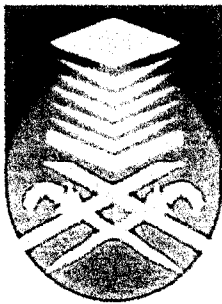# POWER FACTOR CORRECTION FOR BALLAST

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

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ABSTRACT

This project presents the design of power factor correction circuit for ballast type of load. Power factor correction is the process of increasing the power factor without altering the voltage or current to the original load. Alternatively, power factor correction may be viewed as the addition of a reactive element (usually a capacitor) in parallel with the load in order to make the power factor closer to unity. The main target of this project is to obtain the most suitable power factor correction capacitance value in order to improve the power factor of the load. The step-by-step design procedure, which involved many equations, have been implemented in this design.

The model of power factor correction circuit is designed using computer simulation via PSCAD while the software is developed using Visual Basic program. This software is developed in order to calculate the capacitor value used to improve the power factor of the ballast. Thus for verification, this capacitor has been applied in the power factor correction circuit.

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CHAPTER 1

INTRODUCTION

1.1   INTRODUCTION

Power analysis has evolved into one of the important sub disciplines within electrical engineering. Power factor is defined by IEEE and IEC as the ratio of true power to apparent power: PF = W/VA [7]. Power factor takes into account both the phase and wave-shape contributions to the difference between true and apparent power. The phrase power factor frequently is used in the electrical and power electronics industry. Power factor decreases with the installation of non-resistive loads, such as motors, transformers, lighting ballasts and other power electronics [1]. Power is the most important quantity in electric utilities, electronic and communication system. Every industrial and household electrical device, such as fan, motor lamp, pressing iron, television, personal, computer has their own power rating. Most domestic loads (such as washing machines, lamp ballast and air conditioners) and industrial loads (such as induction motor) are inductive and operate at a low lagging power factor. Although the inductive nature of the loads cannot be changed, but its power factor can be increased.

A power factor of one or "unity power factor" is the goal of any electric utility company since if the power factor is less than one, the company have to supply more current to the user for a given amount of power use. In so doing, the company incurs more line losses. The company also must have larger capacity equipment in place than would be otherwise necessary. As a result, an industrial facility will be charged a penalty if its power factor is much different from 1.

The importance of improving the power factor has drive this project to design the power factor correction for lighting ballast. This thesis describes circuit models of power factor correction by using fluorescent lamps as a load, which required ballasts (chokes) for their operation. These devices are inductive in nature. For inductive load, a Power Factor

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