

**APPLICATION OF SCHEDULING TECHNIQUES ON A SPLIT AIR  
CONDITIONER**

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APPLICATION OF SCHEDULING TECHNIQUES ON A SPLIT AIR  
CONDITIONER

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Dedicated to my beloved parents  
**Rasid bin Salim and Nor Aidaa binti Ariffin**

Fiancé  
**Abdul Rahim bin Mohamed**

Siblings  
**Affiq bin Rasid**  
**Hafiz bin Rasid**  
**Farra Najiha binti Rasid**  
**Aishah Sofea binti Rasid**

Master project supervisor  
**Dr. Md Pauzi Abdullah**

and  
**all my friends in MEP programme**

Thank you very much for their supports, encouragements and prayers.  
May Allah bless and give Barakah upon you all.

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## **ABSTRACT**

Cooling system give the highest contribution in e electricity consumption especially in a building for commercial usage. The shortage resource of raw materials causes the researchers and engineers do research in finding the ways on how to reduce the energy consumption in cooling system. Centralized air conditioner and split air conditioner is the most type of air conditioner use nowadays. However, according to previous research, it seen that split air conditioner contributes more saving in terms of electricity usage as well as economic savings compared to centralized air conditioner. Unfortunately, centralized air conditioner is the most usage in commercial building compared to split air conditioner. Scheduling technique is one of the most popular techniques that are always applied in centralized air conditioner in controlling the energy usage by controlling its temperature setting. Hence, this project will investigate the possibility of split air conditioner either can apply the scheduling technique or not.

## ABSTRAK

Sistem penyejukan memberikan sumbangan yang terbesar dalam penggunaan elektrik terutama di dalam sebuah bangunan untuk kegunaan komersial. Kekurangan sumber bahan mentah menyebabkan para penyelidik dan jurutera melakukan kajian dalam mencari jalan bagaimana untuk mengurangkan penggunaan tenaga di dalam sistem penyejukan. Penghawa dingin berpusat dan penghawa dingin berpecah adalah jenis yang penghawa dingin yang paling banyak digunakan pada masa kini. Walau bagaimanapun, menurut penyelidikan sebelum ini, ia dilihat bahawa penghawa dingin berpecah menyumbang lebih penjimatan dari segi penggunaan elektrik dan juga penjimatan ekonomi berbanding penghawa dingin berpusat. Malangnya, penghawa dingin berpusat adalah paling banyak penggunaannya dalam bangunan komersial berbanding penghawa dingin berpecah. Teknik penjadualan adalah salah satu teknik yang paling popular yang selalu digunakan dalam penghawa dingin berpusat dalam mengawal penggunaan tenaga dengan mengawal tetapan suhunya. Oleh itu, projek ini akan menyiasat sama ada teknik penjadualan boleh digunakan dalam penghawa dingin berpecah atau tidak.

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**LIST OF ABBREVIATIONS**

min.	-	minute
Temp.	-	temperature
Cond.	-	condition

**LIST OF SYMBOLS**

°C	-	degree Celsius
m	-	meter
kW	-	kilo Watt
kWh	-	kilo Watt hour
RM	-	Ringgit Malaysia
s	-	seconds
h	-	hour

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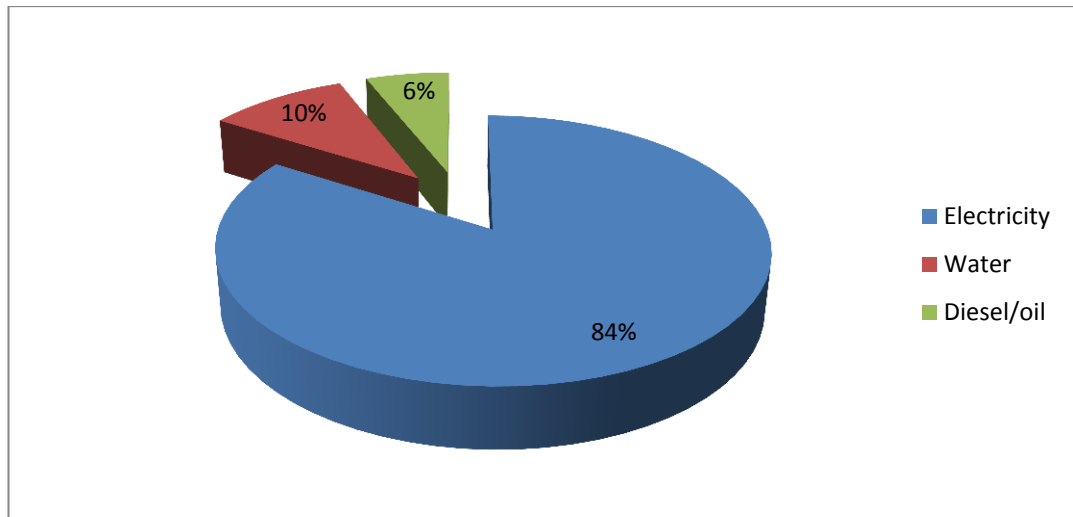


## **CHAPTER 1**

### **INTRODUCTION**

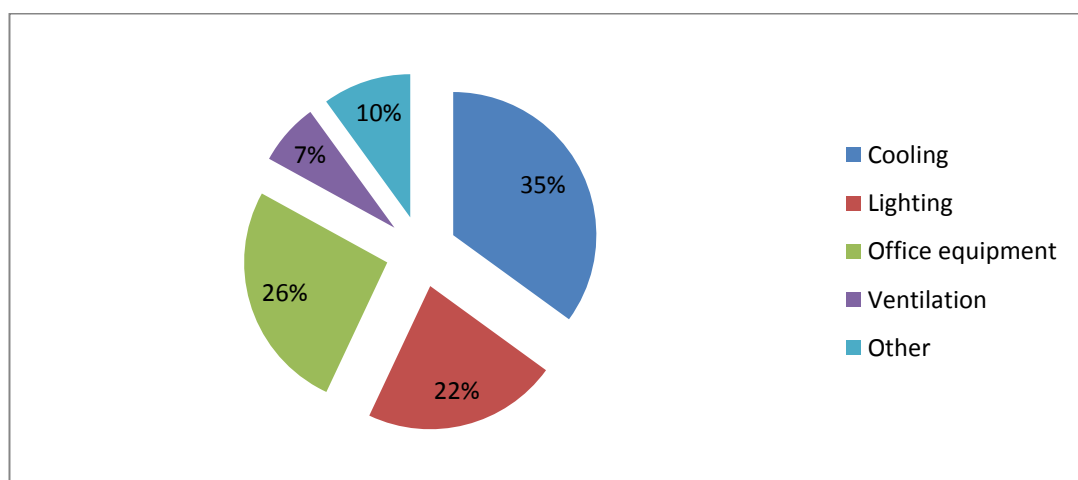
#### **1.1 Problem Background**

Energy consumption is an indicator of a country's industrial progress and the standard of living of its people [1]. The consumption of energy is seen to be increased year by year since it is one of the most important basic requirements for all economic system. More than 75% of the energy came from the non-renewable source such as oil (fossil fuels), coal, natural gas and nuclear energy [2]. Among these, fossil fuels are still dominating the energy sector where the global oil production has increased from 1980 to 2010 including Africa, Central and South America [3]. Development country in Asia and Oceania contributes a major of energy consumption from oil. The electricity is the dominant of the resultant from burning of fossil fuels because of its flexible form where constitutes one of the vital infrastructural inputs in socio-economic development [4]. Malaysia itself especially in peninsular part also consumes high electricity [5]. The limitations of fossil fuels cause its price to be increasing [6] and make the electricity bills nowadays are leading to unprecedented costs [7].



**Figure 1.1** Energy consumption in a building [8]

Other than residential, the building sector is the third largest energy consumption in Malaysia as it is a development country. The rapid growth in construction sector causes the energy consumption to be increased in Malaysia including electricity, water and diesel or oil [8]. Among this type of energy, buildings consumed the highest energy in electricity [9] and electricity consumption in commercial buildings requires serious attention as electricity is the predominant energy source used in these buildings [10]. While, cooling, lighting, office equipment, ventilation and so on are the examples of the electricity usage in commercial building. Cooling which is air conditioner gave the highest domination on the electricity usage in the commercial building [7, 8, 11, 12, 13, 14]. **Figure 1.2** can be referred for clear understanding.



**Figure 1.2** Power loading in commercial building

## **1.2 Problem Statement**

The limitation source of fossil fuels causes the price of electricity become unstable. Hence, there is a possibility for tariff in Malaysia to be increased in future. The increasing of tariff might lead to the increment in bill to be paid by customers. Cooling system which is air conditioner contributes the highest energy consumption in commercial building. Hence, ways to reduce the energy consumption in utilization of air conditioner must be find out.

## **1.3 Objectives**

Before conducting this project, there are several objectives must be set first. The purposes of this project are

1. To study the impact of the scheduling techniques on a split air conditioner in terms of energy saving
2. To propose the best schedule technique for the split air conditioner

## **1.4 Scope of Project**

This project is concentrate on the scheduling technique to control the usage of air conditioner. The type of air conditioner used is split air conditioner due to offer a large potential for savings compared to centralized air conditioner [1]. In order to investigate the effect of the scheduling technique in terms of energy and economic savings, the project is only focussed on the commercial building and hence tariff C1, TNB, Malaysia is used in this project [15].

## 1.5 Thesis Structure

This thesis consists of five chapters as described below:

- i. **Chapter 1** clarify the background of the project, main objective and scopes of work covered for the project
- ii. **Chapter 2** is the literature review related in this project. In this chapter, all the information such as type of air conditioner, the types of scheduling technique available, the advantages and disadvantages of each scheduling technique is explained in detailed.
- iii. **Chapter 3** elaborates the method that is going to be used in order to implement this project. There are two methods have been identified which is conduct the Experiment 1 and Experiment 2. The detail flow of the process involved is discussed in this chapter
- iv. **Chapter 4** shows all the result for the Experiment 1 and Experiment 2. The results obtained are described in detail.
- v. **Chapter 5** is the part for conclusion of the project. The recommendation and suggestion to implement the project will be discussed in this chapter

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