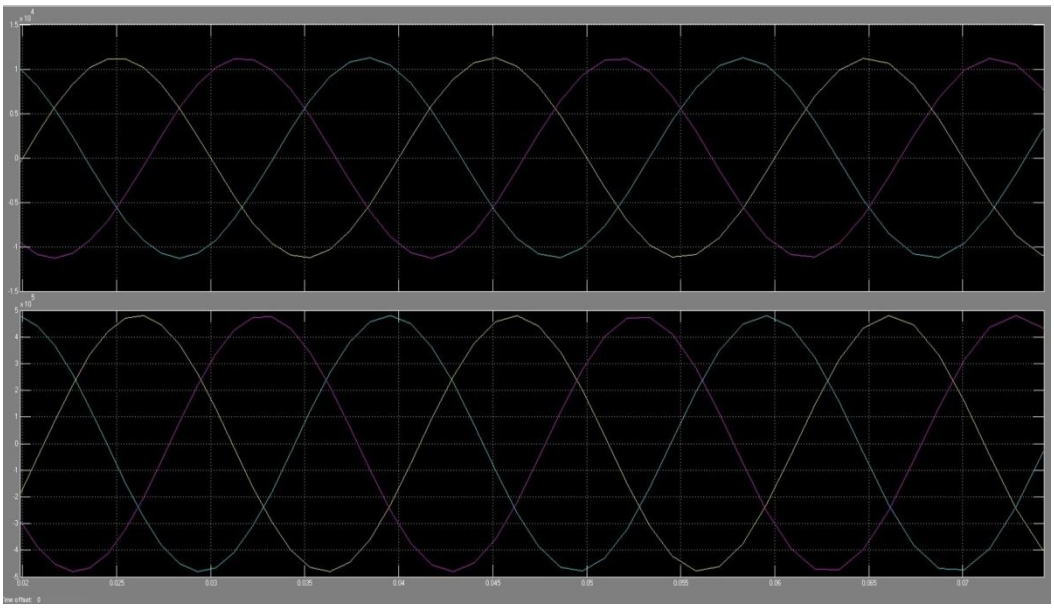


synchoronous machine parameter



Synchronous voltage and current

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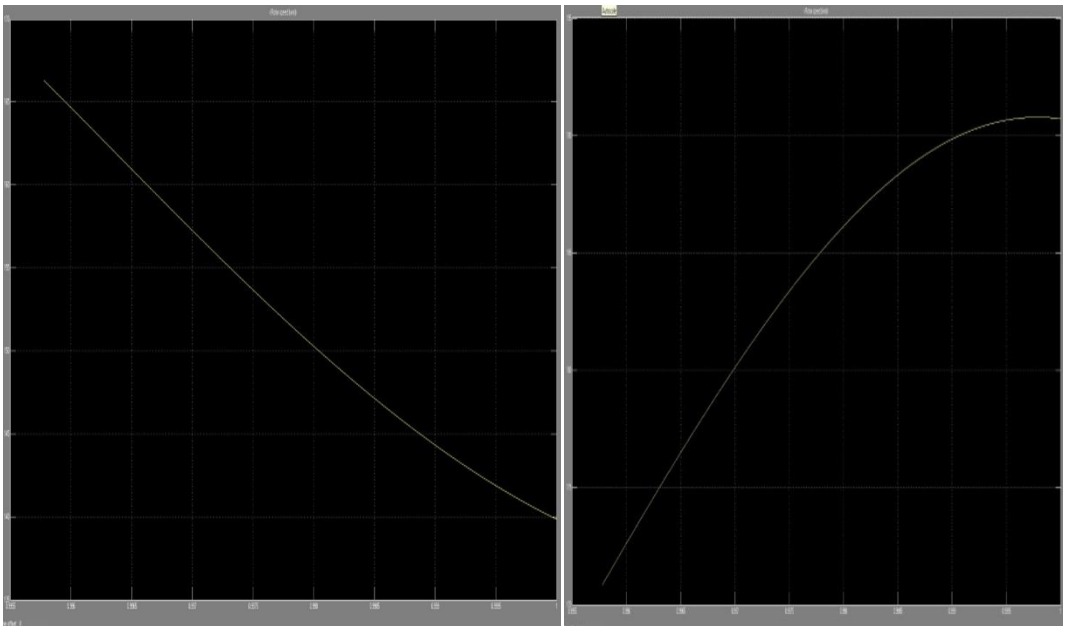
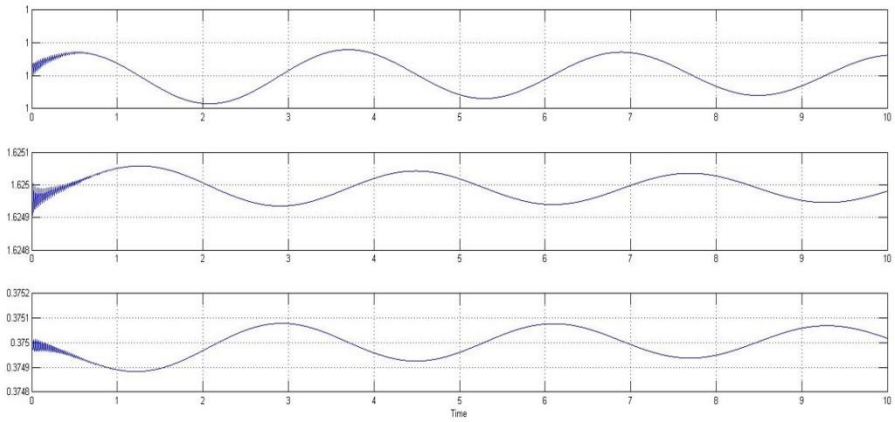
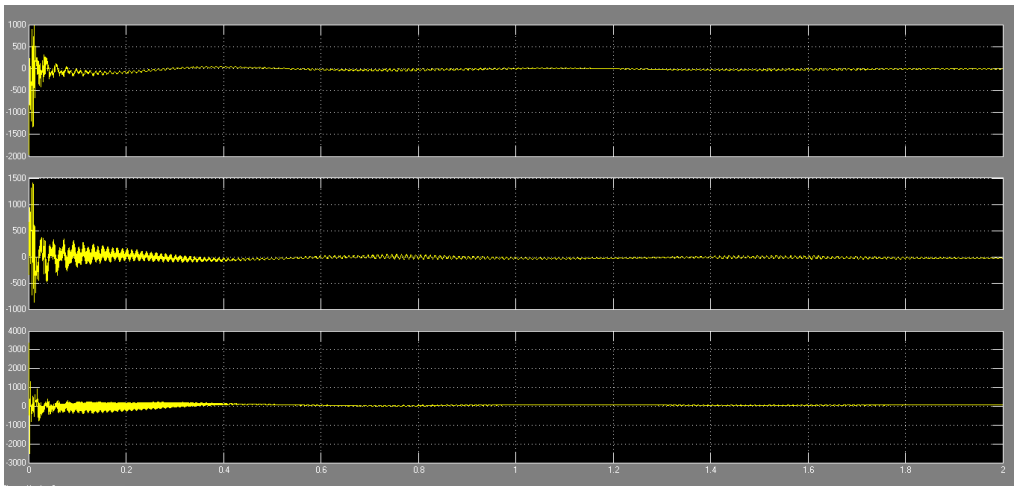


With and without fault at asynchronous motor



Slag bus system



Without faulty condition

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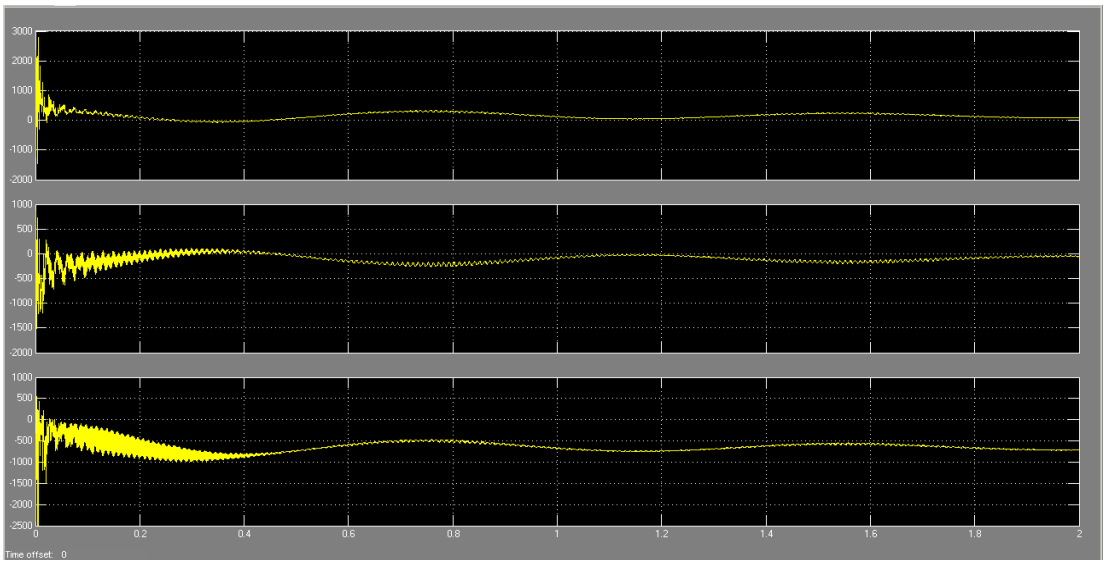

With faulty condition

II. CONCLUSION

The simulation and analysis of three phase fault to achieve results of the transmission line parameter is convenient by using MATLAB software. In this paper simulation of three phase transmission line fault analysis system is proposed. Single Line to Ground fault, Double Line fault etc in transmission line is also simulated. This system opens the way to redesign the bus system of the power system according to its results. The proposed work can able to implement for a larger power systems geographically apart.