International Journal of Scientific Research in Engineering and Management (IJSREM)
Volume: 08 Issue: 03 | March - 2024 SJIF Rating: 8.176 ISSN: 2582-3930

# ELECTRICITY GENERATION USING VERTICAL AXIS WIND TURBINE (VAWT)

**Mrs. Kashmire.M.S[1] , Ms. Pinjarkar.S.S[2], Mr. Deshmukh J.V.[3],**
**Mr. Prathamesh Raghunath Walke [4], Mr. Rajwardhan Rajendra Dabhade[5],**
**Mr. Mohd Sameer Kazi [6] Mr. Kiran Anil Kadam [7]**
HOD of Civil Department[1]
Lecturer, Department of Civil Engineering[2]
Project Guide [3]
Student of Civil Engineering Department [4, 5,6 &7]
Bhivrabai Sawant Polytechnic, Wagholi, Pune, India.
Prathameshwalke652@gmail.com Ms.Pinjarkar.S.S.

----------***----------

**Abstract -**The Vertical Axis Wind Turbine (VAWT) project, conducted by the students of civil engineering, aims to design, construct, and analyze a simplified model of a VAWT powered by traffic flow as the wind source. This project is intended for educational purposes to demonstrate the principles of wind energy conversion and VAWT operation in a hands-on manner. The design phase involves selecting appropriate materials and dimensions for the VAWT blades and support structure to optimize performance under the airflow generated by the VAWT. Factors such as blade shape, angle of attack, and rotational speed will be considered to maximize the turbine's efficiency in harnessing wind energy. The construction of the VAWT model will be carried out using readily available materials, keeping the design simple and accessible for educational settings. The model will be designed to withstand the airflow from traffic and convert it into rotational motion. The analysis phase will involve experimental testing of the VAWT miniature model using the hair dryer as the wind source. Performance metrics, including rotational speed and visual observations of blade motion, will be evaluated under various wind conditions to assess the effectiveness of the model in converting wind energy into mechanical power.

***Key Words*:** VAWT, Traffic, Wind Energy.

## 1. INTRODUCTION

Vertical Axis Wind Turbines (VAWTs) have emerged as a compelling alternative to conventional horizontal axis wind turbines (HAWTs) due to their unique design features and potential advantages in certain applications.

These are only a few types of energy that do not produce carbon dioxide. These are nuclear power and renewable energy sources such as wind, solar, and hydropower Renewable energy sources are cleaned from these sources because there is no waste formed as byproducts of these sources Nuclear energy produces nuclear waste which could take up to but is not limited to 100 years until it can be disposed of properly Wind turbines have been used throughout the world to generate electricity from offshore wind farms to residential smaller scale wind turbines California Energy Commission, 2012 Design fabrication and testing of a Vertical Axis Wind Turbines (VAWT). wind deflectors will be our ongoing final year undergraduate project. Here, the main purpose will be enhancing the performance of the VAWT by designing guide vanes and fabricating at a low cost and getting shaft torque and rpm. And also, it is supposed to be a portable wind turbine.

In this project wind turbine uses the wind's kinetic energy and converts it into mechanical energy. This highway windmill uses wind energy generated by moving vehicles and converts it into mechanical energy. The DC generator converts the mechanical energy into electrical energy. Inverter converts direct

current into Alternating current and this is used to drive the home appliances.

**2. TYPES OF VERTICAL AXIS WIND TURBINES ARE**

- Savories type windmill;
- Darrieus windmill:
- Hawt;
- H.Roter;





**3. OBJECTIVE**

- To reduce carbon emissions
- To reduce electricity charges
- To produce electrical energy at low wind speed

## PROBLEM STATEMENT

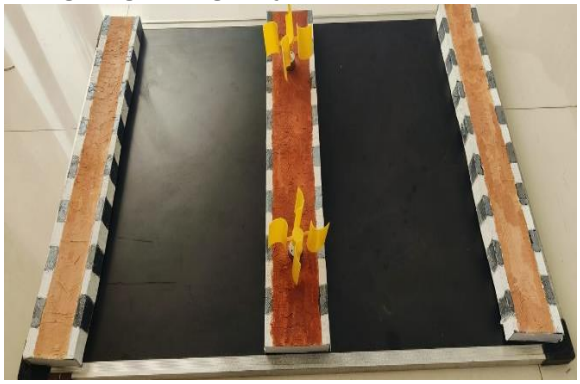
1. **Low Efficiency at Scale:** Many existing VAWT designs suffer from lower efficiency compared to horizontal axis wind turbines (HAWTs), particularly at larger scales, limiting their ability to harness wind energy effectively.

**2. Limited Adaptability:** Current VAWT designs may lack adaptability to varying wind conditions and environments, restricting their deployment to specific locations and applications.

**3. High Manufacturing and Maintenance Costs:** The manufacturing and maintenance costs associated with VAWTs can be prohibitively high, impeding their competitiveness with other renewable energy sources and conventional energy generation methods.

## 4. METHODOLOGY

A new design of a four-bladed helical VAWT miniature model, specifically designed to be utilized on highways to generate electricity, shows the prototype of the manufactured VAWT, which was tested. The turbine after manufacturing a prototype will be placed along the highway in Solapur-n Pune expressway, Maharashtra, India, which has a high volume of fast-moving traffic. The electricity generated will be measured and stored in a battery. Because the electricity produced is direct current (DC), it will be connected to a light-emitting diode (LED) with the same direct current, which can be used for lighting the highway.



## 5. TABLE Of VEHICLE SPEED VS WIND SPEED & POWER GENERATED

Table 1 : Table for Vehicle Speed vs Wind speed & Power generated

| $v_v$ (Km/h) | $v_w$ (Km/h) | Power (kW) | $v_w$ (Km/h) | Power (kW) | $v_w$ (Km/h) | Power (kW) |
|---|---|---|---|---|---|---|
| Value of K→ | **K=0.1** | | **K=0.01** | **K=0.001** | | |
| 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| 10.00 | 19.72 | 232.09 | 1.97 | 23.21 | 0.20 | 2.32 |
| 20.00 | 39.44 | 1856.69 | 3.94 | 185.67 | 0.39 | 18.57 |
| 30.00 | 59.17 | 6266.33 | 5.92 | 626.63 | 0.59 | 62.66 |
| 40.00 | 78.89 | 14853.53 | 7.89 | 1485.35 | 0.79 | 148.54 |
| 50.00 | 98.61 | 29010.81 | 9.86 | 2901.08 | 0.99 | 290.11 |
| 60.00 | 118.33 | 50130.67 | 11.83 | 5013.07 | 1.18 | 501.31 |
| 70.00 | 138.05 | 79605.65 | 13.81 | 7960.57 | 1.38 | 796.06 |
| 80.00 | 157.78 | 118828.26 | 15.78 | 11882.83 | 1.58 | 1188.28 |
| 90.00 | 177.50 | 169191.02 | 17.75 | 16919.10 | 1.77 | 1691.91 |
| 100.00 | 197.22 | 232086.45 | 19.72 | 23208.64 | 1.97 | 2320.86 |

## 6. FUTURE SCOPE

1) To Produce the Energy for the Commercial Uses. Small wind turbines are used in residential applications, depending on the amount of electricity you want to generate and considering the few conditions that are the amount of wind at your site, finding the best location for your system, estimating the system's annual energy output and choosing the correct size turbine and tower.

2) To Create More Opportunities for Industry Setups and Jobs. Since wind turbines themselves run strictly on the power of wind-generated, there is no need for fuel. Once the turbines are installed it doesn't need to be fueled or connected to power to continue working. This also reduces the overall cost of running large-scale wind farms in comparison to other forms of renewable energy. As technology improves, so do the functionalities of the structure itself, creating designs that will generate even more electricity, require less maintenance, and run more quietly and safely.

3) To Make Sure of the Strong Economic Background of the Country. Wind energy doesn't pollute the air like power plants that rely on the combustion of fossil fuels, such as coal or natural gas, which emit particulate matter, nitrogen oxides, and sulphur dioxide- causing human health problems and economic damage

## 7. CONCLUSIONS

The development and optimization of Vertical Axis Wind Turbines (VAWTs) represent a significant stride toward enhancing renewable energy solutions, particularly in urban and constrained environments. Through a systematic approach encompassing design innovation, rigorous testing, and continuous optimization, VAWT technology stands poised to revolutionize the landscape of wind energy generation

## 8. REFERENCES

] International Journal of Engineering and Advanced Technology Studies Vol.10, No.4, pp.20-36 2022

[2] Highway Helical Wind Turbine Project (Next Generation Highway's Potential For. (2012, November 20)

[3] Juni Khyat ISSN: 2278-4632 (UGC Care Group I Listed Journal) Vol-12 Issue-01 No.01: 2022

[4] DU Journal of Undergraduate Research and Innovation Volume 2, Issue 1 pp 116-, 2016

[5] Khan, B. H. (2006). Non-conventional energy resources. Tata McGraw-Hill Education. [6] Rai, G. D. (2013). Non-conventional sources of energy. Khanna Publishers.

[7] Oğulata, R. T. (2003). Energy sector and wind energy potential in Turkey. Renewable and Sustainable Energy Reviews, 7(6), 469-484