

# Study and Overview of Pedal Generated Electrical Power for Integration with Solar

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**Abstract** - Electric energy is the most critical resourceful and popular form of energy instead of only modern society is hugely determined by electrical power, but also rural areas are coated to boost the rural atmosphere. Now the roster of electricity increases daily in life. The power system which employs a hybrid blend of renewable energy resources is found to be a valuable alternative approach for the electrification of those remote areas. This paper provides a summary of the ongoing search for energy generation methods, which might be implemented in remote and rural areas for the enhancement of living standard without affecting the environment.

**Key Words:** Pedal, Controller, Power Conditioning System (PCS), Solar, Simulation.

## 1. INTRODUCTION

The popular power generation techniques in India are completed by conventional energy resources, such as coal, and mineral oil-based power plants that contribute significantly to greenhouse gases emission. And growing industrialization of traditional fossil energy sources like natural gas, petroleum, and coal, which can be a chief source to satisfy energy requirements, is diminished.

Most of the rural areas of India don't have access to electricity. The cost of setup and maintenance of transmission lines in those regions is because of low population densities. Some of these areas won't have access to reliable power even in the next ten years. Therefore alternate means of electrical energy will need to be utilized with enhanced power quality and preparation at the local level. One such choice is to produce electrical energy using Manual Charkha (Pedal generator) as per the Power Generation System.

Small scale power plants are set up under the village energy security programme (VESP) which was implemented by Ministry of new and renewable energy (MNRE), India to achieve the requirement of power. This plan intends to arrange unique sources of renewable energy based systems to satisfy energy requirements of villages in an efficient, cost effective and reliable manner.

Currently, the DC distributed power system for a home will ease the power sources' execution from renewable energies with much efficiency of electricity sending and less complexity connection. From these types of advantages, a power generation based on workout bike gets energy [2].

Some neighbour countries like Bangladesh is a working on the development of new small power generation techniques that may be used in rural areas without harming environment [1] [3]. Study shows that, Pedal generation unit consists of an Electro-Mechanical system. This system demonstrates the conversation of kinetic energy to electrical energy by using alternator and stores it by using battery [1] [3].

## 2. PEDAL POWER GENERATOR UNIT

Here, we discuss the very basic principle conversion of mechanical energy into electrical energy. Previous research shows power generation from kinetic energy using pedal generator [1]. The idea of our study is to use that sort of kinetic energy produce electricity.

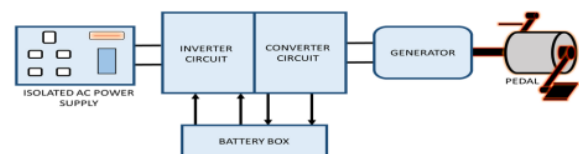


Fig. 1 Block diagram of Pedal System

It's an optimum but easy way to make energy out of pedal power. Generally, the majority of the rural men and women are dependent on bicycles for their convenience. [2][4].

## 3. BASIC PRINCIPLE OF OPERATION OF ALTERNATOR

By rotating a coil inside a magnetic field induces a voltage in the coil terminals, which generates power to supply a load. An AC voltage with mean value zero is produced in its positive & negative terminals if the coil rotates inside a uniform magnetic field at uniform speed. The periodic change of the polarity is a result of the shift in the position of the coil relatively to the magnetic poles.

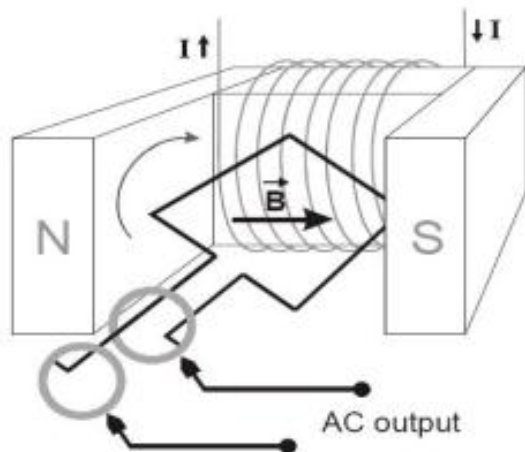


Fig -2: Operating Principle of 1-ϕ alternator

The amplitude of this voltage depends upon the rotation speed along with the magnetic field strength. This is the basic principle of operation of alternator [4][9-10].

#### 4. ROTATIONAL ENERGY & EFFICIENCY

Although, electricity could be generated by several types of converter with solitary or multi-stage conversion, most frequent kind of generation is obtained from mechanical or kinetic energy.

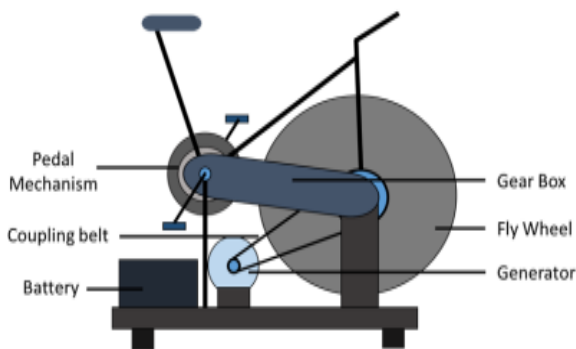


Fig -3: Pedal Rotational Unit

The rotational energy or angular kinetic energy is the kinetic energy because of an object's rotation and is part of its kinetic energy [3][6]. Energy of any item across the axis of rotation could be symbolizing as:

$$E = \frac{1}{2} \times I \omega^2 \quad (1)$$

Where,  $\omega$  = the angular velocity,

$I$  = moment of inertia,

$E$  = kinetic energy.

Here, the electrical energy is defined as the total work done. [3][7].

$$\text{Electric Energy} = \text{electric power} \times \text{time} \quad (2)$$

$$\text{Electric Power} = \text{Voltage} \times \text{Current} = V i \quad (3)$$

Thus the formula for electric energy is given by:

$$\begin{aligned} \text{Electric Energy} &= P \times t = V \times i \times t \\ &= i^2 \times R \times t = (V^2 t) / R \end{aligned} \quad (4)$$

A generator forces current to flow through an external circuit. Many motors could be driven to generate electricity and often make generators working [3][8]. Efficiency is measured as a ratio of the performance to an perfect machine's functionality.

$$\text{Efficiency} = (\text{Measured Performance}) / (\text{Ideal Performance})$$

The power can be measured by the power equation of the fly wheel every second. In terms of rotational energy, it can be written as [3]:

$$\text{Efficiency, } \eta = (V \times i \text{ Watt}) / (1/2 I \times \omega^2 \text{ Joule/Sec})$$

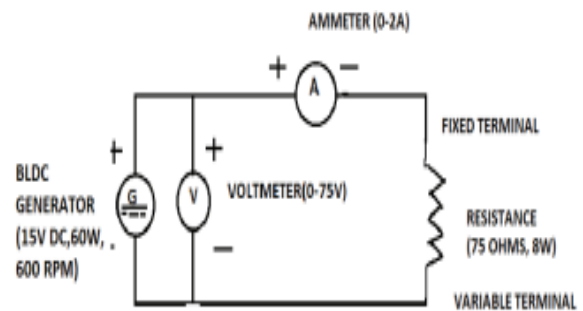


Fig -4: Pedal Rotational Unit

#### 5. CONCLUSIONS

Now once the clouds of energy crisis are shadowing the planet, it's vital to opt for other renewable energy resources to meet our energy requirements. The objective of this work is to analyze whether it is possible to incorporate with other renewable sources such as solar and the target of this work is to analyze the energy generation from the pedal. One such advanced power generation technique is introduced in this paper. Awareness about the tech is objective to perform this project to the next phase in power generation and create consciousness to bring into a revolution where no individual in the world lives without electricity in dark. In our aim, to study the developed of a better system which includes the hybrid energy sources (pedal with Solar) are found feasible that is accessible even by low-income groups to meet their energy requirements.

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## BIOGRAPHIES



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