

Review of Power Quality Improving Using Facts Device

Minal A. Salodkar

ME Student, Department of Electrical Engineering, Amravati University, Amravati.

C.M.Bobade

Head Of Department ,Department of Electrical Engineering, GHRCE&M , Amravati University, Amravati.

Abstract – Healthy power system plays very vital roal in transmission line, but due to non linear load it can't possible somehow. Improvement of power factor is also important issue of power system. To improve power quality there are many facts devices are used, such as SVS STATCOM TCSC and so on. But commonly we can use STATCOM for mitigation of power quality problems, because it can use for low voltage also. Shunt connected STATCOM mainly used for improvement voltage stability. Actually STATCOM find the best location at midpoint as compare to sending end or receiving end specifically at steady state limit 90 degree is best for midpoint location. This paper overview the methods proposed for the improvement of voltage stability and different solution for enhancing the performance of power system.

Index Terms - Facts Statcom, Matlab, Rbf, Fuzzy, Anifs.

1. INTRODUCTION

As we know electricity is basic need now a day. But due to non liner load we have to face lots of power quality problem. We required quality and reliability of power supply. The Introduction of flexible Ac transmission system controller is increasingly used to provide voltage stability and power flow control. The problem generated by different uncertainties existing in power system when design electromechanical non linear oscillation damping control. Large disturbance occur if sudden change in load or fault occur on generation transmission or distribution side. Fig 1 shows the basic structure of STATCOM. STATCOM is its behavior during the voltage collapse at the bus where it is located as it supplies almost a constant reactive

power without being affected by voltage variation across it is the one of the most advantage STATCOM. Active and reactive component are normally controlled by PI controller.

Before starting the analysis of various techniques and methods for voltage stability, it is important to understand the causes of voltage instability in power system. Any type of fault LLLG fault LLLG fault LG fault voltage sag, swell.

This paper gives the overview of various topologies, methods used for mitigating the voltage instability and reactive compensation problem by using of STATCOM. According to paper the benefits and performance of FACTS controller are determined by their location and size [1]. Fig2 shows a MATLAB Simulation is method to find the best location at steady state limit 90 degree angle is best for midpoint location of STATCOM [2]. To overcome instability problem non linear fuzzy logic controller is used [2]. RBF neural network and fuzzy control theory is used for controller of STATCOM [3]. New methods two fuzzy PI controllers are used to improve power transient Stability. [4]. One of the new methods it is a combination of fuzzy and neural network called ANFIS (adaptive Neural Fuzzy Interface System) [5]. There are also many FACTS connected device but comment we used but STATCOM is more compatible than any other devices [6].

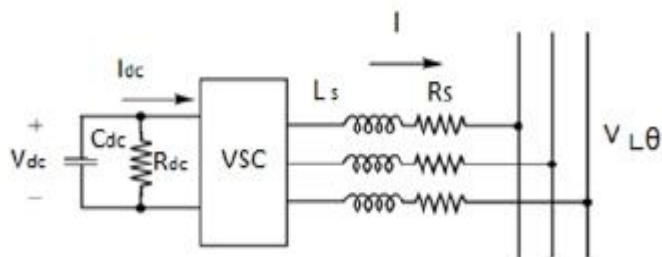


Fig1: Basic Structure of STATCOM

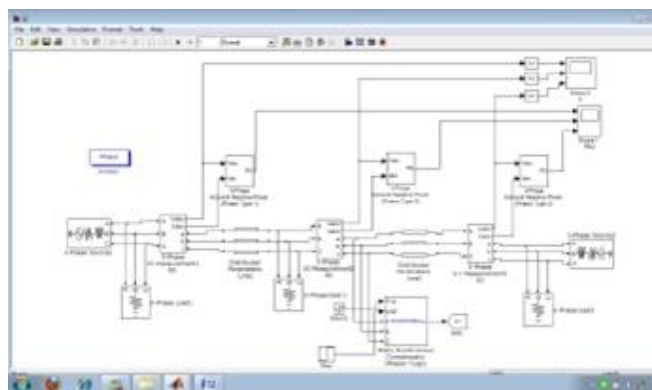


Fig2: Simulation Model When STATCOM Connected

2. MITIGATION TECHNIQUES

2.1 MATLAB SIMULATION

In this method power system proven attractive solution in long distance transmission lines, are to improve the power transfer capability and also to control the power flow in the power system network. In this process work STATCOM is employed as a shunt FACTS device. STATCOM is connected at the various locations such as sending end, middle and receiving end of the transmission line and the results were obtained with and without compensation at different location of STATCOM with different power angle. Proved that the reactive power generated and voltage controlled is better at the middle of the transmission line. This is analyzed that at mid point location of STATCOM power transfer increase with power angle increase but at steady state limit 90 degree is best for better power transfer. So, the location of STATCOM is optimum when connected at the middle of the line [2]. Fig 3 shows active power compensation of three buses at 90 degree.

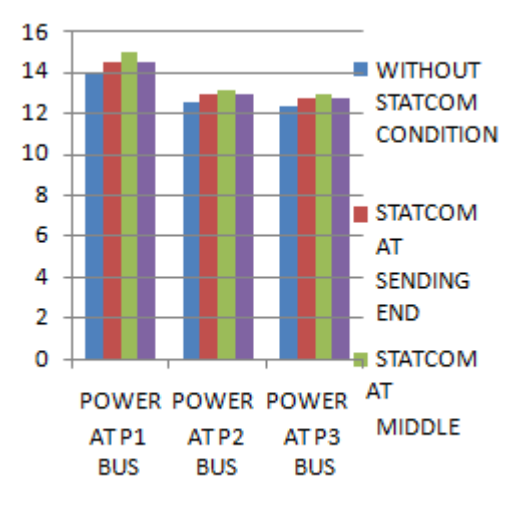


Fig3: Active Power P of B1, B2, & B3 Buses at different Location of STATCOM at 90 Degree power angle.

2.2 FUZZY LOGIC CONTROLLER

The STATCOM improved power system Transient Stability and system damping by using of FUZZY logic Controller. Fuzzy logic worked on single as well as infinite machine bus system. Fuzzy system worked according to behavior of system mean it's a flexible controller but controller input parameter are chosen carefully to provide considerable power system [3].

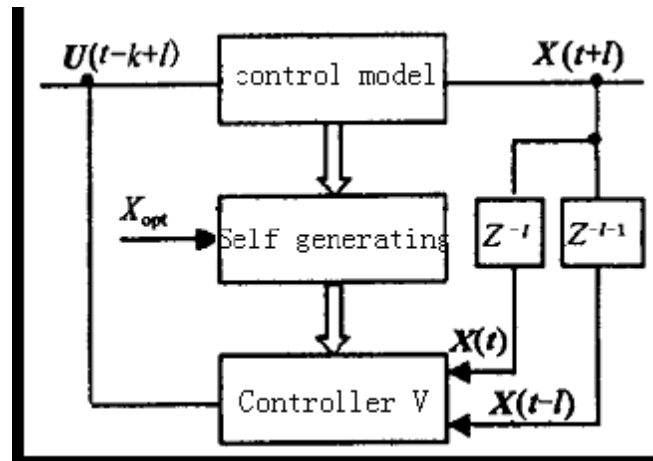


Fig4: FUZZY Logic Control System

The logic is that when frequency is high and it rising fast, system is in critical condition reason behind that is input mechanical power is more than output electrical power [3].

2.3 ANFIS Configuration

For the mitigation of voltage stability and low frequency oscillation with STATCOM based can be obtain by Adaptive Neuro FUZZY Interface system controller. Low frequency is very harmful phenomenon which increases the instability of system [6].

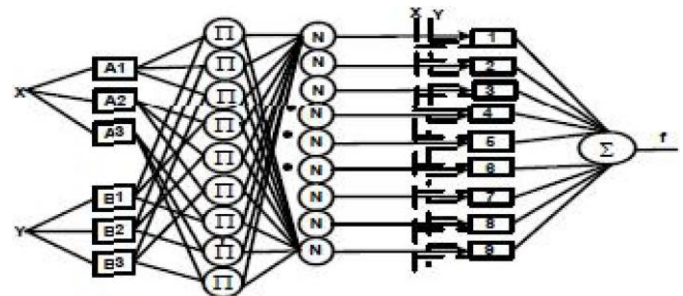


Fig4: ANFIS Topology

STATCOM without auxiliary damping is not possible to overcome this phenomenon that's why they used combination of two system called FUZZY and Neural Network. So in this paper they said that without fuzzy and neural combination mitigation cannot be overcome [4].

2.4 BY USING PI CONTROLLER

This paper conclude that to mitigation of power system or voltage instability can be obtained by two Fuzzy PI controller for STATCOM, one PI controller Design for voltage regulation, another PI controller for Current regulation. So this Fuzzy logic is design for improvement of voltage regulation and current regulation for improvement of transient power stability. They conclude that simulation result indicate the fuzzy based STATCOM controller provided better

transient stability as compare to PI based STATCOM controller for two machine system [5].

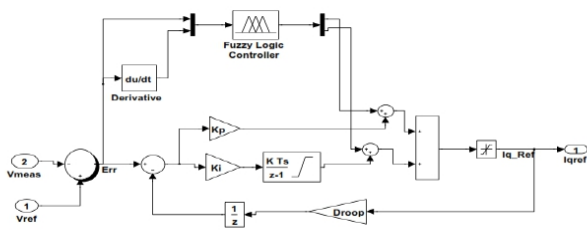


Fig5: FUZZY PI Controller

3. CONCLUSIONS

Various topologies we have to use for best location of STATCOM. But they are varying according to instability of system and get a result with different critical clear time and critical clearing angle. Every result varies from each other in complexity performance and cost. But Most of research paper they used FUZZY and Neuro system combination without used of any bulky type transformer, found very effective cost and optimal solution to remove instability of power system and to become healthy power system. RBF radial basic function whose value depend upon distance from origin so that or alternating distance from source point. All topologies have their own advantages over all system but cost is high. Normal MATLAB simulation cannot overcome low frequency mitigation without any Controller they only define best location but healthy or stable system cannot be obtain by that simulation. In most of the research paper they only used fuzzy or just simply neural network but ANFIS system gives better power quality improvement using SATCOM.

REFERENCES

- [1] Tan , Y.L. ,” Analysis of line compensation by shunt connected FACT controller STATCOM”, IEEE Transaction on Power Engineering Review ,vol.19,pp57-58,AUG 1999
- [2] B.B.Jain,” Best Location of Shunt Connected STATCOM of Long Interconnected Two AC System BUS with different Power Angle for Voltage and Power Control.”, ISSN:2278-7844, vol 2 issue 8,
- [3] A. Ghafouri, M.R. Zolghadri, M.Ehsan,O.Elmatboly and A.Homaifar ,” Fuzzy Controlled STATCOM for Improving the power system transient Stability”, IEEE ,pp 212-217 ,AUG 2007
- [4] Yang Li ,Chen Xiangjie” Rearch On RBF Neural Network FUZZY Control for STATCOM” ,International Conference on Intelligent Human- Machine System, pp 413-417 ,2009
- [5] Surinder Chauhan, Vikram Chopra,Shakti Singh” Power System Transient Stability Improvement using PI Based STATCOM Controller” International Conference on Power Control and Embedded System, pp 212 ,2007
- [6] S.Farid Torabi, Hossein Hosseini, Aref Boudaghi,Hadi Farshbar,Ali Mehri, ”Mitigation of Low Frequency Oscillation with STATCOM Based FUZZY Logic Controller And Adaptive Neural Fuzzy Interference System Controller”IEEE, pp 121, March 2014

- [7] M. Karthikeyan , Dr. P. Ajay –D-Vimalraj,” Optimal Location of Shunt Connected Facts Device for Power Flow Control” IECTECT, pp 36-37 2011
- [8] Elahe NADERI ,” Determination of Performance of The Distribution Static Compansator In Distribution Network, 22nd International Conference On Electricity Distribution , pp 1147 , 10-13 June 2013
- [9] P.K. Dhal ,C.Christober Asir rajan , “ Transient Stability Improvement Using Neuro-Fuzzy Controller Design For STATCOM” , IEEE, PP 510-514 , 30-31 March 2012 .

Authors

Minal A. Salodkar: she is doing M.E (Electrical Power System) in G. H. Rasoni college of Engineering & Management. She has completed his B.E from RTMNU Nagpur. Her areas of research are power quality.

Chetan M. Bobade : He is HOD of Electrical Engineering Department in G. H. Rasoni college of Engineering & Management. His research areas are power system stability and power quality.