CALIFORNIA STATE SCIENCE FAIR
2009 PROJECT SUMMARY

Name(s)
Omkar S. Savant

Project Number
J0127

Project Title
The Lean Mean Green Machine: Finding the Optimum Parameters for an Efficient Windmill

Abstract

Objectives/Goals
The goal of this project is to find the most efficient way to build a windmill.The different areas of investigation are the blade length, blade angle, and gear ratio.My hypothesis for this experiment are the longest blades(31cm) will produce the most voltage because it will have the most torque, the blade angle of 30 degrees will have the highest voltage, and the gear ratio of 7 will produce the most voltage. If successful, this experiment can provide a great help to home owners who decide to harvest the power of wind as a guideline on how to build the windmill.

Methods/Materials
To conduct this experiment, I used a birdhouse as the base and mounted the shaft and generator on the inside of it. Attached to the shaft was the blade set which had either 31cm, 20cm, or 10cm blades which were mounted in 15, 30, 45 or 60 degrees.The birdhouse held the gear ratios of 1,3,5, or 7. When the fan started spinning, the blades would also spin, in turn causing the generator inside the birdhouse to generate electricity, which was measured by a multimeter.

Results
The average results for the gears were 0.31V for a ratio of 1. For the ratio of 3, the voltage was 0.69V. The gear ratio of 5 produced 1.59 volts and the gear ratio of 7 produced 1.9V. The average results for the blade lengths were 1.9V for the 10cm blade, 0.91V for the 20cm blade, and 0.47V for the 31cm blade. The average results for the blade angles were 1.42V for the 15 degree angle, 1.93V for the 30 degree angle, 1.12V for the 45 degree angle, and 1.45V for the 60 degree angle.

Conclusions/Discussion
The results prove two out of three of my hypotheses correct.The best angle was 30 degrees, the most effective length was 10cm, and the most productive gear ratio was 7.The 31cm blade might not have produced high voltage because of its heavy weight.The 45 degree angle had the least output because it cuts the airflow whereas, the 30 degree angle allows the air to slide and push the blade faster.

Summary Statement
My project's goal is to find the most efficient way to build a windmill.

Help Received
Father helped me bulid the windmill.