

Fabrication of swing powered electricity generator

Dr Abdul Munaf Shaik, K.Madhukar Reddy, V.Tanishq, K.Devi Sri Prasad, G.Vamshi

- 1 Professor, MECH, Sree Dattha Institute Of Engineering And Science, Sheriguda, Telangana, India
- 2 student, MECH, Sree Dattha Institute Of Engineering And Science, Sheriguda, Telangana, India
- 3 student, MECH, Sree Dattha Institute Of Engineering And Science, Sheriguda, Telangana, India
- 4 student, MECH, Sree Dattha Institute Of Engineering And Science, Sheriguda, Telangana, India
- 5 student, MECH, Sree Dattha Institute Of Engineering And Science, Sheriguda, Telangana, India

ABSTRACT

The increasing demand for electricity and the depletion of conventional energy resources have created a need for alternative and sustainable energy generation methods. This project presents the fabrication of a swing-powered electricity generator, which utilizes the mechanical energy produced by the oscillatory motion of a swing and converts it into electrical energy. The system consists of a swing mechanism connected to components such as a shaft, gears, and a generator (dynamo), which work together to convert back-and-forth motion into rotational motion for power generation.

When a person uses the swing, the kinetic energy generated is transferred through the mechanical arrangement to the generator, producing electricity. The generated power can be stored in batteries and used for low-power applications such as lighting or charging small electronic devices. Studies show that human motion and vibration-based systems can effectively produce usable electrical energy for small-scale needs, making them suitable for sustainable applications.

This project aims to demonstrate an eco-friendly, low-cost, and innovative approach to energy generation by utilizing wasted human energy. It is particularly useful in public places like playgrounds and in areas with limited power supply. Overall, the swing-powered electricity generator promotes renewable energy usage, energy conservation, and sustainable development.

Keyword : - Swing Powered Electricity Generator, Human Powered Energy, Kinetic Energy Harvesting, Mechanical to Electrical Energy Conversion, Renewable Energy, Electromagnetic Induction, Prototype Fabrication, Power Generation System, Sustainable Energy Solution .

1. INTRODUCTION

In today's world, the demand for electricity is increasing rapidly due to population growth and continuous technological development. At the same time, conventional energy sources are getting depleted, which creates a need for simple, low-cost, and eco-friendly methods of power generation. One such innovative idea is the fabrication of a swing-powered electricity generator, where energy produced from everyday human activities is converted into useful electrical energy.

This project focuses on utilizing the motion of a swing to generate electricity. When a person swings back and forth, mechanical energy is produced in the form of oscillatory motion. This motion can be transferred through mechanical components like shafts, chains, and gears to a generator, which converts it into electrical energy. The generated electricity can be stored in a battery and used for small applications such as lighting bulbs, charging mobile devices, or powering low-energy equipment.

2. LITERATURE REVIEW

Juntakan Taweekun and co-authors studied the design and fabrication of a swing-based electricity generation system. Their work mainly focused on converting the mechanical energy produced during swinging into electrical energy using simple mechanisms. They explained that playground swings can be effectively used to generate electricity, especially in public areas where many people use swings regularly. The generated energy can be stored in batteries and later used for small electrical applications, making it a cost-effective and eco-friendly solution.

Mitsuhide Sato proposed a swing-magnet type generator that converts vibration and oscillatory motion into electrical energy. His study showed that even small movements, such as those from bicycles or similar oscillating systems, can generate usable voltage. The research highlighted the importance of magnetic flux and swing motion in improving power output, proving that swing-based systems can be efficient for low-power applications like LEDs.

J.S. Partridge analyzed the potential of generating electricity from everyday activities like swings and revolving doors. His

study emphasized that human motion is an untapped energy source and can be converted into electricity using suitable mechanisms. The research concluded that although the energy generated is small, it is useful for low-power devices and contributes to sustainable energy solutions.

Yangyang Yan developed a hybrid generator using swing-based structures combined with triboelectric and electromagnetic techniques. His work demonstrated that combining multiple energy harvesting methods can significantly improve efficiency. The swinging motion plays a key role in generating repeated contact and separation, which enhances energy output in modern hybrid systems.

Junxiang Jiang reviewed various vibration-based energy harvesting techniques, especially using piezoelectric materials. His study showed that human motion, including swinging movements, can be effectively converted into electrical energy using advanced materials. The research highlighted that such systems are widely used in small-scale applications and have great potential for future energy solutions

3. METHODOLOGY

The methodology of the swing-powered electricity generator begins with the design and fabrication of a strong and stable swing structure. The swing frame is constructed using metal or rigid materials to support continuous oscillatory motion. Initially, the swing is assembled and checked for smooth back-and-forth movement, ensuring safety and proper alignment. After this, the mechanical components required for power generation are selected, including shafts, bearings, gears, chains, and a generator (dynamo).

The next step involves converting the swinging motion into useful mechanical energy. When the swing moves, it produces oscillatory motion, which is transferred to a linkage mechanism connected to a shaft. This motion is further amplified and converted into rotational motion using a freewheel or ratchet mechanism. The freewheel ensures that the motion is converted into a single directional rotation even though the swing moves back and forth. A flywheel is also connected to maintain continuous rotation and improve efficiency.

After obtaining rotational motion, it is transmitted to the generator using gears and chain drives. These transmission systems help increase the speed of rotation to meet the required input speed of the generator. The generator then converts the mechanical energy into electrical energy based on the principle of electromagnetic induction. The generated electricity is collected and stored in a rechargeable battery for later use.

Finally, the output is tested by connecting small electrical loads such as LED bulbs or mobile charging circuits. The system is evaluated for efficiency, power output, and stability. Adjustments are made to improve performance, such as optimizing gear ratios or reducing mechanical losses. This step-by-step methodology ensures the effective conversion of human mechanical energy into usable electrical energy in an eco-friendly and cost-efficient manner.

Mechanical Properties of the components

Sl.No.	Components	Material	Composition	Properties
1	Supporting Frame	Mild Steel	Carbon (C): 0.1-0.3%	Strength: 250-300 MPa
2	Shaft	MS Bright	Carbon (C): 0.05-0.10%	High Tensile Strength
3	Free Wheel	Tempered Steel	Silicon (Si): 0.2-1.0%	High Strength High Hardness High Toughness Good
4	Sprocket	Alloy Steel	Carbon (C): 0.28-0.33% Manganese (Mn): 0.40-0.60%	Tensile Strength: 560-670 MPa Corrosion Resistance

4. Material Performance Analysis

Material performance analysis is an important step in this project because it helps in selecting suitable materials that can withstand different working conditions of the swing-powered electricity generator. In general, material performance refers to how well a material behaves under forces, temperature changes, and environmental conditions such as moisture and wear. Since this system involves continuous swinging motion, the materials used must be strong, durable, and capable of handling repeated loads without failure.

In this project, materials like mild steel, aluminium, and stainless steel are mainly considered. Mild steel is widely used for the frame because it has high strength and can withstand heavy loads without deformation. Aluminium is preferred in some parts due to its lightweight nature, which helps in reducing overall system weight and improving efficiency. Stainless steel is chosen where corrosion resistance is required, especially in outdoor conditions. Each material is selected based on its mechanical properties such as strength, hardness, and elasticity, which determine how it reacts to applied forces.

5. Experimentation

The experimentation of the swing-powered electricity generator was carried out to analyze how effectively mechanical energy from the swing can be converted into electrical energy. Initially, the fabricated model was set up with all components such as the swing, shaft, gears, chain drive, and generator properly aligned. The system was checked to ensure smooth motion and proper transmission of energy from the swing to the generator. Once the setup was ready, different experimental trials were conducted.

In the first experiment, the swing was operated manually at different speeds (slow, medium, and fast) to observe the variation in electrical output. A multimeter was connected to the generator output to measure voltage and current. It was observed that as the speed of swinging increased, the rotational speed of the generator also increased,

resulting in higher voltage output. This confirms that power generation depends directly on the speed of motion . Further experimentation included checking the effect of mechanical efficiency by observing losses due to friction in bearings, chain, and gears. It was found that proper lubrication and alignment improved performance and reduced energy loss. According to studies, mechanical transmission systems play a key role in improving the efficiency of swing-based generators .

Overall, the experimental results proved that the swing-powered electricity generator is capable of converting human mechanical energy into usable electrical energy. Although the output is small, it is sufficient for basic applications and demonstrates an effective method of energy conservation and renewable power generation .

6. EXISTING SYSTEM, PROPOSED SYSTEM AND MODULE SPLIT-UP

In the existing system, electricity is mainly generated using conventional sources such as thermal power plants, hydroelectric plants, and other large-scale energy systems. These methods depend heavily on natural resources like coal, water, and fossil fuels, which are limited and cause environmental pollution. Also, small-scale human energy is generally wasted and not utilized for power generation. In playgrounds, for example, the energy produced by children while using swings is not used for any productive purpose. Studies show that this mechanical energy from swinging motion can actually be converted into electrical energy but is usually ignored in traditional systems . Hence, the existing system lacks the concept of utilizing human motion as a renewable energy source.

The proposed system introduces a swing-powered electricity generator that converts human mechanical energy into electrical energy. In this system, the swinging motion is captured and transferred through mechanical components such as links, shafts, and gears. This motion is then converted into rotational motion using mechanisms like a freewheel or flywheel. Finally, the generator converts this mechanical energy into electrical energy based on electromagnetic induction. The generated electricity can be stored in batteries and used for small applications like lighting or charging devices. According to research, the back-and-forth motion of a swing can be effectively converted into continuous rotational motion and used for power generation . This system is eco- friendly, cost-effective, and helps in utilizing wasted human energy efficiently.

The project is divided into different modules for better understanding and implementation:

Swing Mechanism Module

This module includes the swing frame, seat, and support structure. It is responsible for producing oscillatory motion when a person uses the swing.

Motion Conversion Module

This module converts the back-and-forth swinging motion into rotational motion. It includes components like connecting rods, crank mechanisms, and freewheel systems.

Power Transmission Module

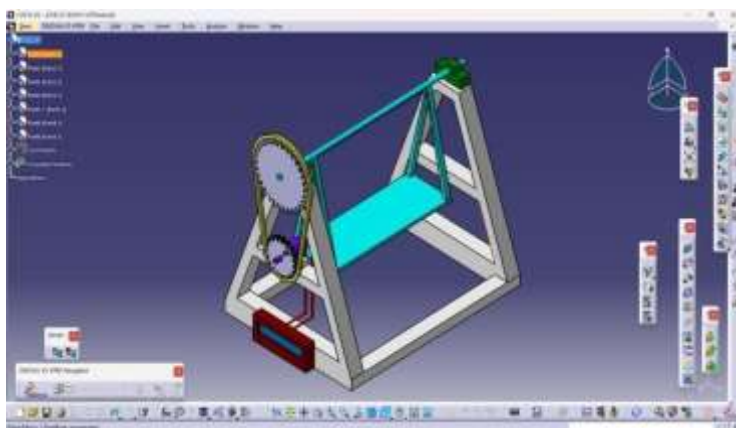
This module transfers the rotational motion to the generator using gears, chains, and shafts. It also helps in increasing speed for efficient power generation.

Power Generation Module

This consists of the generator (dynamo), which converts mechanical energy into electrical energy using electromagnetic principles.

Energy Storage and Output Module

This module includes batteries and electrical circuits to store the generated energy and supply it to loads like LED bulbs or mobile chargers.



FINAL ASSEMBLY

7. RESULTS AND DISCUSSION

After completing the project, the swing-powered electricity generator was tested to check how well it works. The results clearly showed that electricity can be generated from the swinging motion. When the swing was used, the generator started rotating and produced electrical output, which was measured using a meter. This proves that the system is working properly and the idea is practical. It was noticed that the amount of electricity produced depends on how fast and continuously the swing moves. When the swing was slow, only a small amount of voltage was generated, and the connected LED glowed very dimly. But when the swing moved faster, the generator rotated at a higher speed and produced more electricity, making the LED glow brighter. Also, when the swinging was smooth and continuous, the output was more stable. If the motion was uneven, the voltage kept changing.

The mechanical parts like gears, chain drive, and flywheel played an important role in improving performance. The flywheel helped to keep the generator running even when the swing slowed down for a moment. However, some loss of energy was observed due to friction in moving parts. By proper lubrication and alignment, these losses can be reduced and efficiency can be improved.

From the testing, it is clear that the system can be used for small applications like lighting LEDs or charging small devices. Even though the power produced is not very high, it is useful and shows how human energy can be used effectively instead of being wasted.

Overall, the project results are positive and show that the swing-powered electricity generator is a simple, eco-friendly, and useful method of generating small amounts of electricity.

8. TEST RESULTS

S.No	Swing Speed	Oscillations (per min)	Output Voltage (V)	Output Current (mA)	Observation
1	Slow	10-15	1.2-1.8	20 – 40	LED glows dimly
2	Medium	20-30	2.5-4.0	50 – 80	LED glows normally
3	Fast	35-50	4.5-6.0	90 – 120	LED glows brightly
4	Continuous	40+	5.0-7.0	100-150	Stable output observed

9. CONCLUSION

In this project, we successfully designed and fabricated a swing-powered electricity generator and proved that electricity can be generated from simple human motion. The results showed that when the swing moves, the mechanical energy produced can be converted into electrical energy using a generator. Even though the amount of power generated is small, it is still useful for basic applications like lighting LEDs and charging small devices.

This project clearly shows that energy which is usually wasted in daily activities can be used in a productive way. It is a low-cost, eco-friendly, and innovative method of power generation. The system works better when the swing moves continuously and at higher speeds, and its performance can be improved further by reducing mechanical losses.

Overall, this project helps in understanding the concept of renewable energy and encourages the use of alternative energy sources. It is especially useful in places where electricity supply is limited and also promotes energy conservation and sustainability.

10. FUTURE SCOPE OF WORK

This project has a lot of scope for improvement and development in the future. Right now, the system generates only a small amount of electricity, but with better design and advanced components, the output can be increased. For example, using high-efficiency generators, better gear mechanisms, and reducing friction losses can improve overall performance.

In the future, this concept can be applied on a larger scale in public places like parks, schools, and playgrounds where swings are used regularly. If multiple swings are connected to a single system, more electricity can be generated and stored. This energy can be used for lighting street lamps, charging stations, or other small electrical needs.

Also, the system can be improved by adding batteries with higher capacity and smart energy storage systems to store and use power efficiently. New technologies like sensors and automatic control systems can be used to monitor energy generation and usage.

Overall, the swing-powered electricity generator has good potential as a renewable energy source. With further improvements, it can become a useful and practical solution for energy conservation and sustainable development in the future.

REFERENCES

- [1] J. Taweekun et al., "Design, Fabrication and Experimentation of Swing Electricity Power Generation System," *International Journal of Engineering and Technology*, 2018.
- [2] M. Sato, T. Takemura, and T. Mizuno, "Voltage Improvement of a Swing-Magnet-Type Generator for Harvesting Bicycle Vibrations," *Energies Journal*, 2022.
- [3] Gagare Vikrant E. et al., "Electricity Generation and Bottle Crushing by Using Swing," *International Journal of Advance Research and Innovative Ideas in Education*, 2017.
- [4] Jayawant Goyakar et al., "Electrical Energy Generation by Using Swing," *International Journal for Scientific Research and Development*, 2017.
- [5] Prasad Giri et al., "Design and Development of Swing Mechanism for Electricity Generation," *International Journal of Advanced Research in Science, Communication and Technology*, 2025.
- [6] Abdul, A. Z., and Abubakar, A. M., "Potential Swing to Natural Gas-Powered Electricity Generation," *International Journal of Natural Sciences*, 2021.
- [7] CERFRED A. Alcantara, "Development of a Pendulum Driven Electric Generator," *International Journal of Innovative Research in Technology*, 2026.