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HYBRID ENERGY GENERATION FOR STREET LIGHTS

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Abstract - *Renewable energy technologies are appropriate for off-grid services, serving the remote areas while not having to create or extend high priced and complex grid infrastructure. Thus standalone system using renewable energy sources have become a most popular possibility. Uses of hybrid energy systems, benefits of hybrid energy systems, problems and issues associated to hybrid energy systems and a summary of energy storage technologies for renewable energy systems are put forward. This paper conjointly highlights the long run trends of Hybrid energy systems, which represent a encouraging sustainable solution for power generation.[1]*

Key Words: Vertical axis wind turbine, Photo-Voltaic

1. INTRODUCTION

In today's situation power has become the major requirement for human life. Energy is a very important input in every sector of any countries economy. The day-by-day increasing population and decreasing typical sources for power generation, provides a necessity to consider the non-conventional energy resources. In our paper, we are looking forward to conserve the kinetic energy that goes wasted, while vehicles move. The number of vehicles passing over speed breaker on road is increasing at a high rate. Below every speed breaker, setting up an electro-mechanical unit said to be power hump (made of piezoelectric material), could help us preserving this energy and utilize it for power generation. Piezoelectricity is the occurrence of an electrical potential (or a voltage) across the sides of a crystal when subjected to mechanical stress (by squeezing it). The electrical output is improved by setting these power humps in series. Using different electrical devices, we store the generated power. We supply this energy to street lights, traffic lights, and neighboring areas, and thereby help in country's economy. We plan to make it more efficient, by using solar panels that provides for power needs while the vehicles were not in motion. A wind turbine converts the kinetic energy of the motion of the wind to mechanical energy transmitted by the shaft. A generator converts this mechanical energy to electrical energy. So it is necessary to keep in mind, while designing the windmill's structural part.

2. SYSTEM OVERVIEW

In this system, we draw out energy from four sources. These four sources are- Solar PV cell, vertical shaft wind turbine, roller and piezoelectric crystal .The energy extracted from these sources is stored in a battery. Later, this stored energy is employed for controlling power in street lights. This is a very economical system as it reduces electricity wastage. In this proposed system only 50% of the street lights glows when there is no vehicle on the road. When a vehicle passes by all the lights will be lit. A wind mill is machine for wind energy conversion.

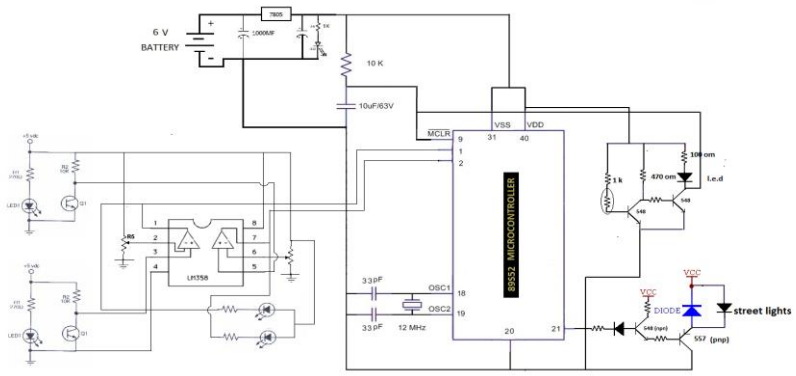

Fig- 1: Circuit diagram

3. SOLAR CELL

A solar cell is also known as photovoltaic cell. Its purpose is to convert the light energy into electrical energy. A solar cell is a p n junction diode where the n region is heavily doped and thin. The light can easily penetrate through the n region. The p region is lightly doped and contains most of the depletion region. The penetration depends on the wavelength. The absorption coefficient increases as the wavelength decreases. Electron hole pairs (EHPs) are created in the depletion region and due to the potential difference and electric field, electrons move to the n region and the holes to the p region. When an external load is connected, the excess electrons pass through the load to recombine with the excess holes. Electrons and holes are also generated within the p and n regions. The shorter wavelengths (higher absorption coefficient) are absorbed in the n region and the longer wavelengths are absorbed in the bulk of the p region. Some of the EHPs generated in these regions can also contribute to the current.[2]. These solar cells are connected together in series or parallel combination in order to constitute a solar panel or solar module. These solar cells are connected in such a way so that they can give an additive voltage.

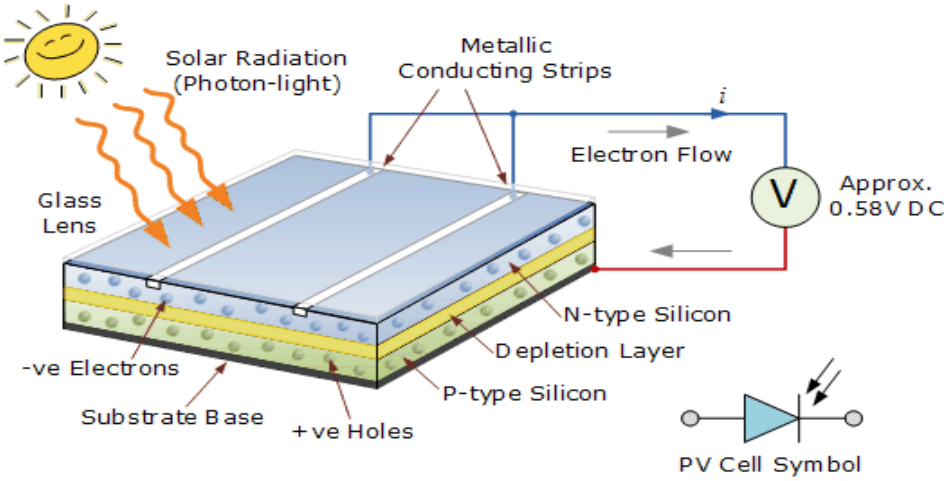

Fig-2: Solar cell

4. ROLLER

As the vehicle passes over the ramp, there is a surface contact between vehicle tires and roller, which will tend to rotate the roller, it is free to rotate as it is supported on bearings which are mounted on T-shape supports which are bolted to wooden base. The roller is coupled to an alternator. Due to the rotation of roller, the alternator converts the mechanical energy of the roller into electrical energy.

Fig-3: Roller Mechanism

5. VERTICAL AXIS WIND TURBINE (VAWTs)

In this type of wind turbine the main rotor shaft is set transverse to the direction of wind (but not necessarily vertically). The main components are located at the base of the turbine. The generator and gearbox are situated closer to the ground, facilitating service and repair. VAWTs do not need to be placed directly in the wind. So, there is no need for wind-sensing and orientation mechanisms. A VAWT tilted sideways, with the axis perpendicular to the wind streamlines, functions similarly. It is also known as "transverse axis wind turbine" or "cross-flow wind turbine.[3]. When a vehicle passes by the vertical axis wind turbine, the air cuts the turbine blades transversally. Due to this the turbine blades start rotating. The generator coupled with VAWT converts the mechanical energy into electrical energy.

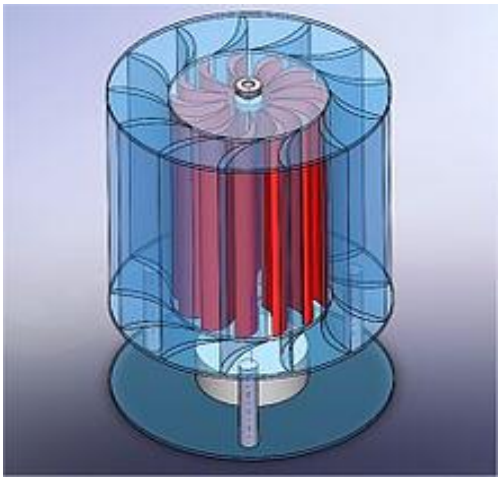

Fig-4: Vertical Axis Wind Turbine

6. PIEZOELECTRIC MATERIAL

The vibration energy is extracted using piezoelectric materials [4]. The conversion chain begins with a mechanical energy source, for example- bike. Bike vibrations are converted into electricity by piezoelectric element. The electricity generated is then formatted by a static converter before supplying a storage system or the load (electrical device).In this study, before developing piezoelectric generator, it was essential to begin with a mechanical vibrations sources identification which means carrying out vibration accelerations and frequency measurement and analysis. So we carried out measurements at various locations of an experimental bicycle to determine the place where extracting more energy is possible. Then a piezoelectric generator adapted to the identified natural mode of vibration of the bicycle was developed. [4]

7. CONCLUSION

Hybrid power generation system is an extremely effective solution for power generation than any other conventional energy resources. It can help in supplying energy to remote places where government is unable to reach. In this way power can be utilized where it generated so that the transmission losses and cost is reduced. People should be motivated to use the non conventional energy resources as it is highly safe for the environment. It doesn't produce any emission and harmful waste products as in case of conventional energy resources. It is cost effective solution for generation of electrical energy. It only needs initial investment. It has also long life span and wide area of application. Overall it is a reliable and affordable solution for electricity generation [5].

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