AN APPLICATION OF ARTIFICIAL NEURAL NETWORK FOR DETERMINING THE TAP CHANGE RATIO OF OLTC IN MINIMIZING REAL POWER LOSS IN A POWER SYSTEM

Thesis is presented in partial fulfillment for the awards of
Bachelor of Electrical Engineering (Honours)
MARA UNIVERSITY OF TECHNOLOGY

NOR HAIDAR BIN HASHIM
Faculty of Electrical Engineering
MARA UNIVERSTY OF TECHNOLOGY
40450 SHAH ALAM
SELANGOR Darul Ehsan

ACKNOWLEDGEMENT

All praises be to Allah, Lord of the Universe, the Merciful. It is with the deepest sense of gratitude of the Almighty Allah who gives strength and ability to complete this project and report it as today.

I would like to express my sincere gratitude to Prof. Madya Dr. Titik Khawa Abdul Rahman and En. Ismail Musirin for her/his patient, guidance and advice throughout the completion of my final project.

I also would like to take this opportunity to express the heartiest thanks to my lovely wife, for her love and support. Last but not least, to my mother, Hambiah Budiman and my family for their support throughout the years and without them, I would never have gone this far.

ABSTRACT

This project presents an artificial neural network (ANN) technique for determining optimum tapping ratio of tap changing transformer which will in turn minimise real power losses in electrical power system. Training data containing variety of load patterns, tap changing transformer ratio and real power losses associated with each tapping are fed into a neural network. By using the Levenberg-Marquardt algorithm, a back propagation network is trained so that it predict the optimum tap ratio when unseen data are fed into the network. The technique was tested on 6-bus IEEE system and the result obtained shows that the proposed ANN technique is highly accurate, reliable and capable to predict at faster rate.

TABLE OF CONTENTS

CHAPTER 1

INTRODUCTION

1.1 Introduction

Conventionally, the optimal operation of the power system networks has been based on economic criterion. However, recent concerns about energy management system have forced the system engineers to incorporate other criteria such as improving voltage profile and transmission losses minimization [1]. Generally power losses in transmission of electrical energy resulted in a loss of revenue due to increased generation capacity requirement [1]. Thus, it is important for system engineers to find solutions to overcome this problem. The quantification and minimization of losses is important because it will also lead to the economic operation of the power system.

A proper distribution of the reactive power generation in a power system will minimised real power loss. Reactive power distribution in a power system can be controlled by adjusting settings of tap changing transformers, generator voltages, shunt capacitors and inductors [1]. This paper will focus only on the application of tap changing transformer and its effect to losses minimization.

Many algorithms have been reported for solving of optimal reactive power (VAR) dispatch and losses minimization. The algorithm can be classified either according to AC load flow or the optimisation techniques applied to determine the optimal reactive power flow [4]. The most popular AC load flow method is Newton-Raphson technique. This technique is highly precise and accurate, but it has some disadvantages, such as complexity and lengthy execution time. The second method, which is the fast-decoupled load flow (FDLF), has been accepted in recent years by the utility industries as a faster and more appropriate approach to obtain power-solution compared to Newton-Raphson technique [4]. These