CALIFORNIA STATE SCIENCE FAIR
2015 PROJECT SUMMARY

Name(s)
Callie M. McCaffery

Project Number
35317

Project Title
Capturing Wind Energy

Abstract

Objectives/Goals
Objective: To understand how to build the most efficient windmill.

The focus will be to change the windmill blade angles and measure the change in the number of rotations per minute without changing other variables, such as wind speed.

Methods/Materials
Materials:
- Home made windmill. Started with a tinker toy prototype and modified it to build a test windmill (tinker toy hub, bass wood blades, clamp supports, and rotation counter)
- Wind tunnel (box fan and foam board tunnel)

Method:
The blade angle was adjusted to 5 different settings (0, 30, 45, 60, and 90 degrees) on the test windmill. At each blade angle setting, the windmill was tested in the wind tunnel for a minute. The number of rotations was recorded for each setting. Five data sets were collected for each blade angle. The tests were run at two wind speeds. The data was recorded and reviewed.

Results
Testing showed that the most efficient blade angle was at 30 degrees. At 45 and 60 degrees the windmill worked, but not as well.

At 0 and 90 degrees, the windmill did not work.

Conclusions/Discussion
I learned that there is an optimum blade angle for windmill operation, and my optimum blade angle was 30 degrees. Although this is the best angle for my windmill, further testing may show that the best setting is a little less or more than 30 degrees (I could not precisely test these angles with my windmill.)

I also learned that changing wind speeds did not change the best angle. From this it is seen that the correct blade angle at low wind speed can perform better than a less efficient blade angle at high wind speeds.

Summary Statement
My project is to determine how windmill blade angles affect the windmill's performance by changing blade angles and measuring results in a wind tunnel.

Help Received
My Dad helped build the test windmill after I built the prototype. My Mom helped during the test and with lessons on the computer.