Cross-Flow Wind Turbine

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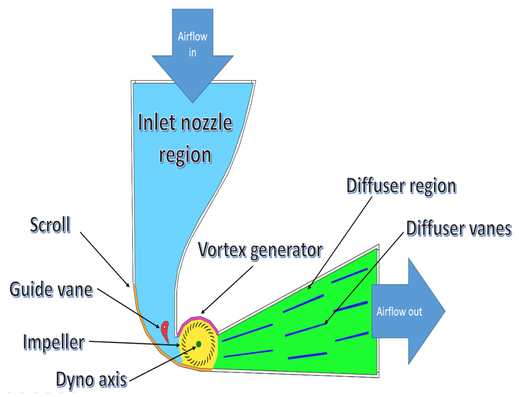
THE DESIGN LAB at Rensselaer

PURPOSE

To develop a wind energy harnessing device that performs well in urban environments by minimizing upfront costs and limiting space consumption, noise pollution and rooftop stresses.



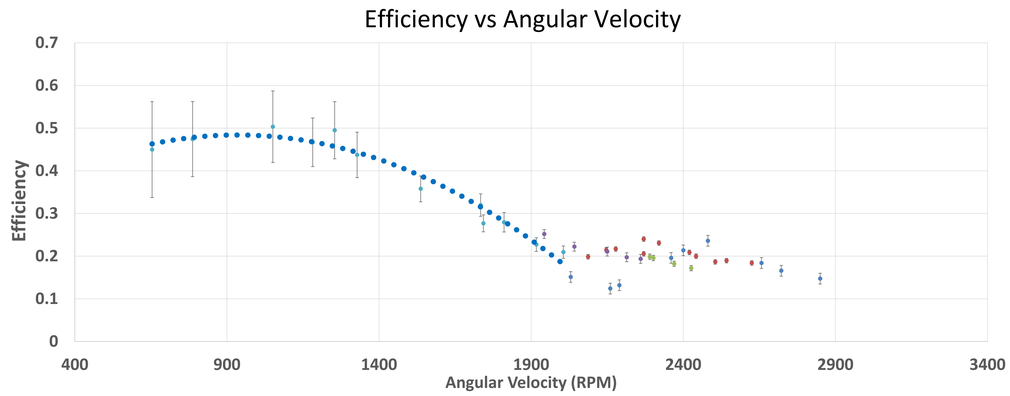
Example of an Impeller for a Cross-flow Wind Turbine

PROJECT HISTORY

- Inherited a benchtop model from previous semester
- Inherited a test site on Folsom Library for final deployment with a Tycon ProWeatherstation deployed on it to collect wind data.
- Previous semester's group had begun development on a pressure sensor telemetry system.

ACCOMPLISHMENTS

Benchtop Model Improvements and Efficiency Testing

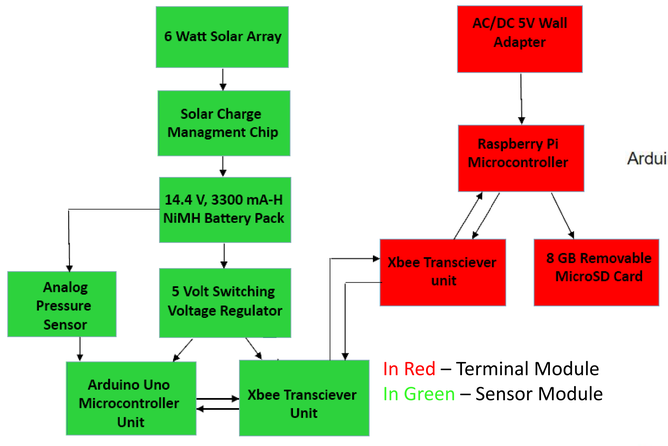


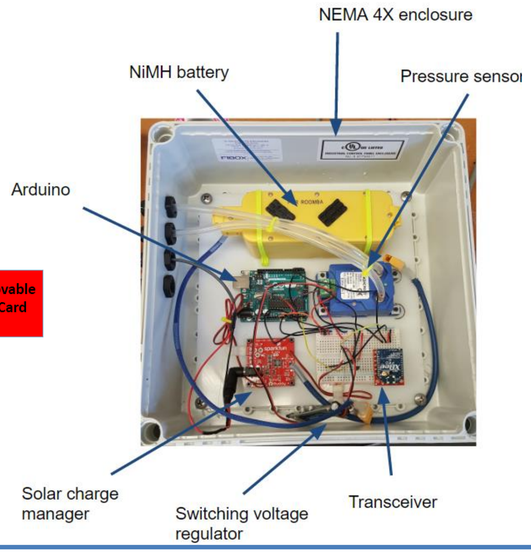
$$\frac{\left(\left(KE_{motor} * I_{loop}\right) + T_{friction}\right) * \omega}{\Delta P * V_{ave} * \rho * A} = \frac{Power_{mechanical}}{Power_{fluid}}$$

Where: $\mathrm{KE}_{motor} = motor\ torque\ constant, T_{friction} = \ friction\ torque$
$\omega = angular\ velocity, \Delta P = change\ in\ pressure, \rho = density, A = area$

Pressure Sensor Telemetry System

Design and construction of the remote pressure differential measurement system is complete. The system was developed for deployment to the southern wall-to-roof edge of the Folsom Library. The system is currently undergoing a series of environmental and site tests to prove expected functionality.





SEMESTER OBJECTIVES

- **Increase system efficiency**
- Improve inlet geometry to increase airflow to impeller fins
- Design and implement guide vane to control angle of attack
- Improve diffuser design to decrease air separation and improve pressure recovery
- **Improve measurement accuracy**
- Finish and test pressure sensor telemetry system to capture data at test location
- Make improvements to current dynamometer system to decrease measurement error

Future Work

- Perform additional round of efficiency testing to validate established data and technique
- Quantify individual efficiency contribution of guide vane and diffuser fins
- Decrease telemetry system net power consumption and deploy at testing location on Folsom Library
- Deploy benchtop model at test site location