

OPTIMAL CAPACITOR PLACEMENT BY USING CAPO APPLICATION AND BUS RANKING METHODOLOGY

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ABSTRACT

Transfer of electrical energy from the source of generation to the customer via the transmission and distribution networks is accompanied by losses. The majority of these losses occur on the distribution system. It is widely recognized that placement of shunt capacitors on the distribution system can lead to a reduction in power losses, improve voltage profile and release system capacity. Reduction of I^2R loss in distribution systems is very essential to improve the overall efficiency of power delivery. The I^2R loss can be separated into two parts based on the active and reactive power components of branch currents.

This thesis work presents a method of minimizing the loss associated with reactive component of branch currents by placing shunt capacitors. The methods that use are Capacitor Placement Optimization (CAPO) and Bus ranking method. The performance of the proposed method was investigated on distribution systems consisting 9 buses and it was found that a significant loss saving can be achieved by placing optimal capacitors in the system. This method has been implemented using Digsilent software. Digsilent is used to model, simulate, and analyze network in distribution system. The effect of using Bus ranking and CAPO method will show in this network within the result based on minimum voltage and total power losses. The result shows that by installing capacitor at suitable location with an appropriate sizing by using CAPO method there will be lower total power losses and higher voltage level in the distribution network. CAPO method gives better performance rather than Bus ranking method.

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CHAPTER 1

INTRODUCTION

1.1 OVERVIEW

The power system can be divided into 3 subsystems which is generation, transmission and distribution system. The distribution system is responsible for transferring of electrical energy from nodes (substation) to load point. A distribution system connects the high-voltage transmission system to consumers. Basically when electric energy transfers from source to the consumer via transmission and distribution system it will caused a lot of losses. Large losses can affect the distribution system in term voltage level to supply to consumer.

Large load on distribution system makes increase of reactive power demand necessary to maintain the voltage within acceptable level. So, lower voltage and higher current can affect the I^2R loss in distribution system is significantly high compared to that in a high voltage transmission system. The pressure of improving the overall efficiency of power delivery has forced the power utilities to reduce the loss, especially at the distribution level [1].

Regarding on this problem, a lot of method is use to overcome power losses or others problem that is related to the load bus which is produce low voltage level. Capacitor placement is one of the methods used in distribution system. It is effective method to reduce the losses and provides support to the voltage at the load [2].

Some application of the capacitors in the distribution systems such as reduction of power and energy losses, release of generation, feeder and sub-station capacity, and improves