

Savonius Rotor Kit

User Guide



PITSCO
EDUCATION

59496 V0510

Introduction

The Savonius rotor was invented in the early 1920s by Sigurd J. Savonius of Finland. This type of wind generator is referred to as a “vertical axis wind generator” because the rotor shaft is in a vertical position. The advantage? Wind from any direction will make the rotor turn.

The Savonius rotor has another advantage over horizontal axis rotors – it turns slower and has more torque. A minimum wind speed of seven to 10 mph is required to operate the Savonius Rotor.

Contents of Kit

The Savonius Rotor Kit should contain the following items. If anything is missing, call Pitsco Customer Service at 800-358-4983.

- Savonius Rotor Template
- 4 wooden blade supports
- 2 screws with washers
- Pinion gear (small gear)
- Drive gear (large gear)
- 3 wooden dowel rods
- Savonius rotor base (piece with four holes)
- Savonius rotor top (piece with four holes and three slots)
- Motor
- Brass rod
- LED
- 3 self-stick plastic feet
- Small steel ball

Required Tools and Materials (not included)

- Soldering iron
- Solder
- #1 Phillips screwdriver
- Scissors
- Pitsco HD Bond or similar adhesive
- Hobby knife or sandpaper
- Cellophane tape
- Acrylic craft paint (optional)
- Cotton swab (optional)
- Fan or other wind source

Preparing the Rotor Blades

- 1) Cut out the four rotor blades from the Savonius Rotor Template. So that each blade has a slight curve perpendicular to the dotted lines, pull each rotor blade against a straight edge such as the edge of a table or countertop (Figure 1). Make more of a curve on one side (Figure 2).

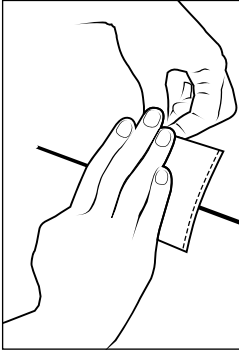


Figure 1

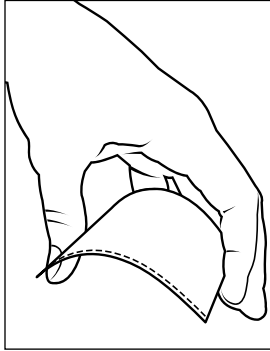


Figure 2

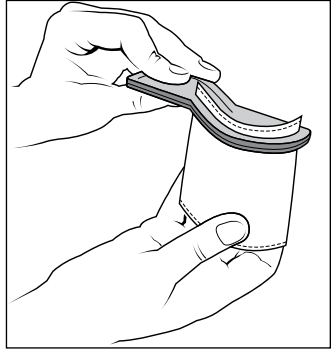


Figure 3

- 2) Line up two of the rotor blade supports. Carefully work one of the rotor blades so a side with the dotted line slides into the precut slots on one side of the rotor blade supports (Figure 3).
- 3) Push in the rotor blade until the two supports are together in the middle of the blade. Take another blade and slide it into the precut slots of the rotor supports' other side. Push in the blade until the supports are in the middle of both blades.
- 4) Repeat Steps 2 and 3 for the other two rotor blades and supports.

- 5) Place one of the assemblies on one of the sides with the dotted line. Push one support down level to the work surface and flush with the end of the blade. Place a thin bead of glue where the blade and the support connect (Figure 4). You might need to push the glue in to the seams a bit with your finger or a cotton swab. Do this for both assemblies and let them dry.

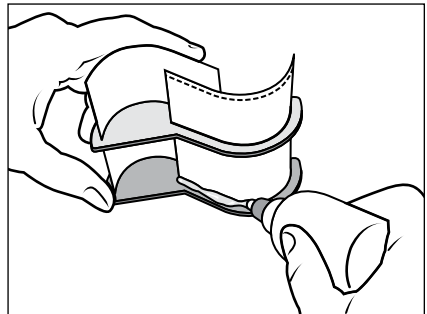


Figure 4

- 6) Turn each assembly over and push the other blades down level to the work surface. Again, place a thin bead of glue where the blades and the supports connect. Let the assemblies dry completely. If desired, paint the blades. You can also paint the dowel rods to give the unit a neat, uniform look.

Assemble the Rotor Blade and Top

- 1) Take the rotor top and push the motor shaft through the top of the rotor top (the side without an indentation) in the middle slot. Holding the motor in place, flip over the rotor top. Place a washer over the end of each screw and insert the screws into the holes on either side of the motor shaft extruding from the rotor top (Figure 5). Tighten the screws slightly – do not tighten them completely.

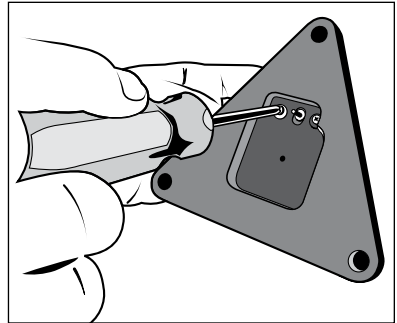


Figure 5

- 2) Find the pinion gear (small gear) and check to see if there are any burrs, called flashing, on its teeth. If there is flashing, use a hobby knife or sandpaper to remove it. Push the pinion gear onto the end of the motor shaft.
- 3) Using sandpaper or a file, slightly bevel both ends of the brass rod. This will help the rod fit into the rotor parts better. Push the drive gear (large gear) onto the brass rod. Push it down so 3-3/8" of the rod extends from one side of the gear (Figure 6).



Figure 6

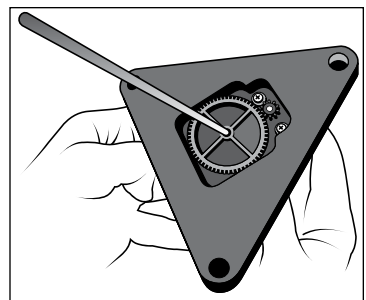


Figure 7

- 4) Insert the short end of the brass rod in the rotor top on the opposite side of the motor. Turn the rod and notice how the gears mesh together (Figure 7 and 8). The motor will move a bit. To find the best position, adjust the motor until the pinion gear moves smoothly by the drive gear when you spin the brass rod (Figure 9).

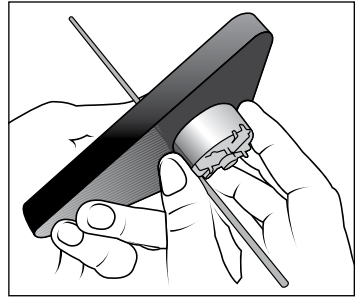


Figure 8

Finish the Rotor Assembly

- 1) Turn the rotor base so the side without holes is facing up. Peel off the backing from the plastic feet and place them toward the three corners of the base. Turn the base over so the feet rest on the work surface.
- 2) Now, place one of the dowel rods in each corner of the rotor base. If they do not fit tightly into the holes, wrap a piece of cellophane tape around the ends of the dowel rods so that the tape overlaps the end a bit. Insert the dowels into the holes. If the dowels don't fit into the holes, sand the ends for a snug fit.
- 3) Remove the brass rod from the rotor top. Push the long end of the brass rod through the center holes of the rotor blades. The blade farthest from the drive gear should be $\frac{3}{4}$ " from the end of the rod (Figure 10).

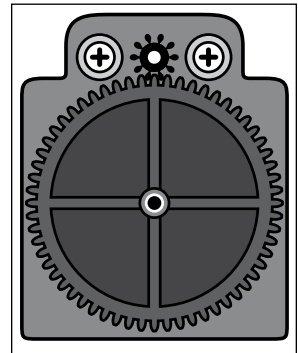


Figure 9

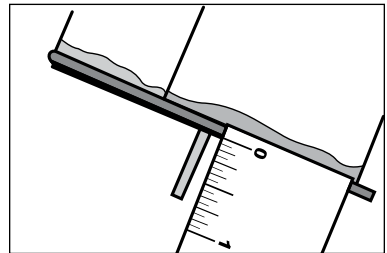


Figure 10

- 4) Line up the blade so the top one is aligned with the etchings on top of the bottom blade (Figure 11). Place a little glue between the rotor blades and press them together, making sure to keep them properly aligned. Let dry.

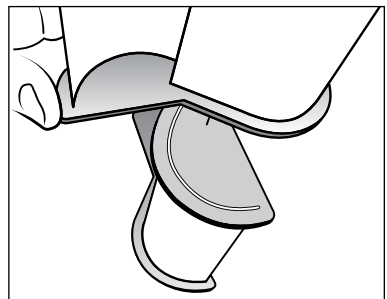


Figure 11

5) Drop the small steel ball into the hole in the center of the rotor base. Push the brass rod through the hole in the rotor top so the gears mesh. Place this on top of the rotor base, aligning the dowel rods with the holes on bottom of the rotor top and fitting the brass rod into the small hole in the rotor base (Figure 12).

6) Set the rotor unit in front of a fan. Take the LED and spread its two wires apart enough so they touch the two terminals on the motor (Figure 13). Run the fan until the rotor blades turn very fast. If the LED lights up, solder the LED wires in that position.

7) If the LED did not light up, flip it over to switch the wires touching the terminals. Run the fan until the rotor blades turn very fast. The LED should light up. If so, solder the LED wires in that position. If it does not light up, see your teacher for assistance.

Now, it is time to take your Savonius rotor for a spin! Set the rotor outside to catch the wind or put it in front of a fan to see the electricity that can be generated by air movement.

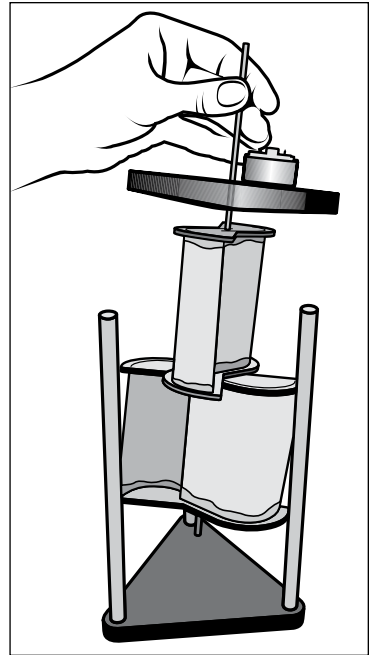


Figure 12

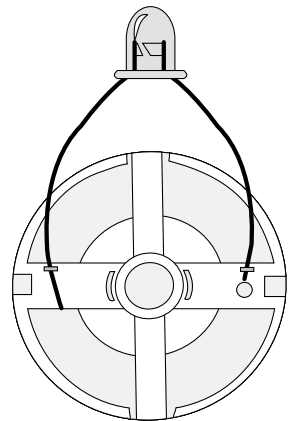


Figure 13

Activity Ideas



What's Watt?

Set up the Savonius rotor in front of a fan (about a foot or so away). Turn the fan on the lowest setting, let the rotor get moving, and then use a multimeter applied to the motor terminals to determine the voltage generated by the rotor. Record the measurement.

Turn the fan up to the next highest setting and measure the voltage. Record the measurement. Continue this process with the rest of the fan settings, being sure to carefully record the setting and its voltage measurement.

Plot the settings and measurements in a graph and discuss the results.

Savonius Rotor vs. Wind Generator

For this activity, you will need a built Savonius rotor and a Pitsco Student Wind Generator. Set up both of these facing a fan so they both receive even air flow. Turn on the fan on a high setting and use a multimeter to determine the voltage of each model. Record the voltage.

Now, turn each model 45 degrees in the same direction – be sure not to move the fan. Turn the fan on the high setting and use a multimeter to determine the voltage of each model. Record the voltage.

Discuss these questions: Did the Savonius rotor perform the same in each test? Did the Student Wind Generator perform the same in each test? Why or why not? How does this test demonstrate the advantage of the Savonius rotor?

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