Mapping Wind Tunnel Characteristics for a Shaded VAWT

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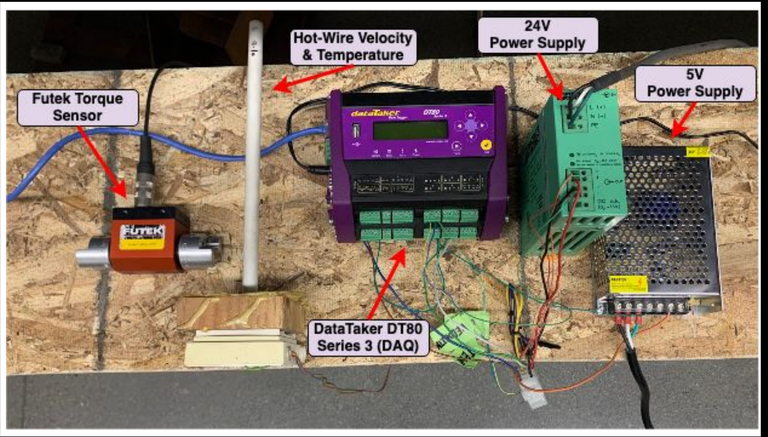
Problem Statement

The idea is to strategically place multiple vertical axis wind turbines (VAWTs) in a shaded formation to improve efficiency performance. The project team mapped the boundary layer parameters of the low-speed wind tunnel as a function of the motor speed to determine the optimum placement of the turbine. The test requires manufacturing three VAWTs that will be utilized to evaluate the impact of the turbine's rpm.

Low Speed Open Circuit Wind Tunnel

Electronic Components



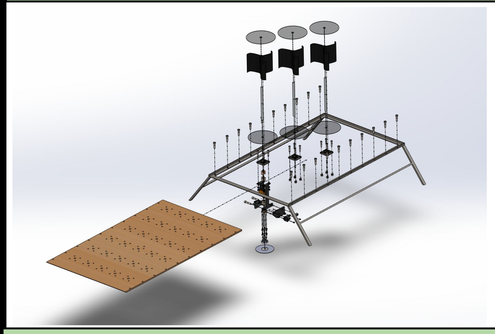
Team

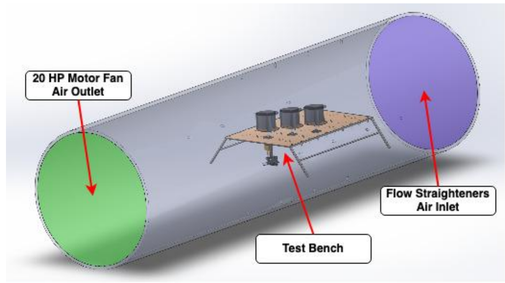
[From Left to Right]	
Shaunt Malloian	***Team Lead***
Nicholas Lim	***Design Engineer***
Carlos Verdeja	***Manufacturing Engineer***
Brayan Mota Lopez	***Simulations Engineer***
Jake Marino	***Test Engineer***

Acknowledgements

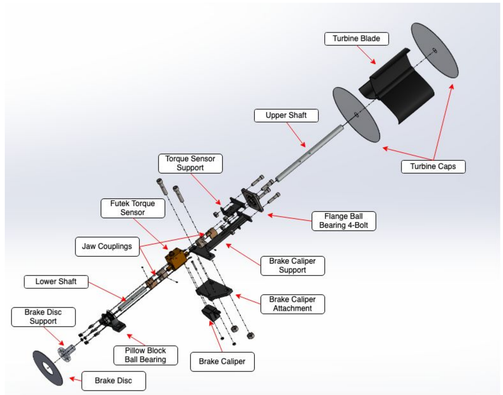
We would like to thank our advisors Dr. Scott Shaffar, Dr. Asfaw Beyene, Mike Lester, and Greg Morris for their guidance and support throughout the course of the project.

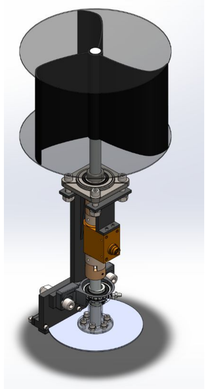
Test Bench





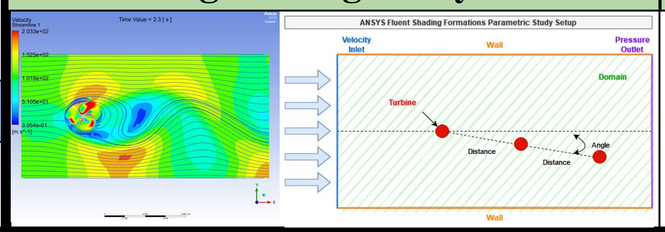
Torque Sub Assembly





Test Setup Inside Wind Tunnel

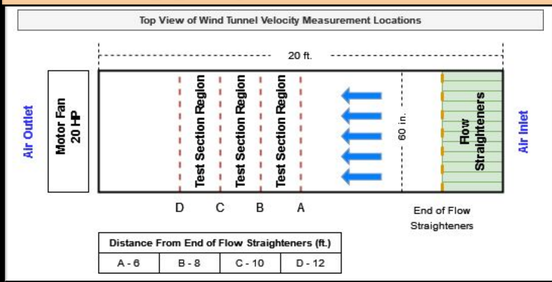
Engineering Analysis

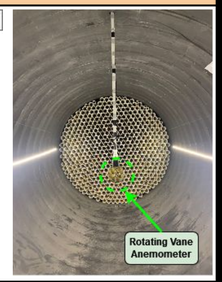


Future Work

Our team was only able to perform CFD on 1 turbine rather than 3 turbines. Future work would involve incorporating multiple rigid body inner domains to perform a wide parametric study on formations.

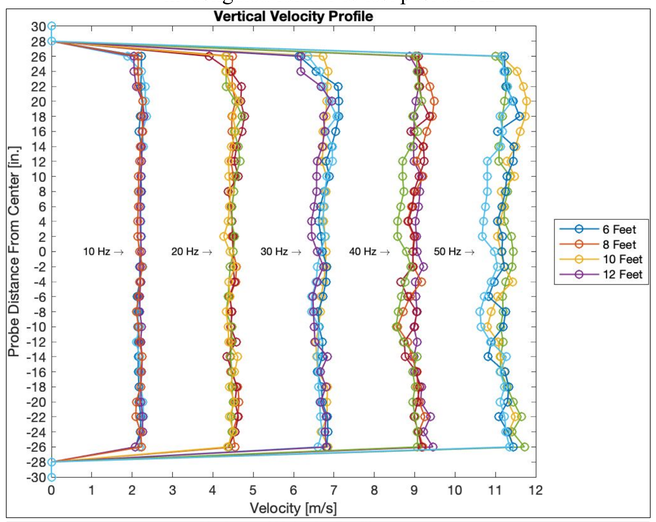
Mapping Characteristics of Flow

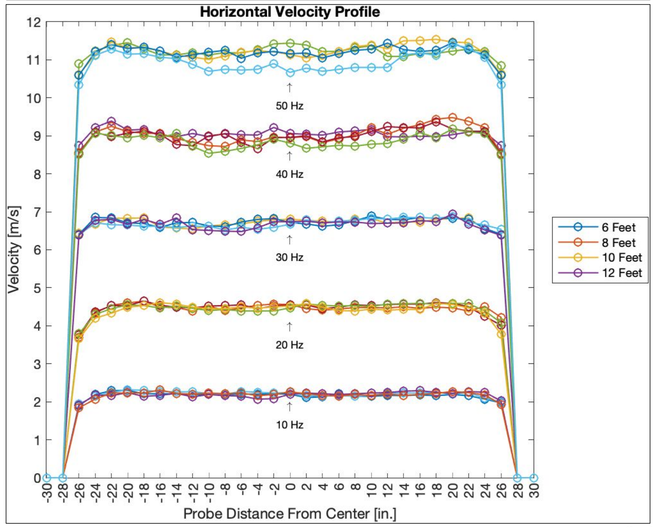




Test Results

6 - 12 Feet of the test section in increments of 2 were mapped radially for the velocity profile shown below in a total of 27 test points per each axis. We can see there is a non-uniform of air flow above around 35 Hz which would need to be investigated further to test past 35 Hz.





Spring 2022