



e-ISSN: 2319-8753 | p-ISSN: 2347-6710

# IJRSET

International Journal of Innovative Research in  
**SCIENCE | ENGINEERING | TECHNOLOGY**



# INTERNATIONAL JOURNAL OF INNOVATIVE RESEARCH

IN SCIENCE | ENGINEERING | TECHNOLOGY

Volume 13, Issue 4, April 2024

**ISSN** INTERNATIONAL  
STANDARD  
SERIAL  
NUMBER  
INDIA

Impact Factor: 8.423

9940 572 462

6381 907 438

[ijirset@gmail.com](mailto:ijirset@gmail.com)

[www.ijirset.com](http://www.ijirset.com)

# Spiral Vertical Axis Wind Power Turbine

**Monesh badiger<sup>1</sup>, Bharat Aniwai<sup>2</sup>, Nagesh pawal<sup>3</sup>, Aditya Dodke<sup>4</sup>, Asst Ms. Nitu Dawkhare<sup>5</sup>.**

Department of Civil Engineering, Rajarshi Shahu Collage of Engineering Polytechnic, Tathawade,  
Maharashtra, India

**ABSTRACT:** The spiral vertical axis wind power turbine represents a novel approach to wind energy generation, featuring a distinctive helical blade configuration rotating around a vertical axis. This abstract explores the unique design and advantages of spiral VAWTs in harnessing wind power. With the ability to capture wind from all directions, they are well-suited for urban environments and areas with variable wind patterns. Their compact footprint and low-profile design make them ideal for installations where space is limited, while advancements in materials and manufacturing techniques enhance durability and efficiency. The spiral VAWT offers reliable performance across a wide range of wind speeds and turbulent conditions, contributing to the global transition towards sustainable energy solutions.

**KEYWORDS:** Spiral Turbine, Tear Drop Shaped Wind Turbine, Wind Turbine, Spiral Turbine, Horizontal Axis Wind Turbine, Wind power.

## I. INTRODUCTION

Vertical axis wind turbines (VAWTs) have garnered attention for their unique design and promising potential in harnessing wind energy. Among the various VAWT designs, the spiral vertical axis wind power turbine stands out for its innovative approach to wind power generation. With its distinctive helical blades rotating around a vertical axis, the spiral VAWT offers several advantages over traditional horizontal axis turbines. The spiral design allows the turbine to capture wind from all directions, making it suitable for areas with variable wind patterns or urban environments where wind direction may change frequently. Additionally, the vertical axis configuration eliminates the need for complex yaw mechanisms to orient the turbine into the wind, reducing maintenance requirements and increasing reliability. Furthermore, the compact footprint of the spiral VAWT makes it ideal for installations where space is limited, such as rooftops or densely populated areas. Its low-profile design also minimizes visual impact, addressing concerns related to aesthetics in residential or commercial settings. In terms of efficiency, the spiral VAWT exhibits favorable performance characteristics, including consistent power output across a wide range of wind speeds and the ability to operate effectively in turbulent conditions. These attributes make it a reliable source of renewable energy for both on-grid and off-grid applications. Moreover, advancements in materials and manufacturing techniques have facilitated the development of lightweight and durable spiral VAWTs, further enhancing their suitability for various deployment scenarios. With ongoing research and innovation, the potential for spiral vertical axis wind power turbines to contribute significantly to the global renewable energy landscape continues to grow, offering a sustainable solution to the challenges of climate change and energy security.

## II. LITERATURE REVIEW

The literature on spiral vertical axis wind power turbines (VAWTs) reflects growing interest in their unique design and potential applications within the renewable energy sector. Researchers have investigated various aspects of spiral VAWTs, including their performance, efficiency, design optimization, and practical implementations. Studies have focused on the aerodynamic characteristics of helical blades, exploring how the spiral configuration influences lift and drag forces, as well as overall turbine efficiency. Computational fluid dynamics (CFD) simulations and wind tunnel experiments have been utilized to analyze airflow patterns and optimize blade geometry for maximum power generation. Additionally, research has examined the suitability of spiral VAWTs for urban environments and areas with complex wind conditions. The ability of these turbines to capture wind from all directions makes them particularly attractive for decentralized energy production in densely populated areas and regions with variable wind patterns. Furthermore, literature reviews have highlighted the need for further research into the practical implementation and

scalability of spiral VAWTs. Challenges such as maintenance requirements, noise levels, and visual impact have been identified as areas requiring attention to ensure widespread adoption of this technology. Overall, the literature underscores the potential of spiral vertical axis wind power turbines as a viable renewable energy solution, offering advantages in terms of design flexibility, efficiency, and suitability for urban environments. Continued research and development efforts are crucial for realizing the full potential of spiral VAWTs and integrating them into the global energy infrastructure.

### III. DESIGN AND CONSTRUCTION OF TURBINE

The design and construction of a spiral vertical axis wind power turbine (VAWT) involve several key considerations to ensure optimal performance and reliability. Here is an overview of the essential steps involved:

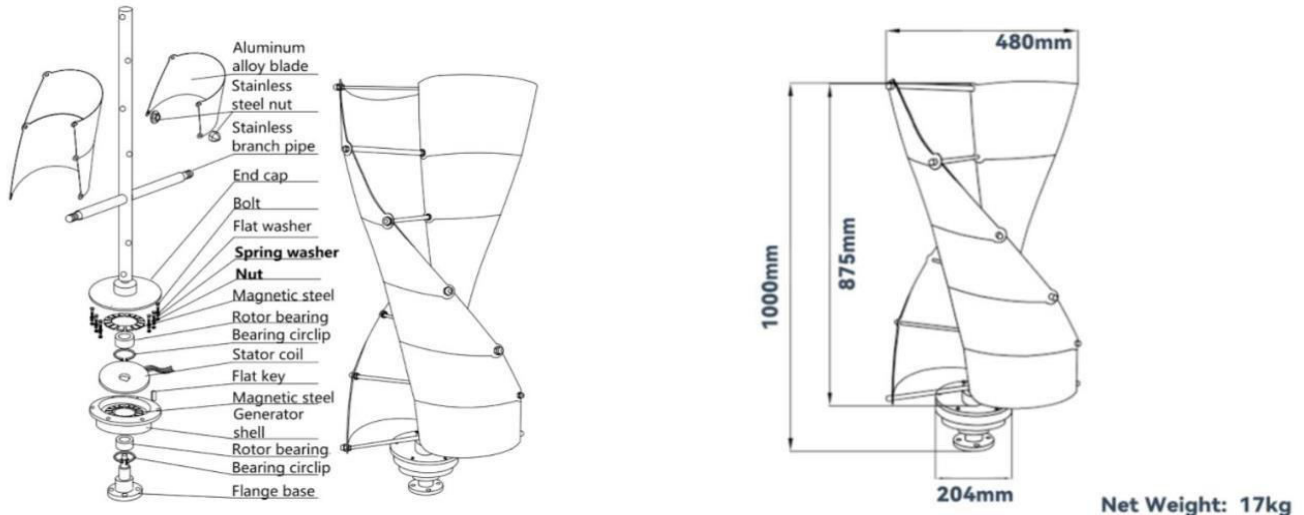
- **Blade Design:** The helical blades are the most critical component of the turbine. Their shape, size, and pitch determine the turbine's ability to capture wind energy efficiently. Computational fluid dynamics (CFD) simulations and wind tunnel testing can help optimize blade geometry for maximum power generation.
- **Vertical Axis Structure:** The support structure for the turbine's vertical axis must be sturdy enough to withstand wind loads and vibrations. Common materials for the frame include steel or aluminum, chosen for their strength and durability.
- **Rotor Assembly:** The blades are attached to a rotor assembly mounted on the vertical axis. This assembly may include a hub to connect the blades and a shaft to transmit rotational motion to the generator.
- **Generator Selection:** The generator converts the rotational energy from the turbine into electrical power. Various types of generators, such as synchronous or asynchronous, can be used depending on the application and desired output.
- **Yaw Mechanism:** While spiral VAWTs inherently capture wind from all directions, a yaw mechanism may still be incorporated to ensure optimal alignment with prevailing wind patterns. This mechanism allows the turbine to rotate about its vertical axis to face the wind direction.
- **Support Structures:** Depending on the installation location, additional support structures such as a foundation or mounting brackets may be required to secure the turbine in place.
- **Safety Features:** Safety considerations, including over-speed protection and braking systems, are essential to prevent damage to the turbine during extreme wind conditions.
- **Materials and Manufacturing:** High-quality materials and precise manufacturing techniques are crucial for ensuring the durability and longevity of the turbine. Advances in composite materials and additive manufacturing processes have led to lighter and more resilient turbine components.
- **Testing and Validation:** Before deployment, the turbine undergoes rigorous testing to validate its performance under various wind conditions. This may include bench testing, field trials, and performance monitoring.



#### IV. WORKING

- **Wind Capture:** As the wind flows around the turbine, the helical blades intercept the airflow from all directions. The spiral configuration enables the turbine to efficiently capture wind energy regardless of its direction, unlike traditional horizontal-axis turbines that require alignment with the wind direction.
- **Rotation:** The wind exerts force on the helical blades, causing them to rotate around the vertical axis of the turbine. This rotational motion drives the rotor assembly connected to the blades, transferring mechanical energy to the generator.
- **Electricity Generation:** The rotational motion of the rotor assembly spins the generator, which converts mechanical energy into electrical power through electromagnetic induction. The electricity generated is then transmitted to the grid or stored in batteries for later use.
- **Yaw Mechanism (Optional):** While spiral VAWTs are designed to capture wind from all directions, some installations may incorporate a yaw mechanism to ensure optimal alignment with prevailing wind patterns. This mechanism allows the turbine to rotate about its vertical axis, adjusting its orientation as wind direction changes.
- **Safety Features:** To prevent damage to the turbine during extreme wind conditions or overspeed situations, safety features such as brakes or aerodynamic stall mechanisms may be incorporated. These features help regulate the turbine's rotational speed and ensure safe operation.
- **Maintenance and Monitoring:** Regular maintenance and monitoring are essential to ensure the continued operation and efficiency of the turbine. This may include inspection of the blades, lubrication of moving parts, and performance monitoring to detect any issues early on.

Overall, the working principle of a spiral vertical axis wind power turbine allows it to harness wind energy effectively, offering advantages such as versatility in wind direction, compact footprint, and suitability for urban environments. As research and technology advancements continue, spiral VAWTs are expected to play a significant role in expanding renewable energy generation worldwide.



### V. ADVANTAGES

- Easy to assemble.
- More easily installed compared to other wind turbine types
- Transportable from one location to another.
- Low cost • No noise pollution.
- Lighter in weight.
- Function in extreme weather, with variable winds and even mountain conditions.
- Higher energy efficiency.
- More easily installed compared to other wind turbine types
- Transportable from one location to another.
- Permissible where taller structures are prohibited.
- Quieter to operate, so they don't disturb people in residential neighborhoods

### APPLICATION

- It can install over the electric automobiles roof. And hence it charges the vehicles.
- It can install over the plants or industries.
- It is also useful in highway areas.
- Roof installation: spiral wind stable operation in turbulent conditions enables it to be roof mounted with fortified hardware similar to antenna mounts, no towers are necessary. It can be installed on a home, building, or business, with a good wind resource.
- Installation: Installation is quick, easy and can provide an alternative to fossil fuel powered generators.
- Negligible vibration: Spiral wind can generate power with negligible vibration as observed in wind tunnel tests at the city college of New York.
- No noise: Because there is negligible vibration there is no noise produced.
- Attractive design: Spiral wind aesthetic design adds to a home's image.

### VI. DISCUSSIONS

The attention towards horizontal and vertical wind turbines have gradually increased. How to improve the utilization rate of wind energy and solve the control problems and automatic start problems has become the focus of researchers. In order to improve the utilization of wind energy and solve the problem of automatic start up, some researchers have proposed new vertical axis wind turbine models, and some researchers have analyzed the aerodynamic performance of wind turbines to optimize the original wind turbine. Some researchers have also intensive on the difficulty of controlling vertical axis wind turbines.

By studying the power generation characteristics of the generator control system and improving the control method, the wind energy conversion efficiency is improved, and the generated electric energy is incorporated into the national power grid. This article draws on the essence of the above two ideas.

First, a new Nautilus isometric helical wind turbine structure is proposed. Then, by analyzing the aerodynamic performance, the blade number and blade size are improved. This article draws on the essence of the above two ideas.

A new Nautilus isometric spiral wind turbine structure was proposed.

## VII. FUTURE SCOPE

The future scope of the project involves designing and constructing a prototype of spiral wind turbine that would be economical environmental, reliable of the project such as building this wind turbine in large scale. By taking fund from Municipal corporation, it can install over the all-suitable areas such as near the seashore, at large grounds. This can be monitored through Supervisory control and data acquisition (SCADA) operators from remote place. The possible innovation includes using stronger, but lighter, eco-friendly material which drops the manufacturing cost as well provides more working efficiency. The addition of wind directional unit to detects wind direction and moving in same.

## VIII. CONCLUSIONS

In conclusion, the spiral vertical axis wind power turbine represents a promising innovation in the field of wind energy generation. With its distinctive helical blade configuration and vertical axis orientation, this turbine offers several advantages over traditional horizontal axis turbines. Moreover, spiral VAWTs exhibit efficient operation at lower wind speeds and are more resilient to turbulent conditions, contributing to their reliability and durability. Reduced maintenance requirements and scalability further highlight the practicality of these turbines for a wide range of applications. As renewable energy technologies continue to evolve, spiral vertical axis wind power turbines are poised to play a significant role in advancing the transition towards sustainable energy sources. Continued research, development, and deployment efforts are essential to unlock the full potential of spiral VAWTs and realize their benefits on a global scale.

## ACKNOWLEDGMENTS

We extend our heartfelt gratitude to our Principal, **Dr. S. S. Gaikwad**, and our Head of Department, **Mrs. L. K. More**, for their invaluable guidance and unwavering support throughout the completion of our project, 'SPIRAL VERTICAL AXIS WIND POWER TURBINE' Specially, we express our sincere appreciation to our project guide, **Mrs. Nitu Dawkhare**, whose expertise and mentorship have been instrumental in the success of this endeavor. We also acknowledge and appreciate all staff of the civil department who were indirectly involved in providing guidance and support.

## REFERENCES

1. M. Weickert, G. Teike, O. Schmidt, and M. Sommerfeld, "Investigation of the LES WALE turbulence model within the lattice Boltzmann framework," *Computers & Mathematics with Applications*, vol. 5, pp. 2200-2214, 2010.
2. Edward and B. W. Philip, "The effect of wind on energy consumption in buildings," *Energy and Buildings*, vol. 1, no. 1, pp. 77-84, 1977.
3. N. J. Choi, S. H. Nam, J. H. Jeong, and K. C. Kim, "Numerical study on the horizontal axis turbines arrangement in a wind farm: Effect of separation distance on the turbine aerodynamic power output," *Journal of Wind Engineering and Industrial Aerodynamics*, vol. 117, pp. 11-17, 2013.



4. Q. Lu, Q. Li, Y. K. Kim and K. C. Kim, “A study on design and aerodynamic characteristics of a spiral-type wind turbine blade,” Journal of KSV, vol. 10, no. 1, pp. 27-33, 2012.
5. Small Wind World Report Summary 2012, World Wind Energy Association, 2012
6. Wind Turbine”, International Journal for Research in Applied Science & Engineering Technology, Volume 2(11), 2014, pp. 316320.



INTERNATIONAL  
STANDARD  
SERIAL  
NUMBER  
INDIA



# INTERNATIONAL JOURNAL OF INNOVATIVE RESEARCH

IN SCIENCE | ENGINEERING | TECHNOLOGY

 9940 572 462  6381 907 438  [ijirset@gmail.com](mailto:ijirset@gmail.com)



[www.ijirset.com](http://www.ijirset.com)

Scan to save the contact details