

### A STUDY OF UNUTILIZED ENERGY IN UITM BUILDINGS

# MUHAMMAD HELMI BIN HAMIDON (98713504)

A thesis submitted in partial fulfillment of the requirements for the award of Bachelor Engineering (Hons) (Mechanical)

> Faculty of Mechanical Engineering Universiti Teknologi MARA (UiTM)

> > **OCTOBER 2002**

#### ACKNOWLEDGEMENT

In the name of ALLAH The Compassionate, the Merciful, Praise be to Allah, Lord of the Universe, And Peace and Prayers be upon His Final Prophet and Messenger

I would like to firstly thank my project supervisor, Associate Professor Ir. Dr. Hj. Abd Rahman Omar for his unbounded support, motivation and guidance in assisting me throughout the duration of this thesis.

I would also like to express my deepest gratitude to the staff of Maintenance and Development office of MARA University of Technology (UiTM) especially to En. Maliki Abdul Ghani (Maintenance Officer) and Che Izam Abu Noh (Electrical & Telecommunications Engineer) for their gracious cooperation and continued support.

I would also like to thank the staffs of ECO Energy Sdn Bhd especially to En. Steve Anthony Lojuntin (Energy Management Consultant), Puan Azizah Kassim (Senior Energy Management Consultant) for their suggestions and ideas.

My special appreciation is also extended to my loving parents, family members and friends for their love and support throughout the completion of this thesis.

ii

#### ABSTRACT

The problem of energy wastage in several buildings in MARA University of Technology (UiTM) has reached a level that is very concerning. After reviewing audit reports on all UiTM buildings, the scenario of energy wastage has been identified happening in several buildings. UiTM's Maintenance and Development office has been identified as some of the buildings that are experiencing unutilized energy, or in other words, wastage of energy. A detailed observation on load profiles for both UiTM's Maintenance and Development offices show that there exists energy wastage during the overnight period. Field investigations conducted identified the sources of these unutilized loads and air conditioning units, mainly split units has been identified as the main components consuming energy during the overnight period. Wastage in energy has been sourced to air conditioning units that are not turned off after working hours. Hence, it can be concluded that there are opportunities for improvements in terms of energy consumption in UiTM buildings and implementing a suitable control system to reduce energy wastage in both the Maintenance and Development offices will ensure that operation cost is minimized and energy usage is optimized.

# **TABLE OF CONTENTS**

## CONTENTS

**CHAPTER 1** 

CHAPTER 2

### PAGE

PAGE TITLE							
ACKNOWLEDGEMENT							
ABSTRACT							
TABLE OF CONTENTS							
LIST OF TABLES							
LIST OF FIGURES							
LIST OF ABBREVIATIONS							
INTRODUCTION							
1.1	An Overview						
1.2	Objectives						
1.3	Scope of Work						
METHODOLOGY							
2.1	Introduction						
	2.1.1	Review of Energy Audit Reports	4				
		on UiTM Buildings					
	2.1.2	Identification of Buildings Consuming	5				
		High Loads During Overnight Period					
	2.1.3	Review of Load Profiles	5				
	2.1.4	Field Investigation	6				

		2.1.5	Collection & Observation of Data	. 6
		2.1.6	Analysis of Data	6
		2.1.7	Testing A Suitable Control System	7
CHAPTER 3	ENE	RGY CO	DNSUMED EQUIPMENTS	
	3.1	Introduction		8
	3.2	Ventil	Ventilation Air Conditioning (VAC)	
		3.2.1	Types of Air Conditioning System	9
	3.3	Lighting		13
		3.3.1	Lamp	13
		3.3.2	Street Lighting	13
		3.3.3	Incandescent Lighting	14
		3.3.4	Fluorescent Lighting	15
		3.3.5	Vapor Lighting	15
	3.4	Gener	al Equipments	16

#### CHAPTER 4 CASE STUDY

4.1	Case Study 1 – Maintenance building			
	4.1.1	Building functions & Operations	18	
	4.1.2	Electrical Supply		
	4.1.3	Lighting	20	
	4.1.4	General Equipment	20	
	4.1.5	Air-Conditioning System	20	
	4.1.6	Building Automation System (BAS)	22	
	4.1.7	Historical Energy Consumption	22	
	4.1.8	Load Apportioning	22	
4.2	Case Study 2 – Development Building			
	4.2.1	Building functions & Operations	24	
	4.2.2	Electrical Supply	26	
	4.2.3	Lighting	26	
	4.2.4	General Equipment	26	
	4.2.5	Air-Conditioning System	26	