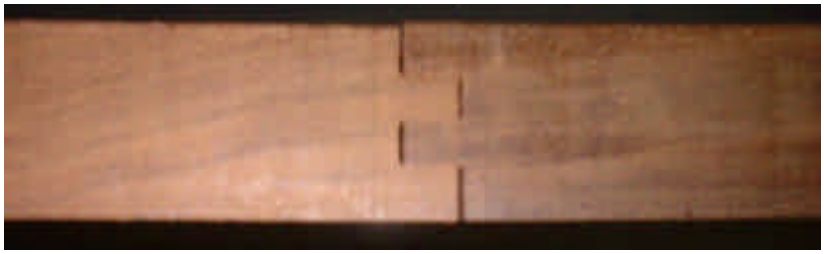
MY CHOSEN IDEA: - ROTOR (BLADES)

For the same reason as above – low wind speeds at Mr Bigins location and – due to the complications in types of vibrations I have stuck to a simple 3 bladed rotor.

Science table top cut into its original planks

- This rotor will be made from an old re-used science table top which keeps in lines with my clients ideas of 'use, reuse and re-cycle'
- The 3 rotors will be set at an 18° when compared to the oncoming wind. This angle was workout by a professional aerodynamic scientist. Basically due to the low wind speeds the rotors need to be set at this angle to make best use of the wind which is available.
- This 18° angle means that the wind turbine should start producing 16 volts direct current electricity at 180 Rpm which the blades should turn at in a 5.5mph wind
- The blades size has been determined by the fact that each plank of the table top wood has a router join between them this means that each plank is 127mm wide and 1.10 meters long.



MY CHOSEN IDEA: - GENERATOR

I have looked at three main ideas for different generators. I looked at: car generators, Permanent Magnet Generators (PMG) and Induction motors running at high speeds. After looking at the advantages and the disadvantages of each of the above I have decided to build a simple one magnet rotor PMG. This will be based around an old car wheel hub.

- My PMG will be designed to produce 16/18 volts Alternating current when tuning at 150rpm I will do this by testing it on a metal lathe.

- The back of the PMG is made from laminates of silicon steel which I will take from a microwave transformer and reshape to form a circle of laminates.

- The wheel bearing will be press fitted into a solid frame hat will be able to take the weight and stress that the blades cause when turning

- This PMG is a simple alternator that has no carbon brushes like car generators and other motors. This means that there is one less thing to go wrong and one less thing to be maintained.

- This PMG design is a basic design that I found on the internet and is specifically designed to produce electricity at low RPM typically 1500-500rpm which is ideal for wind turbine blades that spin at about the same speed.

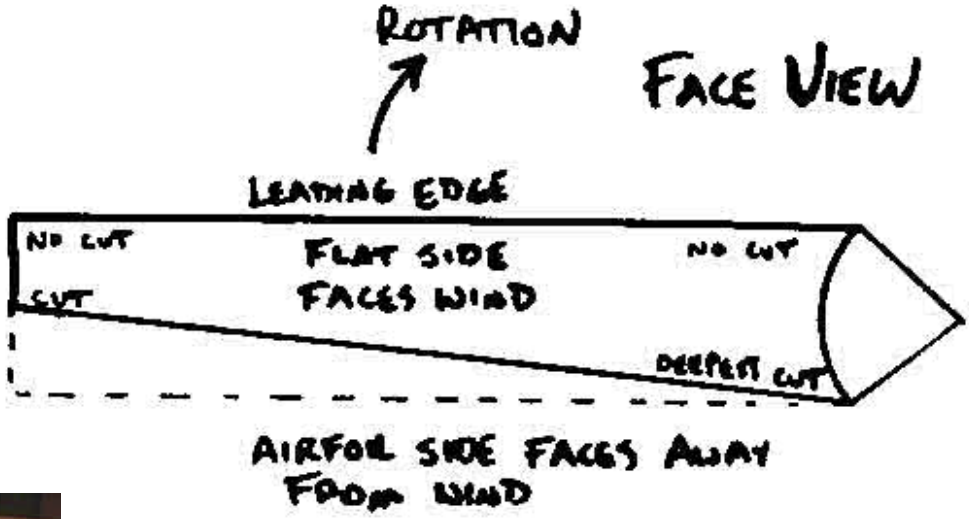
- Any moving part of the PMG is called a rotor and any stationary part of a PMG is called a stator:

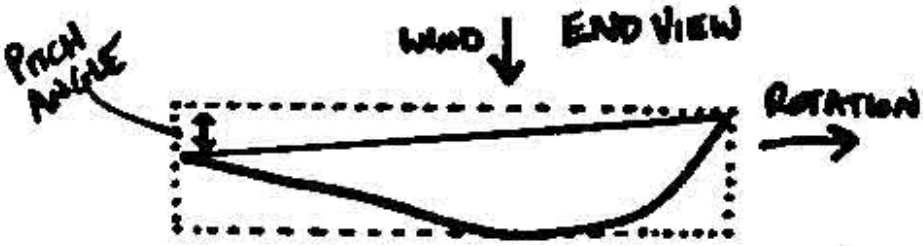
E.g. the blades which are moving on the wind turbine are called rotor blades and the laminates which are fixed to the frame (see later notes) are call a laminate stator

BLADE CONSTRUCTION

I started the blades by having the re-used table top being cut into 3 equal sections measuring 1100mm by 127mm by 25mm. These sections need to have an airfoil shape cut into them. The shape that the blades will look like is similar to the shape on modern jet line airplanes.

The blades will have a taper which means they are wider at the base and narrower at the tips. The diagram below shows how the blades will be carved:



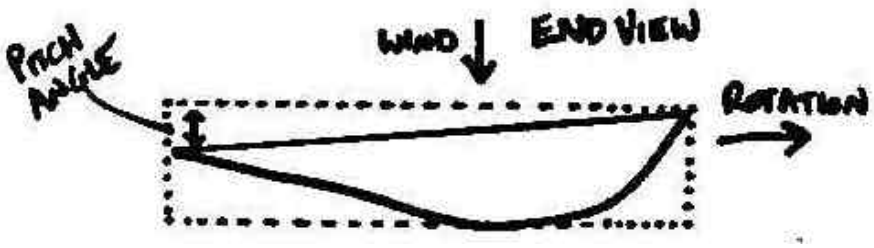


This is how the blades looked after they had been cut into planks.

The blades where then marked with a pencil to show where the taper needed to be cut. The picture below shows the blades taper being cut on a large band saw:

This part is the waste part that will be got rid of in a fire which will return the CO2 it used back into the air that it came from.

From these tapered blank blades I had to carve an ‘airfoil profile’ as shown below:

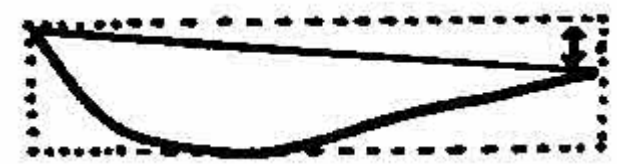


The picture below shows how I carved the blades. I used a spoke shave which was able to get rid of the excess material very quickly.

I finished the blades with a ‘random orbital sander’ which produced a really smooth finish. This smooth finish will allow the air to move over and around the blades easily and faster, in turn this will help the turbine to start in slower winds which increase efficiency.

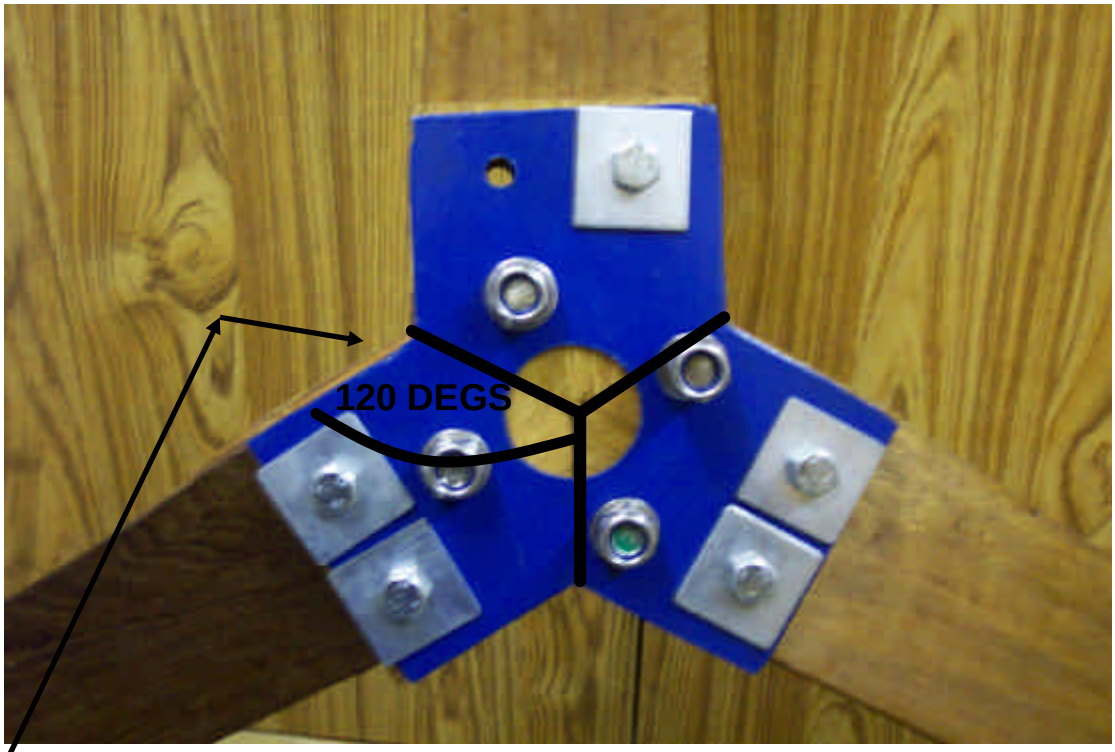
The picture above shows two of the three completed blades. The square ends will be used to set the angle of attack. This is the angle at whish the wind hits the blades, this makes them turn.

If you compare my blade profile with the profile that I was trying to achieve then you can see that there is a slight difference but as I was doing it by eye and feeling alone then I feel it is an ok replica of the profile



After finishing the profile of the blades I had to cut wedges that would set the angle at which the blades would sit facing the oncoming wind. These wedges where cut on a band saw I was not able to take photos of this process as it was very hard to cut the wedges accurately and to take a photo at the same time.

The glue that I used to glue the wedges down with foamed a lot and this had to be cut of when it had cured. The glue is called polyurethane and can stick mot materials together.



In the above picture you can see that I have made two plates (one on the front and one on the back that you can't see). Once the glue that the wedges where stuck on with had cured I had the ends of the blades cut with 120 deg angles so that the three blades would lock into position easily.

Before using to cut metal plats

After using to cut metal plats

To be able to cut the 3mm steel plate into the fixing plates I had to make a paper template and then from that I was able to make a ply wooden template. This wooden template meant that all I had to do to make the same shape on the steel sheet was to use a plasma cutter which fires a jet of burning air through the sheet metal which leaves a clean smooth cut. I simply followed the shape of the wooden template. This allowed me to produce two clean accurate metal fixing plates to hold the blades strongly. If I where to make these plates on a large scale I would use a computer aided laser cutter to produce perfect plates I would also get the laser to cut the holes in the plate as well.