**Background:** As a group, you have constructed a variety of mechanical windmills. Now it time to create wind turbines to test different blade variables.

**Independent Variable:** \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

**Dependent Variable**: Electrical output (voltage)

**Objective:** To construct and test blades with the identified variable. The blade design that results in the most electrical energy will be considered to be the most efficient design for this particular variable.

**Question:** How does the number of wind turbine blades affect electrical output?

**Hypothesis:** \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_.

**Procedure:**

1) Construction: Use the blade template to make the assigned number of turbine blades. The blades will be constructed from election signs. Use hot glue to attach the dowel to the center of the narrow end of the trapezoid so that 2”of the dowel overhangs the end of the trapezoid and is attached perpendicularly to the blade. Each group will make an assigned number of blades.

2) Testing: each blade should be the same size and attached to the hub at the same pitch (angle) of 25 degrees. The blades should be equally distributed around the hub (equal degrees apart). The tower should be 36” from the face of the fan. (Use the markings on the floor to align the tower with the fan.)

3) Data Collection: Use the digital multimeter to measure the number of volts generated at each wind speed (1, 2, and 3).

4) Clean-up: Place your blades in the designated area. (We will use the blades again in the next lab.)

**Data Collection:**

|  |  |  |
| --- | --- | --- |
| **Number of blades** | **Electrical Output (Voltage)** Wind Speed 1 / 2 / 3 | **Average Electrical Output (Voltage)** |
| 2 (Orange) |  / /  |  |
| 3 (Pink) |  / /  |  |
| 4 (Green) |  / /  |  |
| 5 (Blue) |  / /  |  |
| 6 (White) |  / /  |  |
| 7 (Purple) |  / /  |  |
| 8 (Yellow) |  / /  |  |

Graph of average electrical output and number of blades.

**Conclusion:**

1) What was the overall purpose of this experiment?

2) What does the data say about the relationship between the number of blades and the electrical output (voltage)?

3) Does the data support your hypothesis? Why or why not?

4) How could errors in the data be introduced into this experiment?

5) How could this experiment be improved or changed?

6) What could be studied next? How would you set up an experiment to study your idea?

Blade Template