OPTIMAL LOCATION AND SIZING OF THYRISTOR CONTROLLED SERIES CAPACITOR USING PARTICLE SWARM OPTIMIZATION TECHNIQUE

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ABSTRACT

Transmission loss minimization is a significant issue in Power System (PS). The power loss in Power System could be decreased by installing Flexible AC Transmission System (FACTS) devices. This thesis described the application of Particle Swarm Optimization (PSO) for optimal placement and sizing of Thyristor Controlled Series Capacitor (TCSC) to minimize the power loss in the system. PSO is a naturally computational search and optimization method invented within 1995 by Kennedy and Eberhart which focused on habits involving bird flocking or fish schooling. The objective for this study is to develop a PSO algorithm for loss minimization in power system. The impact of population size and weight coefficient throughout the optimization process is also tested. The technique is tested on IEEE 6 bus system.

Index Terms − FACTS devices, thyristor controlled series capacitor, particle swarm optimization

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CHAPTER 1

INTRODUCTION

1.1 Background of Study

FACTS devices is a devices recommended by N.G. Hingorani [1]; a well-known phrase with regard to higher controllability within power systems through method for power electronics devices. Improving the transmission systems ability as well as power flow control versatility and rapidity is the advantages of using FACTS devices [2]. The connection of FACTS devices might be possibly within series or even parallel compensation scheme. Within series compensation, the FACTS devices act as controllable voltage source if it is connected within series along with transmission line of the system. Within parallel compensation, the FACTS devices act as current controller if it is connected within parallel along with transmission line within the power system. One of the FACTS devices which can be used in power system is TCSC. This TCSC is used to control the transmission line reactance to give adequate load compensation. The aim of installing the TCSC is to decrease the power losses in the system. The advantages of TCSC is based on its capability to control the amount of transmission line compensation and it can operate in different modes.

In most recent decades, population based evolutionary computation methods have been examined and actualized to different optimization issues by using the collaboration among the potential solutions [3,4]. PSO technique was presented by Kennedy and Eberhart in 1995 [5,6]. It was on the list of stochastic search methods and produced via simulation of simplified system. This technique have been discovered to become strong within resolving continuous non-linear optimization issues. The PSO take shorter time to make a calculation and have a stable convergence characteristics compared to other stochastic method. Other than that, PSO needs few parameters only. The following

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