



CALIFORNIA SCIENCE & ENGINEERING FAIR 2019 PROJECT SUMMARY

Name(s) Gracyn Manley	Project Number J0115
Project Title The Power of Wind: What Effect Does Blade Angle Have on the Voltage Output of a Wind Turbine?	
<p style="text-align: center;">Abstract</p> <p>Objectives As demand increases for energy, wind turbines have become an intriguing source of electricity around the world. However, wind turbines face many challenges including wind speeds in particular locations and cost values. The purpose of this project is to determine if the angle of blades on a wind turbine effects the amount of energy generated. If the amount of energy harnessed by wind turbines can be optimized, then the cost value will be high enough to benefit people around the world with the ability to leverage the power of wind. The hypothesis of my project is that the blades with a 30 degree angle will produce the most voltage because research suggests that a blade with a tilt at about 30 degrees will accurately lift and spin at a higher revolution per minute than other blade angles.</p> <p>Methods I constructed a wind turbine out of PVC pipe attached to a wood base. Four propellers were made out of cardboard with blades at varying angles, including 0 degrees, 10 degrees, 30 degrees, and 50 degrees. I used a standard blow dryer as my source of wind, which was held 30 cm away from the hub of the turbine, and ran for 30 seconds during each trial. The blades were attached to an electric motor which was connected to a digital multimeter using alligator clips. The voltage output was recorded from the digital multimeter.</p> <p>Results I ran three trials for each blade angle, ensuring that the results of the experiment were accurate and precise. The 0 degree blade produced no voltage output, the 10 degree blade produced an average output of 2.4 mV with a standard deviation of 0.3 mV, the 30 degree blade produced an average output of 11.1 mV with a standard deviation of 0.4 mV, and the 50 degree blade produced an average output of 2.3 mV with a standard deviation of 0.2 mV.</p> <p>Conclusions The hypothesis that the blades on a wind turbine with a 30 degree angle will produce more voltage than angles at 0 degrees, 10 degrees, and 50 degrees was supported in the experiment. The 30 degree blades produced an average output of 11.1mV while the other blades produced lower amounts of voltage. This hypothesis was tested on the independent variable of the angles of the blades. However, many other variables may be tested such as the blade material or the weight of the blade. With this information, scientists may one day create an optimal wind turbine that has a high cost value and allow for many to leverage the power of wind.</p>	
Summary Statement My project supported the hypothesis that a wind turbine with a 30 degree blade angle will produce more voltage than blades at angles of 0 degrees, 10 degrees, and 50 degrees.	
Help Received I designed and built the wind turbine using materials purchased from a local hardware store and Amazon. No outside assistance was received.	