

A CONTROL STRATEGY FOR STATCOM IN ALLEVIATION OF SUBSYNCHRONOUS RESONANCE IN POWER SYSTEMS

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Abstract—Flexible AC transmission systems (FACTS) have been widely utilized as a part of later past for understanding different power system steady state control issues. Moreover, series compensation of transmission lines is being done utilizing capacitor banks with the goal that general power transfer capacity can be enhanced to guarantee stable task. Anyway, this offers ascend to sub-synchronous resonance (SSR) phenomenon under which there might be trade of energy amongst mechanical and electrical system at frequencies underneath the synchronous value, harming the shaft system of generator. This paper explores the impact of FACTS devices like Static Synchronous Compensator (STATCOM) for mitigation of SSR in a single machine infinite bus system. Simulation studies have been done (i) without any FACTS devices and (ii) with FACTS devices. These investigations have demonstrated that SSR in the system can be mitigated, as it were, by utilizing STATCOM with sinusoidal pulse with modulation (SPWM). Further, mitigation of SSR is achieved by outfitting STATCOM with controller for better outcomes.

Index Terms—FACTS, Fuzzy logic control, STATCOM, Sub-synchronous Resonance (SSR), Torsional Interaction..

I. INTRODUCTION

This paper discusses a severe problem in power system in present scenario when the power system has to work at the limits because of never ending demand especially in developing countries. In such countries the loss of generation can cause humongous problems. We need to understand the problems that can cause damage to the system or interruption to the supply of energy. It is needed that we should be able to minimize or eradicate the problems in the system before they can cause any damages. We are in the age of information and the industries are very sensitive, thus requiring a power system which is stable, reliable, efficient and adequate. The quality of power has to be increased with passing day [1] [2]. The adaptability in power system has been expanded by the utilization power electronic devices. Subsequently, more dependable and stable power system control is accomplished by the utilization of Flexible AC Transmission System, otherwise called FACTS. These are the new drifting devices which are explanation for the minimized and sound power systems [3]. An IEEE Committee Report (1985) defines SSR as follows: “Sub-Synchronous Resonance is a condition in electric power

system in which the energy in electrical system exchanges with a turbine of a generator at one or more of the frequencies (natural) of the combined system is below the synchronous frequency of the system” [4]. An IEEE second benchmark Simulink model is used to analyze the SSR problem in this paper. STATCOM with SPWM technique and STATCOM with controller is connected to the system in order to mitigate the SSR problem from the system. The execution of the proposed scheme is verified with MATLAB/SIMULINK.

II. STATIC COMPENSATOR (STATCOM)

It is simply a voltage source converter (VSC) incorporated with SVC. Its operation is similar to that of synchronous condenser but it is all the way a more superior device. It uses various thyristor devices such as GTO, IGCT, IGBT, etc. for switching purpose. In STATCOM, we use a dc source or capacitor as shown in Fig.1. Here, any change in magnitude of voltage on the dc side across the capacitor will directly affect

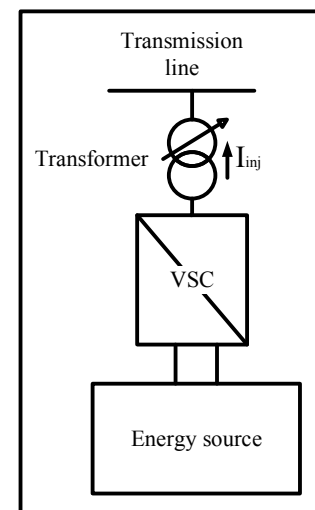


Fig. 1. Schematic diagram of STATCOM