Scientific Journal of Impact Factor (SJIF): 5.71

e-ISSN (O): 2348-4470
p-ISSN (P): 2348-6406

International Journal of Advance Engineering and Research Development

A National Conference On Spectrum Of Opportunities In Science & Engineering Technology
Volume 5, Special Issue 06, April-2018 (UGC Approved)

REVIEW OF D-STATCOM FOR IMPROVEMENT OF POWER QUALITY DISTURBANCES USING MATLAB SIMULINK

Radhika Bihade[1], Prof. V.A.Vyavhare[2], Dr.S.B.Mohad[3]

[1]*Department of Electrical Enggineering. PLITMS Buldhana, Maharashtra, India*
[2]*Assistant Professor, Department of Electrical Enggineering, PLITMS Buldhana, Maharashtra, India*
[3]*Assistant Professor, Department of Electrical Enggineering, PRMCEAM Badnera, Maharashtra, India*

Abstract- *This project explain the improvement of voltage sags, harmonic distortion and low power issue exploitation Distribution Static Compensator (D-STATCOM) in distribution system. Our propose methos is to Implementation are going to be the fascinating operation of the system for undesirable conditions as an example harmonics reduction and every one. The model is predicated on the Voltage supply device (VSC) principle. The D-STATCOM injects a current into the system to mitigate the voltage sags. exploitation SVPWM (space vector PWM) switched DSTATCOM power quality issues isreduced within the distribution system, hence, successively we tend to get the improved power quality.The SVPWM technique use thanks to its many blessings like higher output voltage (15% over standard sine-triangle modulation technique and therefore, higher utilization of DC link), lower harmonics etc. style and simulation of VSC primarily based DSTATCOM for the compensation of power quality issues to create the distribution system a lot of economic exploitation MATLAB computer code. planned work can lead to the economical DSTATCOM supported the voltage supply device (VSC) which is able to meet the development of voltage sag, reduction within the Harmonics and unity power issue. The simulations performed exploitation MATLAB SIMULINK.*

Keywords- *Power Quality, D-STATCOM,VSC,SVPWM,Voltage Sag, Point of Common Coupling (PCC)*

Introduction-

Electrical energy is that the most convenient form of energy because it will be regenerate into numerous kinds ofenergy for various functions as lighting, heating, cooling and for variety of applications. thus the consumption of electricity is increasing day by day throughout the planet. because the consumption of electricity will increase there'llbe a significant shortage of power. The shortage is also as a result of the rise within the consumption or as a result of the defective of the instrumentation within the system. the last word thanks to decrease or overcome these shortages is to extend the facility generation staggeringly or to beat the things of defective. there's an answer to beat the later state of affairs. to beat these issues appropriate measures area unit taken before, like circuit breakers, isolators.While taking these safety measures there is also conditions of change on further instrumentation or changeoff of the current instrumentation. as a result of this development there is also a discount of reactive power or increase of reactive power within the system that results in the active power modification. There is also a fulminantmodification within the load that for fast reduces or will increase the active power that successively results in the voltage modification and distorted waveforms. If any tangency or electric circuit within the line or section happens, the voltage worth changes within the line. All of those problems that area unit associated with issues occurring within the system distressful the steadiness area unit known as as power quality issues. If these issues don't seem to be eliminated by employing a appropriate management technique, the whole system might lose its stability. By keeping the {requirement} of power requirement in day to day life these days there's a requirement to specialise in power quality problems to resolve the economic challenges with the facility system throughout the planet. The term power quality describes by the magnitude and waveforms of the voltage and current in power grid, for normal power quality means that voltage ought to be among the limit and wave shape mustn't be distorted.

Basic Description-

Distribution Static Compensator(D-STATCOM)

It is a FACTS device that is put in for the support of electricity networks that have poor power issue and voltage regulation conjointly, ordinarily it's use for the stabilization of voltage and to boost power issue of that network. it's a voltage supply device primarily based device, which may work as reactive power supply. The D-STATCOM, within which the dc voltaic battery also connected with the device to charge just {in case} of over voltage and to discharge in case of under voltage during this approach by retreating and activity the reactive power it will compensate the reactive

power. so it will improve the ability issue and scale back the harmonics within the system.The D-STATCOM projected here maintains the voltage magnitude among the limits by eliminating the voltage sags and swells within the system.

3.1: Operation Modes of D- STATCOM

There area unit 3 basic modes of operation. Output current of D-STATCOM I varies with Vi. If Vi is capable Vs, the reactive power is zero and therefore the D-STATCCOM doesn't generate or absorb reactive power. once Vi is largerthan Vs., the D-STATCOM shows Associate in Nursing inductive electrical phenomenon connected at the top of its terminal. this I flows through the electrical device electrical phenomenon from the D- STATCOM to the ac system. once Vs is larger than Vi, the D-STATCOM shows that the a electrical phenomenon electrical phenomenonconnected at its terminal. Then this I flows from the ac system to the D-STATCOM, leading to the device rivetinginductive reactive power.

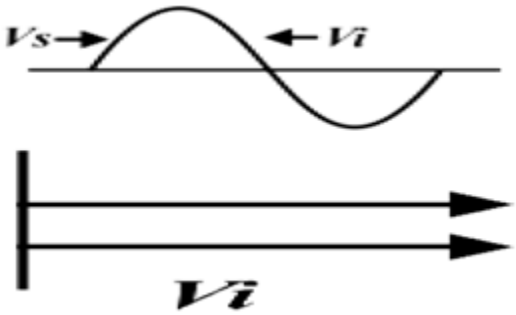
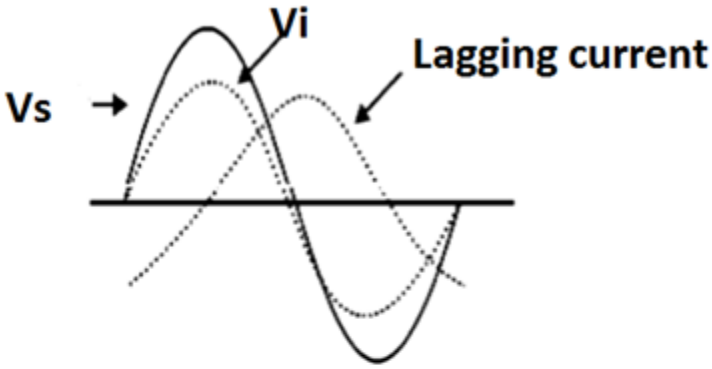


Fig 3.1(a): The no loadmode$V_S = V_i$ If $V_S = V_i$ then I = 0



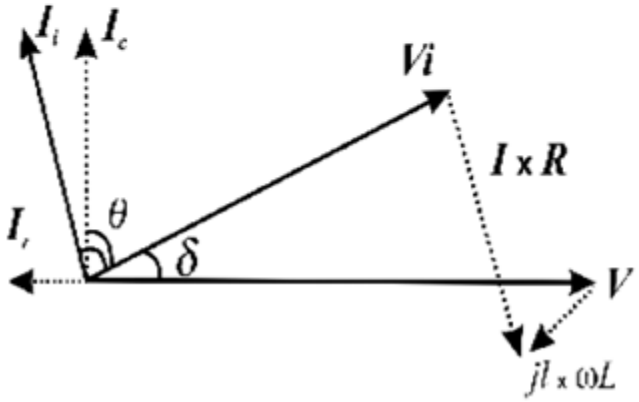


Fig.3.1(b): The Inductive mode $V_S > V_i$

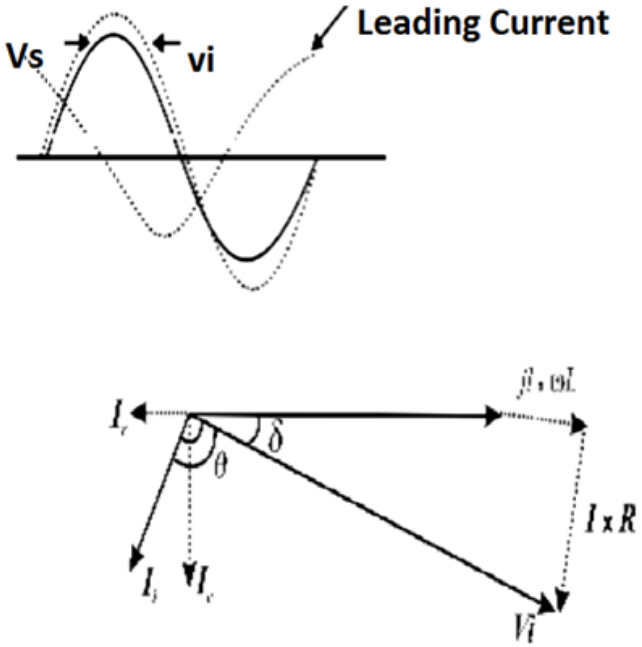


Fig.3.1(c): The Capacitive mode $V_S < V_i$

3.2:Voltage Sag

If there's increase within the load then the voltage within the line decreases quickly due to the decrease within theterminal voltage at the receiving finish or the utility facet. This unexpected modification within the terminal voltage seems as a sag within the voltage within the line. during this case the planned D-STATCOM responds by activity the reactive power to the system in order that the voltage magnitude and thus its wave may be regained.The voltage sag is outlined because the dip within the voltage level or decrease of the normal voltage level between10% to 90th, for a periodof half cycle or morei.e 0.5 cycle to1minute. The voltage signal with sag in shown in Fig.2.2.

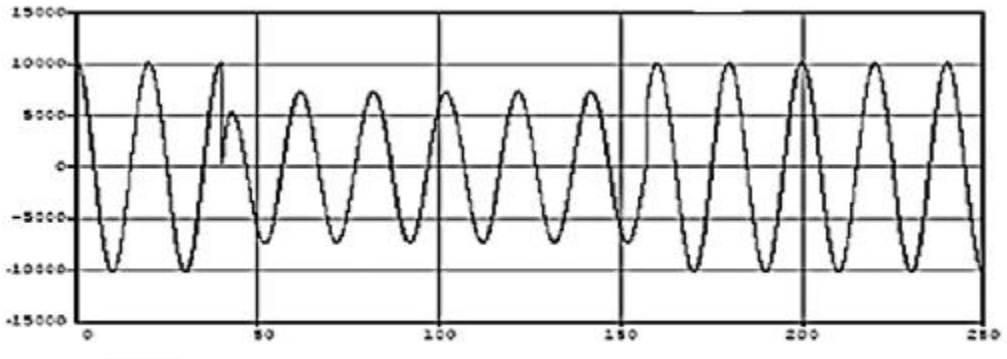


Fig.3.2(a): Voltage sag

Working Principle-

Voltage Source Converter (VSC)

A voltage-source device is a power device that connected in shunt or parallel to the system. It will generate a sinusoidal voltage with any needed magnitude, frequency and point. Voltage supply converters area unit wide utilized in adjustable-speed drives, however may also be wont to mitigate voltage dips. The VSC is employed to either utterly replace the voltage

or to inject the missing voltage. The missing voltage is that the difference between the nominal voltage and also the actual. The device is generally supported some reasonably energy storage, which can provide the device with a DC voltage. The voltage supply rectifier operates by keeping the dc link voltage at a desired reference worth, using a feedback management loop.To accomplish this task, the dc link voltage is measured and compared with a reference Vref. The error signal generated from this comparison is employed to change the six valves of the rectifier ON and OFF. during this method, power will return or come to the ac supply consistent with dc link voltage needs. Addition, the ac current waveforms canbe maintained as virtually sinusoidal, that reduces harmonic contamination to the mains supply[3].

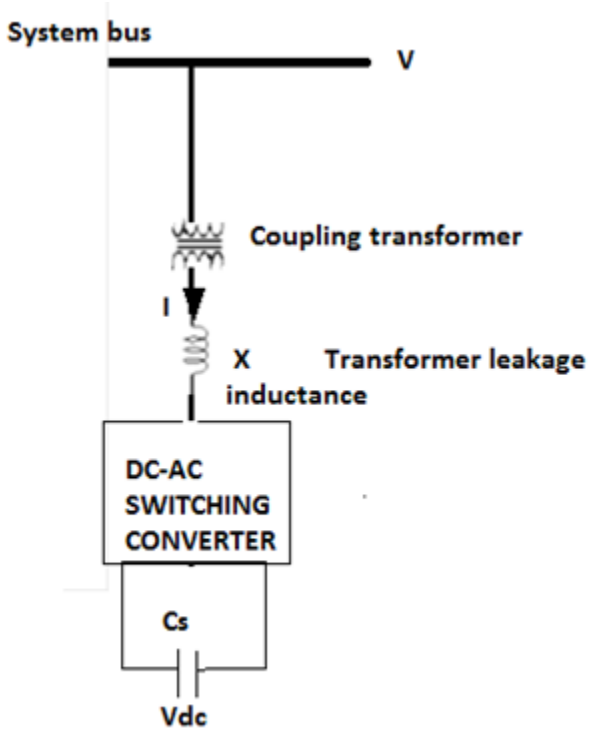


Fig.3.4(a): Operation principle of the voltage source Converter

Converter Mode of Operation
To convert the excessive power in the line into the corresponding dc voltage equivalent then to allow to the storage element that acts as a supply for the rectifying mode of operation.Normally, the VSC isn't only used for voltage sag or voltage swell mitigation,but additionally for alternative power quality problems. e.g. harmonic.

Inverter Mode of Operation
To convert the storage voltage or battery voltage into ac voltage to compensate the reactive power deficiency in line.

D-STATCOM Controller

The aim of the control scheme is to keep up constant voltage magnitude at the point wherever a sensitive load is connected, under system disturbances. The system only measures the RMS voltage at the load terminal i.e.no reactive power measurements are requisite. The VSC shift approach is based on a curving PWMtechnique that offers simplicity and smart result. Since custom power could be a comparatively low-power Application,PWM strategies provide a additional versatile possibility than the basic Frequency shift (FFS) strategies favoredin FACTS applications.

Energy Storage Circuit

DC supply is connected in parallel with the DC condenser. It carries the input ripple current of the convertor, ripple current is arms price of electrical energy flowing through a condenser. This causes an internal temperature rise owing to power losses within the condenser, the rms impact on condenser and it's the most reactive energy storage component. This DC condenser may be charged by electric battery supply or may be recharged by the converteritself.

LCL Passive Filter

There is used of electrical device and condenser so it's known as passive filter.Commonly a high-order LCL filter has been utilized in place of the standard L-filter for smoothing the output currents from a VSC.The LCL filter achieves a better attenuation along with value savings, given the general weight and size reduction of the elements. LCL filters are utilized in grid-connected inverters and pulse-width modulated active rectifiers as a result of they minimize the quantity of current distortion injected into the utility grid, smart performance will be obtained within the range of power levels up to many kw, with the utilization of little values of inductors and capacitors. The LCL filter model is for reduction of harmonic distortion LCL filters square measure very effective.

Total Harmonic Distortion (THD):
Voltage or current waveforms assume non sinusoidal form. The wave corresponds to the total totally different|of various} sine waves with different magnitude and section, having frequencies that are integral multiples of installation frequency.THD is defined because the RMS price of the wave remaining once the basic is removed. a perfect sine wave is 100%, the basic is that the system frequency of 50 or 60Hz.

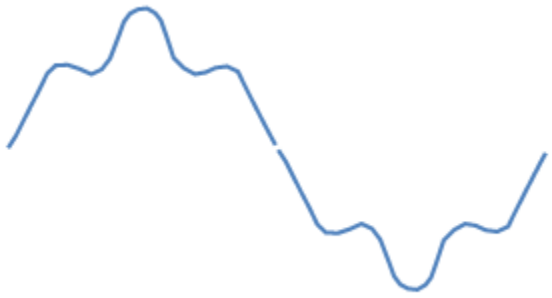


Fig3.5(a): Harmonic distortion

CONCLUSIOND

STATCOM in system the facility quality and voltage profile is improved. The power factors additionally increase nearunity . so by adding D-STATCOM with LCL filter the facility quality is improved. Thus, it is finished that by adding D-STATCOM the voltage and current square measure improved that additionally to complete reactive power compensation, power issue correction and voltage regulation the harmonics also are checked, and for achieving improved power quality levels at the distribution end. By adding LCL passive filter with D-STATCOM, the ThD is reduced. The custom power device D-STATCOM is connected in shunt with distribution system to boost the facility quality. The voltage sag islessened by connecting D-STATCOM to the distribution system. It is finished that D-STATCOM improves the facilityquality and take away the voltage sag condition in distribution network.

REFERENCES

[1]E.Babu,R.Subramanian,,"Neuro-Fuzzy Based Power Quality Improvements in a Three Phase Four Wire Distribution System Using D-STATCOM".International Electrical Engineering Journal (IEEJ) Vol. 4 (2013) No. 1, pp. 953-961 ISSN 2078-2365.

[2] P.Narasimhulu , N.Sreekanth , K.Siva Kumar,"Current Compensation with Reduced Rating VSC and A ZIG –ZAG Transformer an A Three Phase Four-Wire Distribution System",*P.Narasimhulu et al. Int. Journal of Engineering Research and Applications www.ijera.com ISSN : 2248-9622, Vol. 4, Issue 9(Version 4), September 2014, pp.53-58.*

[3] Sajith Shaik, I.Raghavendar, "Power Quality Improvement Of Three Phase Four Wire Distribution System Using VSC With A Zig-Zag Transformer",*Sajith Shaik, I.Raghavendar / International Journal of Engineering Research and Applications (IJERA) ISSN: 2248-9622 www.ijera.com Vol. 2, Issue 6, November- December 2012, pp.452-459.*

[4]Bishnu P. Muni, S. Eswar Rao, and JVR Vithal, "SVPWM Switched DSTATCOM for Power Factor and Voltage Sag Compensation", *International Conference on Power Electronics, Drives and Energy Systems, 2006. PEDES '06.*

[5] M. Nagarjuna, B. Muralimohan, M. Sudheerbabu,"Reduced Rating VSC with a Zig-Zag Transformer for Current Compensation in a Three-Phase Four-Wire Distribution System",International Journal of Modern Engineering Research (IJMER) www.ijmer.com Vol.2, Issue.4, July-Aug. 2012 pp-2957-2963 ISSN: 2249-6645.

[6] Pradeep. H. Yakkundi,K. V. Devadas and K.Suryasen, "Design and Simulation of Space Vector PWM for Three-Phase Induction Motor", *IOSR Journal of Electrical and Electronics Engineering (IOSR-JEEE) e-ISSN: 2278-1676,p-ISSN: 2320-3331, Volume 9, Issue 3 Ver. III (May – Jun. 2014), PP 01-08 www.iosrjournals.org,*

[7] Nisha G. K., Member, IAENG, Ushakumari S. and Lakaparampil Z. V., "Harmonic Elimination of Space Vector Modulated Three Phase Inverter", *Proceedings of the International MultiConference of Engineers and Computer Scientists 2012,* Vol II, IMECS 2012, March 14 - 16, 2012, Hong Kong.

[8] B.Kumara Swamy, P.NageshwarRao, "Simulation Of A Space Vector Pwm Controller For A Three-Level Voltage-Fed Inverter Motor Drive", *International Journal of Advanced Trends in Computer Science and Engineering,* Vol.2 , No.1, Pages : 363 - 372 (2013).