

### **GROUP MEMBERS**

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Wind turbines in general offer a multitude of benefits, making them a valuable choice for energy production. Wind turbine-powered street lights offer a sustainable and cost-effective energy solution, particularly in areas with consistent wind flow. They reduce reliance on non-renewable energy sources and minimize greenhouse gas emissions, contributing to a cleaner environment. These lights are ideal for remote or off-grid locations, where connecting to the electrical grid may be expensive or impractical. Additionally, they provide long-term cost savings through lower electricity bills and reduced maintenance, as they harness free wind energy. By ensuring reliable and independent lighting, wind-powered street lights promote safety, energy efficiency, and environmental sustainability. Particularly ,due to the compact and vertical design of the VAWT , it allows it to harness wind from any direction, making it ideal for urban and rural environments with varying wind patterns.

### **MATERIALS USED IN CONSTRUCTION**

### **Re-Used/Recycled Materials:**

- Motor (Re-used)
- Pulleys(re-used)
- Belt( recycled)

#### **Other Materials:**

- screws wires
- 4 LEDS

# SUSTAINABLE CAPSTONE PROJECTS (SCAP) FALL 2024-2025

## **VERTICAL AXIS WIND TURBINE POWERED STREET LIGHT**

### INTRODUCTION

#### Concept

Vertical axis wind turbine (VAWT) is a wind turbine in which the rotor axis is in the vertical direction (perpendicular to the wind direction).

Wind turbine in general works on a simple principle: instead of using electricity to make wind like a fan, a wind turbine uses wind to make electricity. In other words, it transforms the mechanical energy of wind into electrical energy.



**Benefits of VAWT powered street light** 

Bottle water dispenser (Recycled) Bearing form an other motor (re-used) Wood( Re-used) Metal square pipes (Re-used) metals for the lamp stand(Re-used)



Figure 2. Making of the belt and pulley assembly

### **FINAL PRODUCT**

### **Design and Construction**

The VAWT was built by using a dc motor as the generator. The shaft of the motor is connected via a belt and pulley assembly to the shaft which support the VAWT blades . To the system was added a stand for the lamp (which represents the street light ) . All the components are on a common metallic support.



### Working principle

As wind moves past the blades of the wind turbine, it rotates the blades. These blades turn a generator which uses mechanical energy of the wind to turn and create electrical energy which is then used to power the lamp.

It has been found that DC motors are not very efficient when used as generators because they require high RPM to produce electricity, due to their construction. Our belt and pulley assembly was not able to produce a high RPM to the motor that's why the voltage produced by our constructed VAWT was not high. It was able to light up 4 LEDS in series.

produced. much wind.

In conclusion, the wind turbine-powered street light project successfully demonstrated the potential of using renewable energy for sustainable street lighting. The key finding is that wind energy can effectively power street lights, offering an eco-friendly alternative to traditional systems.

During our course of this project our biggest challenge was creating a stand which allows the bearing to rotate efficiently. Despite this , the project provided valuable insights into renewable energy integration, sustainability, and project management.

Participating in the SCAP program enhanced our understanding of the working principle behind wind turbines in general and vertical axis wind turbine (VAWT) in particular . we also gained a teamwork experience.

Figure 3. FINAL PRODUCT



### **RESULTS AND DISCUSSION**

#### Results

#### How can the system be improved?

To improve the system, different sizes of the pulleys can be used to increase the RPM of the motor so that a higher voltage can be

A battery can also be added to the sytem for the energy storage as well as a solar pannel as back up energy source when there is no

Finally to futher improve the system, a light detector circuit can be added to automatically light up the street light when it is dark

### CONCLUSIONS

### REFERENCES

#### Vertical Axis Wind Turbine

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