**NOVATEUR PUBLICATIONS**
**JournalNX- A Multidisciplinary Peer Reviewed Journal**
**ISSN No: 2581 - 4230**
**VOLUME 11, ISSUE 2, February– 2025**

# DUAL PURPOSE BICYCLE FOR ELECTRICITY GENERATION & FITNESS

Mr. Korshetti. V. V.
Head of Department of Mechanical Engg. S.V.S.M.D'S KKI Polytechnic,
Akklakot Dist:- Solapur, Maharashtra, India

Mr. K. A. Ghurghure
Department of Mechanical Engg. S.V.S.M.D'S KKI Polytechnic,
Akklakot Dist:- Solapur, Maharashtra, India

Mr. Khune.B. S.
Mr. Dhulave. B. N.
Mr. Dhudhabate. S. P.
Mr. Kumbhar K. S.
Mr. Mulla T. S.

**Abstract:**
Pedal-powered electricity generation provides a low-cost, eco-friendly solution for areas lacking reliable power. By converting human effort into electricity, it supports small-scale uses like charging devices and running low-power appliances, while promoting sustainability and physical health. Although efficiency remains modest (32.5%–66.6%) due to energy losses in components, system improvements and integration with solar or wind sources can enhance performance. This approach holds strong potential for off-grid, emergency, and hybrid energy applications.

## Introduction

In today's era of growing energy demands and increasing awareness of sustainable living, innovative solutions that combine eco-friendliness with practicality are in high demand. "Power Pedal: Dual Purpose Bicycle for Electricity Generation and Fitness" is a project that aims to harness human mechanical energy for two key purposes—**generating electricity** and **promoting physical fitness**.

This project aims to design and develop a**pedal-powered system** that allows users to generate electrical energy while exercising. The core idea is to convert the mechanical energy produced during pedaling into **electrical energy** using a generator (such as a DC motor). This electrical energy can then be stored in batteries or used directly to power low-power appliances like mobile chargers, LED lights. The system offers an excellent example of**energy harvesting** from human motion and can contribute to reducing dependence on conventional electricity sources.

Simultaneously, the setup serves as an effective workout machine, encouraging physical activity and healthy living. In an age where sedentary lifestyles are common and energy consumption is rising, this dual-purpose system promotes both **health and sustainability**.

This project not only supports environmental goals but also showcases the practical application of mechanical engineering principles in real-life scenarios. It is especially relevant for rural or remote

areas where electricity supply is limited or unreliable. The working principle of the **"Power Pedal"** project is based on the **conversion of mechanical energy into electrical energy** using the principle of **electromagnetic induction**.

When a person **pedals the bicycle**, **mechanical (kinetic) energy** is generated through the **rotational**

**motion** of the pedals and **crankshaft**. This rotational motion is transmitted via a **rear wheel**, which is **mechanically connected to a dynamo** (or DC generator). As the wheel rotates, it drives the dynamo, causing its internal coil to rotate within a magnetic field.

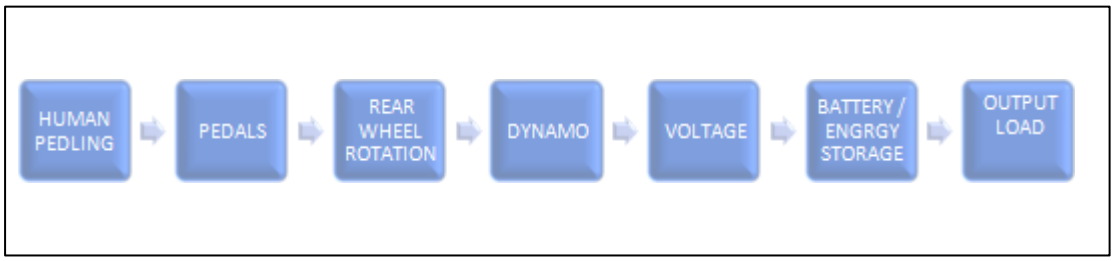
Due to **Faraday's Law of Electromagnetic Induction**, the motion of the coil in the magnetic field induces an **electromotive force (EMF)**, thus generating **electrical energy**. This energy can then be

- ✓ **Stored** in a rechargeable **battery**,
- ✓ **Used immediately** to power **DC appliances** (like LED lights, USB chargers, or fans),
- ✓ **Displayed** using a digital meter for voltage and current output.

This process efficiently converts **human effort** into **useful electrical power**, while also serving the purpose of **physical exercise**, promoting health and fitness.

By combining both **energy generation and workout**, this system promotes **sustainable energy use**, **self-reliance**, and a **healthy lifestyle**, making it ideal for households, gyms, and rural communities with limited access to electricity.

**Block Diagram**




**1. Literature Review and Requirement Analysis**

Study of existing pedal-powered systems

Understanding user needs and deciding the system's output requirements (e.g., voltage, load capacity).

**2. Component Selection**

**Frame:** Modified bicycle or fabricated stationary frame.

**Drive Mechanism:** Chain drive,

**Generator:** DC motor (typically 12V/24V) or bicycle dynamo.

**Flywheel:** To maintain constant speed and improve generator efficiency.

**Battery:** Rechargeable 12V battery for storage.

**Load:** LED lights, USB charging ports, etc.

**Display:** (Optional) Voltmeter/ammeter to show output.

**3. Mechanical Design & Fabrication**

Designing the layout of the system with proper ergonomics

Fabricating the frame to support stationary cycling

Assembling the drive system and generator

**4. Electrical Integration.**

Installing voltage regulator to maintain safe output levels wiring the output to a battery or USB charging module

**5. Testing and Output Analysis**

Testing the system under different pedalling speeds
Measuring voltage, current, and power output
Evaluating system efficiency and charging capability.

**Conclusion:**

Pedal-powered electricity generation systems demonstrate significant potential in addressing energy needs, particularly in areas with limited access to conventional power sources. These systems are simple to design, cost-effective, environmentally friendly, and can be adapted for various applications such as charging devices, powering small appliances, or supplementing renewable energy systems. They also promote physical fitness and reduce carbon emissions by utilizing human effort as a renewable energy source. However, challenges such as low overall efficiency (ranging from 32.5% to 66.6%) and the physical effort required to generate substantial energy limit their practicality for large-scale or long-term applications. Enhancing system efficiency through optimized design and reducing energy losses in components like generators, batteries, and converters can improve their viability. Additionally, integrating these systems with other renewable sources like solar or wind power can make them more effective for hybrid energy solutions. In conclusion, pedal-powered electricity generation is a promising alternative for localized and emergency energy needs while promoting environmental sustainability and health benefits. However, further advancements in technology and efficiency are essential to maximize its impact and broader applicability.

**References**

1. Textbook of Electrical Technology by B.L.Theraja
2. https://news.energysage.com/lithium-ion-vs-lead-acid-batteries
3. https://www.electronicshub.org/brushless-dc-motor-bldc-motor.
4. Textbook of Electrical Technology by B.L.Theraja
5. Reference book of Basic Electrical and Electronics Engg. Author: B.R.Patil

Fig. Working Prototype of the Concept