



UNIVERSITI TEKNIKAL MALAYSIA MELAKA

**Generating Electricity From Tyre Rotation System
Using Statistical Approach**

This report submitted in accordance with requirement of the Universiti Teknikal
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(Department of Mechanical Engineering Technology)(Hons.)

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Date : 15 DISEMBER 2017

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 (Automotive Technology) (Hons.). The member of the supervisory is as follow:

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(EN MUHAMMAD ZAIDAN BIN ABDUL MANAF)

ABSTRACT

Electric power to the vehicle is not free, because alternator consuming fuel consumption to operate. With normal 40% of engine efficiency the efficiency of the belt 98% alternator efficiency and 55%, this make overall energy conversion efficiency of only 21%. This power comes as a direct result of the fuel used in the engine to feed the energy conversion chain. This chain, as described below, starting with the chemical energy stored in fuel and ending with electricity from the alternator. Along the way there are power losses associated with any energy conversion process - including alternator. This loss leads to more fuel is used to produce a given amount of electricity. Obviously, as the alternator to be more efficient in the process of converting mechanical power to electrical power, fuel consumption. And even though the alternator power demand is usually small compared with the overall vehicle, impact on fuel cost is not trivial. This project is based on to identify the factor affecting the electricity generation, to optimize the best design of tyre rotation system to maximize the electricity generation using statistical approach and to establish model for electricity generating by using tyre rotation system.

ABSTRAK

Kuasa elektrik ke kenderaan itu tidak percuma, kerana penggunaan bahan bakar alternator yang digunakan untuk beroperasi. Dengan 40% kecekapan enjin biasa kecekapan kecekapan alternator 98% dan 55%, ini menjadikan kecekapan penukaran tenaga keseluruhan hanya 21%. Kuasa ini datang sebagai hasil langsung dari bahan api yang digunakan dalam enjin untuk memberi makan rantai penukaran tenaga. Rantainya ini, seperti yang diterangkan di bawah, bermula dengan tenaga kimia yang disimpan dalam bahan api dan berakhir dengan elektrik dari alternator. Di sepanjang jalan terdapat kerugian kuasa yang berkaitan dengan sebarang proses penukaran tenaga - termasuk alternator. Kehilangan ini membawa kepada lebih banyak bahan api yang digunakan untuk menghasilkan sejumlah tenaga elektrik. Jelas sekali, sebagai pengganti untuk menjadi lebih cekap dalam proses menukar kuasa mekanikal kepada kuasa elektrik, penggunaan bahan api. Dan walaupun permintaan kuasa alternator biasanya kecil berbanding dengan keseluruhan kenderaan, impak terhadap kos bahan api tidak sepele. Projek ini adalah berdasarkan untuk mengenal pasti faktor yang mempengaruhi penjanaan elektrik, untuk mengoptimumkan reka bentuk terbaik sistem putaran tayar untuk memaksimumkan penjanaan elektrik menggunakan pendekatan statistik dan untuk membentuk model untuk menjana elektrik dengan menggunakan sistem putaran tayar.

DEDICATION

This project and research work is dedicated to my beloved parents for their enthusiastic caring throughout my life, my loving siblings, my supervisor/co. supervisor and also my friends for their encouragement and love

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CHAPTER 1

INTRODUCTION

1.0 Introduction

Completed recycling and energy conservation is the subject of increasingly significant research among the scientific community today. The aim of this project is to build a powerful generator of tire rotation and use it to power some of the vehicle components. This project will help a person develop the engineering skills while learning about clean way to generate electricity. This project is the ability to change from kinetic energy into electrical energy.

In the last decade, engineers and scientists across the world have been searching for designing energy systems harvesting, draw power from a variety of sources such as wind, sun, water, etc. Although the design of the recent energy harvesting equipment had been introduced to the market, this system is expensive and does not produce output power that needed. The system needs to be upgrade and improve for maximum output power, marketability and minimum cost operation.

Engineered is the one to modify existing harvesting energy, these projects include energy harvesting, power storage and distribution system that can be controlled. The objective of this project is to design renewable energy from rotation tyre. Also, people who are interested in reducing the environmental impact and those who want to preserve the environment will use this type of electricity generation thereby reducing the amount of work the engine to generate electricity. Energy from tire rotation is usually wasted in movement without anything to generate. This project will change from kinetic energy into electrical energy and avoiding energy waste from tire rotation.

Current generated in a conductor when the rotation of the tire moving through a magnetic field. When the coil rotates in a magnetic field created by the magnet, the magnetic flux through the coil begins to change, causing the electric field to generate charge carriers through the wire. This process produces an electric current

1.1 Problem statement

Electric power to the vehicle is not free, because alternator consumes fuel to operate. With normal 40% of engine efficiency, the efficiency of the belt 98%, alternator efficiency and 55%, this makes overall energy conversion efficiency of only 21%. Assuming fuel costs of \$ 4.00 / gal, this leads to the cost of electricity on the board 0.51 \$ / kWh, or about 4 times the rate of ordinary household utilities (Bradfield, 2008). As a result, fuel consumption to provide electricity is quite high and cannot be ignored.

The vehicle electronic power is not free. This power comes as a direct result of the fuel used in the engine to feed the energy conversion chain. This chain, as described below, starts with the chemical energy stored in fuel and ends with electricity from the alternator. Along the way there are power losses associated with any energy conversion process - including alternator. These losses lead to more fuel being used to produce a given amount of electricity. Obviously, as the alternator becomes more efficient in the process of converting mechanical power to electrical power, less fuel consumption. And even though the alternator power demand is usually small compared with the overall vehicle, impact on fuel cost is not trivial.

This power comes as a direct result of the fuel used in the engine to feed the energy conversion chain. This chain, as described below, starts with the chemical energy stored in fuel and ends with electricity from the alternator. Along the way there are power losses associated with any energy conversion process - including alternator. This loss leads to more fuel being used to produce a given amount of electricity. Obviously, as the alternator becomes more efficient in the process of converting mechanical power to electrical power, fuel consumption. And even

though the alternator power demand is usually small compared with the overall vehicle, impact on fuel cost is not trivial.

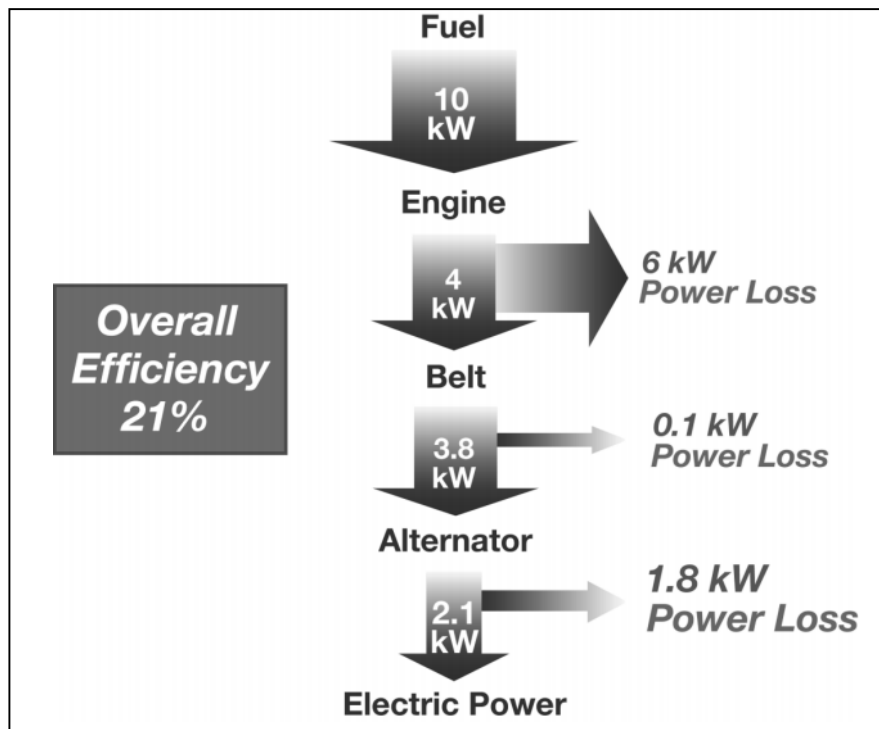


Figure 1.1: Energy conversion chain (Bradfield, 2008)

1.2 Objectives

- 1) To identify the factor affecting the electricity generation.
- 2) To optimize the best design of tyre rotation system to maximize the electricity generation using statistical approach.
- 3) To establish model for electricity generating by using tyre rotation system base on the maximum output.

1.3 Scope

This project is limited to the following aspect:

- mockup design.
- In order to get only the data on how much tyre rotational at certain speed, size of the magnet and coil winding is producing voltage without supply the voltage to any components.

CHAPTER 2

LITERATURE REVIEW

2.0 Introduction

This chapter will review about tyre rotation system, experimental design, overview on different approaches made by previous researchers and make a comparison between my final year project and those similar projects.

2.1 History of generation electricity

The basic method of generation electricity had been discovered during the 1820s and early 1830s by British scientist Michael Faraday. This is today method that been use until now, the electricity generated because of the movement of the wire loop, or a copper disk between the poles of a magnet. 1882 at central stations is where the electricity has been generated.. The first power plants were run on wind generators, and petroleum, with an additional solar energy, tides tidal power, and geothermal sources. The use of electricity lines and power poles were significantly important in the distribution of electricity.

2.2 Method for generating electricity

Seven method that were discovered to change other form of energy into electrical energy.

2.2.1 Static electricity

Static electricity, establish a physical separation and free transportation (eg effect of triboelectric and flash). This method is discovered first and being investigate, and this method is still been using until now.



Figure 2.1: Van de Graff generator (Robert J. Van de Graaff, 1929)

2.2.2 Electromagnetic induction

In the electromagnetic induction, electricity generators, dynamo or alternator convert kinetic energy into electrical energy. This is the form that is favourite to generate electricity and is based on Faraday's law. It can experiment with rotating closed loop of the magnet that important exercise (eg, copper wire). Almost all commercial generating electricity is performed using induction of electromagnetic, in which the energy of the mechanical of the rotating force generator.

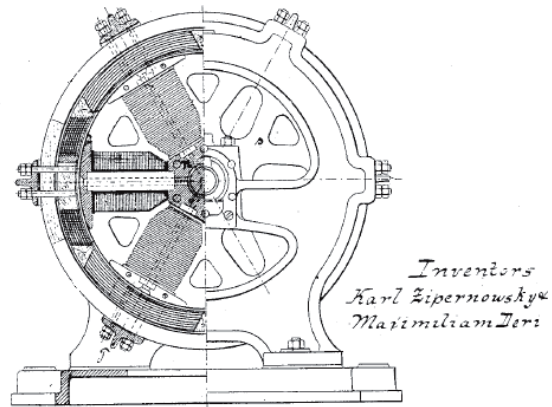


Figure 2.2: Dynamo Electric Machine (end view, partly section, U.S. Patent 284,110)

2.2.3 Turbines

Almost all electrical power is produced with a turbine, wind, water, steam or gas fire. The turbine drives a generator. There are many different methods to develop mechanical energy, including heat engines, hydro, wind and tidal energy. The generation of electricity-driven heat engine. Burning fossil fuels provide most of the heat for the engine, with a significant fraction of fission and some of the resources that are renewable.

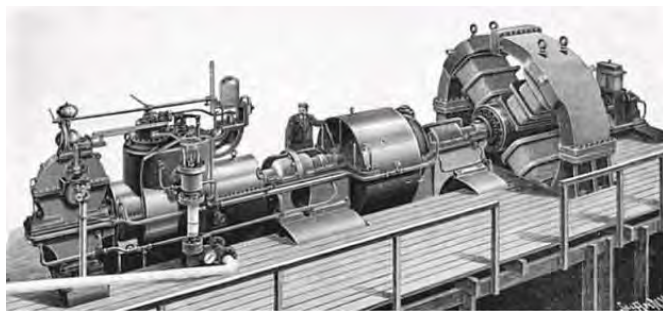


Figure 2.3: 1MW steam turbine (Sir Charles Parsons,1884)

2.2.4 Electrochemistry

Electrochemistry is change of chemical energy into electrical energy, such as batteries. Generation of electricity by using electrochemical is important in mobile applications and mobile devices. At present, usually of the power comes from the electrochemical cells batteries. Primary, like ordinary carbon zinc batteries, acting as a power source directly, but certain types of cells are used as the storage system instead of the main power generation system.

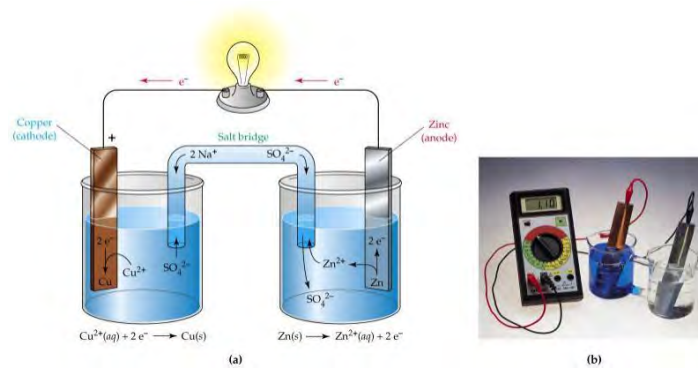


Figure 2.4: Transformation of chemical energy into electricity

2.2.5 Photovoltaic effect

Photovoltaic effect is can be used to change form light into electrical energy, such as solar cells. Photovoltaic panels can change solar light into electricity.



Figure 2.5 Testing a solar battery in 1954 (Bell laps 1954)