CALIFORNIA STATE SCIENCE FAIR
2012 PROJECT SUMMARY

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Project Number
J0116

Project Title
Long Live Wind Energy

Abstract

Objectives/Goals
The purpose of our study was to see how the shape of the wind mill rotor blade affected the power output of the blade. Our hypothesis was that aerodynamic blade would give the most power output.

Methods/Materials
We made a wind turbine of straw and paper. A long thick straw served as an axle. The rotor was made by folding 10cm x 8 cm paper over one end of a straw and gluing it in place. The length of paper blade was kept constant at 10 cm. Two such straws were joined end to end to make a complete rotor and attached to the axle in the center. The axle was then threaded into a hole in the cap of a 500ml bottle so that the other end of the axle protruded through the hole in the bottom of the bottle. A string with paper clip to be used as washer weight holder was attached to this end. The maximum number of washers lifted by the spinning axle straw was the power output measured. This turbine was taped to a bigger soda bottle that had cement rocks as weights. This served as a stand. A fan on high, 130 cm from the soda bottle provided the wind energy. We made and tested 7 different shapes of paper blades, 3 trials on each.

Results
The rectangular blade (10cm x 4 cm) with tear drop profile lifted up 11 washers.
A cylindrical blade with no aerodynamic profile lifted 0 washers.
A triangular blade (10cm x 4 cm) with 4 cm base towards the end of the rotor and apex towards the axle lifted 7 washers.
However the same triangle was glued on the straw with the 4 cm base to the center of the rotor and the apex to the end lifted only 1 washer.
Rectangular blade 10cm x 2.5 cm lifted 1 washer.

Conclusions/Discussion
Our research proved our hypothesis correct. Aerodynamic shape of the wing was important for the power output of the windmill. We also found out that the angle of the wing to the wind was important determining factor, when we placed the wing at 90 degrees to the wind and it just got pushed back into the housing without moving at all. After this we placed all wings at 45 degrees. We also noted that the area of the wing and the length between the maximum lift force applied by the wing to the point of rotation of the rotors also affected the power output.

Summary Statement
The project was to find out what kind of wing gives the maximum power output in a wind mill.

Help Received
Teacher gave us tips on how charts and tables should be made. She reviewed our work. Mother helped me type.