STATCOM OPTIMIZATION USING ANT COLONY OPTIMIZATION TECHNIQUE

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ABSTRACT

Abstract - In recent practice, the use of flexible AC Transmission System (FACTS) devices has been proposed for enhancement of power grid protection and control in power system by improving the stability, reduction of losses, and reduction of generation cost and improves the loadability of the system. However, prohibitive cost is major stumbling block for utility company to install more than a few FACTS devices on any power grid.

Low Environmental Impact technologies such as FACTS Devices and DC links provided solution to rapidly enhancing reliability and up-grading transmission capacity on a long term and cost effective basis. This thesis presents STATCOM optimization using full ACO technique.

The study involved the application of ACO technique for the determination of optimal sizing of STATCOM installed on a transmission line for loss minimization in power system IEEE reliability test system was used for validation purposes.

Keyword – Voltage profile, STATCOM, Ant Colony Optimization (ACO) Technique.

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CHAPTER 1

INTRODUCTION

1.1 Introduction

Local Utility supply encountered enormous challenge to provide reliable and efficient electricity to residential, commercial and industrial users in the digital era. Lengthy delay to complete construction of transmission line, cost and regulatory uncertainty have resulted serious deficiency in power transmission capacity [1].

Increased in electric power consumption causes transmission line to be driven closed or beyond their transfer capabilities which cause the transmission line becomes overloaded and congested [2].

A recent concern about power quality has forced engineers to incorporate system voltage profile, transmission loss minimization in addition to economic criterion when designing transmission line. Power loss in transmission line causes loss of revenue due to increased generation capacity requirement. Transmission systems must be flexible to react to more diverse generation and load patterns.

For system voltage profile, magnitude of bus voltage is specified as voltage control bus and through observation, it is noted that the bus voltage magnitude is controlled by reactive power. Power system controller shall ensure that the Power delivered to consumers is satisfied and voltage at load bus is within the specified value. Failure to maintain these requirements may cause equipment breakdowns or overheating. High load demand may lead to voltage collapse. The voltage collapses occur when the system load (P and Q) is increased beyond a certain limit. There are several techniques to control reactive power in the system and one of the possible methods is applying installation of FACTs devices. The weakest bus of the system shall be improved by introducing reactive power support scheme. Weakest bus of the system is defined as the bus (or substation)