Make Your Own Hydropower

ASSEMBLY GUIDE

MATERIALS LIST

Turbine (Water Wheel)



Plastic Container (Wide Mouth Jug)



9-inch Threaded Rod



Hex Nuts



Plastic Washers



Wire Coils (26 Gauge Copper)



CD with Double-sided Tape



Magnets



Tolerance Card



Short Wire with Alligator Clips on Both Ends







Hot Glue Gun and Glue Sticks



LED Light



Multimeter



Additional items that may be helpful but not included:

- Soldering Iron & Solder
- Electrical Tape
- Table cover to protect from hot glue solder

TURBINE ASSEMBLY INSTRUCTIONS

Materials: 1 Container 1 Threaded Rod 1 Water Wheel Turbine 5 Hex Nuts, Plastic 8 Washers, Plastic

1. The turbine (plastic wheel) needs to be installed in a clear plastic container.



- 2. Insert the threaded rod into one of the holes on the side of the plastic container so that it goes about halfway into the container.
- 3. Insert the turbine wheel into the large opening of the plastic container. Attach the turbine wheel to the threaded rod.



TURBINE ASSEMBLY INSTRUCTIONS, CONTINUED

- 4. Continue rotating the wheel on the threaded rod until the wheel is about 1/3 down the rod. Slide the end of the rod through the other hole in the plastic container.
- 5. The rod will NOT be the same length on each side of the container. On one side, there only needs to be about 2-3 inches of rod showing.



6. Thread the two lock nuts on the short end of the shaft and lock the outside nut by holding both nuts and tightening the outside nut.



- 7. Thread a locking nut on the longer end of the threaded rod to the plastic container. This will keep the rod from moving from side to side.
- 8. You will use the other locking nuts and washers after positioning and securing the stator
- 9. Note: it may be necessary to put a spot of hot glue on each outer edge of the water wheel if it should turn during testing.

STATOR ASSEMBLY AND INSTALLATION INSTRUCTIONS

Materials: 4 Wire Coils (pre-wound) Hot Glue Gun and Sticks 1 Piece Sandpaper Needle-Nosed Pliers Scissors Multimeter Alligator clip wires Soldering Iron and Solder (Optional)

1. Place the 4 coils of wire in a position like an image below. Note: The two coils opposite each other have their wires extended to the center, and the other two coils opposite each other have their wires extended away from the center. (This is of major importance in the construction of your generator



2. On each of the coils of wire, one of the wire ends will be on the side of the coil and the other on the top of the wire. (See image below)



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- 3. With the coils in front of you, make sure the top and bottom coils have the wires coming from the side of the coil and the TOP of the coil.
- 4. With the coils in front of you, make sure the left and right coils have the wires coming from the side of the coil and the BOTTOM of the coil. We need the coils alternating to ensure that the alternate current we generate flows in the correct direction.
- 5. When you have positioned the coils correctly, glue them in position on the side of the plastic container with the longer end of the threaded rod sticking out. The coils should be about ¼ inch from the rod. (At this point there should not be any washers on locking nuts on this end of the rod).



6. Using the image on the following page, trim 6 of the 8 wires to about 6 cm in length, with the cutter on the pliers. Do not trim the set of wires in the top left corner, one from the top coil and one from the coil on the left, those are for the LED light later).

SEE STATOR TEMPLATE ON PAGE 12 FOR DIAGRAM



7. Using the sandpaper, carefully clean about 2 cm at each end of each wire, until the coating is removed, and the wire end is bare. The illustration below shows how to bare the wire by pulling the wire across the sandpaper.



Cleaning coil wires

Wire twist of bare ends

8. Twist wires together to create a continuous circuit. (except for the two untrimmed wires in the top left corner which will connect to the LED bulb, wires #7 & 8). Use the image below. Wire #1 will twist with wire #2, Wire #3 will twist with wire #4, & Wire #5 will twist with wire #6



9. A critical check can now be made with the multimeter to check for the continuous circuit. Read instructions on multimeter for setting. Set multimeter for sound/continuity of current. The turbine will not produce current if there is no continuity of current.

Procedure for checking stator connections with a multimeter:

- 1. Depending on the type of multimeter you are using, you may need to attach alligator clips to the probes coming off the multimeter.
- 2. Turn the multimeter to "Continuity" looks like this symbol 🔌
- 3. Attach one of the alligator clips to the untwisted wire coming off the top coil (wire #8)
- 4. Attach the other alligator clip to the twisted wires on the other side of the top coil, wires #1 & 2 that are twisted together. See image below.
 - a. If there are no breaks, the multimeter will make a sound & move to step #5.
 - b. If no sound is heard, check the wires are twisted tightly.



5. Move the alligator clip from the first set of twisted wires to the next set (wires #3 & 4 that are twisted together). Repeat Step #4. See image below



6. Repeat steps 4 & 5 until all connections are good. See images below.



- 7. Once the twisted wires have shown continuity, connect the multimeter to wires #7 and #8. If there is a sound, then you have a complete circuit for the entire stator. If not, check connections.
- 8. Once you have a complete circuit, it is advised that the 3 twisted sets of wires should either be soldered or taped with electrical tape to keep the wires from coming apart.
- 9. You may also want to gently bend the 3 twisted wires and hot glue them to the container to keep them out of the way.

STATOR TEMPLATE

Guide for Direction of Coil Turns and Connection



Note that coils numbered 1 and 3 have the wires pointing away from the center of the template, and coils numbered 2 and 4 have their wires directed toward the center of the template.

The wires need to be **trimmed and bared** for #1 when connected to #4; #1 when connected to #2; and #2 when connected to #3. Leave the wires for #3 and #4 long as they will attach to the LED.

The correct position of the coils when placed on the template are shown in the picture and indicated on the template diagram above by the solid and dashed lines.

Note: Dashed arrows indicate wires extending out from the center of the template. **Note:** Solid arrows indicate wires extend into center.

Note: Squiggly lines indicate where wires are to be bared, twisted and taped.

ROTOR ASSEMBLY AND INSTALLATION INSTRUCTIONS

Materials: 1 CD Double stick tape Marker 4 Magnets (with the South pole marked) Compass Glue Gun & Glue 1 Tolerance Card (between coils and Magnets) 1 Hex Nut, Plastic 4 Washers, Plastic

1. Place double-faced tape on CD as shown. This is where the magnets are to be placed.

WARNING: The magnets are very strong. It is common for them to move across a table and smash together. This will cause them to break into sharp pieces and are useless. It is recommended that only one magnet is removed from the storage container at a time.



2. Position the magnets on the rotor over each of the taped areas of the CD surface with alternating polarities (important). Peel off the protective layer over each of the pieces of tape and press the magnets firmly onto the tape.



- 3. Slide three plastic washers (to set space) against the Hex Nuts on the rod next to the stator (Copper wire coils from part 3).
- 4. Place the rotor onto the shaft with the magnets facing the wire coils. Place a plastic washer over the shaft, next to the CD. Thread the hex nut up against the washer & CD. This will keep the CD and magnets close to the stator. You will need to make adjustments, sometimes several, to get the rotator as close to the stator as possible without them touching.



The closer the magnets and wires are, the more current you can produce

Space between rotor/stator

The above illustration is viewed from the above container to show the spacing of the rotor to the stator, when in the final position.



- 5. Always use a tolerance card between rotor and stator to store the hydro generator model. This will help keep the copper wires from separating and losing efficiency.
- 6. When you have checked carefully that the rotor turns without hitting the coils, your hydro generator is ready to test.
- Using the multimeter connected to the two connector wires extending up from the stator (Wires #7 & 8) and set the multimeter to measure AC in volts. The symbol on the multimeter will either be AC volts or V~

LED Installation Instructions

- 1. Once you are done testing your generator to ensure it is generating a current, you can attach the LED. Hot glue the LED to the container above and the left of the stator, with the terminals extending down, where they can be easily attached to wires #7 & 8.
- 2. Twist the last 2 wires from the coils that have not been used yet to the leads from the LED bulb. Many find it is necessary to solder the wires to the leads to have a good connection.
- 3. The multimeter can be connected at any time using the alligator clamps, to register the output of your hydro generator.

TESTING OF MODEL

- 1. Connect the multimeter to the two LED connector wires using the 2 alligator clip wires.
- 2. Place the model under a faucet and turn the faucet on. Position the model so the stream of water flows over the turbine blades causing the turbine to turn.
- 3. Increase the flow of water until the LED begins to flash.
- 4. When connected, you can check the output of your hydro generator while a fast stream of water is passing over the turbine blades and turning the turbine. Adjust your model to improve the performance of your generator.
- **5. Caution:** Keep the stream of water flowing through the top of the container and out the bottom, so water does not build up in the container.
- 6. Keep outside of the model as dry as possible.