JETIR.ORG ISSN: 2349-5162 | ESTD Year : 2014 | Monthly Issue
JOURNAL OF EMERGING TECHNOLOGIES AND INNOVATIVE RESEARCH (JETIR)
An International Scholarly Open Access, Peer-reviewed, Refereed Journal

LAMPPOST POWER CONTROL BY USING RENEWABLE ENERGY SOURCE

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Abstract : Energy is an essential aspect in our everyday life. The resources we use are limited, whereas the population consuming the same are increasing day by day. Therefore, there is a need of finding a way to establish a relationship between a natural resources and growing populations. For these problems, wind energy plays the vital role in maintaining the relationship between human being and a energy requirement.

Wind energy is free of cost and available with ease. Wind energy has been harnessed for centuries, but is has only emerged as a major part of our energy solution quite recently and In this project we are designing a prototype of lamppost power control by using wind energy source of Vertical Axis. Further other electrical loads can also be extended.

IndexTerms **- Vertical axis wind turbine, Wind Energy, lamppost**

I. INTRODUCTION

The demand for electrical energy is increasing exponentially and relaying on fossil fuel resources will pose a threat to the human-kind as the availability of these resources are getting limited. Hence the focus should be on the renewable energy sources such as solar, wind, tidal etc [1]. These sources have been coined renewable due to their continuous replenishment and availability for use over and over again. The popularity of renewable energy has experienced a significant upsurge in recent times due to the exhaustion of conventional power generation methods and increasing realization of its adverse effects on the environment. This popularity has been bolstered by cutting edge research and ground breaking technology that has been introduced so far to aid in the effective tapping of these natural resources and it is estimated that renewable sources might contribute about 20% – 50% to energy consumption in the latter part of the 21st century. Facts from the World Wind Energy Association estimates that by 2010, 160GW of wind power capacity is expected to be installed worldwide which implies an anticipated net growth rate of more than 21% per year[2]. The main advantage considering the renew-able energy source as a main stream source for energy generation is that they are clean, non-polluting to the environment and its abundance. Although wind has been harnessed for centuries, it has only emerged as a major part of our energy solution quite recently. Before the 21st century, wind was primarily used to pump water from wells and to grind grain, but over the last twenty years the cost of wind energy has dropped by more than 80 percent, turning it into the most affordable form of clean energy. Recent advances have allowed for sophisticated wind technologies, which previously sat in the mind of thoughtful engineers and inventers, to be developed into cost-effective, reliable solutions. For a small wind turbine to be effective, it must produce energy across a wide range of wind speeds. It must be able to generate energy from winds that are switching directions and gusting. It must also be very quiet, so that it will not disturb people living nearby, and it certainly helps if it is pleasing to the eye as well. Wind power harnesses the power of the wind to propel the blades of wind turbines. These turbines cause the rotation of magnets, which creates electricity. Wind towers are usually built together on wind farms.

II. WIND ENERGY

Wind is used to produce electricity by converting the kinetic energy of air in motion into electricity. In modern wind turbines, wind rotates the rotor blades, which convert kinetic energy into rotational energy. This rotational energy is transferred by a shaft which to the generator, thereby producing electrical energy.

The potential of wind energy as a source of power is large. The energy available in the winds over the earth is surface is estimated to be 1.6x107MW which is of the same order of magnitude as present energy consumption on the earth. In India, high wind speeds, are obtainable in coastal areas of saurashtra western Rajasthan and some parts of central India. They are non -

polluting and it has no adverse influence on the environment. The first power source is photo - voltaic solar cell. These cells convert sun light directly into DC power without any emissions. The second power source is wind energy I.e., the kinetic energy of air in motion. The third one is shock absorber which is connected to suspension.

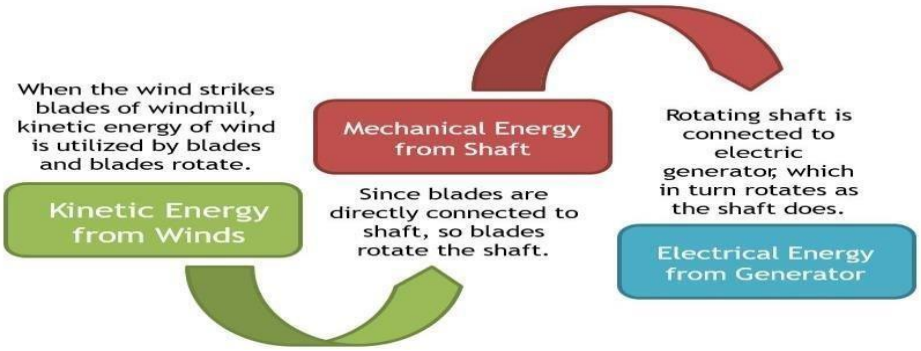


Fig.1 : Basic Concept of Wind Energy

III. TYPES OF WIND TURBINE

A **wind turbine** turns wind energy into electricity using the aerodynamic force from the rotor blades, which work like an airplane wing or helicopter rotor blade.

There are two types of Wind Turbines. They are

A) Horizontal Axis Wind Turbine: Horizontal-axis turbines **have blades like airplane propellers, and they commonly have three blades**. The largest horizontal-axis turbines are as tall as 20-story buildings and have blades more than 100 feet long. Taller turbines with longer blades generate more electricity.

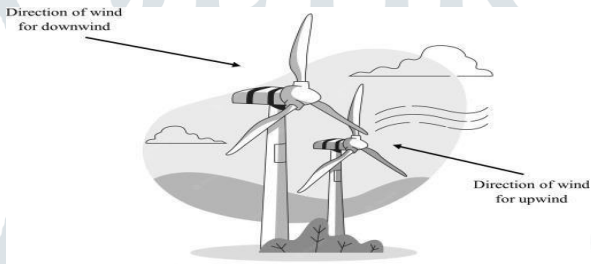


Fig. 2: Horizontal Axis Wind Turbine

B) Vertical Axis Wind Turbine: A vertical-axis wind turbine (VAWT) is **a type of wind turbine where the main rotor shaft is set transverse to the wind while the main components are located at the base of the turbine**. This arrangement allows the generator and gearbox to be located close to the ground, facilitating service and repair.

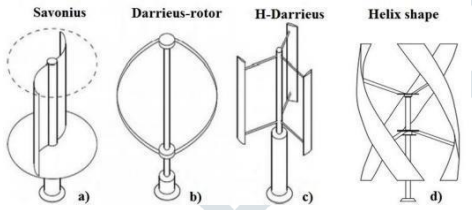


Fig. 3 : Types of VAWT

IV. VAWT COMPONENTS SELECTION

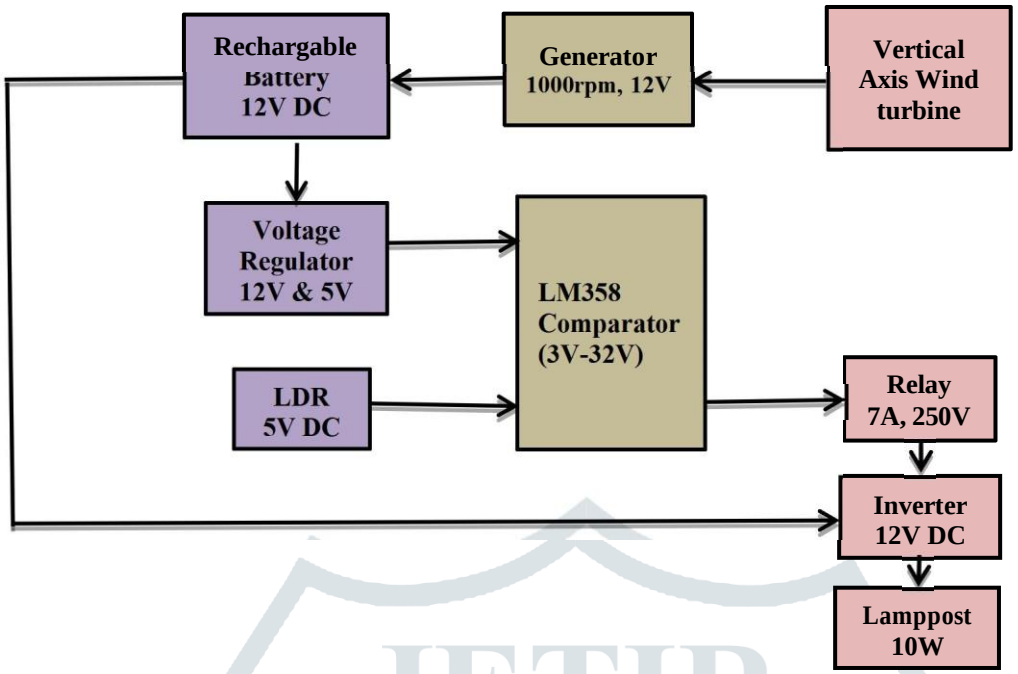
The whole concept of material selection for the manufacturing of the wind turbine lies in the following facts:

i) Blades should be light in weight.

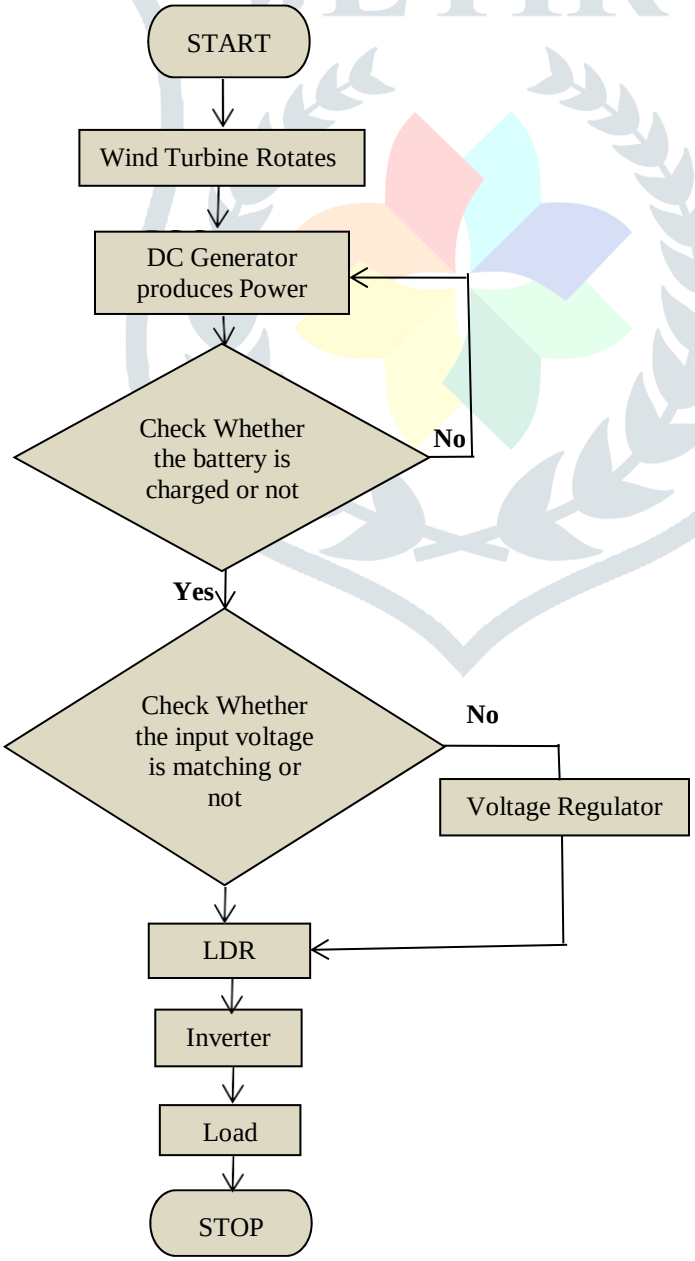
ii) The materials used inside the generator must consists (partially) electrically conductive materials (metals).

Different Types of materials have been selected based on their physical properties and structural rigidity. As structural strength is most important for greater efficiency and smooth power production. wind turbine A 1000RPM 12V DC generator with metal gearbox has been used. The gear box has Shaft Diameter of 6mm. Vertical Tower Directly attached to the rotating blades of the VAWT. A Lead Acid Sealed (SLA Battery) with 12V DC, 1.5 Ah has been used in the prototype. The efficiency under ideal condition of the battery is 86%.

V. PROTOTYPE BLOCK DIAGRAM



VI. FLOW CHART



VII. HARDWARE COMPONENTS

Table 7.1: Hardware details of VAWT

S. No.	Components	Specification	Quantity
1.	Wind Turbine	1000rpm, 12V	1
2.	DC Dynamo	5V	1
3.	Batteries	12V, 4V each	3
4.	Transistor	NPN BC337	1
5.	Resistors	1KΩ	2
6.	Capacitors	1000µF	1
7.	Voltage Regulators	5V & 12V	2
8.	PCB board	-	1
9.	Diodes	IN4007	6
10.	Inverter	12V DC	1
11.	Relay	7A, 250V	1
12.	LDR	5V DC	1
13.	LED Bulb	10 Watt,	1
		3 V	2

Characteristics of Vertical Axis Wind Turbine

- ✧ Height = 1.5 Feet
- ✧ Blade Height = 0.5 Feet
- ✧ Blade Curve = 9m
- ✧ No. of Blades = 3
- ✧ Pitch Angle = 120°

VIII. PROTOTYPE DEVELOPMENT

Fig.4 :Vertical Axis Wind Turbine

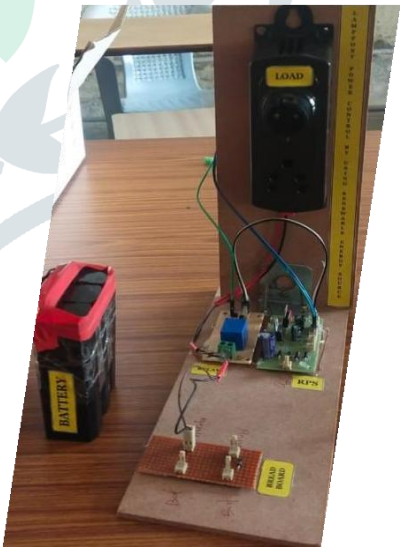


Fig.5: lamppost circuit

IX. Results & Discussion

Fig.5 : Prototype with Load Connection

Fig. 5 displays, the ON/OFF operations of Lamppost Controlled by using the Vertical Axis Wind Turbine and by using the LDR Circuit. The lamppost will switch ON in Night /dark time where light is necessary and in day time the Lamppost automatically Switch OFF.

By the use of Rechargeable Batteries, energy is stored and used whenever necessary. The advantage of these batteries is when the wind availability is less the stored energy can be used without any disturbance.

X. Conclusion

The implementation of hardware is done, achieved the required power capacity for lamppost and also implemented the other application for charging the phone using wind energy. Wind energy is free of cost and available every where round the world. Furtther in future Solar panel can also be integrated.

XI. Refereneces

[1] D.A. Nikam et al., “Power generation from small wind mill” , IRJET vol.6 , No.5, may 2019.

[2] N. Gupta, A. Kumar, S. Banerjee and S. Jha, "Magnetically levitated VAWT with closed loop wind speed conditioning guide vanes," 2016 IEEE 1st International Conference on Power Electronics, Intelligent Control and Energy Systems (ICPEICES), Delhi, 2016.

[3] J. Fadil, Soedibyo and M. Ashari, "Performance comparison of vertical axis and horizontal axis wind turbines to get optimum power output," 2017 15th International Conference on Quality in Research (QiR): International Symposium on Electrical and Computer Engineering, Nusa Dua, 2017, pp. 429-433.

[4] C T. Carper "Design and construction of vertical axis wind turbine using dual layer vacuum forming.

[5] M. Bhutta, N. Hayat, A. Farooq, Z. Ali, S. Jamil, Z. Hussain, "Vertical axis wind turbine - a review of various configurations and de-sign techniques", Renewable and Sustainable Energy Reviews, no. 16, pp. 2012.

[6] C. Ma, L. Song and M. Z. Zhang, "Performance study for a novel vertical axis wind turbine based on simulation analysis," 2017 IEEE 14th International Conference on Networking, Sensing and Control (ICNSC), Calabria, 2017, pp.549-554. https://doi.org/10.1109/ICNSC.2017.8000151.

[7] I. Magalhaes Albuquerque and F. F. d. S. Matos, "A Characterization of Vertical Axis Wind Turbines," in IEEE Latin America Transactions, vol. 14, no. 10, pp. 4255-4260, Oct. 2016. https://doi.org/10.1109/TLA.2016.7786302.

[8] B. Hand, A. Cashman and G. Kelly, "A Low-Order Model for Off-shore Floating Vertical Axis Wind Turbine Aerodynamics," in IEEE Transactions on Industry Applications, vol. 53, no. 1, pp. 512-520, Jan.-Feb. 2017. https://doi.org/10.1109/TIA.2016.2606088.

[9] C. J. Sudhakar, A. V. Deshpande and D. R. Joshi, "Charge controller for hybrid VAWT and solar PV cells," 2017 2nd International Conference for Convergence in Technology (I2CT), Mumbai, 2017, pp. 343-347. https://doi.org/10.1109/I2CT.2017.8226148.

[10] J. L. Achard, G. Maurice, G. Balarac and S. Barre, "Floating vertical axis wind turbine — OWLWIND project," 2017 International Conference on ENERGY and ENVIRONMENT (CIEM), Bucharest, 2017, pp.216-220. https://doi.org/10.1109/CIEM.2017.8120794.