



CALIFORNIA SCIENCE & ENGINEERING FAIR 2019 PROJECT SUMMARY

Name(s) Natalie Araujo; Fredy Centeno; Melissa Perez	Project Number J0102
Project Title Blade Power	
<p style="text-align: center;">Abstract</p> <p>Objectives The objective for the Blade Power experiment was to design four different shapes of wind turbine blades: Blade A-rectangular, Blade B-paddle, Blade C-curved, and Blade D-triangular. The collected data determined which blade shape will have the the highest power output measured with a multimeter.</p> <p>Methods Window blinds polyvinyl chloride(PVC) materials, wooden dowels glued onto the blades, duct tape was used to cover the blades, Kidwind gearbox on the wind turbine, wind tunnel machine, and a multimeter attached to the gear system measured the voltage for each trial.</p> <p>Results A total of 800 trials were completed. Each of the four blade shapes were tested 200 times, using the same generator, the base, length, and gearbox. Blade C, which is a curved airfoil-shaped blade, had the greatest power output with an average of 4.07 volts. Blade C had more stability and produced higher volts after 200 trials because the shape of the blade was able to draw the most wind density and did not have as much drag as Blade, A, B, and D. Then Blade B, the paddle blade, produced an average of 3.4 volts, the second highest voltage. Blade A, the rectangular blade, had a total of 2.9 volts.</p> <p>Conclusions Blade C, the curved airfoil-shaped blade, had the greatest power output, compared to the other three blade shapes. Blade C was shaped with a sharp tip and flat closed base towards the hub leaving no hole space for drawn wind to escape, therefore allowing the maximum density of wind to travel through the blades from the hub s base to the tip, thereby making the blades spin faster. The faster blade spin caused a faster spin of the attached gear system, resulting in higher voltage generated and therefore higher power output. The higher kinetic energy resulted to a higher available wind energy which in turn maximized the mechanical energy that resulted to higher electrical output. This is helpful using more renewable energies, reducing fossil fuels and helping the atmosphere.</p>	
Summary Statement Our project is about finding more efficient blade designs to maximize wind turbine output, so that more renewable energy can be used in the world, thus decreasing the usage of fossil fuels and carbon emission in the atmosphere.	
Help Received We were able to use the wind tunnel and test our turbine in our robotics class. Our mentor, Mrs. Mahoney, helped us print our photos and arranged for a wind farm tour which allowed us to interview, observe, and inquire about actual wind turbine blade designs.	