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Utilization of Free Energy for Power Supply Using Magnetic Generators in Military Operations in Remote Areas

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INDEXING	ABSTRACT
Keywords: Keyword 1 : Permanent Magnet Generator Keyword 2 : RPM Keyword 3 : Renewable Energy Keyword 4 : Free Energy	This research aims to assist the primary duties of the Indonesian Army (TNI-AD) by utilizing a magnet generator with a free energy concept as a solution for energy supply in military operations, especially in remote areas where conventional energy sources are scarce and difficult to access. The magnet generator is designed to operate at low speeds, enabling it to charge military devices efficiently. By designing, testing, and analyzing the magnet generator optimized for low-speed operation, the research aims to ensure that the generator produces energy that can be used in remote military operation fields. The test results indicate that the generator is capable of producing high energy with an efficiency reaching 82.3% at 200 RPM. The energy produced is sufficient to charge military devices and provide a stable backup power supply. With this capability, the designed magnet generator can serve as a reliable power source to support military operations in hard-to-reach areas.

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INTRODUCTION

In supporting the main tasks of the Indonesian Army (TNI-AD), especially in remote and hard-to-reach areas, the availability of reliable energy sources becomes crucial. In terrains such as forests, mountains, and border regions, access to conventional energy sources is often limited or even non-existent (Sugiarta *et al*., 2024). Dependence on fossil fuels or conventional batteries requires complex logistics (Prayogo *et al*., 2021), However, it also elevates operational risks. Consequently, the urgency for efficient and practical alternative energy solutions is paramount.

One potential solution is the utilization of magnetic generators based on the free energy concept (Triana *et al*., 2019). With a design that allows the generator to operate at low speeds, this system can maximize the utilization of available energy, even in challenging environmental conditions (Chen *et al*., 2024).

This study aims to develop and test a magnetic generator optimized specifically for military applications in remote areas. With a focus on powering military devices and providing a stable backup power supply, this generator is expected to meet energy demands in situations where access to conventional energy sources is severely limited (Mujadin *et al*., 2021). The research will involve design, testing, and analysis to ensure the generator can operate effectively and efficiently in difficult environments (Sugiarta *et al*., 2024).

The ultimate goal of this research is to provide an autonomous and sustainable energy solution for the Indonesian Army (TNI-AD), enhancing operational capabilities in remote areas. By reducing reliance on fuel logistics and conventional batteries, this solution aims to improve operational efficiency (Widiatmoko *et al*., 2024), This magnetic generator is anticipated to provide sufficient and stable power to support various military equipment (Rokhim & Alfi, 2019), enhancing efficiency and effectiveness in mission execution (Pliego, 2024).

LITERATURE REVIEW

This study utilizes various tools and materials to design, construct, and test a magnetic generator based on the free energy concept. Neodymium permanent magnets (NdFeB) are used as the primary source of the magnetic field in the generator (Anderson *et al*, 2008). These magnets are chosen for their high energy product, which is effective in generating strong magnetic flux at low speeds. The ability of neodymium magnets to maintain their magnetic strength supports efficient energy conversion within the generator.

For the stator windings, 1.5 mm diameter copper wire is used, known for its excellent electrical conductivity. This copper wire ensures optimal and efficient transmission of electrical current generated by the magnetic flux produced by the neodymium magnets (Gutfleisch *et al*, 2011). The winding design on the stator is configured to maximize the generation of electrical current from the magnetic field, thereby enhancing the generator's efficiency.

The rotor and stator are made from lightweight yet durable metals such as aluminum or stainless steel (Solomon *et al*, 2020). These materials are selected to ensure mechanical stability and resistance to extreme operational conditions. The design takes into account factors such as dynamic balance and structural integrity to ensure smooth operation and minimize vibration. A simple cooling system, such as cooling fins or airflow, is incorporated to maintain the operational temperature of the generator and prevent overheating, which is crucial to sustaining efficiency and extending the lifespan of the equipment.

Measuring instruments, such as a multimeter, are used to measure voltage and current during testing. These instruments enable real-time monitoring of the generator's power output and assist in performance analysis (Rahman *et al*, 2018). Additionally, MATLAB software is used for simulation and data analysis (Chaturvedi, 2017). This software facilitates the mathematical modeling of the generator and aids in evaluating the system's performance and efficiency, both in laboratory and field conditions. With this combination of tools and materials, the research aims to ensure that the magnetic generator operates effectively and meets energy requirements under various operational conditions.

RESEARCH METHOD

This study employs a field experiment method to design, develop, and test a magnetic generator based on the free energy concept, specifically for military operations in remote areas (Neuber, 2005). The experiment focuses on evaluating the generator's efficiency in providing stable power supply to military equipment under various operational conditions, especially in areas with limited access to conventional energy sources. The study is conducted over a six-month period, with testing both in laboratory and field conditions.

1. Location and Time of Research

The research is carried out in a controlled laboratory environment, followed by field testing in a remote area located in a mountainous region of East Java, Indonesia. This location was selected due to its challenging conditions, including limited access to electricity and harsh weather. The experiment runs for six months, from the initial setup and construction of the magnetic generator to the final evaluation of its performance in real military-like conditions.

2. Research Subject

The research subjects consist of two primary configurations:

a. A magnetic generator using neodymium permanent magnets and copper windings, designed for military applications.
b. Conventional power supply systems, including fossil-fuel generators and battery-operated equipment, used as a comparison.

Both systems are tested for their power output, efficiency, and reliability under extreme environmental conditions typical of military operations.

3. Tools and Materials

a. Generator Design and Construction:
   1) Neodymium permanent magnets (NdFeB), used as the primary source of magnetic fields due to their high energy product.
   2) Copper wire (1.5 mm diameter) for the stator windings to maximize electrical conductivity and power generation.
   3) Rotor and stator constructed from lightweight, durable materials such as aluminum or stainless steel.
   4) Simple cooling systems (e.g., fins or airflow) to prevent overheating.

b. Power Output Measurement:
   1) Multimeter and oscilloscope for real-time voltage and current measurements during testing.

c. Simulation and Data Analysis:
   1) MATLAB software for mathematical modeling, performance simulation, and efficiency analysis of the magnetic generator.

d. Comparative Systems:
   1) Conventional fossil-fuel generators and battery-powered devices for comparison in terms of power supply reliability, logistical support, and operational risks.

4. Tools and Materials

a. Free Variables:
   1) Power supply systems (magnetic generator, conventional generators, battery systems).

b. Bound Variables:
   1) Power output (voltage and current), operational efficiency, system reliability.

c. Control Variables:
   1) Environmental conditions (temperature, humidity, weather), military equipment used, experimental duration.

5. Data Analysis Techniques

The data obtained will be analyzed quantitatively. The power output of the magnetic generator will be compared to conventional systems using statistical methods (e.g., t-test for two independent samples). The efficiency of the generator will be calculated by evaluating the power output per unit of input energy. The reliability and operational risks of both systems will be assessed through real-time performance monitoring during field tests. This analysis will provide insights into the feasibility of using free energy-based magnetic generators for military operations in remote areas.

RESULT AND DISCUSSION

This study examines the performance of a free energy-based magnetic generator, considering variables such as magnet type, stator winding configuration, rotor speed, and the physical design of the generator. The data presented reflect the results of testing conducted to evaluate the accuracy and efficiency of the generator.

1. Test Data Of Magnet Type

Testing was conducted using two types of neodymium permanent magnets, namely NdFeB class N52 and N42. The test results show the power output for each type of magnet.

Table 1. Magnet Type Testing

Magnet Type	Voltage (V)	Current (A)	Output Power (W)
NdFeB N52	12.5	2.2	27.50
NdFeB N42	11.0	2.0	22.00

(Source : Author, 2024)

Based on the Table 1, two types of magnets were tested. It can be observed that the NdFeB N52 magnet provides a higher power output compared to the N42. This is due to the stronger magnetic field of the N52 magnet, which enhances the energy conversion efficiency in the generator.

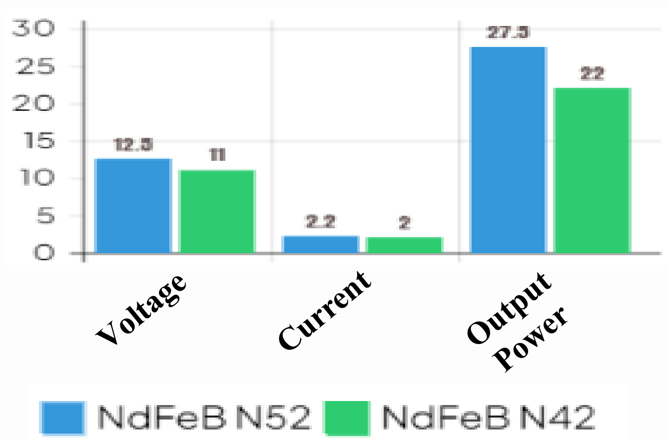

Figure 1: Testing of Different Types of Magnets
(Source : Author, 2024)

From the graph above, it can be concluded that soil moisture sensor-based irrigation systems significantly increase crop yields, demonstrating the potential of this technology in optimizing farmland productivity.

2. Test Data Of Stator Winding Configuration

Three stator winding configurations were tested with different numbers of windings: 1000, 1500, and 2000 turns. The test data are as follows:

Table 2. Stator Winding Configuration Testing

Rotor Speed (RPM)	Voltage (V)	Current (A)	Output Power (W)	Efficiancy (%)
50 RPM	10.5	1.9	19.95	76.0
100 RPM	11.7	2.1	24.57	78.5
200 RPM	12.5	2.3	28.75	82.3

(Source : Author, 2024)

Based on Table 2, it can be concluded that the LCD display test results meet expectations. The LCD can clearly display data in the form of text, such as the main menu, prayer times, exercise times, meal times, and other information.

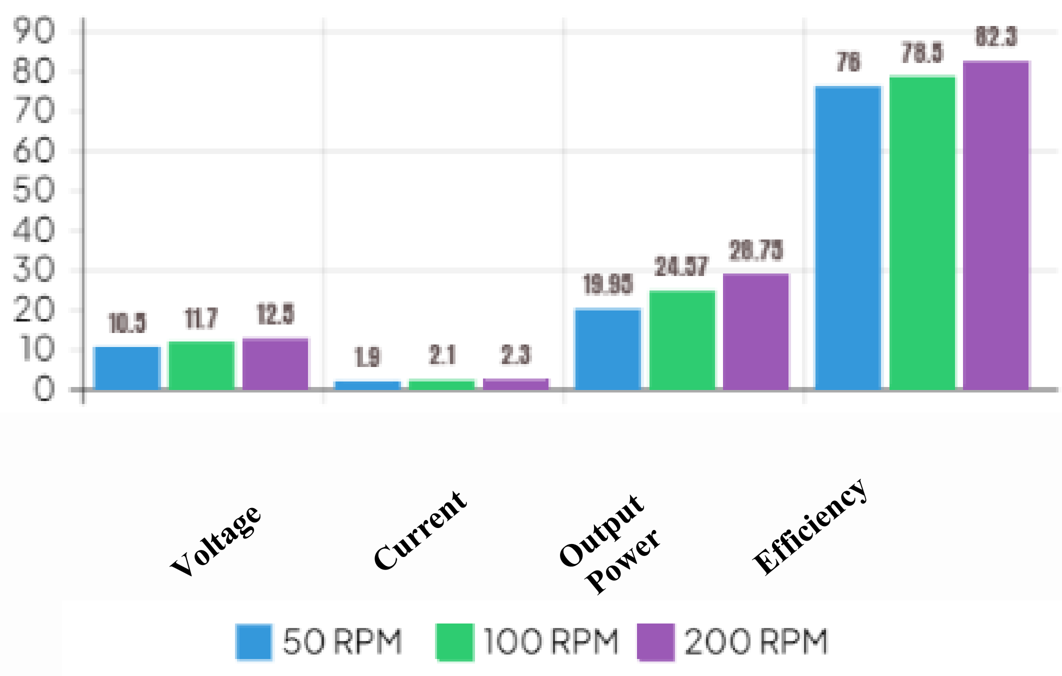

Figure 2: Test data for stator winding configuration.
(Source : Author, 2024)

3. Test data for rotor speed

Testing was conducted at rotor speeds of 50 RPM, 100 RPM, and 200 RPM. The test data show the following:

Table 3. Rotor Speed Testing

Rotor Speed (RPM)	Voltage (V)	Current (A)	Output Power (W)	Efficiency (%)
50 RPM	10.5	1.9	19.95	76.0
100 RPM	11.7	2.1	24.57	78.5
200 RPM	12.5	2.3	28.75	82.3

(Source : Author, 2024)

At a rotor speed of 200 RPM, the generator produced an output power of 28.75 W with an efficiency of 82.3%. At 100 RPM, the output power was 24.57 W with an efficiency of 78.5%, and at 50 RPM, the output power reached 19.95 W with an efficiency of 76.0%.

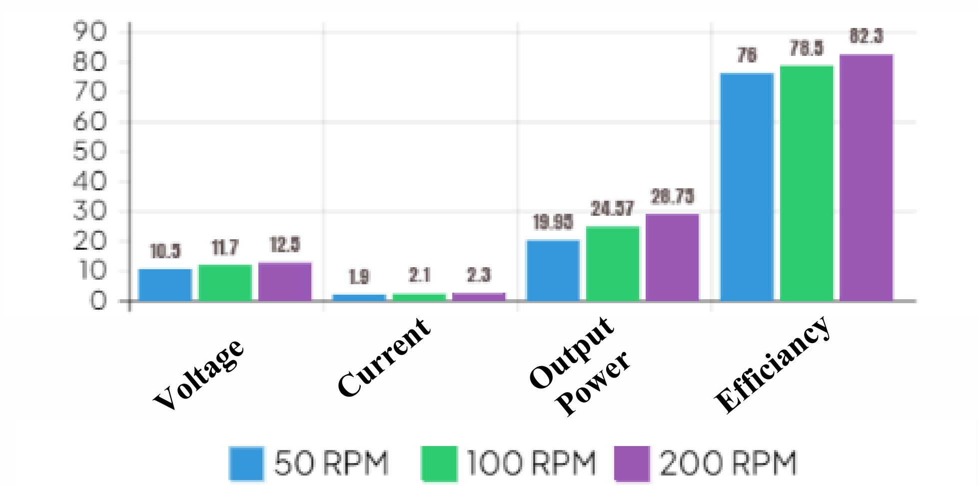

Figure 3: Rotor Speed Testing
(Source : Author, 2024)

CONCLUSION

The testing results of the free energy-based magnetic generator at various rotor speeds show a consistent trend of performance improvement with increasing speed. At a rotor speed of 50 RPM, the generator produces a relatively low output power of 19.95 W with an efficiency of 76.0%. This data suggests that at low speeds, the generator is less capable of optimally utilizing mechanical energy. This could be due to the slow rotation, insufficient to generate a strong enough magnetic field and maximize the energy conversion process.

When the rotor speed is increased to 100 RPM, a noticeable improvement is observed in the output power, which rises to 24.57 W, and efficiency increases to 78.5%. The higher rotor speed enhances the conversion of mechanical energy to electrical energy, indicating that the generator is more effective in converting kinetic energy into electrical power at medium speeds. This improvement may be due to increased interaction between the magnets and stator windings, allowing more energy to be captured and converted into electrical power.

At a rotor speed of 200 RPM, the best results are achieved with a voltage of 12.5 V, current of 2.3 A, output power of 28.75 W, and the highest efficiency of 82.3%. The significant increase in output power and efficiency at this speed indicates that the generator is operating at its maximum capacity at high speeds. This is consistent with the basic principles of electromagnetic generators, where an increase in rotor speed enhances the magnetic field and, consequently, the output power. The higher rotor speed enables the generator to achieve optimal efficiency with better energy conversion, which is crucial for applications that require stable and high power, such as military operations in remote areas.

Overall, these results demonstrate that rotor speed is a key factor in determining the generator's efficiency. By increasing the rotor speed, the generator can produce higher power and better efficiency, making it more suitable for applications that require a reliable and efficient power source under challenging operational conditions.

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