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VOLTAGE STABILIZATION AND REACTIVE COMPENSATION USING A NOVELFACTS- STATCOM

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ABSTRACT

This paper introduces an integrated STATCOM for the improvement of dynamic and transient stability and transmission capability and flexibility for mitigating transmission level power flow problems. The model of the STATCOM within a power system is performed in the MATLAB using the blockset power system. The performance of the selected + 100MV STATCOM scheme connected to the 230KV grid is evaluated. It is included on the inductive and capacitive modes of operation and also flexible AC transmission system is giving rise to an emerging and optimizing the performance of power system,family of compensating devices such as STATCOM,SSSC and also reactive power compensation and voltage regulation is validated for load and system excursions.
Keywords:, voltage stabilization, reactive compensation,48-pulse STATCOM modeling

1.INTRODUCTION

The advent of FACTS system is giving rise to a new family of power electronics equipment for controlling and optimizing the dynamic performance of power system. These power electronic converters connected in parallel or in series with transmission lines bring the interaction between the compensating device and grid network. In this paper it deals with a novel cascaded multilevel converter model, which is 48 pulse GTO based STATCOM employing 4*12pulse voltage source converter is realized and employed to regulate the voltage in high voltage transmission system. They are three basic techniques for reducing the harmonics produced by the converter switching, harmonic neutralization using magnetic coupling, harmonic reduction using multilevel converter configuration and novel pulse width modulation switching techniques.
A three phase GTO VSI, and DC side capacitor. The AC voltage difference across this transformer leakage reactance produces reactive power exchange between the STATCOM and the power system at the point of interface. The voltage provide by a voltage source pulse width modulation inverter is always in quadrature to the STATCOM current.

2. METHODOLOGY

2.1 BLOCK DIAGRAM

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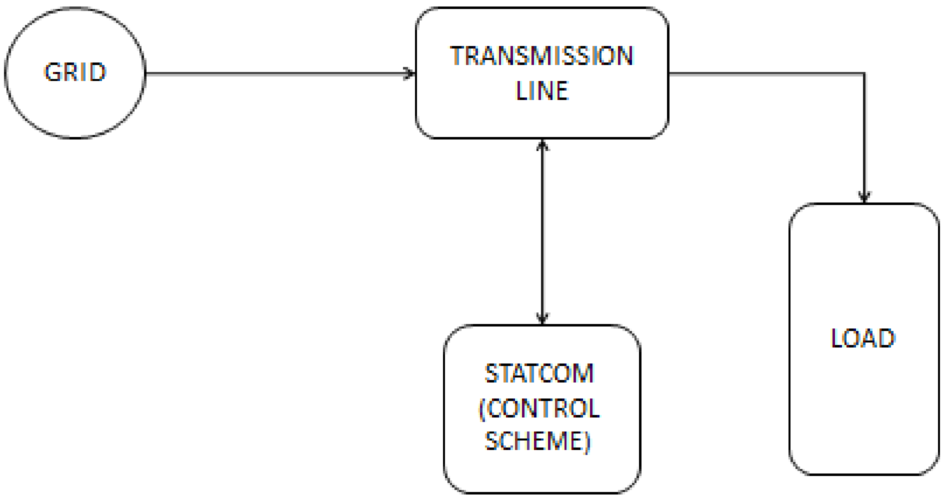

FIG(a). Block Diagram

The block diagram consists of Transmission line,Control Scheme,Electrical Grid and load.An electrical grid is an inter connected network for delivering electricity from producers to consumers it consists of generating stations that produce electrical power ,high voltage transmission lines that carry power from distant source to demand centres.It transmits the wave of voltage and current from one end to another end.it consists of underground transmission line and overhead transmission line.The transmission line is interconnected to the control scheme and then it is connected to the load. STATCOM is a shunt connected reactive compensation equipment which is capable of generating and /or absorbing reactive power whose output can be varied so as to maintain control of specific parameters of the electric power system and also it consists voltage source converter coupling reactors energy storage device. The STATCOM function is to regulate the bus voltage by dynamically absorbing or generating reactive power to the network. The load may be inductive or capacitive load.

2.2 DESCRIPTION

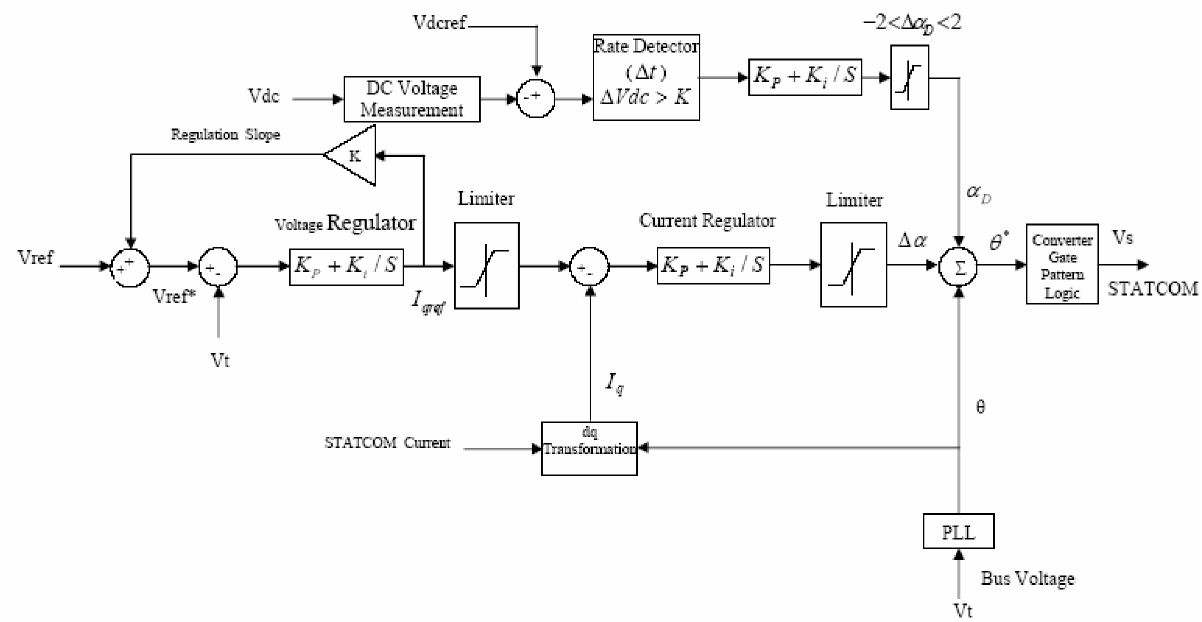

FIG (b). Simulation model

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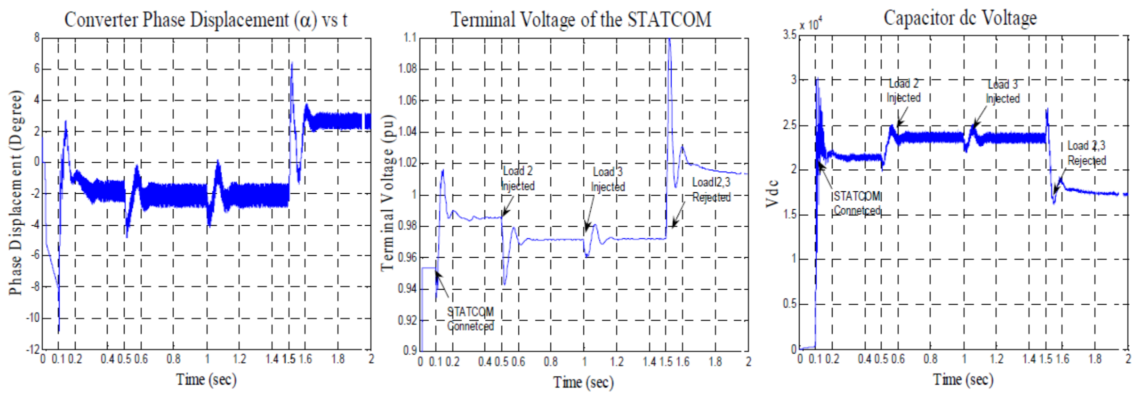
The operationof the full STATCOM model is studied in both capacitive and inductive modes in a power transmission system and load excursion, the control process is based on a novel decoupled current control stratergy using direct and quadrature current components of the STATCOM. In the decoupled controller requires “Electric Blocks” from the power system and control block from the Simulink power blockset library. A + 100MVAr STATCOM device connected to the 230KV distribution network.

The DC link voltage is provided with capacitor which is charged from the AC host network. Regulation loop consisting of reference current provide from the ac voltage regulator which is in quadrature and which control the reactive power. It can be chosen by rate of the variation of this DC voltage. The main concept is to detect any rapid variations in DC capacitor voltage and it is selected be very small and about 1ms.

3.RESULTS

- At t=0.1sec the STATCOM has connected to power system and it is switching on the circuit breaker CB_4 and STATCOM voltage lags transmission line voltage V_B.
- At t=0.5sec at this time P=0.7pu and Q=0.5pu with second inductive load two is added to the bus B_3 which require more reactive power compensation. The STATCOM small voltage phase displacement angle increases.
- At t=1sec at this time capacitive load three with P=0.6pu and Q=0.4pu added to the power system B_3 which require more reactive power. The injected reactive power is decreased by reducing the DC capacitor voltage.
- This result in the output of the PLL is angle which is used to measure the direct axis and quadrature axis component of the AC three phase voltage and current.



(a) (b) (c)

4.CONCLUSION

The dynamic simulation results have demonstrated the high quality of the 48 pulse STATCOM for reactive power compensation and voltage regulation while the system subjected to disturbances such as switching different types of loads.The principle of operation of the harmonic neutralized converters is explained in entitledThree phase 48 pulse GTO converter.This power 48 pulse GTO converter is accessible in power simulation.

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