EXPERIMENTAL DESIGNS OF MAGNETIC GENERATOR USING NEODYMIUM MAGNETS

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ABSTRACT

This paper focuses on a new approach for new methods to generate electricity as an educational tool in polytechnics for experiments related to electricity and magnetism to educate students in order to make learning process more interesting. Lecturers are always looking for better ways to involve students in a class; typically looking for ways to make classes more interesting. Magnets can be an excellent teaching tool for students of all ages and are capable of demonstrating many basic and complex scientific principles. Furthermore, with the current increase of usage of electricity appliances machines in residential areas, the demand for an alternative and cheaper way to produce electricity is high. Because of these, many researchers have done researches and experiments to produce clean energy which is free to reduce the usage of non-renewable energy. Magnetic energy is one of the renewable energy which has been attracting interest of scientist and researchers around the world to be developed because of the high potential of magnetism to be used as a main source of energy and to replace non-renewable energy. This step also saves our planet and prepares our future generation for a better future. The concept of free or renewable-energy has led the study to focus on developing alternative methods to generate electricity so that it can be used to power household appliances using free energy.

Keywords: Magnetic Generator, Neodymium Magnets, magnetism, free energy

1. Introduction

Magnetic Generator is one of the free energy converters that were recently discovered in order to produce free energy. Nickolas Tesla the Father of Electricity stated that; “If we use fuel to generate our power, we are living on our capital and exhausting it rapidly” (Buschow and Boer, 2003). Thus, producing ways to obtain free energy is one of the steps to counter the exhausting energy problem. As we all know, nowadays, the fuels that were used are currently depleting and exhausting. This is because, petroleum is a non-renewable energy sources. Therefore, magnetic generator was designed to counter these matters. Analysis need to be conducted in order to increase its efficiency and usage toward creating free energy. At the end of the day, a magnetic generator design can be produced and could act as a secondary energy alongside the petroleum, the non- renewable energy and other energy sources (Bradsley, 1999).

The aim of this study is to produce an experimental design for the application of magnetic generator using Neodymium magnets. A neodymium magnet (also known as NdFeB, NIB or Neo magnet), is widely used type of rare-earth magnet, as a permanent magnet made from an alloy of neodymium, iron and boron to form the Nd2 Fe14 B tetragonal crystalline structure. Developed in 1982 by General Motors and Sumitomo Special Metals, neodymium magnets are the strongest type of permanent magnet commercially available. These magnets have replaced other types of magnet in the many applications in modern products that require strong permanent magnets, such as motors in cordless tools, hard disk drives and magnetic fasteners. Neodymium magnets are differentiate and classified by the characteristics. As for neodymium magnets, it has different grade. Each grade possess different amount of magnetic force. The higher the magnetic force possessed by the magnet,

the higher the grade is. Some of them possess the same amount of magnetic force. The magnets that possess the same amount of magnetic force usually have different working temperature.

The objectives of this study are:-
(i) To design magnetic generator using neodymium magnets;
(ii) To determine the rate of rotational motion and the electrical power produce by the magnetic generator;
(iii) To determine the power transmission influences against the power produce; and
(iv) To determine the load influences against the power produce.

In today's human life, electricity is an important component. Unfortunately, electricity costs have been steadily escalating and the cause of this is the reliance of power producers on crude oil to keep the generators going. Today, most people were seeking a new green technology to reduce consumption of the electricity. Therefore, a new idea and concept is generated in order to solve this problem. The design that has been chosen is magnetic generator. Thus, further research has been conducted, for the purpose of experimental and analysis study. Lab sheets have been created to analyse the power produced by this prototype. By using this lab sheet, the prototype can be used as an experimental study as well as teaching materials toward the influences of neodymium magnets in generating electrical power. In addition, this prototype should also be able to help to relate magnetism principle learnt in the classroom practically through the design of the magnetic generator.

The scope of this study is focused on:-
(i) Lab sheets produced only apply to the Magnetic Generator that has been designed;
(ii) Analysis is only conducted on the electrical energy produced by the designed Magnetic Generator;
(iii) Analysis only applicable on Magnetic Generator provided;
(iv) Power supply for the design is 12V battery and 12V DC inverter; and
(v) Magnetic Generator Design is based on Magnetism Concept.

2. Methodology

The design for magnetic generator is shown as below. In addition, the components or parts which were used in the design also shown by using the engineering drawing. The parts or components dimensions and their position were shown in the engineering drawing below.

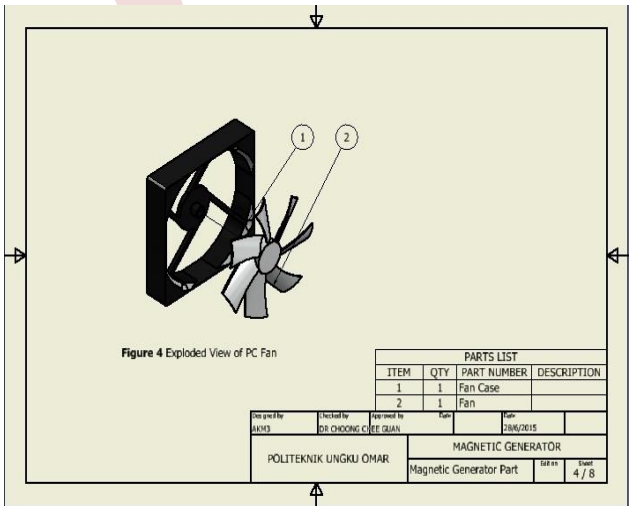

Figure 1: Magnetic Generator design assembly

Figure 1 showed the full assembly of the magnetic generator design. All the

components and parts are assembled according to the plan. Each of their positions are measured based on the design before the assembly. The parts are named afterward based on their functions. These parts or components are included; the board, LED switch, dynamo, multi meter, coupling shaft, switch, magnet holder, driven motor (fan) and driver motor.

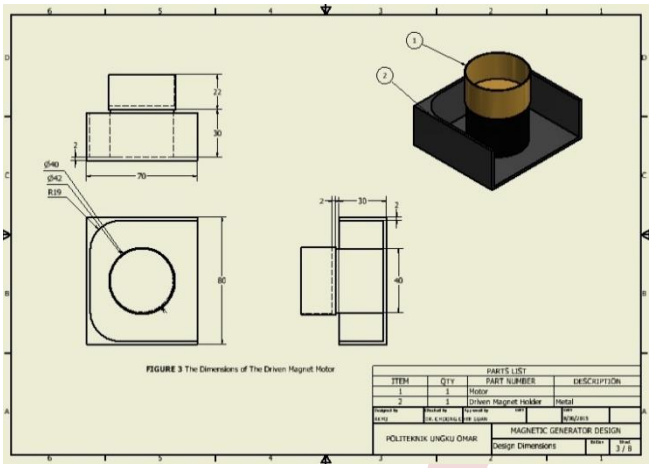

Figure 2: The magnet motor holder

Figure 2 shows the assembly of magnet motor holder. The magnet motor holder comprises from steel magnet holder and a DC electromagnetic motor. The steel magnet holder is the upper part while the DC electromagnetic motor is the lower part. The parts are attached together and serve as a Neodymium Magnet holder. The magnet motor holder will hold the neodymium magnet in order to operate. The application of magnetism is shown between the neodymium magnets with the steel magnet holder.

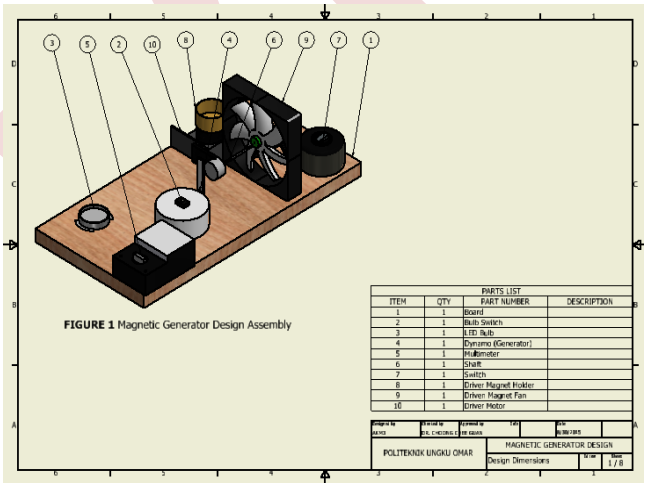

Figure 3: Exploded view of Driven Motor

As shown on Figure 3, driven motor consists of casing and fan. The motor will rotate without any wires or battery attached on the body or connected onto the motor. The fan is connected onto the casing by using shaft attached on the casing body. This motor shall transfer kinetic energy onto the dynamo. The kinetic energy then is converted into electrical energy. This process shall produce electrical power.

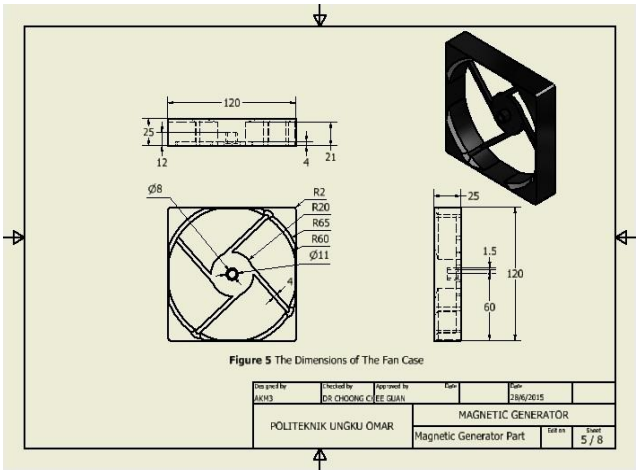

Figure 4: Component of Driven Motor

The component shown on Figure 4 is a casing of the driven motor. The casing acts as a holder toward the fan while the driven motor is running. Figure 4 also shows the dimensions of the casing that is used in the magnetic generator design.

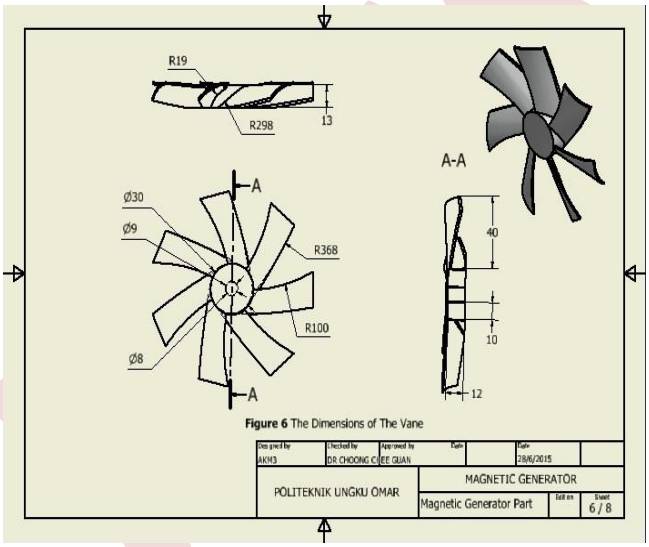

Figure 5: Dimension of the Fan

The fan is used in producing kinetic motion through rotation. It is part of the driven motor components. The dimension of the fan used in the design of magnetic generator is shown on Figure 5.

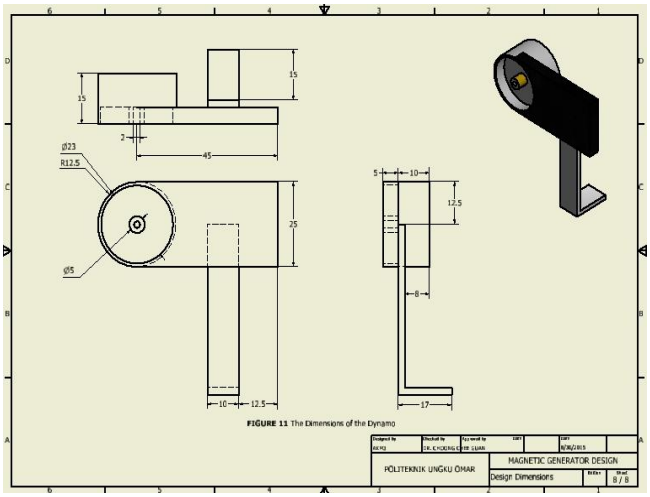

Figure 6: Dimensions of Parts and Components

Figure 6 above shows the dimensions of parts and components. These components and parts are installed onto the board in order to design the magnetic generator. The components shown above are coupling shaft, led switch, led holder and board. The shaft is divided onto three parts; two parts are solid rod while at the center, which joining these two rods are a spring.

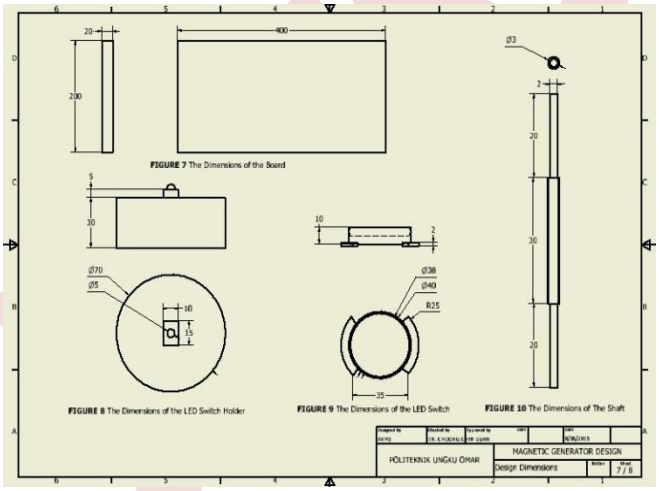

Figure 7: Dimension of the Dynamo

The dimension of the dynamo used in the design is shown in Figure 7. The dynamo is divided into two parts. The first part is the dynamo itself, while the second part is the holder. The holder is used to hold the dynamo. The holder is fastened onto the surface of the board in order to reduce the amount of vibration exerted by the dynamo while running. In the design, the dynamo sole purpose is to convert kinetic energy onto electrical energy through electromagnetism concept.

3. Results and Discussions

The Magnetic Generator is a revolution of the energy concept which is through magnetism (Takeda, 2014). The prototype is designed to help students in doing experiments related to magnetism as depicted in Figure 8. Furthermore, because of the portable design it is easy to be carried around making it easier for users to use it whenever they want and anywhere. In additional it uses free energy. This means that users are able to save cost and also not worrying about spending their money for unwanted expenses. The aim of this project is to produce energy electricity through the use of magnetism.

Figure 8: The prototype of Magnetic Generator

Three experiments were conducted using the magnetic generator that has been designed. The lab sheets were produced in the analysis of Magnetic Generator. The experiments conducted were related to:-

(i) Rotational motion influences against power gain using direct power supply;

Experiments were conducted on the design in order to analyse and to determine the rate of electrical power produce over time by using a constant power supply (James et al., 2010). The experiment also determined the relationship of the rotational motion with the power produce over the time by using a constant power supply.

a. Plot for Current, mA against Time, secs

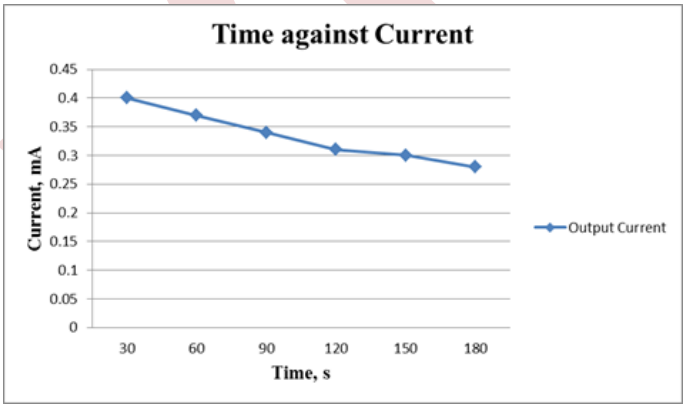

Figure 9: Current against Time

Based on Figure 9, the amount of current produced is 0.35 mA for 90 seconds. It started to decrease from 0.3 mA to mA when it reaches 120 seconds. This was due to the driven motor was getting hot. When the motor starts to heat up, the rotation of the driven motor started to decrease from 600 rpm to 594 rpm. The reduction causes the amount of current produced decreased. But, after 120 seconds the amount of current produce started to be constant again until 180 seconds. Thus, it can be deduced that as time increasing the amount of current produce is constant and the rotation per minute is also constant.

b. Plot for Power, milliWatt against Time, secs

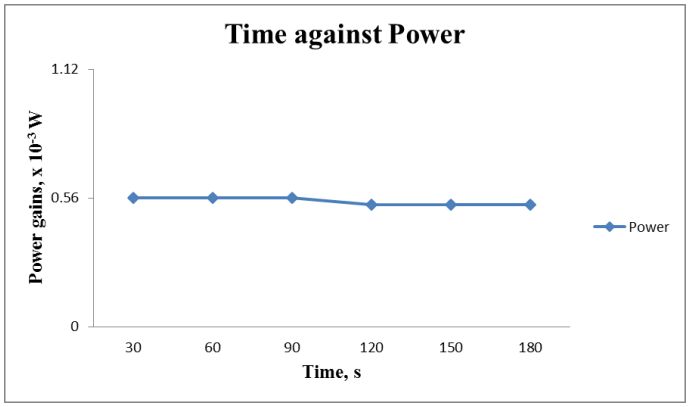

Figure 10: Power against Time

Figure 10 showed that, the power gains produced by the magnetic generator design are constant. The reading of power gains is 0.56 milliWatt when the magnetic generator design running for 30 seconds until 90 seconds. After that the power was decreasing from 0.56 milliWatt to 0.53 milliWatt, the power gains then constant again for about 60 seconds until reaching 180 seconds. Thus, it can be deduced that as time increasing the amount of power gains are constant.

c. Relationship of power gains and rotations per minute

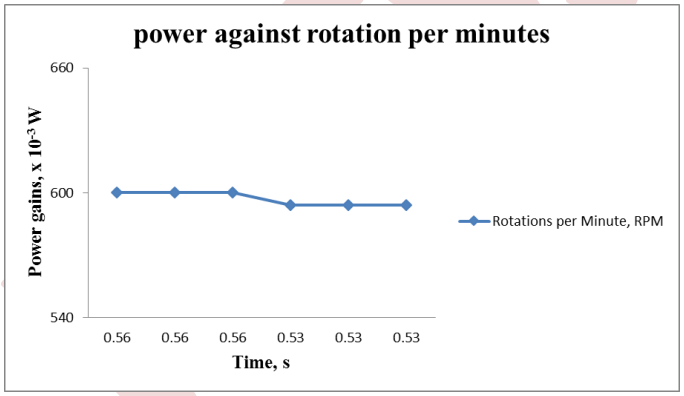

Figure 11: Relationship of Power gains and rotations per minute against Time

Based on Figure 11 shown above, the speed of rotation per minutes is at constant against power gain by magnetic generator design. When the magnetic generator was running for about 30 seconds until 90 seconds, the reading of power gains was 0.56 milliWatt and the speed of the rotation per minutes during that time was 600 rpm. After that, on 90 seconds to 120 seconds the power gains decreases from 0.56 m Watt to 0.53 m Watt. During that time, the speed of rotation per minutes decreased from 600 rpm to 594 rpm. And on 90 seconds to 180 seconds, the graph was showing a constant reading of power gains. Reading shown 0.53 m Watt and the rotation motion was 594 rpm. Thus, it can be deduced that as time increasing the amount of power gain is constant and the rotations per minute is also constant.

(ii) Rotational motion influences against power gain;

Experiments were conducted on the design in order to analyse and to determine the rate of electrical power produce over time (Prakash, 2007). The experiment can also determine the relationship of rotational motion with the electrical power produce as the time is linearly increasing.

a. Plot for Current, mA against Time, secs

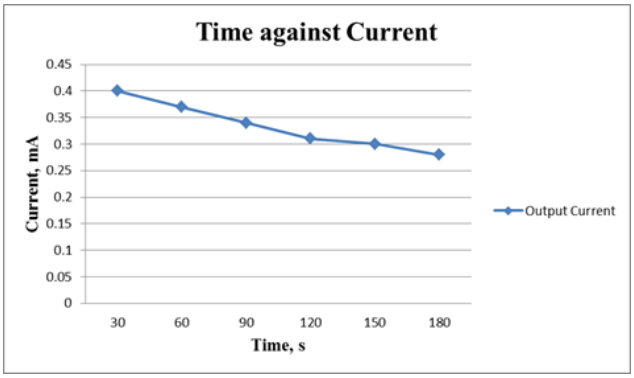

Figure 12: Current against Time

Based on Figure 12 shown above, the amount of current produce by the magnetic generator design is decreasing as the time increasing. The current is decreasing linearly until 90 seconds. After it reaches 120 seconds, it starts to deplete less as compare to 90 seconds before. This may due to ununiformed rotation of the driven magnet that keeps decreasing. This also may be due to the condition of the power source, as the power source is also depleting. Ideally, the current will linearly decreasing as time increasing. Thus, it can be deduced that, the amount of current produce is inversely proportional to time taken.

b. Plot for Power, milliWatt against Time, secs

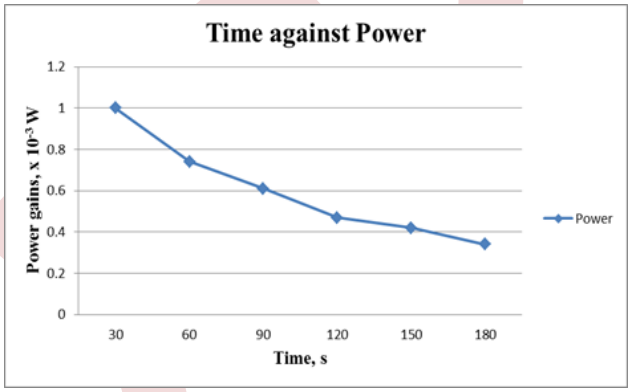

Figure 13: Power against Time

As shown in Figure 13, it shows the amount of power produce by the magnetic generator design is decreasing as the time increasing. Supposedly, the power gain should be linearly decreasing due to time increase. This may due to ununiformed rotation of the driven magnet that keeps on decreasing. This also may be due to the condition of the power source, as the power source is also depleting. Thus, the power gain is inversely proportional to the time taken.

c. Relationship of power gains and rotations per minute

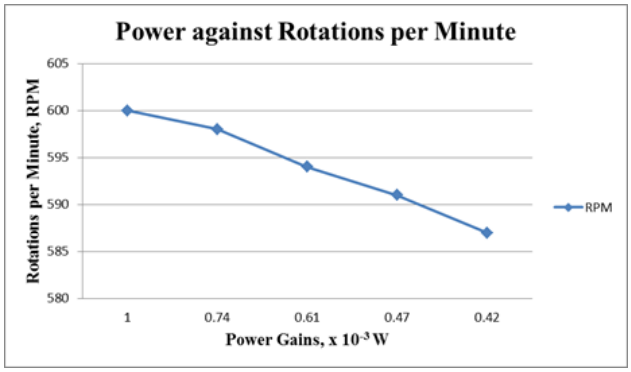

Figure 14: Relationship of power and rotations per minute

As shown in Figure 14, the rotation of the driven magnet is decreasing. It shows that, the lesser the rotations per minute of the driven magnet, the lesser the power gains. The graph theoretically should be decreasing linearly due to the decreasing of power gains and rotation gains as the time taken is increasing. In this experiment, the graph is not linearly decreasing. This may due to ununiformed rotation of the driven magnet that keeps decreasing. This also may be due to the condition of the power source, as the power source is also depleting. Thus, it is deduce that, the power gain is directly proportional to the rotation of the driven magnet.

(iii) Performance of magnetic generator influenced by load variations.

Loads influence was chosen to determine the performance of the magnetic generator design. By varying the load applied on the design, rotations per minute of the design and the power generated can be analyzed (Nicholas, 2009). As a result, the amount of loads of the magnetic generator design can carry will be known. By knowing the amount of load that the magnetic generator could carry, the weight of the alternator can be determined. Thus, the optimum power generated can be achieved through the experiment conducted.

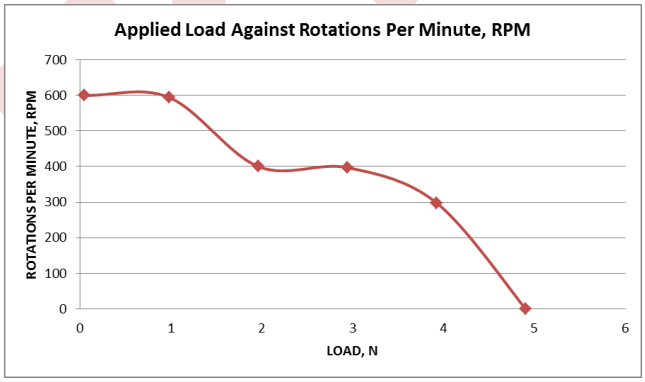

Figure 15: Applied loads against rotation per minute

Based on Figure 15, it can be deduced that the applied load influence the rotations per minute of the wheel. As the loads increases the rotation of the wheel decreases. At point where load is at 4.905 N the rotation stopped. This is due to the driven magnet cannot carry that load. At that point, the torque produce by the fan is higher than the previous point which is at 1.9430 N. Higher force is needed to rotate the shaft. In order to get higher rotation, bigger force is needed where less weight is compulsory.

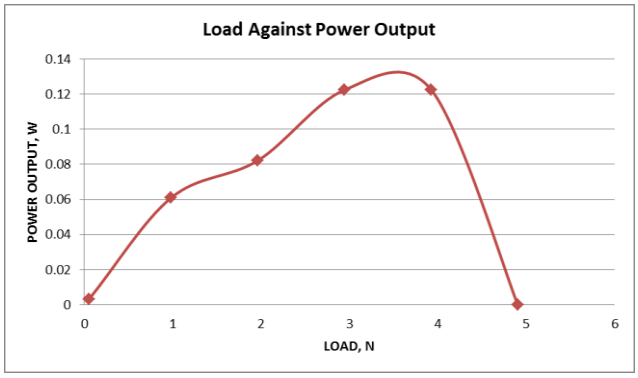

Figure 16: Applied loads against power generated

Based on Figure 16, it can be deduced that, the load that had been applied on the shaft will influence the rate of the torque. As the load is increased, the output power will be decreased. The load had been applied on the shaft will influence the rate of the rotation of the driven magnet. By measuring the rotations per minute produce, power gains are calculated at each variation of load that has been applied. When load applied is at 3.924 N, the maximum power gains is 0.1225 milliWatt. After the design reaching it maximum power, the power then started to decrease as the load start to increase. Thus, from that point, it is deduced that, as the load is increased, the output power will decreased. Graph is plotted to show the result.

4. Conclusions

As a conclusion, by producing magnetic generator, the design was able to be used as a teaching aids or materials. A written document on the magnetic generator design was able to be produced. Three experiments were able to be conducted on the magnetic generator design. The first experiment conducted was able to determine the rotational motion influences against power gains in magnetic generator design. In this experiment, it shows that the rate of power gains was affected by the time for the magnetic generator to produce current. As the current produced is increasing, the amount of power will also be increasing within the time interval until the magnetic generator reaches its maximum limit of power produced. The power gain is also influenced by the number of rotation of the driven magnet. As the number of rotation increases, the current produce, power gains are also increasing. Thus, kinetic motion affects the changes in electrical power.

The second experiment was able to show the influences of power transmissions effect toward the performance of magnetic generator design. The optimum of the power gain on the magnetic generator is depending on the value of the rotations per minute produce by the driven magnet. The selection of power transmission is one of the important factor need to be considered in order to achieve optimum power gains by the magnetic generator. It was concluded that this experiment was able to show that the use of coupling shaft was the best power transmission to achieve optimum power gains on the magnetic generator.

The third experiment was able to determine the performance of magnetic generator under influence of load variation in term of rotations per minute and power gains. The experiment conducted was able to show that the amount of load influences greatly in designing the magnetic generator. The loads carried by the shaft influences the number of rotation for the driven magnet and also the amount of power produced by the design magnetic generator.

By conducting these three experiments were able to help to produce an experimental study lab sheets as teaching aids/materials. Students are exposed to the magnetic generator theory taught in the classroom through experiments using the designed magnetic generator. Thus, the application of neodymium magnets toward generating electricity by means of rotating motion have been proven.

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