

“Review Based on Solar based DSTATCOM using SRF and IRP Control Theory”

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Abstract - In modern eras increasing in use nonlinear load or power electronics load to satisfied the need of todays industry such as adjustable speed drives, office accessories, Synchronous motor drive, Variable Frequency drive Energy efficient lighting etc . but such types of load is create harmonics in the system which flow from load to source and it will harmful to equipment connected to the system so there need to compensate such type of problems already there are various devices available to solve and eliminate such type of problem but every devices having some advantages and drawback. In proposed system use shunt connected based DSTATCOM. In this project, a three phase three wire Distribution Static Compensator (DSTATCOM) is proposed for power quality improvement. There are traditional methods available to Control DSTATCOM such as Single pulse width Modulation, SPWM, SVPWM. In proposed project result analyses by using SRF and IRP controller the result observed in MATLAB Simulink.

Key Words: DSTATCOM, SRF, IRP, SPWM, SVPWM MATLAB/Simulink.

1. INTRODUCTION

Due to the wide use of power electronic based equipment's in the electricity consumer community, power quality has become the key challenge to the researchers. Because all automatic equipment's draw reactive power and inject harmonics into the distribution system so responsible to the poor power quality[3]. Due to limitations and environmental issues of conventional energy sources, continuous efforts are going on to increase the use of renewable energy sources for generation of electrical power. Some researchers have come up with new solutions in the area of renewable energy sources in terms of power quality improvement while dealing with distribution systems. At the distribution side, use of automated, computing devices is increasing day by day such as Personal computers, printers, scanners, fax machines etc. and many other nonlinear loads, so power quality has become major concern among the electric utilities. These type of power electronic based sensitive loads inject harmonics into the line and responsible to the waveform distortions that results poor power factor also. All the power quality mitigation controllers which are

used in distribution systems are known as custom power devices (CPD's). Among all controllers, DSTATCOM is most effective solution of power quality problems[1,2]. DST A TCOM is shunt connected device and it is widely used as power quality mitigation device. The performance of DSTATCOM depends upon the control algorithms [1] those are used to generate reference source current. In this paper PV based DST A TCOM is used so the DC voltage regulation is also very important that can vary with the irradiation level. To control the DSTATCOM, dq and pq based algorithms are used Simulation results demonstrate the effectiveness of controller of DST ATCOM for reactive power compensation, harmonic reduction and load balancing under the unbalanced conditions.

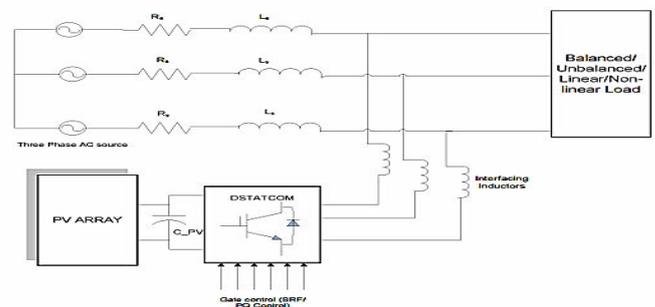


Fig. 1 System Configuration

Fig. shows the basic configuration of PV based DST ATCOM. DST ATCOM is three phase three leg voltage source inverter connected in shunt with load and its DC side is fed through the PV array. The DSTATCOM is connected to the line via interfacing resistances and inductors. Modelling and simulation of PV array is done in MATLAB. switching signals of VSI are controlled through the controller based on SRF and IRPT

2. Body of Paper

Design and simulation of VSC (Voltage source converter) based DSTATCOM for the compensation of power quality problems to make the distribution system more efficient using MATLAB software.

- Main objective of project to eliminate the power quality problem
- To minimize the sag using DSTATCOM
- To minimize swell using DSTATCOM
- To Reduce harmonics using DSTATCOM
- To design PV based DSTACOM to solve Power Quality Problem

Project Methodology

1. Implementing a VSC based DSTATCOM in a system.,
2. Switching of the VSC based DSTATCOM SRP Control
3. Switching of the VSC based DSTATCOM IRP Control
4. Implementation will be the desirable operation of the system for undesirable conditions for example harmonics reduction and all.
5. Simulation of the model can be done in MATLAB software Evaluation of the performance.

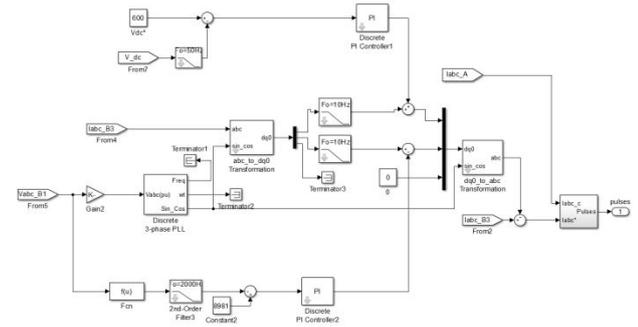


Fig. SRF theory modeling

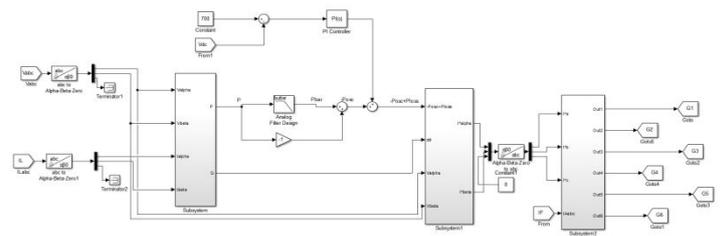


Fig.IRP theory modeling

Result

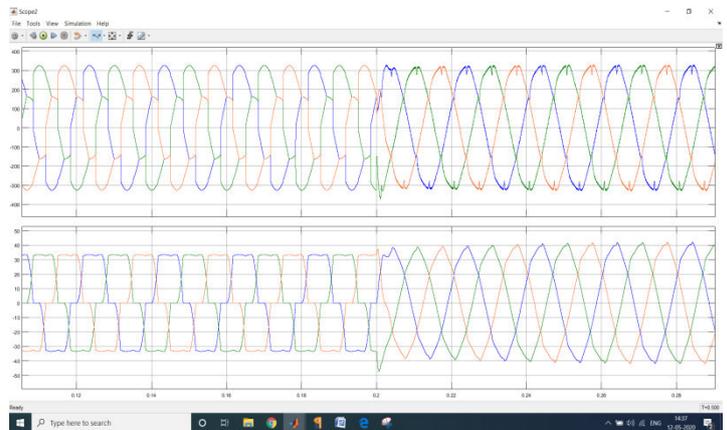


Fig. Source voltages and currents with SRF theory control

The nonlinear load is realized by connecting the three phase diode rectifier to a Resistive-Inductive load (R-L). Unbalanced load is realized by connecting different values of impedances in three phases. Three phase voltage source converter (VSC) act as the DSTATCOM which consist of the six insulated gate

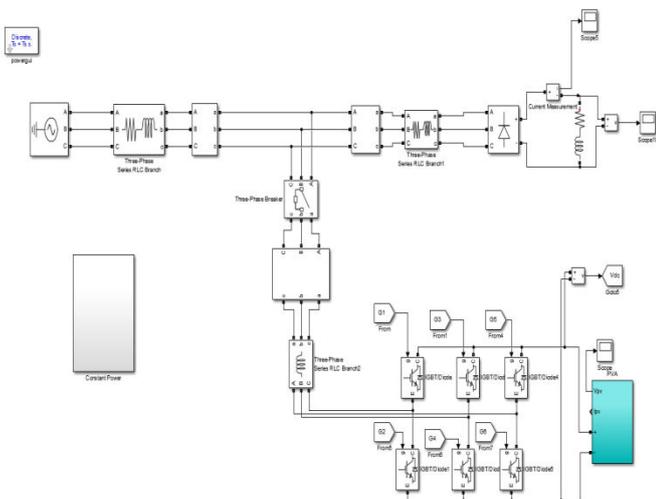


Fig.MATLAB/SIMULINK model of PV based DSTATCOM.

bipolar transistor (IGBT) and anti parallel diodes are connected to each IGBT. DC side of the Voltage source converter (VSC) consists of a PV source which is used to maintain constant voltage for the switching operation of the IGBT switches. Interfacing inductor, L_f is connected on the AC side of the voltage source_

3. CONCLUSIONS

In this paper complete simulation model of PV based DST A TCOM is developed using MAT AB/SIMULINK . Performance of the proposed system is analyzed for PFC and ZVR modes using SRF and IRP based control theories. DC bus voltage regulation is also achieved in each case. Power Quality Improvement is achieved in terms of Power factor improvement, Harmonic reduction and DC bus voltage control. The THD of the source current is 25% which is improved to 2.9% and 1.8% for SRF and IRP theory respectively. In both the theories the THD is maintained below 5% after D-STATCOM is connected.

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