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Enhancement in Active Power by the Application of Capacitor Compensation of a Three Phase Ac Transmission Line

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Abstract: *Shunt compensation, especially shunt reactive compensation has been widely used in transmission system to regulate the voltage magnitude, improve the voltage quality, and enhance the system stability. Shunt-connected reactors are used to reduce the line over-voltages by consuming the reactive power, while shunt-connected capacitors are used to maintain the voltage levels by compensating the reactive power to transmission line. In this paper a model has been simulated using FACTS and a comparison between all the parameters with and without compensation has been formulated.*

Keywords: *Compensation, System Stability, Reactive Power, Active Power, Voltage Regulation*

I. INTRODUCTION

The Simulink model designed using power system tool box of MATLAB is shown below in fig. 1. In this system a total of 12 scopes have been used to analyse the results of different parameters at different points of time. The description of all these scopes have been as given below:-

- Scope has been used to analyze the current waveform supplied by the current source.
- Scope 1 has been used to analyze the voltage output given by the voltage source.
- Scope 2 has been used to analyze the waveform of current before application of the filter.
- Scope 3 has been used to analyze the waveform of voltage before applying any load.
- Scope 4 has been used to analyze the waveform of compensated current.
- Scope 5 has been used to analyze the waveform of voltage drawn by the load.
- Scope 6 has been used to analyze the waveform of current before applying the load
- Scope 7 has been used to analyze the waveform of current drawn by the load after applying the load.
- Scope 8 has been used to analyze the waveform of power drawn by the load before compensation.
- Scope 9 has been used to analyze the waveform of voltage provided by the compensator.
- Scope 10 has been used to analyze the waveform of power drawn by the load after compensation.

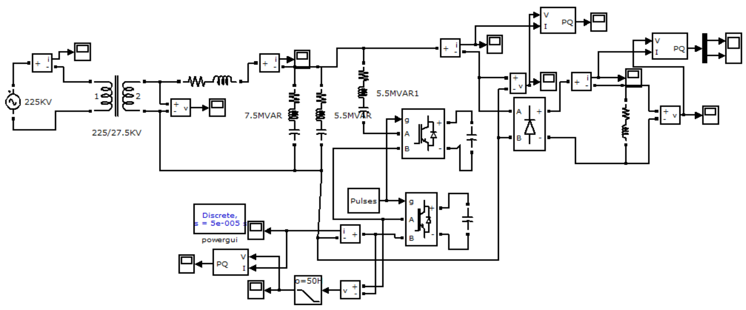


Fig.1 Simulink model of Shunt Voltage Capacitor Compensator

II. MODELLING & SIMULATION

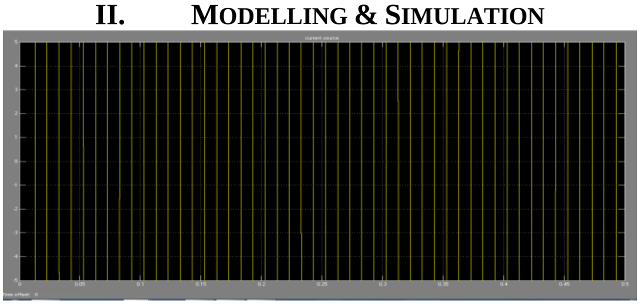


Fig. 2 Waveform for current supplied by the current source

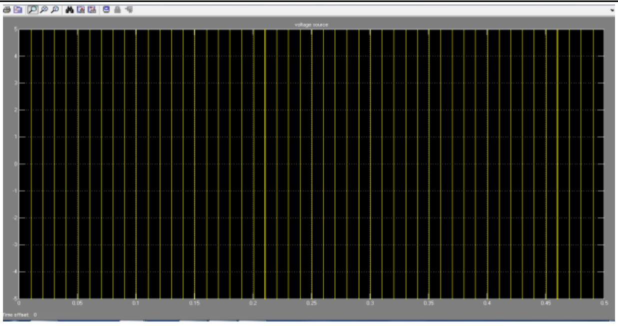


Fig.3 Waveform of the voltage output of the voltage source

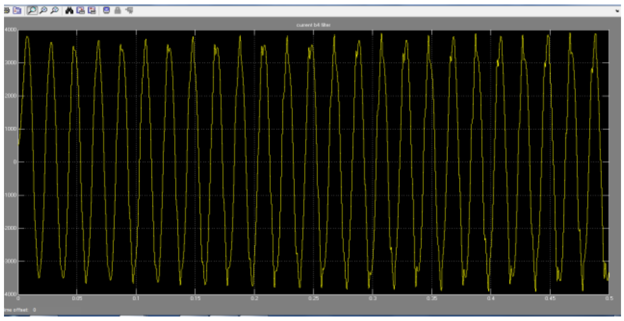
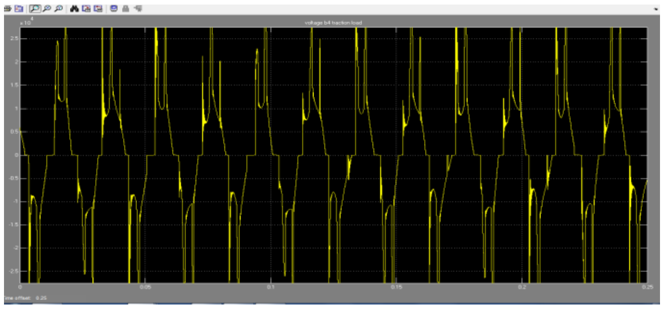


Fig.4 Waveform of current before application of filter



Fig,5 Waveform showing the voltage before applying any load

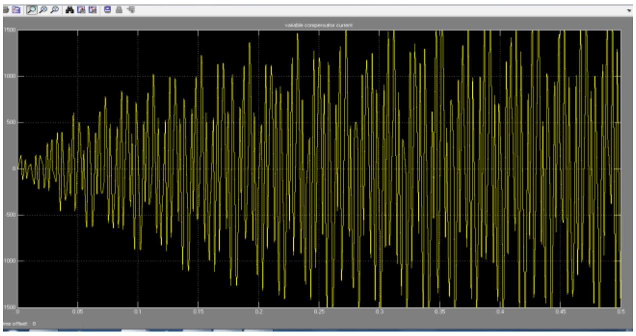


Fig.6 Compensated current waveform

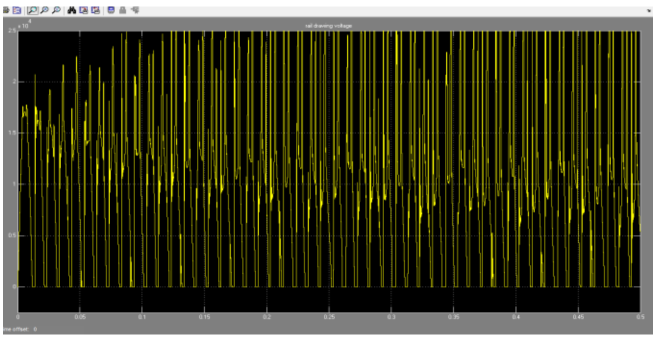


Fig.7 Waveform of voltage drawn by the rail

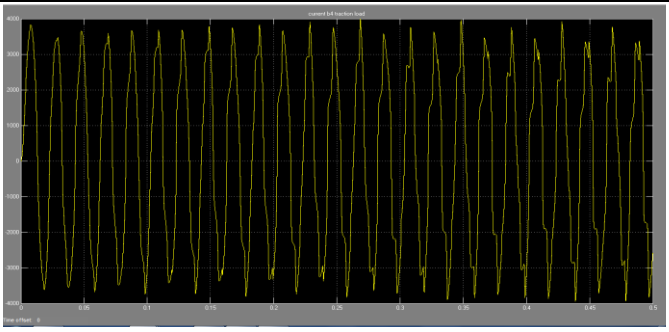


Fig.8 Waveform of current before applying the load

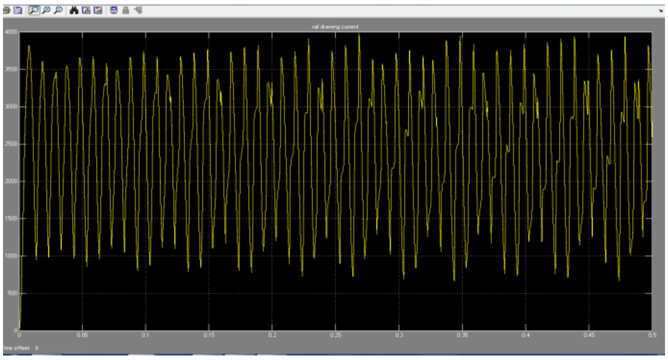


Fig.9 Current drawn by the rail after applying load

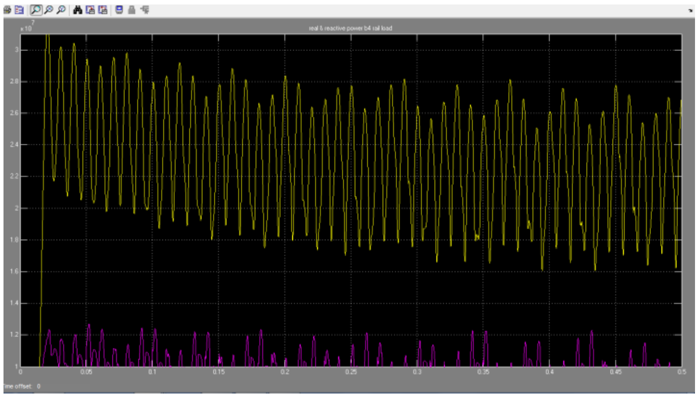


Fig.10 The waveforms showing the power drawn by the rail after applying the load, both reactive and active power content can be seen

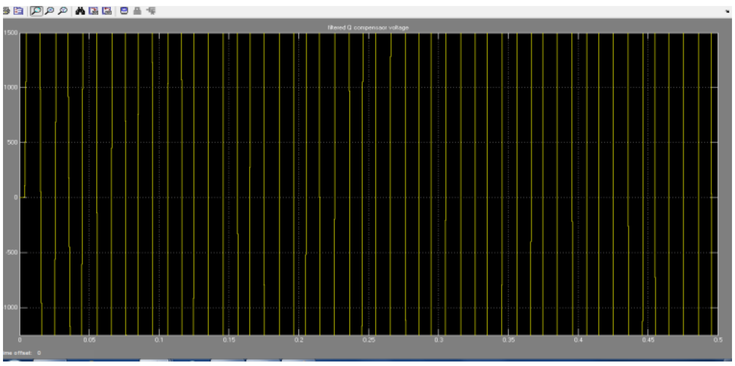


Fig.11 Voltage waveform by the compensator

III. RESULTS

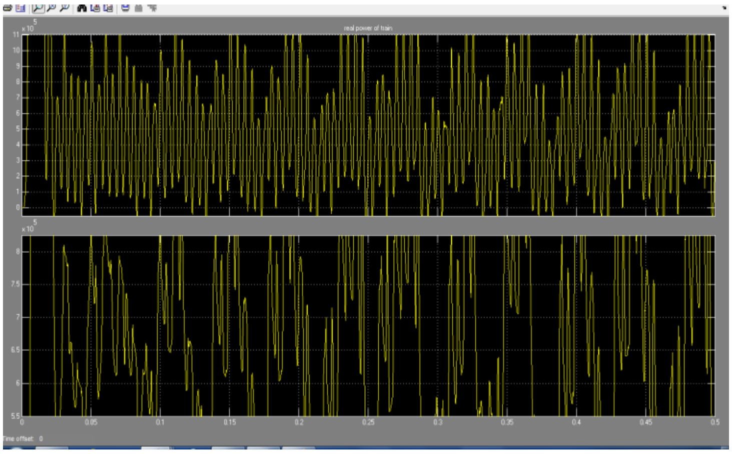


Fig.12 Real power drawn by the train after compensation

IV. FUTURE RECOMMENDATIONS

The protection of shunt capacitor banks uses simple, well known relaying principles such as over voltage, over currents. However, it still requires the protection engineer to have a good its protection. Unbalance is the most important protection in a shunt capacitor bank, but more work is to be done for it to provide fast and effective protection to assure a long and reliable life for the bank. To accomplish this goal, unbalance protection requires high degree of sensitivity that might be difficult to achieve. The main concept for the design of a shunt capacitor bank and its protection has to be further reviewed for more efficient output. The latest IEEE Guide for the Protection of Shunt Capacitors Banks shall be the guiding document when implementing a protection scheme to a shunt capacitor bank.

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