



Wind Turbine Workshop - What next?



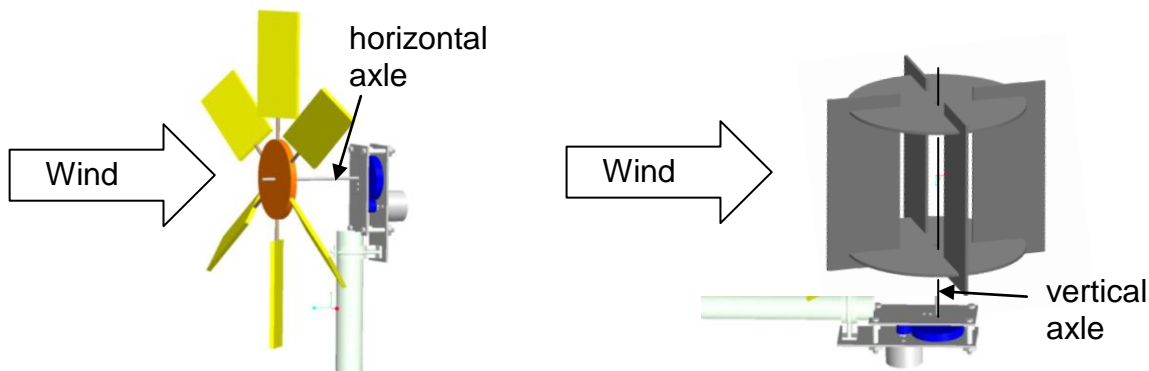
KIT

In this pack, you should find:

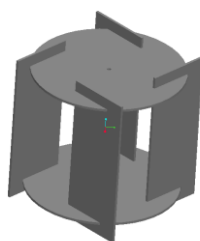
- 30cm steel axle
- Template for a Vertical Axis Wind Turbine

TRY MAKING ANOTHER WIND TURBINE

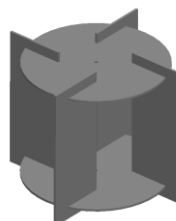
The turbine you made in the workshop was a Horizontal Axis Wind Turbine (HAWT). Its blade spins at 90° to the “tower”. Turbines which spin around the tower are called Vertical Axis Wind Turbines (VAWTs).



- To make a Vertical Axis Wind Turbine, you can either download the template for it from this website: www.eng.cam.ac.uk/outreach/resources/windturbine/vawttemplate.pdf and print off two copies onto stiff card; or you can cut out the paper copy you were given and draw around it onto stiff card or cardboard.
- Cut out the templates. You will need 2 top/bottom plate pieces, and 4 blades). Make slits on the blades and make holes in the centre of the top and bottom plates, but do not cut along the dotted lines.
- Slide the blades onto the top and bottom plates, to create a vertical axis wind turbine.
- To make sure that your Vertical Axis Wind Turbine doesn't slide down the steel rod, you will need to put a blob of blu-tack under it.
- Now attach the steel axle to the gear box from the workshop. Note that you will need to remove the smaller steel axle used at the workshop.
- Test your turbine to see how well Vertical Axis Wind Turbines work.
- Then try varying the angle of the blades, like these:



Blade angle
45 degrees



Blade angle
20 degrees

What differences are there? Why are there differences in power output?

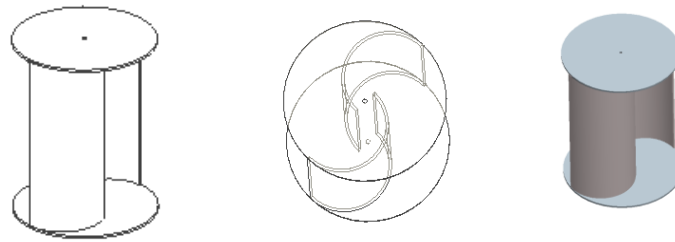
Test around your garden to find the windiest place

See how the wind changes throughout the day and from day to day

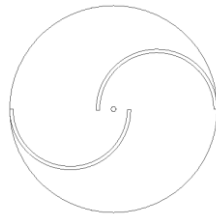
Make the Vertical Axis Wind Turbine out of different materials – paper, card, cardboard and corrugated cardboard. Which works best?

MAKE A SAVONIUS WIND TURBINE

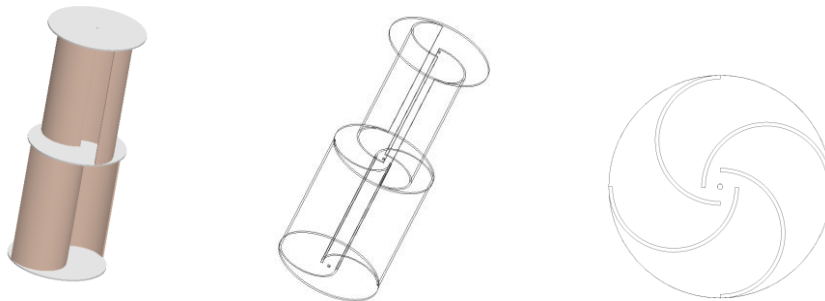
Try making another type of Vertical Axis Wind Turbine



You will need to use a kitchen roll tube or a crisp tube. Ask an adult to help you cut it in half so that you have two semi-circular tubes. Use tape to attach them to a circle of card or cardboard at the top and bottom. They should not be joined in the centre, but should meet the edge of the top and bottom card circles, as shown below:



If this works, why not try a two-tier Savonius Wind Turbine:



To do this, simply add another layer of the semi-circular tubes and a plate on top. Make sure that the second layer is at ninety degrees to the first layer.

Try different lengths of tube to see which lengths produce the most power output when run on your wind turbine, using the long steel rod and some blu-tack to hold the Savonius wind turbine to the rod.

ADVANTAGES OF VERTICAL AXIS WIND TURBINES

- VAWTs have a larger swept area for a given diameter than HAWTs do
- They are less likely to break in high-speed winds
- They do not need to turn to face the wind if the wind direction changes, so they are ideal for turbulent wind conditions
- They do not need a free-standing tower so they are less expensive to build and are stronger in high winds that are close to the ground

DISADVANTAGES OF VERTICAL AXIS WIND TURBINES

- Most VAWTs are only 50% as efficient as HAWT as when their blades rotate into the wind they suffer from additional drag
- They often have a low starting torque, and may require an energy input to start turning
- Most VAWTs need to be installed on quite flat pieces of land, and some sites will be too steep for them but will be suitable for HAWTs