

UNI

VERSITI

THE 11TH INTERNATIONAL INNOVATION, INVENTION & DESIGN COMPETITION INDES 2022

EXTENDED ABSTRACTS BOOK



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ENERGY PROFILING VIA ENERGY AUDIT AT FSKTM BUILDING TOWARDS ENERGY EFFICIENCY IN UTHM

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ABSTRACT

This study aims to determine how much the Faculty of Computer Science and Information Technology (FSKTM) buildings in Universiti Tun Hussein Onn Malaysia (UTHM) utilized energy and to identify factors affecting the usage. An end-use energy analysis was conducted on the building to identify energy apportioning and energy end-use based on different categories such as air conditioning and mechanical ventilation (ACMV) system, lighting system, Information technology (IT) equipment, and other electrical equipment. The analysis was carried out by conducting desktop analysis and field data collection which also involved simple calculations. The Building Energy Index (BEI) was also calculated to measure the efficiency level of the building which was then compared to the Malaysian Standard, MS 1525. Upon completion, it is known that the largest energy consumption end-user in this faculty is the ACMV system which consumes approximately 43.0% of the total electrical energy. The BEI calculation revealed that the building has an index of 128.552 kWh/m2/year which is below than requirement set by Malaysian standard. To increase the building efficiency, energy conservation measures were proposed.

Keyword: Building Energy Index, Malaysian Standard, Energy Efficiency

1. INTRODUCTION

Malaysia essentially has a good generation mix of energy resources ranging from traditional sources such as oil, natural gas, and coal to renewable energy resources such as wind, hydropower, and biomass. More than 90% of the electricity produced for Malaysia was obtained from fossil fuel during the period from 1990 to 2016. Recognizing that the energy sector should be mindful of the sustainability of environment. Diverse policies, and methods have been made available to help preserve the environment (Ahmad Sukri Ahmad, et.al., 2012). However, one concern in most universities is high energy consumption and this places a huge cost burden on the universities (Ahmad Sukri Ahmad, et.al., 2012).

Energy efficiency is usually measured by the output quantity per unit of energy input (e.g., miles per gallon or lumens per watt). Because energy is one of the few factors of production aside from labor, capital, materials and others, energy efficiency improvements contribute to greater energy productivity and economic efficiency (Maheswaran, 2012). Energy management is a method of altering and maximizing resources. Energy management schemes



have been in operation in the electricity industry for many decades. The main roles of these systems are to track, control and optimize the flow and usage of resources (Kling, 2012).

2. METHODOLOGY

This chapter discusses the process of implementing the energy audit in the Faculty of Computer Science and Information Technology (FSKTM) in Universiti Tun Hussein Onn Malaysia (UTHM), which include data collection that involves data on the total amount of energy used for the last 3 years, and some detailed information about the equipment.



Figure 1 Data Collection

Data collection was one of the most labor-intensive activities in energy auditing, and the failure to collect the necessary data would lead to less accurate energy audit performance. Some of the challenges faced by the Registered Electrical Energy Manager (REEM) to construct the building end-use specifications (air conditioning, lightings, and general equipment) was minimal or inadequate building metering equipment.



Next, an important data to be analysed was the total energy consumption for each sector. The sectors involved were air-conditioning consumption, electricity consumption, IT equipment, and others. Each sector plays an important role in the increase of energy consumption in FSKTM. Usually, the highest amount of energy consumption comes from the air conditioning sector. This is because the air-conditioners used in FSKTM consist different types, and each type has a different kilowatt value.

This part was done through a research survey using a questionnaire. A questionnaire is an effective way to get an idea or action plan. Moreover, it is a common method used to recognize people's demands. The respondents were the people in charge of the building and the building users. The respondents involved in helping to complete this survey questionnaire were among the FSKTM staff themselves. This is because they are among the permanent and reliable users in the faculty. There were several types of questions asked related to this energy auditing project.

The calculation, usually simple, was done to quantify the savings achievable from the implementation of the identified Energy Conservation Measures (ECM). The walkthrough or preliminary energy audit was usually carried out in one or two days by the researcher, depending on the size, complexity of the building, and the scope of the audit. Usually, simple instruments such as a clamp amp meter, thermometer, hygrometer (humidity meter), and lux meter were used for this purpose.

3. CONCLUSION

This study on energy consumption in the FSKTM building was conducted to identify the energy consumption and factors affecting energy usage. The objective of this study is important to achieve the goal of the study. There are 2 objectives in this research, the first is to establish an energy profile and carry out energy analysis via a detailed energy audit in FSKTM; while the second is to propose energy-saving measures and potential energy efficiency initiatives. All the objectives were achieved.

The energy audit was conducted on the building to determine the types of energy end-users and their percentage of the total electrical energy apportionment. It was found that implementing an energy audit can reduce energy usage and further reduce the cost of energy in FSKTM buildings.

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