



UNIVERSITI TEKNIKAL MALAYSIA MELAKA

**UNIVERSITI TEKNIKAL MALAYSIA MELAKA**

**AN ALTERNATIVE STATIC GREEN TECHNOLOGY  
GENERATOR FOR CAR**

This report submitted in accordance with requirement of the Universiti Teknikal Malaysia Melaka (UTeM) for the Bachelor Degree of Engineering Technology (Electrical Industrial Power) (Hons.)

by

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**BORANG PENGESAHAN STATUS LAPORAN PROJEK SARJANA MUDA**

TAJUK : **An Alternative Static Green Technology Generator For Car**

SESI PENGAJIAN : **2014/15 Semester 2**

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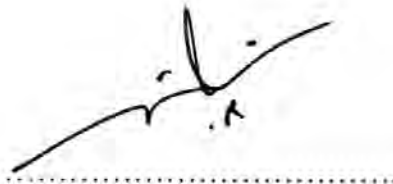
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## APPROVAL

This report is submitted to the Faculty of Engineering Technology of UTeM as a partial fulfillment of the requirements for the degree of Bachelor of Engineering Technology (Electrical Industrial Power) (Hons.). The member of the supervisory is as follow:

A handwritten signature in black ink, consisting of several fluid, connected strokes, positioned above a horizontal dotted line.

(Project Supervisor)



## ABSTRACT

Green energy is energy generated by natural resources such as sunlight, wind, rain, tides, plants, algae, geothermal heat and so on. Nowadays, the most important issue for green technology is the development of alternative fuels, new ways to generate energy and energy efficiency. In this project, the heat from the engine will be a source of energy for charging lead-acid batteries in cars to replace the alternator. The aim of this project is to build a fully functional static generator that can charge the car battery is more than the existing alternator. The peltier or thermoelectric will capture heat from the car engine while the engine is hot. In order to generate electricity to charge the battery continuously, the peltier will automatically connect with the charger circuit. This circuit will help to control the charging process when the battery is in full condition. The system were attached in Proton Satria year 1999 edition engine which is Single Overhead Campshaft (SOHC) 4G13 displaces 1.3L, 1298cc and 73 hp with a bore and stroke of 71.0 mm x 82.0 mm. This project could have a significant impact on the rate of global carbon emissions due to the number of motor vehicles that billions around the world.

## ABSTRAK

Tenaga hijau adalah tenaga yang dihasilkan oleh sumber-sumber semula jadi seperti cahaya matahari, angin, hujan, air pasang, tumbuh-tumbuhan, alga, haba panas bumi dan sebagainya. Masa kini, isu yang paling penting untuk teknologi hijau ialah pembangunan bahan api alternatif, cara baru untuk menjana tenaga dan kecekapan tenaga. Dalam projek ini, haba dari enjin kereta akan menjadi sumber tenaga untuk mengecas bateri asid plumbum pada kereta untuk menggantikan sistem alternator. Tujuan projek ini adalah untuk membina penjana statik yang berfungsi sepenuhnya yang boleh mengecas bateri kereta lebih daripada alternator yang sedia ada. Peltier atau termoelektrik akan menangkap haba dari enjin kereta semasa enjin panas. Dalam usaha untuk menjana tenaga elektrik berterusan untuk mengecas bateri, Peltier akan di sambung dengan litar pengecas automatik. Litar ini akan membantu untuk mengawal proses mengecas apabila bateri berada dalam keadaan yang penuh. Sistem ini ditempatkan dalam Proton Satria tahun 1999 edisi enjin yang Overhead Camshaft Tunggal (SOHC) 4G13 disasarkan 1.3L, 1298cc dan 73 hp dengan gerak dan lejang 71.0 mm x 82.0 mm. Projek ini boleh memberi kesan yang signifikan kepada kadar pembebasan karbon sedunia kerana jumlah kenderaan bermotor yang berbilion jumlahnya di seluruh dunia.

## **DEDICATIONS**

To my beloved parents thank you for your support with my studies. I am very honoured to have you as my parents. Thank you to my wife, Rosliana bt Sahak who's always understand me and never left me alone and thanks again for giving me a chance to prove and improve myself through all our flows of life.



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## LIST OF SYMBOLS AND ABBREVIATIONS

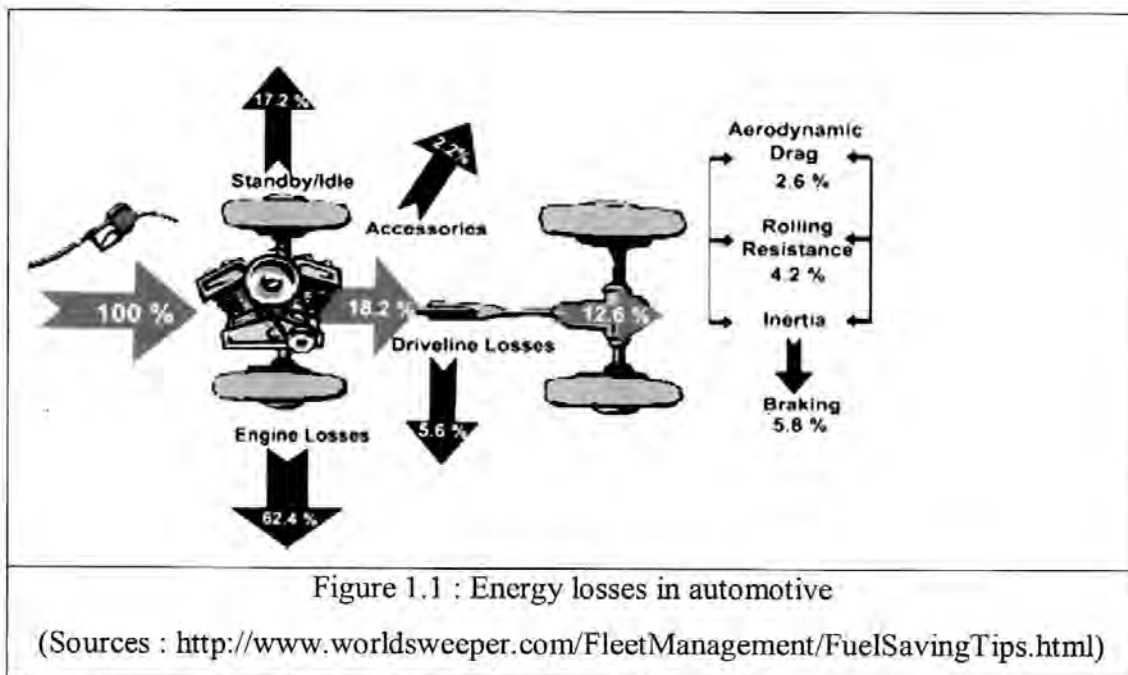
SLA	=	Sealed Lead Acid
IEA	=	International Energy Agency
$ZT$	=	Figure of Merit
$\eta$	=	Thermoelectric Efficiency
$\sigma$	=	Electrical Conductive
$\kappa$	=	Thermal Conductivity
$S$	=	Seebeck Coefficient
$T$	=	Avarage Temperature
$T$	=	Temperature at Hot Junction
$T_c$	=	Temperature at Cold Junction
$\rho$	=	Electrical resistivity

# CHAPTER 1

## INTRODUCTION

### 1.0 Introduction

Car engine produces heat energy the highest in the world due to the number of vehicles it very much. According to research engines operating with efficiency rate of about 30%. Therefore, try to identify the various parties to find alternatives and solutions to improve the efficiency of the engine to reduce fuel consumption. This project is an effort to identify the remains of wasted heat from the car engine can be recycled into electricity and can indirectly reduce the fuel consumption of a car engine.



There are so many cars in the world today that the fuel burnt on the world's roads by those many cars emits 1.73 billion metric tons (equivalent to 3.81 trillion pounds) of carbon dioxide into the atmosphere every year. All of these numbers are set to rise sharply as the earth's population grows. Most of the energy is wasted as exhaust output. So if there is a way to get energy from the segment, of course, it will

have a significant impact on the rate of global carbon emissions due to the number of motor vehicles billions around the world.

### **1.1 Problem Statement**

Car components using engine power with high and persistent levels is alternator, where it serves to charge the car battery. So if there is a way to remove the alternator from its operations and at the same time be able to install a system that uses battery chargers using waste energy as mentioned above, the following will be achieved: -

- i. No other mechanical components that always has a thirst such as bearings, belting, pulley, shaft and others.
- ii. All of the energy previously used by the alternator can be saved.
- iii. The energy for this transfer can be converted into energy to charge the battery.
- iv. Increased fuel efficiency.
- v. The rate of carbon emissions would be reduced drastically.
- vi. Practice green earth more effective.
- vii. The greenhouse effect is reduced.

### **1.2 Objectives of Project**

Based on the problems that have been stated before, this study aims to:

- i. Develop a system capable of transforming waste engine (heat) into electricity to charge the battery.
- ii. To perform the data collection of thermoelectric.
- iii. To prove the heat waste from car engine can produce electricity.



### **1.3 Scope of Project**

In this final year project, it requires the integration of thermoelectric (Peltier) an electronic circuit. The scope of this project includes :-

- i. Develop a component that can capture waste heat at car engine
- ii. Develop a circuit to control activities effectively charging the acid lead battery.
- iii. Integration of thermoelectric and charging circuit.

### **1.4 Project Outline**

This project requires 5 chapter. Each chapter will explain the detail about this project. Start from the background of this project, literature review, methodology, testing and analysis of the project and conclusion of this project.

Chapter 1 will discuss about the main project. It required the introduction, problem statement, objective of the project and project scope. This chapter will clearly tell about the main purpose of this project.

Chapter 2 is more about literature review related of this project. This chapter will explain about theory and implementations of the mechanism of data, components and equipments used in the previous research and projects.

Chapter 3 will be discuss the methodology project as a whole for project completion according to the requirement. It shows that the overall of this project to be done. The main focus is development process of the generator including the structure and circuit



Chapter 4 is more about the testing and analysis. The output result will record and compare with existing alternator. The testing is required some of situation that it are needed.the expected result must be complete because it can decide actual result for the project development.

Chapter 5 will discuss about the conclusion of this project. All the result that have been record will elaborate. This is for future for upgradable of the project if it can be more advance.

### **1.5 Expected project outcome**

This project is to develop a system that capable to transforming a waste engine (heat) to become a charging system. Modelling of the thermoelectric system will be performing firstly. The thermoelectric system will be design and the output will be record and analyzed. Next, the it will combine with electric charging circuit. At the end of this project, the system will produce electricity from waste engine (heat). This project will encourage people to learn more on producing electricity from heat and green technology.

### **1.6 Conclusion**

This chapter describe whole understanding about the project. It is basically a guideline platform in order to achieve the objectives. It is important as much a checklist at every point in this topic. Next in Chapter 2, focus on literature review where more information details phase by phase.

## **CHAPTER 2**

### **LITERATURE REVIEW**

#### **2.0 Introduction**

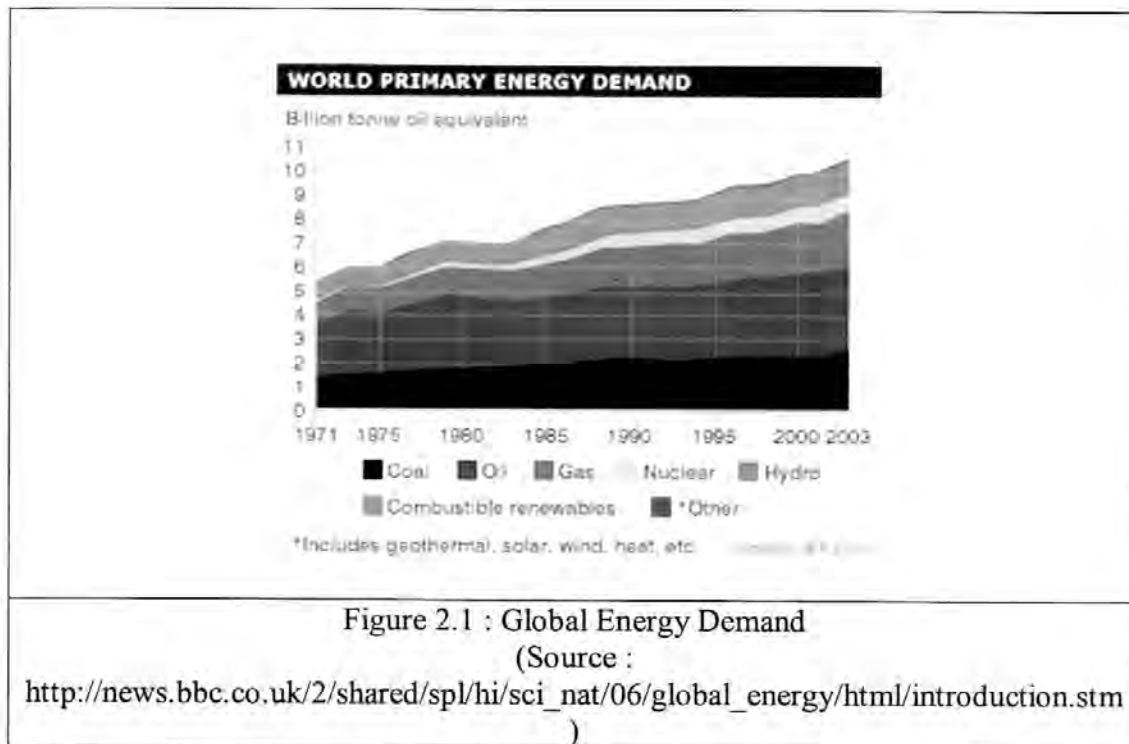
This chapter discuss about the literature review related to the project. It is consists of the products that has been develop by institutions before this project. This chapter contains the theory and implementations of the mechanism of data, components, and equipments used in the previous project.

#### **2.1 Global Energy Demand**

Energy is part of everyday life such as light energy and thermal energy produced at home when we're cooking up is at work. He anywhere there is a natural energy. Energy is also derived indirectly from the goods that we buy and whatever natural ada. Tenaga services is one of the most fundamental parts of the universe. Almost everything and anything is a daily activity depends on energy. How this energy is produced and how we use this energy are the responsibility of all because of the resulting energy is also leading to economic decline and environmental degradation. It will give a bad impression to the next generation.

In other words, we must take the initiative to make use of this energy source to better things. To meet this requirement, it needs an effective long-term planning and require large investments to build the infrastructure to generate power and deliver it to any use of force. According to International Energy Agency (IEA) global demand for energy hasrisen unprecedentedly in the last 150 years, due to industrial development and therapid growth of population. Figure 2.0 showed that world

energy demand are increase by year. The energy is include geothermal, solar, wind and heat.



### 2.1.1 Energy Source

There are various forms of energy in the universe. Among them is chemical energy, electrical energy, thermal energy, light energy, nuclear energy, mechanical energy and so on. There are 2 types of mechanical energy of potential and kinetic energy. The resulting kinetic energy of a moving while the resulting potential energy of water movement. This energy can be converted from one form to another, for example, a piece of magnesium stores chemical energy. If the magnesium was ignited, this chemical energy is converted to the form of heat, light and sound. In addition, the potential energy of the water can turn on hydroelectricity. It transforms the kinetic energy resulting from the movement of water and generate electricity for the home and office.



### 2.1.2 Car Engine – Heat Energy Waste

Gasoline is combusted in order to provide the energy that to move the car. Combustion process in car engines operate at very high temperatures. This phenomenon occurs in engine cylinder blocks. The piston will compress the fuel and oxygen so that the explosion was caused sparks splash resulting from the spark plug. This small explosions produce the energy required to move the shaft to move the vehicle. The process produces thermal energy and kinetic energy. Two main waste products found in exhaust is carbon dioxide which is smoke, water. Other two product also found in car exhaust. There are traces of carbon monoxide and other various forms of the partially burnt fuel.

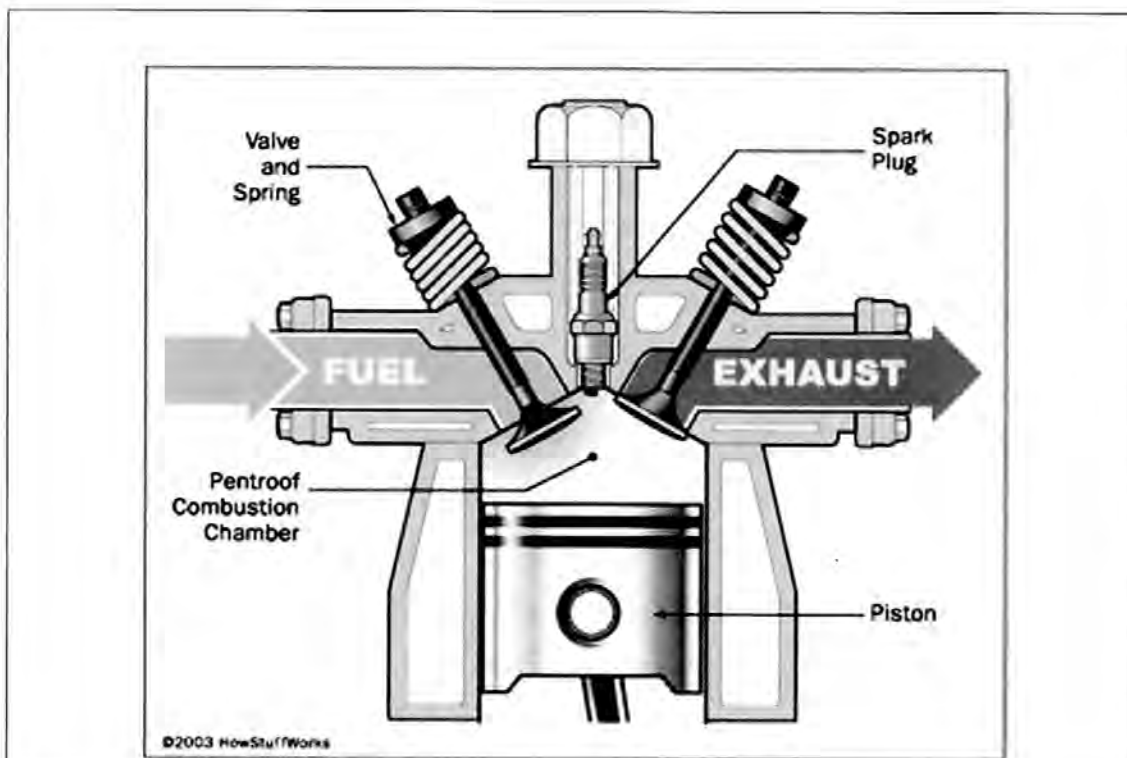


Figure 2.2: Inside a typical car engine. Fuel is exploded in the combustion chamber to provide mechanical energy through the piston.

(Source : <http://auto.howstuffworks.com/hemi2.htm>)

The heat produced by the process of moving the cylinder in the engine block must be cool as quickly as it possibly can melt the aluminum block. The melting

point of aluminum according to the study is 932k. Engine cooling system is in need cool cars block the air moving across the tiny tubes around the engine to avoid serious damage to the engine. There is also a section that does not need to cool down because the division will not damage the engine. These parts are heated by friction or by the exhaust. Based on previous studies, the proportion of exzos or radiator system is the best part for recovering heat from waste incineration. All of these components run at very high temperatures and could be possible points of energy recovery. The following sections will discuss the background information of each possibility.

### **2.1.3 Energy Harvesting Waste**

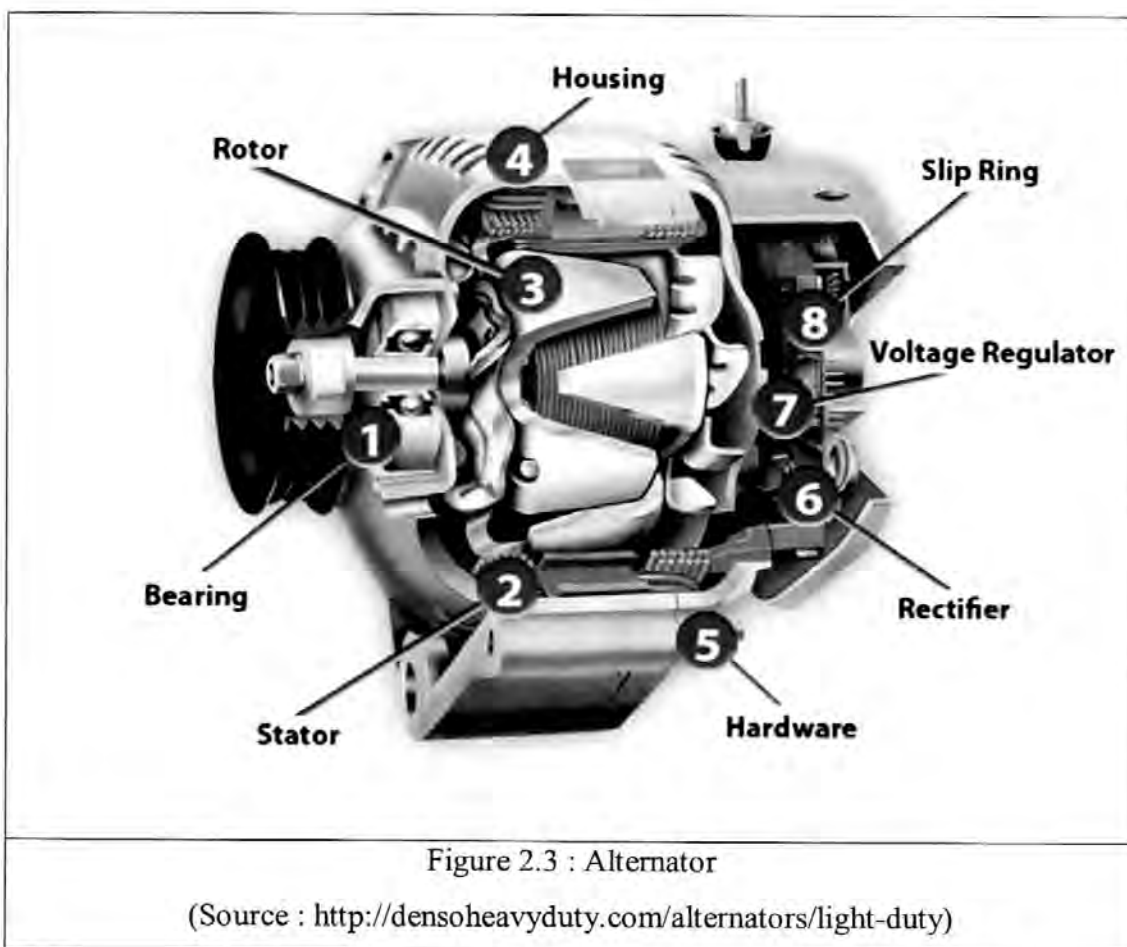
The rest of the staff includes two aspects, which are used to produce energy or power generated or otherwise thrown away. Energy is wasted can become something useful if it can be captured. Although the energy that can be recovered is worth little but it can affect the economy and the environment. The energy can be reused as heat energy, light, sound, vibration or movement can give a very good impression. These energies can be used in various applications and methods.

For example, the energy produced can be used as a power source for your computer, sensor or wireless devices. Now the computer has an increasing speed. The use of computers to generate large amounts of heat. Heat is dissipated into the environment just like that. If the waste heat is used to power your computer, it can help reduce the cost of computing and reduce energy usage in computer use. waste energy also has the potential to replace batteries for small electronic devices. This gives an advantage to all. One is able to reduce maintenance. It is also environmentally friendly disposal of batteries and the problem can be solved. This is because the batteries have chemicals that are harmful to human health. It can also spread deep into the ground and easily soluble in water.



## 2.2 Alternator In Automotive

In the past when creating cars that have electrical systems up to 1960, with commutators DC dynamo generator was used until scientists find affordable silicon rectifier diodes terhasilah the alternator. Alternators are used in modern automobiles to charge the battery and power the electrical system when the engine is operating. Because electric power is increasingly encouraged in the vehicle system with an increased burden of a larger front lapu, electric wipers, heated rear window and other accessories, alternator increasingly popular and very convenient to use, according to Smartrac Technology (2015).



An important car part to recharges the battery using power from the engine is alternator. It also provides power to the electrical components. Figure 2.2 show the alternator component. Alternator is consists of a rotor, stator and housing. The size its about a small ball. Electrical coils mounted on the rotor which is spun by the