DEVELOPMENT OF STATIC VAR COMPENSATOR CONTROLLER FOR EXPERIMENTAL PURPOSES

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ABSTRACT

This project is a development of a computer controlled static Var compensator (SVC) for educational experimental purposes. The system developed, uses fixed capacitor banks as available in the power laboratory incorporated with a newly constructed thyristor controlled reactors (FC-TCR) for reactive compensation experiments. It can simulate a fluctuation of terminal voltage subject to load variations and improves power factor of the supply system. The controller makes use of a personal computer driven by software written in Quick-Basic. Through continuous development this could be extended to incorporate other features such as various control configurations as discussed in the work of Chang et al[4], allowing flexibility in experimentation that could be carried out by students to enhance the study of reactive compensation. The control circuit detects the zero-crossing of each line-to-line voltage waveform and upon receiving voltage signal from digital to analog converter (DAC), generates the controlled gating pulses for the triggering hardware. The thyristors used are back to back pairs and the conduction angles of all the thyristors are the same and vary accordingly with the serial command signal from the computer. Upon conduction thyristor controlled reactors generate a desirable variable susceptances required for compensating. A feedback circuit is also developed to stabilise the SVC system as it is inherently tolerant to changes in the control element as well as the controlled system and can be made very accurate.

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CHAPTER 1

1. INTRODUCTION

The SVC system is used in utility applications to support the voltage of transmission lines during disturbances of both load and generation. These disturbances are normally due to large fluctuation and high demand of reactive power by industrial consumers such as the steel industries. The support voltage is achieved by the rapid control of the SVC reactance to supply the required reactive power demand. Thereby, the reactive current flow is reduced and controlled in the transmission lines.

The ability of SVC to provide dynamic compensation enables the transient stability limit of the ac power system to be increased. Dynamic compensation decreases terminal voltage fluctuation during load variations and limits the occurrence of overvoltages following large disturbances.

The usual scheme of SVC used is thyristor-controlled reactors in conjunction with a fixed or conventionally switched capacitor (FC-TCR scheme)[2]. Firing circuit for phase angle control ($0 < \alpha < 180°$) is used to control the firing angle of the thyristors to generate the required reactive power. In practice, the fixed capacitor is usually substituted by a filter network that has the required capacitive impedance at the