

“Innovative Hybrid Power Generation On Highways”

Sachin S. Patil

Asst. Professor, Dept. of ECE, Hirasugar Institute of Technology, Nidasoshi Karnataka, India
sachinpatil.ece@hsit.ac.in

Abstract- This paper uses the concept of renewable energy is energy that is collected from renewable resources, which are naturally replenished on a human timescale, such as sunlight, wind rain, tides, waves, and geothermal heat. Renewable energy often provides energy in four important areas: electricity generation, air and water heating/cooling, transportation, and rural(off-grid) energy services. Implemented gadget is Comfort coupled with safety and simplicity. The culmination of my effort has resulted in development of new “Hybrid wind and solar with display”.

The gadget present a basic as well as very professional treatment of the subject in a very comprehensive, based on learning effort and understanding capability of today as per their levels. The device is simple and comfortable. Basic calculation, drawing, designing is included in the paper. The salient features of my machine can be listed as the mechanism used is very simple, easy for operation; no skill is required to operate the machine.

Key Words: Renewable energy, Display system and Sensors.

1. Introduction:

As the automobiles moves from highways/expressways, there is a creation of pressure column on both the sides of the road. This pressure column is created due to imbalance of high pressure/low pressure energy band created by the automobiles. Due to this pressure band wind flow and create pressure thrust. This Pressure thrust of wind energy can be converted into mechanical energy with the help of small turbines placing them just nearby these highways sides and centre.



Fig.1: Sample picture of wind turbines installed near side highway.

These small turbines installed on road side by getting high pressure from winds starts rotating. This rotational energy of turbine can be stored in batteries and can be utilized in any work in the form of electricity.

These are vertical axis turbines which can be installed nearby highways. These turbines rotate on the energy pressure created by the nearby moving automobile.

All these turbines can be connected through each other with the help of a common shaft which can be called as drive shaft. This drive shaft can be connected to a dynamo, through this dynamo we can connect to a battery which can store that energy for temporary basis.

This system is used to produce electricity and use it at that place only or can be transferred to nearby village or can be used to develop and maintain a bio diversity or wild life sanctuary nearby.

In India electrical energy is generated mostly with the help of conventional sources of energy. Instead of implementing thermal power plant, we can utilize non-conventional sources such as "WIND ENERGY" in the form of wind turbine and "SOLAR ENERGY".

2. Literature survey

Suresh H. have developed a model to investigate the optimum siting of wind turbine generators based on site and wind turbine type. The methodology of analysis was based on the accurate assessment of wind power potential of various sites. The analytical computation of annual and monthly capacity factors has been carried out by using the Weibull statistical model employing cubic mean cube root of wind speeds. A judicious choice of potential sites and wind turbine generator systems can be made using the model proposed.

Wen-jei Yang adopted the same principle for determining the power generation by a wind machine and discussed about the utilization of excess wind power for hydrogen storage and subsequent secondary power generation.

Rogers studied experimentally the design requirements for a medium sized wind turbine for remote and hybrid power systems. Also, the operational problems of installing medium and large sized wind turbines at remote locations have been addressed. 2.3. Solar Photovoltaic Wind Hybrid System.

3. Problem definition

In the project, hybrid solar and wind turbine system was introduced for the operation in day and night. In daylight hours, solar system can achieve the highest efficiency during the sunny day. Wind turbine able to function during day and night time without any restriction of climate with at least of wind. In order to achieve the highest efficiency for renewable energy systems in whole day, hybrid solar wind turbine system is one of optimum solution to generate the energy in anytime and all weather conditions. Aim of this project is to design the

model of hybrid solar wind turbine in single setup and then investigate the feasibility of the hybrid solar vertical wind.

5. Block diagram and Working

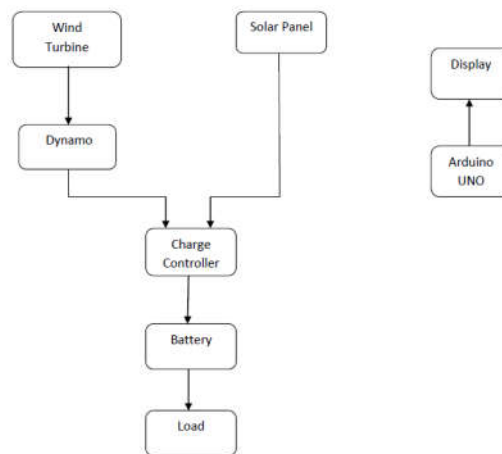


Fig. 2 Block diagram

The design of the system is divided into two parts: Hardware components and software components.

A. Hardware Components: 1. Arduino board 2. Temperature Sensor (LM35) 3. Wind turbine 4. CO2 Sensor 5. Solar panel 6. Dynamo **B. Software Components:** 1. Arduino Software (IDE).

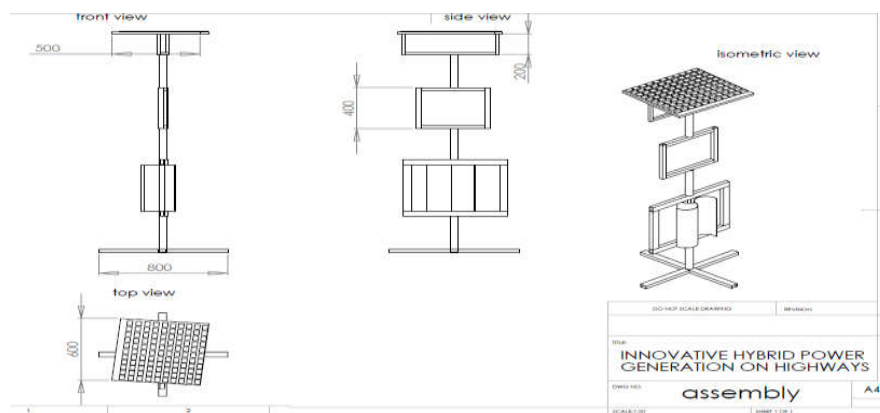


Fig.3 Assembly model diagram

WIND TURBINE:

- The vertical axis wind turbine is used to convert the kinetic energy into Mechanical energy, this turbine blades are made up of light weight material, the turbine input is given to the dynamo.
- Dynamo's work using the wild complex phenomena of electromagnetism. The electricity produced by the solar panel and dynamo is stored in MPPT kit.

SOLAR PANEL:

- Solar panel is placed at the top of wind turbine it will produce electricity.
- **Arduino UNO:** The Arduino UNO is an open source microcontroller board. The board is equipped with sets of digital and analog input/output pins that may be interfaced to various expansion boards and other circuits.
- **Display:** It is used as Multipurpose. It display the current Time, Date, Temperature, and carbon contents present in atmosphere.

6. Hardware Implementation

Fig. 4 Hardware Connection Setup for Innovative Hybrid Power Generation On Highways.

7. Result Analysis and Discussion

The wind turbine produce maximum 30V.

solar panel will produce 17V.

Display will displays the CO₂ and Current Temperature present in the atmosphere also it display the Date and Time.

$$\text{Power co-efficient} = \frac{\text{Power of the wind rotor}}{\text{Power available in the wind}}$$

Where power available is calculated from the air density, rotor diameter, and free wind speed as shown above and is given by

$$P_{\text{wind}} = 0.5 * \rho_a * A * v^3$$

The maximum theoretical power co-efficient is equal to $16/27$ or 0.593 . A rotor in a free flow wind stream cannot exceed this value forces on the blades and thrust on turbine.

As stated earlier, here blades of propeller type wind turbine are considered. There are two types of forces, which are acting on the blades. One is circumferential force acting in the direction of the wheel rotation that provides the torque and other is the axial force acting in the direction of the wind stream that provides an axial thrust that must be contracted by proper mechanical design.

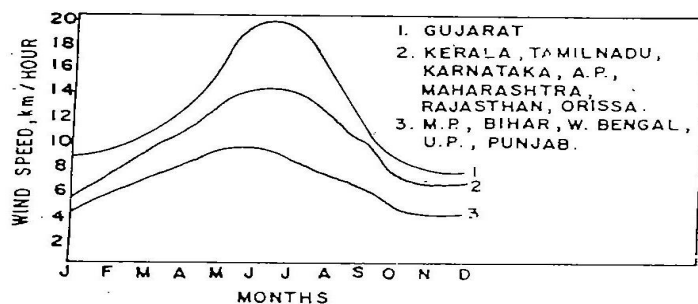
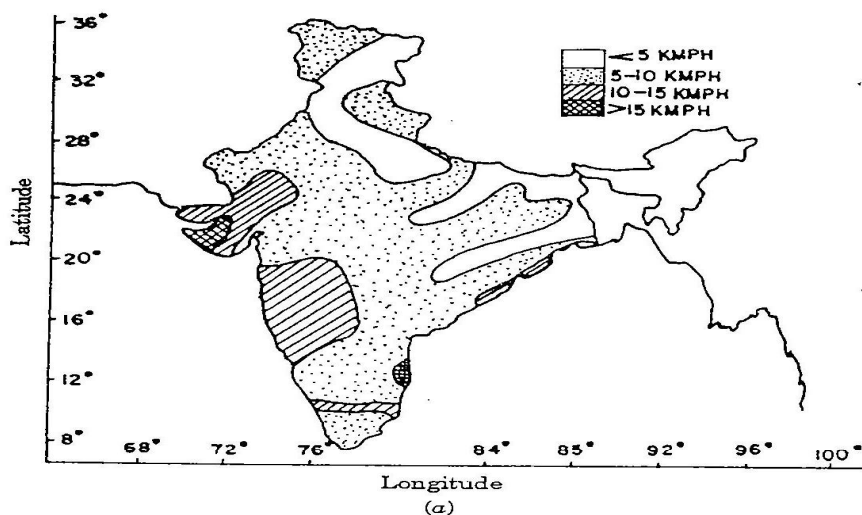


Fig. 5 a: Wind speed in India

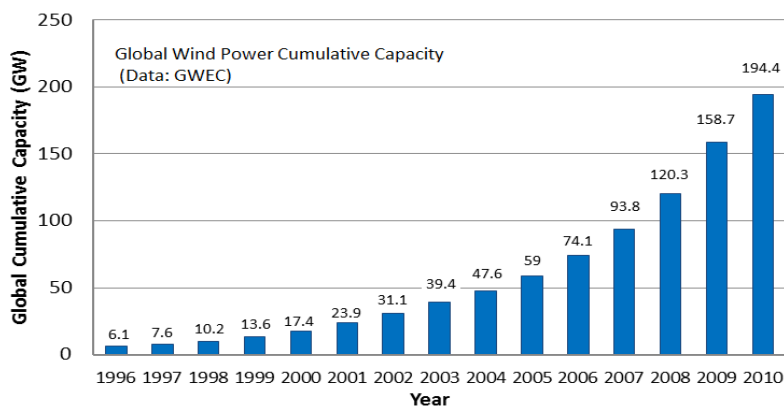


Fig. 5 b: Utilization of Wind Energy year wise

8. Conclusion

The maneuverability of the device is quite good and the handling is quite simple. For commercial purpose one can improve the efficiency of the device effectively by increasing the size of the device.

9. Future scope

The hybrid system model can also be erected in the path of rail road where high pressure of wind is developed by the motion of the train. When manufactured on large scale, power generation cost of this system will reduce.

10. References

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