Power Upgrading of Transmission Line by Combining AC-DC Transmission and Analysis of UPFC

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Abstract- *The basic concept in designing of any power lines in transmission of ac-dc power with power upgrading using UPFC is proposed through a single circuit ac transmission line. In this proposal certain limitation are their due to the use of ground as return path. More ever the instantaneous value of each conductor voltage with respect to ground becomes higher than the Line-Line voltage. By using UPFC that is unified power flow controller we can make it possible to handle practically all power flow control and transmission line compensation problem which provide functional flexibility in power which is not possible by the use of conventional thyristor control system. In this paper we have design UPFC to improve stability of power oscillation that are caused due to non-linearity of the load. MATLAB -Simulink model has been develop for this concept.*

***Keywords*;** Control system, MATLAB, UPFC, power devices, Series converter, Shunt converter.

I. INTRODUCTION

With the need of increase power transfer transient and dynamic stability is an important factor for secure operation of power system. The system (UPFC) is suitable control strategy that has the potential to significantly improve the transient stability margin. UPFC is the most versatile and can be used to enhance the system stability and is capable of both supplying and absorbing real and reactive power with respect to AC-DC-AC transmission line. The UPFC is in phase with dc bus voltage and inject voltage of variable magnitude and phase angle and can exchange real power with transmission line and thus improve power flow capability of the line. The UPFC is robust and system specially designs for most technically in the flexible ac transmission.

The UPFC consist of series branches of R-L-C to balance the power between power between shunt and series converter and to maintain constant voltage across transmission line. The optimal design of UPFC has many positive influences on validating of the power system running. These UPFC belongs to the family of the family of FACT controllers.

There are in general five types of controller used worldwide in transmission line. They are Load tap changer (LTP), Phase angle regulator (PAR), Static VAR compensator (SVC), Static compensation (STATCOM), UPFC. Among all of these the Unified Power Flow Controller (UPFC), finds an important place by offering real time and dynamic compensation of AC transfer system in order to create required multi-functionality of the system. UPFC is able to control all the parameters influencing the power flow in the transfer line (i.e voltage of impedance and phase angle) and that's why its unique name is unified is given. In addition it can independently control the flow of real and reactive power.

II. Designing of UPFC

The UPFC consist of a series R-L-C network in bus line. The UPFC is designed consist of three important methods.

1) It can control the terminal voltage of the line.
2) It can perform series compensation.
3) Phase-shift control- Phase shift by UPFC is in the state which find phase change but its amplitude doesn't change.

Multipurpose control of UPFC; it may control the power at the same time and compensation is carried out with respect to terminal voltage and line series compensation change or alteration in phase-shift angle.

The power circuit of UPFC is shown below
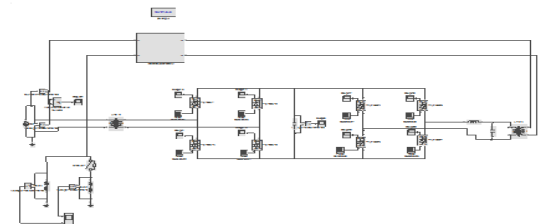
III. Simulation Model

Fig1.Simulation of model of system.
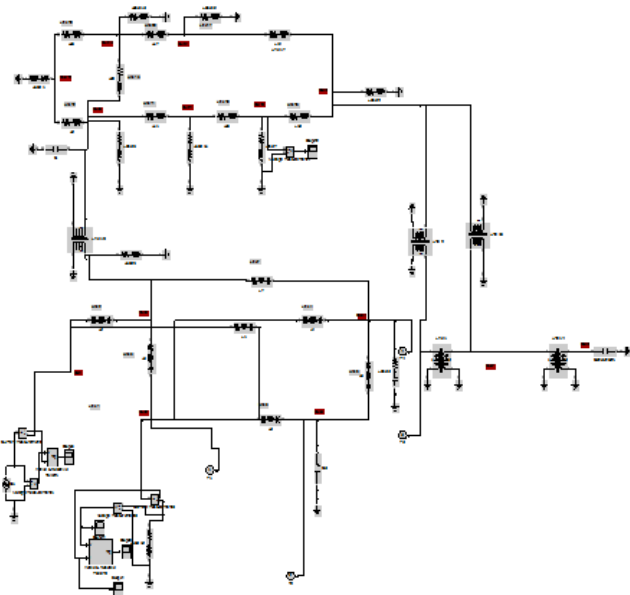
IV. Simulation Model of UPFC

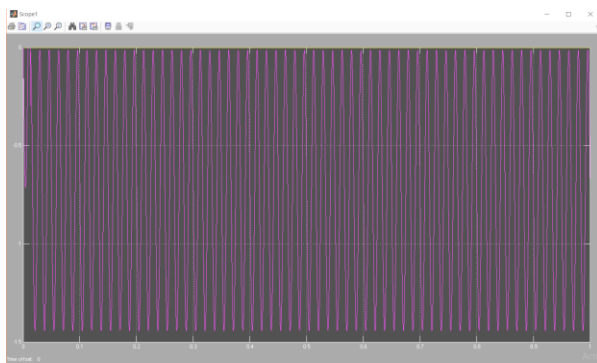**Fig2.Simulation model of UPFC**

V. Results

Fig3. Result of thyristers.

VI. Conclusion

The purpose of applying FACTs tools is to removes the oscillation of the power angle and increase stability of the system by upgrading the power more-ever the UPFC helps in providing the quality power without damping and controlling the voltage effectively at the non-linear load side.

UPFC is one of the index tools of AC transfer system having promising capabilities for controlling the parameters of utilizing the transfer system in the steady state and the transient state of system.

VI. References

1) L. Gyugyi, C.D. Schauder, S.I. Williams, T.R. Reitman, D.R.Torgerson and A. Edris, 1995, "The Unified Power Flow Controller: A new approach to power transmission control", IEEE Trans. On Power Delivery, 10(2), pp. 1085-1095.

2) M. Noroozian, L. Angquist, M. Ghandhari, G. Andersson, 1997, "Use of UPFC for Optimal Power Flow Control,"IEEE Transactions on Power Delivery 12(4), pp. 1629-1634.

3) B.A. Renz, A. Keri, A.S. Mehraben, C. Schauder, E. Stacey, I.Kovalsky, L. Gyugyi, and A. Edris, 1999, "AEP Unified Power Flow Controller Performance", IEEE Trans. o Power Delivery, 14(4), pp.1374-1381.

4) L.Gyugi, Unified power flow controller concept for flexible ACtransmission systems, IEE Proceedings-C, Vol.139, No.4, July 1992,pp. 323-331.

5) K.S. Verma,, S.N. Singh, H.O. Gupta, Location of unified power flowcontroller for congestion management, Electric Power Systems Research 58 (2001) 89-96.

6) M. Noroozian, L. Angquist, M. Ghandhari, G. Andersson, 1997, "Use of UPFC for Optimal Power Flow Control," IEEE Transactions on Power Delivery, 12(4), pp. 1629- 1634.

7) D. Murali, Dr. M. Rajaram, Active and Reactive Power Flow Control using FACTS Devices, International Journal of Computer Applications (0975 – 8887), Volume 9 – No.8, November 2010.

8) S. Tara Kalyani, G. Tulasiram Das, Simulation of Real and Reactive Power Flow Control with UPFC Connected to a Transmission Line, International Journal Of Computer Applications, 2008, (16-22)

9) Xiao-Ping Zhang, Christian Rehtouz, Bikash Pal, Flexible AC Transmission Systems: Modeling and Control, Springer-Verlag Berlin Heidelberg, 2006.Papers from Conference Proceedings (Published)

10) Bhanu CHENNAPRAGADA Venkata Krishna, KOTAMARTI. S. B.Sankar, PINDIPROLU. V. Haranath, "17th International Conference on Electricity Distribution," CIRED, Barcelona 2003, Session 5 Paper No 19.