

POWER QUALITY IMPROVEMENT IN DISTRIBUTION SYSTEM USING D-STATCOM

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Abstract: Energy quality is a major concern in the distribution system. There will be obstacles to achieving a transfer of reactive power in the distribution system due to a wide power angle, even with a substantial voltage magnitude gradient. Here, a DSTATCOM is almost new as a FACTS device capable of compensating for reactive power. D-STATCOM is a three-phase voltage voltage converter that is used to reimburse the upright voltage of the household appliance for irresistible and start-up reactive power. Here the Simulink model and the control system are designed in the territory of the simultaneous MATLAB connection. Here is also the modeling of D-STATCOM.

I. INTRODUCTION

Vitality quality is a lot of electrical limits that enable the piece to work in a normal way without a noteworthy loss of execution or valuable life. The electrical gadget, for example, an electric engine, a transformer, a generator, a PC, a printer, a specialized gadget or a family apparatus. Every one of these gadgets and others respond adversely to vitality quality issues, contingent upon the seriousness of the issues. Responsive power can't be transmitted through a wide power point, even with a significant voltage extent inclination. Receptive power must be created close to the point of utilization. We can complete a few motivations to limit

- It is wasteful amid the exchange of genuine high power and requires a considerable voltage extent angle.
- Causes high genuine and receptive power misfortunes.
- May harm the accompanying burden rejects because of brief overvoltage.
- Requires bigger gear for transformers and links.

Hence, a D-STATCOM is utilized as a FACTS sidestep gadget. A synchronous static circulation. The compensator (D-STATCOM) is a quick reaction strong state control controller that gives adaptable voltage control in point-to-direct association toward utility power supply for PQ enhancements. It is conceivable to change the transport voltage by retaining or producing receptive vitality from the framework to the converter and from the converter to the framework at the normal coupling point.

II.DSTATCOM

Circulated static compensator (DSTATCOM) is a static voltage based inverter compensator utilized for responsive power remuneration and voltage guideline. The association (branch) to the dissemination organize happens through a standard electrical circulation transformer. The DSTATCOM is fit for creating a constantly factor remuneration to surpass the most extreme estimation of MVA capacitive or inductive dimension shifter. The DSTATCOM persistently checks the waveform of the line concerning a reference AC flag and, in this manner, ready to give the right measure of responsive development remuneration present or deferred to diminish the measure of voltage variances. The primary segments of a DSTATCOM appeared in Fig. 1. It comprises of a DC capacitor, at least one VSC units, an AC channel, a coupling transformer for correspondence with the inverter yield line voltage and Strategy of PWM control. In this execution of DSTATCOM a voltage inverter changes over an immediate voltage into a substituting stage voltage is synchronized and associated with the mains through a little interfacing reactor and a capacitor

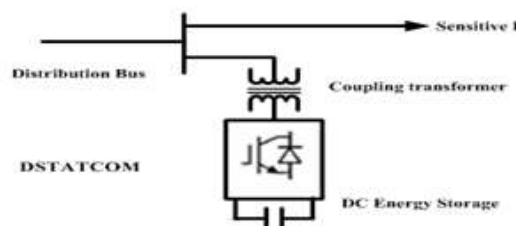


Figure 1. Basic block diagram of DSTATCOM

A voltage converter is associated with the transport through a three-stage transformer. A voltage converter is an electronic power gadget, which can create a sinusoidal voltage with the required recurrence and stage edge. The VSC is used to absolutely displace the voltage or to implant the missing voltage. Here the missing voltage is the complexity between the apparent voltage and the certified voltage. The strong state hardware in the converter are changed to get the ideal yield. The arrangement of channels on the inverter yield to ingest the sounds. A capacitor is utilized as a DC voltage hotspot for the inverter. PCC is the normal point. The coupling with the assimilation of the receptive power happens from and towards the framework and the gadget. At the dimension of appropriation voltage, the exchanging gadget is commonly the IGBT because of lower exchanging misfortunes and decreased measurements. D-STATCOM has the preferred standpoint that different gadgets, for example, the traditional SVC can work at a lower voltage and don't deliver lower request music

III. FUNCTION OF DSTATCOM

The basic operating principle of STATCOM is explained with the help of Fig. 2. The voltage converter yield voltage (V_i) is stage controlled with the framework voltage (V_s), as appeared in this figure, and the STATCOM yield current (I) differs relying upon V_i .

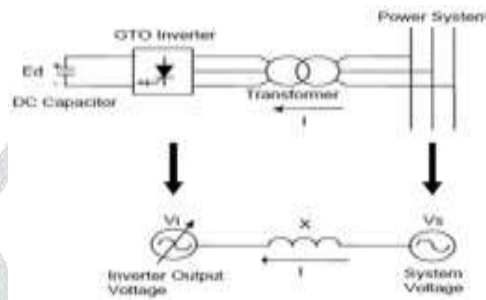


Figure2. Basic operating principal of DSTATCOM

On the off chance that V_i is equivalent to V_s , at that point receptive vitality isn't conveyed to the vitality framework. In the event that V_i is more noteworthy than V_s , the stage edge of I is prompting the stage edge of V_s by 90 degrees. Subsequently, the principle receptive power streams from the STATCOM (capacitive mode). On the off chance that V_i is not as much as V_s , the stage edge of I is postponed concerning V_s by 90 degrees.

Thusly, the deferred receptive power streams into the STATCOM (inductive mode). The measure of responsive power is corresponding to the voltage distinction among V_s and V_i . Note this is a similar essential working guideline as a synchronous rotating capacitor.

Fig 3 shows the DSTATCOM operation under different operating conditions a) capacitive mode b) inductive mode.

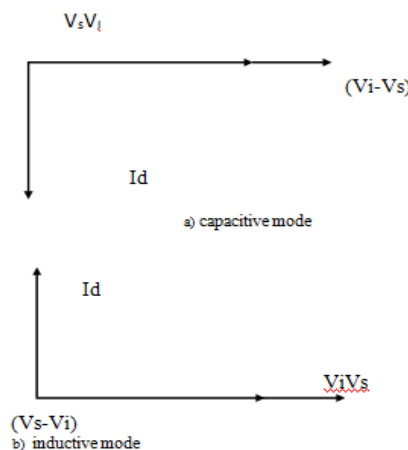


Figure3. DSTATCOM operation

II. MATLAB APPROACH

A distribution system supplying a balanced and linear load is taken up for MATLAB simulation. The system diagram is shown in Fig 4

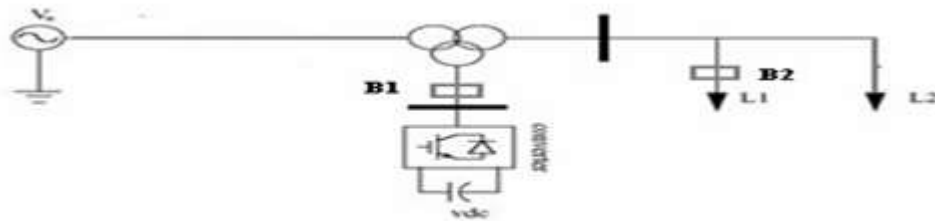
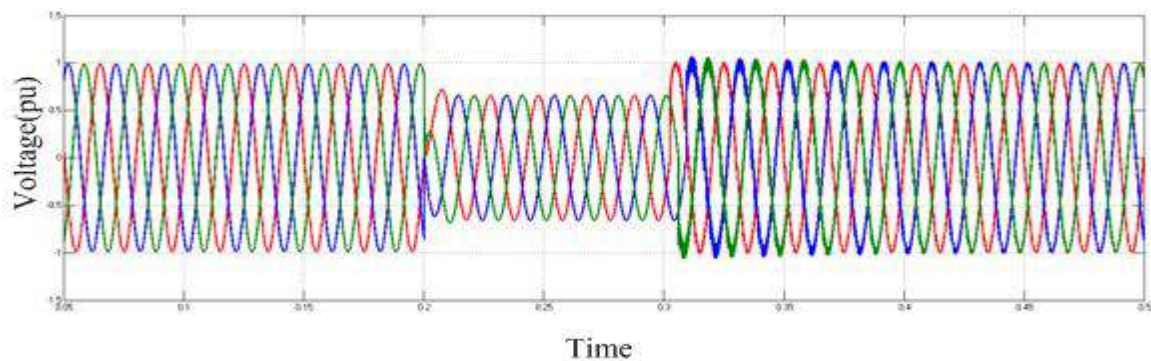


Figure4. System diagram

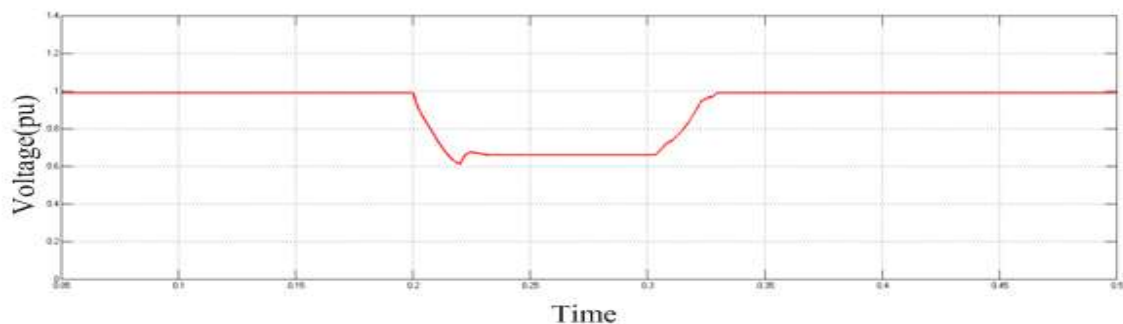
The test framework appeared in figure 4. Incorporates a 230 kV, 50 Hz transmission framework, spoken to by a Thevenin comparable, which nourishes the essential side of a 3-winding transformer associated in Y/Y/Y, 230/11/11 kV. A variable burden is associated with the auxiliary side of the 11 kV transformer. A two-level D-STATCOM is associated with the 11 kV tertiary twisting to give prompt voltage backing to the heap point. A 750 μF capacitor on the DC side gives the vitality stockpiling abilities of the D-STATCOM. The switch 1 is utilized to control the time of activity of the D-STATCOM and the switch 2 is utilized to control the association of the heap 1 to the framework.

RESULTS AND ANALYSIS

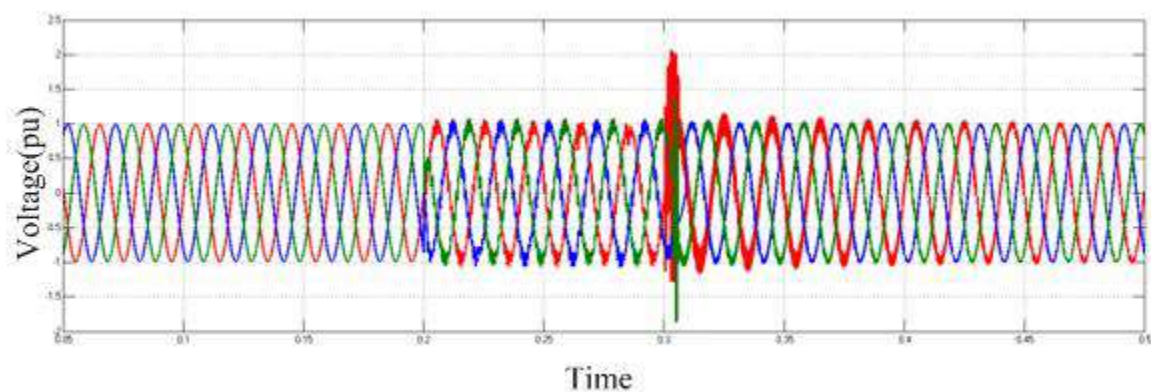
For the case of low voltage drop of the result (a) load voltage under fault conditions without compensation (b) voltage magnitude in fault condition without compensation (c) load voltage in fault condition after compensation (d) voltage magnitude in fault condition after compensation. (e) Current injected by D-statcom



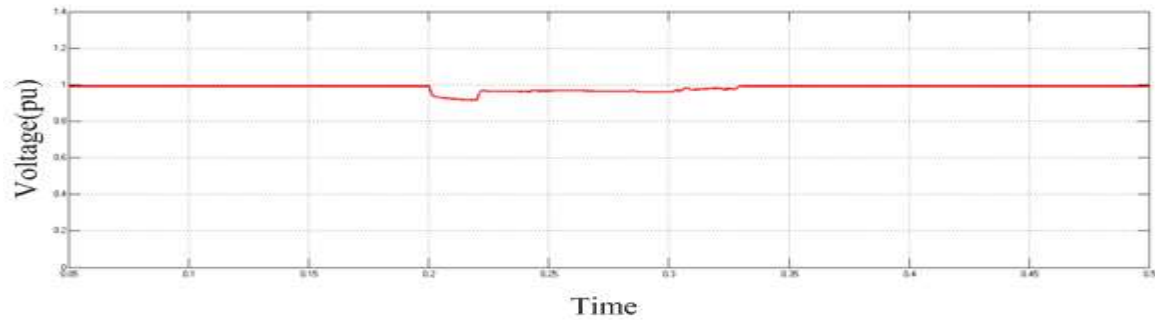
(a) load voltage under fault condition without compensation



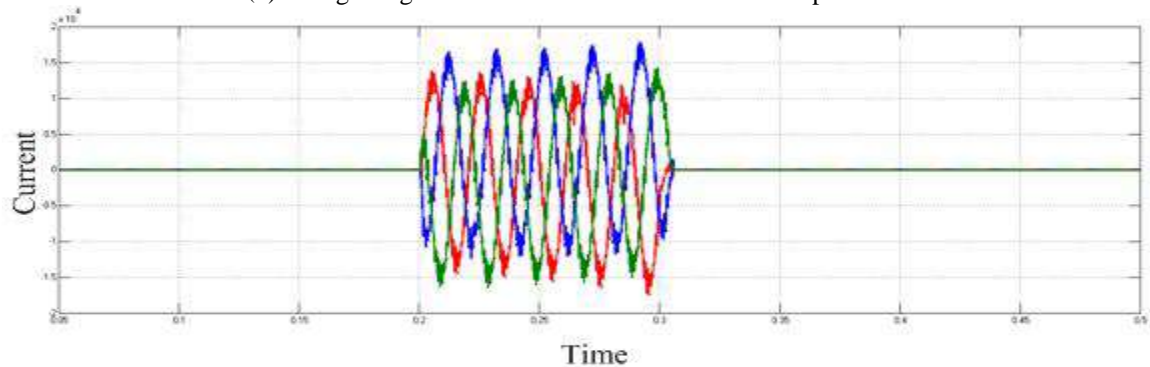
(b) voltage magnitude under fault condition without compensation



(c) load voltage under fault condition after compensation



(d) voltage magnitude under fault condition after compensation



(e) current injected by D-statcom

CONCLUSION

The model of a D-STATCOM has been analyzed and developed for use in simultaneous connection environments with power system blocks. Thus from the previous waveforms obtained, it was concluded that DSTATCOM can improve the energy quality problems in the distribution system. It can adjust the load of the load bus and compensate the reactive power when the linear loads are connected to the system and, therefore, improves the reliability of the system.

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