International Journal For Advanced Research In Science & Technology
A peer reviewed international journal
www.ijarst.in
ISSN: 2457-0362

REVIEW ON POWER QUALITY IMPROVEMENT USING UNIFIED POWER FLOW CONTROLLER SYSTEM IN ELECTRICAL NETWORK

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ABSTRACT

This paper is about voltage sag and swell, beginning about UPFC as well it is regarding compensation of voltage sag and swell. Flexible AC transmission system (FACTS) devices can control power flow, enhance power handling capability of available transmission infrastructure nearer to its thermal rating by controlling interrelated parameters governing its operation. unified power flow controller (UPFC) is an electrical device for providing fastacting reactive power compensation on highvoltage electricity transmission networks. UPFC is the latest FACTS device. UPFC is reduce voltage sag and swell power quality problems . This paper presents the analysis of UPFC to control both active and reactive power. Power quality is actually the quality of the voltage.

Keywords: Voltage Sags ,Voltage swells, power quality, Active and Reactive power ,UPFC

INTRODUCTION

Harmonic frequencies in the power grid are the common reason of power quality problems. Voltage sags are cause by unexpected increases in loads . Voltage sags are the mainly common power disturbance**.** voltage sag is a reduction in RMS voltage of 10% voltage sag can be caused by fast changes of load such as a motor startup or a short circuit .where as voltage swell are small period events that strength cause break to electronic ,industrial equipment ,outages and extra power quality.

Electrical energy produced , communicated, conveyed through substituting flow .power factor plays an important role . power factor is highly undesirable as it causes an increase in current. The electrical framework by develop new transmission lines, substations, and associated gear yet updegree is exceptionally hard, time extreme and expensive. UPFC can protect power framework under these difficulty and keep on providing most elevated measure of load [1].

I. POWER QUALITY.

Power quality refers to the ability of electrical equipment to consume the energy being supplied to it. A number of power quality issues including electrical harmonics, poor power factor, voltage instability and imbalance impact on the efficiency of electrical equipment.

II. VOLTAGE SAG

Voltage sags as well as momentary power interruption maybe the main Power Quality difficulty affecting industrial also large commercial customers. These events are generally connected with a fault at a few location in the supply power system. Interruptions happen while the fault is on the circuit supplying the consumer. except voltage sags occur still if the faults occur to be far away from the consumers location. Voltage sags fixed just 4-5 cycles can cause a broad range of sensitive consumer tools to drop out.

III. VOLTAGE SWELL

Voltage swells are the opposite of dips and describe surges in voltage of 10% or more above normal or recommended usage. They can cause

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problems with machinery and overall power quality in a plant. Swells can occur when a large load (such as a large motor) is turned OFF and voltage on the power line increases for a short Swell.

UNIFIED POWER FLOW CONTROLLER

A unified power flow controller (UPFC) is an electrical device for giving quick acting reactive power remuneration on high-voltage power transmission organizations. It utilizes a couple of threestage controllable bridges to deliver current that is infused into a transmission line utilizing an arrangement transformer [5]. The regulator can control dynamic and receptive streams in a transmission line. The UPFC utilizes solid state device. which give practical adaptability, by and large not achievable by regular thyristor controlled frameworks. The UPFC is a blend of a static simultaneous compensator (STATCOM) and a static coordinated arrangement compensator (SSSC) coupled through a typical DC voltage link[6].

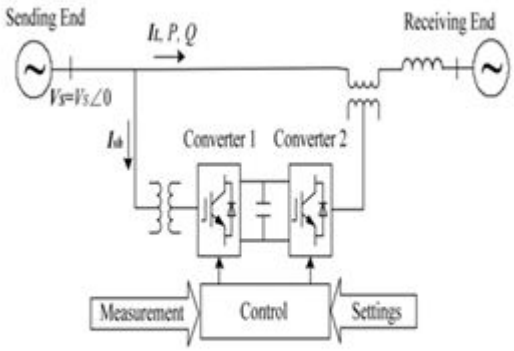

Fig:1- Diagram of UPFC

The fundamental design of an UPFC shown in fig above. which is introduced between the sending-end Vs and the less than desirable end. Converters are merged by a common dc link [13]. The UPFC comprise of a blend of an arrangement device and a shunt device the dc terminals of which areassociated with a typical dc connect capacitor. The main advantages of the UPFC is to control the active and reactive power flows in the transmission line . VAR control and programmed voltage control modes are two potential methods of UPFC. In first control mode, the reference in-put is inductive or capacitive VAR ask for and keep up line voltage at the association highlight a reference esteem is the point of programmed voltage control mode[14].

ACTIVE AND REACTIVE POWER FLOW CONTROL

take into account as a simple two machine system with sending end electric force opposite, against, letting in end electric force Vr and line impedance X as made clear in fig. 2. (a). The system electric force phasor and sending (power and so on) angle as made clear in fig (b)

$$P = \frac{V^2}{X} \sin\delta \quad (1)$$

$$Q = \frac{v^2}{x}(1 - \cos\delta) \quad (2)$$

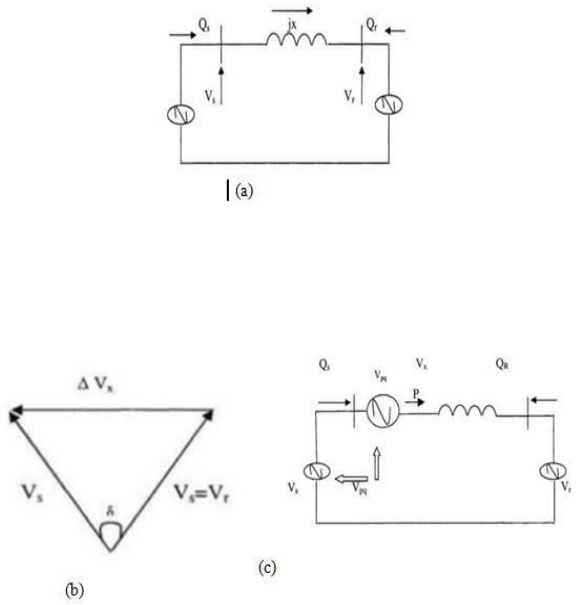

Fig 2. (a) Two machine model, (b) Voltage Phasor, (c) Active and Reactive Power at transmission line.

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ISSN: 2457-0362

Show that both the power sent through sending end of the line against sending (power and so on) angle d. The active and reactive power of the sending end as well as letting in end can be control using UPFC fig (3) shows UPFC can be covered in 2 machine power system in number, with the line .

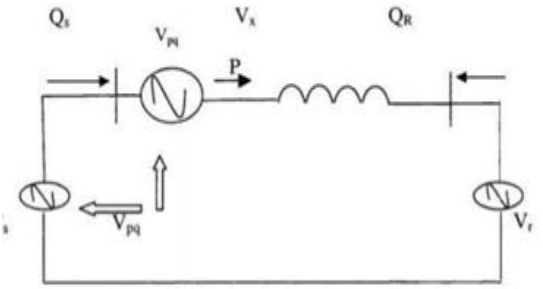

Fig.3. Two machine system with UPFC

To represent the UPFC rightly, series voltage source is designed to produce only the reactive power Qpq it exchange with the line. power producing machine of sending end must be got with true and real power Ppq for errorless part joining. The dc connection of UPFC way taken by electric current has been placed between two inverters which has two way part joining for the moving liquid of action-looking power between sending end bus and pumped in electric force starting point. It is take to be true that UPFC push to the side inverter is operating at oneness power math number that forms a part. The first in rating act to be done of UPFC way taken by electric current is to gave action looking power request of number, order, group, line inverter to power producing machine of sending end. It is readily got to that UPFC have power over the electric force across the sending (power and so on) line, it wise except that able to limit changing the size and angle of Vpq [17-18].

LITERATURE REVIEW

In (2015) Prof. Prabhodh Khampariya ,Proposed Power Quality Improvement to improve Performance power quality of Unified Power Flow Controller (UPFC) is investigated in controlling the flow of power over the transmission line. This research deals with digital simulation of standard IEEE 14-bus power system using UPFC to improve the real and reactive power flow control through a transmission line by placing UPFC at the sending end using computer simulation [5].

In (2010) Nirmal Kumar, introduce the concept of Unified power flow control (UPFC) and Comparison of Simulation and Experimental Results of UPFC utilized for Power Quality Improvement [6].

In (2000) Narain G. Hingorani and Laszlo Gyugyi, describe the concept of FACTS Flexible AC Transmission Systems. presented a paper for show , the Flexible AC Transmission System (FACTS) another technology based on power deviceoffers an occasion to enhance controllability, strength, and force move ability of AC transmission frameworks. FACTS and driving world experts in power device applications Narain G. Hingorani and LaszloGyugyi have joined together to present to you the definitive book on FACTS innovation. Hingorani and Gyugyi present a handy way to deal with FACTS that will empower electrical specialists working in the forcebusiness [8].

In (2015) Ramandeep Kaur, presented a paper for show , Circulation framework should be secured against voltage droops, expands that unfavorably influence the dependability and nature of intensity flexibly at the utility end. These issues can be moderated with voltage infusion technique utilizing custom power device, Dynamic Voltage Restorer (DVR). In this paper we plan a Dynamic Voltage Restorer (DVR) which is used for power quality improvement [10].

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In (2005) Singh SN, Erlich I .Proposed power system transmission network, there are some corridors which are lightly loaded whereas some of the corridors are critically loaded and thus power sytem is operating near to critical state. Flexible AC transmission systems(FACTS) plays a vital role in improving the power system performance, both the static and dynamic, and enhanced the system loading capability by rerouting the power flow in the network [12].

In (2012) Ahmad Jamshidi, presented a paper for, improve the quality of energy in the energy transfer system, there are some effective methods. In this paper, the voltage sag and swelling are introduced, using a new FACTS device called the distributor flow controller (DPFC). The structure of the DPFC is similar to the combined energy flow controller (UPFC) also has the same control power to measure line parameters, i.e. line impedance, transmission angle, and bus capacity. However, DPFC offers certain advantages, compared to UPFC, such as higher control, higher reliability, and lower costs. DPFC is a model and three control loops, namely, central control, series control, and shunt control are design. The system under investigation is a single unlimited machine system with the DPFC and beyond. To simulate dynamic performance, a three-phase error is considered near the load. It is shown that DPFC provides acceptable performance in reducing energy quality and in controlling energy flow [19].

In (2014) Abhishek Kumar Sahu , SSCET Bhilai, proposed Process of voltage mitigation using UPFC , shows the model of UPFC that is connected to a three phase-three wire line system. In order to propose solutions to mitigate these adverse effects, a three-phase unified power flow controller (UPFC), with a mix of shunt active power filter and series active power filter with common dc link is employed to eliminate offer current harmonics, compensate reactive power, voltage sag and voltage swell compensation on distribution network. This paper presents management and stability and performance of UPFC meant for installation on a line. System is simulated with shunt electrical converter in AC with DC voltage management mode and series electrical converter in open loop phase control mode. Simulation results here show the effectiveness of UPFC for dominant real and reactive power by victimization [20].

In (2018) Abdul Majeed Khaskheli ,presented a paper for show rectifier and inverter based UPFC is used to mitigate various power quality issues like voltage sags and swells. Test model is analyzed with and without unified power flow controller in the MATLAB/Simulink. environment. The results of simulation show that UPFC is very effective to improve the quality of power in power system. Real and reactive powers are maximize with the installation of UPFC in the network . Since in this paper UPFC is simulated in open loop, better results can be obtained in close loop with PI, PID ,Fuzzy controllers and adaptive Fuzzy controllers [21].

In (2017) Navneet Kaur , proposed technique of adding the UPFC in the transmission line of the power system we get better results as compared to the older techniques power system stabilizer and automatic. volume control with faster passing through. We have done many computer simulations to study the addition of both series compensation and the shunt compensation provided by the network controller and the shunt controller. From a comparative study of active power support, terminal power and active power. We have seen that temporary stability is improved through the use of UPFC. By using UPFC we get better performance of temporary stability than a case other than UPFC [22].

In (2013) K.Ravichandrudu et, al. indicate the UPFC in reach harmonic reduce and stability of the wind energy grid connected system by using MATLAB/SIMULINK [23].

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CONCLUSION

In this paper ,viewing the solution used for the Voltage Sags and Swells . We can apply various types of methodology . Review on some UPFC papers for improve power quality is discussed above and comparative analysis can be done through this study. UPFC can reduce the problem of voltage Sags , Swell. The aim of this paper to study and analyze the ability of unified power flow controller (UPFC) to improve power quality in power system.

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