



Comparative Study by modelling and simulating two types of Wind Turbines

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Objective

- VAWTs are more suited for installation at urban areas with slow and turbulent wind environments as these machines can start producing power at low speeds.
- VAWT is omni-directional and can generate power for wind flow from any direction, unlike HAWT which must face the wind always for the best output.
- VAWT have cost benefits as lesser blade material is used , lesser manufacturing costs , lesser installation costs (due to transportation) and lesser maintenance costs as drive trains are located at the base.
- Also offer operational benefits as more stable design as COG is closer to ground and fewer moving parts in the system.
- Innovative large scale applications being developed in the UK, US, France and Sweden, showing promising results.



Methodology

- Initially, we went through various research papers and then chose airfoil NACA 0018.
- Upon choosing NACA 0018, we chose the different parameters that we would build the model on.
- The H darrieus has one of the best performance among VAWTS and helix is an upcoming model, hence we wanted to compare them.

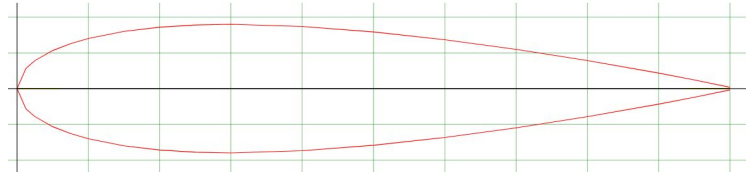
Validation

- Once the two models have been completed, we can compare them based on the common parameters.
- Experimentally obtained results can be compared to the theoretical results obtained from the research papers.
- First we will analyze individually, and then we will proceed to compare them on the same platform.

Results up to Mid -Semester



Helix VAWT



NACA 0018

Common Parameters between the 2 models:

Airfoil Type: NACA 0018

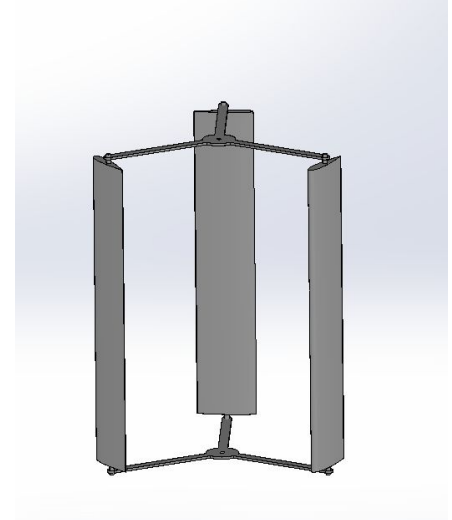
Chord Length = 0.1 m

Vertical Height of Blade = 0.48 m

Diameter of Rotor = 0.25 m

Angle between blades = 120 degrees

Angle offset for Helix VAWT = 60 degrees



Darrieus-H VAWT



Plan of work for remaining semester

Step 1

Finish the modelling required for both the turbines

Step 2

Simulate both the turbines under same environmental conditions

Step 3

Check the functioning for different parameters

Step 4

Check for the financial viability of the turbines

1. Checking the parameters
 - a. Size of the windmill
 - b. Height of the windmill
 - c. Radius of the turbine
 - d. Material of the windmill
 - e. Ecological Factors
2. Check for financial viability
 - a. Cost of Setting up
 - b. Cost of the maintenance
 - c. Will the project be profitable in future?
3. Energy Output over time