CALIFORNIA STATE SCIENCE FAIR
2013 PROJECT SUMMARY

Name(s)
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Project Number
J0131

Project Title
Wind Turbines

Abstract

Objectives/Goals
How does the number of blades and blade shape, size, angle, and curve affect the efficiency of a wind turbine?

Methods/Materials
Materials:
Styrofoam,Balsa Wood,Wooden Rods,Lego NXT Set,Cup (For the Tower),Fan,Craft Knife,Hot Glue Gun and Glue,Drill and Drill Bits,Styrofoam Cutter,Art Tools (Ruler, Compass, Pen, Scissors, Protractor)
I tested the number of rotations per minute by using an NXT to count the number of rotations per minute.

Results
The short-bladed wind turbine rotated the fastest. 20o angles also worked well. The wind turbine with the convex head moved in the opposite direction of the other wind turbines. With more blades, the number of rotations increased. As the angle increased, the number of rotations decreased. 0o and 90o angles, as well as the one-bladed turbine, didn#t move.

Conclusions/Discussion
If there are more rotations, more kinetic energy is being converted into electrical energy by the wind turbine. My hypothesis is that more blades will generate more energy because there is more surface area for the wind to act on, the blades should be medium sized and rectangle shaped, and the blades should be at 30 degrees so that the wind can still move past but the blades will be moved relatively quickly. My hypothesis was partially correct. Some incorrect parts are that 20o angles and shorter blades worked better. The shorter, medium-width, flat, rectangular and the 20o angle blade moved faster.
The ratio of the rotations to the blade area was not always proportional and constant. If blade area is the only factor that influences the number of rotation, the blade area would be constant. Therefore, other factors also influenced the number of rotations. The best conditions were more lift, a better tip-speed ratio, and more power applied to the turbine. I achieved this by using more blades, shorter, wider, and relatively flat blades, and a lower angle.

Summary Statement
My project tested the effects of blade design on a wind turbine's effiency.

Help Received
Mom and Dad helped me get materials and took me to the library for research. Sister helped me build wind turbines. Dad's coworker lent me Styrofoam Cutter.