

**ENERGY AUDIT IN FACULTY OF MECHANICAL ENGINEERING  
UiTM SHAH ALAM, SELANGOR**

**This thesis is presented in partial fulfillment for the award of the  
Bachelor of Electrical Engineering (Hons)  
UNIVERSITI TEKNOLOGI MARA  
MALAYSIA**



**AHMAD FAUZI BIN SHARIF**

**2007126645**

**Faculty of Electrical Engineering**

**UNIVERSITI TEKNOLOGI MARA**

**40450 SHAH ALAM, SELANGOR**

## **ACKNOWLEDGEMENTS**

All praise is to Allah S.W.T, The Most Gracious and Most Merciful who has given me the strength, ability and patience to complete this project. I would like to thank many people who made my life at Universiti Teknologi MARA so memorable and continuously encouraged me to complete my study toward my Bachelor's Degree in Electrical Engineering.

First and foremost, I would like to express my sincere thanks and appreciation to my project supervisor, Prof. Datin Ir. Dr. Shah Rizam Bte Mohd Shah Baki, my co-supervisor, Prof. Madya Ir. Zulkefli Bin Yaacob, Ir. Razali Bin Abd Hadi and also En Samsudin from KET (Unit Kesihatan Dan Keselamatan Elektrik Dan Tenaga) and other contributors for their guidance, support and helpful advices to develop the Energy Audit in Faculty of Mechanical Engineering UiTM Shah Alam, Selangor. Also, thanks to all my fellow colleagues for their invaluable support and motivation given either directly or indirectly towards the completion of this project. Special thanks to the staff of Faculty of Electrical Engineering for their assistance for the use of the facilities at the laboratory.

Last but not least, my deepest appreciation goes to my beloved family, especially my father and mother who are my greatest source of inspiration, for their moral support, motivation and understanding towards the accomplishment of this project.

## **ABSTRACT**

People nowadays are more concerned about energy efficiency and conservation. One of the focal points of such concern is on energy consumption in buildings. An energy audit is considered as one of the comprehensive methods in checking energy usage and wastage in buildings. This project addresses the implementation method of energy saving in Faculty of Mechanical Engineering (FKM) at Universiti Teknologi MARA (UiTM) Shah Alam, Malaysia. Power quality, harmonic and power factor issues are successfully identified and recommendation for improvement is highlighted. The power quality data is obtained by Fluke 1750 recorder install at the Main Switch Board (MSB) Faculty of Mechanical Engineering. After the installation is done, the data will be recorded for a day. As a result, the lower power factor, high harmonics distortion in phase currents and imbalance load in three phases at the Faculty of Mechanical Engineering are the causes of high electrical energy consumption which is contribute to the total overall monthly electrical bill of the Complex of Engineering building. The lighting system design also contribute to the high energy consumption because from the inspection made on the artificial lighting, all the lighting at the open corridor does not take into consideration of sufficient illumination provided by the natural day-lighting. The lighting at all open corridors for various levels are switched-on during day-lighting. In this project, energy saving concept and purpose is analyzed. By analyzing current utilization situation of energy in FKM building, the significance of energy audit in FKM building to produce improvement in operation efficiency and cost saving initiatives due to high monthly electrical consumption and penalty charge due to low power factor operation by the supply utility. The monthly bill at the Engineering Complex Tower should be reduces at least 20%.

## TABLE OF CONTENTS

CHAPTER	LIST OF TITLE	PAGE
	DECLARATION	I
	DEDICATION	II
	ACKNOWLEDGEMENT	III
	ABSTRACT	IV
	TABLE OF CONTENTS	V
	LIST OF FIGURES	VII
	LIST OF TABLES	IX
	ABBREVIATION	X
<b>1.0</b>	<b>INTRODUCTION</b>	
	1.1 INTRODUCTION	1
	1.2 PROBLEM STATEMENT	3
	1.3 PROJECT OBJECTIVE	3
	1.4 SCOPE OF STUDY	4
	1.5 THESIS ORGANIZATION	5
<b>2.0</b>	<b>LITERATURE REVIEW</b>	
	2.1 INTRODUCTION	6
	2.2 OVERVIEW OF ENERGY AUDIT	6
	2.3 HARMONIC ISSUES	7
	2.4 POWER FACTOR	9
	2.5 UNBALANCE LOAD	10
	2.6 MALAYSIA STANDARD IEEE STD 519-1992	11

# CHAPTER 1

## INTRODUCTION

### 1.1 INTRODUCTION

This energy crisis and greenhouse effect are the impetus behind energy saving. The energy audit is used to “diagnose” the weak points of the building energy-usage system, tap latent power and to build up energy-saving responsibility. The Energy audit focuses mainly on total energy consumption of the equipments, especially on air- conditioning system, electronically equipments, lighting, and elevators, etc. By conducting a survey on the energy use, the equipment load in the building is gathered for the analysis. Some measures to increase energy efficiency are put forwards [1].

The energy process is an organized approach to identify energy waste in a facility, determining how this waste can be eliminated at a reasonable cost with a suitable time frame. Energy audit is widely used and many have different meaning depending on energy service companies. Energy auditing of a building can range from a short a walkthrough of the facility to a detailed analysis. It is not only serves to identify energy use among the various services and to identify opportunities for energy conservation but it is also a crucial first step in establishing an energy management program. The audit will produce the data on which such a program is based [2].