

Mobile Tower Operate Using Wind Energy

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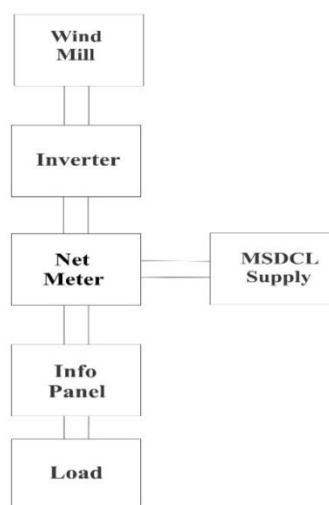
ABSTRACT:The aim of this project is operating the mobile tower with the help of windmill. The mobile tower operated on the windmill energy. Traditionally we see that for a working of a mobile tower company used the MSEB supply & a Diesel Generator, but in this process the running cost of a Diesel Generator is very high. The cost is approx. 6 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 windmill. 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, Renewable energy, MSDCL supply

I. INTRODUCTION

The project is designed to develop a pollution free mobile tower. For working of a mobile tower company use MSDCL 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 put Windmill which is located inside the tower. In this system we have two supply one is from MSDCL and other is from windmill. This both supplies connected to the tower. At a time, tower takes only one supply as input. If first supply is low then it will shift on other supply. We can supply the excessive energy to MSDCL, so it helps to reduce the monthly bill generated by MSDCL. For this we used induction generator for generate electricity from windmill and grid connection is done for return supply to MSDCL

II. METHODOLOGY



The tower we choose for this project is Ground Based Tower (GBT). These types of tower are mostly available in the village area. In the village side area, the density of wind is very high and this will help to rotate wind mill faster. The height of GBT tower is very high & its structure is also very strong. Because of that 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 operate on DG set in remote area which makes more pollution.

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



FIGURE:1 TRANSFORMER

- b) **VERTICAL AXIS WINDMILL:** Windmill convert the kinetic energy of wind into the clean renewable electrical energy. Vertical axis windmill work on any direction of air flow. By this advantage, efficiency of this windmill is very high in low density air pressure area. H-type blade are use which provide best efficiency among all the blade. This windmill consist 3-5 blade depend on windmill capacity and air pressure. In three blade construction the angle between two blades is 120° . 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.

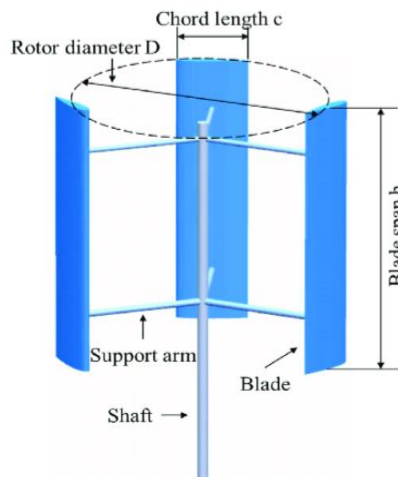


Figure:2 H-type Rotor

- c) **SYNCHRONOUS GENERATOR:** Voltage regulator is electrical or electronic device which provide suitable power supply. Its work is automatically. Depending on the design, it may be used for AC or DC voltages. Feedback voltage regulators operate by comparing the actual output voltage signal with some fixed reference voltage signal. If error is occurred then by adding or reducing the voltage level it can math with reference voltage. And according to set voltage level, voltage regulator provide output.



Figure:3 Synchronous Generator

- d) **VOLTAGE REGULATOR:** Voltage regulator is electrical or electronic device which provide suitable power supply. Its work is automatically. Depending on the design, it may be used for AC or DC voltages. Feedback voltage regulators operate by comparing the actual output voltage signal with some fixed reference voltage signal. If error is occurred then by adding or reducing the voltage level it can math with reference voltage. And according to set voltage level, voltage regulator provide output.



Figure:4 Automatic Voltage Regulator

- e) **SMPS:** SMPS full form is switch-mode power supply. Its work is to convert AC voltage power to lower voltage DC power. It provides multiple output terminal. Mostly SMPS are used for computer system devices also in industrial machine tool. In our project we required multiple voltage for various application so we use SMPS to fulfil the multiple voltage requirements.



Figure:5 Switch Mode Power Supply

- f) **BI-DIRECTIONAL METER:** Net metering is a billing system that allows electric customers to sell to their electric utility any excess electricity generated by their DG system. Many different renewable sources may be eligible for net metering credits, but rooftop solar, rooftop windmill installations are the most common type are promoted with net metering. While net metering policies vary by state, customers with rooftop windmill or rooftop solar or other systems usually are credited at the full retail electricity rate for any electricity they sell to electric utilities via the grid. The full retail electricity rate includes the cost of the power also all of the fixed costs of the poles, wires, meters, advanced technologies, and other infrastructure that make the electric grid safe, reliable, and able to accommodate rooftop windmill panel or other systems. Through the credit or payment, they are receive, net-metered customers effectively avoid paying these costs for the grid.



Figure:6 Bi-directional Meter

g) **SCADA:** The components required for the reliable operation of the overall system are system control and monitoring, the energy management system (EMS), and system thermal management. System control and monitoring is general (IT) monitoring, which is partly combined into the overall supervisory control and data acquisition (SCADA) system. It also provides real-time data and real-time fault analysis. By using PLC and SCADA we can control the operation of windmills which are located in remote locations.



Figure:7 SCADA Panel And PLC

h) **LOAD (MOBILE TOWER):** In our project, a mobile tower acts like a load, where we give the generated energy to this load. It requires both AC and DC current. AC supply is required for auxiliary equipment like light, air conditioning, and other applications. Where DC supply is used to operate the mobile tower radiation plates and its connected devices. This equipment works on plus and minus 24 volts for one operator. It requires 60Amp current. It requires a continuous supply without distraction and minimum switching.



Figure:8 Mobile Tower

III. EXPERIMENTAL RESULTS

By this design we can replace the pollution-making mobile tower with the renewable, clean, and pollution-free mobile tower. By this design we can promote the renewable energy and create a new way to save the fossil fuel.



IV. CONCLUSION

The design and implementation of this technique is directly targeted for energy saving with increase in use of renewable sources so that the running cost of mobile tower is gradually decreases. This project aims is to run the mobile towel by renewable resources and saving the running cost. Also, the excessive energy is provided to other application like street light and MSDCL.

REFERENCES

- [1] S. N. Bhadra, D. kashtra, S. Banerjee (2005), wind electrical system, New Delhi: oxford university press, ISBN – 13: 978-0-19-567093-6; ISBN – 10: 0-19-567093-0.
- [2] Pressman, Abraham I. (1998), *Switching Power Supply Design* (2nd ed.), McGraw-Hill, [ISBN 0-07-052236-7](https://doi.org/10.1002/9780470522367).
- [3] Boyer, Stuart A. (2010). *SCADA Supervisory Control and Data Acquisition*. USA: ISA - International Society of Automation. p. 179. [ISBN 978-1-936007-09-7](https://doi.org/10.1002/978111936007097).
- [4] Faculty of mechanical engineering (2011), design data book of engineering, Coimbatore: kalaikathir achagam page no.: 1.40, 8.1 – 8.53.
- [5] Zorn Petrušić and Andrija Petrušić, “Application of a bidirectional electricity meter in the 5kW gridconnected photovoltaic power plant”, Proceedings of the 5th Small Systems Simulation Symposium 2014, Niš, Serbia, 12th-14th February 2014.
- [6] South, P. and Rangi, R., 1972. *A Wind Tunnel Investigation Of A 14 Ft. Diameter Vertical Axis Windmill*. 7th ed. Ottawa: National Research Council Canada.