DESIGN AND VIBRATIONAL ANALYSIS OF ELECTRIC POWER GENERATOR

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SUPERVISOR DECLARATION

"I hereby declare that I have read this thesis and in my opinion this report is sufficient in terms of scope and quality for the award of the degree of Bachelor of Mechanical Engineering (Automotive)"

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DECLARATION

"I hereby declare that the work in this thesis is my own except for summaries and quotations which have been duly acknowledged."

Signature : …….

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DEDICATION

I dedicate this thesis to my beloved family especially to my father and mother, Dr. Mohd Azman Bin Abdullah, Dr. Md Fahmi Bin Abd Samad @ Mahmood and my friends and hope the sacrifice you are done will be rewarded by Allah SWT.

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ABSTRACT

This project is to design and analysis pneumatic power generator. For today, the internal combustion engine that produced smoke emission and noise pollution are the main issue for green environment. Generator is usually used internal combustion engine to produce electricity. In this research and development, air compressed power generator (ACPG) is the new development to overcome the smoke emission and save the green environment. This project have the conceptual design where the first element is air compressor. The air compressor is function as compressed air to run an air motor. The air compressor is operated by using external supply. Then, the air motor is proceed to run an electric generator. This generator will produce electric. After a moment, when the air compressor have achieves its peak pressure , the external power can be disconnected. The electricity is produced by the generator. Then, the generator transfer the electricity to the air compressor by using electric motor that we called auxiliary power. Furthermore, the electric produced is more than the amount used by its electric motor. This surplus electric (power output) is then tapped for other applications. This system is continuously running without external power input. This project to reduce using of electricity where the cost of electricity for today is increased the rate. This project, the mountings and frames of the system is designed by using CATIA software. Analysis is put the load act on the mountings to determine the force available. The mountings and frames are design to make the system of the air compressed power generator in line that easy to bring or move anywhere and to make the system orderly in arrangement.

ABSTRAK

Projek ini adalah untuk mereka bentuk dan analisis penjana kuasa melalui pneumatic iaitu udara mampat. Pada hari ini, enjin pembakaran dalaman yang menghasilkan pelepasan asap dan pencemaran bunyi adalah isu utama pencemaran alam sekitar. Penjana biasanya digunakan enjin pembakaran dalaman untuk menghasilkan elektrik. Dalam kajian ini dan pembangunan, udara termampat penjana kuasa (ACPG) adalah pembangunan yang baru untuk mengatasi pelepasan asap dan menyelamatkan pencemaran alam sekitar. Projek ini mempunyai reka bentuk konsep di mana unsur yang pertama adalah pemampat udara. Pemampat udara adalah berfungsi sebagai udara termampat untuk menjalankan motor udara. Pemampat udara dikendalikan dengan menggunakan bekalan luar. Kemudian, motor udara adalah meneruskan untuk menjalankan penjana elektrik. Penjana ini akan menghasilkan elektrik. Kemudian, apabila pemampat udara mengumpul tekanan sehingga mencapai kemuncaknya, kuasa luar boleh diputuskan. Penjana kuasa akan menghasilkan elektrik. Kemudian, penjana elektrik memindahkan untuk pemampat udara dengan menggunakan motor elektrik yang kita dipanggil kuasa bantu. Tambahan pula, elektrik yang dihasilkan adalah lebih daripada jumlah yang digunakan oleh motor elektrik. Lebihan ini elektrik (kuasa keluaran) kemudian boleh disambung untuk aplikasi lain. Sistem ini terus berjalan tanpa input kuasa luaran. Projek ini untuk mengurangkan penggunaan elektrik di mana kos elektrik untuk hari ini meningkat kadarnya. Projek ini, yang penahan beban dan kerangka sistem yang direka dengan menggunakan perisian CATIA. Analisis diletakkan perbuatan beban atas tunggangannya untuk menentukan daya yang ada. Penahan beban dan bingkai reka bentuk untuk membuat sistem udara termampat penjana kuasa dalam talian yang mudah untuk membawa atau memindahkan mana-mana sahaja dan untuk membuat sistem reka bentuk yang teratur dalam susunan.

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LIST OF SYMBOLS

A	=	surface area
A_x	=	horizontal acceleration
A_y	=	vertical acceleration
A_z	=	acceleration at z-axis
v	=	velocity
P	=	pressure
cm	=	centimeter
T	=	temperature
p	=	density
c_p	=	specific heat
k	=	thermal conductivity
μ	=	viscosity
v	=	voltage

LIST OF ABBREVIATIONS

FYP	Final Year Project
PSM	Projek Sarjana Muda
CAD	Computer-aided Design
DAQ	Data Acquisition System
CO	Carbon Monoxide

CHAPTER 1

INTRODUCTION

1.1 BACKGROUND

This chapter will cover on the problem statement, objective of the project and project scope. Furthermore, the information of the project will be stated clearly to enhance the understanding as a method to achieve the project goal.

1.2 PROBLEM STATEMENT

Nowadays, based on the earth's environment, it can been seen that the world become more pollute and there are many people which are easily infected by diseases because of fossil fuel. Firstly, the factor is mostly people are used fuel such as petrol or diesel to run the machine on internal combustion engine. This problem has encouraged many researches to try find and look for the best solution to overcome the air pollution.

In the research on the electric generator development, to run the generator by using

fossil fuel such as petrol or diesel is affected and not good for environment. Internal combustion engine that in system of the generator must be changed and develop to overcome the problem of earth's environment. These generators produce power independently, but the smoke emission and noise pollution are still the main issues for green environment effects. Moreover, these generators are using fossil fuel which is not sustainable.

In addition, while the overall death rate from unintentional carbon monoxide (CO) poisoning has decreased in the United States due to improved automobile emissions controls and a decline in CO poisoning from motor vehicles, exposures have not changed from some sources of CO. One of these is the operation of portable electrical generators in poorly ventilated spaces. This study sought to describe the population poisoned from CO produced by portable electric generators, and to determine the reasons that generators are operated in a hazardous fashion.

For today, many citizens like to use the applications without known about the system and the effect of overuse the energy from power supply. Fossil fuel is using for today as an important thing to generate in part of the internal combustion engine. The fossil fuel is produced from the oil platform in earth. The development of this project, to change the generator generates by using fossil fuel to the new concept is generator generate by using electric generator form automotive battery to motor starter and the motor starter generate the generator without using the fossil fuel. This development can be reduce the air pollution and used the free energy to generate the generator.

1.3 OBJECTIVES

The objective of this project is to study the vibration and its concept. Then, the objective is to design and sketch CAD model. Besides that, the electric power generator need to analyze the mounting design.

1.4 SCOPES

There are two scopes in this project should be done. First, design the frame of electric power generator by using CATIA software. Then, the scope is analysis the frame by using CAD software to apply the load. Lastly, analysis the vibrational of the electric power generator to obtain the results.

CHAPTER 2

LITERATURE REVIEW

2.1 INTRODUCTION

This chapter includes an overview of the project consists of a description of introduction about the devices are uses in the project where are tachometer, power monitor, motor starter, automotive battery, Lego Mindstorm EV3, accelerometer and power generator.

2.2 TACHOMETER

It is a device that used for measurement of angular velocity and in an engine or other machine can be measures the speed of a rotating shaft. There are two types of tachometer such as analog tachometer and digital tachometer. For analog tachometer, the instruments lies in continuity of the analog information on their outputs. For digital tachometer, it has discrete output equivalent to the angular speed. Some procedures to use the tachometer are fix one of the reflective marks to the rotating surface or part of the target measurement object and then, aim the red visible ray at the mark. In case, if the

multiple marks are fixed to the target of measurement object, the measurement can be performed at a lower speed.

Figure 2.1 : The Tachometer

2.3 POWER MONITOR

The **Figure 2.2** is a device that will help people to understand the consumption of electricity in a house. The power monitor can be used and measured on any devices with an electrical, but it is only intended to measure 120V loads for standard household loads. It also can be used to understand how much electrical appliances cost under two different rate structures which are flat rate and Time of Use (TOU). Moreover, it can be used to compare how much appliances would cost to operate under one's current usage patterns versus how much users would cost to operate under different usage patterns.

This device have many functions that allow people to check different aspects of electricity usage. For testing energy use, the most important units in this device are Watts (W) and kilowatt hours (kWh). The Watts function measures the instantaneous draw that how much electricity a device is using, whereas the kWh function measures the electricity

usage a device over time. In power monitor, various data and results can be collected by install the device on any plug of the electrical appliances. Basically, the results can be collect such as voltage (V), current (A), low and high power (W), power per hour (kW/h), frequency (f) and power factor.

Figure 2.2 : The Power Monitor

2.4 MOTOR STARTER

This mechanical component is motor starter which are the most important thing to start or turn on the car engine. The **Figure 2.3** is a device that function as to start up the internal combustion engine (ICE). An electric motor forms the basis of the starter motor. When the motor starter switch is turned on, the starter relay turns on the electric motor. This motor drives the starter gear ring through the pinion gear. The rotating movement of the motor starter is created from the interaction of two magnetic fields. This component come with permanent magnets or with electromagnets. The energy required by the motor starter is provided by the battery. The motor starter requires some high power or voltage to start up the motor starter.