Optimizing Turbine Efficiency, Year Three

Stafford, Hunter

The purpose of this research is to determine if a more efficient and cost effective wind turbine design can be created through the utilization of novel engineering concepts. This researcher hypothesizes that, through the utilization of these novel engineering concepts, a more efficient and cost effective wind turbine can be created. The revolutions per minute of the three and four blade turbines as well as the wind speed directly behind the blades was measured at controlled wind speeds and regression models were created for the relationship between the turbines' rpm and the wind speed they were subject to. Models were also made to show the relationship between the wind speed approaching the turbines and the speed of the air leaving the turbines. These linear regression models were then graphed and compared. Using a composition of the models, the most efficient counter rotating wind turbine design could be determined. The results were then compared to previous years' designs to determine of a counter rotating wind turbine design was as efficient as year II's design. Finally, the two designs were analyzed based on materials and costs required for production to determine if the counter rotating design is more cost effective. The counter rotating design was found to be most efficient when the three blade turbine was oriented in front of the four blade turbine. This counter rotating design also had over two times the relative rpm as last year’s design. This design was also far more cost effective. A wind turbine created from this model would theoretically produce far more than the standard wind turbine and could therefore be built much smaller allowing it to be introduced into urban areas as well as developing countries with limited resources.

Awards Won: