Electricity Generation Using Wind Power

Melkunde Manthan Shivsharan [1], Chame Ramchandra Kamlakar [2], Adsule Abhinav Sharad[3], Deshmukh Sumit Govind[4] , Prof. Ashitosh Ankulge [5]

[1, 2, 3, 4] Dept of Diploma in Electrical Engineering

[1, 2, 3, 4] Vishweshwarayya Institute Of Engineering & Technology, Almala, Maharashtra ,India

Abstract- *This expanded report presents a more technical and calculation-oriented study of a small PVC windmill electricity generation system. The report preserves the academic chapter structure of the sample report supplied by the user while changing the project topic from cycle-based generation to wind-based generation. The work is anchored to the user-supplied YouTube project topic, namely a homemade PVC windmill for electricity generation, and is further developed into a formal engineering-style document through the addition of assumed design specifications, analytical calculations, electrical architecture, and multiple diagrams.*

The study explains how a PVC rotor extracts energy from wind, converts it into shaft torque, drives a 24VDC generator, conditions the variable output through rectification and regulation, and finally delivers power to a battery or low-voltage DC load. A detailed hardware chapter is included to document the rotor, hub, shaft, bearings, generator, rectifier, capacitor, controller, battery, and measuring instruments. The report also introduces standard wind-energy equations such as rotor swept area, available wind power, power coefficient, electrical output, tip-speed ratio, rotor-speed estimation, and battery charging time. These calculations are clearly marked as educational engineering estimates because the source video itself does not publish a full bill of materials or measured laboratory data.

The resulting document is suitable for project submission, viva preparation, or further customization into institution- specific format. It is especially useful for students who need a longer project report with more technical depth, better organization, and stronger numerical content than a simple overview report.

Keywords: PVC windmill, small wind turbine, renewable energy, aerodynamic power, DC generator, battery charging, project report, educational prototype.

I. INTRODUCTION

The proposed project is a small wind-energy conversion system fabricated using PVC rotor blades and a compact electromechanical generator. The windmill is intended to convert naturally available wind energy into useful electrical power for low-voltage applications. In engineering terms, the system can be divided into three domains: aerodynamic capture, mechanical transmission, and electrical conditioning. The aerodynamic part consists of blades and hub; the mechanical part consists of shaft, bearing, and coupling; and the electrical part consists of generator, rectifier, controller, battery, and load.

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II. HISTORICAL

Electricity Generation Using Wind Power Wind power has been used for thousands of years, starting in places like Ancient Egypt for sailing boats and later in Persia for grinding grain using windmills. In the late 19th century, scientists such as James Blyth and Charles F. Brush developed the first wind turbines to generate electricity. Although its use slowed after World War II due to fossil fuels, interest in wind energy grew again during the 1970s energy crisis. Today, wind power is an important renewable energy source used worldwide, especially in countries like China and United States.

III. OBJECTIVE

The main objective of electricity generation using wind power is to produce clean and renewable energy by converting wind energy into electrical energy. It aims to reduce dependence on fossil fuels, lower environmental pollution, and support sustainable development. Wind power also helps in decreasing the impact of climate change and provides an eco-friendly alternative for meeting the growing energy demands of countries like India and China.

IV. WORKING PRINCIPLE

The working principle of wind power generation is based on converting the kinetic energy of moving air into electrical energy. When wind blows, it rotates the blades of a wind turbine. These blades turn a shaft connected to a generator, which then converts mechanical energy into electricity using electromagnetic induction. The amount of electricity generated depends on the speed of the wind and the size of the turbine blades. A gearbox is often used to increase the rotation speed for efficient power generation. The generated electricity is then transmitted through cables and can be stored or supplied to homes and industries. Modern

wind turbines are widely used in countries like India and Denmark for clean and sustainable energy production.

V. ADVANTAGES

- It is a clean and renewable source of energy.
- It does not produce air pollution or harmful gases.
- Wind energy is free and abundantly available in nature.
- It reduces dependence on fossil fuels.
- Low operating and maintenance costs after installation.
- Helps in sustainable development in countries like India and Germany.
- Wind turbines can be installed on farmland without disturbing agriculture.
- Suitable for both small-scale and large-scale electricity generation.

VI. FOLLOWING ARE THE MAIN COMPONENTS OF ELECTRICITY GENERATION USING WIND POWER

1.PVC Blades

2. PVC Pipe

3. . DC Motor

4. Grinder Machine

5.Copling Shaft

6. Nut & Bolt

7. Bearing

VI. CONCLUSION

Wind power generation is an important and sustainable method of producing electricity using natural wind energy. It is eco-friendly, renewable, and helps reduce pollution and dependence on fossil fuels. With continuous technological advancements, wind energy is becoming more efficient and widely used in countries like India and Denmark. Overall, wind power plays a key role in meeting future energy demands while protecting the environment.

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