**POLITEKNIK SULTAN SALAHUDDIN ABDUL AZIZ SHAH**

# Initiatives in Reducing Energy Consumption in SASMEC Kuantan

**NORSYAHIRAH BINTI AMIRRUDIN**

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Name of Student : NORSYAHIRAH BT AMIRRUDIN

Student Registration Number : 08BFM17F3027

Student MyKad Number : 960511-33-5098

Dissertation Title : Initiative in Reducing Energy Consumption in SASMEC Kuantan

Program : Bachelor of Technology in Facility Management with Honours

Department : Civil Engineering

Institution : Politeknik Sultan Salahuddin Abdul Aziz Shah, Shah Alam

Signature of Student : ……

Date :

**Verified by:**

Name of Supervisor : Sumaini binti Che Maid

Department : Civil Engineering

Institution : Politeknik Sultan Salahuddin Abdul Aziz Shah, Shah Alam.

Signature of Supervisor : ……

Date :

## APPRECIATION

First of all, I would like to thank Alhamdulillah to Allah S.W.T, because of His bounty and grace, I was able to complete this dissertation successfully despite various trials and tribulations. Alhamdulillah.

On this occasion, I would like to express my sincere thanks to Mrs. Sumaini bt Che Maid as my supervisor for her patience, support, advice and guidance given so much in the production of this dissertation.

Thousands of thanks to both of my parents who have always been supportive, prayerful, reminding and giving me much needed motivation. Indeed, all the sacrifices that have been made are very much appreciated and I will remember them for the rest of my life.

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# ABSTRAK

Tenaga adalah salah satu elemen penting yang kita gunakan sekarang. Tenaga digunakan secara meluas di hampir semua bangunan dan dapat dikaitkan dengan keperluan asas manusia. Pengunaan tenaga secara tidak optimum banyak memberi kesan termasuk terhadap alam sekitar. Pemanasan global yang semakin membimbangkan dilihat banyak memberi impak kepada kehidupan seharian manusia. Tujuan utama kajian ini adalah untuk menghasilkan amalan terbaik dalam mengurangkan penggunaan tenaga di SASMEC.

Di era teknologi baru, tenaga sangat penting untuk memberikan kuasa kepada semua peranti yang kita gunakan setiap hari. Objektif utama penyelidikan ini adalah untuk mengenal pasti inisiatif yang mempengaruhi dalam mengurangkan penggunaan tenaga di SASMEC.

Kajian penyelidikan ini menggunakan kaedah kuantitatif iaitu tinjauan soal selidik untuk mengenal pasti inisiatif yang mempengaruhi dalam mengurangkan penggunaan tenaga di SASMEC Kuantan. Soal selidik dianalisis secara statistik menggunakan perisian SPSS. Berdasarkan penemuan tersebut, pengguna adalah salah satu inisiatif yang dapat mempengaruhi dalam mengurangkan penggunaan tenaga di SASMEC.

## ABSTRACT

Energy is one of the essential elements we use today. Energy is widely used in almost all buildings and can be linked to basic human needs. Sub-optimal energy consumption has many effects, including on the environment. Increasingly alarming global warming is seen to have a huge impact on people's daily lives. The main purpose of this study is to produce best practices in reducing energy consumption in SASMEC.

In the era of new technology, energy is very important to power all the devices we use every day. The main objective of this research is to identify influential initiatives in reducing energy consumption in SASMEC.

This research study uses a quantitative method that is a survey questionnaire to identify initiatives that influence in reducing energy consumption in SASMEC Kuantan. Questionnaires were analyzed statistically using SPSS software. Based on the findings, consumers are one of the initiatives that can influence in reducing energy consumption in SASMEC.

**CONTENTS**

# CHAPTER 1

## 1.0 INTRODUCTION

## 1.1 INTRODUCTION

Energy is one of the important elements we use today. Energy is widely used in almost all buildings and can be attributed to the basic needs of human beings. Without energy, it is impossible to complete all the work. In the era of new technology, energy is essential to provide power to all the devices we use every day. Like buildings, energy is widely used.

Scientists define energy as work ability. Modern civilization is possible because people have learned how to convert energy from one form to another, and then use it for work. People use energy to walk and ride bicycles, drive along roads and boats along waterways, cook food on stoves, make ice in freezers, illuminate our houses and offices, make products, and send astronauts into space. There are many different forms of energy, including heat, light, motion, electricity, chemistry, and gravity.

These forms of energy can be divided into two conventional types of energy, used to do work potential or stored energy, kinetic energy or work energy. Energy can be converted from one form to another. For example, the food a person eats contains chemical energy, and a person's body stores this energy until he or she uses it as kinetic energy during work or entertainment. The chemical energy stored in coal or natural gas and the kinetic energy of water flowing in rivers can be converted into electrical energy, and electrical energy can be converted into light and heat.

There are many different energy sources, which can be divided into two basic categories. Renewable energy that can be easily replenished. Non-renewable energy that cannot be easily replenished. Renewable and non-renewable energy sources can be used as primary energy sources to generate useful energy, such as heat, and can also be used to generate secondary energy sources, such as electricity and hydrogen.

Due to our dependence to energy, the usage becoming increasing day by day. Then this becoming the world new treat as the usage can be reach to the limit one day later. Due to that, the energy saving should be apply from now to ensure that people are aware with this situation.

Therefore, it is important to undergo study to improve the usage of energy in the hospital. Without proper way to reduce energy, we will always wasting the energy.

## 1.2 DETERMINATION OF THE CONCEPT OF THE STUDY

### 1.2.1 RESEARCH ISSUES

For research issues, the concern about the energy usage in a hospital become problem no days. The usage of energy increasing day by day. Most of building in Malaysia are with high level of the energy consumption they use energy in many different ways. (Moghimi, Mat , Lim, Zaharim, & Sopian , 2014)

The high usage of energy distribute to climate change. As such, significant opportunities are regained regarding saving energy, reducing emissions and providing appropriate thermal conditions in buildings. Hospitals in particular face these issues more critically than other buildings due to their unique characteristics and requirements. Hospitals operate around the clock, and their micro climate can significantly affect both patients and staffs. Patients' thermal requirements are not only due to physical weakness but can also affect the healing process and the length of stay in hospital. (Azizpour.F, Moghimi , Lim, & Mat, 2012) This affect the environment to the area which the lead to pollution to the nearest area.

When HVAC systems suffer any failures, the symptoms of such failures can be easily ignored by operators and occupants (Yang, Shen , Chen, & Gunay, 2018) the worker ignorance become a problem when they do not take action when the machine not functioning well. This later affect the energy use to run the machine.

It is worth noting that there are no regulations to enforce to monitor building systems operation by installing proper sensors. Therefore, some sensors were sometimes installed improperly (Yang, Shen , Chen, & Gunay, 2018), the maintenance worker should be more professional and skilful to handle the situation.

### 1.2.2 PROBLEM STATEMENT

‘Hospitals are the buildings with high level of the energy consumption they use energy in many different ways. Hospitals operate 24 hours and 7 day in a week, one of the most important issues in hospitals is indoor environment as well indoor air quality and needing fresh air in majority of parts, it leads hospitals to load more air conditioning, also tropical climate and hot humid area need a high level of air conditioning due to level of temperature and humidity, therefore in this condition integrated energy efficiency in hospitals could minimize the amount of energy consumption and save the energy cost.

Baseline energy information is the first step for managing energy in a building to know the ways of using energy and estimate how it can be saved, (Moghimi, Mat , Lim, Zaharim, & Sopian , 2014) However, the energy efficiency in some Hospital are not achievable and this become the center of consent as we now try to approach the low energy use in a building.

The energy usage in hospital are in their maximum level as hospital treat their patient every day and some of the equipment in hospital use for critical patient such as oxygen machine and many more. This is why the energy use is high. Their depency to energy is maximum as they cannot out of supply. When the power are off the generator automatically will supply the energy.

### 1.2.3 CENTRAL RESEARCH QUESTION

The central research question for this study what are the measure taken in reducing the energy consumption at SASMEC in order to produce the best practices in reducing the energy consumption at SASMEC. With proper best practices can help SASMEC to reduce the usage of energy. This also can give chance of the building occupant to always aware with it. The energy usage in hospital sometime waste without management acknowledge. For example sometime they tend to left their room without turn off their switch, forgot to off their computer and more. This somehow becoming habit and can contribute to wasting the energy. The usage of energy in HVAC also one of their reason. The maintenance work that not be done properly will also affect to energy usage.

### 1.2.4 AIM OF STUDY

The main purpose for this study is to produce the best practices in reducing the energy consumption at SASMEC.

### 1.2.5 THE SECONDARY RESEARCH QUESTION

From the study that have been undergo, there is a few question that become the based reference for this research. The aim for this research are to answer for a few question:

i. What are the initiatives that influence in reducing energy consumption SASMEC?
ii. How to analyze the initiatives of influence in reducing the energy consumption at SASMEC?
iii. What is the recommend the improvement in reducing the energy consumption at SASMEC?

### 1.2.6 RESEARCH OBJECTIVES

To achieve the aim for the objectives and answered for the secondary research question, there are a few objectives that has been identified:

i. To identify the initiatives that influence in reducing energy consumption at SASMEC.
ii. To analyze the initiatives of influence in reducing the energy consumption at SASMEC.
iii. To recommend the improvement in reducing the energy consumption at SASMEC?

## 1.3 SCOPE OF RESEARCH

The scope of research for this study is consist the location which is locate in IIUM (SASMEC) only. The research is undergo by analyse the data from the monthly energy use of the SASMEC.

### 1.3.1 ADVANCE PACT SDN BHD

Advance pact is service provider for the SASMEC that maintain the all the facility in SASMEC. They services are cover for civil, mechanical and electrical maintenance work. If got any maintenance work, the Advance Pact team will help SASMEC.

### 1.3.2 SASMEC staff

The SASMEC staff also consist of engineering department which they are in charge in order to manage the building always in good condition. They will monitor all the work done by the Advance Pact team.

## 1.4 IMPORTANCE OF RESEARCH

This research purpose are to give the best suggestion for Initiative for Reducing Energy Consumption in SASMEC. The energy usage should be in minimum usage. The user should not waste the energy purposely. Without proper awareness the energy consumption cannot be reduce.

Furthermore, this problems occur in most of building. So this initiative also can be applied in the SASMEC building and also can be applied in the house.

# CHAPTER 2

## 2. LITERATURE REVIEW

### 2.1 INTRODUCTION

The main purpose of literature review was to survey previous study in knowledge for the research. This was in order to understand the research conceptual. It is important in where that the info come from in order to understand the research that has been conducted. The research is about to find Initiative for Reducing Energy Consumption in Hospital (SASMEC). This also a way to identify a few issues that had been highlighted to support this research for being undergo

Energy is used widely now days. It became one of important thing to this world. With energy power can help people with daily life. In hospital the energy is used in almost every appliance. In the hospital, energy used to light up the light in hospital. Energy also used to generate power to HVAC system in the hospital. All we can say without energy the function of the building can be gone. But the usage is sometime over use to few mistake that happen daily. Therefore, this research is to help by suggest a few initiative for the hospital to reduce the energy consumption in SASMEC.

The outcome for this research, consist of a few suggestion for the hospital that can be used in order to reduce the energy consumption in SASMEC. This will help SASMEC to reduce the cost for energy usage and save energy for the world.

## 2.2 DEFINITION OF INITIATIVE OF REDUCING ENERGY CONSUMPTION IN SASMEC

### 2.2.1 INITIATIVES

The meaning of initiatives is a new plan or process to achieve something or solve a problem. The initiative also meaning the ability to judge what needs to be done and action (Cambridge Dictionary 6th Edition 1995). Initiative mean a new plan for dealing with a particular problem or for achieving a particular purpose (Oxford Dictionary 3rd Edition 2010). Initiative is the ability to be resourceful and work without always being told what to do. It requires resilience and determination. People who show initiative demonstrate they can think for themselves and take action when necessary. It means using head, and having the drive to achieve.

Initiative makes you a desirable for opportunities as we are showing we can think for our self, as well as proving that we will continue to develop and grow in the role. Initiative will allow us to get ahead of the competition and ensure were up to date with what is going on. People who show good initiatives, they generate exciting and beneficial ideas.

### 2.2.2 REDUCING ENERGY

The meaning of reducing is to become or to make something become smaller in size, amount, degree, importance. (Cambridge Dictionary 6th Edition 1995). Reduce also means to make something less or smaller in size, quantity, price, etc.; to become less or smaller in size, quantity. (Oxford Dictionary 3rd Edition 2010).

The meaning of energy is the power from something such as electricity or oil that can do work, such as providing light and heat. Energy also means the power and ability to be physically and mentally active. (Cambridge Dictionary

6th Edition 1995). Meanwhile, energy also bring meaning a source of power, such as fuel, used for driving machines, providing heat and the strength, effort and enthusiasm required for physical or mental activity, work (Oxford Dictionary 3rd Edition 2010). Energy can be converted from one form to another in various other ways. Usable mechanical or electrical energy is, for instance, produced by many kinds of devices, including fuel-burning heat engines, generators, batteries, fuel cells, and magneto hydrodynamic systems.

Energy is something that we have taken for granted for centuries. Whether it is burning fires to create heat or generating electricity to power our homes, it is there when we need it. Needless to say, our modern lifestyles come complete with various energy demands. We use an incredible amount of energy every day with global demand increasing day by day. Despite increasing efforts, our switch to clean renewable energy remains a work in progress. As such, we still burn fossil fuels for a lot of our energy needs which is contributing to global warming.

### 2.2.3 CONSUMPTION

The meaning of consumption is an amount of something that is used, or the process of using something, so that there is less of it. (Cambridge Dictionary 6th Edition 1995). Consumption also means the act of using energy, food or materials, the amount used. (Oxford Dictionary 3rd Edition 2010). Most of the energy used in buildings is used to maintain a comfortable indoor environment in terms of thermal comfort (heating or cooling) and air quality (ventilation). Other energy uses are electric light, domestic hot water and household appliances or other electrical equipment.

### 2.2.4 SASMEC

In 2010, the prime Minister , Dato Seri Najib Tun Razak announced the development of IIUMM Medical Centre during his budget speech. All relevant federal and state agencies were mobilised in the efforts to realize the idea and in early 2011, the agreement was finalised between AZRB the ministry of Higher Education , Ministry of Health and IIUM (SASMEC) with an approved budget of 412 million.

The IIUM Medical Centre was built based on the Private Funding Initiative (PFI) with 25-year concession agreement, on 27.8 acress of land, equipped with 350 beds for inpatients and supported by more than 133 specialists. The IIUM Medical Centre also includes the development of an undergraduate and postgraduate teaching hospital and tertiary referral centre, complementing the medical and allied health faculty provisions.

On 12th December, 2012 the Foundation Stone Laying Ceremony was held and officiated by His Royal Highness, the Sultan of Pahang, Sultan Ahmad Shah Al-Musta'in Billah, who is also the Constitutional Head of IIUM. The Ceremony marked the beginning of the construction of the IIUM Medical Centre. On 9th May 2016 the IIUM Medical Centre was hand over to IIUM. This success is the outcome of the painstaking task and well-coordinated effort by IIUM and all relevant agencies. IIUM (SASMEC) is located in Indera Makhkota, Kuantan Pahang.

## 2.3 RESEARCH CONCEPTUAL FRAMEWORK

A Conceptual framework is a visual representation that helps to illustrate the expected relationship between cause and effect in a financial context. Different variables and the assumed relationships between those variables are included in the model and reflect the expectations. It is also called a Conceptual Model or research model. Conceptual framework also can take reference from other journal that being done before this. This will help to analyse the framework.

The conceptual framework is explanation for the initiative for reducing energy consumption in SASMEC. This conceptual framework will help to identify the issues that becoming the problem yet can improve the SASMEC to reduce the energy usage. There a few issues that affect energy usage such as maintenance, design, management and user.

Therefore, the identification of the issue can help the research to find out the best initiative that can be used to help SASMEC to reduce the energy usage. This also can help to cut cost monthly.

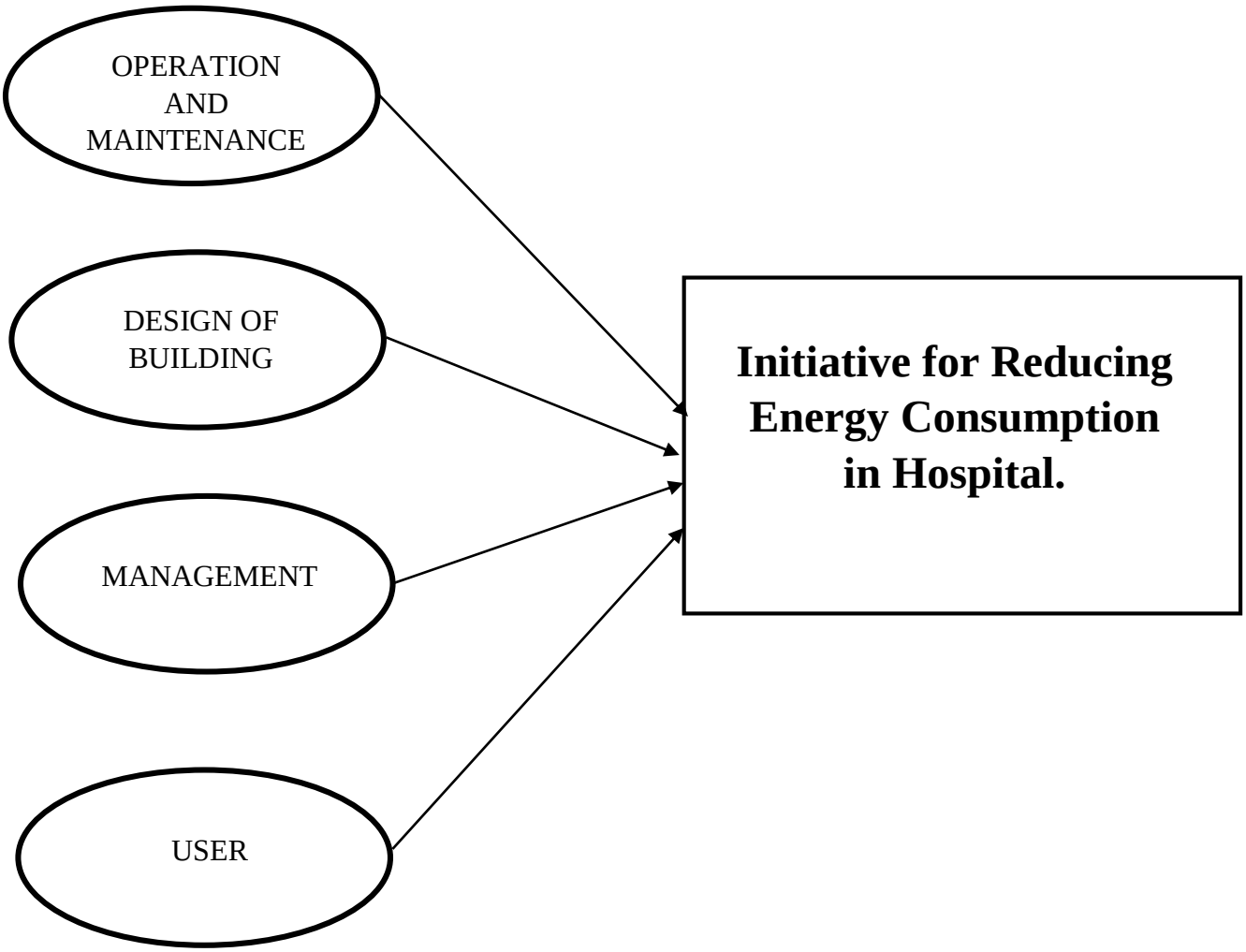


***FIGURE 2.1 CONCEPTUAL FRAMEWORK***

### 2.3.1 MAINTENANCE AND OPERATION

Maintenance work in a building is common with the facility use. But the maintenance also can effect in the energy use if they doing the maintenance work not be done properly. Maintenance costs should account for shutdown costs, energy consumption atmospheric emissions and aging of equipment and facilities. (Sanz-Calcedo, 2018) The improvement of hospital HVAC systems in terms of energy efficiency, to conclude that regular maintenance operations should account for periodic cleaning of filters in HVAC equipment. (Sanz-Calcedo, 2018)

Sometime the technical team take the maintenance work not seriously thus, this can affect their quality of work. The maintenance work should be done by following the procedure and checklist that already given. The commonly faced problems are insufficient indoor air exchange, poor control on indoor thermal conditions, bad space ergonomics that influence the ventilation system operation, poor technical installations maintenance and understaffed technical departments (Ahmet Teke & Timur, 2014). Without proper maintenance work, seem can increase the energy usage mostly on machines.

### 2.3.2 DESIGN OF THE BUILDING

In construction, usually the engineering team only involve and mostly the facility team does not involve. After the building is complete, the problem will appear as the maintenance work cannot done properly due to the design not friendly maintenance. The involvement of facility team during design stage is very important. As health facilities tend to operate 24 hours a day, making facilities performance function particularly is very critical. This sector cannot afford ‘trial and error’ approaches or service failures with patients, provided that fatal mistakes dealing with patients might result in serious damage or even death (Mwanzaa & Mbohwa, 2015)

In Malaysia the involvement of Facility Management mostly after the building is complete. The problem is most of the facility managers not participating in the briefing, designing and cost analysing stages of new building developments (Shohet & Nobili, 2015)

### 2.3.3 MANAGEMENT

The management playing as important role to manage the maintenance team to do their work. The management should be alert with whom their hiring and recognised the skill according to the job. Most of the worker lack of knowledge and skill so that it affect to the work done. When they identified the worker that not so skilful, they should send their worker to training so they can improve their skills.

Management commitment to maintenance issues always affects institutions and unfortunately hospitals are not exempted. Lack of training of maintenance staff on new trends in maintenance and especially when new equipment are bought contributes to reduced mean time between failures (Mwanzaa & Mbohwa, 2015). This show that the management should get involved with the maintenance team to know either they can do their work or not.

### 2.3.4 USER

The training and user awareness will help to create an energy management team, consisting of representatives of various sectors of the hospital, with the mapping task and proposed actions to reduce energy consumption. (Machado, Scarvarda , Zhao, & Kipper, 2015) Aims to optimize the use of energy guiding, directing, and controlling the actions over economic resources, thus minimizing the relationship between the consumption and service, reducing general and specific indices of the amount of energy required.

Before taking any initiative or action aimed at energy savings in a company, it is important to implement an internal program of energy conservation. This importance is related to the fact that individual actions tend to lose their effect over time. The plan requires initiative and creativity, as actions that require work style changes, which are difficult obstacles to overcome. (Machado, Scarvarda , Zhao, & Kipper, 2015)

The user should have awareness in how to reduce the energy usage. Sometime the habit of a user that does not care will affect the energy consumption like leaving the computer without using, leave the light on and more. This awareness will open the user's eyes to the importance of energy saving. The building is mostly used by user so most of them will use appliance to do work in office.

## 2.4 CHAPTER SUMMARY

In the literature review, researcher already explain about the definition of Initiative of Reducing Energy Consumption in SASMEC. Researcher also explain about the background of the study and also conceptual framework about this research. In the beginning of the research, the researcher already include about the source of data collection about the Initiative of Reducing Energy Consumption. Furthermore, the researcher already classified the research into a few part:

i. Operation and Maintenance
ii. Design of the Building
iii. Management
iv. User

All of these part become the reference for the researcher to undergo the research to gain the objectives of this research. This research also being held in SASMEC and the data collection is coming from the trusted source and reliable for this research. With all these part combine can give and outcome to suggest the Initiative of Reducing Energy Consumption in SASMEC.

# CHAPTER 3

## 3.0 RESEARCH METHODOLOGY

## 3.1 INTRODUCTION

Research methodology is a systematic way to solve a problem. It is a science of studying how research is to be carried out. Essentially, the procedures by which researchers go about their work of describing, explaining and predicting phenomena are called research methodology. It is also defined as the study of methods by which knowledge is gained. Its aim is to give the work plan of research (Patil, 2016)

Research methodology is an investigation specifically through a search for a new facts in any branch of knowledge. The main objective of research are to gain familiarity or achieve a new sight toward a certain topic. Its function as to verify and test the importance fact that we use to support the research. Besides, it's to analyse an event, process and phenomenon that occur before this. Research methodology also use to determine the frequency at which something occurs.

In this chapter, will be explain few step about the stage of research and method that being use to get the data and analyse the data. The method use is to gain the research outcome for the research to be acceptance

## 3.2 PHILOSOPHY OF RESEARCH

The word 'Pragmatism' is commonly used in English language to denote the practicalities of just getting on and doing what the situation demands. It seem to invite easy compromise, short term expediency, and taking the path of least resistance without the encumbrance of theoretical principle or value. In context of research, it's often been used to imply an anodyne alternative that might be adopted when there appears to be no clear paradigmatic preference to guide the process inquiry. (Simpson, 2018)

Pragmatism advocates the unity of knowledge and action, of value and experience. It's introduces a criterion or rule (pragmatism maxim) for the meaning of concept. The main idea of this rule is that the meaning of a concept is located the consequences example in the way of alter the behaviour of human being and not a metaphysical search. (Pavlis & Gkiosos, 2017)

Pragmatism is approach where the evaluation of theory is based on action taken. The truth only can be acceptance when the theory is proven by action. Only proven theory can be acceptance while unpractical theory will be rejected.

### 3.2.1 DEDUCTION APPROACH

The deductive method can start from any theoretical base, from which any number of alternative hypotheses could be deduced. Authors are expected to start their papers with substantial introductions, justifying their theoretical starting points and the hypotheses they have deduced. And since their starting points are not grounded in empirical observation, but on a proposed theory that often is not fully validated yet they are vulnerable to the criticisms of the editor and the reviewers who each may favour a different theory and hypotheses as the starting point for the research. (Woiceshyn & Daellenbach, 2018)

In deductive approach, the research can use qualitative to achieve the research result. The questionnaire can be done by using quantitative method in order to the information for the research purpose. A questionnaire can be conduct to approach the exact method can be used to maintain the facility so it can reduce energy consumption.

### 3.2.2 INDUCTION APPROACH

In the subjectivist inductive approach, theory not only exists as an abstract description that researchers read and debate, but it can also reside within the researcher as a cognitive frame that shapes his or her thinking and research design choices. In this approach, theory is not stable. It is constantly evolving, informed by researchers' experience, values, and perceptions. Furthermore, the subjectivist inductive researcher can engage with a single theory or with several theories in a single study or across a program of research. (Varpio, E. Paradis, S. Uijtdehaage, & M. Young, 2019)

Inductive approach usually analyse from the observation, then observe form pattern later come out with hypothesis then it will confirm the theory. The research can use interview using qualitative method to interview the competent person in order to find out the outcome.

### 3.2.3 ABDUCTION APPROACH

Abduction is said to be the predominant mode of reasoning in medical diagnosis. Abduction play a central role in philosophy debates on so-called under determination argument. Under determination argument generally start from the premises that a number of given hypotheses empirically equivalent, which their authors take to mean the evidence is unable to favour one of them over the other. (Damartini & Marchiori, 2018)

Abduction is combination for both method. The researcher will use abduction to get the aim and objective then use abductive method to get the end result. For this research abduction method will be used.

### 3.3 RESEARCH DESIGN

A research design is a blueprint to guide the research process by laying out how a study will move from the research purpose/questions to the outcomes. It is a comprehensive planning process used to collect and analyse data in order to increase the understanding of a given topic. At a general level, the research process consists of three primary stages: posing a question for examination, collecting data to answer the question, and presenting an answer to the question. Although the general research process is broadly similar across disciplines, this research will focus on the research design and methods (Abutabenjeh & Jaradat, 2018)

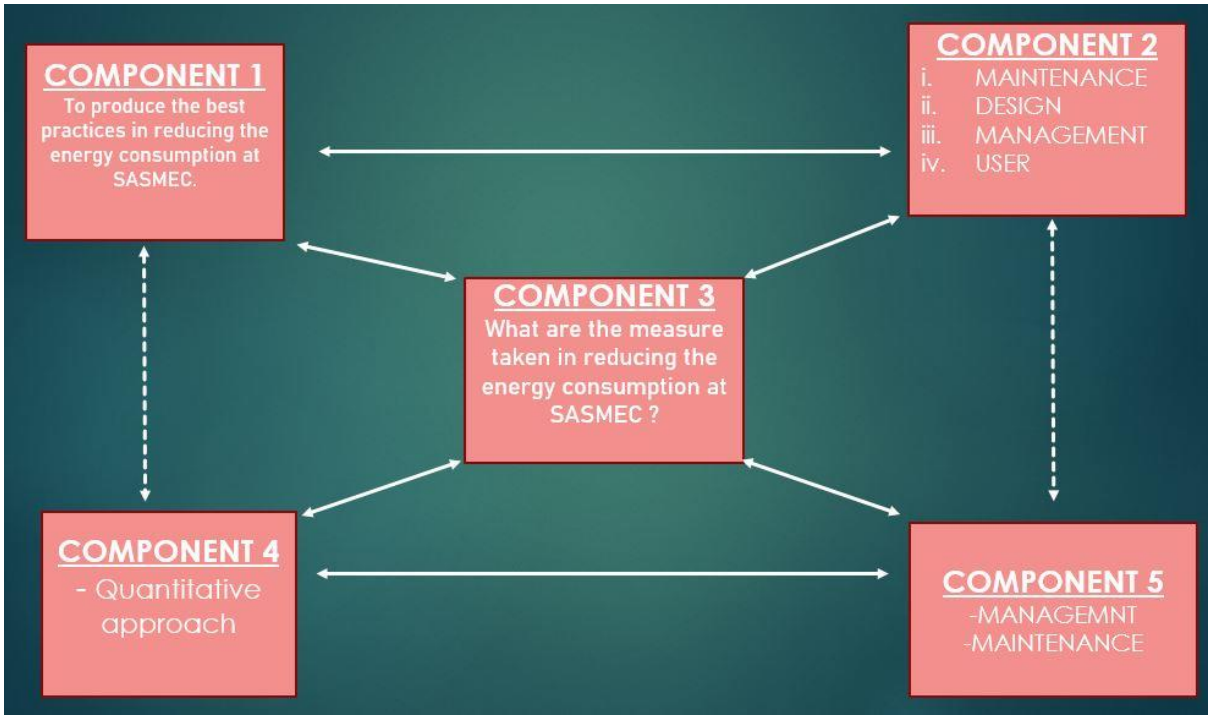


Figure 3.1 Research Design

### 3.3.1 AIM

The main purpose for this study is to produce the best practices in reducing the energy consumption at SASMEC. The aim of research is assemble form objective, aim and all the component that has been discuss in Chapter 1.its also related with conceptual design, method and research question

### 3.3.2 CONCEPTUAL FRAMEWORK

A Conceptual framework is a visual representation that helps to illustrate the expected relationship between cause and effect in a financial context. Different variables and the assumed relationships between those variables are included in the model and reflect the expectations. It is also called a Conceptual Model or research model. Conceptual framework also can take reference from other journal that being done before this. This will help to analyse the framework.

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### 3.3.3 RESEARCH QUESTION

From the study that have been undergo, there is a few question that become the based reference for this research. The aim for this research are to answer for a few question:

i. What are the initiatives that influence in reducing energy consumption SASMEC?

ii. How to analyze the initiatives of influence in reducing the energy consumption at SASMEC?

iii. What is the recommend the improvement in reducing the energy consumption at SASMEC?

### 3.3.4 METHOD

Method use for the research is quantitative (questionnaire). This method involve the maintenance team and management team to undergo the research in SASMEC.

a. Questionnaire

Questionnaire is a research device or instrument that is made up of a series of questions which are closed-ended or open-ended. Its use quantitative approach to gain data. The goal is to collect relevant data from respondents which can then be used for a variety of purposes. When we give the respondent the ability to give a longer answer, it can yield more insights because they can elaborate on their thoughts.

Questionnaires, though versatile, aren't ideal in every situation especially when we need to understand specific issues. It’s not advisable to use a questionnaire to ask specific questions about a product or service considering. This may lead to bias and false positives about the feasibility of the product.

## 3.4 VALIDITY

Validity mean how far the research can be accepted and how the reaction of the research. Validity is defined as the extent to which a concept is accurately measured in a quantitative study. For example, a survey designed to explore depression but which actually measures anxiety would not be considered valid. The second measure of quality in a quantitative study is reliability, or the accuracy of an instrument. In other words, the extent to which a research instrument consistently has the same results if it is used in the same situation on repeated occasions. Validity use for this research consist of worker among APSB organization.

## 3.5 SAMPLE RESEARCH

In research terms a sample is a group of people, objects, or items that are taken from a larger population for measurement. The sample should be representative of the population to ensure that we can generalise the findings from the research sample to the population as a whole.

To draw conclusions about populations from samples, we must use inferential statistics, to enable us to determine a population's characteristics by directly observing only a portion (or sample) of the population. We obtain a sample of the population for many reasons as it is usually not practical and almost never economical.

Probability sampling is also known as 'random sampling this is a sampling which permits every single item from the universe to have an equal chance of presence in the sample. For instance in a raffle draw were individual units will be picked from the overall group not a deliberately nonetheless by certain process, this incident is only a blind of chance that will limits whether unique items or the additional items is to be preferred. (Etikan I, 2017)

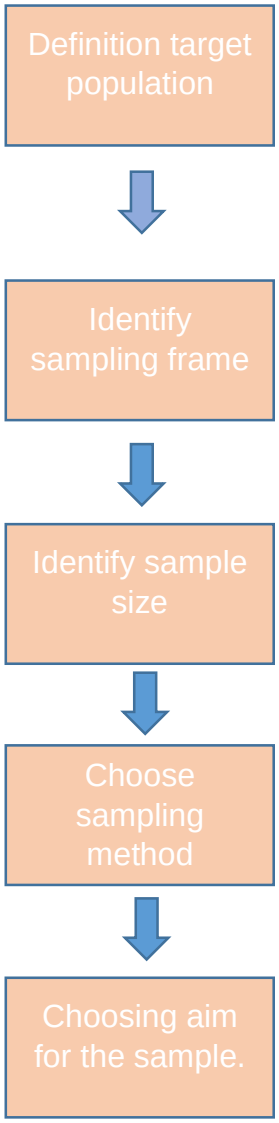


Table 3.1 Sampling Flow Chart.

## 3.6 CHAPTER SUMMARY

In this chapter, having numerous methodological deliviations will be utilized in this study. Choosing the methodology, think about plan, information collection strategies utilized, consider rebellious, tests and information examination methods. Researcher have also described how to conduct studies. Each portion of the title in this chapter has been seen to supply a more detailed and clearer clarification within the compilation of the ponder methodology. In this chapter, it is additionally portrayed as a step taken for more point by point information collection to get more precise information.

# CHAPTER FOUR

## 4.0 DATA COLLECTION

## 4.1 INTRODUCTION

This chapter will describe about the method of data collection that has been done by the researcher. This data collection process involves how the data is to be collected, making observations on an issue that has occurred, record the data, collecting data, selecting and isolating data when the data is used. Primary data are data that are collected regarding the researcher specific problem problems (Hox & Hennie, 2005). In this chapter, the researcher will go over how the research data is collected and recorded in greater depth to ensure that each piece of information received addresses each question and purpose of the study.

As a result of this data collecting, researchers have used a variety of data collection tools to address the questions and objectives they have presented. This data collection instrument is appropriate for the study's scope and can answer the three objectives provided by the researcher in the study's first chapter. In this chapter, the researcher also used a questionnaire to collect data and information for the aim of answering the study's objective questions.

## 4.2 DATA COLLECTION INSTRUMENT

Data collecting tools are methods that are used to collect and measure information in a systematic method in order to fulfil the study's objectives. During a study, data has been collected from two different sources primary and secondary. A primary source, such as surveys and interviews, is a data source that directly gives information for the goal of data gathering. Because this source obtains data from significant information materials in this study, this primary data source plays a vital role during the study in determining the study's results.

This primary source's data will be needed to answer study questions and objectives, as well as to conduct analysis, draw conclusions, and organise the study. Furthermore, the aims of the study and the goals of the study conducted can be determined using this primary source. Books, journals, magazines, the internet, papers, and prior theses, is referred to as secondary sources. To meet the study's aims and questions, questionnaires was used as instruments.

### 4.2.1 QUESTIONNAIRE

Questionnaire is the simplest and most typical approach used by researchers to gather data from a study more quickly and precisely. For phenomena that are not directly observable, researchers commonly use questionnaires as indirect measures of the phenomenon of interest. (Sousa, Jeffrey , & Lopez, 2016) Because the process of completing this questionnaire form is simple, many researchers have used it as the preferred method of gathering information and data during their research. As a result, this strategy of using a questionnaire form is also applied by researcher as a data collection instrument for the study for initiative of reducing energy in SASMEC Kuantan.

In this questionnaire, the researcher will focus to the research objective which is to:

i. To identify the initiatives that influence in reducing energy consumption at SASMEC?

ii. To analyse the initiatives of influence in reducing the energy consumption at SASMEC?

iii. To recommend the improvement in reducing the energy consumption at SASMEC?

This questionnaire was developed using element to suggest the best practice that can be done to improve the energy usage at SASMEC. Has many advantages by using the questionnaire instrument to obtain information and data which cannot be misused and will gain respondents' trust. Furthermore the respondent's identity can be kept secret and it is much easier to get feedback by using the questionnaire instrument because it is easy to distribute to the target group as respondents. The costs incurred by using this instrument can be reduced and low.

For this research, the questionnaire involving 33 respondent in SASMEC form different department in maintenance field. The department divided into four consist of Advance Pact Sdn Bhd, SASMEC staff from IIUM, SRZ which is subcontractor for Mechanical department and PAKAR which is subcontractor for Electrical department. By ensuring that the respondents' personal information is kept private and only utilised for research purposes. The items in this questionnaire are based on four constructs that are part of the study's conceptual framework. This questionnaire form is also applied to answer the study's sub-questions as well as the study's first, second and third objectives. This is the list of the questions asked in the survey.

| | |
|---|---|
| SECTION 1 | Demography |
| SECTION 2 | Factor That Can Influence The Initiative In Reducing Energy Consumption In SASMEC Kuantan |

*4.2.2.1 SECTION 1: DEMOGRAPHY OF RESPONDENT*

In this section, the researcher has listed some background factors of respondents to obtain appropriate data to answer the questions that will be asked to respondents in section 2. There are several questions asked in section 1, that involves the respondent's age, position, work experience, department an education level respondent in. In this section, it is not included in the analysis because the purpose is to facilitate the researcher to determine who suitable respondents to answer the survey questions is and this is to ensure that each background should be kept confidential by others.

*4.2.2.2 SECTION 2: FACTOR THAT CAN INFLUENCE THE INITIATIVE IN REDUCING ENERGY CONSUMPTION IN SASMEC KUANTAN.*

In this section, the researcher has listed the factor that can influence the initiatives in reducing energy consumption in SASMEC Kuantan. This section has been divided into by following the conceptual framework. For question in this section will answer all the objective research question.

**SECTION 2**

Section B is a factor that can influence the initiative in reducing energy consumption in SASMEC Kuantan and please tick (／) in the selected box.

| EVALUATION STAGE | STRONGLY DISAGREE | DISAGREE | NOT SURE | AGREE | STRONGLY AGREE |
|---|---|---|---|---|---|
| | 1 | 2 | 3 | 4 | 5 |

| B. OPERATION AND MAINTENANCE | | 1 | 2 | 3 | 4 | 5 |
|---|---|---|---|---|---|---|
| **B1** | The air-conditioning system need to be operated 24 hours per day. For a proper function of hospital | | | | | |
| **B2** | Maintenance work need to be done by following with procedure to improve the performance of the air-conditioning system. | | | | | |
| **B3** | Air conditioning system need to be operating smoothly to improve the energy consumption. | | | | | |
| **B4** | Air conditioning system will operate smoothly if maintenance work done following PPM schedule. | | | | | |

| C. DESIGN OF BUILDING SPACE | | 1 | 2 | 3 | 4 | 5 |
|---|---|---|---|---|---|---|
| **C1** | A proper design of spaces can help the building to reduce energy usage. | | | | | |
| **C2** | An appropriate space layout by arranging space area with natural daylight can help reducing energy. | | | | | |
| **C3** | Space arrangement is important to help building minimize energy consumption | | | | | |
| **C4** | Natural ventilation indirectly help proper air circulation without using any appliance. | | | | | |

| D. MANAGEMENT | | 1 | 2 | 3 | 4 | 5 |
|---|---|---|---|---|---|---|
| **D1** | Management team provide training on energy consumption in order to improve skill | | | | | |
| **D2** | The involvement of technical specialist is important, to provide a good maintenance system. | | | | | |
| **D3** | Building owner management provide new technology equipment to reduce energy consumption in building. | | | | | |
| **D4** | A complete briefing on task, can help reducing error during operational process. | | | | | |

| E. USER | | 1 | 2 | 3 | 4 | 5 |
|---|---|---|---|---|---|---|
| **E1** | The user knowledge about importance of energy, can help in reducing energy consumption. | | | | | |

| | | | | | | |
|---|---|---|---|---|---|---|
| **E2** | The user training regarding of energy in the building, can help in reducing energy consumption. | | | | | |
| **E3** | User awareness on energy consumption can help reducing energy. | | | | | |
| **E4** | User need to be reminded in order to apply energy saving as a culture. | | | | | |

### 4.3 PILOT TEST

The researcher conducted this pilot study with ten respondents who work in maintenance at other hospitals. The goal of this pilot study was to see if the items used in the survey questions were accurate. This pilot study is necessary to ensure that the respondents' responses to the questions they intend to ask are accurate, as well as the data findings.

| Cronbach's alpha | Internal consistency |
|---|---|
| $\alpha \geq 0.9$ | Excellent |
| $0.9 > \alpha \geq 0.8$ | Good |
| $0.8 > \alpha \geq 0.7$ | Acceptable |
| $0.7 > \alpha \geq 0.6$ | Questionable |
| $0.6 > \alpha \geq 0.5$ | Poor |
| $0.5 > \alpha$ | Unacceptable |

Figure 4.1: Table for Cronbach’s alpha score

Cronbach's alpha is a metric for determining the internal consistency, or reliability, of a set of scale or test items. In other words, a measurement's reliability refers to how constant it is in measuring a term, and Cronbach's alpha is one means of determining how strong that consistency is. Cronbach's alpha is calculated by comparing the variation for all individual item scores to the overall score for each observation (typically individual survey respondents or test participants).

| Reliability Statistics | |
|---|---|
| Cronbach's Alpha | N of Items |
| **.944** | **16** |

Figure 4.2: The Cronbach’s alpha score

The purpose of preparing this pilot study is to ensure that the questions used are easy to understand, check first with 10 randomly selected respondents, ensure that the survey questions are in the correct condition and complete with clear instructions and easy to understand by each age group of respondents regardless of their educational background and understanding. For this research the Cronbach’s Alpha score was 0.944. Based on the Cronbach’s Alpha score the questionnaire are in Excellent range and acceptable for this research.

## 4.4 CHAPTER SUMMARY

The use of instruments for the data collection process that has been used in this study has been described in this chapter in more detail and clearly. The data collection process used by the researchers is by using survey question forms methods that are considered easier to accept data and instrument methods commonly used by many other researchers.

Overall, this chapter describes comprehensively related to data collection starting with how to write survey questions, instrument methods used and how to select the writing of filtered questions using pilot study methods. By using the instrument method and method of this pilot study can guarantee that the questions issued in this survey question is the best and appropriate to obtain the objectives and goals of this study. The instrument used is based on the highlights of previous studies.

Finally, based on the description presented in this chapter, the researcher has tried to ensure that it follows all the things outlined for the purpose of data collection to ensure that it follows as well as possible and organized. This is to ensure that everything done can give and achieve the objectives and goals of the study conducted.

# CHAPTER 5

# DATA ANALYSIS

## 5.1 INTRODUCTION

This chapter will describe and discuss the results of the findings obtained by analyzing the data to measure the objectives that have been set in the study that are related to the conceptual framework that has been built at the beginning of this chapter of this study. Apart from that, discuss the analysis process based on the findings obtained from the sample and the instrument method used, namely the questionnaire form related to the study initiative for reducing energy consumption in SASMEC Kuantan. The analysis of this data is to answer the questions and objectives of the study that are presented and collected and then processed to explain in this chapter.

Instruments used such as questionnaires were distributed to maintenance workers at SASMEC using the online method, namely Google form. A total of 33 questionnaires were returned to the researcher after being answered by the respondents for the purpose of analyzing the findings of the data obtained.

The results of the data and data analysts will be included in tabular form to make it easier to understand. Before being displayed, the data obtained will undergo filtering using SPSS software program (version 25.0). There are two methods of analysis that will be displayed in the form of percentage and mean obtained through the use of this SPSS software program.

## 5.2 RESPONDENT DEMOGRAPHY

In this section, the researcher will explain about the demographics that are included to the respondents at the beginning of section 1 in the survey questionnaire conducted. A total of 33 questionnaires were received back by the researchers to analyze the data to achieve the objectives of the study. Section 1 which is this demographic part, the researcher has stated some questions that will be answered by the respondents such as examples:

a. Age
b. Gender
c. Department
d. Position
e. Work experience
f. Education level.

All information and data obtained from the respondents in this section 1 through the questionnaire will be displayed in the form of diagrams and percentages after analysis.

### 5.2.1 RESPONDENT ANALYSIS FOR AGE

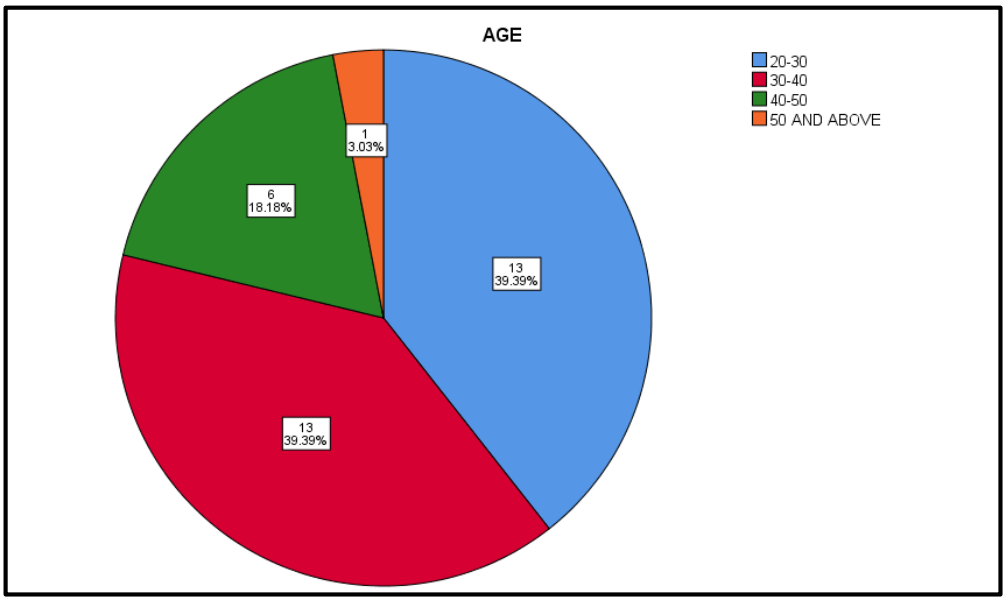


Figure 5.1: Chart for age of respondent

Figure 5.1 describe about the age of respondent taking this questionnaire. The percentage of respondent age 20-30 years old are 39.39% which cover up to 13 respondent. Respondent age from 30-40 years old also recorded 39.39% which cover about 13 respondent same as the range age for 20-30 years old. For respondent age 40-50 years old are 18.18% which cover around 6 respondent and lastly, respondent from age 50 and above cover around 3.03% which is only 1 respondent.

### 5.2.2 RESPONDENT ANALYSIS FOR GENDER

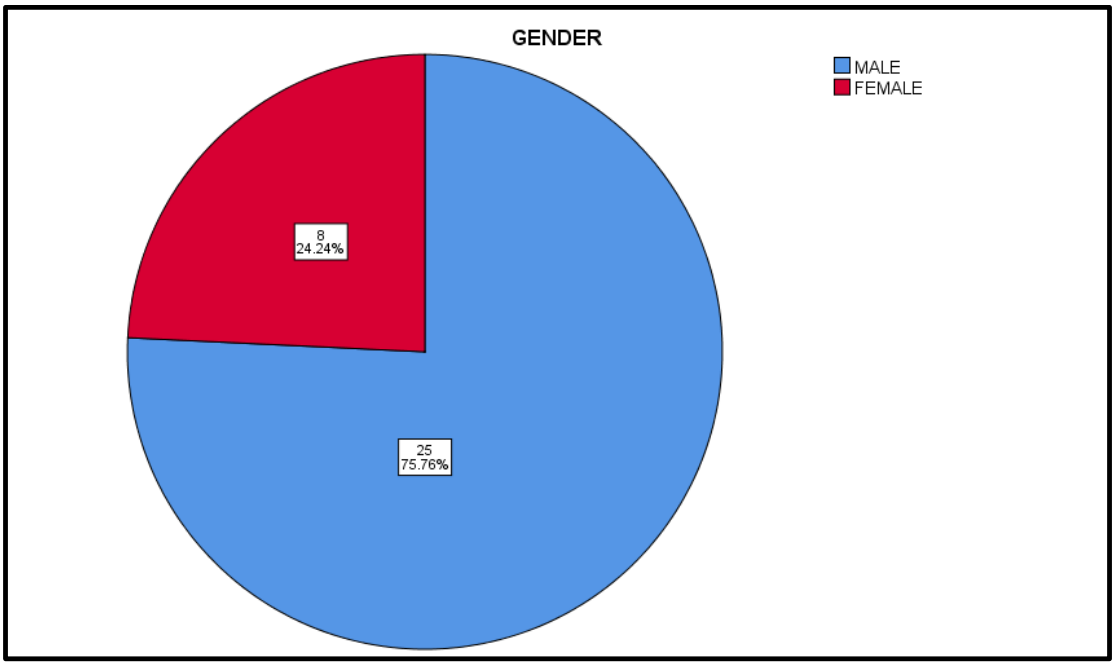


Figure 5.2: Chart for gender of respondent

Figure 5.2 describes the percentage of gender that was answered by 33 respondents who participated in the survey questionnaire built SASMEC. Respondents consisted of males and females randomly selected online. Based on the percentage obtained, a total of 75.76% of respondents are male which 25 respondent and 24.24% of respondents are female which 8 is. Therefore, the researcher found that men are more involved in this study because the hospital building is usually maintained by male employees who are the majority of employees in the building.

### 5.2.3 RESPONDENT ANALYSIS FOR DEPARTMENT

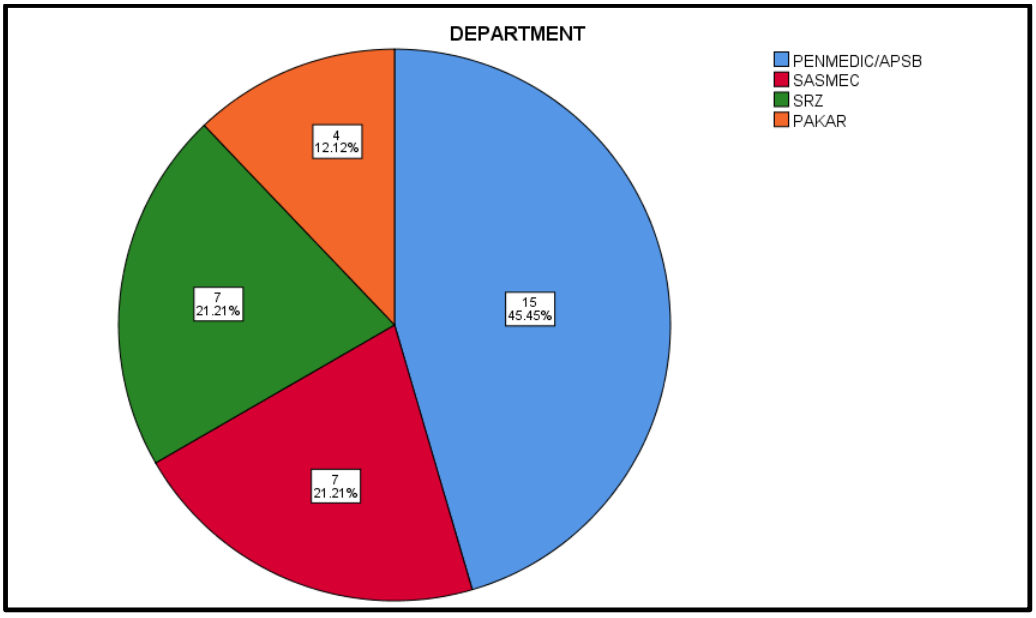


Figure 5.3: Chart for department of respondent

Based on the chart above shows the respondent based on department. The number of respondent that answer this questionnaire mostly from APSB department. The percentage of respondent are 45.45% consist of 15 respondent. For SASMEC department the respondent percentage are 21.21% consist of 7 respondent. Meanwhile, the respondent from SRZ percentage are 21.21% consist of 7 respondent and lastly from PAKAR which percentage recorded are 12.12% consist of 4 respondent. Researcher can concluded that respondent are majority form APSB department that involve with this questionnaire.

### 5.2.4 RESPONDENT ANALYSIS FOR POSITION.

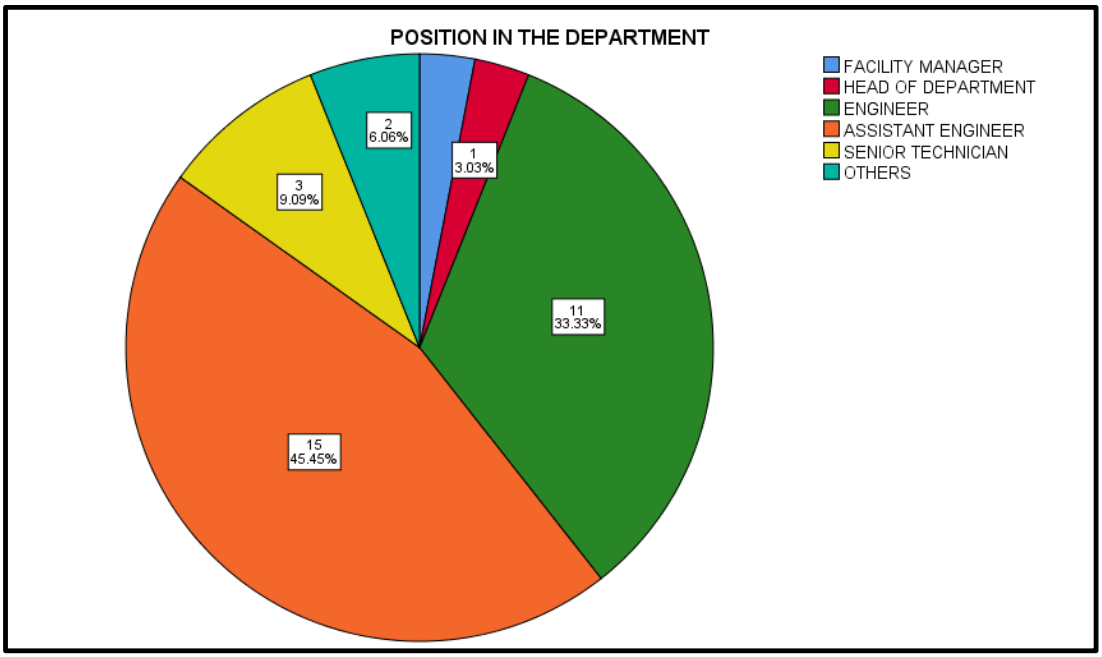


Figure 5.4: Chart for position of respondent

Based on the chart above shows the respondent based on position. The number of respondent that answer this questionnaire mostly from assistant engineer. The percentage of respondent from assistant engineer are 45.45% consist of 15 respondent. For engineer, the respondent percentage are 33.33% consist of 11 respondent. Meanwhile, the respondent from senior technician percentage are 9.09% consist of 3 respondent. Percentage from others are 6.06% consist of 3 respondent. And lastly from Facility manager and Head of Department which percentage recorded are 3.03% from each of them consist of 1 respondent each. Researcher can concluded that respondent are majority form assistant engineer that involve with this questionnaire.

### 5.2.5 RESPONDENT ANALYSIS FOR EDUCATION LEVEL

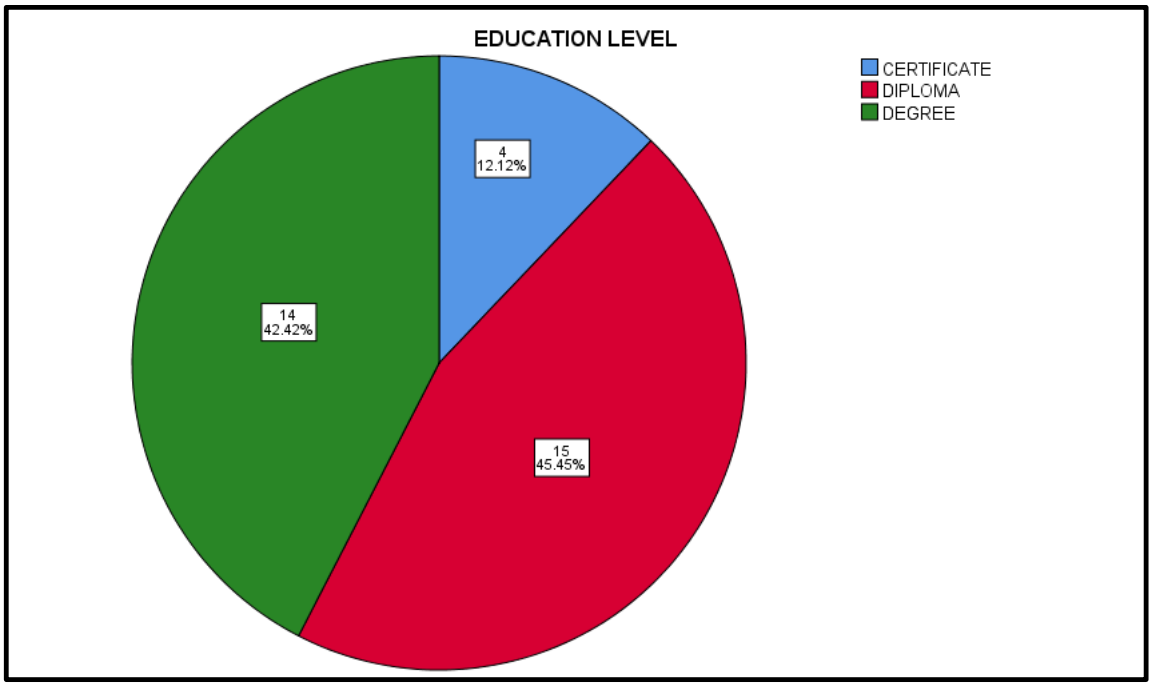


Figure 5.5: Chart for education level of respondent

Based on the chart above shows the respondent based on education level. The number of respondent that answer this questionnaire mostly from diploma. The percentage of respondent from diploma are 45.45% consist of 15 respondent. For degree, the respondent percentage are 42.42% consist of 14 respondent. Meanwhile, the respondent from certificate percentage are 12.12% consist of 4 respondent. Researcher can concluded that respondent are majority from diploma holder that involve with this questionnaire.

### 5.2.6 RESPONDENT ANALYSIS FOR WORK EXPERIENCE

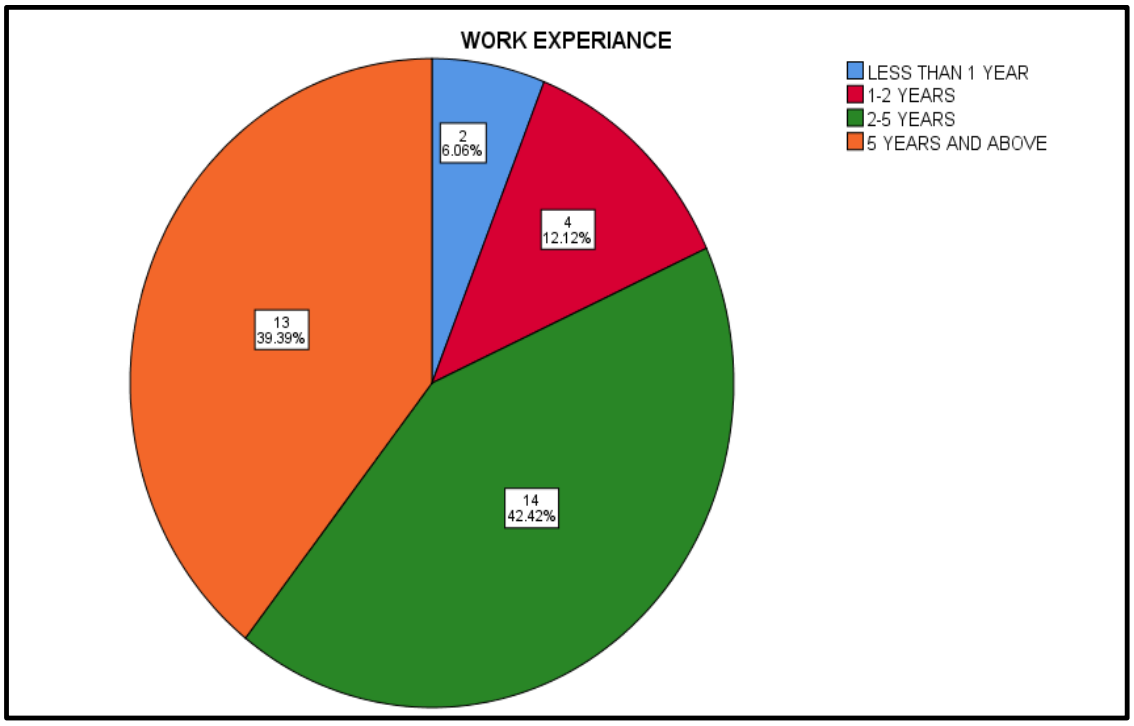


Figure 5.6: Chart for respondents of work experience

Based on the chart above shows the respondent based on department. The number of respondent that answer this questionnaire mostly from 2 to 5 years' experience. The percentage of respondent are 42.42% consist of 14 respondent. For 5 years' and above work experience the respondent percentage are 39.39% consist of 13 respondent. Meanwhile, the respondent from 1 to 2 years working experiences percentage are 12.12% consist of 4 respondent and lastly from less than 1 year which percentage recorded are 6.06% consist of 2 respondent. Researcher can concluded that respondent are majority form 2 to 5 years working experience that involve with this questionnaire.

## 5.3 RESEARCH FINDING FOR FIRST OBJECTIVES

The first objective of this research is to identify initiatives that influence in reducing energy consumption at SASMEC. The reading of past studies was the solution proposed to reach this intended objective. The researcher was able to identify the constructs that were produced based on past study readings. Based on the reading material that researcher study, researcher sum up that the factor that influence the initiative in reducing energy consumption is SASMEC are:

i. Operation and maintenance.
ii. Design of the building.
iii. Management.
iv. User.

Researcher already come out the initiatives as the conceptual framework for the questionnaire made.

## 5.4 RESEARCH FINDING FOR SECOND OBJECTIVES.

The second objectives for this research is to analyse initiatives that influence in reducing energy consumption at SASMEC. To achieve this objective, the method used from information through survey forms in Google form that have been distributed to study respondents. This survey form is based on the construction principles found in the conceptual framework which from operation and maintenance, design of the building, management and user.

| B. Operation and Maintenance | | |
|---|---|---|
| **Description** | **Mean** | **Std. Deviation** |
| B1. The air-conditioning system need to be operated 24 hours per day for a proper function of hospital | 4.39 | .998 |
| B4. Air conditioning system will operate smoothly if maintenance work done following PPM schedule. | 4.36 | .653 |
| **Mean Average** | **4.38** | |

Figure 5.7: Construct for Operation and Maintenance

Based on Likert's scale, the mean score that above 4.20 can be classed as strongly agree. For this construct the mean score is 4.38. The air-conditioning system need to be operated 24 hours per day for a proper function of hospital get 4.39 mean score. Most of respondent are strongly agree with this statement. This is because, hospital are operated 24 hours per day. Without air conditioning system, the air circulation in hospital will drop. This also can affect the air quality in hospital which is important because hospital is a place to treat patient. So the air quality need to be in good condition.

Secondly, air conditioning system will operate smoothly if maintenance work done following PPM schedule get 4.36 score. For this statement, most of the respondent are strongly agree with it. The maintenance work need to be done right on time. This to prevent the equipment from any damage. If the maintenance done by the schedule. It can reduce the chance for equipment in low quality.

| C. Design of the building | | |
|---|---|---|
| **Description** | **Mean** | **Std. Deviation** |
| C1. A proper design of spaces can help the building to reduce energy usage. | 4.52 | .566 |
| C2. An appropriate space layout by arranging space area with natural daylight can help reducing energy. | 4.30 | .585 |
| C4. Natural ventilation indirectly help proper air circulation without using any appliance | 4.36 | .653 |
| **Mean Average** | **4.39** | |

Figure 5.8: Construct for Design of the Building

For design of the building, the mean average score are 4.39. Based on Likert's scale, score that above 4.20 are describe as strongly agree. For a proper design of spaces can help the building to reduce energy usage the score are 4.52 which most of respondent are strongly agree. For an appropriate space layout by arranging space area with natural daylight can help reducing energy get mean score 4.30 which strongly agree. With help of natural lighting, it can reduce the usage of energy with turn off light and so on. Lastly, Natural ventilation indirectly help proper air circulation without using any appliance

| D. Management | | |
|---|---|---|
| **Description** | **Mean** | **Std Deviation** |
| D1. Management team provide training on energy consumption in order to improve worker skill | 4.18 | 1.044 |
| D3. Building owner management provide new technology equipment to reduce energy consumption in building. | 3.55 | 1.148 |
| D4. A complete briefing on task, can help reducing error during operational process. | 4.27 | .761 |
| **Mean Average** | **4.00** | |

Figure 5.9: Construct for Management

Based on Likert's scale, the mean score that above 4.00 can be classed as agree. For this construct the mean score is 4.23. The Management team provide training on energy consumption in order to improve worker skill get 4.18 mean score. Most of respondent are agree with this statement.

Secondly, building owner management provide new technology equipment to reduce energy consumption in building get 3.55 score. For this statement, most of the respondent are agree with it. If the building owner management provide new technology equipment slightly can improve the energy consumption in that building.

Lastly, a complete briefing on task, can help reducing error during operational process get 4.27 score. This can help team to understand their job scope properly before they start doing their task and help them to understand the procedure and precaution in work.

| E. User | | |
|---|---|---|
| **Description** | **Mean** | **Std Deviation** |
| E3. User awareness on energy consumption can help reducing energy. | 4.52 | .566 |
| E4. User need to be reminded in order to apply energy saving as a culture. | 4.55 | .869 |
| **Mean Average** | **4.54** | |

Figure 5.10: Construct for user

For construct user, the mean average are 4.54 which is in range strongly agree in Likert's scale. The mean average for this construct is the highest among the four construct. For construct user awareness on energy consumption can help reducing energy get 4.52 score which is strongly agree. To reduce energy consumption. It is important for user to understand and aware that energy consumption must be in optimal usage. Secondly for construct user need to be reminded in order to apply energy saving as a culture, mean score is 4.55 which is strongly agree. The user need to be reminded always so it will become habits and sooner or later can be used as culture.

## 5.5 FINDING FOR THIRD OBJECTIVE.

The third objectives for this research is to recommend the improvement in reducing energy consumption at SASMEC. To achieve this objective, the method used from information through survey forms in Google form that have been distributed to study respondents. This survey form is based on the construction principles found in the conceptual framework which from operation and maintenance, design of the building, management and user.

| **B. Operation and maintenance** | | |
|---|---|---|
| Description | Mean | Std. Deviation |
| B2. Maintenance work need to be done by following with procedure to improve the performance of the air-conditioning system | 4.55 | .506 |
| B3. Air conditioning system need to be operating smoothly to improve the energy consumption | 4.70 | .467 |
| **Average Mean** | **4.63** | |

Figure 5.11: Construct for operation and maintenance

Based on Likert's scale, the mean score that above 4.20 can be classed as strongly agree. For this construct the mean score is 4.63. Based in this questionnaire, respondent strongly agree that maintenance work need to be done by following with procedure to improve the performance of the air-conditioning system. This is because, when the maintenance work following the right procedure, the quality of maintenance will improve and this will put the equipment in a good quality to running. When the equipment running smoothly, this will made the energy consumption can be reduce.

Secondly, air conditioning system need to be operating smoothly to improve the energy consumption get 4.70 score. For this statement, most of the respondent are strongly agree with it.

| **C. Design Of The Building** | | |
|---|---|---|
| Description | Mean | Std. Deviation |
| C3. Space arrangement is important to help building minimize energy consumption | 4.21 | .781 |
| **Average Mean** | **4.21** | |

Figure 5.12: Construct for design of the building

In order to recommend the improvement in reducing energy consumption at SASMEC, based in the questionnaire, respondent strongly agree that space arrangement is important to help building minimize energy consumption with mean score 4.21. With help of natural lighting and natural air ventilation can help to reduce energy consumption in the building. This can be taken as one of initiative to reduce energy consumption.

| D. Management | | |
|---|---|---|
| Description | Mean | Std. Deviation |
| D2. The involvement of technical specialist is important, to provide a good maintenance system. | 4.24 | .792 |
| **Average Mean** | **4.24** | |

Figure 5.13: Construct for management

For this construct, respondent are mostly strongly agree with the involvement of technical specialist is important, to provide a good maintenance system with score 4.24. With the involvement of specialist in team can give some exposure to the other in team. By this, it can improve skills of the worker during maintenance work at site. They will also sharing their knowledge with other workers.

| E. User | | |
|---|---|---|
| Description | Mean | Std. Deviation |
| E1. The user knowledge about importance of energy, can help in reducing energy consumption | 4.45 | .666 |
| E2. The user training regarding of energy in the building, can help in reducing energy consumption | 4.33 | .692 |
| **Average mean** | **4.39** | |

Based on Likert's scale, the mean score that above 4.20 can be classed as strongly agree. For this construct the mean score is 4.39. Based in this questionnaire, respondent strongly agree the user knowledge about importance of energy, can help in reducing energy consumption with score 4.45. This is because, user need to know basic knowledge in order to help management reducing energy usage. User are most of the occupant in the hospital consist of nurse, doctor and office worker. With huge number and majority, if they apply the knowledge can help team to achieve this target.

Lastly, the user training regarding of energy in the building, can help in reducing energy consumption get 4.33 score. For this statement, most of the respondent are strongly agree with it. To improve the user knowledge, training need to be done periodically so that the user always aware and know how to optimal the energy usage in hospital.

## 5.6 CHAPTER SUMMARY

Overall, the results of the study using predefined instruments such as questionnaires have been analysed thoroughly and described in this chapter in a comprehensive and orderly manner. All data from the questionnaire will be processed and calculated using the SPSS program has been described through the analysis that has been completed along with suggestions and improvements carried out. In conclusion, the researcher has obtained answers to achieve the objectives stated in chapter 1 at the beginning of the study.

# CHAPTER 6

# CONCLUSION

## 6.1 INTRODUCTION

This chapter will describe the results of the study and finally build conclusions based on the findings of the study. This chapter is the last chapter in this study and the researcher will state comprehensively and achieve all three objectives that have been set in this study at the initial stage of the study. Furthermore, this chapter will briefly describe what will be elaborated on the research question, research implications, research limitations and conclusions as well as suggestions for improvements that can be made for future reference.

## 6.2 SUMMARY RESEARCH QUESTION FINDING

This study was conducted for understanding how to produce the best practices in reducing the energy consumption at SASMEC.

### 6.2.1 RESEARCH QUESTION 1.

Based on the findings of the study obtained by the researcher to achieve the first question issued in chapter 1 above. From the first question issued, the researcher was able to construct an objective to identify the initiatives that influence in reducing energy consumption at SASMEC.

#### 6.2.1.1 How to identify the initiatives that influence in reducing energy consumption at SASMEC?

For this section there a few initiatives that can influence in reducing energy consumption is SASMEC that being identifies. From this research, the researcher mostly identify the initiatives by reading from other research. The researcher identify the initiatives that reducing energy consumption at SASMEC by referring other journal about energy research journal. Form that, researcher acknowledge, there are a few factor that can influence in reducing energy consumption at SASMEC. Firstly, the identification of initiatives that influence in reducing energy consumption is Operation and Maintenance.

Maintenance work in a building is common with the facility use. But the maintenance also can effect in the energy use if they doing the maintenance work not be done properly. Maintenance costs should account for shutdown costs, energy consumption atmospheric emissions and aging of equipment and facilities. (Sanz-Calcedo, 2018) The improvement of hospital HVAC systems in terms of energy efficiency, to conclude that regular maintenance operations should account for periodic cleaning of filters in HVAC equipment. (Sanz-Calcedo, 2018). This statement show that operation and maintenance can influence the initiative of energy consumption in SASMEC.

Furthermore, the second identification of initiative that influence in reducing energy consumption at SASMEC is Design of the building. The researcher discover this by referring resources from reading journal and article. Design of the building also one of factor that can influence in reducing energy consumption at SASMEC.

In construction, usually the engineering team only involve and mostly the facility team does not involve. After the building is complete, the problem will appear as the maintenance work cannot done properly due to the design not friendly maintenance. The involvement of facility team during design stage is very important. As health facilities tend to operate 24 hours a day, making facilities performance function particularly is very critical. This sector cannot afford ‘trial and error’ approaches or service failures with patients, provided that fatal mistakes dealing with patients might result in serious damage or even death (Mwanzaa & Mbohwa, 2015)

Next, to identify initiatives that can influence in reducing energy consumption is SASMEC are also done by reading from research. For this the researcher find out that management and lastly user that can be the factor for initiatives that can influence energy consumption in SASMEC.

Management commitment to maintenance issues always affects institutions and unfortunately hospitals are not exempted. Lack of training of maintenance staff on new trends in maintenance and especially when new equipment are bought contributes to reduced mean time between failures (Mwanzaa & Mbohwa, 2015). This show that the management should get involved with the maintenance team to know either they can do their work or not. The management playing as important role to manage the maintenance team to do their work. The management should be alert with whom their hiring and recognised the skill according to the job.

The training and user awareness will help to create an energy management team, consisting of representatives of various sectors of the hospital, with the mapping task and proposed actions to reduce energy consumption. (Machado, Scarvarda, Zhao, & Kipper, 2015) Aims to optimize the use of energy guiding, directing, and controlling the actions over economic resources, thus minimizing the relationship between the consumption and service, reducing general and specific indices of the amount of energy required.

### 6.2.1.2 How to analyse the initiatives that influence in reducing energy consumption at SASMEC?

Based on the second objective of the study, the data analysis was done using mean score analysis in Statistical Package for Social Science (SPSS) software. This second question has been discussed in detail in chapter 5 and indirectly, the analysis shows that mostly respondents are strongly agree the initiatives that influence in reducing energy consumption at SASMEC are from operation and maintenance, design of the building, and user. However, all respondents only agree for management construct.

For operation and maintenance construct, the mean score is 4.50. The air-conditioning system need to be operated 24 hours per day for a proper function of hospital het 4.39 mean score. For Maintenance work need to be done by following with procedure to improve the performance of the air-conditioning system score are 4.55. Meanwhile, air conditioning system need to be operating smoothly to improve the energy consumption get highest score 4.70. Lastly, air conditioning system will operate smoothly if maintenance work done following PPM schedule get 4.36 score.

Design of the building design construct, a proper design space can help the building to reduce energy usage get mean score 4.52. For an appropriate space layout by arranging space area with natural daylight can help reducing energy get 4.30 mean score which is agree. Next is space arrangement is important to help building minimize energy consumption which get 4.21 mean score. Lastly, natural ventilation indirectly help proper air circulation without using any appliance get 4.36. For overall mean score for design of the building construct, the average mean are 4.35.

In management construct, the mean score average are 4.05. For management team provide training on energy consumption in order to improve worker skill get 4.18. The involvement of technical specialist is important, to provide a good maintenance system get score for 4.24. Next, building owner management provide new technology equipment to reduce energy

consumption in building get the lowest score among all which is 3.55. Finally, a complete briefing on task, can help reducing error during operational process which get 4.27.

Lastly for user, the mean score average are 4.46. For this construct respondent agree that the user knowledge about importance of energy, can help in reducing energy consumption which get 4.45 score. The user training regarding of energy in the building, can help in reducing energy consumption get score for 4.33. Meanwhile, user awareness on energy consumption can help reducing energy get score 4.52. Lastly, user need to be reminded in order to apply energy saving as a culture.

This is the analysis for the initiatives that influence in reducing energy consumption at SASMEC. The analysis was analyse by the information gather form respondent through Google Form the generated in SPSS.

#### 6.2.1.3 How to recommend the improvement in reducing the energy consumption at SASMEC?

Based on the questionnaire given to the respondent, there are a few recommendation that can be made in this building. For operation and maintenance, that maintenance work need to be done by following with procedure to improve the performance of the air-conditioning system. This is because, when the maintenance work following the right procedure, the quality of maintenance will improve and this will put the equipment in a good quality to running

In design of the building, space arrangement is important to help building minimize energy consumption. With help of natural lighting and natural air ventilation can help to reduce energy consumption in the building. This can be taken as one of initiative to reduce energy consumption. The team might can rearrange the spaces for SASMEC. Help of natural element can help the building to reducing energy usage daily. This also can be consider as the fresh look for rearrange the spaces.

Next, building owner management can provide new technology equipment to reduce energy consumption in building. New technology is important for reducing energy consumption in hospital. Lot of new technology can be implement such as installation of solar to support energy usage in hospital that can cover non critical area. With this slight change also can help management to achieve target for reducing energy usage.

Lastly, user knowledge about importance of energy, can help in reducing energy consumption. This is because, user need to know basic knowledge in order to help management reducing energy usage. User are most of the occupant in the hospital consist of nurse, doctor and office worker. With huge number and majority, if they apply the knowledge can help team to achieve this target. Besides, the team also can apply periodically training for staff and also user of the hospital so that they will acknowledge more about the importance of reducing energy consumption.

## 6.2 RESEARCH IMPLEMENCATION

Based on the conceptual framework that already been explained in chapter 2 based in literature review, finding of analysis the research can give impact in few aspect. With this research, it can help facility management team to implement the suitable initiative in reducing energy consumption at SASMEC. This research has been done in the SASMEC building and the respondent giving their opinion. So based on the opinion, it can give them idea how to reducing energy consumption in SASMEC

Furthermore, the research can help team to recognize that user are mostly the influence that can reduce energy consumption in SASMEC. By this research, it increase the awareness among the Facility Management team towards the importance of giving information regarding the energy consumption to user.

## 6.3 RESEARCH LIMITATION

The conclusions of this study take into account some of the limitations of the study that occurred during the conduct of this study. Among the limitations of the study faced by the researcher is to implement this study initially focused on a large number of respondents but due to constraints due to the spread of Covid-19 pandemic which makes it difficult to target a large number of respondents have made the researcher decided to reduce the number of respondents who participated in this survey.

In addition, among the limitations faced by the researcher is to receive poor feedback from respondents after submitting the survey form using the Google Form method because of the movement control order issued by the Government of Malaysia during the spread of the Covid-19 pandemic. Therefore, the researcher had to add the time set by the researcher to ensure that all the data received and analysed are accurate.

Finally, the problems and obstacles faced by the researchers have brought the best results by obtaining the findings of the study data. All the obstacles faced by the researchers were faced with full professionalism to prepare this study. The seriousness of those who helped in the success of this study as well as the high cooperation shown has helped to complete the study and reduce the problems faced by researchers. Therefore, the researcher has successfully achieved the goals and objectives set in this study.

## 6.4 SUGGESTION

The researches aim is to produce best practices to reduce energy consumption in SASMEC. There a few suggestion that can be made to reduce energy consumption such as doing the Preventive Plan Maintenance by following schedule and proper procedure. By following procedure, maintenance it can reduces the variation that occurs when many craftspeople are conducting the same work. It's also can minimizes the odds of an individual making a mistake. By following scheduled maintenance are tits can help to reduce reactive maintenance, equipment failure, and maintenance backlog. This help increase the lifetime of assets and reduce the number of equipment repairs and replacements. This also can assure that the equipment always in a good performance. Good quality of equipment can reduce energy consumption because the equipment can run smoothly.

Furthermore, user training are important as more than simply repairing damaged parts or responding to complaints from building users is required of operations employees. Participants in energy management training get the comprehensive knowledge and skills they need to effectively manage and monitor the organization's energy use, discover potential for additional energy-saving initiatives, and purchase and operate appropriate new equipment.

Because energy management training helps raise the profile of energy management programs, participants come out with a much better understanding of the importance of such programs and the business case for good energy management. Therefore, training helps get user on board with the program and helps management to reduce energy consumption in SASMEC

## 6.5 CONCLUSION

The results of this study found out reducing energy consumption in SASMEC is very important. This is because the hospital energy management plays an important role in the implementation of energy usage in the SASMEC building. If the management and users know about the effectiveness of energy consumption reduction brings some benefits gained by them such as reducing energy costs, reducing the greenhouse effect, reducing environmental pollution and increase awareness of the importance of energy use. Finally, all weaknesses have been identified and suggestions have been given for improvement to reduce energy consumption at SASMEC.

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# APPENDIX

# INITIATIVE IN REDUCING ENERGY CONSUMPTION IN SASMEC KUANTAN

Hi, I'm Syahirah a last year student of Bachelor of Technology in Facility Management with Honour at Polytechnic Shah Alam. Currently I'm undergo a final year research about INITIATIVE IN REDUCING ENERGY CONSUMPTION IN SASMEC KUANTAN. All the answer is confidential as their purpose only for this research for the study.

This questionnaire consist of section 1 and section 2. Please answer all the question given.

Therefore, I would like to request your kind services to take some time to answer this questionnaire. Thank you for your time. Have a good day.

**SECTION 1**

Please tick (／) in the selected box

1. AGE

☐ 20-30
☐ 30-40
☐ 40-50
☐ 50 AND ABOVE

2. GENDER

☐ MALE
☐ FEMALE

3. DEPARTMENT

☐ APSB / PENMEDIC
☐ UIA
☐ PAKAR
☐ SRZ

4. EDUCATION LEVEL

☐ SPM
☐ DIPLOMA
☐ DEGREE
☐ MASTER/PHD

5. POSITION

☐ FACILITY MANAGER
☐ HEAD OF DEPARTMENT
☐ ENGINEER
☐ ASSISTANT ENGINEER
☐ SENIOR TECHNICIAN

6. WORK EXPERIANCE

☐ LESS THAN 1 YEAR
☐ 1-2 YEARS
☐ 2-5 YEARS
☐ 5 YEARS ABOVE

**SECTION 2**

Section B is a factor that can influence the initiative in reducing energy consumption in SASMEC Kuantan and please tick (／) in the selected box.

| EVALUATION STAGE | STRONGLY DISAGREE | DISAGREE | NOT SURE | AGREE | STRONGLY AGREE |
|---|---|---|---|---|---|
| | 1 | 2 | 3 | 4 | 5 |

| B. OPERATION AND MAINTENANCE | | 1 | 2 | 3 | 4 | 5 |
|---|---|---|---|---|---|---|
| **B1** | The air-conditioning system need to be operated 24 hours per day. For a proper function of hospital | | | | | |
| **B2** | Maintenance work need to be done by following with procedure to improve the performance of the air-conditioning system. | | | | | |
| **B3** | Air conditioning system need to be operating smoothly to improve the energy consumption. | | | | | |
| **B4** | Air conditioning system will operate smoothly if maintenance work done following PPM schedule. | | | | | |

| C. DESIGN OF BUILDING SPACE | | 1 | 2 | 3 | 4 | 5 |
|---|---|---|---|---|---|---|
| **C1** | A proper design of spaces can help the building to reduce energy usage. | | | | | |
| **C2** | An appropriate space layout by arranging space area with natural daylight can help reducing energy. | | | | | |
| **C3** | Space arrangement is important to help building minimize energy consumption | | | | | |
| **C4** | Natural ventilation indirectly help proper air circulation without using any appliance. | | | | | |

| D. MANAGEMENT | | 1 | 2 | 3 | 4 | 5 |
|---|---|---|---|---|---|---|
| **D1** | Management team provide training on energy consumption in order to improve skill | | | | | |
| **D2** | The involvement of technical specialist is important, to provide a good maintenance system. | | | | | |
| **D3** | Building owner management provide new technology equipment to reduce energy consumption in building. | | | | | |
| **D4** | A complete briefing on task, can help reducing error during operational process. | | | | | |

| E. USER | | 1 | 2 | 3 | 4 | 5 |
|---|---|---|---|---|---|---|
| **E1** | The user knowledge about importance of energy, can help in reducing energy consumption. | | | | | |
| **E2** | The user training regarding of energy in the building, can help in reducing energy consumption. | | | | | |

| | | | | | | |
|---|---|---|---|---|---|---|
| **E3** | User awareness on energy consumption can help reducing energy. | | | | | |
| **E4** | User need to be reminded in order to apply energy saving as a culture. | | | | | |