

An Overview on Power Quality Problems by Using D- STATCOM

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ABSTRACT— Voltage sag and harmonics are every now and again occurred issues related while, non-linear loads are be placed. This impacts the basic loads connected at same line of basic coupling of the distribution line. Here this paper shows a diagram to beat the power quality issues and examination of different harmonics and sag disturbing the distribution line by FACTS devices known as Distribution Static Compensator (D-STATCOM). The control method of Unit Template Algorithm for reference current age is proposed in this paper. The model of distribution line and D-STATCOM are implemented by MATLAB-SIMULINK programming.

KEYWORDS- Sag, Harmonics, D-STATCOM, Distribution line, Unit Template Algorithm.

I. INTRODUCTION

Electric utilities and end clients of electrical power has been continuously concerned about the electric power quality. In the power industry and shopper premises the term control quality issues has turned into the most essential part. The Electricity control part exchange issue isn't cramped to just vitality proficiency and condition yet more significantly on direction and nature of supply or nature of energy. The nature of Electrical Power can be describe as the degree of any deviation from the negligible estimations of the recurrence and voltage magnitude. Power quality may likewise be describe as the degree to which both the delivery of electric power and influences the execution of electrical gear during the operation. From a client point of view, an issue of energy quality is defined as any power issue manifested in current, voltage, or recurrence deviations that outcome in control wastage of client of hardware or disappointment. It is beyond a noteworthy worry in the present time; it particularly turns out to be preeminent with the introduction of profoundly evolved devices, whose execution is exceptionally touchy to the nature of energy supply. Nowadays modern industrial procedures are built on a lot of energy electronic devices, for example, adjustable speed drives and programmable rationale controllers (PLC). The vast majority of electronic devices are extremely delicate to disturbances and subsequently industrial loads turn out to be less agreeable to control quality issues, for example, harmonics, voltage dips, voltage swells, interferences, flashes, and indents.

For producing the reference current a unit template algorithm is discussed in this paper. Genuine source current in the hysteresis controller compared with the reference current [3]. Hysteresis controller produces exchanging heartbeats and it is given to the IGBT of the voltage source converter. The DSTATCOM is connected at distribution line to discharge or ingest the responsive current at PCC. The disposal of harmonics are done by repaying current, keeps the information waveform sinusoidal during the operation of nonlinear loads. Subsequently in this paper two power quality issues i.e voltage sag and harmonics are addressed.

II. D-STATCOM

It is a shunt connected power device having voltage source converter (VSC), DC vitality stockpiling, coupling transformer and yield filer. Balanced three stage AC voltages are generated from DC vitality source by the voltage source converter [1]. This voltages generated from VSC are in stage and given to the interconnected grid through coupling transformer. Compelling control of receptive and dynamic power stream in D-STATCOM and distribution line is achieved by appropriate adjustment of magnitude and period of the D-STATCOM.

The Active channel (AF) innovation is presently implemented for providing remuneration for responsive power, harmonics, or unbiased current in air conditioning systems [2]. It has been executing and evolved in the past quarter century of development with changing setups, solid-state devices and control systems. AF's are likewise implemented to direct terminal voltage, to wipe out voltage harmonics, to smother voltage glint, and to enhance voltage adjust in three-stage frameworks. These wide scope of destinations is achieved either in mix or individually, depending upon the prerequisites and design and control procedure which must be selected fittingly. This area describes the present status and history of development of the AF innovation. The widespread utilization of solid-state control of air conditioning power, the power quality issues ended up noticeably huge. There are countless which covering power quality overview, examination, estimations, cause, and impacts of receptive power and harmonics in the electric systems [3]. AF's are fundamentally divided into three sorts, in particular, two-wire (single stage), three-wire, and four-wire three-stage setups to meet the prerequisites of the three sorts of nonlinear loads on supply frameworks. The single-stage loads, for example, stoves, domestic lights, TV's, aeration and cooling systems, PC control supplies, , Xerox machines and laser printers carry on as nonlinear loads and cause control quality issues. The single-stage (two wire) AF's are investigated in shifting setups and different control systems to address the issues of single-stage nonlinear loads. Beginning in 1971, numerous setups, for example, the dynamic shunt channel, dynamic arrangement channel, and blend of shunt and arrangement channel have been developed and commercialized additionally for uninterruptible power supply (UPS) applications. The two ideas based on a voltage-source inverter (VSI) with capacitive vitality stockpiling and a present source inverter (CSI) with inductive vitality stockpiling are used to develop single-stage AF's. Since real measures of air conditioning power are absorbed and consumed by three stage loads, for example, ASD's with solid-state control. Recently, the vast majority of ASD frameworks join AF's in their front-end design. A significant number of productions have reported on three stage three wire AF's beginning in 1976. Dynamic arrangement, dynamic shunt, , and mixes of both, named as dynamic power quality conditioners and additionally aloof channels combined with dynamic arrangement and dynamic shunt AF's are some run of the mill setups used. Most control procedures, for example, momentary receptive power hypothesis at first developed synchronous edge d– q hypothesis, step channel method and synchronous detection method are used in the development of three-stage AF's. The issue of intemperate impartial current is observed in four-wire three-stage frameworks, predominantly due to nonlinear unbalanced loads, for example, fluorescent lighting, PC control supplies, and so forth. Settling the issues of nonpartisan present and unbalanced load streams has been attempted in for four-wire frameworks. These endeavours are of shifting nature, similar to symphonious remuneration, end/reduction of unbiased current, load adjusting, receptive power pay, and mixes of these. An expansive number of volumes of work is reported on the hypotheses related to the estimation and detection of the different amounts, for example, responsive power, genuine power, and so on., within the sight of harmonics in the supply frameworks with nonlinear loads. These ideas and speculations are very significant to remove the control signals for AF's and for the development of instruments to quantify regular and recently defined amounts within the sight of unbalance and harmonics. For communicating the adequacy of AF's, it is

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critical to develop good measuring frameworks, and these new ideas have given another power to instrumentation innovation in this field. The issues of load unbalance and receptive power were recognized long back, and they wound up plainly increased within the sight of nonlinear loads [4]. Numerous productions write about solid-state compensators for responsive power, voltage flash, and adjusting the nonlinear receptive loads, for example, footing loads, bend heater, and so forth. Numerous phrasings, for example, static glimmer compensators, static var compensators, static var generators, and so forth., have been used in the writing. The advent of quick self-commutating solid-state devices ends up plainly one of the main considerations in advancing the AF innovation.

III. LITERATURE SURVEY

Power quality is a noteworthy worry in the present period; it turns out to be particularly imperative with the execution of sophisticated devices, whose execution and operation is exceptionally delicate to the nature of energy supply. Modern industrial procedures are based on a lot of programmable rationale controllers and electronic devices and adjustable speed drives. These electronic devices are exceptionally delicate to disturbances and subsequently industrial loads turn out to be less tolerant to control quality issues, for example, voltage swells, voltage dips, and harmonics [5]. Voltage dips are considered a standout amongst the most extreme disturbances to the industrial gear. Over voltages and Swells can cause over warming stumbling or destruction of industrial gear, for example, engine drives. The vast majority of electronic gears are exceptionally touchy loads due to harmonics in light of the fact that their control depends on either the pinnacle esteem or the zero intersection of the supplied voltage, which are altogether affected by the symphonious distortion. This paper investigates the key issues in the power quality issues. As one of the successful power quality issues, the beginning, outcomes and alleviation systems of voltage sag/swells and interferences issue will be discussed in detail. The study describes the procedures of moderating the issues in a distribution framework by a solid state control gadgets based devices called Distribution Static Compensator (D-STATCOM). Voltage from device is connected into the framework to rectify the issues. The execution and investigation of the D-STATCOM is studied for the power quality issues to be viewed.

Specialized writing on the AF's has been reported since and, over the most recent two decades, has boomed. Around 1990, the vast majority of business development ventures were completed and incorporated [7]. Various arrangements discussed before have been investigated, yet could not be developed financially due to intricacy considerations and cost. At first reported arrangements were very broad and the rating of solid-state devices involved was huge, which resulted in high cost. Due to these reasons, the innovation could not be translated to field applications. Later on, the rating of dynamic sifting method was reduced by the introduction of supplementary latent separating without deteriorating the general channel execution [9]. Besides, modern AF's are equipped for remunerating very high orders of harmonics (regularly, the 25th) dynamically. In any case, as high-order harmonics are little, they are compensated and mitigated by utilizing a detached swell channel. This approach has offered enlarge to field applications, and in nations, for example, U.S and the Japan., AF worthiness for field applications has increased up to the 1000-kVA go. Another real endeavour has been to isolate out different remuneration parts of the AF's to reduce the cost and size. Albeit, additional highlights get included on particular demand. Financial considerations were the disruption at the underlying phases of AF development, however now they are getting to be noticeably affordable due to a reduction in the cost of the devices used. With the symphonious defilement in show day control frameworks, the demand for the AF is expanding. Recommended standards, for example, IEEE-519, will bring about the increased utilization of AF.

IV. PROBLEM DEFINITION

The marvel of energy quality and issues through use of energy gadgets is studied in the paper. The point of the control plot is to keep up consistent voltage magnitude at the point where a delicate load is connected at distribution line, under framework disturbances. The wide scope of energy quality disturbances covers sudden and brief duration varieties, e.g. oscillatory and rash homeless people, short intrusions, voltage sags, and in addition steady state deviations, for example, harmonics. This paper, particularly look at the utilization of a power electronic shunt compensator named as DSTATCOM to adjust the current drawn from an utility to firmly rough balanced sinusoidal waveforms, without adversely influencing the execution of voltage at the purpose of regular coupling. In this manner, adjustment of the feedback picks up makes it conceivable to reduce voltage vacillation in transient states, when the dynamic channel has the capacity of combined voltage control and consonant damping. By utilizing UPQC the control plan of a shunt dynamic power channel must ascertain the present reference waveform for each period of the inverter to keep up the dc voltage consistent and produce the best possible inverter gating signals. To adjust the impacts of supply voltage distortion, the arrangement compensator is required to infuse or absorbed proper symphonious voltages. A novel procedure for the change of energy quality issues based on custom solid state control devices the investigation of the outcomes obtained from different systems are presented.

V. PROPOSED SOLUTION

This paper introduces an outline to conquer the power quality issues and examination of different harmonics and sag disturbing the distribution line by FACTS devices known as Distribution Static Compensator (D-STATCOM) . The control method of Unit Template Algorithm for reference current age has been proposed in this paper. The model of distribution line and D-STATCOM are implemented by MATLAB-SIMULINK programming. Figure 1 demonstrates the generalized square diagram of D-STATCOM connected to distribution line.

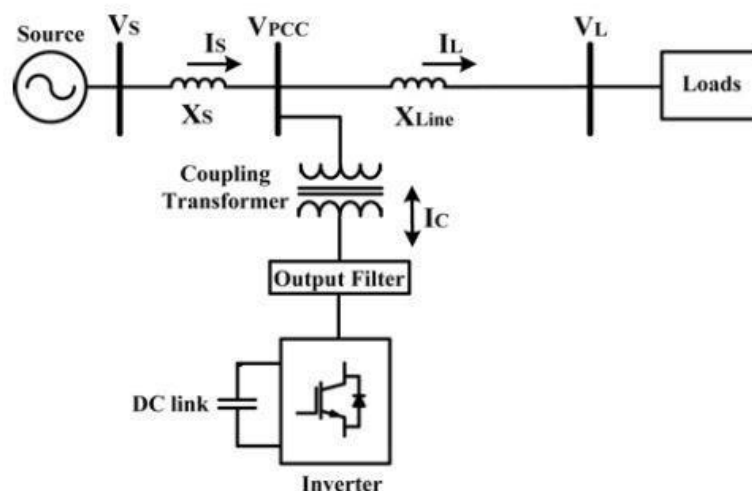


Fig.1 A generalized connection of D-STATCOM to Distribution Line

VI. CONCLUSION

A considerable survey of AF's has been presented to provide an unmistakable perspective on different parts of the dynamic channel (AF) to the specialists and architects working in this field. The significant increment in the utilization Copyright to IJARSMT

of solid-state control brings about consonant contamination over as far as possible. Utilities are finding it difficult to keep up the power quality at the purchaser end, and buyers are paying the punishments indirectly as increased plant downtimes, and so on. At introduce, AF innovation is very much developed, and numerous makers are manufacturing AF's with extensive limits. The utilities in the long operation will produce the buyers with nonlinear loads to utilize the AF's for keeping up the power quality at decent levels. An extensive number of AF setups are accessible to repay consonant present, responsive power, nonpartisan current, unbalance current, and harmonics. The purchaser can choose the AF with the required highlights. It is hoped that this study on AF's will be a valuable reference to the clients and producers.

REFERENCES

- [1] Abhayrajsinh J. Rana, "Application of D-STATCOM for Power Quality Improvement in Distribution Line" 2016 International Conference on Computationj of Power.
- [2] Mohammed Barghi Latran, Ahmet Teke and Yeliz Yoldaz, "Mitigation of Power Quality Problems using Distribution Static Synchronous Compensator: A comprehensive review" 2015.
- [3] Bhim Singh, P. Jayaprakash, D.P. Kothari, Amrish Chandra and Kamal Al Hadad, "Comprehensive Study of D-STATCOM Configuration" IEEE Transaction 2014.
- [4] Bhim Singh and Jitendra Solanki, "A Comparision of Control Algorithms For D-STATCOM" ,2009.
- [5] Bhim Singh, Alka Agya A.P. Mittal and J.R.P. Gupta, "Modeling Design and Anlysis of Different Controllers for D-STATCOM",IEEE Conference 2008.
- [6] Amrish Chandra, Bhim Singh, B.N Singh and Kamal Al Haddad, "An Improved Control Algorithm of Shunt Ative Filter for Voltage Regulation, Harrmonic Elimination, Power Factor Correction, and Balancing of Non-linear Load", IEEE Transaction, 2000.
- [7] Bhim Singh and Sushil Kumar, " Modified Power Balance Theory for Control of D-STATCOM", IEEE Conference, 2010.
- [8] Mahesh K. Mishra, Arindam Ghosh and Avinash Joshi, "Operation of D-STACOM in Voltage Control Mode", IEEE Transaction, 2003.
- [9] Joao L. Afonso, H.J. Ribeiro da Silva and Julio S. Martins, "Active Filters For Power Quality Improvement", IEEE Conference, 2001.