

# Review Paper on Applications of D-Statcom in Distribution System

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**Abstract-**In recent years the power quality problems is a big issue in distribution system. There are different types of problems in power quality. These problems are power factor, reactive power compensation and harmonic distortion. Different types of FACT devices like as SVC, STATCOM, IPC, DVR, UPFC, TCSC, TCPST and DSTATCOM can be used to solve these types of problems. But now a days D-STATCOM is using to mitigate these problems of power quality. It is a custom power device which is installed in parallel with distribution system. Regarding problems of power quality, these devices are used but for getting better response, D-STATCOM is used. There are various techniques and also control techniques are available for implement these problems. These techniques are PWM, SPWM, SVPWM, PDPWM (modulation techniques) and other techniques are Phase Shift Control, d-q theory, Synchronous Reference Frame (SRF) model etc. And with reference frame model using PI controller the DSTATCOM can be controlled. In this paper the applications of DSTATCOM are discussed. DSTATCOM can be used in distribution system, wind power, solar power generation and also used with fuzzy system. The simulation of test model was carried out with the help of SIMULINK & MATLAB software.

**Keywords:-** SVC, STATCOM, IPC, DVR, UPFC, TCSC, FACT, TCPST, DSTATCOM, SIMULINK, MATLAB.

## I. INTRODUCTION

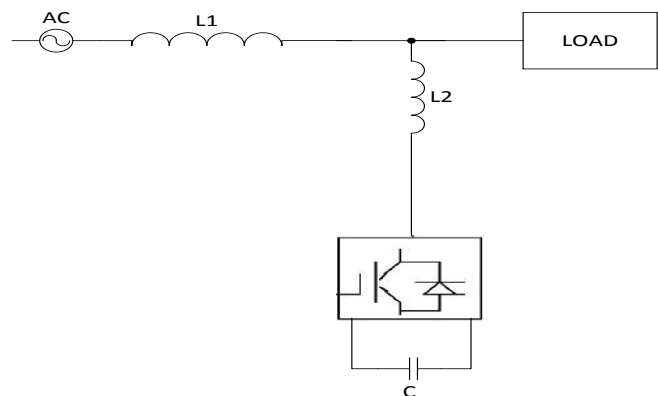
In the early days of power transmission due to reactive power unbalances, the problems like voltage deviation during load changes and power transfer limitation were observed. Most of the AC loads are consuming reactive power due to presence of reactance. Power quality is getting poor due to heavy consumption of reactive power. The development in fast and reliable semiconductor devices (GTO and IGBT) allowed new power electronic configurations to be introduced to the tasks of power Transmission and load flow control. Over the transmission parameters, the FACTS devices offer a fast and reliable control. Most widely known custom power devices are SVC, STATCOM, IPC, DVR, UPFC, TCSC, TCPST and DSTATCOM. Among them DSTATCOM is very well known and can provide cost effective solution for the compensation of reactive power and unbalance loading in distribution system. DSTATCOM is capable to inject a current into the system to correct the power factor and reactive power compensation and harmonics reduction. In this paper the test model of DSTATCOM is showed in simulation to observe how DSTATCOM works. The DSTATCOM applications are mainly for sensitive loads that may be drastically affected by fluctuations in the system voltage.

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## II. DISTRIBUTED STATIC COMPENSATOR (DSTATCOM)

The Distributed Static Compensator (DSTATCOM) is used in distribution system for reactive power compensation and to reduce harmonics. DSTATCOM is connected in parallel with transmission lines. For example if we are transmitting sum of power through transmission lines and at receiver end we are receiving it with some noise or any other interruption that means losses are there. These may be reactive power, voltage sag and harmonics. So we use DSTATCOM for reactive power compensation and also mitigate the voltage fluctuations. For the faster control Voltage Source Converter (VSC) can be used with Pulse Width Modulation (PWM) to mitigate the voltage fluctuations and other modulation techniques or other converter can be also used with DSTATCOM. And DSTATCOM is used to mitigate harmonics, power quality improvement and reactive power compensation in distribution system.



**Fig. 1 Basic Configuration of DSTATCOM**

## III. ADVANTAGES OF DSTATCOM

- 1.) DSTATCOM is used in voltage regulation in distribution line.
- 2.) It is also used to improve power factor as unity.
- 3) It is also used to mitigate harmonics in distribution system.
- 4.) DSTATCOM can be also used for load balancing.

## IV. DISADVANTAGES OF DSTATCOM

- 1.) The consumption of reactive energy will be important.
- 2.) In transmission lines the voltage drop can be big but their distance would matter.

V. VOLTAGE SOURCE CONVERTER

A Voltage Source Converter (VSC) is a power electronic device; this voltage source converter can generate a sinusoidal voltage with any required phase angle, frequency and also for magnitude. Voltage source converters are most widely used in variable-speed drives and also be used to decrease the voltage drops. For completely replace the voltage, the VSC is used to inject the ‘missing voltage’. The ‘missing voltage’ is the difference between the transient wave and the actual sine wave. The converter is a solid state electronics device that supplies DC to the converter. The VSC is an energy storage device. The VSC is used with DSTATCOM for power quality problems like as harmonics and fluctuation.

VI. TEST MODEL & RESULTS

In this paper the test model is shows in simulation. This model is used for DSTATCOM to determine that how DSTATCOM can work in distribution system. The complete configuration of test model as follows in figure 2 on the next page and here the result shows in figures 3, 4 & 5 and it is a simulink diagram for transmission lines in distribution network. In this paper it is shows that how DSTATCOM works in distribution network and controls the voltage and current parameters. In figure 3 the values of voltage and current shows at the input and inverted current. In 4<sup>th</sup> figure there are four parameters like as reference, dc voltage and modulation index. And in 5<sup>th</sup> figure the values of power, voltage and current shows. In this figure it is shows that the DSTATCOM working and current is sinusoidal.

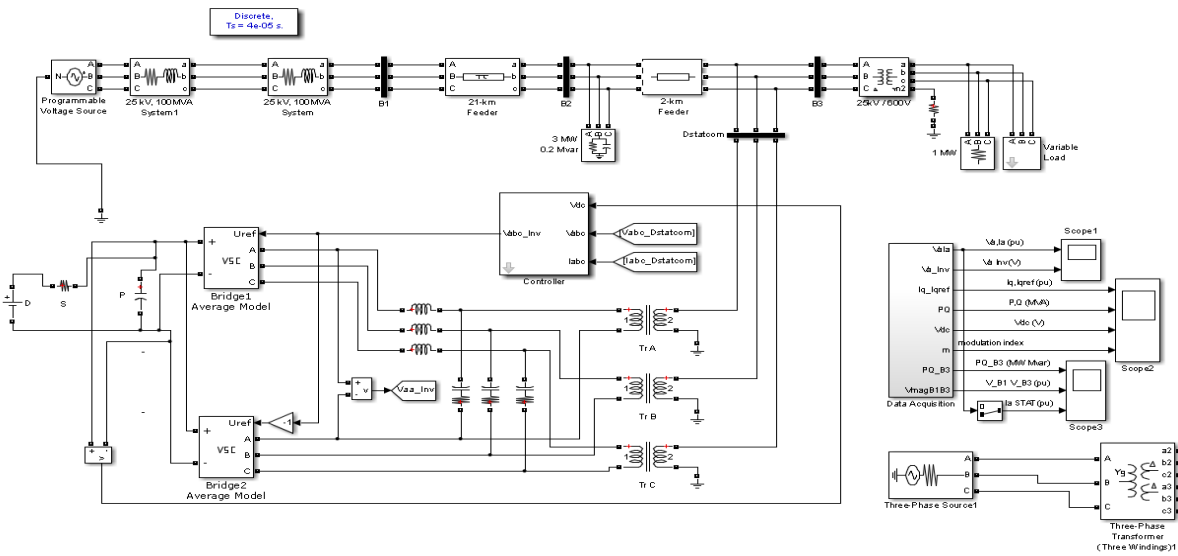


Fig. 2 Test Model of DSTATCOM

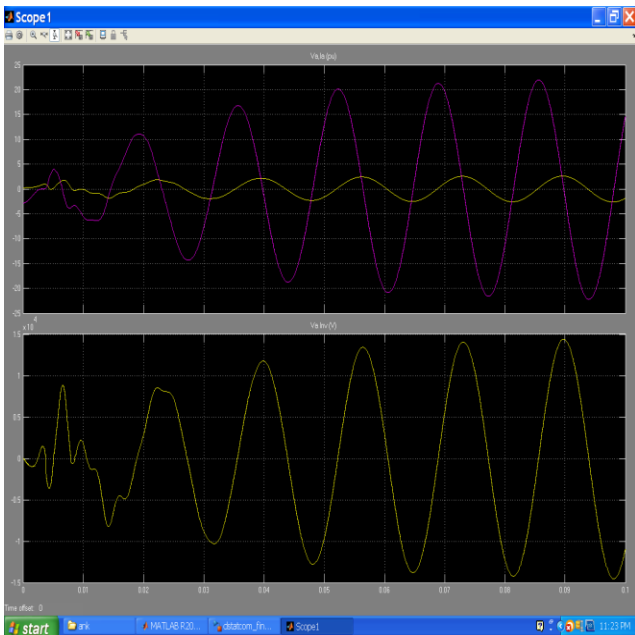


Fig. 3 Voltage and Current at Input and Va Inverted

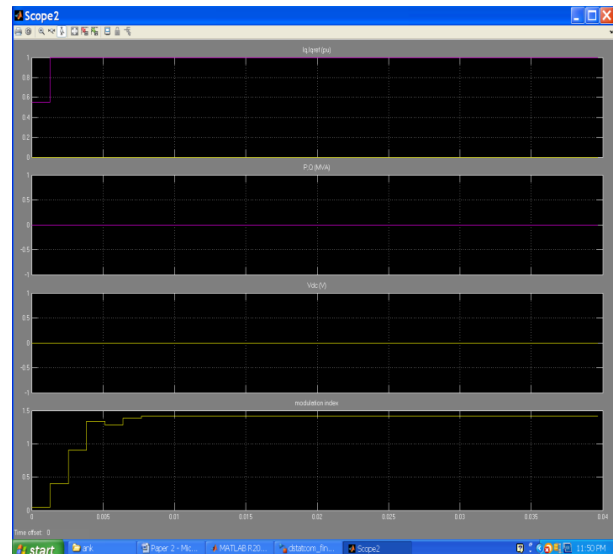
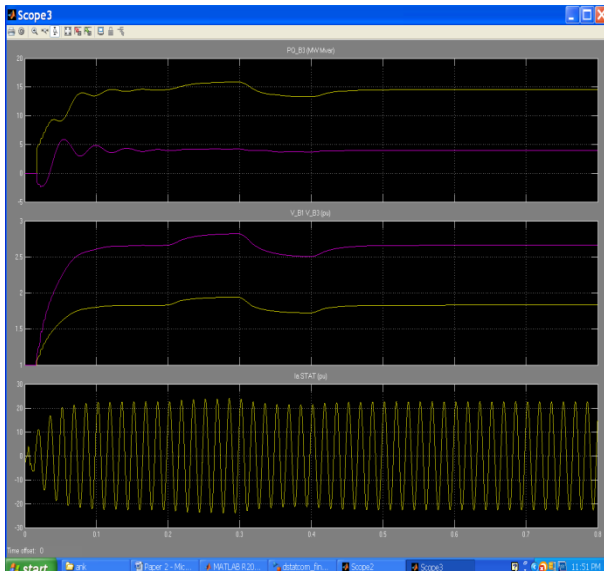


Fig. 4 Reference Current, dc Voltage, P.Q (MVA) and Modulation Index

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**Fig. 5 Values of Power, Voltage and Current**

## VII. CONCLUSION

In this paper the applications of DSTATCOM is shown in distribution network. DSTATCOM is different from the other FACTS devices and it can be used in many applications. DSTATCOM belongs to FACTS devices and these devices have different configuration but now a day's DSTATCOM is using in custom power device because it gives better response than other FACTS devices. The concept of DSTATCOM is similar to STATCOM but in addition DSTATCOM can also be used for reactive power compensation. So now it is clear that DSTATCOM is used in many applications. In distribution system DSTATCOM will be very helpful because these power quality problems will increase for different systems.

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