



WIND AND SOLAR POWERED STREET LIGHT POLE

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Abstract: In this paper is wind and solar powered street light pole wherein, design of the components and their analysis has been carried out and, the fabrication of the model has been done as per the calculations that have been obtained from the design and analysis. Electricity has helped in reducing physical efforts to a very large extent, but, the way in which it is produced is quite a matter of concern. Even today, most of the electricity that we use is produced through conventional methods. These conventional methods commonly use fossil fuels to produce electricity. Not only are these methods expensive, but also cause grave damage to the environment. The use of fuels for the generation of electricity results in increased costs and emissions of hazardous pollutants. The only alternative is a new method that is not only cheap and efficient, but also eco-friendly

Keywords: Solar, Wind, Power Generation

I. INTRODUCTION

In this project is “Wind and Solar Powered Street light Pole” wherein, design of the components and their analysis has been carried out and, the fabrication of the model has been done as per the calculations that have been obtained from the design and analysis. Electricity has helped in reducing physical efforts to a very large extent, but, the way in which it is produced is quite a matter of concern. Even today, most of the electricity that we use is produced through conventional methods. These conventional methods commonly use fossil fuels to produce electricity. Not only are these methods expensive, but also cause grave damage to the environment. The use of fuels for the generation of electricity results in increased costs and emissions of hazardous pollutants. The only alternative is a new method that is not only cheap and efficient, but also eco-friendly.

Now a day’s major percentage of the electricity generation is contributed by generation through Coal, Diesel, Hydro, Nuclear sources of energy. The use of such fuel as a primary source of power generation produce very dangerous situation in environment. Hybrid solar & micro wind turbines consist of the small solar panel & micro wind size wind turbine as compare to the large centralized wind turbine. Working principle of the Wind turbines is to convert the kinetic energy of the wind firstly first into rotational kinetic energy in the turbine and then this rotational energy has been converted to the electrical energy via the generator or alternator that can be supplied, via the national grid, for any purpose. The energy which available in the wind and solar for conversion primarily depends on the wind velocity, swept area of the turbine & solar radiation.

II. LITERATURE REVIEW

This chapter presents the background information on the issues to be considered in the present research work and to focus the significance of the current study.

Qusay Hassan and et. al., [1] presented the comprehensively examines hybrid renewable energy systems that combine solar and wind energy technologies, focusing on their current challenges, opportunities, and policy implications. Despite the individual merits of solar and wind energy systems, their intermittent nature and geographical limitations have spurred interest in hybrid solutions that maximize efficiency and reliability through integrated systems. A critical analysis of available literature indicates that hybrid systems significantly mitigate energy intermittency issues, enhance grid stability, and can be more cost-effective due to shared infrastructure. The review identifies key challenges, such as system optimization, energy storage, and seamless power management, and discusses technological innovations like machine learning algorithms and advanced inverters that hold the potential for overcoming these hurdles.

Importantly, the review elucidates the role of policy in accelerating the adoption of these systems by highlighting successful case studies of government incentives, public-private partnerships, and regulatory frameworks that have fostered investments in hybrid renewable energy systems. The study concludes with the outcomes obtained that signify the potential for hybrid renewable energy systems to not only meet but exceed future energy demands sustainably, provided there is concerted effort in research, investment, and policymaking

Rajkumari Jagzape and et. al., [2] studied the combination of various however complementary energy generation systems supported renewable energies or mixed is understood as hybrid system. During this paper a hybrid power generation by exploitation star and wind energy with voltage electronic device system is meant with wind energy and hydro power supply using PSCAD software. Here a simulation approach is adopted to watch the various characteristics of hybrid installation. From the study it's clear that this hybrid power system provides voltage stability and automatic load sharing capability.

K. B. Mohan Krishna, and et. al., [3] presented the hybrid power generation system using Solar and Wind energy. It is fact that energy is an important resource for any country in the world to develop economically strong in all aspects. Without energy one cannot sustain the life such as transportation from one place to another, home needs, industrial purposes etc., More than 80% world energy consumption is produced by using fossil fuels it is estimated that the fossil fuel reserves will end by 2250.

However this technology is already existed in two different forms, but we are giving the two technologies in one place. Most probably concentrating on the wind turbine blade design by using readily available PVC (Poly Vinyl Chloride) pipes. It is easy to get them into required size and shape by following design considerations. It is household usage purpose project which is available at low cost compared to individuals available. The reason behind combining both of them is to improve the pole efficiency for the same using in conventional methods.

Ashish S. Ingole and et. al., [4] studied the electricity is most needed facility for the human being. All the conventional energy resources are depleting day by day. So we have to shift from conventional to non-conventional energy resources. In this the combination of two energy resources is takes place i.e. wind and solar energy. This process reviles the sustainable energy resources without damaging the nature. We can give uninterrupted power by using hybrid energy system. Basically this system involves the integration of two energy system that will give continuous power.

Solar panels are used for converting solar energy and wind turbines are used for converting wind energy into electricity. This electrical power can utilize for various purpose. Generation of electricity will be takes place at affordable cost. This paper deals with the generation of electricity by using two sources combine which leads to generate electricity with affordable cost without damaging the nature balance.

Peter Jenkins and et. al., [5] presented the energy is critical to the economic growth and social development of any country. Indigenous energy resources need to be developed to the optimum level to minimize dependence on imported fuels, subject to resolving economic, environmental and social constraints. This led to an increase in research and development as well as investments in the renewable energy industry in search of ways to meet the energy demand and to reduce the dependency on fossil fuels. Wind and solar energy are becoming popular owing to the abundance, availability and ease of harnessing the energy for electrical power generation.

This paper focuses on an integrated hybrid renewable energy system consisting of wind and solar energies. Many parts of Libya have the potential for the development of economic power generation, so maps locations were used to identify where both wind and solar potentials are high. The focal point of this paper is to describe and evaluate a wind-solar hybrid power generation system for a selected location. Grid-tied power generation systems make use of solar PV or wind turbines to produce electricity and supply the load by connecting to the grid.

In this study, the HOMER (Hybrid Optimization Model for Electric Renewable) computer modeling software was used to model the power system, its physical behavior and its life cycle cost. Computer modeling software was used to model the power system, its physical behavior and its life cycle cost. The hybrid power system was designed for a building at the University of Al-Marj (MARJU). Through the use of simulations, the installation of ten 100-kW wind turbines and 150-KW solar PV was evaluated.



III. OBJECTIVES

- ❖ To study the feasibility of solar-wind hybrid power systems for rural electrification
- ❖ To analyze and evaluate the renewable energy potential mainly for those two resources, solar and wind
- ❖ To make the prefeasibility analysis and estimate the load demand;
- ❖ To assess the technical feasibility of a hybrid solar-wind power system to meet the load requirements of the specific remote village electrification.
- ❖ To evaluate a strategy to optimize the size of the energy generation and storage subsystems.

IV. METHODOLOGY

- ❖ With the help of literature we learn about previous researches, models and designs which is related to our projects.
- ❖ The designs have been made using certain software in order to initiate and prepare our project.
- ❖ The dimensions are finalized according to our requirements.
- ❖ Materials are selected after proper analysis in order to full fill the design our model and other factors like weight, ease to manufacture, etc.
- ❖ Fabrication is done according to the planned design.
- ❖ Several tests are done to evaluate the working efficiency of the model.
- ❖ The report has been prepared.

V. DESIGN CONSIDERATION AND DRAWING

5.1 Design consideration

To develop this system & to investigate performance, modeling and mathematical calculations have to develop. Different models of hybrid system have covered in literature. Following are the components from review of literatures:-

5.1.1 Meteorological data:

Meteorological analysis of the location has to be made for optimization process. It is important for total utilization of PV/Wind sources. Measuring solar and wind resources data is main input of the hybrid system. That all data should be measured hourly, daily and as per weather or climate change.

5.1.2 Load Demand:

It is necessary part of system to design & analyze. To find out the exact load demand it is very complicated and difficult to decide. Load variation for different seasons is not predictable, so system have to design for nearer or more than load demand to full fill requirements.

5.1.3 System Configuration:

By studying all data like solar radiation, wind speed and load demand proper selection of equipment have to be made. But sizing of system will be according to the environmental conditions. Because producing power from solar-wind is depend upon the location which is to be selected.

The project design and model a grid-connected wind-solar hybrid power generation system to meet a certain part of the load requirement of a local need of power generation. The Wind and Solar potential of different geographical locations were studied through literature searches and the detail analysis of identified locations was carried out

5.2 Design Drawing

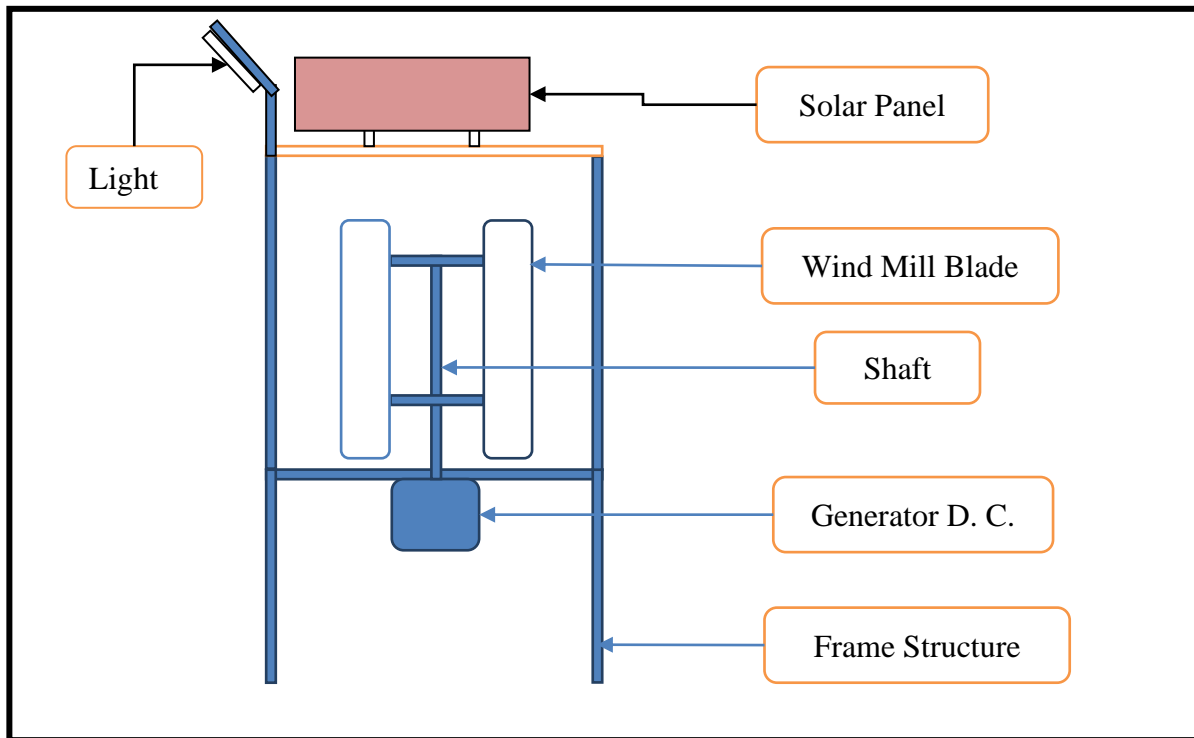


Figure: Hybrid solar and wind power generation

VI. MANUFACTURING PROCESSES

6. 1. Measurement of the material required dimension:

Measurement is the foundation of scientific inquiry. In order to test our hypotheses, we must observe our theoretical concepts at the operational level. In simple words, we must measure what we have defined. But there are different levels of measurement, which provide differing amounts of information about the theoretical construct. There are also some basic issues about the adequacy of measurement which we must address.

6. 2. Cutting operation as per dimension:

Cutting processes work by causing fracture of the material that is processed. Usually, the portion that is fractured away is in small sized pieces, called chips. Common cutting processes include sawing, shaping (or planing), broaching, drilling, grinding, turning and milling. Although the actual machines, tools and processes for cutting look very different from each other, the basic mechanism for causing the fracture can be understood by just a simple model called for orthogonal cutting.

6. 3. Machining operation on required parts:

Turning is a cutting operation in which the part is rotated as the tool is held against it on a machine called a lathe. The raw stock that is used on a lathe is usually cylindrical, and the parts that are machined on it are rotational parts – mathematically, each surface machined on a lathe is a surface of revolution. Machining is an essential process of finishing by which work pieces are produced to the desired dimensions

6.4. Drilling and tapping the material as per dimension:

These four methods all produce holes of different types. Drilling produces round holes of different types; reaming is used to improve the dimensional tolerance on a drilled hole; boring uses a special machine operating like a lathe, to cut high precision holes; and tapping creates screw-threads in drilled holes. Drilling: The geometry of the common twist drill tool (called drill bit) is complex; it has straight cutting teeth at the bottom – these teeth do most of the metal cutting, and it has curved cutting teeth along its cylindrical surface.

6.5. Welding the material as per dimension:

Welding is a process for joining two similar or dissimilar metals by fusion. It joins different metals/alloys, with or without the application of pressure and with or without the use of filler metal. The fusion of metal takes place by means of heat. The heat may be generated either from combustion of gases, electric arc, electric resistance or by chemical reaction. During some type of welding processes, pressure may also be employed, but this is not an essential requirement for all welding processes. Welding provides a permanent joint but it normally affects the metallurgy of the components. It is therefore usually accompanied by post weld heat treatment for most of the critical components. The welding is widely used as a fabrication and repairing process in industries. Some of the typical applications of welding include the fabrication of ships, pressure vessels, automobile bodies, off-shore platform, bridges, welded pipes, sealing of nuclear fuel and explosives, etc. Most of the metals and alloys can be welded by one type of welding process or the other.

6.6. Grinding the project welding joints:

There are several types of grinding machines. The main ones are surface grinders, grinding wheels, cylindrical grinders and center less grinders. The figure below shows examples of a few of these. Surface grinders produce flat surfaces. To improve dimension control on cylindrical parts, center less grinders, which use long cylindrical wheels, are employed. The axis of the regulating wheel and grinding wheel are slightly misaligned, causing the part to travel slowly in the axial direction, and after some time, the part automatically moves beyond the length of the wheel. Controlling the angle of misalignment can control the time that the part is subjected to grinding. If a turned part of complex shape (e.g. stepped shafts) are to be ground, then cylindrical grinding is used, which employs specially made grinding wheels, whose profile fits the profile of the part to be ground.

VII. FUTURE SCOPE

This hybrid power generation at small level that help to construct hybrid generation plant with a minimum cost with highest generating capacity. In past days vertical axis wind turbine had to be start by giving the excitation, our project aspect is to make self-starting wind turbine and another is that to reduce the power fluctuation due to the uneven wind. So that we get constant power supply.

VIII. CONCLUSION

Obviously, a complete hybrid power system of this nature may be too expensive & too labour intensive for many industrial technology departments. However, many of the same benefits could be gleaned from having some subset of the system. For example, a PV panel, batteries & an inverter, or just a PV panel & a DC motor.

The enhancement to instruction, especially in making electrical power management. More physical intuitive & real world are substantial & the costs & labour involved in some adaptation of the ideas in in this paper to a smaller scale setup are reasonable. The use of Solar & Wind hybrid power generation is an especially vivid & relevant choice for students of electrical technology as these are power source of technological, political & economic importance in a country.

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