Analysis And Modeling For Control Damping Oscillations With UPFC

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Abstract- *This paper presents deals to control the power flow, optimizing the stability and increasing the capacity of transmission line. The major aspect of steady to maintenance and control of power system so we deal in a systematic approach for designing FACTS devices like UPFC. It enhances stability and control of power flow. This paper investigates the performance of power system with and without UPFC . So finally, we established the Simulink model of UPFC and results are compare to get best performance of the system.*

Keywords- SMIB, UPFC(FACTS)

I. INTRODUCTION

Power systems over the global becoming complex everyday and constant necessities are coming for stable, secured, controlled, cost-effective and better excellence power. these necessities grow to be more essential when environment becoming more vital and important deregulation. power transfer capability in transmission system is inadequate due to different factors like steady state stability limit, thermal limit, transient stability limit and system damping.

One of the main criteria, deciding the power system operation is its stability. stability of the power system is the capability to sustain the machines connected to the system in synchronism. however trouble always happen either due to the rapid addition or removal of load, short circuit of lines, lightning etc .The electrical damping of power system need to be ease to stable oscillations free power transfer.

Flexible AC transmission system and distributed flexible ac transmission system presents possible and cost-effective result to these troubles and so these devices are necessary to use global for improving presentation of power system. development in semi-conductor electronics have helped in the growth of new control technologys for stability improvement, which contains the use of facts controllers [1].

Facts controllers are high power electronic controllers, which can be useful individually or collectively in power system, to manage the line parameters like series and shunt impedances efficiently.facts devices improve the stability of the power system with its rapid control characteristics and constant compensating ability[5].

The manage of power flow and raise in the transmission capacity of the presented transmission lines are the two main purpose of facts technology [3]. these objectives help in the best possible consumption of the existing power system and enhance the controllability of the power system. unified power flow controller is one such facts device, able of improving the dynamic control of real and reactive power flow. UPFC is the component of facts family that has emerged for the controlling and the optimization of power flow in the transmission systems]. the unified power flow controller uses a arrangement of a shunt controller (statcom) and a series controller (sssc) organized through a common dc bus. all the constraints of the power transmission line (impedance, voltage and phase angle) can be controlled at the same time by UPFC [1]. in accumulation, it can execute the control function of the transmission line real/reactive power flow, upfc bus voltage and the shunt-reactive-power flow control [2].

Both the series and shunt converters use a voltage-sourced converter (VSC) linked on the secondary side of a coupling transformer. Both the converters equally contribute a wide range of control of both the real & reactive power in the transmission lines, thus helping in the improvement of system constancy and reliability

As a result, UPFC is to control the active and reactive power flow during the transmission line. it is widely traditional that the upfc is not able of damping the oscillations with its normal controller.A well-designed upfc controller can not only raise the transmission capability but also improve the power system stability and compare the performance of upfc based damping controllers with and without UPFC Performance.

II. SINGLE MACHINE INFINITE BUS SYSTEM

This coordination consists of a synchronous generator which is connected infinite bus system through a transmission line. It is seen that the single machine connected

to the infinite bus always disturbed with the frequent load change and it may leads to be serious stability problem

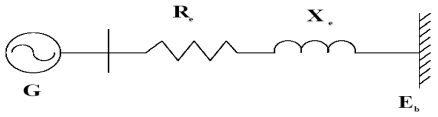

Fig. 1. SMIB SYSTEM

III. FACT DEVICES

It defined as AC transmission network integrating semiconductor-based power electronic device as well as different stationary controllers to increase the capacity of power flow and also expand the controllability of the system.

IV. FACTS CONTROLLER

It contains power electronic devices as well as other static devices with advance power electronic conversion and switching capability. It is essential to explain that some other static device which is used as a controller are not belongs to the power electronic family but mostly the used controller are thyristor devices. When we are use the FACTS as a reactive power controller they are afford with minimum storage at dc side. FACTS Controllers are distributed into four groups [8] [9].

1. Series FACTS Controllers
2. Shunt FACTS Controllers
3. Combined Series-Shunt FACTS Controllers
4. Combined Series-Series FACTS Controllers

V. UNIFIED POWER FLOW CONTROLLER

Unified power flow controller (UPFC) is a arrangement of static synchronous compensator (STATCOM) and a static synchronous series compensator (SSSC) which allocate bi-directional flow of real power between the series output terminals of SSSC and the shunt output terminals of the STATCOM by a common dc link and are controlled to supply concurrent real and reactive series line compensation without an external electrical energy source [6].

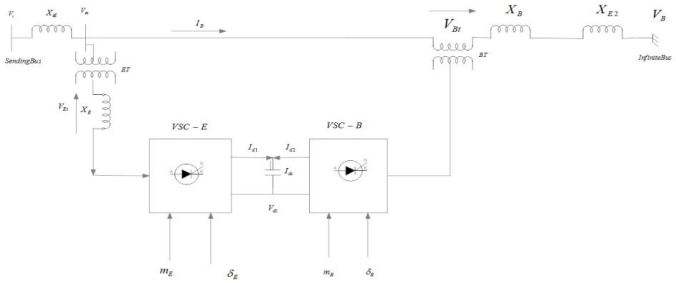

Fig.2 UPFC installed in SMIB system

VI. MODELING OF SMIB SYSTEM WITHOUT UPFC

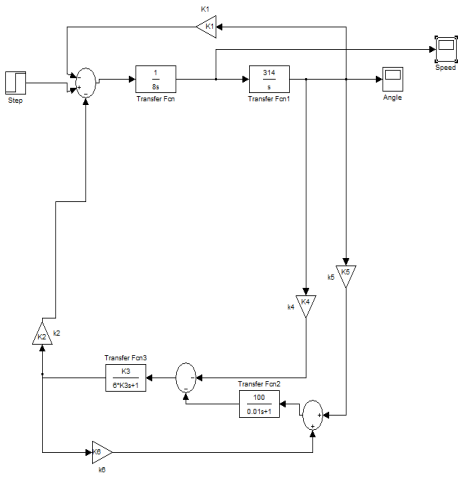

Fig.3: Simulink model for SMIB power system without UPFC

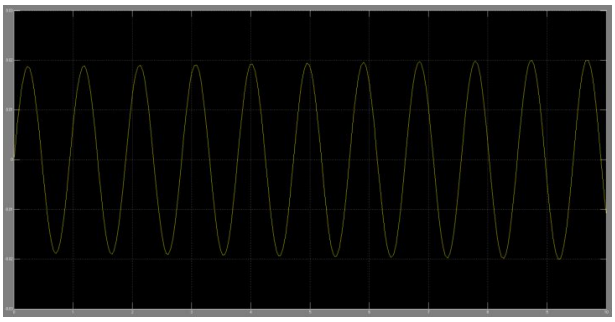

Fig.4: Speed Deviation for SMIB power system without UPFC

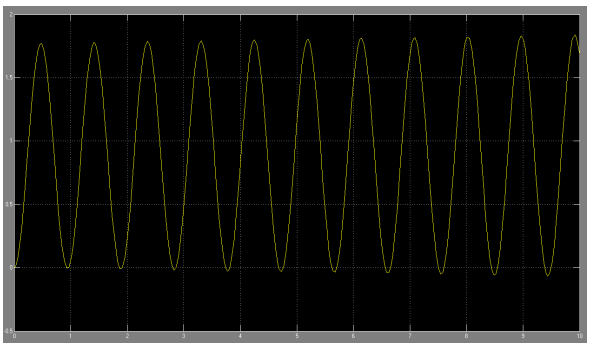

Fig.5: Angle Deviation for SMIB power system without UPFC

VII. MODELLING OF SMIB WITH UPFC

The small-signal stability of a SMIB system is seen that the Single Machine connected to the infinite bus always concerned with the frequent load change and it may leads to be serious stability problem and should be discussed. Exploration of SMIB provides physical perception of the small but Low Frequency Oscillations. The SMIB system directly involves to the study of LFO .If proper damping is not supplied to the system then the small oscillation leads to create a savior instability problem [20].

These papers also investigate the impact of UPFC with SMIB system under low frequency oscillations by providing suitable damping signal using PSS. By picking proper control parameter i.e. speed and angel deviation as a input function and using the knowledge base of the system performance with mamdani interface damping signal which can effectively reduce the system oscillation. And a compression study is made to see the effectiveness of these controllers [16-17].

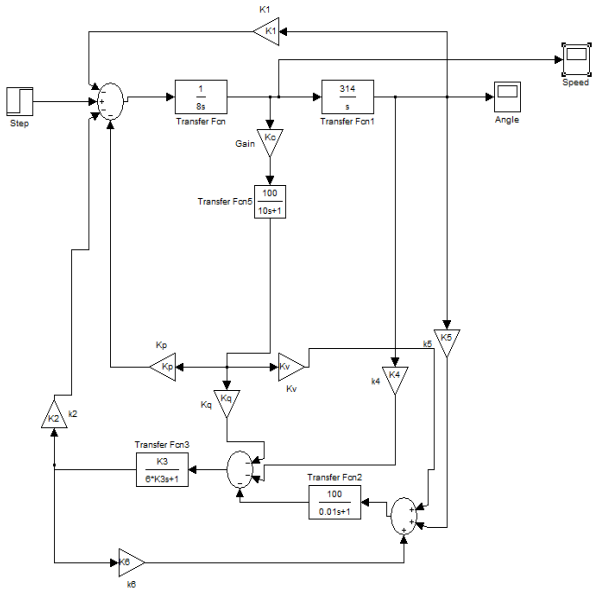

Fig.6: Simulink Model for SMIB power system with UPFC

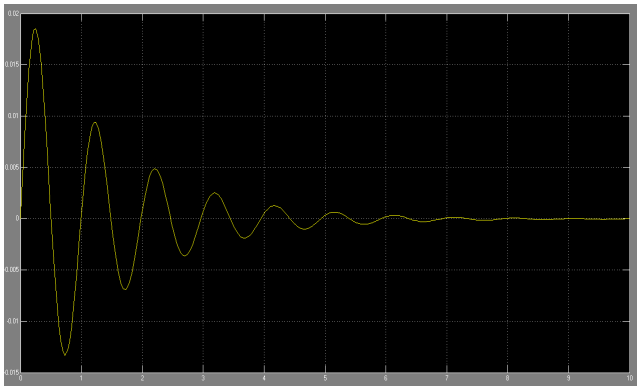

Fig.7: Speed Deviation for SMIB power system with UPFC

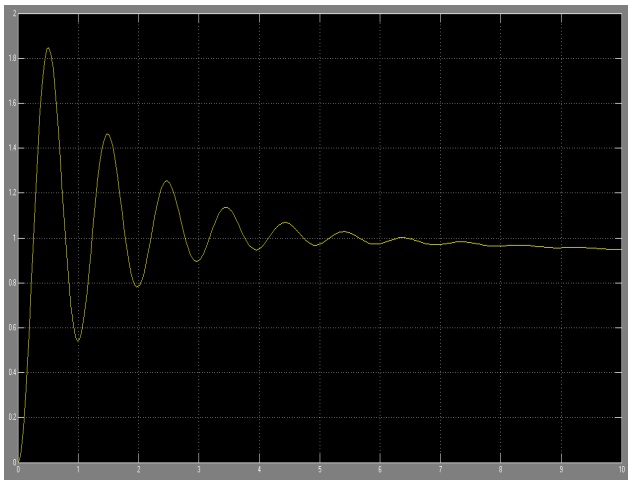

Fig. 8: Angle Deviation for SMIB power system with UPFC

VIII. CONCLUSION

The entire system presents the effectiveness and stability response of the UPFC without and with. we simulate the model of UPFC connected SMIB system. If Power Flow Controller is connected then lesser rating of UPFC becomes sufficient for stabilization of the system oscillation at very shortest interval of time for both the steady and transient conditions. This power flow controller can use with a UPFC(FACTS) device for of system like single machine system to enhance the stability of the system with damping the oscillation we studying the result of power system in SMIB system and UPFC connect SMIB system.UPFC can adjust the distribution of the power flow smooth and quickly that's why it provide the stability. The response of UPFC based SMIB is better than SMIB system.

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APPENDIX

The nominal parameters and the operating condition of the system are given below.

Power system data:	Operating condition :
T_{do}=5.044s X_d=1.0 pu X_q=0.6 pu M=2H=8.0 MJ/MVA D=0.0 K_a=100 T_a=0.01s	V_t=1.0 pu V_b=1.0 pu f= 50 Hz