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POWER QUALITY AND VOLTAGE STABILITY IMPROVEMENT OF SHIPBOARD POWER SYSTEMS WITH NON LINEAR LOADS

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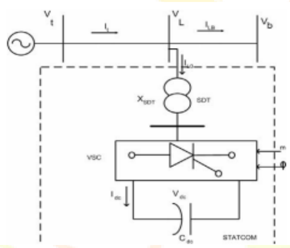
ABSTRACT :

The static synchronous compensator is used in power system network for improving voltage of a particular bus and compensates reactive power. It is connected to a bus near to source to improve the voltage profile and reactive power compensation. The STATCOM control scheme for grid connected system for power quality improvement.The proposed scheme is applied for both linear and non linear load. The study of shunt connected FACTS devices is a connected field with the problem of reactive power compensation and better mitigation of transmission related problems in today's world. In this paper we study the shunt operation of FACTS controller, the STATCOM, and how it helps in the better utilization of a network operating under normal conditions. First we carry out a literature review of many papers related to FACTS and STATCOM, along with reactive power control. Then we look at the various devices being used for both series and shunt compensation. The study of STATCOM and its principles of operation and control, including phase angle control and PWM techniques, are carried out. We also delve into the load flow equations which are necessary for any power system solution and carry out a comprehensive study of the Newton Raphson method of load flow. Apart from this, we also carry out a study of the transient stability of power systems, and how it is useful in determining the behavior of the system under a fault without the STATCOM and then the STATCOM is implemented and the characteristics of the rotor angle graph along with faults at various buses are seen. In this project we it is tried to show application of STATCOM to a bus system and its effect on the voltage and angle of the buses.

INTRODUCTION:

Today's power systems are evolving from a relative static operation scenario to a more dynamic one due to the presence of electricity markets, the deep impact of renewable and distributed generation and other drivers that introduce more variability and uncertainty in the operation of the power system. For example, under the electricity market operation, situations exist where the generation and consumption results coming from the market are limited by power transmission security and load constraints. Flexible AC Transmissions Systems (FACTS) were firstly developed in the 1990's. FACTS devices can help to alleviate transmission congestions but also other power system problems, which make this technology to be increasingly taken into account by TSOs. In addition, it can be said that this technology has reached maturity and that the cost of these power electronics based solutions has considerably decreased. However, as the investment cost of FACTS is still high, their optimal location in the Power System is a crucial factor. Therefore, several FACTS location methods considering power system optimization techniques have been developed in the last years. Developing countries especially can apply versatile voltage regulation and system Stabilization measures, in order to utilize more effectively the latent capacity in existing transmission networks, in preference to committing larger resources to new overhead lines and stations. The use of power electronics in the form of Thyristor Controlled Reactors (TCR) and Thyristor Switched Capacitors (TSC) in a Static Var Compensator (SVC) is well established. The application of power electronics in new configurations of FACTS offers the possibility of meeting such demands. FACTS devices are routinely employed in order to enhance the power transfer capability of the otherwise underutilized parts of the interconnected network. The Static Synchronous Compensator (STATCOM) using GTOs (GateTurnoff Thyristors) is a principal state-of the- art FACTS equipment and is now a commercially available additional tool for use by system planners and designers [2,3] for shunt reactive power compensation in transmission and distribution systems. As with all static FACTS devices the STATCOM has the potential to be exceptionally reliable but with the added capability to: sustain reactive current at low voltage (constant current not constant impedance), reduce land use and increase reliability (footprint 40% of SVC) and, be developed as a voltage and frequency support (by replacing capacitors with batteries as energy storage). Although currently being applied to regulate transmission voltage to allow greater power flow in a voltage limited transmission network in the same manner as a static var Fig 1– Basic interfacing of STATCOM with transmission line compensator (SVC), the STATCOM has further potential. By giving an inherently faster response and greater output to a system with a depressed voltage, the STATCOM offers improved quality of supply.



Power Generation and Transmission is a complex process, requiring the working of many components of the power system in tandem to maximize the output. One of the main components to form a major part is the reactive power in the system. It is required to maintain the voltage to deliver the active power through the lines. Loads like motor loads and other loads require reactive power for their operation. To improve the performance of ac power systems, we need to manage this reactive power in an efficient way and this is known as reactive power compensation. There are two aspects to the problem of reactive power compensation: load compensation and voltage support. Load compensation consists of improvement in power factor, balancing of real power drawn from the supply, better voltage regulation, etc. of large fluctuating loads. Voltage support consists of reduction of voltage fluctuation at a given terminal of the transmission line. Two types of compensation can be used: series and shunt compensation. These modify the parameters of the system to give enhanced VAR compensation. In recent years, static VAR compensators like the STATCOM have been developed. These quite satisfactorily do the job of absorbing or generating reactive power with a faster time response and come under Flexible AC Transmission Systems (FACTS). This allows an increase in transfer of apparent power through a transmission line, and much better stability by the adjustment of parameters that govern the power system i.e. current, voltage, phase angle, frequency and impedance.power requirement acting as a UPS. Fuzzy logic controlled novel boost inverter improves overall efficiency and dynamic performance of the STATCOM system. Further, it is also designed to solve the voltage quality problem of distribution system with the minimum usage of energy from the utility grid and in the most efficient way by making optimal usage of solar energy. The proposed STATCOM system model involves two PV systems with low power DC to DC converter, chargeable batteries, switches, fuzzy logic controlled SPWM based boost inverter implemented by two DC to DC boost converters and one injection transformer for each phase under sag/swell. The results obtained after simulation verifies the effectiveness of the proposed model of STATCOM in recovering the voltage sag/swell and interruption on the low voltage side of the distribution. The STATCOM model proposed is found capable of recovering voltage sag up to 0.1 p.u. and swell up to 1.9 p.u. of pre-sag voltage.

Conclusion from the literature review :

From the analysis of literature review the literature survey a separately excited STATCOM based on controlled PVDC link has been designed to mitigate voltage sag and swell, via a correction ratio of up to ± 30%. This is based on assumption that there is a sufficient and constant DC source in the input of the inverter. Depending on the PI controller, suitable compensating voltage vector via shunt injection transformer will compensate the ratio of voltage disturbance and the load would not be affected by disturbance at the source. The second survey the ways to speed up the technology development towards the extensive integration of the STATCOM in the near future. As mentioned above; the STATCOM can be integrated into the network in several control configurations to overcome the problems related to power quality. In this work, the STATCOM is integrated to a power grid connected to a PV farm in order to mitigate the intermittency and variability of solar energy and overcome grid faults caused by voltage sags and swell at the PCC. The proposed STATCOM control scheme employs a fuzzy logic controller and an in-phase compensation technique. The designed STATCOM and the electric system are evaluated under various fault conditions.Third survey organized STATCOM for preventing customers from momentary voltage disturbance on the utility side and In order to avoid minimize the active power injection into the grid. Voltage sag are result of transient phenomenon in power grid such as short circuit in the upstream power in tx line ,inrush current involved with the starting of large machine, sudden change of load, etc Traditional methods of tap changing transformer and UPS are bulky, costly and not fast enough eliminate the voltage sag load side. Custom power devices STATCOM as power electronics based solution to minimize costly outcomes of voltage sag.The fourth literature survey for current-source non-linear loads, the power quality of the output voltage deteriorated slightly. However, for voltage-source loads, the quality of the load voltage was poor. Two alternatives were compared with the SF controller: a PID and a cascade controller. The SF controller was less intuitive, but its design was straightforward. The PID and the cascade controllers exhibit accurate performance; however, when there was no load connected downstream the STATCOM, only the SF controller was able to properly damp the LC filter resonance. Control alternatives like hysteresis controllers can be found in the literature and a comparative analysis with this alternative is of interest for further research. The fifth literature survey STATCOM is operated in Standby mode, where the PV array voltage is zero and the inverter is not active in the circuit to keep the voltage to its nominal value. Active mode, where the STATCOM senses the sag, swell and outage. STATCOM reacts fast to inject the required single phase compensation voltages. Bypass mode, where STATCOM is disconnected and bypassed in case of maintenance and repair. Power saver mode, when the PV array with low power dc-dc converter voltage is enough to handle the load.

The final literature survey the proposed STATCOM system model utilizes solar energy stored in the battery for mitigation of voltage sags, swells and interruptions hence result in huge cost saving for consumer side and reduces the payback period of the STATCOM system. It stores the solar energy in separate back up for night time utilization purpose rather than drawing energy from the grid which minimizes the usage of grid energy and increases the reliability of STATCOM for the consumer. Further Hardware implementation and testing the efficacy of the proposed system is under the future scope of work.

Problem statement:

- Unlike static var compensator (SVC), the STATCOM does not employ capacitor or reactor banks to produce reactive power.
- The major disadvantage of a traditional STATCOM (with no energy storage)
- it has only two possible steady-state operating modes, namely, inductive (lagging) and capacitive (leading).
- Even though both the traditional STATCOM output voltage magnitude and phase angle can be controlled, they cannot be independently adjusted in steady state due to the lack of significant active power capability of STATCOM.

Need for Reactive power compensation :

The main reason for reactive power compensation in a system is: 1) the voltage regulation; 2) increased system stability; 3) better utilization of machines connected to the system; 4) reducing losses associated with the system; and 5) to prevent voltage collapse as well as voltage sag. The impedance of transmission lines and the need for lagging VAR by most 18 machines in a generating system results in the consumption of reactive power, thus affecting the stability limits of the system as well as transmission lines. Unnecessary voltage drops lead to increased losses which needs to be supplied by the source and in turn leading to outages in the line due to increased stress on the system to carry this imaginary power. Thus we can infer that the compensation of reactive power not only mitigates all these effects but also helps in better transient response to faults and disturbances. In recent times there has been an increased focus on the techniques used for the compensation and with better devices included in the technology, the compensation is made more effective. It is very much required that the lines be relieved of the obligation to carry the reactive power, which is better provided near the generators or the loads. Shunt compensation can be installed near the load, in a distribution substation or transmission substation.

TECHNIQUE FOR COMPENSANATION:

The compensation techniques are two types i.e. shunt compensation and series compensation techniques. Figure 1 show without shunt compensation. In this fig. 1 the active current is in phase with the load voltage. The load is inductive and hence it requires reactive power for its proper operation. This has to be supplied by the source. If the reactive power can be supplied near the load, the line current can be minimized, reducing the power losses and improving the voltage regulation at the load terminals. This can be done in three ways: 1) A voltage source, 2) A current source, 3) A capacitor. So the current source device is used to compensate which is the reactive component of the load current as shown in fig.2. In this case the voltage regulation of the system is improved and reactive current component from the source is reduced.

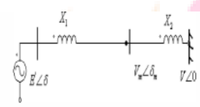
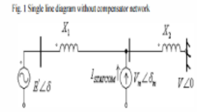
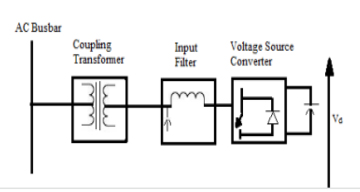


Fig. 1 Single line diagram without compensator network



Static Shunt Compensator:

One of the many devices under the FACTS family, a STATCOM is a regulating device which can be used to regulate the flow of reactive power in the system independent of other system parameters. STATCOM has no long term energy support on the dc side and it cannot exchange real power with the ac system. In the transmission systems, STATCOMs primarily handle only fundamental reactive power exchange and provide voltage support to buses by modulating bus voltages during dynamic disturbances in order to provide better transient characteristics, improve the transient stability margins and to damp out the system oscillations due to these disturbances. A STATCOM consists of a three phase inverter (generally a PWM inverter) using SCRs, MOSFETs or IGBTs, a D.C capacitor which provides the D.C voltage for the inverter, a link reactor which links the inverter output to the a.c supply side, filter components to filter out the high frequency components due to the PWM inverter. From the d.c. side capacitor, a three phase voltage is generated by the inverter. This is synchronized with the a.c supply. The link inductor links this voltage to the a.c supply side. This is the basic principle of operation of STATCOM.



For two AC sources which have the same frequency and are connected through a series inductance, the active power flows from the leading source to the lagging source and the reactive power flows from the higher voltage magnitude source to the lower voltage magnitude source. The phase angle difference between the sources determines the active power flow and the voltage magnitude difference between the sources determines the reactive power flow. Thus, a STATCOM can be used to regulate the reactive power flow by changing the magnitude of the VSC voltage with respect to source bus voltage.

PHASE ANGLE CONTROL :

In this case the quantity controlled is the phase angle δ. The modulation index "m" is kept constant and the fundamental voltage component of the STATCOM is controlled by changing the DC link voltage. By further charging of the DC link capacitor, the DC voltage will be increased, which in turn increases the reactive power delivered or the reactive power absorbed by the STATCOM. On the other hand, by discharging the DC link capacitor, the reactive power delivered is decreased in capacitive operation mode or the reactive power absorbed by the STATCOM in an inductive power mode increases.

THEORY OF STATCOM :

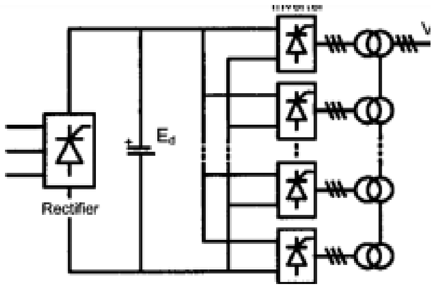
Static Synchronous Compensator (STATCOM):
Static synchronous compensator (STATCOM) is a fast-acting device capable of providing or absorbing reactive current and thereby regulating the voltage at the point of connection to a power grid. The technology is based on VSCs with semi-conductor valves in a modular multi-level configuration.

The dynamic reactive current output range is symmetrical (during normal disturbed network conditions); however, non-symmetrical designs are possible by introducing mechanically or thyristor switched shunt elements with unified control systems to cover most conventional applications. The STATCOM design and fast response makes the technology very convenient for maintaining voltage during network faults (as STATCOMs are capable of providing fast fault current injection limited to the rated current), enhancing short term voltage stability. In addition, STATCOMs can provide power factor correction, reactive power control, damping of low-frequency power oscillations (usually by means of reactive power modulation), active harmonic filtering, and flicker mitigation and power quality improvements. Typical applications are in the electric power trans-mission, electric power distribution, electrical networks of heavy industrial plants, arc furnaces, high-speed railway systems and other electric systems, where voltage stability and power quality are of the utmost importance.

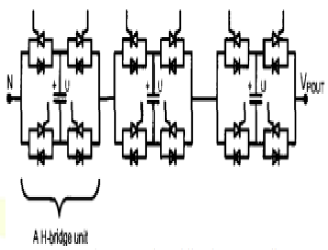
The STATCOM is basically a DC-AC voltage source converter with an energy storage unit, usually a DC capacitor. It operates as a controlled Synchronous Voltage Source (SVS) connected to the line through a coupling transformer. The controlled output voltage is maintained in phase with the line voltage, and can be controlled to draw either capacitive or inductive current from the line in a similar manner of a synchronous condenser, but much more rapidly. Compared to SVC and other conventional reactive power compensators, STATCOM has several advantages listed below. STATCOM has a dynamic performance far exceeding the other var compensators. The overall system response time of STATCOM can reach 10 ms or less. STATCOM has the ability to maintain full capacitive output current at low system voltage, which also makes it more effective than SVC in improving the transient stability. Simulations indicate that 1.3Mvar SVC and 1 Mvar STATCOM have similar effects in maintaining dynamic voltage stability. STATCOM has much larger operating range as compared with that of SVC. Compared with SVC, STATCOM can easily realize redundancy design, which brings a higher reliability. IGCT, IGBT, used in STATCOM, require simpler gate drives and snubber circuits, and also make STATCOM more reliable. STATCOM has a smaller installation space, about 50% of that for SVC. The STATCOM of Alstom and Mitsubishi are made relocatable, with a power density of 1Mvar/m3. The main objective of STATCOM is to obtain an almost harmonic neutralized and controlled three-phase AC output voltage waveforms at the point of common coupling (PCC) to regulate reactive current flow by generation and absorption of controllable reactive power by the solid-state switching algorithm. The P-Q relation of STATCOM is found by following equation where S is the apparent power flow, P the active power flow, Q the reactive power flow, Vs the main AC phase voltage to neutral (rms), Vc the STATCOM fundamental output AC phase voltage (rms), X is the leakage reactance, L the leakage inductance, f the system frequency and α is the phase angle between Vs and Vc.

MAIN CIRCUIT TOPOLOGY :

There are mainly two types of STATCOM main circuit configurations: multi pulse converter, multilevel converter. In the multi pulse converter, the 3-phase bridges are connected in parallel on the DC side .The bridges are magnetically coupled through a zigzag transformer, and the transformer is usually arranged to make the bridges appear in series viewed from the AC sides. Each winding of the transformer is phase-shifted to eliminate selected harmonics and produce a multi pulse output voltage. Pulse Width Modulation (PWM) can be applied to improve the harmonics content, at the expense of higher switching and snubber loss, plus reduced fundamental var rating. The disadvantages of multi pulse converter configuration are: the phase-shift transformer makes the system complex and bulky; there will be a unique transformer design for each STATCOM installation. Compared to the multipulse converter based STATCOM multilevel converters are more flexible and have a wide application. They can be used as active power filters and to handle unbalanced loads. No phase shift transformer is required in this configuration, so a lower investment cost, plus a lower power loss, can be expected. The multilevel converter configuration can be further classified into three different configurations: 1) Diode-clamped converter, 2) Flying capacitor converter, 3) Cascade converter. The concept of the cascade multilevel converter is put forward by Fang Zheng Peng in 1996 A cascade converter is constructed by standard H-bridges in series. Each H-bridge converter unit provides three voltage levels (-U+ 0, U.



1. multilevel converter

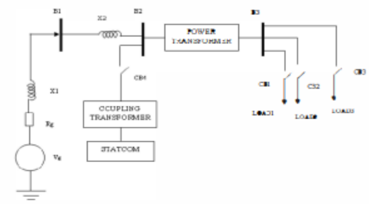


2. Cascade converter design

Compared with the other two multilevel configurations and the multi pulse converter, the cascade converter eliminates clamping diodes, flying capacitors, or the bulky zigzag transformer, and so requires least component mounts, and the modularity of this configuration makes it much easier to implement converters with a large number of levels. Larger dc side capacitors are required compared to the diode clamped and flying capacitor converter under balanced condition but it provides separate phase control to support significant voltage unbalance.

. A 100Mvar STATCOM device is connected to the 230-kV (L-L) grid network. The feeding network is represented by a Thevenin equivalent at (bus Bl) where the voltage source is represented by a kV with 10,000 MV A short circuit power level with a followed by the transmission line connected to bus B2. The ST A TCOM device comprises the voltage source converter-cascade model connected to the host electric grid. It is connected to the network through the coupling transformer. The dc link voltage is provided by the capacitor C, which is charged COMPLETE MODELING FOR STATCOM

from the ac network. The decoupled current control system ensures full dynamic regulation of the bus voltage and the dc link voltage.



A single line diagram representing the STATCOM.

At the time of starting the source voltage is such that the ST A TCOM is inactive. It neither absorbs nor provides reactive power to the network. The following load sequence is tested and results are taken. At t=0.06 sec STATCOM is connected to the system by switching circuit breaker CB4. At t=O. 1 load 1 is connected by switching CB 1. At t= 0.3 load 2 is connected by switching CB2. At t= O.S load 2 is connected by switching CB3

Existing system :

- Power systems are large-scale systems and there exists many uncertainties in calculation of their parameters.
- Most of the methods for stability analysis and damping controllers design are model based; it means that we should identify system dynamics .
- As we know, this is a difficult and complex task, especially when the system should be modeled exactly.
- Fuzzy logic control is an appealing alternative to conventional control methods when system follows some general operating characteristics and a detailed process understanding is unavailable or traditional system model becomes overly complex.
- Usually, fuzzy logic controllers (FLCs)are designed base on system behavior and there is no need to achieve exact model of the system.

Proposed system

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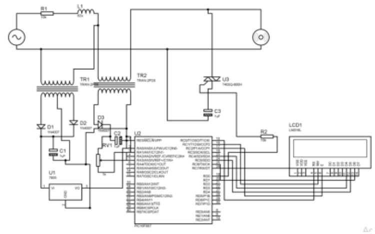


PIC MICROCONTROLLERS:

PIC microcontrollers (Programmable Interface Controllers), are electronic circuits that can be programmed to carry out a vast range of tasks. They can be programmed to be timers or to control a production line and much more. PICs have a set of registers that function as general-purpose RAM. Special-purpose control registers for on-chip hardware resources are also mapped into the data space. The addressability of memory varies depending on device series, and all PIC device types have some banking mechanism to extend addressing to additional memory (but some device models have only one bank implemented). Later series of devices feature move instructions, which can cover the whole addressable space, independent of the selected bank. In earlier devices, any register move must be achieved through the accumulator. The code space is generally implemented as on-chip ROM, EPROM or flash ROM. In general, there is no provision for storing code in external memory due to the lack of an external memory interface. The exceptions are PIC17 and select high pin count PIC18 devices. All PICs handle (and address) data in 8-bit chunks. However, the unit of addressability of the code space is not generally the same as the data space. For example, PICs in the baseline (PIC12) and mid-range (PIC16) families have program memory addressable in the same word size as the instruction width, i.e. 12 or 14 bits respectively. In contrast, in the PIC18 series, the program memory is addressed in 8-bit increments (bytes), which differs from the instruction width of 16 bits.

In order to be clear, the program memory capacity is usually stated in number of (single-word) instructions, rather than in bytes.

The architectural decisions are directed at the maximization of speed-to-cost ratio. The PIC architecture was among the first scalar CPU designsand is still among the simplest and cheapest. The Harvard architecture, in which instructions and data come from separate sources, simplifies timing and microcircuit design greatly, and this benefits clock speed, price, and power consumption. PIC microcontrollers are based on the Harvard architecture where program and data busses are kept separate. Early versions of PIC microcontrollers use EPROM to store the program instruction but have adopted the flash memory since 2002 to allow better erasing and storing of the code.

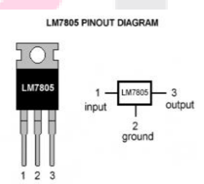
They are reliable and malfunctioning of PIC percentage is very less. And performance of the PIC is very fast because of using RISC architecture. Power conception is also very less when compared to other micro controllers.

PIC 16F877 series normally has five input/output ports. They are used for the input/output interfacing with other devices/circuits. Most of these port pins are multiplexed for handling alternate function for peripheral features on the devices. All ports in a PIC chip are bi-directional.

REGULATOR 7805

Voltage sources in a circuit may have fluctuations resulting in not providing fixed voltage outputs. A voltage regulator IC maintains the output voltage at a constant value. 7805 IC, a member of 78xx series of fixed linear voltage regulators used to maintain such fluctuations, is a popular voltage regulator integrated circuit (IC). The xx in 78xx indicates the output voltage it provides. 7805 IC provides +5 volts regulated power supply with provisions to add a heat sink.

All voltage sources cannot able to give fixed output due to fluctuations in the circuit. For getting constant and steady output, the voltage regulators are implemented. The integrated circuits which are used for the regulation of voltage are termed as voltage regulator ICs. Here, we can discuss about IC 7805.The voltage regulator IC 7805 is actually a member of 78xx series of voltage regulator ICs. It is a fixed linear voltage regulator. The xx present in 78xx represents the value of the fixed output voltage that the particular IC provides. For 7805 IC, it is +5V DC regulated power supply. This regulator IC also adds a provision for a heat sink. The input voltage to this voltage regulator can be up to 35V, and this IC can give a constant 5V 5V for any value of input less than or equal to 35V which is the threshold limit.



7805 IC Rating

- Input voltage range 7V- 35V
- Current rating $I_{c=}$ 1A
- Output voltage range $V_{Max=5.2V}$, $V_{Min=4.8V}$

The purposes of coupling the components to the IC7805 are explained below. C_1- It is the bypass capacitor, used to bypass very small extent spikes to the earth. C_2 and C_3- They are the filter capacitors. C_2 is used to make the slow changes in the input voltage given to the circuit to the steady form. C_3 is used to make the slow changes in the output voltage from the regulator in the circuit to the steady form. When the value of these capacitors increases, stabilization is enlarged. But these capacitors single-handedly are unable to filter the very minute changes in the input and output voltages. C_4- like C_1, it is also a bypass capacitor, used to bypass very small extent spikes to the ground or earth. This is done without influencing other components.

Applications of Voltage Regulator 7805 IC

- Current regulator
- Regulated dual supply
- Building circuits for Phone charger, UPS power supply circuits, portable CD player etc
- Fixed output regulator

Adjustable output regulator etc.

POWER SUPPLY

A power supply is an electrical device that supplies electric power to an electrical load. The main purpose of a power supply is to convert electric current from a source to the correct voltage, current, and frequency to power the load. As a result, power supplies are sometimes referred to as electric power converters

.CONTROL STRATEGIES AND APPROCHES :

The control system is the heart of state-of-the-art STATCOM controller for dynamic control of reactive power in electrical system. Based on the operational requirements, type of applications, system configuration and loss optimization, essential control parameters are controlled to obtain desired performance and many control methodologies in STATCOM power circuits have been presented. In a square-wave mode of operation, phase angle control (α) across the leakage reactance (L) is the main controlling parameter. This control is employed in a twolevel converter structure, where DC voltage (Vdc) is dynamically adjusted to above or equal to or below the system voltage for reactive power control. In a three-level configuration, the dead-angle or zero-swell period (β) is controlled to vary the converter AC output voltage by maintaining Vdc constant. The control system for STATCOM operated with PWM mode employs control of α and m (modulation index) to change the converter AC voltages keeping Vdc constant. For voltage regulation, two control-loop circuits namely inner current control loop and external/outer voltage control loop are employed in STATCOM power circuit. For voltage regulation, two control-loop circuits namely inner current control loop and external/outer voltage control loop are employed in STATCOM power circuit. The current control loop produces the desired phase angle difference of the converter voltage relative to the system voltage and in turn, generates the gating pulses, whereas the voltage control loop generates the reference reactive current for the current controller of the inner control loop. This control philosophy is implemented with proportional and integral control (PI control) algorithm or with a combination of proportional (P), integral (I) and derivative (D) control algorithm in d–q synchronous rotating frame. The general mathematical approach, modelling and design of control systems for compensator circuits are proposed .In the process of designing and implementation of control system, acquisition of many signals is involved. Initially, the essential AC and DC voltages and current signals (instantaneous values/vectors) are sensed using sensors. In the next step, these signals are synthesised by techniques such as d–q synchronous rotating axis transformation, α-β stationery reference frame of transformation and so on.

ADVANTAGES & FIELD OF APPLICATION

Modern designs are modular and allow for a high level of scalability and flexibility, ensuring the total required dynamic and steady state rating. Via the addition of shunt elements, the symmetrical output range of the pure STATCOM device can be adjusted to also meet non-symmetrical performance requirements. For conditions where a fast non-symmetrical dynamic range is required, on the one hand, thyristor-switched reactors and capacitors can be operated in parallel to form hybrid solutions. On the other hand, mechanically switched reactors and capacitors can be added to optimise slow response performance and provide additional steady-state capacity as required by e.g. typical intra-day load flow changes.

CONCLUSION

In this research, a review of past literature published on the various control strategies of STATCOM is presented. In this work, we have found that with the advancement of power electronics converters, the power engineers find various occasions to develop the control strategy so that harmonics are reduced as possible. We can also see that a multilevel cascaded multi-pulse STATCOM have found great applications in today power system .There is a great scope for power quality researchers for developing fast adaptive controllers for STATCOM. Different configuration of STATCOM has been discussed.

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