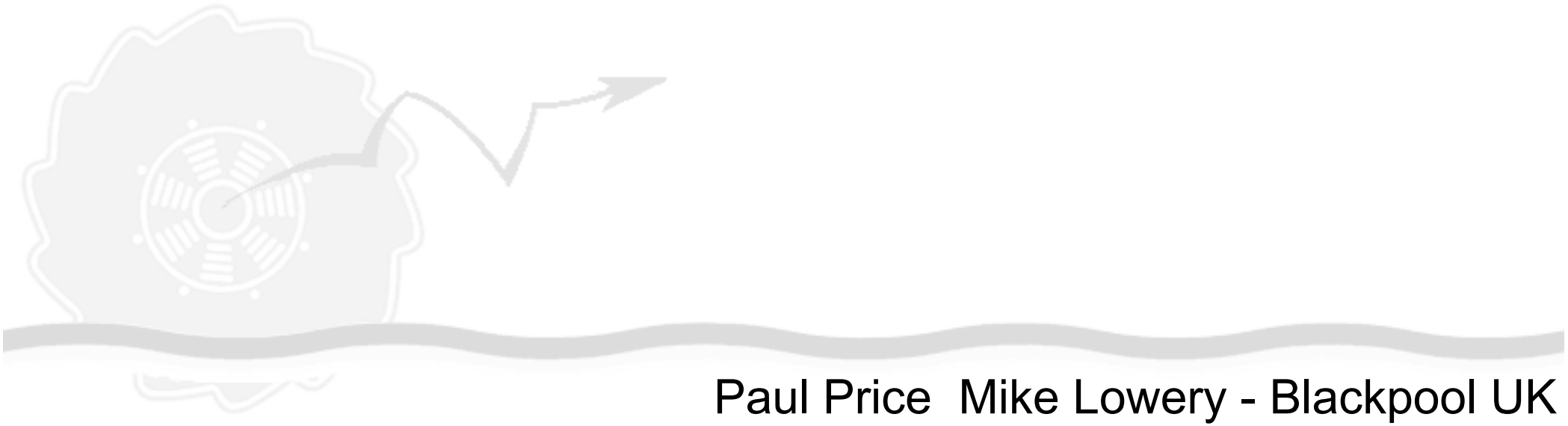
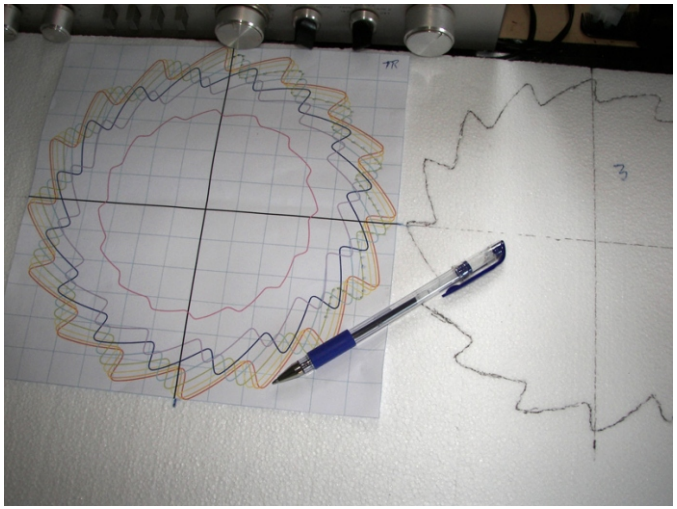
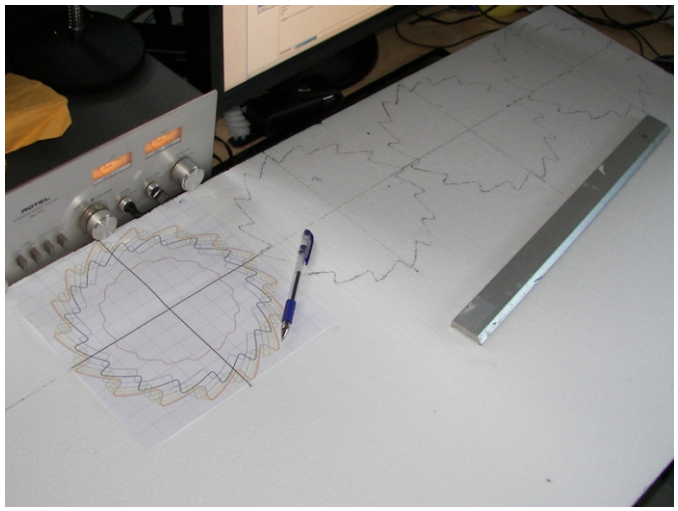
NO BUDGET HEB PROTOTYPE



Paul Price Mike Lowery - Blackpool UK

Drawing Curves Onto Polystyrene.

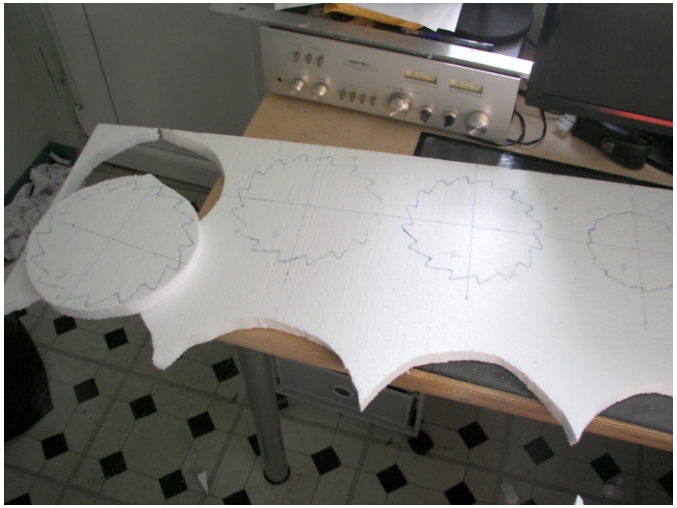


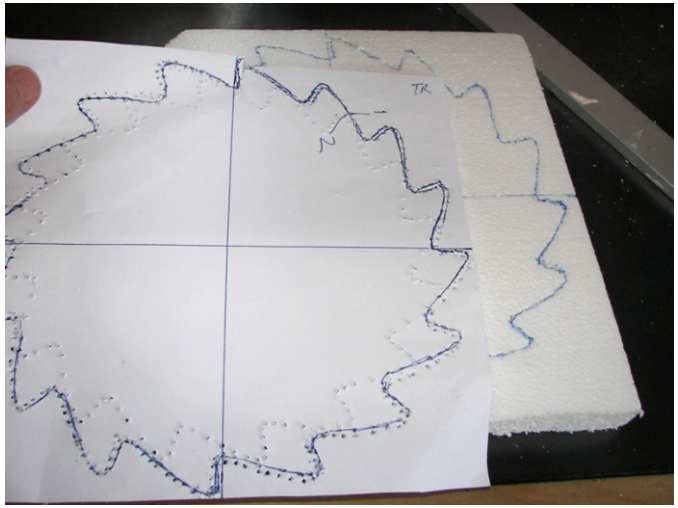


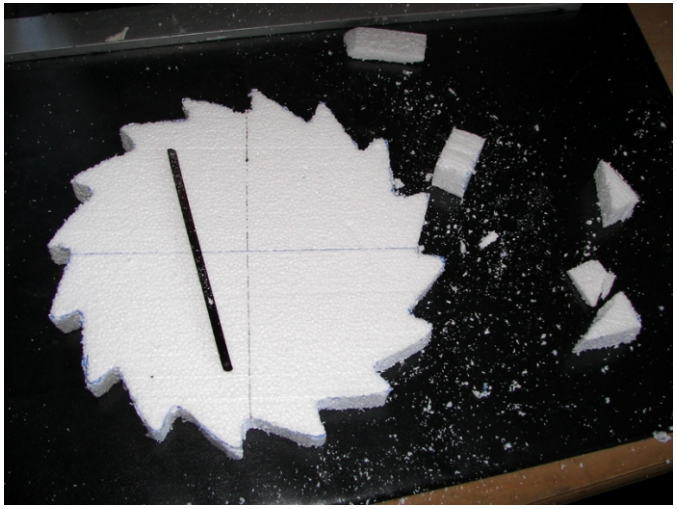
Polystyrene (Styrofoam) is ordinary insulation foam 25mm sheets.

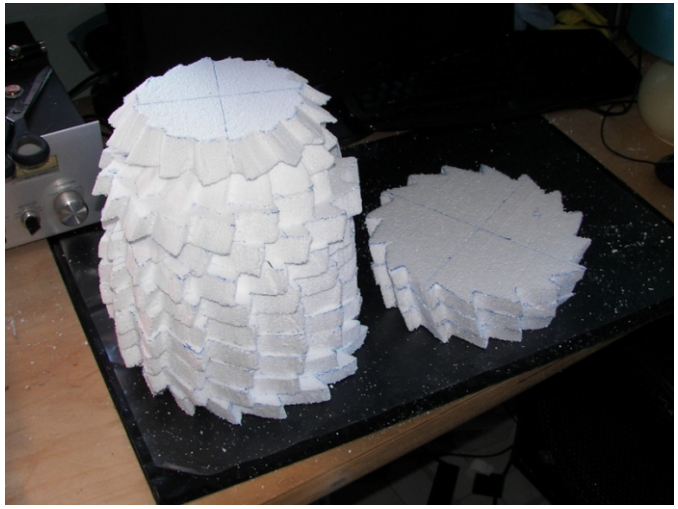
Use ruler to mark centre lines. Match up centre lines on template with centre lines on foam. Be really careful not to let the template slip. Might be good to use pins.
Gel pen used to poke through curve template to mark dots on foam. Join dots when you've gone all round. Give each curve a number as you trace them. (Largest #1 to smallest #8 in this case)

Cutting Out









The sections are not a straight cut so you need to mark the next curve on the back of each section (Eg. #2 section would have #3 curve mirror image on the back)

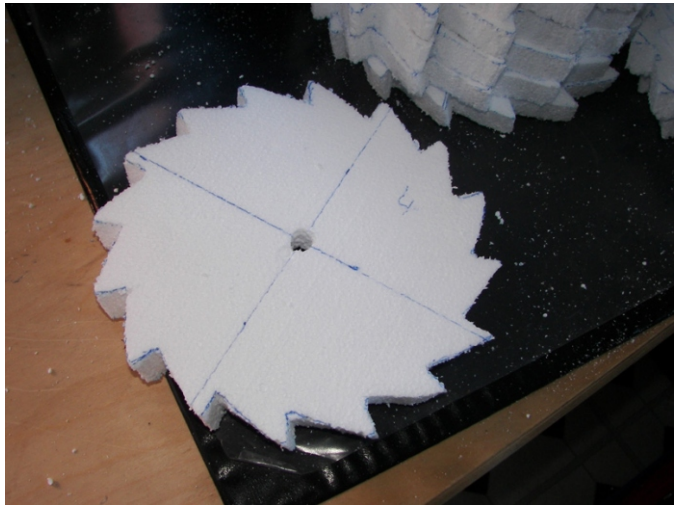
To do this roughly cut out each section. Then with the pen continue the centre lines down the edges of the foam section as a guide to draw more centrelines on the back. You could use a spirit level to be extra accurate.

Join the holes of the curve you want on the back of the template with the pen for clarity

This is a bit of a cock-up. I should have simply printed out reverse (mirror image) versions of the curves

Carefully cut out section profile with hack saw blade. (Hot wire cutter would be a luxury) Follow both curves on either side of the section. This is actually not as tricky as it sounds and you don't have to be too fussy. Your first one or two might be a bit rough but there is always filler and sandpaper.

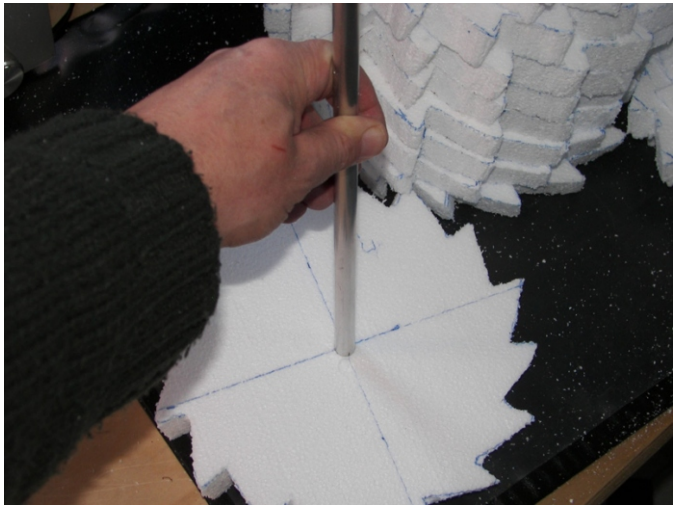
The Axle

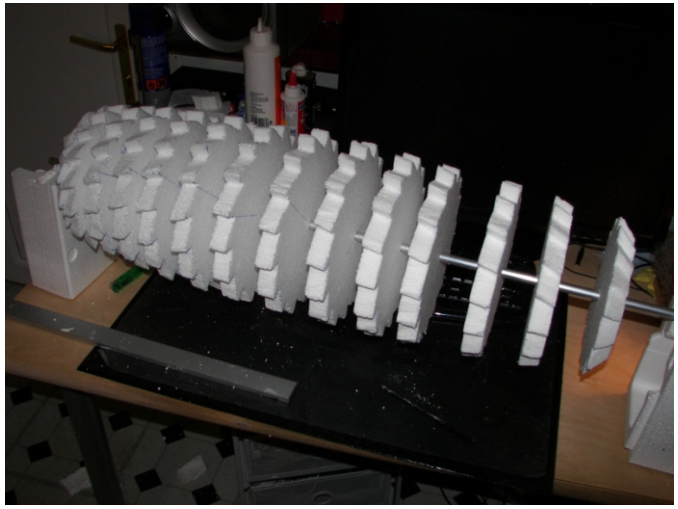


Aluminium tube is good for the axle due to its light weight and offers a large diameter which gives a bigger surface area for the foam sections to adhere to.

Rough up the end of the tube and use the tube itself to drill through the sections.

Thread onto axle ready for gluing.





Assembling Sections

Two glues are used. I found most glues either eat the foam or won't set because the foam is non-porous.
I ended up using a PVA floor tile glue to glue sections together and ARALDITE (2 part epoxy resin) for gluing to the axle

Keep the centre lines lined up. It might help to draw them back onto the edges of the sections
I spread the epoxy outwards from the axle a bit so that it can better "grab" into the foam. There will be quite bit of force on this interface when the generator is attached.

Load on a bit of weight on while it all sets.

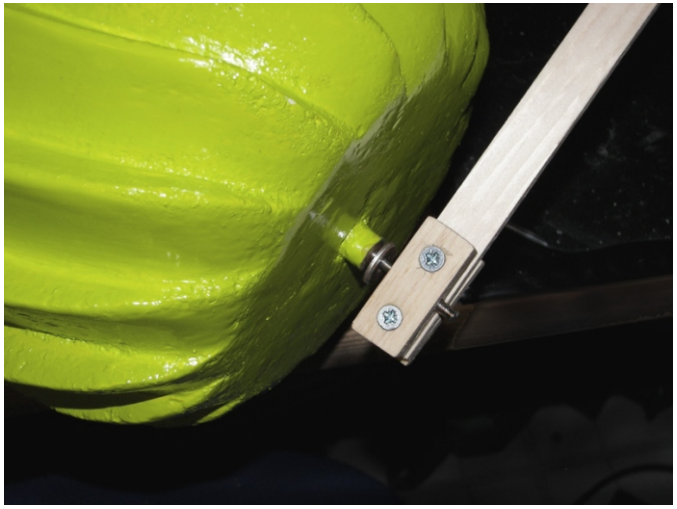
Finishing

The HEB can now be sanded off with any fine sandpaper. I then used a very light filler used for model RC aircraft and sanded again.

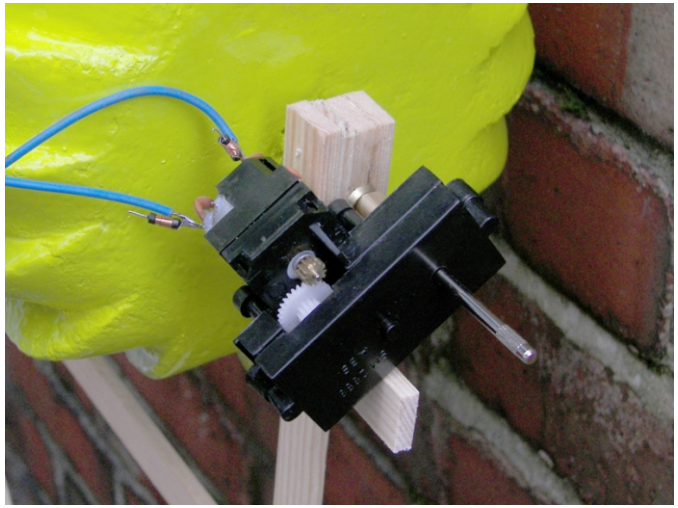
The aluminium axle can be cut to length.

Plug axle with wooden dowels glued in with epoxy. These can be drilled and small diameter chrome steel rods can be glued in as bearings.

Frame from pine profile. Bearings fabricated from some wood.
Electrical conduit clamps used for swing joints
Extendable clothes line prop as bridge.



Generator

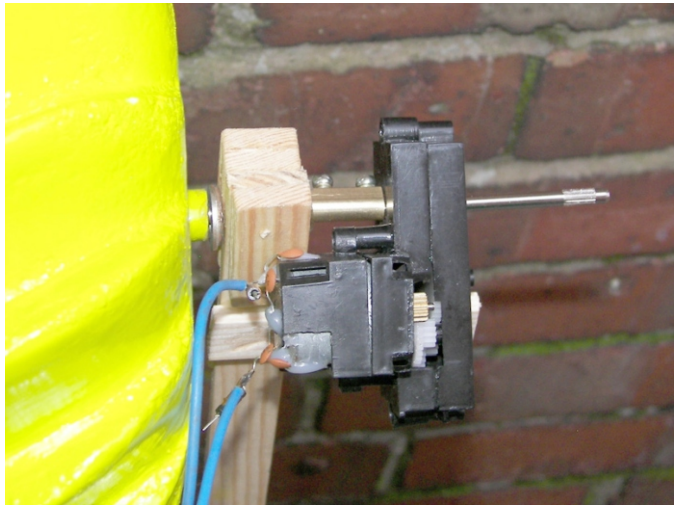


Electric motor with integrated gear train.
This is very inefficient and will probably only power a few LEDs. The increase in flux density when you short out the motor makes it so you can no longer even turn the shaft with your fingers. The model will probably not quite overcome the load of a filament bulb with this setup on our test water at ~2.5 mph flow.

The generator very simply attached to HEB axle with an electical connector.
A piece of wood glued to frame to stop it from spinning.

Not yet tested on water.

Scrapped a toy car for these axles and also the motor and gear train to act as the generator components.



Notes:

This model is to test a method of constucting a much bigger prototype to find a way to very cheaply prove the HEB concept and explore ways of cheaply and easily building various configurations as may be required.
It is clear from this model when seen on water that the treads need to be more “V” shaped as per the original design and this will be incorporated in subsequent builds.

We are quite pleased with the model’s performance as it seems to give a fair amount of torque for this scale. It at least proves that it would be reasonable to go ahead and produce larger prototype.

Test location (paste into Browser)

http://maps.google.co.uk/maps?f=q&source=s_q&hl=en&geocode=&q=%2B53%C2%B0+48'+28.93%22,+-2%C2%B0+59'+35.40%22&aq=&sll=53.804681,-2.999589&sspn=0.007312,0.025342&g=%2B53%C2%B0+48'+28.93%22,+-2%C2%B0+59'+35.40%22&ie=UTF8&ll=53.807993,-2.993056&spn=0.000914,0.003168&t=h&z=19