

Evaluation of Improvement of Voltage Profile by using FC-TCR in Power System

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Abstract :- This paper will discuss and demonstrate how Static Var Compensator(SVC)FC-TCR has successfully been applied to control transmission system dynamic performance for system disturbance and effectively regulate system voltage. Modelling and simulation of static var compensator(SVC for power system stability and improvement of power transfer capability have studied .First ,power flow results are obtained and then power(real and reactive power) have been studied for an uncompensated system and then compared with the results obtained after compensating the system using SVC device. Better utilisation of existing power system capacities by installing new devices such as Flexible AC Transmission system(FACTS) has become very important This work focuses on studying the effect of (SVC)FC-TCR on the voltage stability limit of power flow.All the simulation have been carried out in MATLAB/SIMULINK A methodology for determining the power flow margin is simply briefed.

Keywords :- FACTS,SVC ,Real and Reactive Power, FC-TCR, Voltage Sag, Voltage Profile , Matlab / Simulink, Thyristor controlled reactor.

I. INTRODUCTION

FACTS Technology is becoming more and more popular due to improvement in Power Electronic Technology and reduction in costs. Several FACTS controllers for shunt, series or both shunt & series compensation are now operating in power systems around the world.. The number of devices and electrical machines that absorbs the reactive power has been increased with either developments at technology or rising wealth levels in offices and houses. However the utilities aim to achieve this with the most beneficial compensation devices. Usually placing adequate reactive power support at the weakest bus enhances the Static- Voltage stability margin. The main objective of the Present paper is to discuss a new control method for SVC (FC-TCR) controllers for Transmission system . Reactive power imbalance occurs due to heavy load and voltage fluctuations . FC-TCR is providing necessary voltage to eliminatethe sag present in the system[1] .Sag means deep voltage fluctuation at any instant time.

II. BASIC FC-TCR

In Fig 1.FC-TCR is shown in which combination of fixed capacitor and thyristor control reactor is taken to study the operation.FC-TCR is one type of svc.There are two type of compensation to to operate the basic fc-tcr.

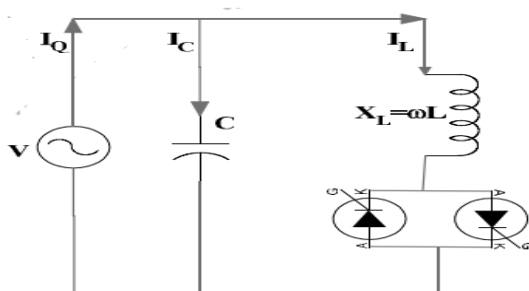


Fig.1 Basic FC-TCR

In FC-TCR Sag and Swell creation is done. Swell means sudden raise in voltage at any specific instance of time. Sag creation is due to inductive load and swell creation is due to capacitive load. Only filter eliminates harmonic Present in the system.It does not enhance the voltage level.It does not eliminate the sag present in the system.The power transfer limit in either shunt series compensation. The compensation can be provided in the following ways.

A. Shunt capacitive compensation

This method is used to improve the power factor. Whenever an. To compensate, a shunt capacitor is connected which draws current leading the source voltage.

B. Shunt inductive compensation

This method is used either when charging the transmission line, or, when there is very low load at the receiving end. Shunt capacitance in the Ferranti effect). by a thyristor-based ac switch with firing angle control

III. MODELING OF FC-TCR

In Fig 2 Matlab model without FC-TCR is shown.In fig 2 Nonlinear load used for universal bridge such as bridge rectifier.Passive shunt filter such as high pass filter is used.In fig 3 Matlab model with FC-TCR is shown.In fig 3Delay angle given to firing pulse generator six pulse given to TCR branch.The scheme consists of basic transmission model of compensated system.This model consists of different buses at with the simulation results were obtained.

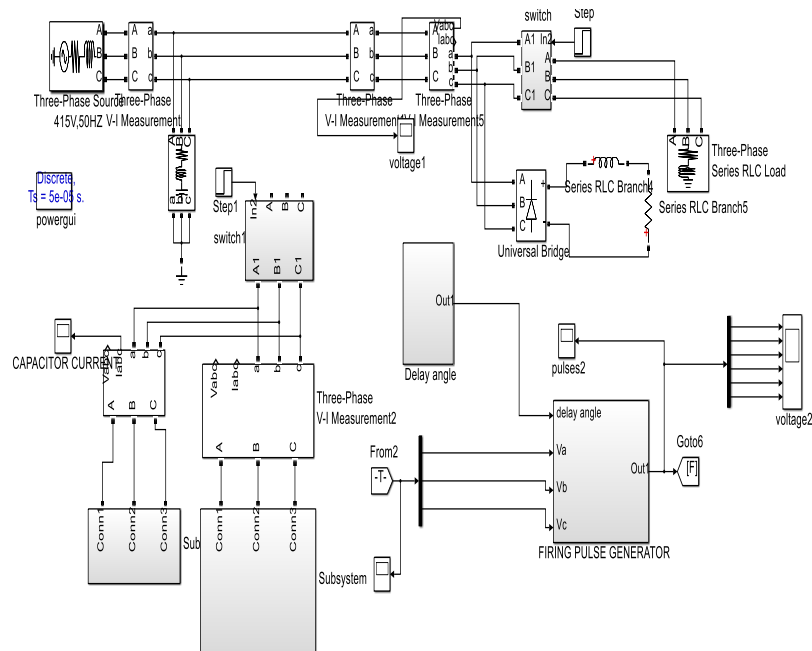


Figure 2. Matlab circuit without FC-TCR

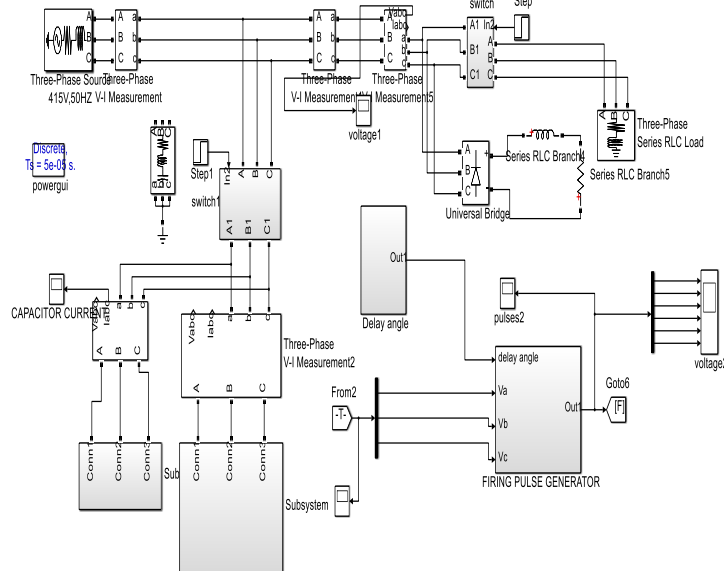


Figure 3. MATLAB circuit with FC-TCR

IV. RESULTS AND DISCUSSION

Simulation results of filter connected is as shown Fig 4 in which voltage sag will not occur in the system. Only filter eliminates harmonic present in the system and it does not enhance the voltage level.. When system is without FC-TCR as shown in Fig 5. then sag creates between 0.2 to 0.7 seconds and the voltage magnitude is change less than 1 p.u. We have to compensate the above system by using SVC system so that we can get actual voltage profile. After updated voltage profile we change the simulation result will represent that the voltage profile is compensated and the magnitude of the voltage profile is also maintained at the actual voltage. The results such voltage sag elimination as shown in Fig 6.

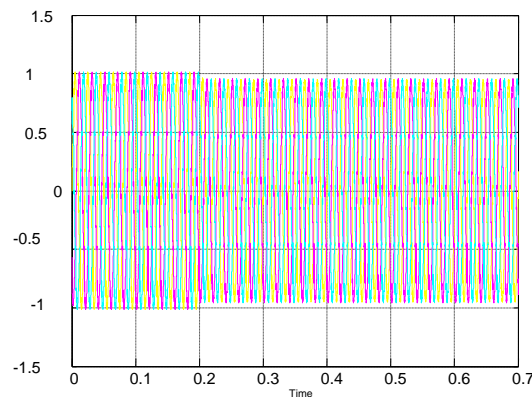


Figure 4. o/p when filter is connected to the system

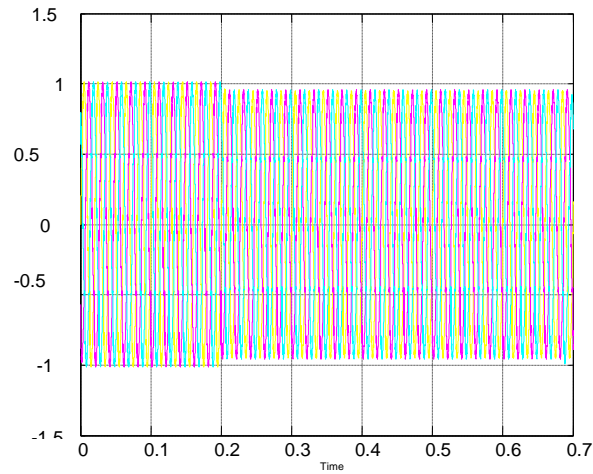


Figure 5. O/P Sag voltage without FCTCR

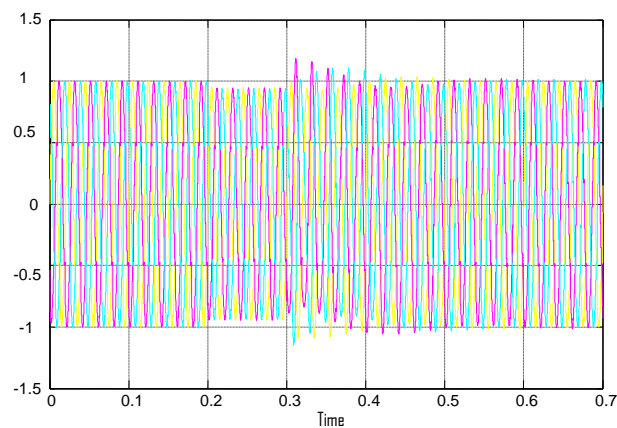


Figure 6.O/P voltage sag elimination with FC-TCR

V. CONCLUSION

From the above simulation we conclude that fc-trcr is able to compensate the voltage sag.It also increases the power transmission capability.

The simulation results indicated a considerable increase in power flow limit .Further study on voltage swell elimination is in propose work.It can be study for the most effective way of increasing the power flow limit.

REFERENCES

- [1] Ghanshyam Vishwakarma and Nitin Saxena Department of Electrical Engineering, Jabalpur Engineering College Jabalpur, (MP) “ Enhancement of Voltage Profile by using Fixed Capacitor- Thyristor Controlled Reactor (FC-TCR)” (Received 17 June, 2013, Accepted 05July, 2013)
- [2] Jyoti Govind Agrawal M-Tech IV SEM IPS, G.H.Raisoni College of Engineering Nagpur, Maharashtra jyotingp7777@gmail.com. K.D.Joshi G.H.Raisoni College of Engineering Nagpur, Maharashtra kdjoshi22@gmail.com “Experimental Study of Some Variable Impedance Type FACTS Devices” 2011 Fourth International Conference on Emerging Trends in Engineering & Technology,978-0-7695-4561 2011 IEEE.
- [3] Swapnil Sharma and Dikesh Patel P.G.Scholar PIET,GTU,Vadodara,India.Modelling And Simulation Of FC-TCR For Reactive Power Compensation Using The MATLAB/SIMULINK .International Journal Of advances in Engineering & Technology,Jan,2015 Vol 7 ,Issue 6,pp1767-1773.
- [4] Ms.Shilpa Gupta EN Dept Inderprastha Engineering College Ghaziabad,India.Reactive Power Contol Using FC-TCR. International Journal Of Innovative Technology and Research volume No.1,Issue No 1,Jan 2013,037-041.
- [5] S E Haque, Member IEEE N H Malik, Member IEEE King Saud University, Riyadh, Saudi Arabia W'Shepherd, Sen. Member, IEEE Univ. of Bradford, U.K. “Operation Of A Fixed Capacitor-Thyristor Controlled Reactor (FC-TCR) Power Factor Compensator”. “ IEEE Transactions on Power Apparatus and Systems”, Vol. PAS-104, No. 6, June 1985
- [6] Rahil S. Parikh¹ Ashish R. Patel² IPG Student, Gujarat Technological University 2Asst. Professor, Electrical Engg. Dept. Ahmedabad 2BVM Engineering College, Anand, Gujarat, India “A User Friendly Simulink Model for FC-TCR to Investigate Power System Issues” IJSRD - International Journal for Scientific Research & Development| Vol. 1, Issue 12, 2014 | ISSN (online): 2321-0613
- [7] Jaime Gutierrez Juan Carlos Montaiio Dept. Applied Physics 111. Ingenieros, Avda. de 10s Spanish Research Council Reina Mercedes Campus,, Escuela Superior de (CSIC), IRNAS Descubrimientos s/n, POB 1052 41092-Sevilla, Spain. 41080-Sevilla, Spain. jaiben@us.es montano@irnase.csice. “Power-Quality Improvement in Reactive Power Control Using FC-TCR Circuits” 0-7803-7474-61021 02002 IEEE
- [8] H. García, PGIIE, Institute Tecnológico de Morelia,Morelia, México,hec_gviveros@hotmail.com M. Madrigal, PGIIE, Instituto Tecnológico de Morelia, Morelia, México,Manuelm @itmorelia .edu.mx “Modelling and Analysis of a TCR-FC Reactive Power Compensator Using the Harmonic Domain “ 2009 Electronics, Robotics and Automotive Mechanics Conference
- [9] Ashwin Kumar Sahoo Department of Electrical Engineering SSN College of Engineering Chennai, India Email: ashwinsahoo@yahoo.com T. Thyagarajan Department of Instrumentation Engineering MIT, Anna University Chennai, India Email: thyagu_vel@yahoo.co.in. “Modeling of Facts and Custom Power Devices in Distribution Network to Improve Power Quality” 2009 Third International Conference on Power Systems, Kharagpur, INDIA December 27-29 Paper no.:229
- [10] S.Quaia - F.Tosato University of Trieste - Dipartimento di Elettrotecnica, Elettronica ed Informatica via valerio 10 - 34127 Trieste (Italy).Load rebalancing by TCR's tecnology: theory and model simulation 1991 IEEE
- [11] Y.L. Tan, Y Wang, IEEE Power Engineering Review, August 1998 ISSN 0272-1724/98, 1998 IEEE “Effects Of Facts Controller Line Compensation On Power System Stability
- [12] N.G Hingorani,LGygy,” Understanding FACTS; Concepts and Technology of Flexible AC Transmission Systems” IEEE Press ,New York ,2000