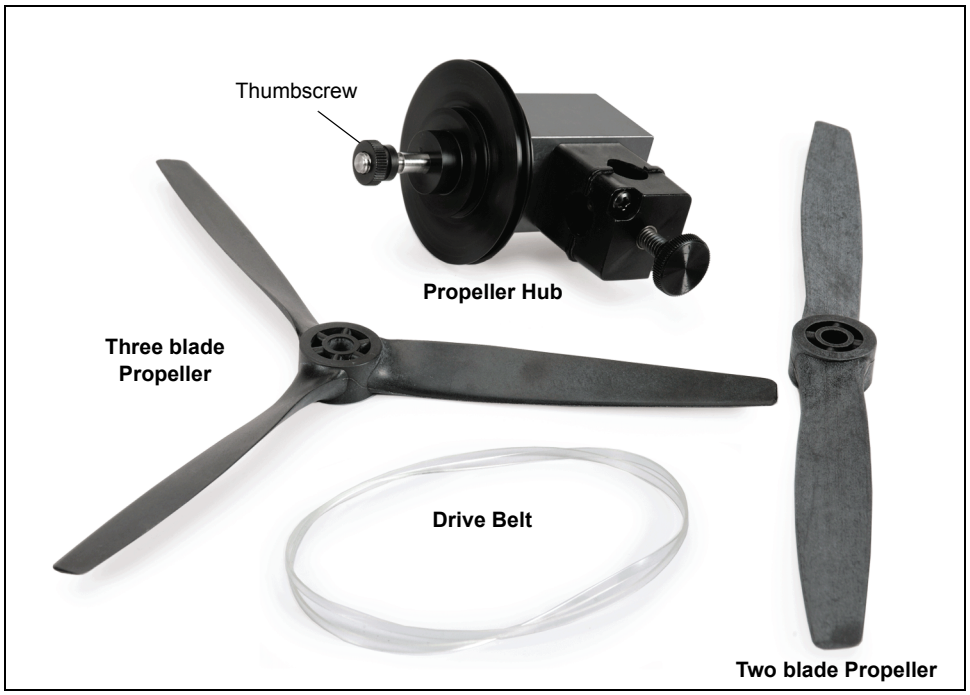
Propeller Wind Turbine

ET-8776



Included Items	Included Items
Propeller Hub	Three blade Propeller (10” or 25 cm diameter)
Drive Belt	Two blade Propeller (11” or 27 cm)

Required Equipment*
Energy Transfer–Generator (ET-8771B)
Support Rod (such as ME-8736)
Large Rod Base (such as ME-8735)

Also required is a wind source, such as a fan.

Recommended Equipment*
PASCO Computer Interface
PASCO Data Acquisition Software
Voltage Sensor (such as UI-5100)
Weather/Anemometer Sensor (PS-2174)

- *Visit the PASCO web site at www.pasco.com for more information. FCC Compliance

Introduction

The Propeller Wind Turbine is designed to be used with the Energy Transfer–Generator (ET-9771B). The Propeller Wind Turbine and ET–Generator can convert the kinetic energy of moving air to electrical energy. When connected to a PASCO Interface, the output from the ET–Generator can be measured, recorded, displayed and analyzed by PASCO Data Acquisition Software. A Weather/Anemometer Sensor can be used to measure air speed so that electrical energy output can be compared to air flow.

The three different size pulleys on the Propeller Hub allow for the study of gear ratios, and the two different propellers can be used to study the effect of propeller type and diameter.

Setup

Mount the ET–Generator on a support rod. Mount the Propeller Hub on the same rod about 25 cm above the generator. Put the drive belt on one of the pulleys of the generator and the on one of the pulleys on the Propeller Hub. Put one of the propellers on the shaft of the Propeller Hub and fasten it in place with the included thumbscrew.

Adjust the position of the Propeller Hub and /or the ET–Generator up or down so that the drive belt is not slack. **NOTE**: Do not overstretch the drive belt.

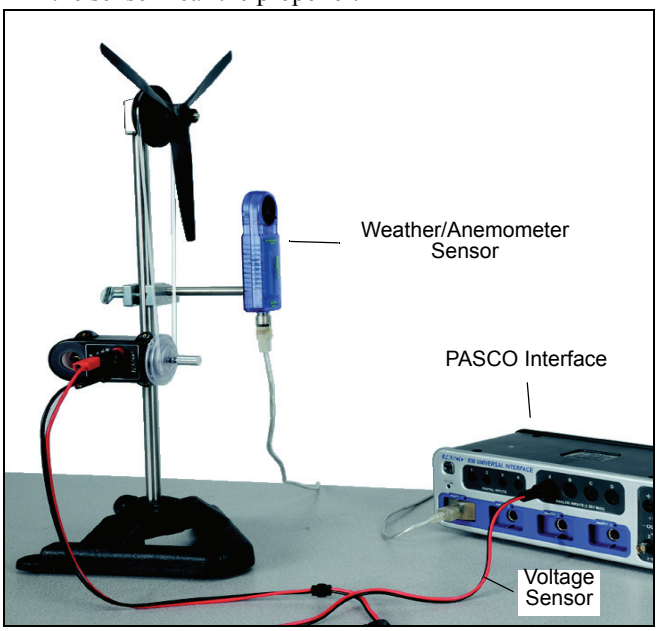
Arrange a fan or other wind source in front of the propeller.

Data Recording Setup

1. Plug the 100 ohm resistor plug of the ET–Generator into the banana jacks on the side of the generator.

2. Connect a Voltage Sensor from the resistor plug to the PASCO Interface.

3. If you are using a Weather/Anemometer Sensor (PS-2174), connect it to the PASCO Interface and mount the sensor near the propeller.



4. In the PASCO Data Acquisition Software, set up a calculation for Power. Remember that electrical power can be calculated from voltage and resistance:

$$P = \frac{V^2}{R}$$

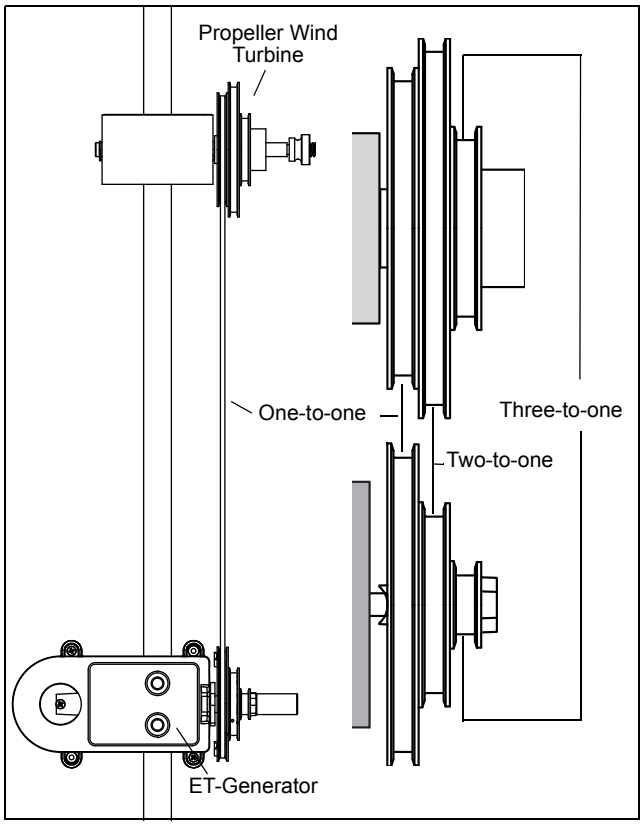
where V is the voltage measured by the sensor and R is the resistance of the resistor plug, 100 ohms.

Experiment Suggestions

Gear Ratios

When the drive belt is on the large size pulley of the three step pulley on the ET–Generator, and the belt is on the same size pulley (the medium size) on the Propeller Hub, the gear ratio is one to one (1:1). When the drive belt is on the largest diameter pulley on the Propeller Hub, and the belt is on the medium size pulley on the ET–Generator, the gear ratio is two to one (2:1). When the drive belt is on the smallest diameter pulley on the hub, and the belt is on the smallest diameter pulley on the ET–Generator, the gear ratio is three to one (3:1).

Adjust the position of the Propeller Hub and the ET–Generator up or down to keep the drive belt tight but not stretched.



The figure shows the Propeller Wind Turbine without the propeller.

Propeller Type and Diameter

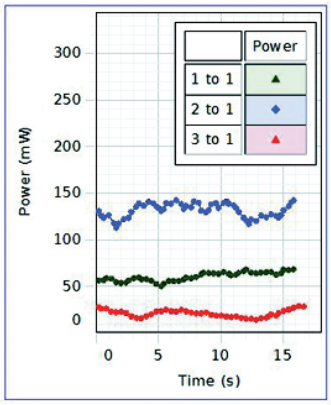
Investigate how the power output of the ET–Generator varies when the larger diameter two blade propeller is used in comparison to when the smaller diameter three blade propeller is used.

Power and Wind Speed

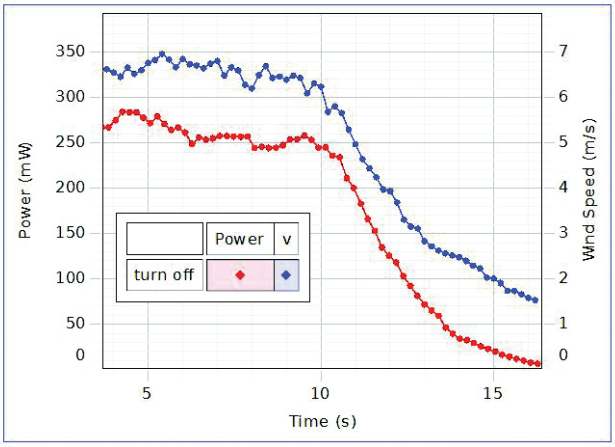
Investigate how the power output of the ET–Generator varies as the wind speed is increased or decreased.

Sample Data

The sample data show that the 2:1 gear ratio results in the most power output.



The sample data show the correlation between wind speed measured by the Weather/Anemometer Sensor and power generated. The large house fan providing the wind was turned off at the halfway point.



Technical Support

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For the latest information about the Complete Microwave Optics System or its accessories,

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