A Study of the Efficiency of Wind Energy Capture Devices, Phase II: Design Enhancements and Improvements

Lah, Gabe

Pokornowski, Evan

The engineering goal of was to design and fabricate a vinyl wind tunnel capable of laminar flow when compared to a plywood design. In order to test the blades, a vinyl wind tunnel was engineered and compared to a previously constructed plywood wind tunnel. The first section of the vinyl wind tunnel was the contraction cone; its purpose was to pull a large volume of high velocity air expanding it without creating turbulence. The contraction cone was made out of white vinyl trim molding cut into polygons to funnel the air into the laminar flow grids. The laminar flow grids were located before the testing chamber. The test bed size was determined by the size of the airfoils tested (four inches). After the contraction cone a fan housing was put in place. Vinyl airfoils were designed using an MH1 technique with a computer design program. The engineering goal to design and fabricate a wind tunnel was successful; when the blade profiles were placed into the wind tunnel there was enough wind velocity to create laminar flow, but not significant lift. The original hypothesis: If PVC sheets are used instead of plywood, then there will be less turbulence and more laminar flow inside of the wind testing chamber was supported. The PVC designed wind tunnel had less variability and higher wind speeds on average than the plywood design, ANOVA $p<.0001$. Continued testing needs to be done, using a fan that can produce enough wind velocity to generate measurable lift.