DAMPING OF LOW FREQUENCY OSCILLATIONS
IN MULTIMACHINE POWER SYSTEMS
USING FUZZY LOGIC CONTROLLED STATIC VAR
COMPENSATOR

by

AMR ABDALLAH EMAM

A Thesis Submitted to the
Faculty of Engineering at Cairo University
In Partial fulfillment of the
Requirements for the Degree of
Master of Science
in
Electrical Power and Machines

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ABSTRACT

The main purpose of the thesis is focused upon the enhancement of dynamic stability and the improvement of the dynamic behavior of electrical power system using fuzzy logic controlled static var compensater (FLSVC). This is performed through damping the low frequency oscillation (LFO) thus improving the dynamic behavior of the power system.

The location of SVC in the system is an important factor for the potential of the SVC to contribute in damping LFO. A siting index (SI) technique is used in this work to select the best location for the SVC in order to obtain best damping for the LFO.

A fuzzy logic controller (FLC) has been developed for the damping loop of the SVC using transmission line power deviation and the derivatives of this signal as the controller input variable. Comparative design and tuning method of the FLC to perform the function of a linear counterpart proportional integral (PI) controller is developed. A fuzzy logic PI (FZ-PI) controller is obtained.

The SI technique and the FZ-PI controller were tested on two small power systems exhibiting both local and inter-area modes of oscillation and the results are provided in Chapter (6). The thesis provides the developed software package used for building up a multi-machine power system model equipped by a SVC, analyzing it through eigen value analysis and participation factor. Also it provides a program for siting analysis using singular value decomposition of the matrices of the system state space representation.