EVOLUTIONARY PROGRAMMING BASED TECHNIQUE FOR OPTIMAL CAPACITOR SIZING IN DISTRIBUTION SYSTEM FOR LOSS MINIMIZATION

This report is present in partial fulfillment for the award of the

Bachelor of Electrical Engineering (Honours)

Of

UNIVERSITI TEKNOLOGI MARA (UiTM)

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ACKNOLEDGEMENT

In the name of Allah S.W.T, Syukur Alhamdulillah, the Most Gracious and Most Merciful. All perfect praises belong to Allah alone, Lord of the world. May His blessing be upon Prophet Muhammad S.A.W and the members of his family.

I would like to express my utmost gratitude to my project supervisor, Dr. Ismail Musirin for his guidance advice, motivation, criticisms towards the continuous accomplishment of this project. My gratitude to all my friends especially the final year degree student in Electrical Engineering for their motivation and synergy to drive me towards the final destiny.

Special appreciation and loves to my beloved family, especially my mother

for being the greatest person in my life. My appreciation and thanks also go upon Salmiah Binti Desa for her endless love and encouragement and also for being the source of inspiration.

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ABSTRACT

Power losses in distribution system have become the most concerned issue in power losses analysis in most power system study. In effort of reducing power losses within distribution system, real power compensation has become increasingly important as it affects the operational, economical and quality services for electric power systems.

This project report presents Evolutionary Programming Based Technique for Optimal Capacitor Sizing in Distribution System for loss minimization. The objective is to minimize the distribution loss in power system. The study involved the development of EP engine to minimize distribution loss using capacitor placement technique. A 69-distribution system is used to implement the proposed EP technique. Results from the study revealed that the proposed optimal capacitor placement technique has significantly minimized distribution loss. Minor modification in the developed engine could be performed to solve other optimization problems.

Key-words: - Capacitor placement, Evolutionary Programming (EP), Loss minimization, objective function.

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CHAPTER 1

INTRODUCTION

1.1 Introduction

Distribution system provides the final link between the high voltage transmission system and the consumers. Many distribution used in practice have a single circuit main feeder and are defined as a radial distribution systems. The power loss in a distribution system is significantly high because of lower voltage and hence high current, compared to that in a high voltage transmission system [12]. The pressure of improving the overall efficiency of power delivery has forced the power utilities to reduce the loss, especially at the distribution level.

Reconfiguring the network can reduce the power loss in a distribution system. The reconfiguration process changes the path of power flow from the source to the loads. The loss can also be reduced by adding shunt capacitors to supply a part of the reactive power demands. Shunt capacitors not only reduce the loss but also improve the voltage profile, power factor and stability of the system. The active power demands at all nodes and losses must be supplied by the source at the root node, as distribution system is mainly radial. However, addition of shunt capacitors can generate the reactive power and therefore it is not necessary to supply all reactive power demands and losses by the source. Thus, there is a possibility to minimize the loss associated with the reactive power flow through the branches.

Computational techniques for capacitor placement in distribution systems have been extensively researched since the 60's with several available technical publications in this research area [2]. Several optimization techniques have been applied to the optimal placement of capacitors in distribution systems such as genetic algorithm, artificial immune system, ant colony optimization and fuzzy logic.