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AN IMPROVED DSTATCOM TOPOLOGY TO COMPENSATE NONLINEAR LOADS

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ABSTRACT

Traditionally, static capacitors and passive filters have been applied to improve power quality (PQ) in a distribution system. However, those normally have issues such as constant compensation, system parameter dependent outcome, and possible resonance with line reactance. A distribution static compensator (DSTATCOM) has been proposed in the literature to triumph over those drawbacks. It inserts reactive and harmonics element of load currents to make supply currents balanced. Normally, the dc-link voltage is maintained at lots higher value than the maximum value of the phase-to-neutral voltage in a 3-section 4-wire system for excellent compensation (in a 3-section 3-wire system, it is higher than the phase-to-phase voltage). But, a higher dc-link voltage will increase the rating of the VSI, makes the VSI heavy, and effects in better voltage rating of insulated gate bipolar transistor (IGBT) switches. It leads to the growth in the cost, size, weight, and power rating of the VSI.

KEYWORDS: DSTATCOM, VSI, Non linear Loads, power etc.

INTRODUCTION:

Power quality is a measure of the vigorousness of electricity to patron devices. Synchronization of the voltage frequency and phase build the scheme to utility of their proposed way with no substantial lack of recital. The term is used to explicate electric power that drives an electrical load and the load's capacity to function well. Without the appropriate electricity, an electrical device (or load) may also malfunction, fail in advance or not function at all. There are numerous approaches wherein electric power can be of poor quality and lots of more reasons of such poor quality power. The electricity then moves through the wiring system of the end consumer till it reaches the burden. The complexity of the system to move electric energy from the point of production to the point of consumption blended with variations in weather, generation, demand and different factors offer many possibilities for the quality of supply to be compromised. While "power quality" is a convenient term for lots, it is the quality of the voltage—instead of power or electric current—that is in reality defined by the term. Power is sincerely the flow of energy and the current demanded by a load is basically uncontrollable.

LITERATURE SURVEY:

This paper gives a control set of rules based totally on enhanced phase-locked loop (EPLL) for distribution static compensator (DSTATCOM) to compensate reactive power, to offer load balancing, to remove harmonics, to improve power factor, and to regulate factor of common coupling (p.c) voltages below linear and nonlinear loads. In this technique, an extraction of essential active and reactive power additives of load currents for the estimation of source currents consists of a signal-processing set of rules based on the EPLL scheme. The proposed control set of rules is applied using a digital signal processor

The some other approach an implementation of a 3 phase distribution static compensator (DSTATCOM) using a back propagation (BP) control set of rules for its features including harmonic removal, load balancing and reactive power compensation for power factor correction, and zero voltage regulation below nonlinear loads. A BP-based totally control set of rules is used for the extraction of the elementary weighted value of active and reactive power additives of load currents that are required for the evaluation of reference source currents. A prototype of DSTATCOM is developed the use of a digital signal processor, and its overall performance is studied under various working circumstance

DSTATCOM:

DSTATCOM [1] is a voltage source converter (VSC) this is linked in shunt with the distribution system with the aid of a tie reactance related to compensate the burden current. In general, a coupling transformer is set up among the distribution system and the DSTATCOM for separating the DSTATCOM from the distribution system. Further, the tool needs to be set up as near the sensitive load as possible to maximise the compensating functionality. Being a shunt linked device, the DSTATCOM specially injects reactive power to the system. The function of DSTATCOM is useful for a frail AC system [2]. The structure of DSTATCOM is shown in

figure 1. The system schemes of DSTATCOM are in brief defined as follows:

ISOLATION TRANSFORMER:

It provides isolation between the DSTATCOM circuit and the distribution network.

VOLTAGE SOURCE CONVERTER

A voltage source converter comprise of a storage mechanism and devices of switching, generating a sinusoidal voltage at any required frequency, magnitude and phase angle.

DC CHARGING UNIT:

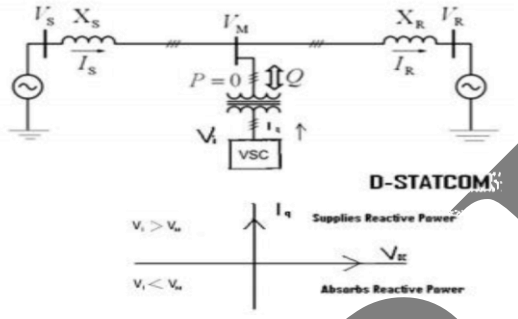
This is useful for charging of the source. It also retains the dc link voltage at the ostensible rate.

HARMONIC FILTERS:

It is used to reduce the harmonics by filtering action.

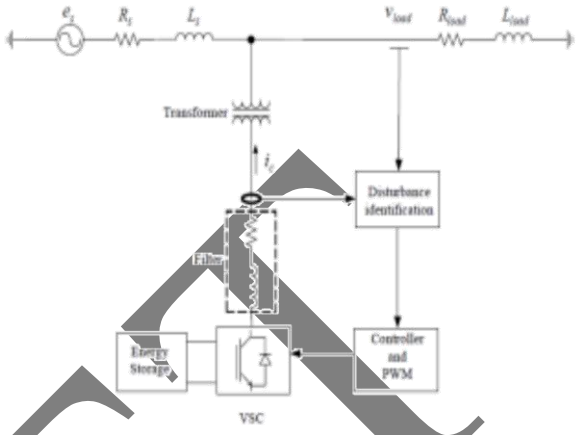
ENERGY STORAGE UNIT:

Storage of electrical energy is necessary by various means.

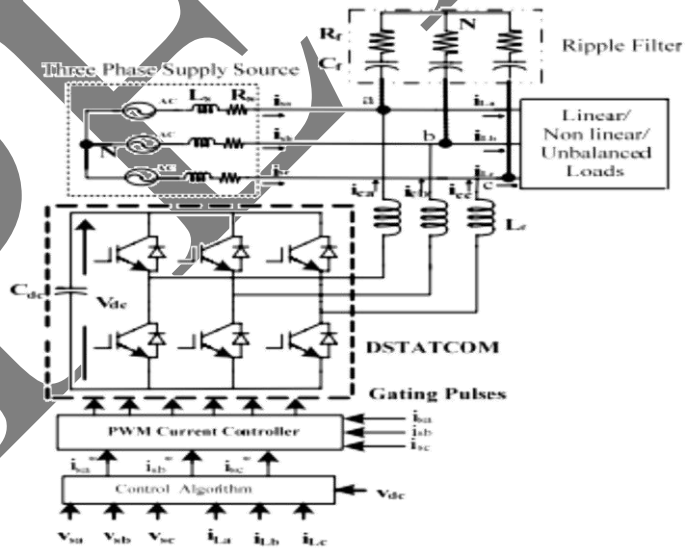


Structure and operating modes of DSTATCOM

The effectiveness of the DSTATCOM in correcting the fault relies upon the value of Z th or fault level of the load bus. Whilst the shunt supplied current Ish is ready in quadrature with VL, the favored correction of voltage can be accomplished without injecting any active power into the system. as an alternative, while the value of Ish is decreased, the identical correction of voltage can be accomplished with minimum apparent power injection into the system. The contribution of the DSTATCOM to the load bus voltage equals the injected current times the impedance visible from the device additionally, that is the source impedance in parallel with the load impedance. The capability of the DSTATCOM to compensate the voltage dip is constrained by way of this available parallel impedance. It facilitates to lessen the voltage fluctuations at the p.c (point of common coupling) [5], [6]. Voltage dips can be mitigated by means of DSTATCOM, which is primarily based on a shunt connected voltage source converter. VSC with pulse-width modulation (PWM) gives fast and reliable control for voltage dips mitigation. The topology of the DSTATCOM connected at distribution stage. Inside the proposed model, the application of DSTATCOM to enhance the power quality in a distribution network with single Line to ground (SLG) fault and Double phase to ground (DPG) fault and three-phase fault is investigated.



System scheme of DSTATCOM



Schematic diagram of DSTATCOM control strategies

Objectives of any compensation approach

1) Excellent performance,
2) Fast response,
3) Flexible
4) Easy implementation

The control strategies of a DSTATCOM are specifically applied in the following steps.

Measurements of the system variables and signal conditioning

Extraction of reference compensating signals generation of firing pulses for switching devices. The generation of proper pulse width modulation (PWM) firing is the maximum essential part of DSTATCOM control and it has a tremendous impact on its compensation objectives, transient and steady state performance. A PWM primarily based distribution static compensator gives faster response and capability for harmonic removal

[18]. This section discusses the subsequent control schemes of a DSTATCOM for power factor correction and harmonic mitigation primarily based on

1) Phase shift control
2) Indirect decoupled current control
3) Regulation of AC bus and DC link voltage

CONCLUSION:

The simulation effects given that decrement of dc-link voltage, filter inductance, current via the shunt capacitor and damping power loss are decreased with DSTATCOM with LCL filter out followed with the aid of series capacitance. This contribution shows decrement in cost, weight, size, and power rating of the conventional DSTATCOM topology. Effectiveness of the proposed topology has been verified via large computer simulation.

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