SPRING (FINAL) TERM REPORT

SUBMITTED TO: Dr. CHIKAODINAKA NWANKPA

AND THE

SENIOR DESIGN PROJECT FACULTY OF DREXEL UNIVERSITY

ENTITLED: THYRISTORS CONTROLLED CONVERTER FOR LINE COMPENSATION

PROJECT NUMBER: ECE 04

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EXECUTIVE SUMMARY

Purpose and Scope of Project

A major problem facing power engineers is the society's ever increasing demand for more electrical power. Electrical loads from homes and industries generate and absorb reactive power. With the tendency of these loads to change from one hour to the next, the reactive power balance within the power grid varies as well. This variance results in unacceptable voltage variations, voltage depression and at its worst voltage collapse. The Static Var Compensator (SVC) is an excellent power electronics based device that can quickly and continuously provide reactive power compensation. Installing an SVC at one or more substations can result in increased power transfer capability and reduced losses while maintaining a smooth voltage profile. The purpose of this project is to construct and implement a small-scale model of a Static Var Compensator (SVC) in the Drexel Power Lab.

Budget

Approximately 90% of the projected budget has been spent towards acquiring the hardware necessary to build the SVC unit. The major expenses have been the electrical enclosure, FC36M Microcontroller firing board, reactors, capacitors and thyristors. The remaining budget has been spent on acquiring other necessary circuit elements such as resistors, mounting hardware and wiring.

Technical Accomplishments

The software simulation necessary to verify the expected results and limits of the SVC hardware was completed and proved invaluable in the selection of required hardware. The hardware aspect of the project has been completed, and testing has shown the effectiveness of the SVC in reactive power control and ultimately in voltage regulation.

Conclusion

The completion of this project will provide small scale hardware based training module for use by future power students to learn and experiment more with the SVC. To further this goal a laboratory experiment procedure has been developed to accompany the hardware.

ABSTRACT

The team has designed and constructed a scaled down model of a three phase Static Var Compensator (SVC) in the Drexel Power Lab. The SVC is part of the Flexible Alternating Current Transmission System (FACTS) family of power electronic devices. It plays an important role within the power system - to minimize power losses, maximize power grid transmission capability, and regulate supply voltage. It achieves this through reactive power compensation, whereby reactive power is absorbed or injected into the power system as needed. To aid in design a software model was created in MATLAB's SIMPOWER program and numerous simulations ran to validate the hardware model. The results were used to build and implement the SVC hardware model which will be used by future power students to learn and experiment with power system compensation.

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