Use of UPFC In Mitigating Harmonics From A 53kv Distribution Line

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Abstract- In this paper the UPFC show has been utilized wipe out the impacts of sounds in a conveyance line arrangement of 53kV . The proposed framework has been actualized utilizing Matlab and simulink2014 and the outcomes have been ordered for prepared referenced. It has been demonstrated that the sounds existing in a 53kV dissemination line are effectively moderated by the UPFC framework and the part of arrangement pay is more when contrasted with shunt pay.

Keywords- FACTS, UPFC, POWER QUALITY, VSC

I. INTRODUCTION

The power-exchange capacity of long transmission lines are generally constrained by expansive flags capacity. Monetary variables, for example, the high cost of long lines and income from the conveyance of extra power, give solid motivating forces to investigate all monetarily and in fact plausible method for raising as far as possible. Then again, the improvement of powerful approaches to utilize transmission frameworks at their greatest warm ability has gotten much research consideration as of late. Quick movement in the field of force hardware has as of now impacted the power business. This is one direct result of the idea of adaptable air conditioning transmission frameworks (FACTS) viewpoints, which has gotten to be practical because of the change acknowledged in power-electronic gadgets. On a basic level, the FACTS gadgets could give quick control of dynamic and responsive power through a transmission line. The brought together power-stream controller (UPFC)is an individual from the FACTS family with exceptionally alluring components. This gadget can freely control numerous parameter, so it is the blend of the properties of a static synchronous compensator (STATCOM) and static synchronous arrangement compensator (SSSC) [1]

The conversion from DC voltage to AC voltage is obtained by using standard bridge circuits. These bridge circuits use GTO as their building blocks. Since these circuits convert DC voltage to AC voltage, they are termed as voltage source converters (VSC). The control framework connected with VSC permits it to conform its size and stage edge. The expression "inverter" has additionally been utilized to signify the VSC. Consider now the association of two VSC associated consecutive with a typical DC Connect capacitor "C" as appeared in Fig. 1.1. Such a game plan takes into account al1 the three works to be specific arrangement, shunt and stage point remuneration to be brought together in one unit. Inverter 1 is associated with a shunt transformer and the inverter 2 is associated with an arrangement transformer.

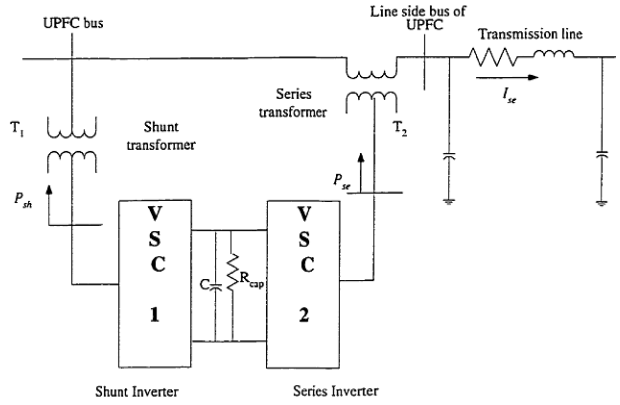


Fig. 1.1 UPFC constructions.

It is promptly seen that the VSC associated with the shunt transformer can perform the capacity of a variable responsive power source like that of shunt compensator. In expansion, the inverter 1 can charge the DC connects capacitor. Inverter 2 can give arrangement or stage point pay by infusing an arrangement voltage of legitimate stage relationship. In the instance of arrangement pay, inverter 2 can work free of the inverter 1, as inverter 2 supplies/expends just responsive power and does not have any genuine power trade with invener 1. In such a case. the DC interface capacitor voltage will in a perfect world be consistent.

II UPFC Modeling

2.1 Load flow models

Diverse load stream models have been utilized to mode1 the UPFC in fluctuating level of multifaceted nature and have been talked about here quickly. As specified in part l, an UPFC comprises of two inverters associated consecutive with a DC connect capacitor. One inverter is associated in shunt and the other in arrangement with the transmission line as appeared in Fig.1.2. The early demonstrating endeavors for an UPFC were focussed on the arrangement inverter displaying. The reason being that

business programming did not have arrangement voltage source models. American Electric Power (AEP) and Westinghouse concocted a heap stream show [8]. The prerequisite for the consideration of the model was that the Load stream ought to be a comprehended one. Fundamentally, what was required was that the voltages and the edges of the power framework transports must be known ahead of time to inchde the UPFC demonstrate. The Load stream show for UPFC comprised of two generators, one speaking to the shunt inverter and the other the arrangement inverter. Distinctive arrangements of these generators were expected to show distinctive working conditions. Fig.1.3 demonstrates the model that was utilized to incorporate the UPFC into Load stream thinks about [8]. Here the procedure of illuminating begins with the opening of the arrangement line, and the generator G2 creates the booked genuine and responsive power. The planned power in the transmission line is changed over into a proportional load at the terminal where the generator G l is associated. The generator G1 produces the required responsive energy to keep up planned transport voltage.

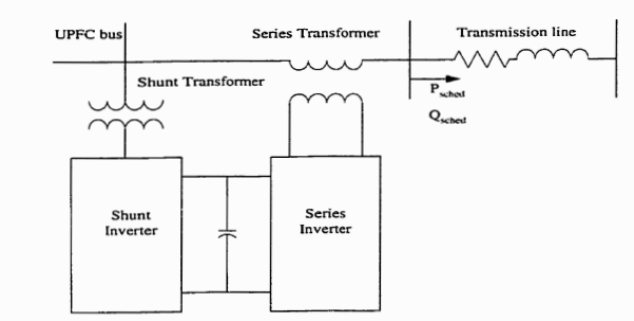


Fig.1.2 A UPFC connected to a Transmission line.

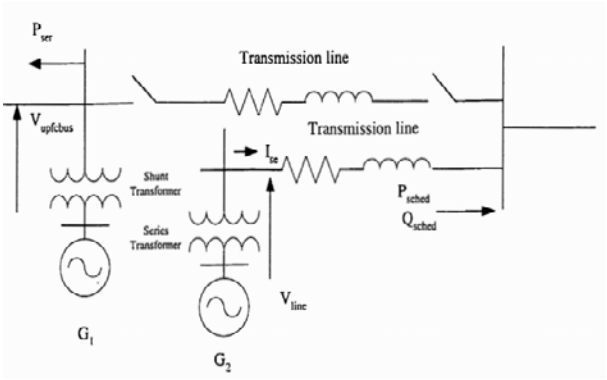


Fig.1.3 Coupled source mode1 for UPFC.

Generator G2 also supplies the real power demand of the series inverter. The series injected voltage is the phase difference betweenV_{line} and V_{upfcus} .The product of series injected voltage and the current I_{se} gives the amount of volt-ampere of the series inverter. The real part of the volt-ampere (P_{ser}) of the series inverter is added as a load at the shunt inverter bus. The algorithm to perform the addition of equivalent loads at the shunt inverter bus, to open the appropriate lines, have been included in their program. The problem is that it needs a solved load £low case. The idea of solving a load flow with an UPFC is to obtain the shunt and the series inverters' injected voltages for a given operating condition. This procedure is crude for solving a load flow with UPFC.

2.2 Simulink Model

Fig below shows the final simulink model for the implementation of UPFC:-

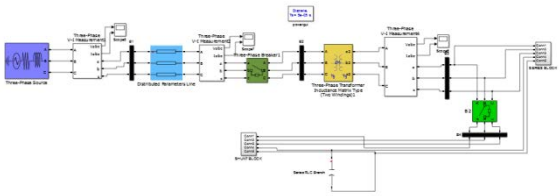


FIG. 2.1 COMPLETE SIMULINK BLOCK

The simulink consists of the following blocks :-

(a) 3-PHASE SOURCE

3-Phase Source block of SimPower System is used as 3Φ Voltage source with following ratings:

a) Phase-to-phase rms voltage (V) 400V
b) Frequency (Hz) 50Hz
c) Internal connection Yg
d) Source resistance (Ohms) 0.001
e) Source inductance 1e-8

(b) LINE IMPEDANCE (Zt)

Line impedance (Zt) is a three phase RLC branch used to represent line impedance having

following parameters.

- Resistance R (Ohms) 0.01
- Inductance L (H) 1e-6

(c) V-I MEASUREMENT

- Three phase VI Measurement block is used to measure line to ground voltages and line currents.

(d) CIRCUIT BREAKER

A three phase Circuit Breaker is connected in series with line and SAPF. Breaker timing is defined such that it connects SAPF with system after some time simulation has started in order to have a better look at line current harmonics and the effect of SAPF.

(e) POWERGUI

This block is needed to run any SimPower System model. It provides option for configuration of simulation and analysis of system.

f) Shunt & series blocks

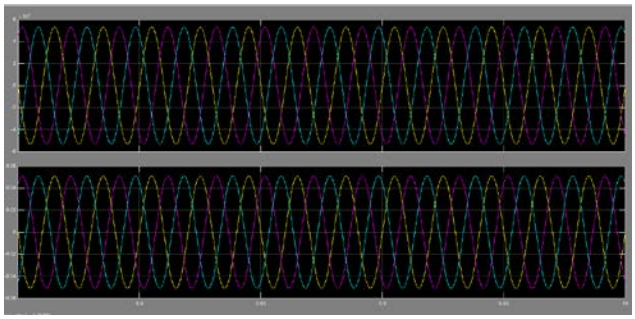
This block is a subsystem consisting of the power mosfets which turn ON and OFF as per the theory discussed in UPFC section.

III RESULTS

Thus with these basic framework , the results obtained for UPFC in coping the power surge protection in case of distributed line system are summarized as below :-

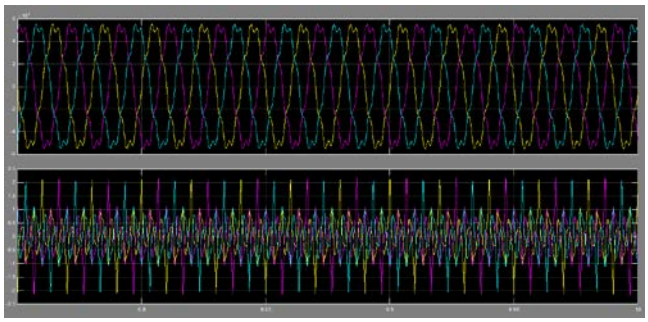
Case 1 : SHUNT = CONNECTED && SERIES = CONNECTED

The setting for connecting and disconnecting the shunt and series block are controlled by the help of switches as shown below :-

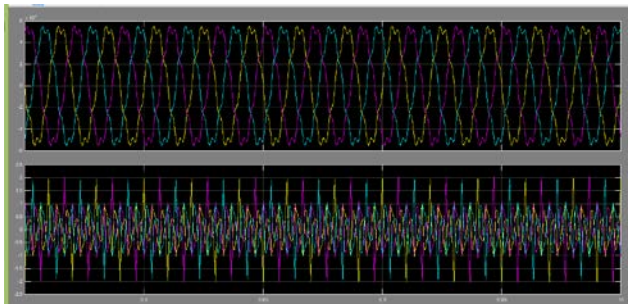


As clearly seen from the above waveforms that the3 phase voltgaes and current are completely in sync with each other and hence harmonics due to distributed lines is completely mitigated by the UPFC installed.

Case 2. Series = disconnected & Shunt block = connected

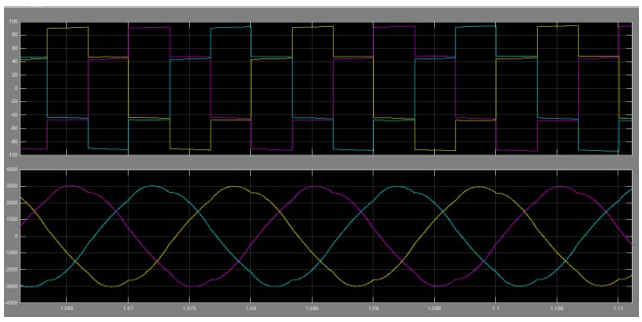


Clearly in the absence of series blocks harmonics are visible in the three phase voltages and current

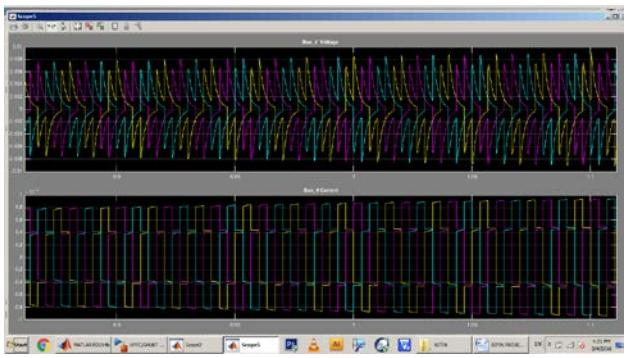


Series block Off& Shunt block Off

Also the real time voltages and current injected (or absorbed) by both the blocks are as given below :-



Real time voltage and current injected by the series block



Real time voltage and current injected by the shunt block

V CONCLUSION

In this manner from the outcomes appeared in the past parts it is entirely clear that for conveyance organize if UPFC is connected then the sounds are significantly lessened . In any case, furthermore imperative to note in this exploration work that the impact of arrangement pay is more as seen from the figure when contrasted with shunt remuneration in light of the fact that in an exceptional situation where we have evacuated shunt pay and conveyed arrangement pay than the sounds are less . In this manner one can say that for circulation line sounds shunt pay of UPFC has not exactly critical part to play.

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