CALIFORNIA STATE SCIENCE FAIR
2006 PROJECT SUMMARY

Name(s)
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Project Number
S0109

Project Title
Harnessing the Wind: How Can We Increase the Power Output of a Wind Turbine?

Abstract

Objectives/Goals
The purpose of my experiment was to test if a wind turbine could be designed to work more efficiently, and also be more eco-friendly, by funneling air through an hour-glass shaped cover around the turbine. My hypothesis was that by forcing the air (wind) through the smaller space, more power would be generated at the same wind speed.

Methods/Materials
To build my wind turbines, I used model airplane propellers and a small 9-volt motor. The covers were made using plastic flowerpots. To control wind speed, I built a wind tunnel from a whole-house fan and poster boards. I measured the power generated by the wind turbines with and without covers around them. I compared the results in order to measure the gain in power for three different covers and three different wind speeds. I also measured wind speed in the wind tunnel, and calculated the efficiency of my wind turbines.

Results
As I predicted, more power was generated with the covers. The power increased an average of 2.3 times when the turbines were placed inside the shaped covers. The maximum gain was 3.3 times. However, the increase was 30 percent less than I predicted. The efficiency of the turbines ranged from less than 1 percent to over 10 percent.

Conclusions/Discussion
My hypothesis was correct. By funneling air into a smaller space the power output of the wind turbine could be increased. Applications of my experiment include creating wind turbines that are more efficient. Since the cover can prevent birds from coming near the blades, the turbines are also more eco-friendly.

Summary Statement
My project is about increasing the power output of a wind turbine by using an hour-glass shaped cover to speed up the airflow.

Help Received
My dad cut the flower pots, helped me with power tools to construct my apparatus, and showed me the statistical formula to use. My mom proofread my poster.