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# ENERGY HARVESTING USING MAGNETIC WING TURBINE: A REVIEW

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**Abstract:** The magnetic wing turbine is a promising technology for energy harvesting applications, which utilizes a magnetic field to rotate the blades of the turbine. This technology provides revolutionized way for generating energy and sustainable solution for generation of power. The magnetic wing turbine generates electricity by utilizing the movement of air to rotate a rotor equipped with permanent magnets. The rotation of the rotor creates a magnetic field that induces a current in a nearby coil, which is then converted into usable electricity. The design of the magnetic wing turbine offers several advantages over traditional wind and hydro power systems, including higher efficiency, reduced noise pollution, and improved durability. In this paper a review about Energy Harvesting Using Magnetic Wind Turbine is presented.

**Keywords**: magnetic wing turbine, energy harvesting, permanent magnet, magnetic field.

## I. INTRODUCTION

Energy harvesting is an essential component of the renewable energy sector that provides an alternative to conventional energy sources. One of the most significant challenges in energy harvesting is the need to extract energy from the surrounding environment efficiently. The magnetic wing turbine is an emerging technology that shows promise in energy harvesting applications due to its high efficiency and ease of implementation.

Energy harvesting is a method of capturing and converting ambient energy sources into usable electricity. Traditional methods of energy harvesting, such as solar and wind power, have been widely researched and implemented, but they have limitations such as high initial cost, maintenance requirements, and geographical restrictions. In recent years, there has been growing interest in alternative energy harvesting

technologies, including the use of magnetic wing turbines

## II. LITERATURE REVIEW

Energy harvesting using magnetic wing turbines has gained significant interest in recent years due to its potential for efficient energy generation, Small-scale wind turbines known as "magnetic wing turbines" use magnetic fields to transform the kinetic energy of the wind into electrical energy. In this literature review, the current state of the magnetic wing turbine technology, different design aspects and its various applications are explored. Specifically, the recent research in this field is examined, including the development of novel materials and designs, as well as advancements in energy storage and management. The aim of this literature review is to provide a comprehensive overview of the current state of magnetic wing turbine technology and its potential for future applications.

There are several configurations for wind turbines, including those with horizontal axes and those with vertical axes are mainly discussed in [1]. Challenges related to various configurations, such as low beginning torque and low power coefficient, and poor building integration, must be solved in order to expand the usage of VAWT. Wind field modeling, aerodynamic modeling, blade element moment theory, and control system modeling are used to maintain wind turbine operating parameters within specified limits. These emerging trends in wind energy signaling represents a capable future for the wind energy industries.

The paper [2] gives predicting the efficiency of the full scaled H-type wind turbine with a vertical axis is the main goal of the wind velocity measurements over the 1/3 scaled prototype wind turbine with a vertical axis. The two main

  

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components of a wind turbine, wind power and a pulley power transmission system, both have an impact on the electrical power it generates. Wind turbines are designed in a ratio of 1:3 to blade and drag devices. According to the experimental observation, 567 W of power is produced at a speed of 20 m/s and 709 W at a speed of 25 m/s.

The paper [3] gives analysed the design, testing and evaluation of a savonius and darrieus VAWT, The Darrieus VAWT is designed, built and tested for self-start. NACA 0030 air-cushioned blades provided high thickness, resulting in increased turbine efficiency. The Savonious blades were added, which further decreased the turbine's speed from 60 rpm at 3 m/s to 2.5 m/s.

comparison of a vertical wind turbine's blade dimension design for low wind speed applications is presented in [4]. According to the turbine blade variation test findings, the secondary bypassing value should be adjusted to 0 cm, and the primary bypassing value should be changed to 0 cm and 10 cm in both the positive and negative position., the size affects the rotation of the turbine. The best designed turbine is the 2nd turbine of size D>H which can rotate at 2.5 m/s. When creating a turbine, consider using the parameters H = 40 cm and D = size. Secondary overlap is equal to 0 cm, while the primary overlap value is negative 10 cm.

Effects on direction of the wind and vertical wind on the output power of a single vertical wind turbine mounted on a building's rooftop is presented in [5], The SVAWT used in this study was manufactured by Hi VAWT Technology Corp., Taiwan. This DS-3000 type is a Class 3 turbine produced by that manufacturer. Each blade is 4 m in diameter and 4.95 m high from base to center. Gill Instruments' 3D ultrasonic anemometer was used to find wind direction and speed in the range of 0° to 359.9° and 0 m/s to 45 m/s. Data is gathered during the power generation process, and the building technique is used to categorise the corresponding wind speed. The capacity of all energy outputs produced at wind speed between 3.25 and 3.74 m/s is equivalent to 3.5 m/s of wind speed on average.

Compared both for horizontal and vertical axis wind turbines (HAWT and VAWT) is presented in [6], A 3D printer was used to create two different kinds of wind turbines. The Three - bladed design and a straightforward HAWT were used for this project, and the material utilised is thermoplastic PLA. Two experiments were conducted to examine the relationship between output voltage and output current with variation of commutator RPM. The generator shaft is driven by a ZGB37RG58i 60 RPM DC motor rated at 12 V with the same gear size. The output voltages of the power source and the DC motor are measured using two multimeters. Windmills are put though tests under and without load. Magnetic field generator with low torque and high-power output was chosen as the electric generator for this investigation. The torque of the generator determines the blade's diameter.

Survey of Large-Scale Modern Vertical-Axis Wind Turbine Research at Uppsala University is presented in [7], A 200 kW VAWT is installed in Torsholm, The VAWT and the substation are the two key components of the systemA straightforward drive three-phase 225 kW permanent magnet ribbon connecting synchronous generator for a wind energy converter has been constructed and tested in a lab. The 200-kW turbine features a unique wooden shaft design. The concrete foundation is utilised to support the stator when the wind speed exceeds 6.6 metres per second and the power efficiency is greater than 96%. Costs for multi-megawatt generators should be much lower as a result of this strategy.

A Stand-Alone Wind Energy Conversion System's Dynamic Reaction to a Wind Gust with Battery Energy Storage is presented in [8], Using one step-up transformer, the DC bus voltage is converted to a set frequency of 60 Hz and a phase rms value of 115V via a sinusoidal PWM inverter. The system's performance in a computer simulation of changing wind speed is compared to actual data acquired by the data acquisition system, since the current in the battery bank is proportional to the torque of the wind turbine, it functions as a capacitor to maintain the generator voltage during short storms. The response of a battery storage wind energy conversion system to variations in wind speed or load demand is predicted using a straightforward numerical simulation model. Only generator current, rectifier current and battery current directly affect wind speed.

Design and Construction of a Prototype Roadside Wind Energy Harvester for Highway Lighting is presented in [9], A prototype of a large wind turbine has been developed and is designed to generate energy using natural wind and wind turbulence. Combined with an Lshaped connector and a steel frame with a DC motor running at 12 volts, 300rpm and 1Amp current. System costs vary depending on location and operating conditions. It is costeffective, user-friendly for highway lightning systems, and can be used to light many houses and buildings.

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Energy Storage System with Electric DoubleLayer Capacitor Output Leveling of Renewable Energy is presented in [10], The distributed constant model is used in computer simulation part, The power system is estimated to consider the effect of the output characteristics between the wind turbine and the turbine's output power and incorporates the WTG (induction generator) and CS-ECS linked to a three-phase transformer connected to the WTG connector. In order to address the ECSS issue with a voltage source inverter, as a means of energy storage, this study recommends CS-ECS. The FQ DCDC converter's PWM carrier frequency is 500 Hz, and the calculation circuit was created by trial and error to set the reference value for active and reactive power. The simulation results demonstrate that CS-ECS successfully suppresses variations in WTG terminal voltage and tie current.

Applying a multi-criteria decision-making process to choose the most effective substance for making horizontal blades for wind turbines to produce sustainable energy is presented in [11], a pair-wise matrix and a ranking of the four options were created using the AHP and TOPSIS approaches. According to the study, 78% of aluminium alloys performed the best, after that 67% of fibreglass, 44% of stainless steel, and 25% of mild steel. The authors suggest that 6061-T9 aluminium alloy be used in the building because of its great corrosion resistance, robustness, max strength ratio, and weather resistance, wind turbine blades. Further heat treatment of aluminium alloy can enhance its mechanical and thermal stability.

battery storage systems in electric power systems is presented in [12], To generate the necessary voltage and current, operational voltage and peak current capacity are configured in various series/parallel configurations. An electrical cooling system is called BESS (PCS) that recycles electrical energy from batteries and optimizes it for alternating current (ac) loads. Lead acid batteries are less economical, but have significant space and maintenance requirements and a short lifespan. Due to its high energy density, lithium-ion batteries are frequently used in distributed and renewable energy systems as well as uninterruptible power supply (UPS) systems. Li-ion batteries have an approximately 100% efficiency rate and a 3000-cycle life at 80% deep drain.

## III. SUMMARY

In this study, we conducted experiments to evaluate the efficiency of a magnetic wing turbine for energy harvesting. From the review it can be concluded that the design with six blades, each alternate blade is mounted with magnets is a best way for effective energy harvesting. When the vehicle passes near to the wind turbine fan will continuously rotate and generate electricity. The voltage and current is continuously obtained by using current and voltage sensor, which is connected to ESP32 board. The observed data will be stored in ThingSpeak Cloud for real time monitoring. The generated electricity will be stored in battery for the applications like tollgate, street, highway lights.

## IV. CONCLUSION

This study demonstrated that the magnetic wing turbine is a promising technology for energy harvesting applications. The high efficiency of the turbine makes it suitable for use in remote locations where conventional energy sources are not available. Further research is needed to optimize the design of the turbine and evaluate its performance under different environmental conditions. The magnetic wing turbine has the potential to revolutionize the field of energy harvesting and provide a sustainable source of energy for future generations.

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