

MALAYSIA'S HOTEL ENERGY MANAGEMENT SYSTEM (EMS) FOR
ENERGY EFFICIENCY IMPROVEMENT

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Dedication to my beloved wife, Siti Aishah Mohamed, whose support me, physically, mentally and emotionally, throughout my Master's study.

For my siblings and friends, appreciate your encouragement and help.
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ABSTRACT

Energy management terms are rather defined by a different type of meaning by various types of people. For an industrial owner or sector, energy management is judicious or effectiveness usages of energy in order to maximize profit by minimizing the operation cost and enhance competitive positions. Performing energy management system for a hotel is rather critical to reduce operational cost. Since the consumption of energy in hotels depends on various factors, it was necessary to have a clear idea about some of the general characteristics that have proven to influence energy consumption in hotels; these include area, built up area, number of rooms and occupancy rates. This project study the potential of energy saving in one of the five star hotels located in Kuala Lumpur. The project aims to reduce the energy consumption of the building. Therefore, the methodology proposed are to analyze the potential of energy saving, life cycle cost and the payback period of the retrofit lighting system. A software simulation called Relux Suite is used to simulate the existing lighting system and the alternative proposal for the outcome result in term of illumination factor and energy consumption. The output of the simulation then is compare between the existing and the several alternatives proposal. Then the commercial part for retrofitting the lighting system is briefly discussed in term of payback period and return of investment. The study found out that program proposed had potential of cost reduction by RM 1.8M per year with a minimum return of investment (ROI) of 4% - 8%. Based on the result, this case study has achieved its objective it term of commercial value but not for the building energy index which is estimated of 182.6 kWh/m²/year compared that is stated in MS 1525 standard which is 135 kWh/m²/year.

ABSTRAK

Istilah pengurusan tenaga biasanya ditakrifkan secara berlainan maksud bergantung kepada jenis individu. Bagi pihak pengurusan ataupun pemilik – pemilik industri, pengurusan tenaga yang efektif adalah untuk memaksimumkan keuntungan dengan meminimumkan kos operasi dan meningkatkan kedudukan daya saing. Melaksanakan sistem pengurusan tenaga untuk hotel adalah berada pada tahap kritikal dalam mengurangkan kos operasi. Memandangkan penggunaan tenaga di hotel – hotel bergantung kepada beberapa faktor, adalah perlu untuk mengetahui beberapa ciri umum yang terbukti mempengaruhi dalam penggunaan tenaga seperti keluasan kawasan, bilangan bilik dan juga kadar penghunian. Projek ini mengkaji potensi penjimatan tenaga dalam salah satu daripada hotel lima bintang yang terletak di Kuala Lumpur. Projek ini bertujuan untuk mengurangkan penggunaan tenaga bangunan. Oleh itu, kaedah yang dicadangkan adalah untuk menganalisa potensi penjimatan tenaga, kos kitaran hayat dan tempoh bayar balik sistem retrofit lampu. Satu perisian simulasi di kenali sebagai Relux Suite telah digunakan untuk mensimulasi sistem lampu sedia ada dan cadangan alternatif sistem lampu berlainan. Hasil simulasi tersebut kemudian dibandingkan di antara sistem sedia ada dengan sistem cadangan alternatif. Kemudian faktor komersial untuk penukaran sistem sedia ada kepada cadangan sistem alternatif dibincangkan dari segi tempoh bayaran balik dan juga pulangan pelaburan. Kajian ini mendapati bahawa program yang dicadangkan mempunyai potensi pengurangan kos sebanyak RM 1.8J setahun dengan pulangan minimum pelaburan (ROI) sebanyak 4% - 8%. Berdasarkan keputusan, kajian kes ini telah mencapai objektifnya untuk nilai - nilai komersial tetapi bukan untuk indeks tenaga bangunan yang dianggarkan daripada 182.6 kWh/m²/tahun berbanding yang dinyatakan dalam MS 1525 standard yang adalah 135 kWh/m²/tahun .

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CHAPTER 1

INTRODUCTION

1.1 Background of Study

Energy management terms are rather defined by a different type of meaning by various types of people. For an industrial owner or sector, energy management is judicious or effectiveness usages of energy in order to maximize profit by minimizing the operation cost and enhance competitive positions. In fact, for most manufacturing and other commercial organization energy management is of the most promising profit improvement-cost reduction program available today [1].

Malaysia's energy demand will increase intensively and grow towards the future. Most of energy consumption in Malaysia is contributed by industrial and commercial sector. Figure 1.0 show the electricity consumption distribution in Malaysia.

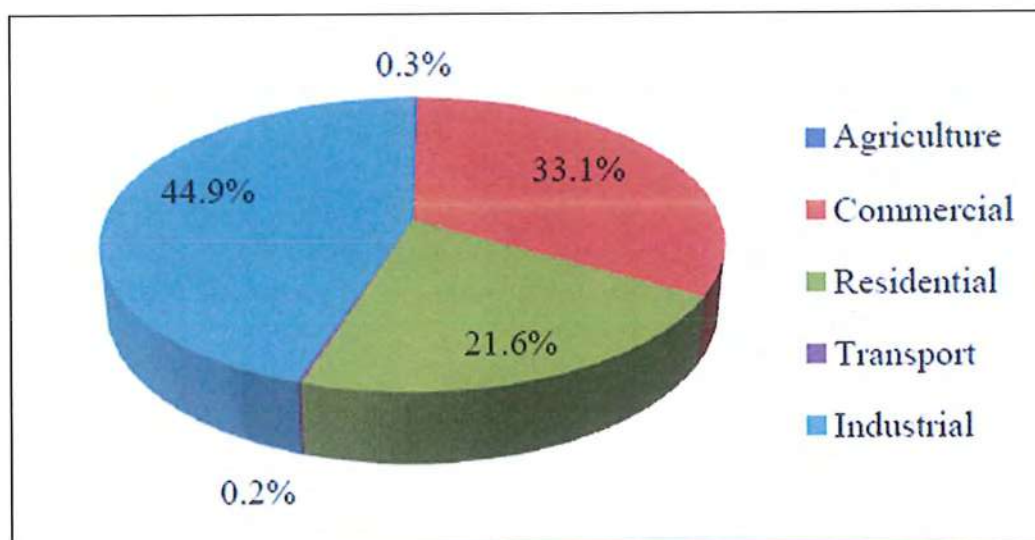


Figure 1.0: Electricity consumption in Malaysia by sector [2].

Focussing only on commercial sector that contribute about 33.1%, a small scale case study for energy management system (EMS) is carried out. The study is focused on the effect for electrical energy consumption in the selected building. The selected building for the case study is located in Kuala Lumpur, Malaysia. This is an existing building in a commercial sector with a nature business of tourism or hospitality sector which is a hotel. Performing energy management system for a hotel is rather critical to reduce operational cost. In order to establish the energy management system, firstly it needs to establish the development and implementing an energy policy. By establishing the policy and determining the measureable target, the main energy user can be identified and set the energy objective can be set.

According to MS 1525: 2007 Code of Practice on Energy Efficiency and Use of Renewable Energy for Non Residential Buildings, the recommended building energy index is 135kWh/m²/year [3]. Figure 1.1 shows the typical of building energy index in Malaysia. The fact is, most of the building in Malaysia does not meet this criterion which can lead to waste of energy or more energy being consumed. If the energy index is higher than what is stated in the standard, implementation of an energy management system is recommended

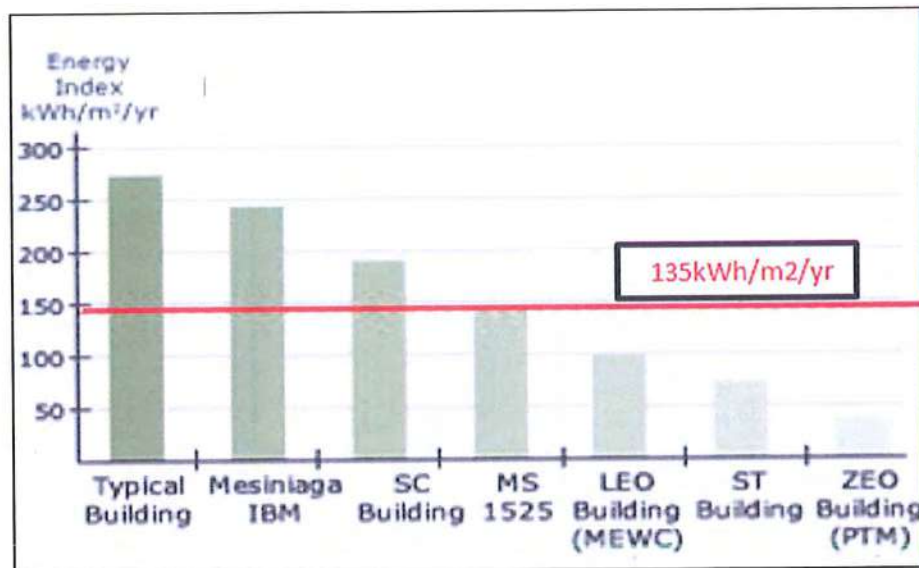


Figure 1.1: Typical building energy index in Malaysia

In order to implement energy management system, there are few step need to be considered such as introduction and development of energy policy. The policy must be well drafted in order to identify the objective of energy efficiency.

Once the policy and the objective have been established, then, the main energy user or the measureable targets has to be identified. For this study, a hotel, the main energy users are the customer or tenant who occupied for the room.

When the system of energy management system is established, what is required is to maintain the system and review the system continuously by checking and take corrective action as often as possible and to improve the system where impossible.

1.2 Problem Statement

An increase in energy consumed raised serious concern to the government to overcome the phenomena by promoting end use energy efficiency, this mean using less energy but maintaining the same level of service [5].

Since the consumption of energy in hotels depends on various factors, it was necessary to have a clear idea about some of the general characteristics that have proven to influence energy consumption in hotels; these include area, built up area, number of rooms and occupancy rates [23].

One of the buildings in Kuala Lumpur which is a hotel has been chose to carry out a study regarding the energy utilization of this building as well as the operation. The hotel consists of 40 floors. The purpose of this study is to analyse the real energy consumption of this building in term of electricity usage.

Other than that, this hotel building energy index is rather high and does not comply with the MS 1525 Standard. It means that the energy usage for this building is not efficient. So by designing a suitable system may reduce the energy consumption in this building. There are two design strategies that affect the energy efficiency in a building which is:

1. Passive Design Strategy – mostly involve with the building design structure and architectural matter. The selection of building façade, building shading, materials use plays an important role.
2. Active Design Strategy – this refer to selecting utilities equipment and control system that is energy efficient which will result a reduction in term of energy consumption and running cost.

This hotel is an existing building; therefore this project will be focusing on the active strategy design in order to achieve the energy efficiency in term of usage rather than passive design.

1.3 Objectives

The objectives of this study are to study the load distribution design for this hotel building system that is contributed the most of energy consumption, via site survey and conducting energy audit.

Further to the above, the factor in contributing the energy consumption level is analyse for energy efficiency and to comply with the MS 1525 and others relevant standard.

Once the requirement and the parameter have been decided, the alternative method for the system against the existing system is proposed and analyse in term of technical aspect and commercial value.

1.4 Project Scope

The scopes of works of this project are described as below:

- i. To study the load distribution design for this building that contribute the most energy consumption level; i.e. HVAC, lightings, small powers and etc.
- ii. To identifying what type of material used for the building that is such as lighting system.
- iii. Analyse the data gathered for energy usage (kWh) that has been taken via site measurement.
- iv. Determining the building energy index for this as compared to the MS 1525.

1.5 Significant of Project

An increment in energy consumption has a big impact on the environment. This issue has become a concern not only in our country but worldwide. Therefore, a policy for energy efficiency should be proposed for any organization. The government has played its part by creating a standard regarding the energy efficiency and the execution of the policy is yet to be done.

Due to this issue, the development of energy saving equipment has grown rapidly in order to achieve the goals. This energy efficient equipment or product will

result in reduction of energy consumption and achieving a good building index mention in the standard, whether in term of Green Building Index (GBI) or the Building Energy Index (BEI).

This study is carried out in order to determine the level of energy consumed in this building and to carry out a strategy or proposal in order to optimizing the energy usage especially in terms of electricity.

1.6 Organization of Report

This study report mainly consists of five main chapters which are introduction, literature review, methodology, result and analysis and finally conclusion.

Chapter 1 of this study will be mainly focused on the general briefing or explanation of energy management system (EMS). This chapter also explain the purpose for this research works such as problem statement, the objectives of the study, scope of study and the significant of the project is being stressed out.

Chapter 2 will be more on the discussion about literature review on the background and the implementation of energy efficiency system especially for an existing commercial building. This chapter will theoretically covered in discussion on the method of implementing energy efficient system for internal lighting system and briefing understanding in term of commercial part.

Chapter 3 is the methodology for this study. In this chapter, the method proposed will be explained in further details on how to achieve the energy efficient system. The software for simulation the lighting system has been used to perform the parameter required for the lighting system.

Chapter 4 will be focusing on the result obtained in the chapter 3. The results will be analysing in term of technical compliance and economical part such as the cost and return of investment.

Chapter 5 is the main conclusion of this study, which is further discussion about the compliance and the achievement if implementing the alternative proposal is being reviewed. Also the suggestion of future works.

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