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MITIGATION OF POWER QUALITY ISSUES IN DISTRIBUTION SYSTEM USING D-STATCOM

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I. ABSTRACT

Electric problems always occur regarding of time and place. This may cause an impact to the electric supply and thus may affect the manufacturing industry and impede the economic development in a country. The increased concern for power quality has resulted in measuring power quality variations, studying the characterizing of power disturbances and providing solutions to power quality problems. The aim of this work is to improve the power quality for Distribution System with D-STATCOM .Power quality is the combination of voltage quality and current quality. Power quality is the set of limits of electrical properties that allows electrical systems to function in their intended manner without significant loss of performance or life. The electrical power quality is more concerned issue. The main problems are stationery and transient distortions in the line voltage such as harmonics, flicker, swells, sags and voltage asymmetries.

Recently, the Power electronics controllers are gaining concern to provide the quality of power for both power suppliers and consumers. Various power filtering technology i.e. passive filters, active power filters, hybrid filters have applied from time to time for giving the solution of power quality problems to users, But could not fully satisfied them.

Now day's a new concept of custom power is used for customers' satisfaction. D-STATCOM would be very useful for researchers dealing with power quality problems which is the most efficient and effective modern custom power device used in power distribution networks. D-STATCOM injects a current in to the system to correct the voltage sag and swell. The control of the Voltage Source Converter (VSC) is done with the help of SPWM.

Performance of D-STATCOM depends on controlling algorithms. In this dissertation a comparative study has been done for controllers of the D-SATCOM with linear as well as non-linear loads. SRF strategy generates unit vectors from the grid voltage and operates a voltage source inverter. It uses co-ordinate transformations to generate the current reference .This dissertation presents power quality improvement in the form of Power Factor Correction, Harmonic reduction and reactive power compensation using DSTATCOM and simultaneously Simulink models which are based on the Voltage Source Converter (VSC) principle have been developed.

II. INTRODUCTION

One of the fundamental obligations of an utility framework is to supply electric power as sinusoidal and streams with suitable extents and recurrence for the clients at the purposes of basic coupling (PCC). In spite of the fact that the created voltage of synchronous machines in force plants are practically sinusoidal, some unsighted conditions, for example, lightning and short out flaws and nonlinear burdens cause consistent state slip or transient voltages and current unsettling influences. For example, electric curve heaters cause voltage changes, power electronic converters produce current sounds and mutilate voltage waveforms, and short-circuits deficiencies bring about voltage lists and swells. The other hand most client loads, for example, PCs, microcontrollers and healing centre gear are touchy and unprotected to power quality unsettling influences and their fitting operation relies on upon the nature of the voltage that is supplied to them.

These days, electric force frameworks are under developing anxiety, more mind boggling to work, and more precarious with unscheduled/uncontrolled force streams and higher misfortunes. The explanation for is higher interest and less era and in addition imperatives on the development of new lines. Then again, various high-voltage power frameworks are working underneath their warm evaluations due to voltage and steadiness limits. Traditional electric force conveyance frameworks, by and large, are not intended to handle the control necessities of complex, profoundly interconnected force frameworks. This circumstance requires the audit of customary force conveyance strategies and rehearses and the formation of new ideas. These strides would permit the utilization of existing lines up to their full abilities without decrease in framework solidness and security. Another reason that is compelling the survey of ordinary force exchange strategies is the propensity of present day power frameworks to take after the changing worldwide economy. Driving pattern of deregulation of electrical force showcases because of the changing worldwide economy is empowering rivalry between utilities.Deregulation of electric force industry obliges adaptable control of force stream that may be practically achieved by utilizing imaginative force gadgets innovation. Improvements in force gadgets innovation have prompted outline power hardware gear that may be utilized as a part of high voltage frameworks. The force gadgets association in force framework has a long convention. It has been being used for high voltage direct current (HVDC) power transmission where, electronically controlled force converters permit the force streams according to administrator activities. Henceforth HVDC line can be utilized to its warm limit. In any case, HVDC is extravagant for general utilize, and is just sparing when power frameworks in distinctive locales isolated by long separations are interconnected. This is conceivable just by guaranteeing a continuous stream of force at legitimate voltage and recurrence levels. As an aftereffect of this, FACTS gadgets and Custom force gadgets are acquainted with electrical framework to enhance the force nature of the

electrical force. With the assistance of these gadgets we are fit to lessen the issues identified with force quality.

III POWER QUALITY IN DISTRIBUTION SYSTEM

The vast majority of the more imperative universal gauges characterize power quality as the physical attributes of the electrical supply gave under typical working conditions that don't upset or aggravate the client's procedures. Subsequently, a force quality issue exists if any voltage, current or recurrence deviation brings about a disappointment or in an awful operation of client's gear. Notwithstanding, notice that the nature of force supply suggests essentially voltage quality and supply unwavering quality. Voltage quality issues identify with any disappointment of gear because of deviations of the line voltage from its ostensible attributes, and the supply dependability is described by its ampleness and accessibility.

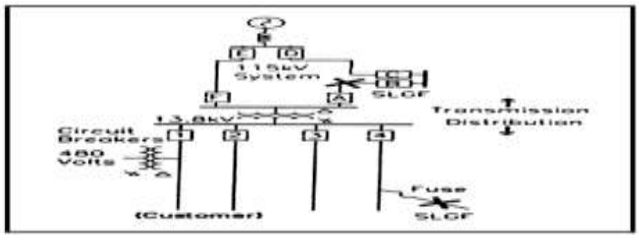
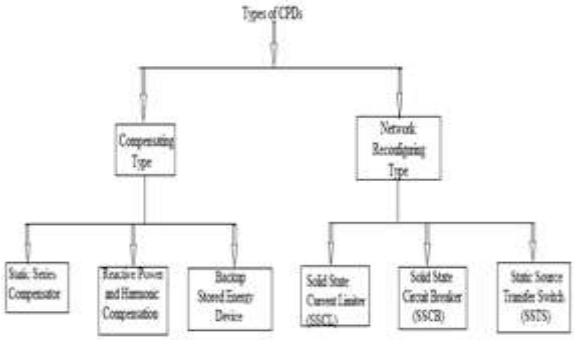


Fig. Power Quality in Distribution System

IV Types and configurations of CPDs



SSCL, SSCB, and SSTS are the most illustrative in this classification. SSCL is a GTO based gadget that embeds an inductor in arrangement with the force framework and limits the flaw current and once the deficiency is cleared the inductor is expelled from the circuit. SSCB goes about as a security gadget. It secludes the broken circuit from the force framework. SSTS exchanges quickly the heap from the blamed line to an option line to secure a delicate burden. Because of the utilization of GTO or thyristors in these gadgets, they are in this way called "strong state" devices.

The remunerating sort gadgets are utilized for dynamic sifting; burden adjusting, force element rectification and voltage regulation. The group of remunerating gadgets incorporate DSTATCOM ,DVR and UPQC

DISTRIBUTION STATCOM (D-STATCOM)

Distributed static compensator is a parallel voltage controller, which is schematically depicted in figure consists of a filter, VSC, a direct current energy storage gadget, a coupling transformer connected in shunt to the distribution network through a coupling transformer. The voltage source converters the direct current

voltage across the storage device into a set of 3-phase ac output voltages. These voltages are in phase and coupled with the alternating current system through the reactance of the coupling transformer. D-STATCOM has the same structure as that of an STATCOM. It can be used in the context of FACTS at the transmission level, custom power controllers at the distribution level and in end users' electrical installations. A coplicatedl configuration of a voltage source controller based D-STATCOM is shown in Fig. The DSTATCOM has emerged as a promising CPD to provide not only for voltage sag mitigation but a host of other PQ solutions. Important applications of it include voltage regulation, load balancing, power factor correction, harmonic filtering, and flicker mitigation. In general, the functions of DSTATCOM are reactive power compensation, harmonic elimination, along with load balancing in the distribution system in PFC and ZVR modes of operation.

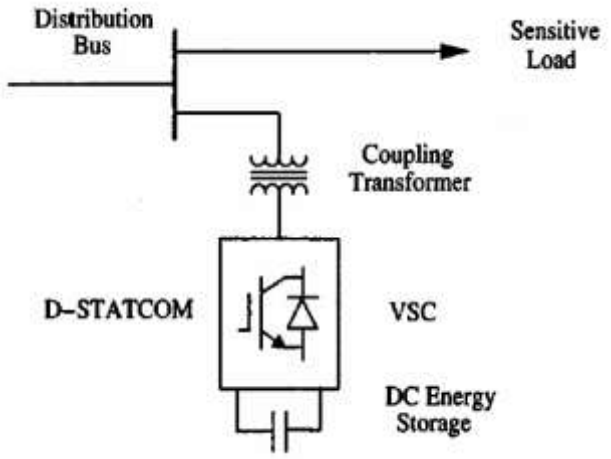


Fig. Schematic representation of the D-STATCOM as a custom power Device

BASIC PRINCIPLE AND OPERATION OF D-STATCOM

A DSTATCOM is a controlled reactive source, which includes a VSC and a direct coupling link capacitor connected in parallel, capable of generating and absorbing reactive power. The principles of a DSTATCOM are based on the equivalence of the conventional rotating synchronous compensator.

The alternating current terminals of the VSC are connected to the Point of Common Coupling through an inductance, which could be a filter inductance of the coupling transformer

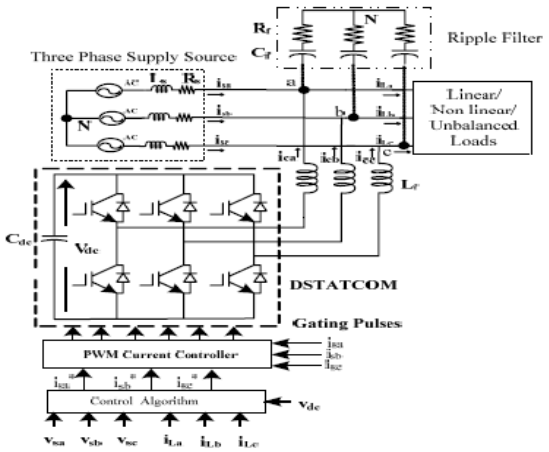


Fig. Block diagram of complete D-STATCOM control system

CONCLUSIONS

In this dissertation work has been done the power quality problems such as voltage sags, interruption, and voltage swell. Theobjective of work is to study the performance of D-STATCOM for mitigating voltage sag, interruption, and to improve the power quality in

distribution network with non-linear load. The investigation is made on different condition for nonlinearload. In this work the investigation is composed of power system distribution system with and without D-STATCOM. Power factor comparison for source and load side. So it can be concluded that D-STATCOM effectively improves the power quality in distribution network with non-linear load.

The dissertation presents a comparative study on effectiveness of two approaches for determining D-STATCOM reference compensation currents. The mathematical derivation of the IRPT and SRF algorithm has been employed to demonstrate the behaviour of D-STATCOM

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Variation of domain thickness was previously considered by Liang et al. (2000a), but in the simple context of exploiting the linear relationship between displacement and thickness in a structure consisting purely of a single designable domain. This approach is invalid for any design which includes a non-modifiable framework or multiple groups of elements which may be assigned different thicknesses.