IJCRT.ORG ISSN : 2320-2882

INTERNATIONAL JOURNAL OF CREATIVE RESEARCH THOUGHTS (IJCRT)

An International Open Access, Peer-reviewed, Refereed Journal

Windmill Operated Mobile Tower

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ABSTRACT: Now in this modern age, we see that the uses of smartphone and the Internet is rapidly increasing, to fulfil the demand of internet. We required mobile tower & now a days the demand from rural area is more than the urban area, but because of lack of electricity we did not fulfil their demand & because of this the tower operators uses diesel generator through this they fulfil the overall demand. But in this case the cost of using DG set is high & also it makes too much pollution to counter this we are introducing this project. The name of this project is Windmill Operated Mobile Tower. The aim of this project is operating the mobile tower with the help of windmill. The mobile tower operated on the windmill energy. Traditionally we see that for a working of a mobile tower company used the MSEDCL supply and a Diesel Generator, but in this process the running cost of a Diesel Generator is very high. The cost is approx.8 lac/year & also the DG makes much more pollution when it generates electricity. The DG use diesel as a fuel because of that it makes much more pollution which is harmful for our environment. Through this paper we aim to debate the potential for alternative routes of giving primary source of electricity for operation of mobile tower and providing clean & pollution free electricity for the mobile tower. In this project we are placing the Windmill at place of Diesel Generator. Then we can generate the electricity with the help of windmill, and we can make the mobile tower pollution free. The running cost of a wind mill is negligible in the system. There is only some periodical maintenance we have to do. In this way can make a new kind of tower which running cost is very less and mainly it does not make pollution.

KEYWORDS: DG set-Diesel generator set, windmill, mobile tower

INTRODUCTION

The project is designed to develop a pollution free mobile tower. For working of a mobile tower company use MSEDCL electricity and Diesel Generator. DG set make much more pollution, to totally reduce this we remove the DG set and in place of DG set we are taking supply from Windmill which is located upper side of the tower. In this system we have two supplies one is from MSEDCL and other is from windmill. This both supplies connected to the tower. At a time, tower takes only one supply as input. We can supply the excessive energy to MSEDCL, so it helps to reduce the monthly bill generated by MSEDCL. For this we used Synchronous generator for generate electricity from windmill and grid connection is done for return supply to MSEDCL.

METHODOLOGY

The tower we choose for this project is Ground Based Tower (GBT) (Tubular type tower used). These types of tower are mostly suitable for the village area. In the village side area, the density of wind is very high and it will help to rotate wind mill faster. The height of GBT tower is very high & its structure is also very strong. Because of this it can hold the windmill very easily and it will give much more protection for windmill. The only aim of this project is that to generate clean, pollution free & reasonable Energy to operate a mobile tower. Because now a days the rate of use of smartphones is very high. Because of that the number of mobile towers is increasing very rapidly and the tower operates on DG set in remote area which makes more pollution.

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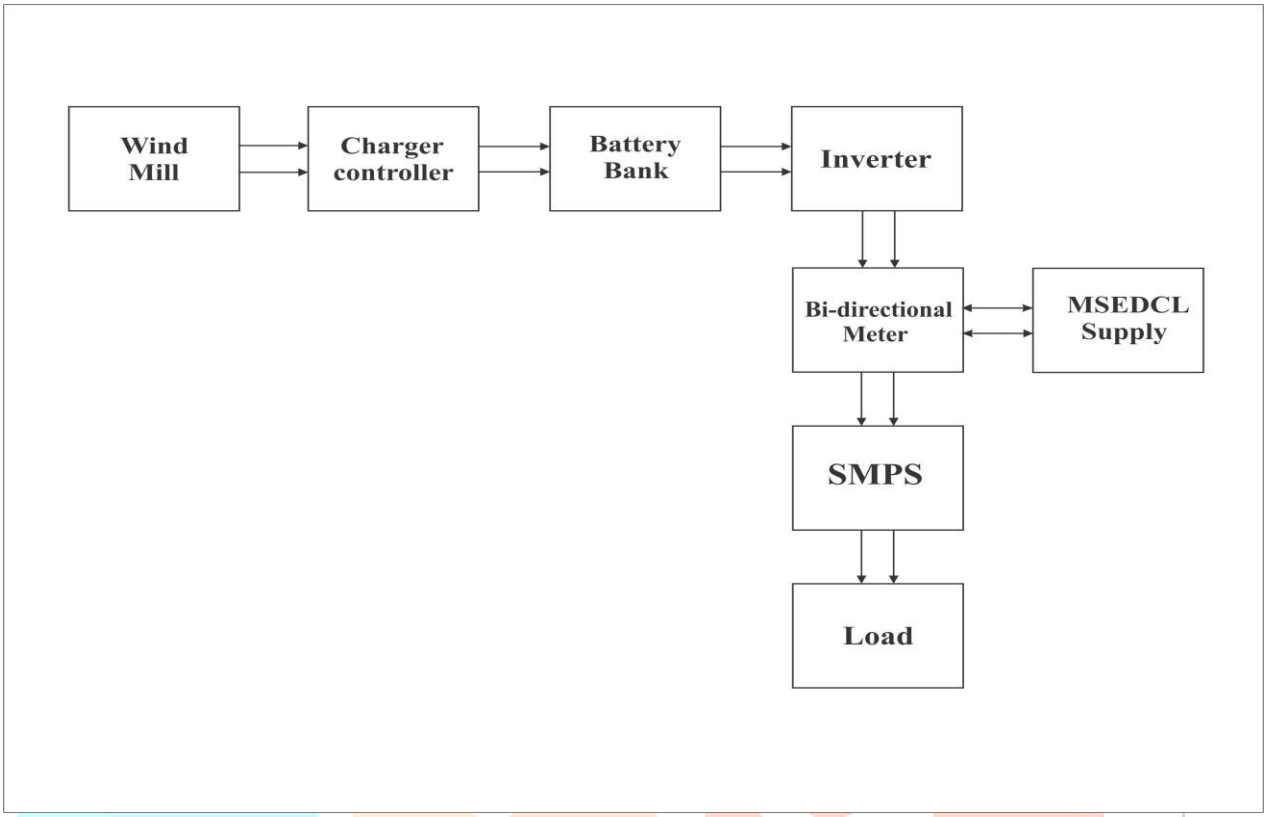
BLOCK DIAGRAM



- **Vertical axis windmill:** a windmill is combination of wind turbine, gear system and other devices which are convert the wind energy into electrical energy. Kinetic energy of wind is first converting into mechanical energy, and then this mechanical energy is converting into electrical energy vertical axis energy. Vertical axis windmill does not require any specified wind direction to generate electricity. That is vertical axis windmill works in any direction of wind. Blade of windmill is 120^0 shift with each other. Here we use 3 blade wind turbines. A combination gears increase the speed of rotation of the rotor from about 18 revolutions a minute to roughly 1,800 revolutions per minute, so this speed that allows the turbine's generator to produce AC electricity It is compact in size.

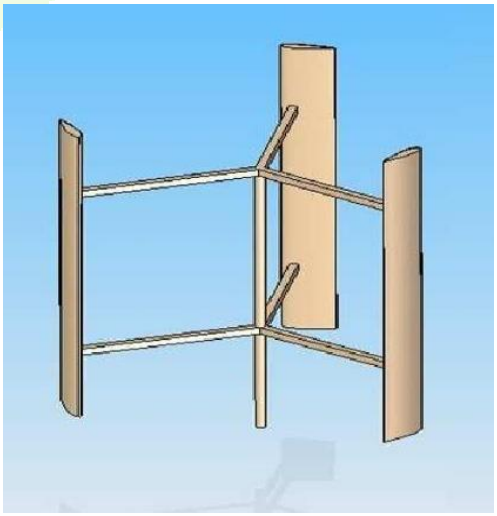


Fig 1. Vertical axis windmill

- **Charge controller:** by using good, reliable charge controller we can achieve low cost and benefit that consumer can get from it. This is the main component of any battery charging system. The main function of a charge controller is in a renewable energy system is to regulate the voltage and current from sources into a rechargeable battery. It disconnects the generator from battery bank when it gets full charged.

Fig 2. Charge Controller

- **Battery bank:** the battery system consists of the battery pack, which connects multiple cells to appropriate voltage and capacity; the battery management system (BMS); and the battery thermal management system (B-TMS). The BMS protects the cells from harmful operation, in terms of voltage, temperature, and current, to achieve reliable and safe operation, and balances varying cell states-of-charge (SOCs) within a serial connection.

Fig 3. Battery Bank

- **SMPS:** Switch mode power supply is device that convert AC or DC signal into regulated DC output. Its operated at high frequency. So, the size of component is decreases.in output size there are multiple output terminal with various voltage level. Switching elements are connected in series to switching the current supply to a smoothing capacitor turn ON and OFF. Efficiency of SMPS is around 85% to 90% and also it flexible with voltage usages.

fig 4. SMPS

- **Inverter:** A three-phase inverter is operated to control the voltage and its frequency, balancing and levelling of loads, and harmonics mitigation at PCC. To maintain constant frequency, the VSI is forced to operate at desired frequency. For the voltage and frequency control at PCC in the presence of perturbations and nonlinear load, proportional resonant (AWPRC) and proportional integral (AWPI) controllers with ant windup are suggested to avoid the saturation phenomenon two different control approaches are combined to achieve all desired tasks simultaneously when the system is operating in grid and islanding modes. A remote-controlled switch selector is used to select the right control based on the information received from the data centre using smart meters.

Fig 5. Inverter

- **Bidirectional meter:** Bi-directional metering is available to customers who install renewable fuel generators such as solar, wind, hydro or biomass sources and operate the generator in parallel with their electric company's electrical system. This meter is measure both incoming and outgoing supply and store this data. This data is automatically sent to consumer as well as company so the billing is calculated. The generator system can offset a customer's electric energy usage with any excess electricity produced. As the generator system produces electricity, the kilowatt-hours are first used to meet the customer's home electric requirements such as lighting and appliances and decoration. If excessive electric energy is produced from the system than the customer needs, then the additional kilowatt-hours are measured, and fed into the grid connected utility's electric system.

Fig 6. Bidirectional Meter

- **Transformer:** Transformer is a static device which transfers alternating current from one side to another side by change in magnitude without change in frequency. It works only on AC Voltage. It changes in current or voltage magnitude. Mainly it consists two windings, one is primary and another is secondary. In this project we use step down transformer is use. We required plus and minus 24v for one operator and 48v for two operators. Transformer is key component of electrical grid.

Fig 7. Transformer

- **Synchronous Generator** In wind energy conversion systems (WECS), the turbine collects the kinetic energy of the wind and convert it into mechanical energy through a dynamic interaction with the electrical generator which then it turns converts this mechanical energy to electrical energy. The PMSM (Permanent Magnet Synchronous Motor) are torque-controlled using field orientation technique. A three-phase IGBT inverter with closed loop current PI-controllers are used to drive the PMSM. The operation principle of a Synchronous Generator is based on "Faraday's law of electromagnetic induction". The synchronous generators are synchronous electro-mechanical machines used as generators and consist of a magnetic field on the rotor that rotates and a stationary stator containing multiple windings that supplies the generated power.

Fig 8. Synchronous Generator

- **Load (Mobile Tower):** In this project mobile tower is act like a load, where we gave the generated energy to this load. It required both AC and DC current. Ac supply is required for auxiliary equipment like light, air condition and other application. Where DC supply is use to operate the mobile tower radiation plates and its connected device. This equipment works on plus or minus 24 volts for one operator. It required 60Amp current. It required continuous supply without distraction and minimum switching.

Fig 9. Mobile Tower

SYSTEM IMPLEMENTATION

CONCLUSION

In this project we are using the Windmill generated energy as the primary source of Power, and The Electricity which coming from MSEDCL is a Secondary source of Power. Thus, we are generating the electricity with the help of windmill, and it makes the mobile tower pollution free. In this way can make a new kind of tower which running cost is very less and mainly it does not make pollution. The design and implementation of this technique is directly targeted for energy saving with increase in use of renewable sources. The aim of project is to run the mobile tower by renewable resources and saving the running cost. Also, the excessive energy is provided to other application like street light and MSEDCL through the grid system.

ACKNOWLEDGEMENT

We are pleased to present “Windmill Operated Mobile Tower” as our project and take this opportunity to express our profound gratitude to all those people who helped us in completion of this project. We are thankful for our college for providing us with excellent facilities that helped us to complete and present this project. We would also like to thank the staff members and lab assistants for permitting us to use equipment in the lab as and when required. We express our deepest gratitude towards Prof.Liladhar Bhamare for his valuable and timely advice during the various phases in our project. We would also like to thank Prof.M.K.Kumawat for providing guidance and support. We also like to thank them for providing us with all proper facilities and support as the project coordinator. We would like to thank Mr.Satish Dolas for providing guidance and support, patience and faith in our capabilities and for giving us flexibility in terms of working and reporting schedules.

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