Ain Shams University
Faculty of Engineering
Electrical Power and Machines Dept.

Selection of Capacitor Types and Switching Techniques in Distribution Networks with Different Harmonic Levels

By

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A thesis submitted to Ain Shams University for the requirements
of the degree of MASTER of SCIENCE
In

(ELECTRICAL ENGINEERING (Power and Machines)

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Cairo 2014

سورة البقرة الآية: ٣٢

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STATEMENT

This thesis is submitted to Ain Shams University in partial fulfillment of the requirements for the degree of M.Sc. degree in Electrical Engineering (Power and Machines).

The work included in this thesis is carried out by the author at Electrical Power and Machines Department, Ain Shams University. No part of this thesis has been submitted for a degree or a qualification at any other university or institute.

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ACKNOWLEDGMENTS

Praise be to Alllah, the knower of all, who supported me at all over my life, taught me what I did not know and bestowed me the ability to accomplish this work.

My deepest gratitude to **Prof. Dr. Mohammed Abd El-Latif Badr** for his continuous help and kind supervising effort Useful notices, support and caring through my work on the master thesis.

My deepest gratitude and appreciation to **Dr. walid Helmy Abd El Hameed. and Dr. Amr Magdy Abdin**, my direct supervisor, for his significant assistance, valuable, and continuous guidance throughout this work.

I would like to thank **Prof .Dr. Abd El Samii Bassioni Kotb, Prof. Dr. Ahmed Abd. El – Sattar Abd. El Fattah**. For his Fruitful discussion, motivating guidance and advices. I learned a lot from him which would affect heavily on my future research.

I would like to thank all my family especially my **father** and my **mother** whom always adise and encourage me to do my best and to whom I dedicate this thesis.

Most Sincere thanks to all members in electric engineering department for their sincere cooperation and assistance.

Abstract

The present thesis is concerned with one of the most important subjects in distribution networks. The point is to improve the performance of these networks as for the reduction of power losses, and improvement of voltage profile over the feeders. It has been noticed that not only proper sizing & siting of capacitor bank connections in the network improves the performance, but also the type of capacitor banks and their switching technology as well, are of primary importance.

It is well documented that the extensive use of electrical energy and advances in power electronics application in industry have resulted in increasing harmonic levels and decreasing power factor in industrial distribution systems. Therefore the search for power factor improvement has been accepted as a major goal for many years. Capacitor banks are recognized to be the most preferred means for power factor enhancement. They provide low cost reactive power source, and reduce the active power loss in the network. This leads definitely, to the increase of life time of all network components.

The thesis depends on obtaining real data from industrial loads, obtained by direct measurements, and using this data in building a single model for performing best selection of capacitor bank types for industrial load application with different harmonic levels.

The thesis shows that the distribution of capacitor banks near loads within a factory with suitable control has a direct effect on enhancing the power factor.

The thesis finally introduces a study of system performance with different types of capacitors at different points in the network. Switching technologies together with higher harmonic effects are examined in distribution network.

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