MODELING AND DESIGN OF INTELLIGENT DISTRIBUTED POWER FLOW CONTROLLER FOR POWER QUALITY ISSUE

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ABSTRACT

In this project we are implemented an advanced facts controller based power electronic device is presented i.e. distributed power flow controller (DPFC) is developed to enhance the power quality of the generated power. In this dissertation the voltage sag and swell problems are compensated by using the DPFC facts controller and it enhances the quality, by considering the increasing of power demand requirement in this case we have to consider the linear and non-linear load conditions in the generation of electrical power in the grid side. The DPFC arrangement is identical to the UPFC, in these advanced facts controller avoided the usage of common dc-link capacitor in between the series and shunts connected converters and also preferred distributed three phase converter in the place of three phase voltage source converter three individual single phase converters utilized. We are proposed the direct and quadrature control strategy is performed to operate effective manner. The developed DPFC is situated with the single infinite bus system with two parallel transmission lines are presented that corresponding SIMULINK/ MATLAB results are discussed in this proposed project. The experimental and simulation results are tested and verified it generates the higher performance of the power system.

Index Terms: ***Facts Based Distributed Power Flow Controller, Voltage Sag And Swells, Power Quality Improvement And Direct And Quadrature Axis Control.***

I. INTRODUCTION

Now a days we are facing the major problem is power quality in the transmission systems it will effects the many industrial applications like as production and information engineering also effects in the high technology communication engineering for the on line service technology. Accordingly these major concerns the power quality issue is concentrated. The power quality importance is enhanced in both industrial domestic applications for the commercial electrical users. The power system must have to consider and protect the system from environments and surrounding increased deregulations and sudden changing in loads and frequency are causes for to disturb the power quality of the system.

An advanced power electronic semiconductor devices are researched and identified the Facts based topologies to protect the power system. The Facts technology has been developed with the different components are utilized in the different components are utilized in the system. Power losses in the consumers and the requirements are results to generate the poor power quality. The researchers are much concentrated on these

power quality issues and explains its importance. The below statements a explains the solutions of PQ In the advanced generation load based equipment's are connected with the microprocessor based different controllers and power electronic devices are very sensitive with nonlinear loads variations in the power system. The increased power quality problems has raised the effects of the customers are understood and challenged the utilities to enhance power quality and the power transportation.

The damage in the any device has more important contents in entire system because of the advanced modern technologies are integrated in the process to get the quality in the output side receiving end voltage in most cases. To get the effective required voltage with respect to the supply voltage we have to consider some limitations.

In the past years the office purpose and the industrialization and domestic purposes usage of power requirement is increasing year by year. So the output of the receiving end voltage is must concentrated on the interruptions and the objectives of the end user alignment is maintained by the overall modification of the power elements are controlled by the to produce the proper required sufficient voltages. Power quality does not only involve on the suppliers excluding it also operated with the concentrated depended upon the customer that how they absorb electricity. Power quality performance at the generator side can be called as the generator‘s capability to produce power at operated frequency 50 Hz with small variation happened, while power quality reliability at the transmission side and distribution side are forwarded and referred to the essential load voltage within the presence of plus or minus 5% of supply voltage.

Gerry Heydt in "Electric Power Quality" explained the power quality performed as – the analysis, measure, and development of constant bus voltage, frequently a load bus voltage, to preserve that voltage to be sinusoidal at required desired produced voltage and frequency. With the progression of this topology a huge number of complicated electrical and electronic components are utilized such as programmable logic controllers (PLAs), computers, variable speed drives are preferred etc. there is decrease in power quality problem and this corresponds to defeat in conditions of time and price of the development sectors and commercial usage electrical consumers goods requirements.

Accomplishment of different FACTS elements in the power system arrangement can assist in tumbling the number of various power quality issues. For the well-organized employ of power system arrangement major sources a impression of Flexible AC Transmission Systems (FACTS) was developed in the year of 1980‘s. The basic trends and implementations of FACTS controlling technologies are worked based upon the utilization of high-voltage power electronic semiconductor devices to operate real and reactive power compensations flow and maintained required sufficient voltage in the transmission arrangement.

II. POWER QUALITY PROBLEMS

2.1 Various Power Quality Problems

a) Impulse: Narrow pulse through quick rise and exponential or damping oscillations are considered within the decay; 50 V to 6 kV magnitude, 0.5 μs to 2 ms period can be called as impulse as given in Fig. 1(a). It minimizes are load corresponding controlling patterns, utility switching troubles, fuse flaming, arcing contacts damaged due to this fault etc.

b) EMI: It can be illustrated from Fig. 1(b) and is explained as the recurring low energy harmonics generated in the range of 10 kHz to 1 GHz band width, with 100 μV to 100 V magnitudes. It can be affected by normal tools

performance operation (switching pulse power supplies requirements, motor speed controllers and compensators etc.) carrier power line announcement and wireless broadcasting researches.

c) SAG: It is expressed as the sudden decrement in voltage between the range of 0.1pu to 0.9pu and it is able to be observed in the given Fig. 1(c). It is because of the starting of higher loads are presented; utility switching patterns and ground faults are created.

d) Swell: A sudden increment in voltage between the ranges of 1.1pu to 1.8pu can be conditioned to the creation of swell as displayed in Fig. 1(d). The main reasons of swell are load diminish, efficiency switching.

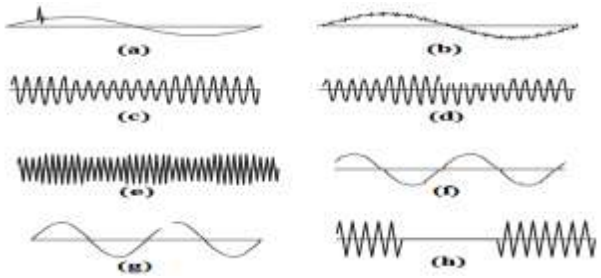

Fig.1. Power Quality Problems

e) Flicker: Small repetitive disturbances in the voltage modules are termed as flicker. Flicker has been showing in Fig. 1(e). Energetic load is its major problem.

f) Notches: It is identified as rhythmic dips i.e. uninterruptable continuous variations in the line voltage, with short period of timings and it can be pragmatic that in Fig. 1(f). The main problem for its incidence is present trend communications in monitored or uncontrolled 3-phase rectifier model.

g) Waveform distortion: the divergences from idealized normal conditions sine wave owing to the attendance of distortions or inter oscillations are generated is treated as waveform distortion. Fig. 1(g) demonstrates waveform distortion. It can be affected by rectifier's case, phase-angle compensators, and other nonlinear load conditions and/or intermittent loads or interrupt loads.

h) Outage: Zero-voltage circumstance of a single phase rectifier or different phases are affected in a multi-phase system arrangement, for supplementary than a 50% of time period is called as outage voltage and it can be observed in Fig. 1(h). Load equipment damages, utility apparatus failure, ground fault, accidents happened, lightning controlling arrangement other parameters of surroundings are major drawbacks of outage.

2.2 The Influence of Power Quality Problems in Power quality: Troubles are definitely destructive for in cooperation the power system arrangement and consumers having different influences as follows:

1) There is diminution in the effectiveness and life period of the generating major parameters components transmission lines arrangements and electrical parameters owing to supplementary loss of command system device.

2) There is induction heating in some part of transformer being formed by involuntary pulsation, noise with higher voltage.

3) There is an augment in artificial graceful and maloperation detections of relay defense and mechanization which can directed to incorrect quantity of electric difficult instrument.

III. DPFC CONTROL

The DPFC has major three control strategies are proposed:

3.1 Central Control

This controller performs all the series and shunt compensators and gives required reference signals generate the both of the shunt controller and series compensators of the Distributed Power Flow Controllers. Recording to the system necessities, the inner control generates parallel voltage reference controlling signals for the series converters and reactive current signal for the shunt converter. All the references signals are generated by middle manage are at the fundamental minimum frequency.

3.2 Series Control

Each single-phase converter has it's possess sequence control throughout the line. The compensator is used to sustain dc voltage of a dc link capacitor by means of third harmonic content frequency generate sequence electrical energy at a elementary frequency which is prearranged by private control. Since of single phase series compensator voltage in progress will happened whose frequency corresponds on frequency of current that flows throughout converter.

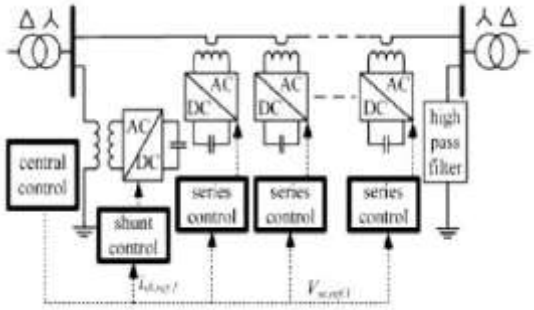

Fig: Central Control of DPFC

So abolish this generated harmonics there are two probable behaviors one is escalating of turns proportion of single phase transformer associated and the subsequent is exercise of dc capacitor of bulky capacitance.

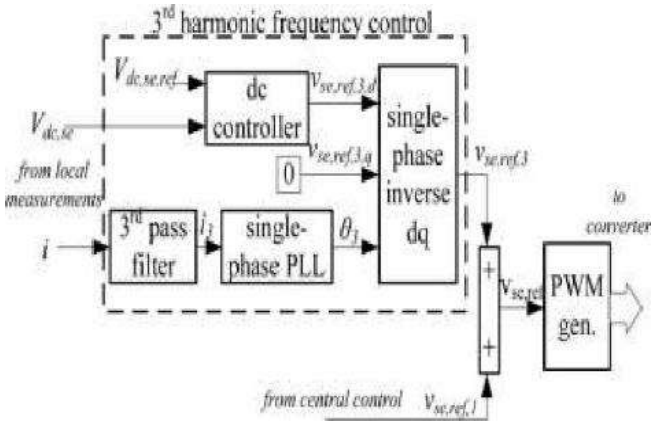

Fig: Series Control of DPFC

Any series manager has a low-pass and a 3rd-pass filter to create minimum fundamental and 3rd harmonic current, correspondingly. 2-single-phase phase lock loop technique (PLL) is preferred to take frequency and phase in sequence from system arrangement .The PWM-Generator provides block manages switching procedure.

3.3 Shunt Control

The shunt converter consists of a 3-phase converter associated anti parallel connected to a single-phase converter technology. The 3-phase converter mingles vigorous authority from grid at minimum fundamental frequency and monitors the required dc voltage of capacitor flanked by this controller and single-phase solitary Other commission of the shunt converter is to inject the extra required voltage stable third-harmonic present into lines throughout the neutral winding current wire of Δ-Y Within the arrangement, multiple series converters are prohibited by a innermost compensator.

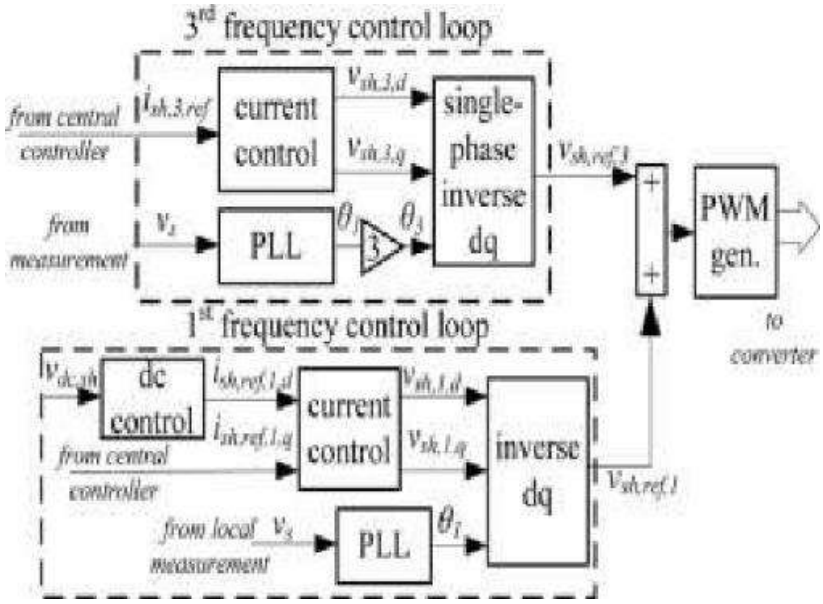

Fig: Shunt Control of DPFC

The middle compensator generates the required reference voltage magnitude signals for all series controllers. The required reference and current surrounded by the complex are deliberated by its Simulink output.

In this arrangement we are implemented the direct and quadrature control technique are implemented with various faults are controlled and maintained those faults are concentrated to compensate the problems with using the distributed power flow controller.

IV. CONCLUSION

In the power transmission system arrangement to improve the power quality by providing some external effective control strategies are premeditated. In this recommended paper voltage sag and voltage swells are compensated by association of an advanced facts controller DPFC is presented. The DPFC controller block diagram is identical to the UPFC and it has same controlling capability it used the major parameters such as line impedance and bus voltage amplitude and the transmission angle and there is no necessity of using the common dc- link capacitor. DPFC has more advantages as compared to the UPFC those are high performance, high

controlling capability and high reliability with low cost of the controller. The DPFC is modulate and replicated by the three controller loops distributed and maintained in series converter arrangement.

In this we are implemented the direct and quadrature control strategy is adopted for the firing pulses of the DPFC to performed very effective manner. These are produced the required voltage is accurately. The system preferred single phase infinite bus system is selected, the system checked and verified with the dynamic performance of the machine in the three phase system. The generated results are proposed in the MATLAB/ SIMULINK. Finally the power quality of the power transmission system is enhanced.

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