



PEDAL OPERATED ENERGY CONVERSION

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Abstract

Pedal-operated energy conversion systems offer a sustainable solution for generating electricity, particularly in resource-constrained environments or off-grid settings.

This paper explores the design, implementation, and efficiency of such systems, focusing on their potential applications in rural areas, disaster relief efforts, and eco-friendly initiatives. By harnessing human power through pedaling, these systems can convert mechanical energy into electrical power, providing a reliable source of electricity for various purposes.

Key considerations include the design of the pedal mechanism, power transmission system, and energy storage components to optimize efficiency and usability. Additionally, the socio-economic impacts and environmental benefits of pedal-operated energy conversion systems are discussed, highlighting their potential to empower communities and promote sustainable development. Overall, this research underscores the importance of innovative approaches to energy generation that prioritize accessibility, affordability, and environmental sustainability.

Riding bicycle helps in maintaining a good physic and along with it power can be also generated. This paper presents methods in generating electricity by pedaling a bicycle. It also explains in detail the method using bottle dynamo to generate power. A detailed analysis of using pedal power is also presented.

Keywords : E- Bike Motor; Converter; bicycle; rechargeable batteries

1. Introduction

Pedal-operated energy conversion refers to the process of generating energy through human pedal power. This method typically involves using foot pedals to drive a mechanism, such as a generator or a pump, to convert mechanical energy into electrical energy, kinetic energy, or hydraulic energy.

It's often used in applications where electricity or mechanical power is needed, but access to conventional sources of energy is limited or unavailable.

Power generated by pedaling can be converted from mechanical to electrical energy by using either dynamo or alternator. Pedal-operated energy conversion refers to the process of converting human power, generated through pedaling a mechanism like a bicycle or similar device, into another form of energy, typically mechanical or electrical.

This concept is often used in pedal-powered machines, such as generators, water pumps, or even food processors, where human energy input is used to drive a variety of tasks. Pedal-operated devices are often employed in areas where access to electricity or other power sources is limited, offering a sustainable and eco-friendly alternative for various tasks. We all know that energy can neither be created nor destroyed but can be transformed from one form to another.

But we are wasting resources that can produce energy as if they are limitless. If we can renew and reuse the energy we waste, it would help in some way to the problem of scarcity of energy, which is the major threat of present world. Humans are able to generate approximately 150W of power while riding bicycle. However, this power goes waste without any use. If we can make use of this energy, we would be able to power many electronic devices.

Pedal-powered battery is innovative approach not only addresses energy needs in emergencies or off-grid locations but also promotes physical activity, contributing to both environmental and individual well-being. As technology advances, further refinements and diverse applications are expected for this human-powered solution to electricity generation.

2. Literature Review

This chapter discusses on various benefits and technique of human power energy harvesting that have been conducted by previous researchers such as harvesting energy from the body temperature and kinetic movement such as walking, shaking motion and working principle of bicycle and power storage. Besides, the permanent magnet generator working principle and type of generator also described in this chapter. Lastly, fundamental of energy efficiency and the prediction of energy efficient pedal forces in cycling are also include.

Renewable energy has brought about significant attentions to the whole world due to, its benefits which to reduce pollution and at the same time provide sustainable clean source of energy. As mentioned before, the most common types of renewable energy are solar, wind, and tidal. Although renewable energy has huge advantage than non-renewable energy, there is energy resources that very close to us has not been recognized which is human power. In theoretical investigation of the benefits of human powered product by Hyunjae Daniel Shin he discovered there are two kind of benefits, first is the direct benefit which include financial and second is the environmental benefits and intangible benefits which cover the health and behavior scope of benefits. This shows the win-win situation where human powered energy not only provide clean environment but give advantages to human itself.

In 2017, wearable energy harvesting from body to battery was proposed by Michele Magno as solution to overcome short lifetime of wearable devices. Although its challenging due to strict constraints in term of size, weight and cost, he managed to present the taxonomy of technology, architecture and design trade-off for efficient energy harvesting (EH) system for wearable devices. The main idea are to use kinetic and thermal EH from the human body and pump to control circuit before supply to load or storage.

3. Problem Statement

Although renewable energy plays an important role in reducing greenhouse gas emissions such as biofuels, solar, and wind, they are favorable and located in remote area. For example, on cloudy days or when disaster phenomenon occurs solar is not an efficient way to harvest energy and leads to where the victim cannot reach for electricity. The temporary energy keeps used by the user until it's drain out. In order to avoid this situation, occur, we generate our own power by cycling during emergency situation happened. During cycling, energy transfer from human to circular motion on rear tire of the bicycle through the use of a foot pedal and crank system. In some developing countries are using pedal powered tools. Although this is a relatively slow method, it is clean energy. Pedal technology is nearly perfect with 97% efficiency. Using your own power helps you understand the amount of energy you use, reduce your ecological footprint and help you burn some calories. Almost every house has at least one bicycle at their home. The cycling power can be used to charge phones, process food, and pump water.

4. System Design

A block diagram of a pedal-operated energy conversion system typically includes components like pedals, a transmission system (gears), a generator or dynamo to convert mechanical energy into electrical energy, and sometimes a battery or capacitor to store the generated energy. It might also include control elements like switches or regulators. Each block represents a functional component or subsystem of the overall system.

5. Hardware Components

- 1) **Bicycle Pedal Assembly:** Bicycles offer a practical and mobile platform, allowing the generator to be easily moved to different locations, making it suitable for off-grid or remote areas.
- 2) **Pedals and Pedal crank:** Pedals and pedal cranks are used in pedal-operated systems, like axial flux generators, to efficiently convert human mechanical energy into rotational motion.
- 3) **Chain and Tooth:** "Chain and tooth" could refer to a variety of things, depending on context.
- 4) **E- MOTOR:** "E motor" typically refers to an electric motor, a device that converts two ways mechanical energy into electrical energy and electrical energy into mechanical energy. we using mechanical energy into electrical energy.
- 5) **Inverter:** Pedal-operated energy conversion inverter involves designing a system that converts mechanical energy generated from pedaling into electrical energy.
- 6) **Plug box:** A plug box in pedal-operated energy conversion typically refers to a junction box or interface that connects the pedal generator to electrical devices.

6. Circuit Diagram

A circuit diagram for pedal-operated energy conversion would typically include components for generating, converting, and storing electrical energy. The specific layout and connections will depend on the design requirements, power output of the pedal generator, and the types of devices being powered. It's essential to ensure that the circuit is designed safely and efficiently to maximize energy conversion and usability.

7. Conflict of Interest

In the context of pedal-operated energy conversion, a conflict of interest could arise if, for example, a company producing pedal-powered generators also has financial interests in promoting their use over other forms of energy generation, such as solar or wind power. This conflict might lead to biased information being disseminated about the benefits of pedal power compared to alternative energy sources.

Similarly, conflicts of interest could arise if individuals or organizations involved in promoting pedal-powered energy solutions have personal or financial ties to companies that manufacture or distribute pedal-powered generators. This could lead to decisions being made based on financial gain rather than the best interests of consumers or the environment.

8. Result and Discussion

In a result and discussion section about pedal-operated energy conversion, you would typically present the findings of your research, experiments, or analysis regarding the effectiveness, efficiency, and practicality of pedal-powered energy systems. Here's how you might structure such a section.

9. Conclusion

At a time when there is energy crisis casting its shadow all over the world, one has to look into alternate renewable energy resources. One such alternate way to generate power is presented in this paper. The rotational energy of the tires in the bicycle, generated by pedaling can be used to operate small powered devices. Both dynamo and alternator can be used and various options and situations where a dynamo or alternator can be used are provided. The various applications where this power could be used are also discussed in this paper. Pedal energy sources are useful for supplying power to a variety of low power devices, mainly in areas without access to the power grid. Their main advantages over other renewable sources is that the output power.