IJIRR

International Journal of Information Research and Review
Vol. 04, Issue, 11, pp.4681-4683, November, 2017

RESEARCH ARTICLE

STUDY OF IMPLEMENTATION OF MAGLEV TURBINE & SOLAR POWER FOR STREETLIGHTS

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ARTICLE INFO

Article History:

Received 02nd August, 2017
Received in revised form
18th September, 2017
Accepted 28th October, 2017
Published online 30th November, 2017

Keywords:

Study of Implementation of
Maglev Turbine,
Solar Power for Streetlights.

ABSTRACT

Every device we use in our day-to-day life such as mobile phone, computer, induction cookers, washing machines, vacuum cleaners, etc. requires electric power supply. Thus, the advancement in technology is increasing the electrical and electronic appliances usage which, in turn is increasing the power demand. Thus, to meet the load demand, different techniques are used for electric power generation. In the recent times, to avoid pollution and to conserve non-renewable energy resources like coal, petroleum, etc., renewable energy sources like solar, wind, etc. are being preferred for power generation. The combination of renewable energy sources can also be used for generating power called as hybrid power system. As a special case, we will discuss about the working of solar-wind hybrid system in this paper report. Solar and wind hybrid power systems are designed using solar panels and small wind turbine generators for generating electricity. Generally, these solar wind hybrid systems are capable of small capabilities. The typical power generation capacities of solar wind hybrid systems are in the ranges from 1 kW to 10 kW. Objectives of this are- To create new opportunities in low wind speed areas, with starting speed as low as 1.5m/s, combined with solar panels for non intermittent operation. By use of magnetic levitation in windmill to reduce the friction & eliminate the need of bearings in windmill. It convert wind and solar energy into electrical energy remarkably cheap with low operating cost. By use of Magnetic levitation, due to absence of friction, conversion of energy with very less noise compared to existing conventional wind mills take place. It Harnesses eco-friendly and non-polluting energy resources effectively. Use of low voltage devices, hence safe for use and installation. It provide continuous power from hybrid of solar and wind energy conversion.

INTRODUCTION

Energy is essential for our society to ensure our quality of life and to underpin all other elements of our economy. The escalation in cost and environmental concerns involving conventional electrical energy sources have increased interest in renewable energy sources. Many societies across the world in which we live have developed a large appetite for electrical energy. This appetite has been stimulated by the relative ease with which electricity can be generated, distributed and utilized, and by the great variety of its applications. It is arguable whether the consumption of electricity should be allowed to grow unchecked, but the fact is that there is an ever-increasing demand for this energy form. Clearly, if this demand is to be met, then the world's electricity generating capacity will have to grow continuously. Presently, almost all the electricity generation takes place at central power station which utilizes coal, oil, gas, water or fissile nuclear material as the primary fuel source. There are problem facing the further development of generating methods based on any of these conventional fuels. Hydropower generation is restricted to geographically suitable areas, and reserves of coal, although presently plentiful, are not renewable. The possible hazards of nuclear power have been much publicized, particularly those concerning the storage and military use of nuclear waste material. Nevertheless, to assist in maintaining electrical supply to many of our societies, it seems like an increasing nuclear power presence, involving breeder and possibly fusion reactors, will be tolerated. To achieve this and to aid in management of the existing fossil-fuel resources also, it is essential that some part and an increasing part, of future electrical energy research and development should be concerned with so called non-conventional methods of electricity generation. It is estimated that renewable sources might contribute about 20%-50% to energy consumption in the later part of the 21st century. Solar-wind hybrid power generations are visible options for future power generation. Besides being free, they are free of recurring cost.

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They also offer power supply solutions for remote areas, not accessible by grid power supply. Today around 30,000 wind turbines and more than 1,00,000 off-grid solar PV systems are installed all over the world. Wind and solar hybrid model with proper storage system have been keen interest for the last few years. In this project, our focus is on a hybrid model of solar and wind power.

Solar and Wind Hybrid Concept

Hybrid models have been an effective means of generating electricity throughout the world. Lots of research work has been done and continuing to accommodate new advances in this system. This project reports the probabilistic performance assessment of a Wind- Solar Photovoltaic (SPV) Hybrid Energy System. In addition, solar-wind system with backup storage batteries were designed, integrated and optimized to predict the behavior of generating system. In this investigation, wind turbine generators, photovoltaic panels, and storage batteries are used to build a gridlinked generation system which is optimal in terms of multiple criteria including cost, reliability, and emissions. The standalone solar photovoltaic energy system cannot provide reliable power during non sunny days. The standalone wind system cannot meet the constant load demands due to significant fluctuations in the magnitude of wind speeds throughout the year. Therefore, energy storage systems will be required for each of these systems in order to satisfy the power demands. Usually storage system is expensive and the size has to be reduced to a minimum possible for the renewable energy system to be cost effective. Hybrid power systems can also be used to reduce energy storage requirements. By integrating and optimizing the solar photovoltaic and wind systems, the reliability of the systems can be improved and the unit cost of power can be minimized .Solar and wind hybrid power systems are designed using solar panels and small wind turbine generators for generating electricity. Generally, these solar wind hybrid systems are capable of small capabilities. The typical power generation capacities of solar wind hybrid systems are in the range from 1 kW to 10 kW. The electric power generated from solar energy system and wind energy system can be used for charging the batteries or for feeding DC loads or we can use the entire power for feeding AC loads. In this project, our aim is to power streetlights using this solar-wind hybrid system.

Complete description of maglev windmill

In this project Magnetic levitation weight reduction structure for a vertical wind turbine generator included. The fixed permanent magnet fixed to the frame has a first repulsive surface. The axle is connected to the frame. The revolving permanent magnet fixed to the axle has a second repulsive surface in relation to the first repulsive surface of the fixed permanent magnet. Both the first and the second repulsive surfaces repel with each other. The blade hub and the generator connected to the axle. When the revolving permanent magnet is rotated, the axle functions as a balance center. An out structure supports the stator and the rotor is placed over turbine head. The main components of the system are the maglev zone, blade hub and Auxiliary Current (AC) generator. It will convert the kinetic energy from the wind to the electricity for usage. The main function of the free spinning roof ventilator is to provide fresh air in roof space and living area all year round 24 hours a day free of charge. The new idea of the magnetic levitation helps to improve the turbine speed and electrical production.

Component description

1. Neodymium Magnets

The Neodymium metal element is initially separated from refined Rare Earth oxides in an electrolytic furnace. The Neodymium, Iron and Boron are measured out and put in a vacuum induction furnace to form an alloy. Other elements are also added, as required for specific grades e.g. Cobalt, Copper, Gadolinium and Dysprosium (e.g. to assist with corrosion resistance). The mixture is melted due to the high frequency heating and melting the mixture. In simplified terms, the"Neo" alloy is like a cake mixture with each factory having its own recipe for each grade. The resultant melted alloy is then cooled to form ingots of alloy. The neodymium magnet is given a protective coating.

2. Magnet Placement

Two ring type neodymium (NdFeB) magnets of grade N-35 of outer diameter 50 mm, inner diameter 6 mm and thickness 5 mm are placed at the center of the shaft by which the required levitation between the stator and the rotor is obtained. Similar Disc type magnets of 8 mm diameter are arranged as alternate poles one after the other, along the periphery of the rotor made of plywood of 30mm diameter. These magnets are responsible for the useful flux that is going to be utilized by the power generation system.

3. Coils

An electromagnetic coil is an electrical conductor such as a wire in the shape of a coil, spiral or helix. Electromagnetic coils are used in electrical engineering, in applications where electric currents interact with magnetic fields, in devices such as inductors, electromagnets,transformers, and sensor coils. A changing external magnetic flux induces a voltage in a conductor such as a wire, due to Faraday's law of induction. The induced voltage can be increased by winding the wire into a coil, because the field lines intersect the circuit multiple times.

4. Coil Arrangement

46 gauge wires of 500 turns each are used as coils for power generation.10 sets of such coils are used in the prototype. These coils are arranged in the periphery of the stator exactly in a line to the arranged disc magnets. The coils are raised to a certain height for maximum utilization of the magnetic flux. Each set of such coils are connected in series to obtain maximum output voltage. The series connection of the coils is preferred over the parallel connection for optimizing a level between the output current and voltage.

5. Wind Sail

The principal components of a windmill are of course the SAILS. Indeed, it is the sails which transmit the wind power to all those parts which together form the windmill. It is obvious that the shape and the construction of the sails are of primary

importance, for they determine the proportion of the energy which can be transmitted from the wind to the mill. This frame is a system of bars mortised into the stock and connected together with laths or up longs. The bars in the transverse direction project slightly through the stock and are connected in the longitudinal direction by the up longs. Attached to the stock are the leading boards, a set of boards which may be compared to some extent to a foresail before the mast. The wind, blowing on the sails, gives a sideways force component which makes the sails turn.

6. AC-DC Conversion module

An ac to dc converter is an integral part of any power supply unit used in the all electronic equipment. Also, it is used as an interface between utility and most of the power electronic equipments. These electronic equipments form a major part of load on the utility. Generally, to convert line frequency ac to dc, a line frequency diode bridge rectifier is used.

Applications

In India, local governments face great challenges in providing adequate utility services to their populations. Unstable energy supply and the increasing energy demands of a rapidly growing population can often lead to a weak electricity grid. As a result, most cities and towns are facing severe electricity shortages. Municipal corporations can ameliorate these strains through targeted interventions to reduce energy consumption from municipal operations in street-lighting. The local government (Bhopal Municipal Corporation - BMC) consumes energy in operations such as water treatment and supply, sewage treatment and pumping, street lighting and transportation, as well as in its own buildings. The focus of the activities is on the promotion of renewable energy applications with the goal of changing all the conventional streetlights into solar-wind hybrid powered streetlights. Since BMC requires energy for different purposes, if streetlights are made independent from BMC, it will be beneficial for the same. Energy requirement of BMC will be decreased and also, it can use electricity for other purposes so that no electricity shortage takes place. Our concept is to make streetlights independent from municipalcorporations, by using hybrid of solar and wind energy conversion. Our hybrid model uses vertical axis maglev wind turbine in conjunction with solar panels for energy production required for streetlights. It has double benefit, first it is continuous in operation as two modes are employed for charging of battery for lighting. And theother benefit is quicker payback to local governments with existing infrastructure and renewable energy electricity supply.

The installation of solar wind hybrid powered streetlights has following advantages –

- Cost saving and GHG reductions in street lighting.
- Noiseless operation.
- Reduction in load factor of municipal power supply grid.
- Quicker payback of initial cost.
- Clean and green energy.
- Continuous service resulting in no electricity shortage.
- Better traffic control.
- Independency of street-lighting systems.
- Contribution in development of country.
- Building the economy of country by reducing carbon footprints.

Conclusion

Hybrid power generation system is good and effective solution for power generation than conventional energy resources. It has greater efficiency. It can provide electricity to remote places where government is unable to reach. So that the power can be utilize where it generated and hence it will reduce the transmission losses and cost. Cost reduction can be done by increasing the production of the equipment. People should be motivated to use the non conventional energy resources. It is highly safe for the environment as it doesn't produce any emission and harmful waste product like conventional energy resources. It is cost effective solution for electricity generation. It only need is the initial investment. It also has long life span. The scope of hybrid system, mainly solar and wind, in Bhopal are very high and it is very reliable for both rural and urban areas. Overall, it is good, reliable and affordable solution for electricity generation.

Acknowledgement

I am very thankful to my colleagues from UIT-RGPV who provided ideas and insight that assisted the research in a greater way. I thank DR. A.C. TIWARI, HOD Department of Mechanical Engineering, UIT-RGPV for assistance with analyses technique and methodology, and also Prof. Nitin Shrivastav, Asst. Professor, Department of Mechanical Engineering, UIT-RGPV for suggestions that help in the successful completion of manuscript.

REFRENCES

Ashok Kumar, L., P. Surekha and S. Sumathi, 2015. Solar PV and wind energy conversion systems.

Dahiru Sani Shu'Aibu, 2012. Magnetic Leviation control system

Hau, E. 2000-2006. Wind Turbines

Murari Singh, George Lucas, 2008. Blade design and analyses of Turbines.

Stiebler M. 2008. Wind Energy systems for electric power generation.

Thomas Ackermann, 2005. Wind Power in Power systems.

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