Spin the simpleGEN with Wind

Wind consists of air molecules in motion, and matter in motion has kinetic energy. A wind turbine transforms the kinetic energy of the wind into electrical energy.

OBJECTIVES

The objective is to generate power using wind.



Figure 1 KidWind simpleGEN

MATERIALS

1 KidWind simpleGEN

From the KidWind simpleGen kit

8″ hex shaft with Hub Quick Connect

2 hex locks

Wind Turbine Hub

Dowels

Blade Pitch Protractor

Digital multimeter

Additional materials:

Cardboard, balsa wood sheets, or reclaimed materials for making turbine blades

Safety goggles

Hot glue and hot glue gun

Box-style window fan with 3 speeds

Scissors and/or hobby knife

Procedure

1. Record the number of turns of wire used in your generator.

2. If the 4″ hex shaft is installed on the generator, replace it with the 8″ hex shaft with pre-installed Hub Quick Connect.

a. Install one hex lock onto the shaft and push it until it is within about 3″ of the Hub Quick Connect on the end of the shaft.

b. Insert the 8″ shaft through the center holes on the simpleGEN housing. Push a second hex lock onto the shaft to hold it in place.

3. Create four turbine blades and assemble a turbine, with the blades equally spaced. Use a Blade Pitch Protractor to make sure all four blades are angled the same amount and in the same direction. Choose an angle less than 45°. Record the angle you chose.

4. Push the Wind Turbine Hub onto the Hub Quick Connect. Place the turbine and fan so that the wind from the fan blows directly towards the turbine blades.

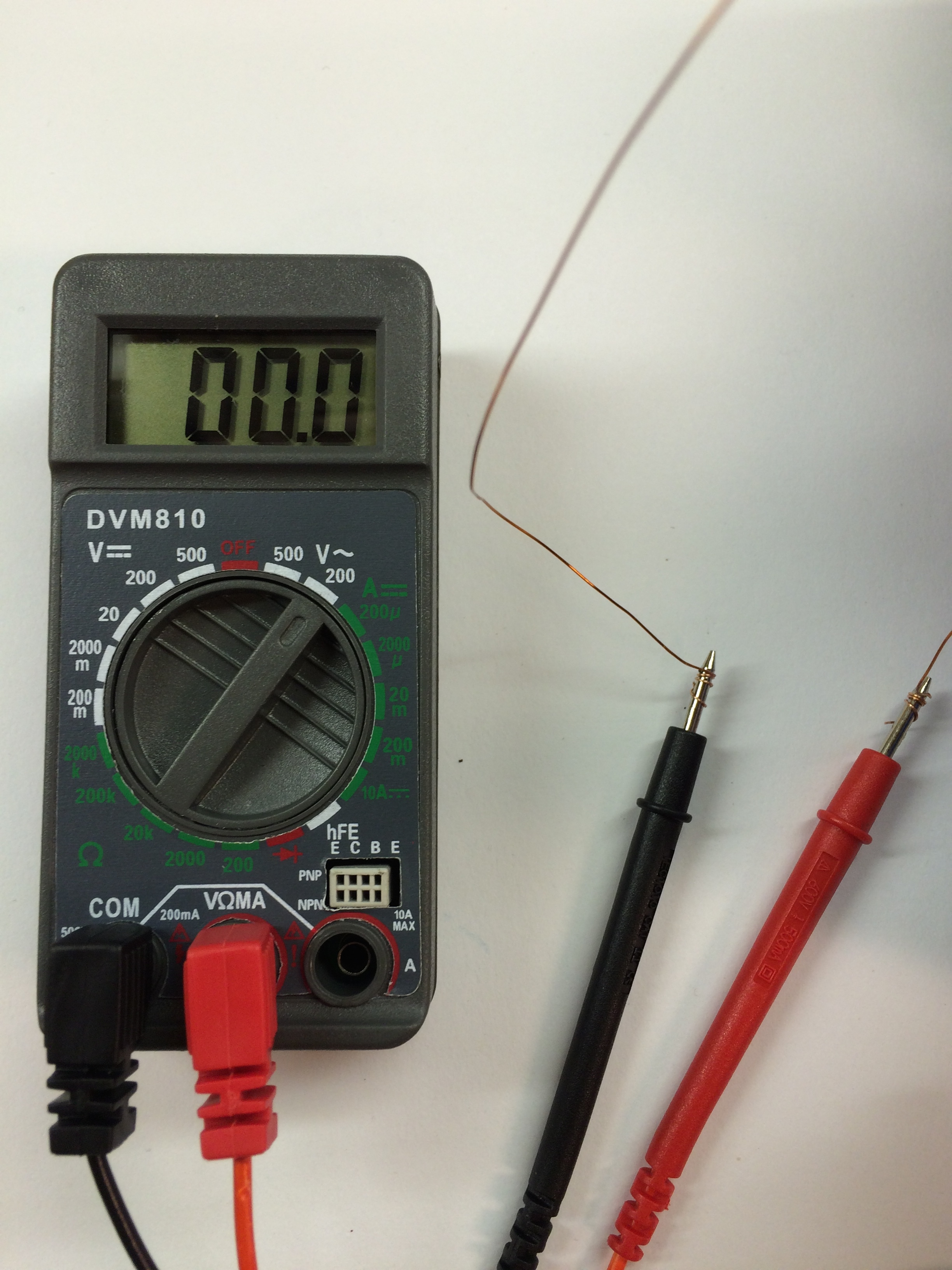
**5. Connect the two ends of the generator wire to the two terminals of the digital multimeter. Set the multimeter to measure alternating voltage as shown in Figure 2.

Figure 2

6. Put on safety goggles. Turn on the fan to the lowest speed while watching the display on the multimeter. When the display stabilizes, record the voltage reading in Table 1.

7. Repeat Step 6 for the middle and highest fan speeds.

8. Choose *one* of the following variables to change and repeat Steps 4–7. The instructor may assign which variable to test. Record what you changed and the new data in Table 2.

Variables:

* Number of blades: 2, 3, 6, or 12
* Angle of blades: increase or decrease the angle
* Length of blades: shorten the blades equally

9. Discuss your results with your classmates. See if you can find any patterns in the results based on the variables that were changed.

Analysis

Total number of turns of wire: \_\_\_\_\_\_\_\_\_ Number of magnets in holder:\_\_\_\_\_\_\_\_\_\_

Number of blades: \_\_\_\_\_\_\_\_\_\_ Angle of blades: \_\_\_\_\_\_\_\_\_\_

Length of blades: \_\_\_\_\_\_\_\_\_\_

|  |  |  |  |
| --- | --- | --- | --- |
| Table 1 | | | |
|  | Fan on low speed | Fan on medium speed | Fan on high speed |
| Voltage reading (V) |  |  |  |

Total number of turns of wire: \_\_\_\_\_\_\_\_\_ Number of magnets in holder:\_\_\_\_\_\_\_\_\_\_

Number of blades: \_\_\_\_\_\_\_\_\_\_ Angle of blades: \_\_\_\_\_\_\_\_\_\_

Length of blades: \_\_\_\_\_\_\_\_\_\_

|  |  |  |  |
| --- | --- | --- | --- |
| Table 2 | | | |
|  | Fan on low speed | Fan on medium speed | Fan on high speed |
| Voltage reading (V) |  |  |  |

Analysis questions

1. Write a statement that describes the relationship between the fan setting and voltage generated by a wind turbine.

2. When you changed one variable, did you expect the voltage produced to go up or down, and why?

3. Based on changing the one variable, how could you generate more voltage using the energy from the wind?

**EXTENSION**

Based on changing the one variable you changed, design and carry out an experiment to discover more detail about the relationship between your variable and the generated voltage. Have your experimental design approved by the instructor before performing the experiment.