UNIVERSITI TEKNIKAL MALAYSIA MELAKA

DEVELOPMENT OF ROAD POWER GENERATION BY APPLYING THE CONVERSION SYSTEM

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

by

MUHAMMAD ASHRAF WAJDI BIN MOHMAD BAKHARI

B071410397

950315-02-6117

FACULTY OF ENGINEERING TECHNOLOGY

2017

UNIVERSITI TEKNIKAL MALAYSIA MELAKA

BORANG PENGESAHAN STATUS LAPORAN PROJEK SARJANA MUDA

TAJUK: **DEVELOPMENT OF ROAD POWER GENERATION BY APPLYING THE CONVERSION SYSTEM**

SESI PENGAJIAN: **2016/17 SEMESTER 2**

Saya **MUHAMMAD ASHRAF WAJDI BIN MOHMAD BAKHARI**

mengaku membenarkan Laporan PSM ini disimpan di Perpustakaan Universiti Teknikal Malaysia Melaka (UTeM) dengan syarat-syarat kegunaan seperti berikut:

1. Laporan PSM adalah hak milik Universiti Teknikal Malaysia Melaka dan penulis.
2. Perpustakaan Universiti Teknikal Malaysia Melaka dibenarkan membuat salinan untuk tujuan pengajian sahaja dengan izin penulis.
3. Perpustakaan dibenarkan membuat salinan laporan PSM ini sebagai bahan pertukaran antara institusi pengajian tinggi.
4. **Sila tandakan (✓)

☐	SULIT	(Mengandungi maklumat yang berdarjah keselamatan atau kepentingan Malaysia sebagaimana yang termaktub dalam AKTA RAHSIA RASMI 1972)
☐	TERHAD	(Mengandungi maklumat TERHAD yang telah ditentukan oleh organisasi/badan di mana penyelidikan dijalankan)
☐	TIDAK TERHAD	

Disahkan oleh:

_____ _____

Cop Rasmi:

Alamat Tetap:

K2, KAMPUNG SRI BELUKAR,

MUKIM TELOI, 08200,

SIK KEDAH.

Tarikh: 8 May 2017

Tarikh: _____

** Jika Laporan PSM ini SULIT atau TERHAD, sila lampirkan surat daripada pihak berkuasa/organisasi berkenaan dengan menyatakan sekali sebab dan tempoh laporan PSM ini perlu dikelaskan sebagai SULIT atau TERHAD.

FAKULTI TEKNOLOGI KEJURUTERAAN
Tel : +606 234 6623 | Faks : +606 23406526

Rujukan Kami (Our Ref) :
Rujukan Tuan (Your Ref) :

17 MEI 2017

Pustakawan
Perpustakaan UTeM
Universiti Teknikal Malaysia Melaka
Hang Tuah Jaya,
76100 Durian Tunggal,
Melaka.

Tuan/Puan,

PENGKELASAN LAPORAN PSM SEBAGAI SULIT/TERHAD LAPORAN PROJEK SARJANA MUDA TEKNOLOGI KEJURUTERAAN ELEKTRIK (KUASA INDUSTRI): MUHAMMAD ASHRAF WAJDI BIN MOHMAD BAKHARI

Sukacita dimaklumkan bahawa Laporan PSM yang tersebut di atas bertajuk ***"*Development of Road Power Generation by Applying The Conversion System*"*** mohon dikelaskan sebagai *SULIT / TERHAD untuk tempoh LIMA (5) tahun dari tarikh surat ini.

2. Hal ini adalah kerana IANYA MERUPAKAN PROJEK YANG DITAJA OLEH SYARIKAT LUAR DAN HASIL KAJIANNYA ADALAH SULIT.

Sekian dimaklumkan. Terima kasih.

Yang benar,

_____

* Potong yang tidak berkenaan

NOTA: BORANG INI HANYA DIISI JIKA DIKLASIFIKASIKAN SEBAGAI SULIT DAN TERHAD. JIKA LAPORAN DIKELASKAN SEBAGAI **TIDAK TERHAD**, MAKA BORANG INI **TIDAK PERLU DISERTAKAN** DALAM LAPORAN PSM.

DECLARATION

I hereby, declared this report entitled “Development of Road Power Generation by Applying the Conversion System” is the results of my own research except as cited in references.

Signature : …….

Author’s Name : MUHAMMAD ASHRAF WAJDI BIN MOHMAD BAKHARI

Date : ……

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 Electrical Engineering Technology (Industrial Power) with Honours. The member of the supervisory is as follow:

……

(Nurul Ashikin binti Mohd Rais)

ABSTRAK

Angin, solar dan hidro adalah tenaga yang boleh diperbaharui dan tenaga yang tidak mencemarkan. Semua itu nerupakan tenaga yang biasa digunakan untuk menghasilkan tenaga elektrik untuk kegunaan harian. Seperti yang kita tahu, arang batu dan minyak mempunyai kos yang tinggi untuk penggunaan tenaga dalam kehidupan seharian. Gas asli tidak boleh dikitar semula yang memberikan kesan yang mungkin merosakkan hutan dan habitat haiwan. Terdapat beberapa tenaga sisa atau pemulihan tenaga yang boleh membantu tenaga yang boleh diperbaharui seperti penjanaan kuasa jalan raya. Penjanaan kuasa jalan raya merupakan konsep penjanaan kuasa yang paling cekap yang menukarkan tenaga kinetik kenderaan kepada tenaga elektrik yang mengambil tekanan yang dikenakan kepada kenderaan dan memutarkan motor untuk menjana elektrik. Objektif projek ini adalah membangunkan penjanaan kuasa jalan raya, menyiasat cara-cara untuk mengurangkan kos dan untuk menganalisis voltan yang dijana daripada kelajuan dan beban. Sistem ini mesti berupaya untuk menjana elektrik dengan ketinggian pemutus kelajuan dengan 8cm dan 15cm dan panjang rak ataupon gear aci 7cm. Maklumat penting adalah untuk mengenal pasti ketinggian pemutus kelajuan dan panjang rak atau gear aci untuk mendapatkan nilai optimum dan kecekapan data daripada analisis. Ketinggian pemutus kelajuan yang sesuai dan panjang aci gear yang digunakan dalam projek ini akan menyumbangkan prestasi yang sempurna dalam penjanaan kuasa jalan raya. Dari keputusan itu, nilai yang disignifikan bagi semua hasil adalah dalam graf.

ABSTRACT

Wind, solar and hydro are renewable energy and non-polluting energy. All this type of energy is commonly used to produce of electric power for daily use. As we know, the coal and oil are had high cost for the energy consumption in daily life. The natural gas cannot be recycled which give the effect that might damage the forest and animal habitat. There are several waste energy or recovery energy that can back up the renewable energy such as road power generation. Road power generation is the most power generation concept that converts the kinetic energy of vehicles into electrical energy which take the stroke motion of vehicles and rotate motor that can generates electricity. The objective of this project is developed road power generation, investigate ways to reduce cost and to analyze voltage generated from speed and load. The system must be able to generate electricity by height of speed breaker with 10cm and 15cm and length of rack which is 7cm. The important key to identify is height of speed breaker and length of rack which is important to get the optimum and efficiency value of data from the analysis. The suitable height of speed breaker and length of rack that use in this project will contribute a perfect performance of road power generation. From the result, the significant finding for all result is in graph.

DEDICATION

To my beloved parents, Mohmad Bakhari bin Yaacob and Norpishah binti Salim for support me until nowadays.

To my siblings, Mohd Adham Wafi bin Mohmad Bakhari, Nur Amirah Najwa binti Mohmad Bakhari, and Muhmammad Alif Wazir bin Mohmad Bakhari which always give an opinion in this project. This is the present for all of you and I hope you all happy.

ACKNOWLEDGEMENT

I would like to thank to all those who have supported, encouraged, challenged, and inspired me. Specially thanks to my supervisor Nurul Ashikin binti Mohd Rais and all honorable lecturer in UTeM for all their guidance, loves, and attention which has made it possible for me to make it up to the point. Thanks also to my beloved family, classmates, and housemates who bestowed me with the commitment, supports, and awareness to follow the possible route.

TABLE OF CONTENT

LIST OF TABLES

LIST OF FIGURES

LIST OF ABBREVIATIONS, SYMBOLS AND NOMENCLATURE

PMDC	-	Permanent Magnet Direct Current
DC	-	Direct Current
AC	-	Alternate Current
PLC	-	Programmable Logic Control
F	-	Force
USA	-	United State of America
kWh	-	kilo Watt hour
sec	-	second
Rsh	-	shunt winding
Rse	-	series winding
HVAC	-	High Voltage Alternate Current
RPG	-	Road Power Generation

CHAPTER 1
INTRODUCTION

This chapter describes the background of project. Besides that, this chapter also examines the objectives of this project including the scope of the project. The problem statement also will be discussed in this chapter. The structures of this report briefly described the project as well as to ensure better visualization of the whole project.

1.0 Introduction

Energy efficiency is important for several reasons such as reducing the cost of operation, management and maintenance of electrical energy efficiently. This means that significant cost saving can be achieved with energy efficiency improvements. In orders to achieved the energy efficiency the renewable energy and waste energy has been determined.

The renewable energy and waste energy known as energy recovery has been considered as the most efficient plan to reduce the usage of fossil fuel in orders to save the environments. Moreover, the operational mode of many utilization in this world is not sufficiently optimized which many energies that can be recovered are wasted. It shows that there are many amounts of energy that has been wasted that can be recovered it back. The energy can be recovered by using several systems that occur such as from the combustion system of the exhaust gas that can be recovered

and be use to several applications. Furthermore, other example is the heat that is out form the HVAC condenser can be use as heat sources.

There are several applications that can be use as energy recovery such speed breaker which is known as Road Power Generation. This road power generation system receives its kinematic energy from the vehicles that pass through the speed breaker which convert the kinetic energy to electrical energy. This system are the excellent solution for recovery energy to supply the electrical energy for the poor countries that are poor in natural resources such Lebanon. This is because Lebanon is limited in natural resources that use in generate electrical power.

Road power generation are consists of metal plate that covered by rubber liner which attach to the road. This plate is install at the residential area, which is applying by changing the speed breakers and zebra line with this plate. The plate is connected to spring, rack gear and pinion. The spring function is to make the plate back to its position after vehicle move on the plate. When vehicle move on the plate, the plate will move down as rack gear move which give the pinion rotate. The pinion that rotate are install to the generator will produce electrical energy. It is the changing from the kinetic energy to electrical energy. The production of electric energy will store in the battery charger, then this electric energy will use to supply street light.

1.1 Objectives

The main objectives of this project are to propose the development of road power generation by applying the conversion system. This report is to produce the efficient energy by using several techniques of engineering.

The objective of this project is:

(i) To convert the kinetic energy to the electrical energy.

(ii) To investigate ways to reduce the cost energy supply to street light.

(iii) To analyze the voltage generated from the load of vehicles.

1.2 Problem Statement

1.2.1 High Electricity Cost

The higher in electricity cost caused of the increased electricity tariff and high energy consumption which is depends on the usage of the material that street lighting system used, whereas this factor can contribute to high cost of electricity. Besides that, the lighting system of the street light is one of the main factor that caused the high electricity cost because the street light needs high power to operate which is around 80-400W.

1.2.2 High Energy Consumption

Nowadays, people are more worries about energy consumption in the household, factories and company. The uses of electrical energy without occupants were wider. It will affect street light especially at the resident area which give no more lights at road in orders to save the energy because of the wider use of electrical energy. The usage of energy must also be controlled to reduce the waste of electrical energy.

1.3 Work Scope

There are several scopes of work for this project:

1.3.1 Phase I (PSM 1)

(i) Collecting and calculate the theory data of power produce from road power generation.

(ii) Research about the street light, energy saving and energy consumption.

1.3.2 Phase II (PSM 2)

(iii) Development of road power generation to produce efficient output power.

(iv) Collect and analyze the data from the field and laboratory test of road power generation.

CHAPTER 2
LITERATURE REVIEW

2.0 Introduction

Nowadays, the global warming and climate change has been rises which give the acknowledge that traditional dependence on fossil fuel extracts a heavy cost from the environment. Consequently, the recognizes of benefits having use the renewable energy and recovery energy have been known. Nowadays, the most efficient strategies to reduce the financial and environmental drawbacks of the excessive utilization of fossil fuel is by using the renewable energy and energy recovery (Mohamad Ramadan, 2015). The electricity demand has increase at faster rates than the overall energy supply. At present majority of electricity is get from the conversion of others source of energy, like coal, natural gas, oil, nuclear power, and other natural sources, which are called primary sources (Pankaj, 2015). The growing of the global warming are caused by carbon dioxide emissions from the use of fossil fuels, which give a question about the long term this energy can be use.

The last 10 years has shown rapid climate change caused by global warming and the awareness about the sustainable environment is increase. In this state, the role of renewable and waste energy in daily life is a great significance for the environmental stability. Sun, water and wind are consider to be the most common renewable energy sources for power generation. The questions is how long this renewable energy can be remains?. In orders to back up this sources the waste energy is create. The most excellent waste energy is road power generation using speed breaker out of many waste energies. The road power generation will produce electricity which is said to be “clean” because its production produce no pollution

which is this clean energy sources is growing demand (Adnan, 2013). Advantage of road power generation is that it can give more energy supply if road still has car moving on it.

2.1 Production of New Energy Sources

Energy is a foremost necessity for human life because without energy such as electricity human life journey has been disturbed. Today, the world use energy in many forms whatever its nature or not but the consumption of energy is a big crises nowadays because production energy from nature will finish. There are many form of energy and its conversion of energy in one form or the other the development of the clouds, the motion of the air and the kinetic energy of water are a few instances that stand testimony to this fact. The extensive tradition of energy has motivated in an energy crisis, and there is a need to advance approaches of optimal consumption, which will not only ease the crisis but also reserve the environment. Energy conservation is the inexpensive new source of energy. Generation of energy on road is one of the most current ideas. The road power generation device converts the kinetic energy of the vehicles into electric energy by installing mechanism on the road, it takes the pressure motion of the vehicles and converts it to the rotary motion that can generates the electricity.

In this study a novel technique has been projected to generate electricity from speed breakers. This method will help to reserve our natural resources. For vehicle flow, it shows that around 40400 vehicles per day is moves, which includes 2/3/4/6/8 wheelers that can formed energy much more significant related to the experimental results obtained, thus making and creating a good energy is setup of vehicles on impact with the speed breakers is nevertheless lost. This is lost to heat and sound. This energy can be tapped, stored and used as back up or for small tenders (Piyush, 2015).

The application of energy is a sign of the development of a nation. For example, the per capita energy partaking in USA is 9000 KWh (Kilo Watt hour) per year, while the consumption in India is 1200 KWh (Kilo Watt hour). One might accomplish that to be substantially rich and prosperous, a human being needs to invest more and more energy. A survey has been done due to the energy loss in India had published a sadness report that 85,000 villages in India still do not have electricity this is because the supply of power in the most part of the country is poor accordings to the study by Priyadharshini.M in "Every Speed Breaker Is Now a Source of Power" (Priyadharshini.M, 2015).

2.2 Implementation Road Power Generation

Road power generation is a new energy sources that have been investigate nowadays which is not use in wide range because the renewable energy like solar, wind and hydro can still be use this day. India and United States of America(USA) is the most country that use this waste energy compare to Malaysia which is zero usage of this energy. This is because India install capacity stood at 315426.32 Megawatt (MW) which are not enough to supply energy to its citizen. India is a big country which full with citizen, so the government has come up with idea that the automotive industry in India is one of the largest in the world and one of the fastest growing globally. India's passenger car and commercial vehicle manufacturing industry is the seventh largest in the world, with an annual production of more than 3.7 million units in 2010. Facing with these vehicles every day will give us headache. But this problem could be an answer of new type power generation and creation of road power generation (Noor Fatima et al, 2011).

The implementation of this road power generation in Malaysia is needed in orders to back up the renewable energy sources that are not consistent. The implementation area is focusing at the school, toll, and residence area. For example, the implementation at residence area is very suitable because it just switches the old speed breaker with this road power generation. The government is no need to remote a village or the residence area when to build the wire grid system for hundred

kilometers in orders to supply the electricity. This green scheme offer a cheap, reliable, and cost effective of alternative energy. A group of workers in USA has been develop this road power generation project at a road. It is produce 10.44V and 0.736A for the load car of 470kg and 10km/h of speed for one car. It shows the production of power is 7.685W for one push onto the speed breaker.

Figure 2.1 : Road power generation from rack and pinion system.

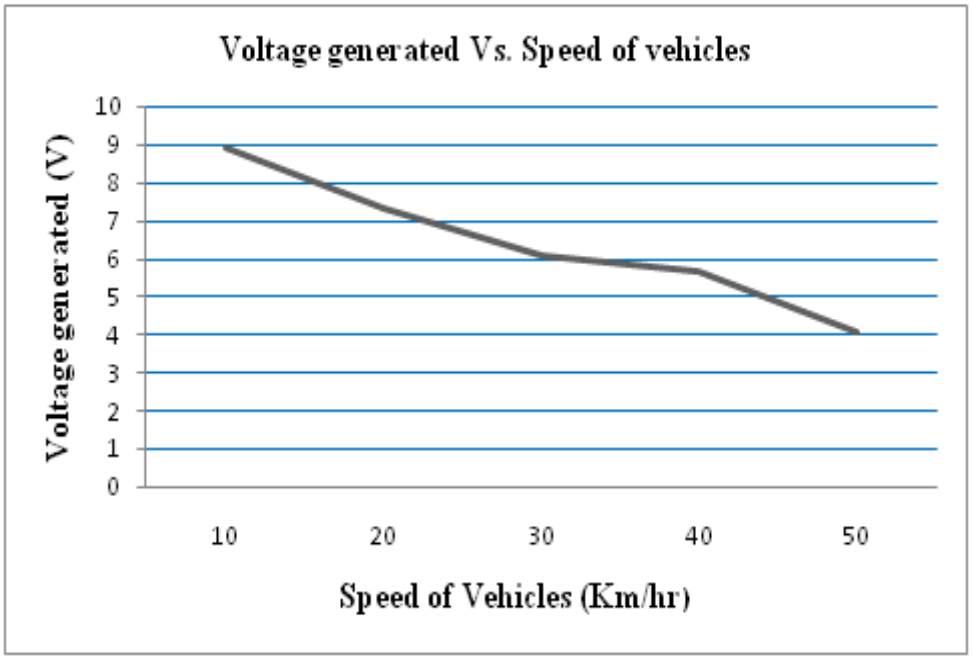

Figure 2.2 : The voltage generated due to speed of vehicles.

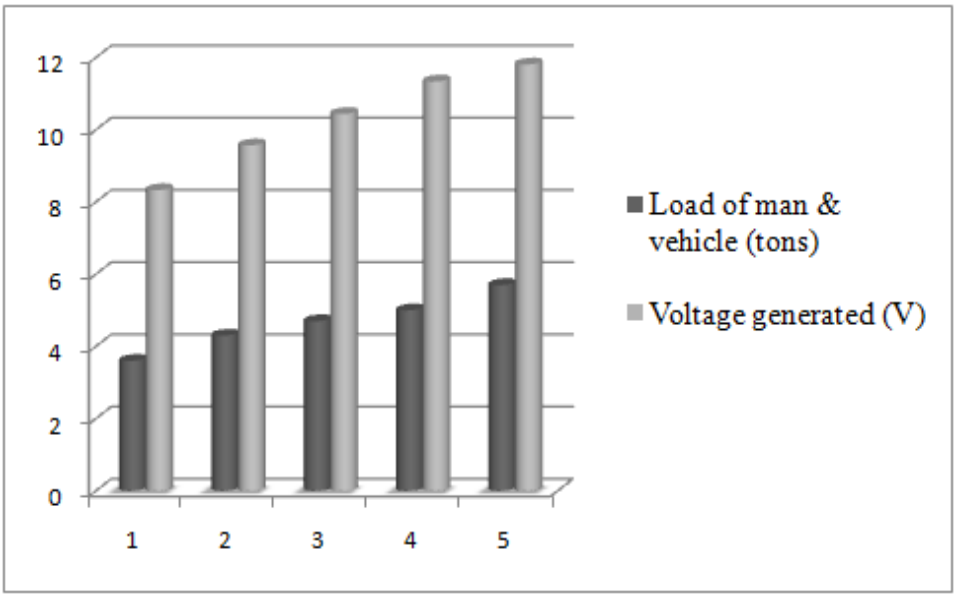

Figure 2.3 : The voltage generated due to the load of vehicle.

The voltage generated is based on the speed of vehicles and load of vehicles. Lower speed of speed more voltage is generated. Due to the load, more heavy the car will produce high voltage. This study case shows possible practical use of road power generation system in orders to provide basic electricity supplies.