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RESEARCH ARTICLE

UNINTERRUPTED POWER GENERATION FROM RENEWABLE ENERGY SOURCES

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ABSTRACT

Versatility, abundance and environmental friendliness have made solar energy one of the most promising renewable sources of energy. Solar energy is converted into Electrical Energy by using solar cells and can be used to drive various appliances. This paper reports generation of uninterrupted power by utilizing simultaneously both the wind and solar energy using a gyroscopic wind turbine coupled solar panels. A gyroscopic wind turbine is designed which can generate about 12V.Solar panels can generate about 6V. By combining these two constant power of 4.3W can be obtained.

INTRODUCTION

Interest in clean and renewable energy sources is growing and will continue to grow as more people recognize that fossil fuels like coal, oil, and natural gas are limited resources and that burning fossil fuels releases large amounts of carbon dioxide, a greenhouse gas, into the Earth's atmosphere. Renewable energy sources are derived from everyday occurrences in the environment, from items that can be re-grown, or from bi-products of human/animal activity. The most prominent and environmentally benign forms of sustainable energy are captured from natural sources like wind, ocean tides, and sunlight. The increasing problem of global warming, combined with the reduction of fossil fuel sources, contributes to make wind turbine an established renewable technology for the future energetic scenario.

Wind turbines have been subjected of an intense research program in the last decades and actually wind power technology presents an annual growing rate of 23.6 %, with a total worldwide power installed capacity of 196630 Megawatt and 2.5% of the global electricity consumption. Energy is a major factor in today's society Alternative fuel and alternative energy resources are in great demand. Most everyone in the world is looking for more energy efficient ways to live. Hybrid vehicles and other fuel-efficient technology are arising around the world. This project is to generate electricity by utilizing both the wind and solar energy at the same time using a gyroscopic wind turbine coupled with solar panels.

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In this project a gyroscopic wind turbine is designed which can generate about 12v and also solar panels which can generate about 6v. By combining these two outputs a constant output is obtained.

World Energy Resource

There are three popular green renewable energy sources that are currently being used and provide a total 2.5% of world's energy requirements (Fig. 1). They consist of

- Hydro - 2.2%
- Wind - 0.2%

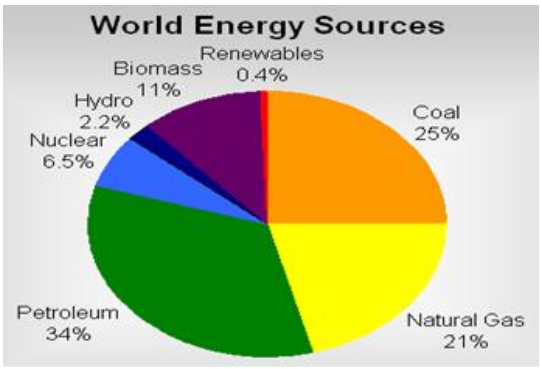

Fig. 1. World Energy Sources

Solar Energy

Solar power commonly refers to the generation of electricity using the energy directly delivered by sunlight. This power can either be generated using the photovoltaic effect or be

concentrated to use as a heat source as in a conventional power plant. The current price per watt of solar power stands at $5/Watt for small capacity solar panels (1-10W) compared to grid electricity, which costs around 0.0115Cents/watt.

Wind Generation System

India now ranks as a "wind superpower" with an installed wind power capacity of 1167 MW and about 5 billion units of electricity have been fed to the national grid so far. In progress are wind resource assessment program, wind monitoring, wind mapping, covering800 stations in 24 states with 193 wind monitoring stations in operations. Altogether 13 states of India have a net potential of about 45000 MW.

- Horizontal-axis wind turbines (HAWT)
- Vertical-axis wind turbines (or VAWTs)

Wind Turbine Design and Construction

Wind turbines are designed to exploit the wind energy that exists at a location (Fig. 2). Aerodynamic modeling is used to determine the optimum tower height, control systems, number of blades and blade shape (Table 1).

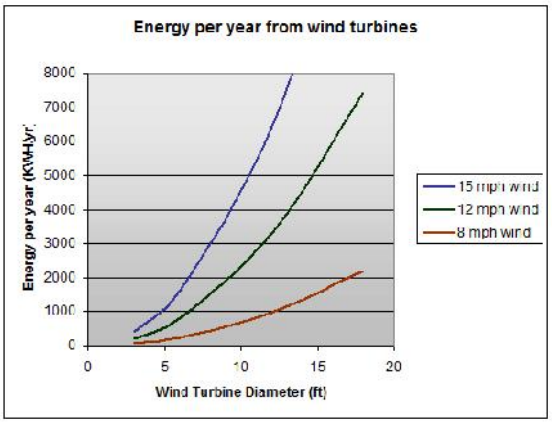

Fig. 2. Energy per year from wind turbines

Table 1. Specification of turbine components

SI.NO	COMPONENT	SPECIFICATION
1	Turbine Blade	508 mm x 508 mm
2	Swash Plate Mechanism	Oscillatory to Rotary motion
3	L-Angle channel (19.05mm)	254 mm length 203.2mm length 482.6 mm length
4	Battery	12 Volt DC 6 Volt DC
5	DC Generator	12 Volt
6	Control Circuit	12 Volt DC
7	Solar Panel	6 Volt, 1Watt
8	LED Bulb (Load)	6Volt

5.1Swash Plate Mechanism

Fig. 3 illustrates swash plate mechanism for wind turbine movement. The swash plate mechanism consist of two discs one at the top and the other one at the bottom. The upper disc gets connected with the blade by means of bolts. The bottom disc is connected to a plate coupled with gear with some eccentricity. These two discs are connected by means of specially made c-clamps.

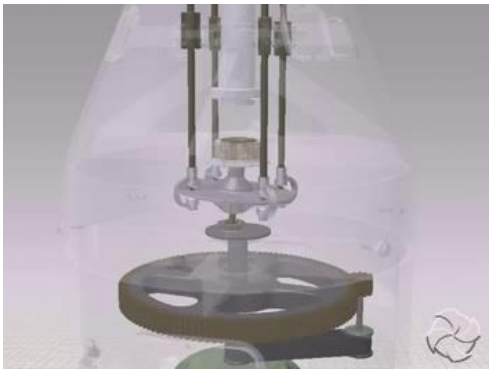

Fig. 3. Swash Plate Mechanism

Blade Design

Fig. 4shows the designed blades for turbine. The blade of the wind turbine has an area of 508*508 mm2 and it's a pretty big part of the wind turbine. It has four flaps on its corner, these flaps plays an important role. They create a major imbalance in the blade even for a slight change in the wind speed.

Fig. 4. Designed turbine blade

MATERIALS AND METHODS

Fig. 5 shows the methodology adopted in this work. As per the block diagram the main components of the project are solar power unit, Wind power unit, controller unit, storage unit (battery), load (power output).

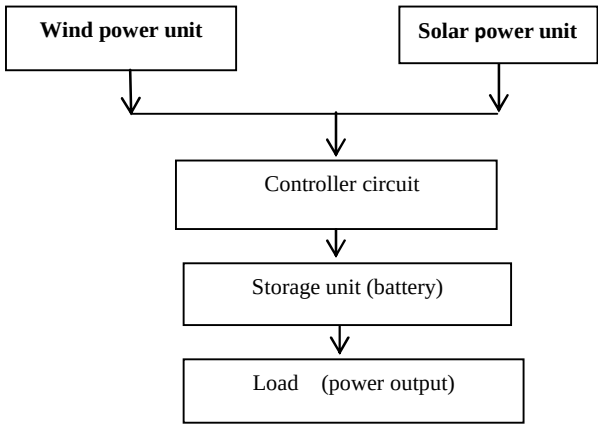

Fig. 5. Block diagram of sequence of events

The solar power unit consists of four solar panels each of 6v and 1watt.When the panels are exposed to sun light due to photovoltaic effect the power is generated. The power which is generated is the transferred to the storage unit by means of a wire. The wind power unit consists of a vertical axis wind turbine which works on the principle of gyroscopic effect. Due to swash plate mechanism the wind energy is converted into rotary motion which is then converted into electrical energy by means of a generator. The power output from the generator is transferred to the storage unit by means of wires. The main function of this unit is to control the current flow from the system to the storage unit. This unit prevents the back flow of current in the circuit and also it's regulates the power supply in the whole circuit. Using two batteries of different capacities as per our requirement, one battery is of 6v which is used to store the power from solar panels and the other battery is of 12v which is used to store the power from the wind turbine. This device is connected at the end of the circuit.

Working principle

The entire system can be divided into three main parts such as wind turbine blade, swash plate mechanism and DC generator.

Wind Turbine Blade

Wind turbine blade has four flaps on its corner, these flaps plays an important role. They create a major imbalance in the blade even for a slight change in the wind speed. These flaps increase the response of the wind turbine to the wind. The solar panels are fixed on the blades. The blade has a tapper to side for solar panels because the solar panels cannot be kept straight.

Swash plate Mechanism

When the blade gets oscillated due to wind energy, the upper disc which is connected to the blade gets tilted. The bottom disc is connected by means of c-clamp; it gets tilted through the same angle of the upper disc. The bottom disc is connected eccentrically to a plate, the plate makes an quarter revolutions and hence the oscillatory motion is converted to the rotary motion.

The DC generator

The DC generator is coupled with the plate by means of a gear drive. The DC generator is coupled to the rotary input which generates electric power. Rotary motion to the DC generator is given from the swash plate mechanism through the gear arrangement. Hence in the entire system gets two kinds of power supplies, one is from the solar energy and the other is from the wind energy. The power generated is stored in a battery by means of a controller circuit.

RESULT AND DISCUSSION

Energy is important for the development of human civilization. As conventional energy exhausts, the development of clean and renewable energy, such as wind energy and solar energy becomes ever important to people life. In this project, power is generated simultaneously using solar and wind energy. Power generated from wind turbine per annum can be calculated as (KWh/year) = 0.01328 (D^2)* (V^3).

Where D is the blade diameter in feet, and V is the wind velocity in mph. For example, If the year round average wind speed of 12 mph, 10 ft. diameter wind turbine blade, the power produce about $(0.01328)(10)^2*(12)^3$ = 2300 kWh/year.

Power generation from solar panels between the time period of 9a.m. to 4p.m. is tabulated in Table 2. Table represents the constant power generation all over the day.

Table 2. Power generated from solar panel

S.NO	TIMINGS	VOLTAGE(V)	CURRENT (A)
1	9AM-10AM	5.70	0.15
2	10AM-11AM	5.56	0.14
3	11AM-12AM	5.63	0.146
4	12PM-1PM	5.74	0.16
5	1PM- 2PM	5.45	0.13
6	2PM- 3PM	4.99	0.12
7	3PM- 4PM	4.91	0.12

Power is generated from solar and wind energies during 8 a.m. to 5p.m.Wind energy generate power during the night time. Hence by using this combined unit power generation is more than using the solar panels alone.

Conclusion

The sun delivers more energy to the Earth in one hour than is used in a year from all currently available sources, however only 0.1% of the world's energy is derived from it. Similarly the wind energy which is converted into power is also in very less percentage. Hence in this project discuss the power generated using both solar and wind energy at the same time. For the motion transmission gyroscopic effect is utilized.The power generation and efficiency is increased by combining the solar energy and wing energy.

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