

# SCIENCE OF HYDROPOWER MODEL

**Materials** (the materials marked with asterisks are not in the kit):

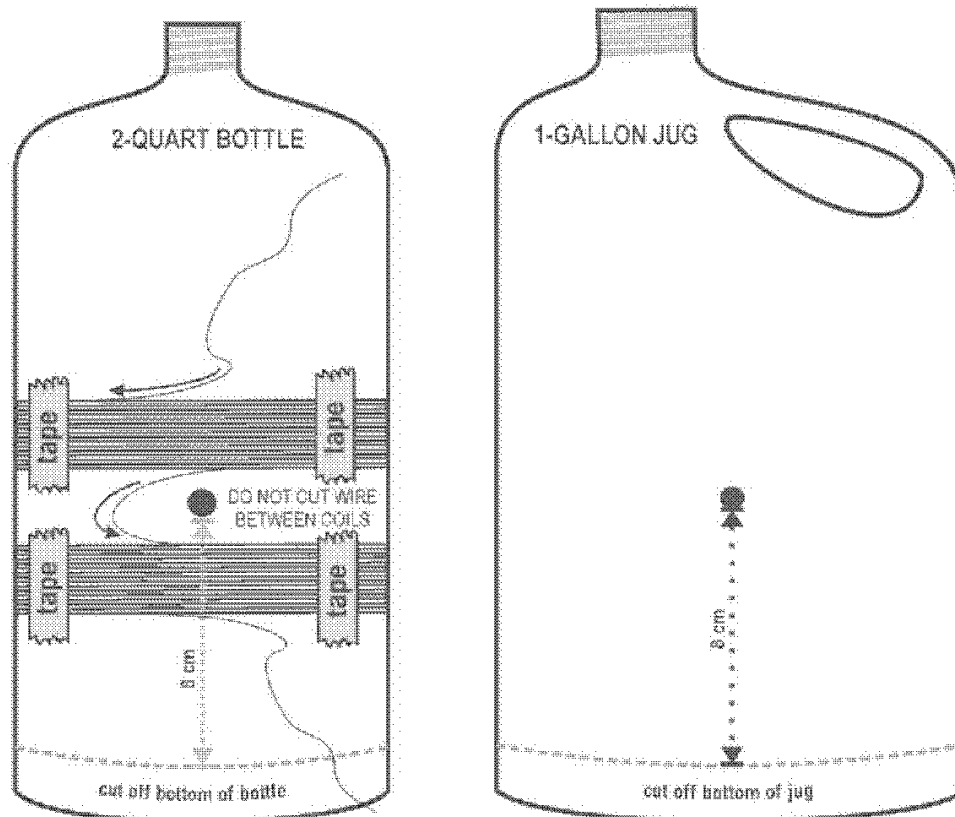
1 gallon plastic jug with handle	1 2-quart plastic bottle	1 wooden dowel (1/2")
1 piece styrofoam (2 cm)	8 wooden blades	4 rectangle magnets
1 piece of plastic tubing (15 cm)	4 pieces of wood for magnets	1 sharp-pointed scissors*
tape*	1 glue	1 nail*
marker*	1 fine sandpaper**	

## Instructions for 2-quart Bottle:

1. Cut the bottom off the bottle.
2. Measure 8 cm from the bottom of the bottle and cut a hole big enough for the dowel to fit through easily.
3. Make another hole in the same location on the opposite side of the jug.
4. Above the hole, wrap the wire 100 times around the jug, leaving 10 cm of wire at the starting end.
5. Tape the coil of wire to the jug, but DO NOT CUT IT from the spool.
6. Below the hole, wrap the wire in the OPPOSITE direction 100 times around the jug.
7. Leave 10 cm of wire at the end in the same location as the extra wire above the hole and cut the wire.
8. Tape the coil of wire to the jug, leaving the end free.
9. Use fine sandpaper to gently rub the coating from the ends of both wires to a distance of 1 centimeter.

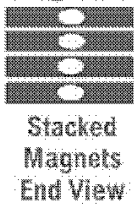
## Instructions for 1-gallon Jug:

1. Cut the bottom off the jug.
2. Measure 8 cm from the bottom of the jug and cut a hole big enough for the dowel.
3. Make another hole in the same location on the opposite side of the jug.



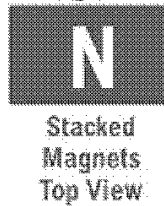
# SCIENCE OF HYDROPOWER MAGNET ASSEMBLY

Diagram 1



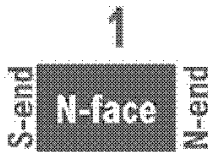
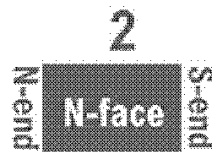
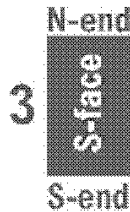
1. While stacked, mark one end of each of the stacked magnets with a permanent marker to indicate the N-end as shown in Diagram 1.

Diagram 2



2. Mark the top face of each stacked magnet with an N using a permanent marker in turn as you remove the magnets from the top one at a time and place around the tubing in the configuration below left. Make sure you place the magnets at a distance. The unmarked faces and ends of the magnets will indicate the S poles.

Diagram 3



## OVERHEAD VIEWS OF MAGNET ASSEMBLY



To confirm placement, Magnets 1 & 2 will repel each other, as will 3 & 4.

Diagram 4

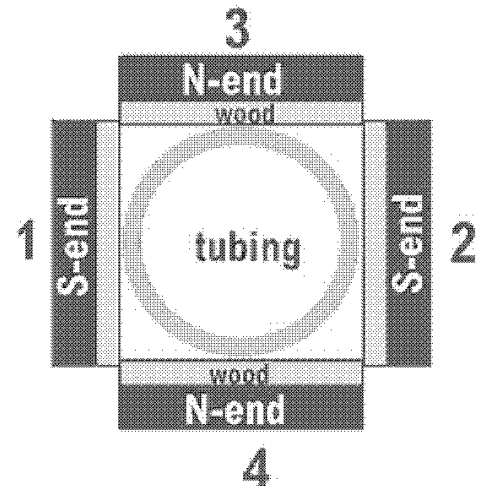


Diagram 5

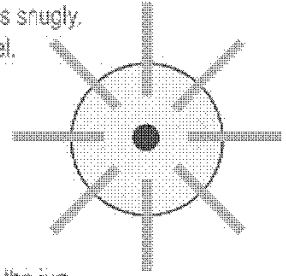


3. Mark the magnets as explained in Steps 1 & 2 and place them in the configuration shown in Diagram 3.
4. Glue a piece of wood to the top faces of the magnets. Allow to dry. Remark the top N faces on the wood.
5. Cut a 2.5 cm piece of plastic tubing. Place the dowel through the tubing to stabilize the tube. Hold the dowel and tube upright.
6. Place a thick bead of glue the length of the magnet on the wood piece as shown in Diagram 5.
5. Lift the S-end of Magnet 1 to a vertical position and glue to the tubing, holding it firmly in place until the glue is set.
6. Glue Magnets 2, then 3, then 4 to the tubing one at a time following the same procedure. The finished magnet assembly should be configured as shown in Diagram 4.

# SCIENCE OF HYDROPOWER MODEL ASSEMBLY

## Instructions for Hub:

1. Cut a 2 cm piece of styrofoam for the hub.
2. Make a hole in the middle of the styrofoam with a nail. Insert the dowel into the hole and make sure it fits snugly.
3. Evenly space the 8 wood blades around it, using glue to reinforce them. Remove the hub from the dowel.



## Model Assembly:

1. Cut three 2.5 cm and two 1.5 cm pieces of plastic tubing.
  2. Wrap tape around one end of the dowel so that it will not fit through the holes in the jug.
  3. Slide the other end of the dowel through one hole in the jug.
  4. Inside the jug, slide a 2.5 cm spacer onto the dowel.
  5. Slide the hub onto the dowel, then another 2.5 cm spacer. Insert the dowel through the second hole in the jug.
  6. Slide the dowel through a 2.5 cm spacer, then through one hole in the plastic bottle.
  7. Slide the dowel through a 1.5 cm spacer inside the bottle, through the magnet assembly, through a 1.5 cm spacer and out the hole.
  8. Wrap tape around the end of the dowel to prevent the dowel from sliding out of the bottle.
  9. Arrange the hub on the dowel in the exact center of the jug.
  10. Adjust all components until the dowel spins freely inside the jug and the bottle.
- If it does not fit on the dowel snugly, glue it to the dowel in the center of the jug. Do the same for the magnet assembly in the bottle.

