TAP SETTING TRANSFORMER FOR LOSS MINIMIZATION USING GENETIC ALGORITHM

This thesis is presented in partial fulfillment for the award of the Bachelor of Electrical Engineering (Honours)

UNIVERSITI TEKNOLOGI MARA

MALAYSIA

MAZYUDIN BIN MOKHTAR
Faculty of Electrical Engineering
UNIVERSITI TEKNOLOGI MARA
40450 Shah Alam
Selangor Darul Ehsan

ACKNOWLEDGEMENT

In the name of ALLAH s.w.t, the Beneficent and the Merciful. It is with the deepest sense of gratitude to the Al-Mighty Allah who gives strength and ability to complete this project and report as it is today.

The success of this project was due in part to various personnel involved at the each of every stage. It is to this effect that I would like to convey my most sincere gratitude to my supervisor PM Wan Norainin Wan Abdullah, who has given me many valuable suggestions, constructive criticism, guardian, and encouragement throughout the time until the project is completed.

I am also greatly indebted to all the lecturers who had given me knowledge, advises and valuable information throughout my study period in UiTM. To all of them I would like to express my appreciation and sincere gratitude.

My special thanks to all laboratory and workshop technicians who gave me valuable information during the course of my study and during LAB experiment

I also would like to express my appreciation to those who have devoted their time either directly or indirectly, especially friends who have been together through happy and difficult moment during our stay in UiTM.

MAZYUDIN BIN MOKHTAR

ABSTRACT

This paper presents an alternative approach to the use of load flow by incorporation Genetic Algorithm (GA) to search the optimal transformer tap setting in order to minimize losses. The choice of transformer tap setting can be determined whilst minimizing losses. The performance of this GA technique is to be tested using standard IEEE 6-bus and IEEE 30-bus system for its capability and feasibility. All simulations are done using Matlab program version 7.0

Keyword-Power Flow Analysis, Genetic Algorithms, Transformer Tap, Fitness, Selection, Crossover, Mutation.

TAP SETTING TRANSFORMER FOR LOSS MINIMIZATION USING GENETIC ALGORITHM

TABLE OF CONTENTS

CONTENTS		PAGE NO
Declaration		i
Acknowledgement		ii
Abstract		iii
Table of contents		iv
List of Figures		vii
List of Tables		viii
Symbol and Abbreviations		ix
CHAPTER		
1	**INTRODUCTION**	
	1.1 Background	1
	1.2 Objectives	2
	1.3 Organization of the Thesis	2
2	**POWER FLOW ANALYSIS**	
	2.1 Introduction	4
	2.2 Bus Classification	4
	2.3 Bus Admittance Matrix	6
	2.4 Input of Power Flow Data	9
	2.5 Line Flow and Losses	9
	2.6 Newton Rhapson Power Flow Solution	11

CHAPTER 1

INTRODUCTION

1.1 BACKGROUND

The purpose of an electrical power system is to generate and supply electrical energy to consumers. Generating station, transmission line and the distribution system are the main components of an electric power system. In daily operation of electric Power System, a stable power supply is becoming very important. The purpose of optimizing power system transformer tap setting is to minimize power system losses.[1]

Minimization of losses is important because it can lead to economic operation of power system. If more losses can be minimized, the power can be consumed efficiently. Existing power generation and transmission can be used effectively without having to build new installations and the same time save the cost of losses.

Transmission losses become a major factor to be considered when it is needed to transmit electric energy over long distances or in the case of relatively low load density over a vast area. The active power losses (I^2R) may amount to 20 to 30% of total generation in some situations. Losses in power systems can arise from these mechanisms such as line and cable losses, transformer losses, machine losses (core and cooper), and Eddy current losses in metal housings. [4]

A power system controller must ensure that the power demand is satisfied and the voltage at each load bus is within a specified limit. The low voltages in the system would lead to system collapse. It is an established 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, at specified level. Four method of controlling reactive power on a bus using components connected to the bus are: [5]

a. By adjusting synchronous generator or motor field excitation
b. By using shunt capacitor
c. By regulating transformer