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The Role of the Gab and Attack Angle against the Speed and Power on Thepermanent Magneticgenerator

Sugeng Hadi Susilo[1], Zahratul Jannah[2]
[1,2]Department Mechanical Engineering, Politeknik Negeri Malang

Abstract
The depletion of the world's fossil oil reserves and the increasing energy demand, demand to look for other energy sources. Generating electrical energy using renewable energy such as energy: water, wind, solar, and battery charging systems. It can also convert mechanical energy to electrical energy, known as synchronous generators. The purpose of this study was to determine the effect of the variable rotor-stator motor distance, and the angle between the rotor magnets on rotation and power. A set of permanent magnet generator modules for measuring the speed and torque generated by the permanent magnet generator. The rotor-stator is made of magnets that are placed on the resin. The rotor-stator magnet motor gab is set (5, 10, 15, 20, and 25) mm while the angle of attack of the rotor-stator is 30°, 45°, 60°. The lowest output power is obtained at a gap of 35 mm with a rated power with a load of 939.32 Watts. While the highest output power is at a gap of 10 mm with no load conditions of 5483.52 Watts. As the gap gets closer, the power gets bigger, the rotation speed gets bigger too. The indicated by the stress has increased significantly by the increase in rotation speed and followed by an increase in frequency when the gap is getting closer.

Keywords*: Gab, attack angle, Rotor-stator, generator magnet permanent*

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I. Introduction

The depletion of the world's fossil oil reserves and the increasing energy demand, demand to look for other energy sources. Generating electrical energy using renewable energy such as energy: water, wind, solar, and battery charging systems. It can also convert mechanical energy to electrical energy, known as synchronous generators[1]-[3]. Synchronous generators are divided into permanent magnet generators and non-permanent magnet generators. The axial type permanent magnet synchronous generator is a generator whose rotor and stator positions are perpendicular to its axis. This uses a permanent magnet on the rotor and coiled copper wire as a stator. To produce motor rotation without electrical energy using a permanent magnet motor [4], [5]. The first permanent magnet motor was introduced by Howard Johnson in 1980 and got a patent in America. But until now it has not been widely used. So it is necessary to develop an applicative. In principle, permanent magnet motors work based on the difference in magnetic repulsion forces on the rotor and stator. The difference in magnetic repulsion is converted into rotary motion. [6]–[8]used a superconductor on a neodymium magnet so that it could produce low power losses, resulting in high motor performance. Meanwhile, Minato 1998, using a permanent magnet with the same polarity on the rotor, forms an angle to the rotor line, but still uses an electric current supply to make a stator magnet. [9], [10]who conducted the motor magnet permanent Johnson experiment using Quick Field software with the result that the magnetic configuration is periodic at 45 °, while the motor rotation is influenced by the magnetic curve and rotor-stator distance.

In the 1980s,China invented magnetic field technology and succeeded in making free energy devices in which one unit measuring 150cm x 120cm x 80cm can produce about 5 KW of power. The way this free energy machine works only uses magnets as the main driving force, this tool is without batteries, without electricity, and without fuel, can move continuously at high speed, is stable, and is very strong in thrust or pull, so it can play a dynamo 1000 watts to 5000 watts of electricity[11].

[12]-[14] developed an extraordinary electric generator, generator, and heating device which operates based on permanent magnets. One device absorbs 100 watts of electricity from the source, produces 100 watts to recharge the source, and generates more than 140 BTU of heat in two minutes.

[15], [16] with US patent have made two models of electric transformers powered by permanent magnets. This tool uses 6 watts of the electrical input to control the magnetic field path that comes out of a permanent magnet. By sending a magnetic field, first to the output coil, and then to the second output coil, and by doing this repeatedly and quickly like ping-pong, the device can produce 96 watts of electrical output with no moving parts. Bearden refers to his device as a Moving Electromagnetic Generator (MEG), or in other words, a stationary magnet generator. [17]-[18] has duplicated the Bearden set in France. The basic principle of this tool

was first disclosed by Frank Richardson from the United States in 1978. Troy Reed, also from America, has made a special magnetic fan model that heats up when the fan rotates. The device absorbs the same amount of energy to rotate the fan, whether it generates heat or not [19].

This research uses a set of permanent magnets for both the rotor and so that the operation does not use electrical energy at all. The position of the rotor and stator magnets is placed at an angle to the motor rotor rotation path. The motor can rotate due to magnetic thrust alone, and not magnetic thrust and attraction, as the Johnson motor works. It is necessary to do research related to the influence of the rotor-stator distance variables of a magnetic motor, and the angle of attack between the rotor magnet and the horizontal axis on rotation and power.

II. Magnet Generator Design

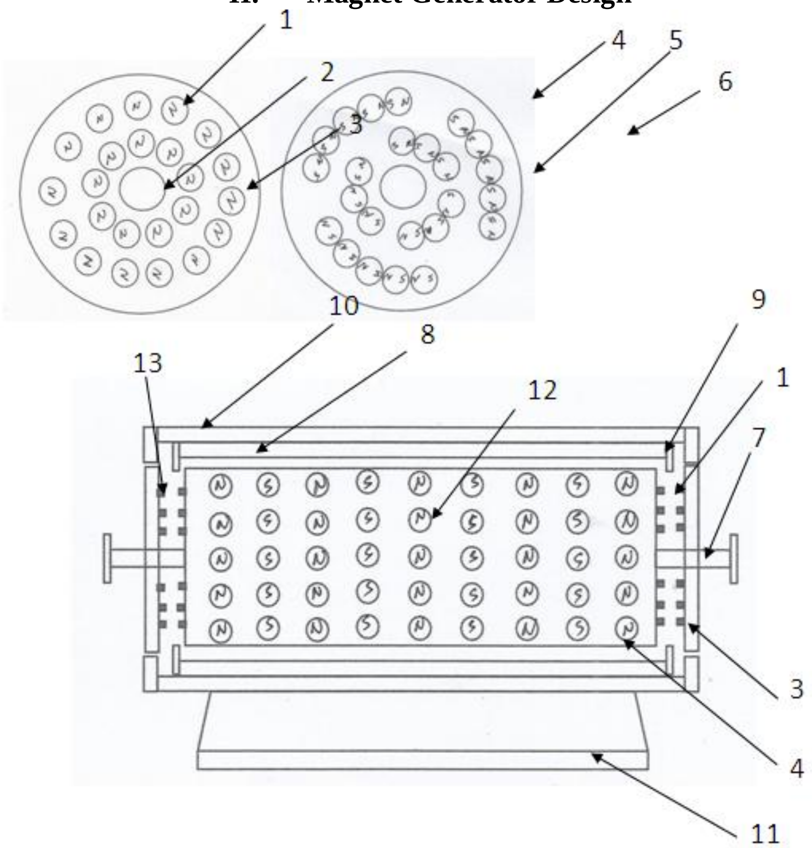

Figure 1. Magnet Generator Design

With 1. Stator magnetic motor. 2. Inner Diameter of stator magnetic plate. 3. stator plate. 4. rotor of the magnetic motor (= generator rotor). 5. Inner diameter of rotor magnetic plate (= rotor magnet generator). 6. Magnetic motor rotor plate (= magnet generator rotor). 7. Threaded shaft. 8. Copper wire coil. 9. Place copper wire. 10. Magnetic generator housing 11. Magnetic generator buffer 12. Rotor magnet generator. 13. Magnet motor rotor.

In a magnetic motor as the generator driving, the placement of the magnets must be accurate so that there is no lock of magnetic forces. So that the rotating motion of the rotor runs normally, without any motion locking process.

Tool testing is carried out to obtain data from the tools that have been made. In testing, a comparison of the results obtained from the research is carried out against the target to be achieved, if the results have not reached the target, then the design is improved until the results are as expected. Testing is done with no load and a load of 100 W lamp. Analysis of the test data is then carried out to obtain the optimal design.

This magnetic motor uses a rotor and stator system. Where the arrangement of the rotor and stator is different. The unbalanced amount of repulsion and pull forces can move the rotor, resulting in a magnetic motor rotation. The unequal amount of repulsion and pull forces using an odd number of magnetic groups on the rotor. Whereas in the arrangement of the stator magnets close together but the distance between the magnetic groups is different.

The rotor consists of plates of non-magnetic material, with magnetic groups, using a Diametrically Magnetized Cylinder Neodymium Magnets type magnet. The arrangement of each magnetic group consists of several magnets that have N-S poles next to each other. The stator section consists of plates of non-magnetic material, with neodymium magnets forming a circle with the same distance (radius) as the rotor. The magnets on the stator use a neodymium-cylinder-magnet-rare-earth-cylinder-magnet type while the distance between magnets in the magnetic arrangement varies. The magnetic poles on the stator are composed of only one uniform pole (N or S). To produce rotation, the rotor and stator are close to one axis. In the rotor, the meeting between the non-magnetic plate and the shaft is given to place the bearing holder, so that the rotor can rotate, resulting in motor rotation.

III. Material And Method

A set of permanent magnet generator modules for measuring the speed and torque generated by the permanent magnet generator. The rotor-stator is made of magnets that are placed on the resin. The rotor-stator magnet motor gab is set (5, 10, 15, 20, and 25) mm while the angle of attack of the rotor-stator is 30°, 45°, 60°. Making tools is done by starting with collecting materials and equipment needed in designing a generator. The manufacture of the generator is carried out very carefully, thoroughly, and precisely so that it can avoid failure or damage that may occur, and it is hoped that results can be obtained as expected. Tool testing is done to obtain data from the tools that have been made. In testing, a comparison of the results obtained from research is carried out against the targets to be achieved. The test is carried out with no load and with a lamp load of 100 W to determine the output power of the generator that has been made.
Experiments were carried out using a tachometer

IV. Results And Discussion

Permanent magnet generator designed by arranging a permanent magnet as a rotor or magnetic motor stator. The permanent magnets used are of the neodymium type. Permanent magnet replacement is intended to increase the output power of the generator so that at low speeds a large output power can be obtained.

This permanent magnet generator uses a magnetic motor to drive it. The distance between the rotor and the generator stator used is from 5 - 25 mm by still considering the mechanical construction of the generator. The rotating motion of the generator rotor cuts the stator magnetic field, causing an electric voltage. Generator testing is carried out with no load and 100 W of power to determine the maximum voltage, current, frequency, and output power. Figure 2 shows the gap relating to the output power at various angles.

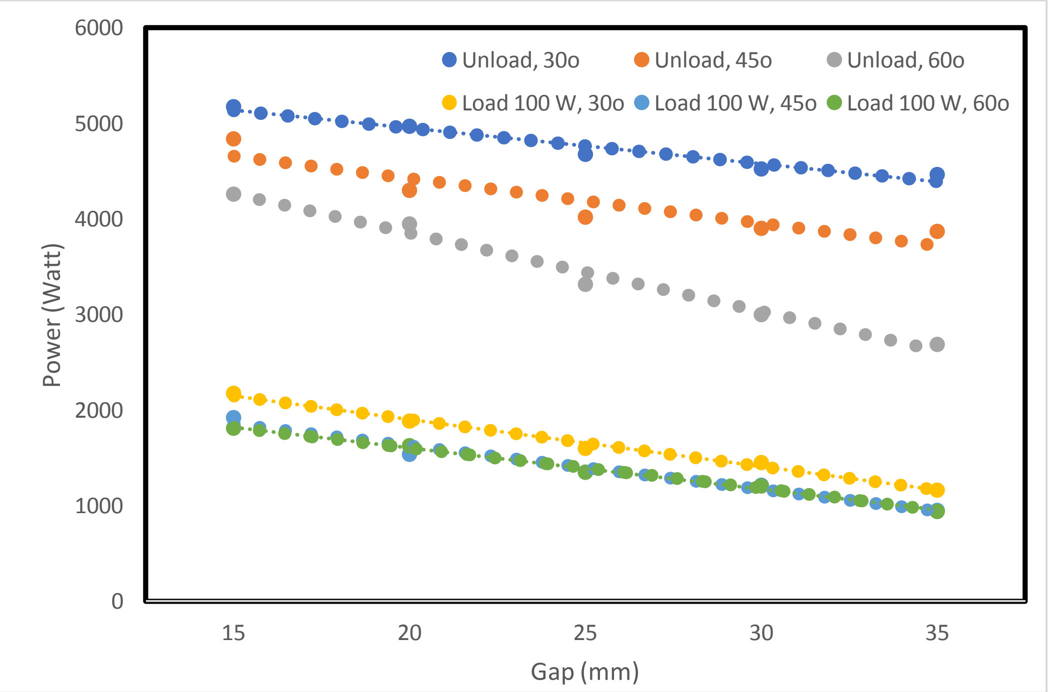

Figure 2. The gap relating to the output power at various angles

Figure 2 shows the results of the unload test where the generator power has a significant increase which is directly proportional to the rotor-stator gap. From Figure 2 it can be seen that the generator frequency also increases which is directly proportional to the rotor rotational speed. The lowest output power is obtained at a gap of 35 mm with a rated power with a load of 939.32 Watts. While the highest output power is at a gap of 10 mm with no load conditions of 5483.52 Watts. As the gap gets closer, the power gets bigger, the rotation speed gets bigger too. This is indicated by the stress has increased significantly by the increase in rotation speed and followed by an increase in frequency when the gap is getting closer. The highest voltage in this unload test was obtained at a frequency of 59.5 Hz with a voltage value of 224 V. This permanent magnet generator experienced an average voltage increase of 11.8%, at every 5 mm gap increase. When the generator is given a load, there is a decrease in voltage and current, resulting in decreased generator power. The further the gap between the rotor-stator, the power decreases linearly. This shows that the gap has a linear effect on the generated generator power.

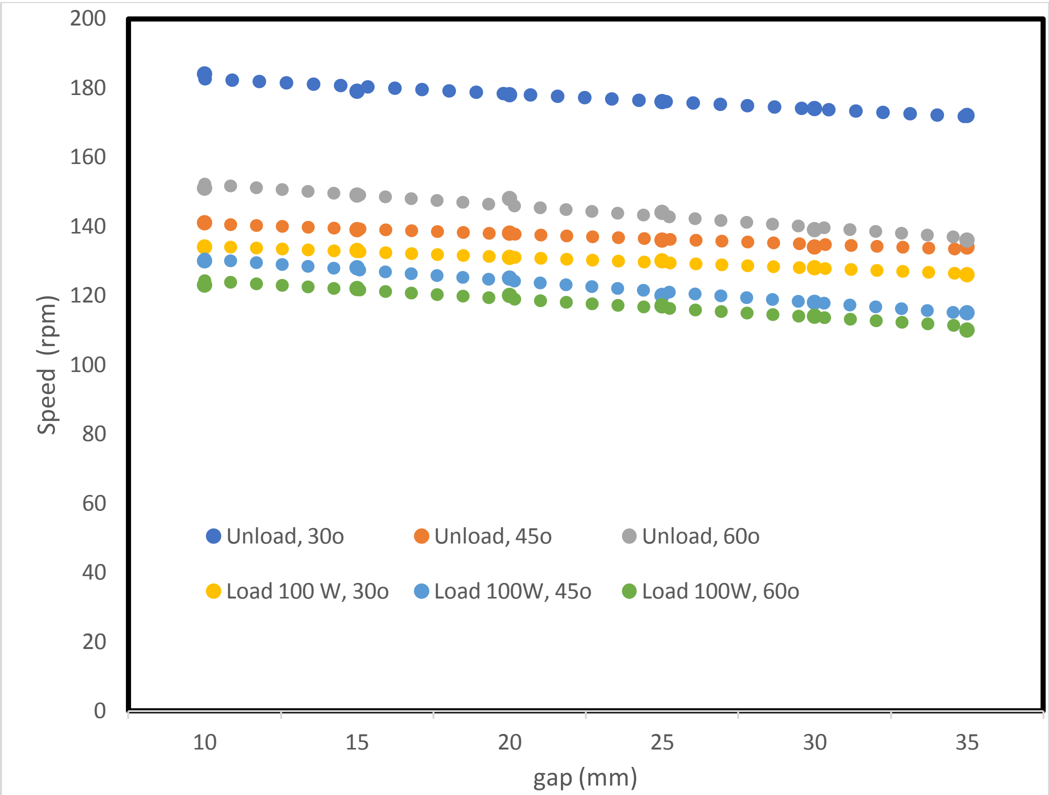

Figure 3. The relationship between the gap and motor rotation at various angles

Figure 3 shows a relationship between the stator-rotor gap and the rotational speed of the magnetic generator. The amount of rotation speed when given a load with no load shows a very striking difference. The closer the gap causes an increase in voltage and current also flows thus accelerating the rotational speed. The frequency also increases in value following the increase in the value of the speed when given a load, it is obtained that the voltage value is lower than the unload test at the same speed and number of turns. This happens because some of the generated stress loses stress on the load. The addition of load when the generator is inactive condition will generally make the generator rotational speed decrease, this will also have an impact on decreasing the frequency and decreasing the generator output voltage. The reason is that the load served will generate a current which then passes through the stator winding to produce a magnetic field in the opposite direction to the rotating field of the rotor so that the rotation of the rotor becomes restrained. However, in the research that has been carried out using this permanent magnet generator, when the load is carried out when the generator is in an inactive condition, the rotor rotational speed remains stable. This is because the load on the generator is too small so that the current flowing in the stator winding only creates a small magnetic field and is unable to withstand the rotating speed of the rotor.

V. Conclusion

From the results of research on the design of permanent magnet generators, several things were obtained, including:

- The lowest output power is obtained at a gap of 35 mm with a rated power with a load of 939.32 Watts. While the highest output power is at a gap of 10 mm with no load conditions of 5483.52 Watts. As the gap gets closer, the power gets bigger, the rotation speed gets bigger too. This is indicated by the stress has increased significantly by the increase in rotation speed and followed by an increase in frequency when the gap is getting closer. The generator power has a significant increase which is directly proportional to the rotor-stator gap. As the gap gets closer, the power gets bigger, the rotation speed gets bigger too.

- The closer the gap causes an increase in voltage and current also flows thus accelerating the rotating speed. The frequency also increases in value following the increase in the value of the speed when given a load, it is obtained that the voltage value is lower than the unload test at the same speed and number of turns.

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