Modelling and Simulation of Power Quality Disturbance using MATLAB/SIMULINK

V.Kavitha, K.Subramanian

Abstract: ***Power quality is a very important part to achieve the good quality of the supply. Power quality is defined as the in all electrical networks or any grids its giving perfect along with pure sinusoidal wave form and free noise without any disturbance. To improve the power quality we need some analyzes and research on power quality disturbance perfectly. According to this paper mainly identify the power quality disturbance and harmonic disturbances by changing the short term voltage a little movements. Mainly the wave will analyzed through the four transform equations. . The simulation results and the theoretical analysis show that the model in this paper could simulate the voltage change and harmonic disturbance well, which can provide data and basis for detection and identification of PQ and further control measures.***

Keywords: Power quality, three phase universal bridge, Distributed parameters line, fault breaker.

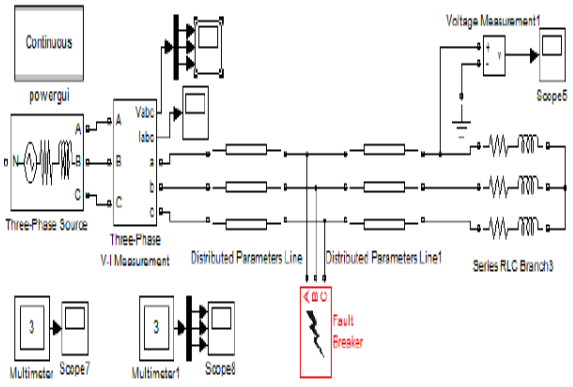
I. INTRODUCTION

Electrical power is very important that can be used to modern industry, agricultureanddaily life. Most of the power quality problems came from the widely use of the nonlinear load .Power quality disturbances create a bad quality of the power supply it won't give a pure sinusoidal wave in the distribution networks.The great influence of the power quality is safe, reduce energy consumption. To reduce the power quality disturbances we need toanalyze applying filters and some of the other technique. Most of the power Electronics equipments Based on the harmonics reduction only along with current harmonics. Finally the solution to the getting very low power factor, low efficiency, Magnetic interference, Power system voltage fluctuations.Filters is very important to detect the power quality disturbances in the distribution networks.Modelling and simulation will get its wave form and data it can be supplied for the research of power quality detect and analyzing. We can easy to understand power quality intuitively, with the help of the wave forms. That's why modelling and simulation has higher theoretical value, and also it can be necessary to model the power quality disturbances. It can be identifying the voltage and current of power system after a fault but this only be the temporal voltage drop only not including the other power quality disturbances. Even though it is useful to lead voltage wave form to matlab for the following analysis and detection.It can be consider the interface transformations among the matlab and Pscad it is fussy.Simulink is avisual simulation tool of matlab, it will be used to power system and power electronic devices.According to this paper develop a power quality disturbance model based on the simulink of the matlab. It will be getting disturbing wave form of voltage change and harmonic disturbance through simulation.

Design of voltage change model and parameters setting:
The power quality disturbance split into two types one is the transient interruptions and steady state disturbances. According to the transient power quality problems mainly including voltage change and different transient problems and appearances .Voltage change is the RMS node voltages changes in a very short timings. If it is any large load transformations because of the any system failure situations the voltages mainly changes with respect to time including voltage sag, voltage swell, and voltage interruptions. Transient means is to the transient over voltages it will be dived into the transient pulse and transient oscillations. According to this paper voltage changes is the main issues and it can be affecting most of the power electronics equipments.

In the power system short fault will be occurs, it will be dividing three types of earthling first one is the three phase shorting, two phase shorting, two phaseearthing, and single phase earthling.

Harmonics Disturbance model using with Distributed parameter line and fault breaker:



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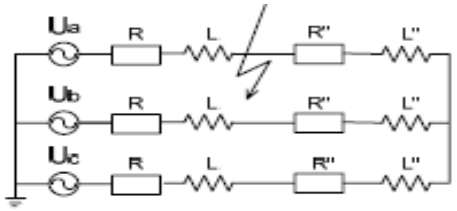


c diagram

We can selecting the simulation time will be0.3s and it is a single phaseear thing fault between the 0.11s-0.15s. The parameters ofthe module as shown in figure. The voltage source will connect the neutral groundingalong with three phase voltage source as 380v grid power frequency is the 50hzseparate parameter line will be adopted in the range of 40km.The distributor parameter line 1and 2 is having the three phase fault breaker it will be located in the particular distributed parameter line 1 and 2.We need to select thr RL load will be in the range of R=10ohm,L=0.005H and three phase VI measurements are the connected to measure the voltage current of the load side and power side.

Change of voltage harmonics distortions wave forms:

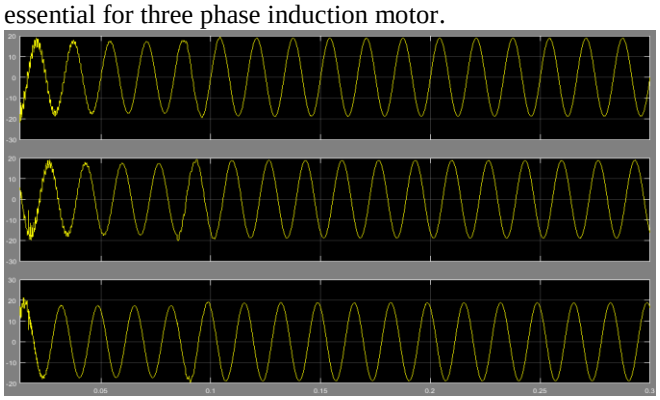
Voltage harmonics distortions:

Effects of voltage distortion:

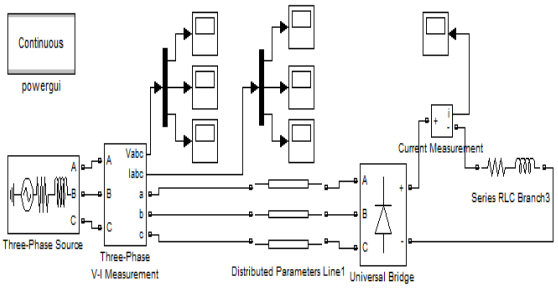
In an electrical system , overheating will be developed by current distortion due to voltage distortion.Since voltage distortion is not path dependent, even though minimum distortion effect ,harmonic voltage induced in one part of the distribution system will be same in the common buses within it. SimilarlyiIn a non linear load if high voltage distortion appears it won't appear the complete system.

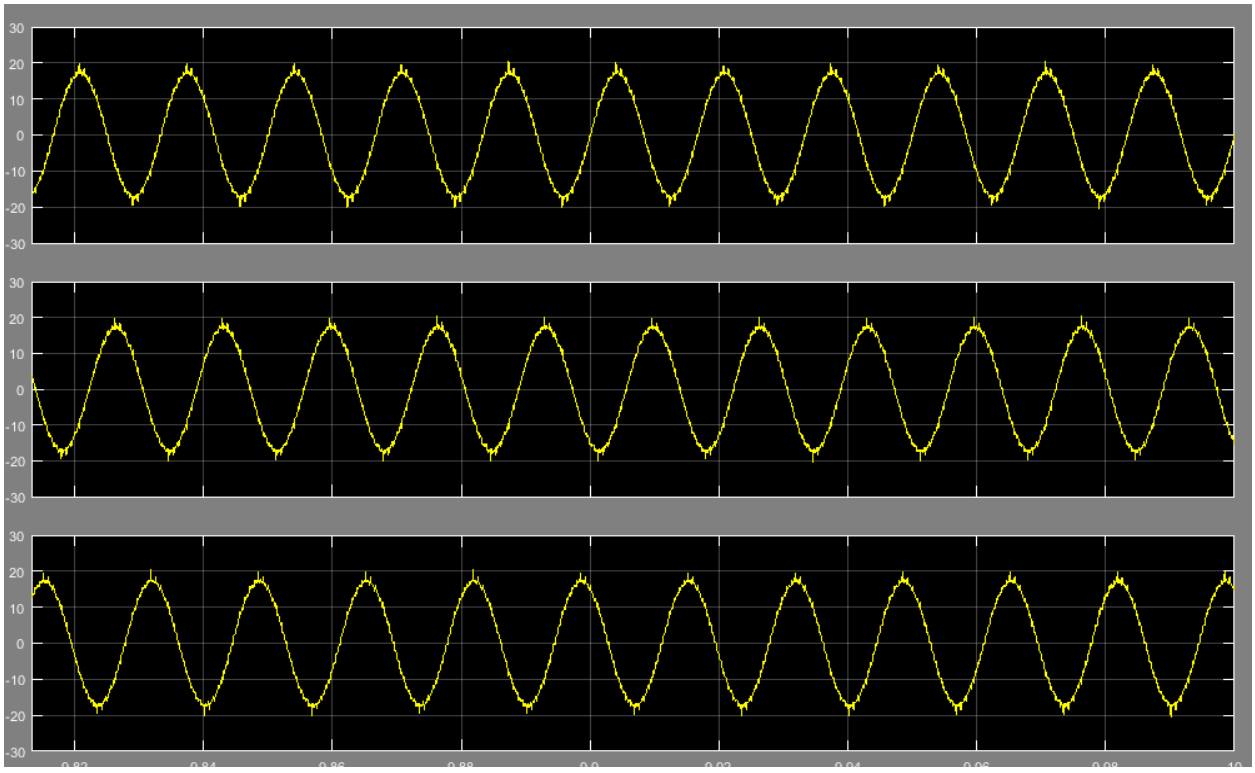
In non -linear load the Voltage distortion is minor for phase-to-phase or phase-to-neutral fault. In three phase Induction motor load, voltage distortion with 5th harmonic is applied , it will produce negative torque.

Due to this the motor rotates in the reverse direction and slows down its rotation. To operate the motor again to normal operating speed, motor will draws more current which will affect the motor winding and also it will causes the protective devices. So elimination of 5^{th} harmonics is essential for three phase induction motor.



Harmonics disturbance model using with universal bridge:

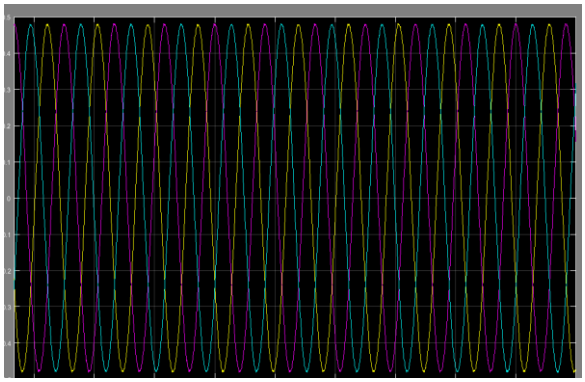


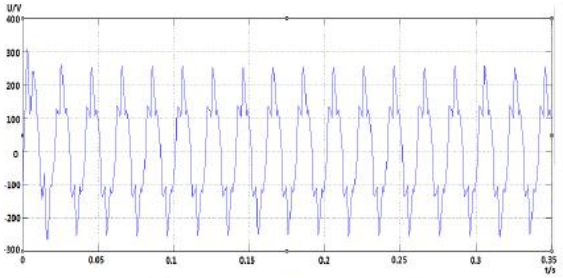


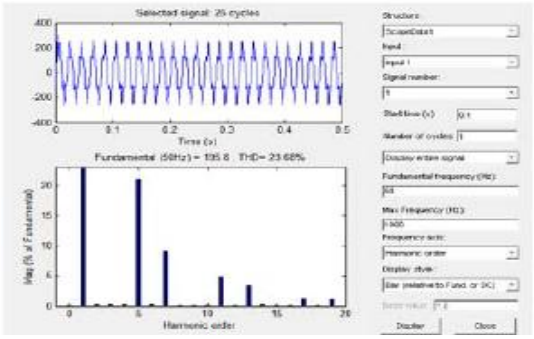
Effect of current distortions:

Most of the nonlinear devices can produced the high current harmonics distortions like transformers and motors.

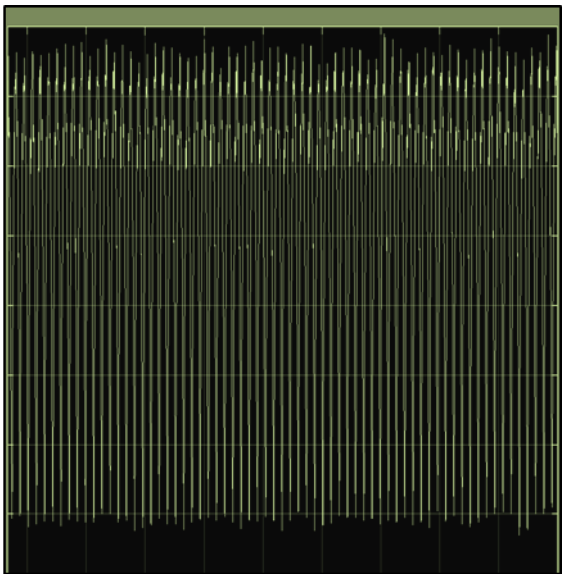
The current distortion on transformers induction motor and non linear loads will produce heating losses i.e. I^2Z. Since the impedance of the transformer is dependent of the frequency and if current distortion is due to 5^{th} harmonic, then heating effect will be 5 times of the heating effect due to fundamental current. Since the current distortion is dependent on the path, harmonic current effect will be on non linear load and not on the any other protective devices.







Current distortions waveforms:



Voltage sag:

Voltage sags are the most common power disturbance. At a typical industrial site, it is not unusual to see several sags per year at the service entrance, and far more at equipment terminals. Voltage sags are caused by abrupt increases in loads such as short circuits or faults, motors starting, or electric heaters turning on, or they are caused by abrupt increases in source impedance, typically caused by a loose connection.Voltage sags can arrive from the utility; however, in most cases, the majority of sags are generated inside a building. For example, in residential wiring, the most common cause of voltage sags is the starting current drawn by refrigerator and air conditioning motors.

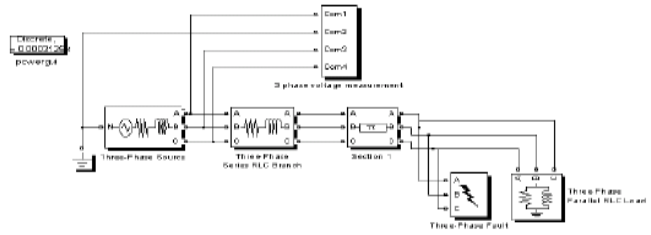
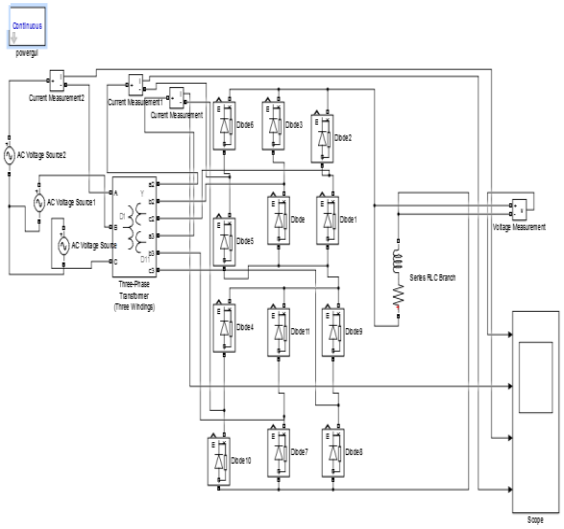


Fig. 1 Simulation of voltage sag

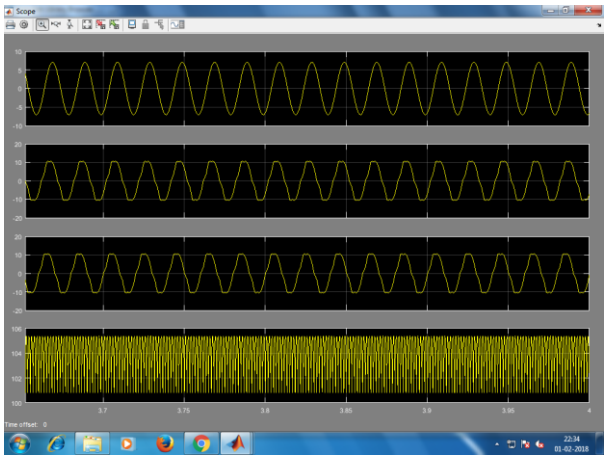
12 pulse Three Phase Rectifier Output Wave Forms:

According to this founded three phase rectifier output waveforms it is showing lot of current distortions along with voltage distortions. Becauseit is not a pure sinusoidal fundamental voltage and current waveforms.



Harmonics disturbances occurs in this 12 pulse output waveforms:

Voltage Output Distortions waveforms Along with current Distortions waveforms:



V. CONCLUSION

The paper studies the causes of various power quality events and develops electrical model these disturbances. To ensure reliable supply, to prevent malfunctioning of protection system and to life of electrical Equipment it is imperative that power quality assessment is properly and timely performed. Efficiency of several techniques is evaluated on the databases having various voltages and current data values. However, due to nonavailability of the practical data it becomes imperative to create one's own database for the assessment of techniques.Thus this paper aims to development electrical system models for various events which further can be employed in suitable power quality assessment technique.

REFERENCES:

1. F. Jurado, N. Acero, and B. Ogayar, "Application of signal processing tools for power quality analysis," in *Proc. of Canadian Conf. Electricaland Computer Engineering*, May 2002, vol. 1, pp. 82–87.
2. O. Poisson, P. Rioual, and M. Meunier, "Detection and measurement of power quality disturbances using wavelet transform," *IEEE Trans. Power Del.*, vol. 15, no. 3, pp. 1039–1044, Jul. 2000.
3. S. Santoso, W. M. Grady, E. J. Powers, J. Lamoree, and S. C. Bhatt, "Characterization of distribution power quality events with Fourier andwavelet transforms," *IEEE Trans. Power Del.*, vol. 15, no. 1, pp. 247–254, Jan. 2000.
4. A. M. Gaouda, S. H. Kanoun, M. M. A. Salama, and A. Y. Chikhani, "Pattern recognition applications for power system disturbance
5. classification," *IEEE Trans. Power Del.*, vol. 17, no. 3, pp. 677–683, Jul. 2002.
6. Z.-L.Gaing, "Wavelet-based neural network for power disturbance recognition and classification," *IEEE Trans. Power Del.*, vol. 19, no. 4, pp.1560–1568.
7. S. Santoso, E. J. Powers, W. M. Grady, and A. C. Parsons, "Power quality disturbance waveform recognition using wavelet-based neural
8. classifier- part I: Theoretical foundation," *IEEE Trans. Power Del.*, vol. 15, no. 1, pp. 222–228, Oct. 2004.
9. M.H.J. Bollen, "What is Power Quality", Electric Power Systems Research, vol.66, pp.5-14, July 2003.