THE STUDY OF ANT COLONY OPTIMIZATION (ACO) PARAMETERS FOR STATCOM OPTIMIZATION

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ABSTRACT

Abstract - Continuous demand in power transmission network caused by reactive power has been highlighted as the main factor in voltage depreciation and also increase of total transmission loss. Past studies have reported several possible techniques such as optimal reactive power dispatch, optimal capacitor placement; transformer tap setting and static VAR compensator are solutions for reducing voltage collapse occurrences. This paper presents Ant Colony Optimization (ACO) technique to improve voltage stability condition along with transmission loss and voltage profile monitoring using STATCOM. The purpose is to search for a solution for the best parameters of ACO that will improve the voltages and also to reduce the power losses in an electric power system. The proposed technique was tested using the standard IEEE 30-bus system and the capability of developed ACO in solving continuous optimization problems has been revealed as the added value in the algorithm.

Keywords - Ant Colony Optimization; ACO parameters; Voltage Magnitude; Power Losses.

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CHAPTER 1

INTRODUCTION

1.1 BACKGROUND OF STUDY

The voltage instability has been found to be responsible for several major network collapses in many countries. This situation is normally due to the stressed condition as a result of the increase in reactive power load. The control strategies aim to avoid some of the symptoms that lead to voltage collapse such as heavily loaded situation, weakened by transmission outages, or subjected to reactive power deficiencies, and it may result in uncontrollable system-wide voltage collapse, loss of loads and blackout.

For voltage control, magnitude of the bus voltage is specified at a voltage controlled bus and it is observed that reactive power controls the bus voltage magnitudes. The operating system loads need a significant amount of reactive power that has to be supplied and to maintain load bus voltages within their acceptable operating limits [2]. Scheduling of reactive power in an optimum manner reduces circulating reactive power promoting better voltage profile which leads to appreciable real power saving on account of reduced system losses [3].

A power system controller must ensure that the power demand is satisfied and the voltage at each load bus is between a specified limit. The low voltages in the system would lead to system collapse. It is a fact that the voltage collapse occurs when the system load (P and/or Q) increases beyond a certain limit. Thus, controlling reactive power, Q, will result in maintaining a bus voltage magnitude, V, at specified level [1].