edexcel

Website Exemplar

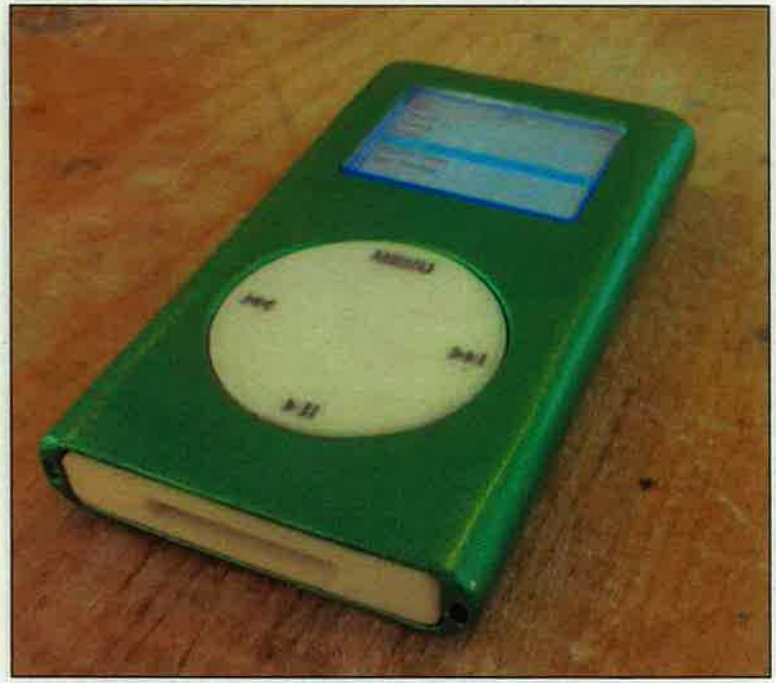
GCE D&T Graphics Product.

Unit: 6GR01

Topic: Room Interior / MP3.

AS Graphics Products EDEXCEL 8GRO1 2009

Portfolio of Creative Skills



Contents

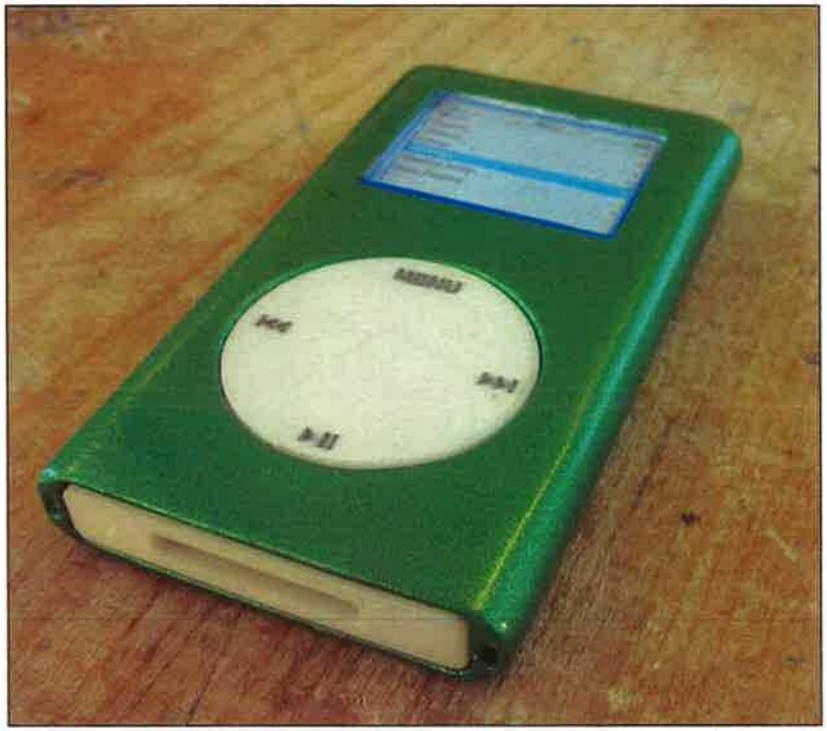
Task 1: iPOD Mini

Task 2: Room Interior

Task 3: Point of Sales Display

Task 4: Product Investigation

Task 1: iPod Mini



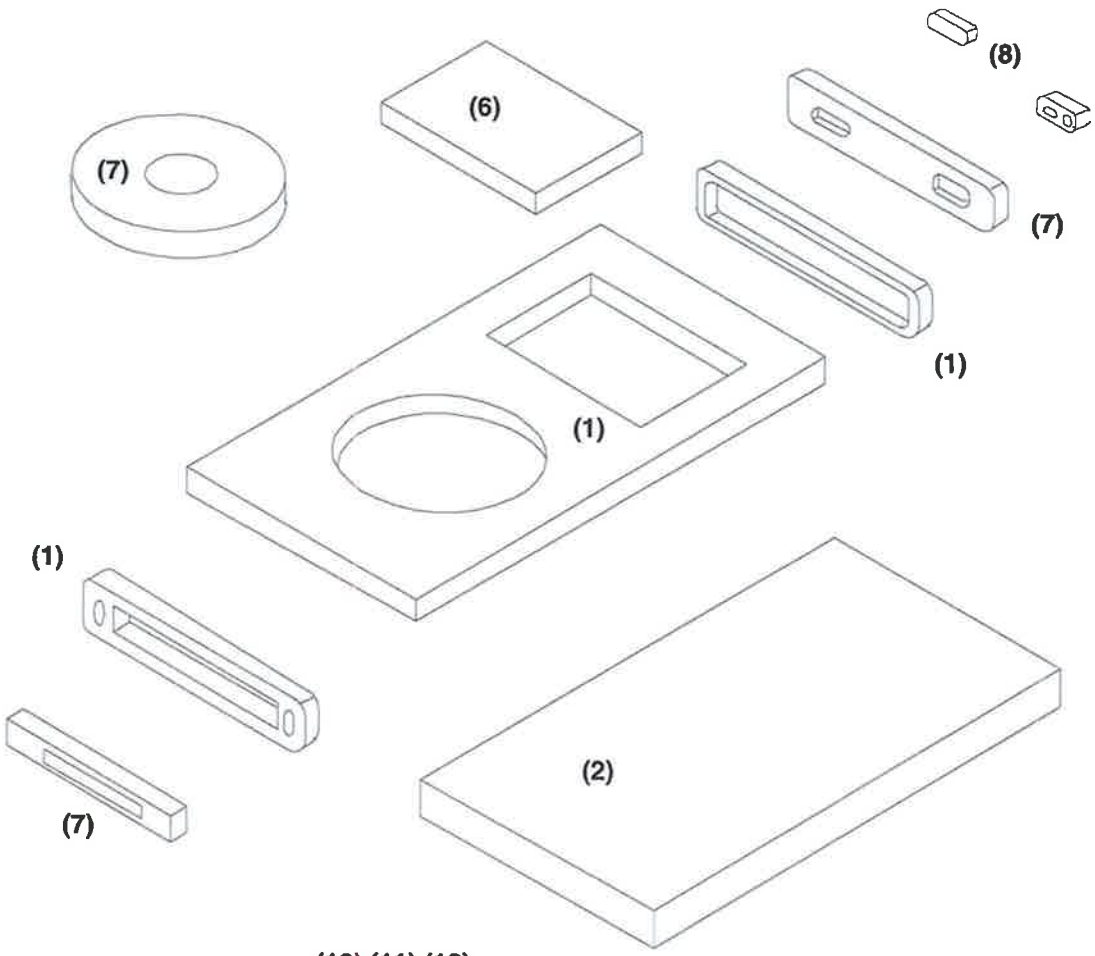
Specification

Your block model must be:

1. completed with a tolerance of ±1mm
2. as realistic as possible
3. finished to a high standard
4. made from the materials given
5. be completed in 15 hours

Materials List:

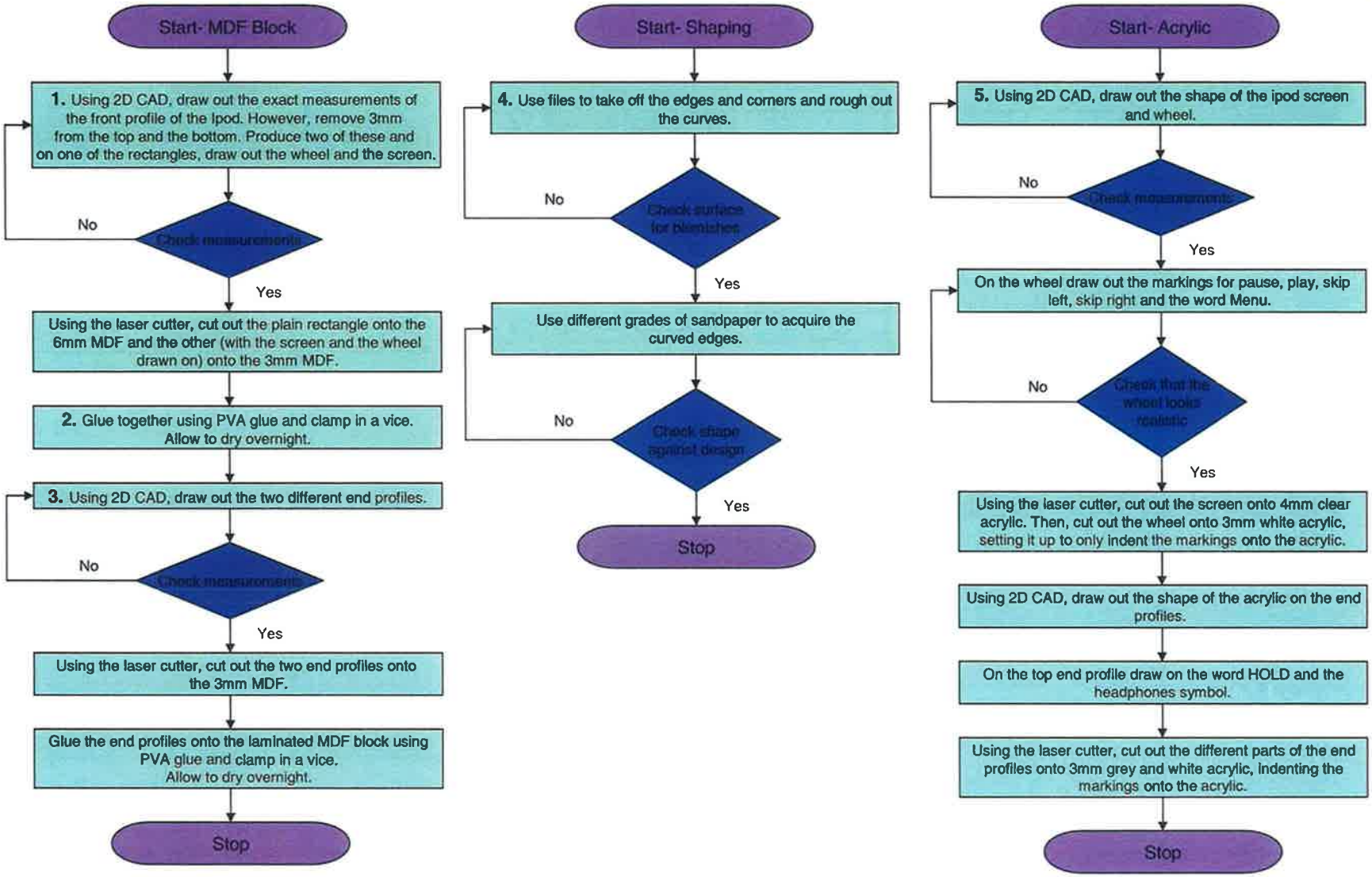
- 3mm **(1)**, 6mm **(2)**, 9mm **(3)** MDF
- 1.6mm beech veneer **(4)**
- 2mm **(5)** and 4mm **(6)** clear acrylic
- 3mm white acrylic **(7)**
- 3mm grey acrylic **(8)**
- 40mm EPS foam **(9)**
- car body filler **(10)**
- spray primer **(11)**
- spray paint **(12)**



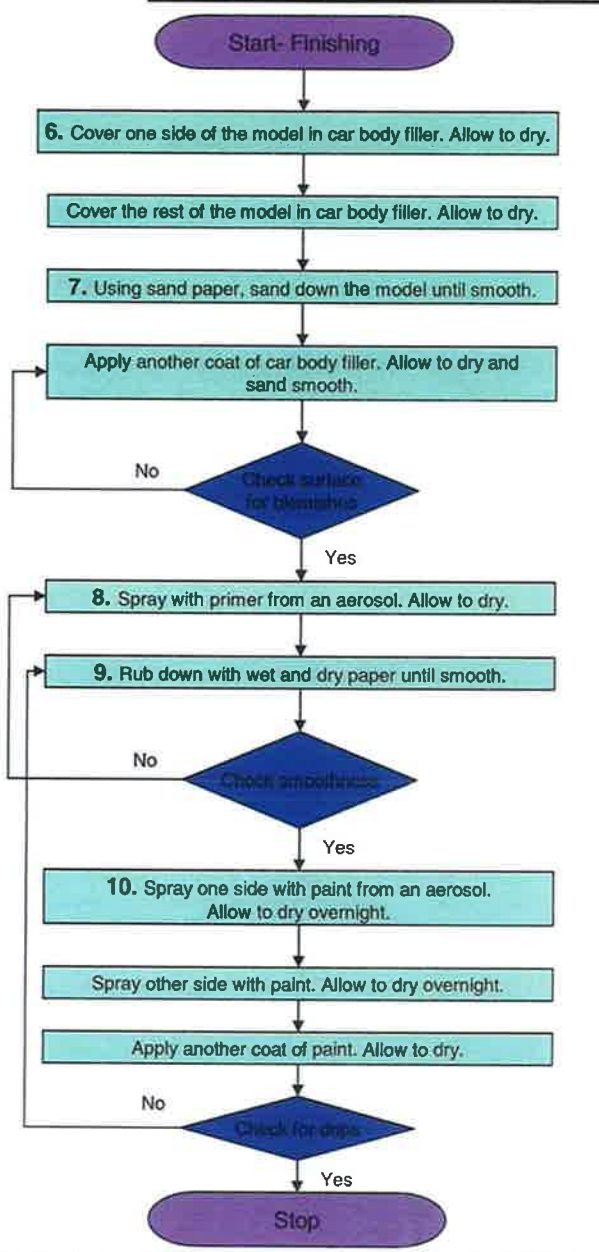
(10) (11) (12)

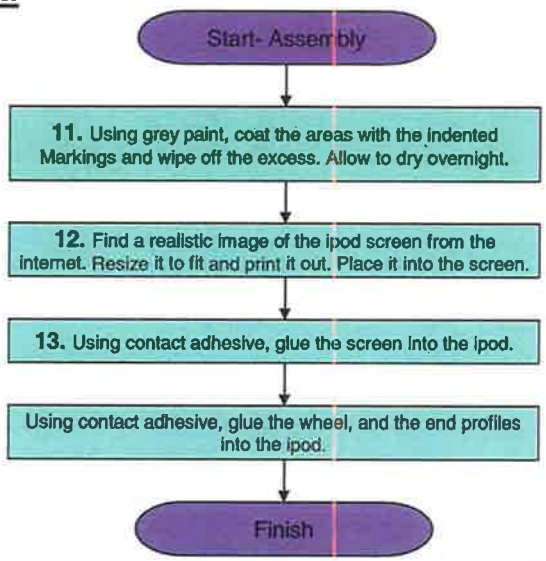
On MDF

Production Plan



Production Plan Continued





See numbered tasks for comparison with my production (pages 5,6,7)

	Task	5 hours per week		
		Week 1	Week 2	Week 3
1	Laser cutting MDF	1 hour		
2	Laminating MDF	Drying time		
3	Laser cutting end profiles	1 hour		
	Laminating end profiles	Drying time		
4	Rough shaping of curves		1 hour	
	Fine shaping/smoothing of curves		1 1/2 hours	
5	Laser cutting acrylic parts		1/2 hour	
6	Cover in car body filler		Drying time	
7	Sanding		1 hour	
8	Priming model			Drying time
9	Rub with wet and dry paper			3 hours
10	Finishing with aerosol paint			Drying time
11	Painting acrylic parts			1/2 hour
12,13	Assembly			1 hour

Total: **15 hours over 3 weeks**

Justification

Materials

Materials on offer:

- 3mm, 6mm, 9mm MDF
- 1.6mm beech veneer
- 2mm and 4mm clear acrylic
- 3mm white acrylic
- 3mm grey acrylic
- 40mm EPS foam
- car body filler
- spray primer
- spray paint

My choices of materials

Originally I had intended to make the model Ipod out of the EPS foam. This is because EPS foam can be easily cut, shaped, glued using PVA glue and can be finished to a high standard. However, I wanted my ipod to have fine detail as my specification required it to be as realistic as possible. Therefore, I considered using MDF (medium-density fibreboard). MDF is made from tiny wood chippings which are bonded together with an adhesive at high pressure. Because of the way it is made, the advantages of MDF are that it can be shaped easily like wood as well as having the added advantage that it has no grain to work with. This means that I could achieve the fine detailing as required. MDF can also be laminated for extra strength while also creating the exact block measurements as needed so that it is within ±1mm tolerance as the specification requires it to be. MDF also gives an excellent surface finish as it can be sanded really smooth and finished well with a variety of surface treatments (e.g. spray primer and spray paint), using the materials given as the specification requires. Furthermore, this is a good property as my specification requires my Ipod to be finished to a high standard. It is because of all these advantages that I decided MDF was the best choice for my block model.

I decided that once I had laminated the MDF and taken measurements of the model, if it was below the 1mm tolerance as required by the specification, I could either use the beech veneer to thicken the model or cover my model in a thinker coating of car body spray. Both methods would have complied with the specification by using the materials given. However, as my Ipod turned out to be just slightly under 1mm, I chose to add the coat of car body filler instead of the beech veneer. This is because I was able to add an even spread of thickness on all parts of the model which would not have been achieved if I had decided to use the beech veneer provided.

For the screen, the wheel and the ends of the ipod, I decided to use acrylic. This is because it does not require a surface finish as it already has a high quality finish. Also, it is really smooth and comes in flat sheets which can be easily cut to the required measurements. One of the tools I used to get the exact measurements, was the laser cutter which was perfect for cutting acrylic. Furthermore, acrylic comes in different colours which was helpful because the specification needs the model to be as realistic as possible. It could also use clear acrylic which was needed for the screen so that the Ipod display could be viewed through it. However, I needed to handle the acrylic with care in order to protect the high quality finish as acrylic can be easily scratched because it has a low scratch resistance. Even with this disadvantage, I decided that acrylic was a good choice as there are few other materials which have the properties I required. Finally, it is one of the only options I had as the specification required me to use only materials that I am provided with.

As I had the option to use car body filler and spray primer, I decided that they were ideal in the finishing of the block model. I covered the model in car body filler first and sand down. I then used the spray primer and use wet and dry paper until the surface is perfectly smooth and flat. These finishes fitted with the specification stating that it should be finished to a high standard. I then used the spray paint to cover the ipod so that it is as realistic as possible, as required in the specification. I could have used only paint however, the final quality of the model Ipod would have been poor in comparison with the materials I used.

Justification continued

Processes

Laser cutting

To cut out the exact measurements of the MDF required, I decided that I would use the laser cutter. This is because I was able to draw my model on CAD software (computer aided design) and achieve the exact measurements, beings the easiest and quickest way to achieve the ±1mm accuracy as required by the specification. I could have used the Hegner saw to cut out the rough sizes however it would not produce straight cut lines and it would have been hard to cut out the screen and the perfect circle needed for the wheel, not achieving the criteria for being as realistic as possible. I could have used a Forsener Bit to cut out the circle however, it would have not guaranteed the perfect size as the correct size drill part was not provided. These methods would have taken a lot of time to sand down and even then, it would not compare to the high standards that can be achieved by the laser cutter.

Furthermore, when cutting out the acrylic, I decided that it would be best to use the laser cutter again. It meant that the same circle that was cut out for the MDF would be the same measurement as used for the acrylic, meaning that it would be a perfect fit and be very realistic. The other option would have been to cut it out on the Hegner saw by hand which is not ideal again because getting the perfect circle would have been extremely hard. Also, it is very challenging to sand down acrylic and very time consuming, meaning I may not have finished within the 15 hours allowed as stated in the specification.

Lastly, I chose to use the laser cutter because it produced engravings onto the acrylic (e.g. the Menu button) making it as realistic as possible. This method was better than sticking on stickers for the buttons and produced very high quality acrylic parts.

Laminating

I decided to make the model out of two bits of MDF (see exploded view) so that I could achieve the measurements of ±1mm accuracy. I also used one part to cut out the basic rectangle shape and the other to cut out where the screen and wheel would fit. I used PVA glue to laminate the MDF together as PVA is used for gluing together wood. I could have used one piece of MDF however it would have been difficult to get the exact thickness needed and I would have also been very hard to cut out the area where the screen and wheel would fit. For this I could have used a Mortise machine however, I would have never been able to achieve the straight and perfect rectangle for the screen to fit comfortably and be realistic. Lastly, I knew that MDF is really good for laminating so I decided to use this process.

Chiselling

When I put the acrylic screen into the MDF, it did not lie completely flush with the wood and therefore I used the process called chiselling to scrape out some of the MDF. It allowed a better fit for the acrylic, producing a very realistic model as needed in the specification.

Sanding

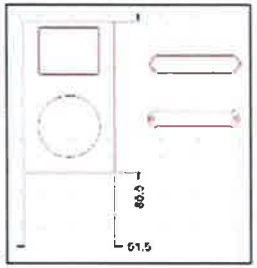
To achieve the perfect curved edges on the model, I started with a rough grade of sand paper and then I smoothed it off with finer grades of sandpaper. I sanded by hand so that I could feel the curve and keep it realistic. I could have used the disc sander however, I felt that it would be tricky to get the right curve and hard to judge if I had taken too much off. This technique achieved the correct curve to make it within ±1mm tolerance and realistic as needed by the specification.

Finishing

I decided to use car body filler and primer with wet and dry paper to create the perfect smooth finish and use the materials given as required by the specification. I also used spray paint instead of other paint to get a smooth and even finish. This made the ipod look realistic and complied with the specification.

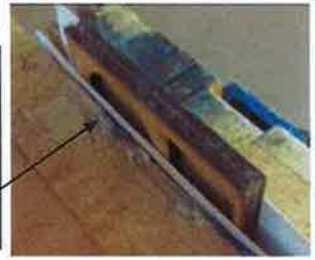
Production of iPod

1. Firstly, I drew out the shape of the Ipod on 2D CAD. Using this software I then was able to laser cut this exact shape onto the MDF.

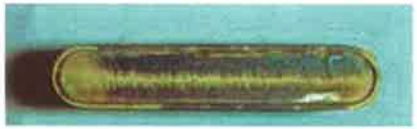


When using the laser cutting, I had to keep watching it for a precaution in case something went wrong. I also kept my finger on the stop button in case of an emergency.

2. I then glue the two pieces of MDF together using PVA glue and clamped it in a vice to dry overnight. I used pieces of paper to protect the wood from it scratching in the vice.



3. I laser cut the end profiles out and glue each end onto the block model. As they were 1mm thick walls, I had to be extremely careful and when I clamped them to dry overnight. I had to make sure that it was given as little pressure as possible so they wouldn't break.



4. Now I had the basic model made out of MDF, I needed to shape the curves. As the end profiles had been cut from the laser cutter with the curves already on them, I used them as guides for the shaping of the rest of the ipod. To begin with I clamped my model in a vice while I created the rough shape of the curves. Then I used my hands so that I could constantly feel the curve and create the perfect shape.

I wore a dust mask and goggles for health and safety precaution when I was sanding.

5. Next, I used 2D CAD again to draw out the acrylic parts.

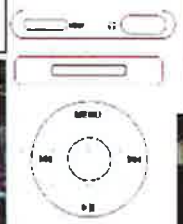
On the wheel, I wrote the Menu button and the symbols for the controls. I used the laser cutter to cut the different parts from grey and white acrylic.

I made sure the laser cutter was set to 'deep engrave' when I cut out the wheel. This gave the symbols I had drawn on a good depth which I would be able to fill in with paint.

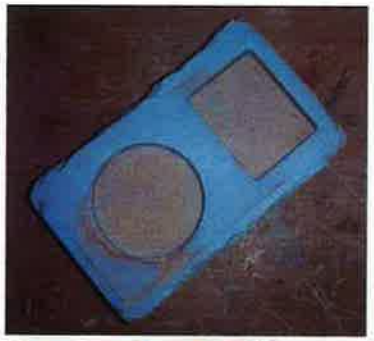
To test that the measurements were correct, I tried to fit the acrylic into the model. I found that the measurements were correct as the acrylic fitted perfectly.

6. With the model in perfect shape, I covered it in car body filler and left it to dry.

When using car body filler, I wore gloves to protect my hands and I made sure there was good ventilation for health and safety precautions. Also, I wore goggles and a dusk mask for extra protection in case there were harmful fumes.



Production continued



7. I then sanded down the car body filler until it was perfectly smooth. As there were a few scratches I refilled just the smallest areas and then sanded down again. As a lot of dust is produced when sanding, I wore a dust mask and goggles for health and safety precautions.

When I sanded down that curves, I took my time using different grades of sandpaper to get them smooth and evenly shaped.

10. I then covered it with a spray paint.

As the fumes may have been toxic, I made sure I was somewhere well ventilated. As there was no fume cupboard, I took my model outside to spray it. I wore a mask for protection against the fumes.

I then gently rubbed the model down again and re sprayed it.

This allowed it to become perfectly smooth and added a thicker coat of paint, creating a deeper and richer colour of that of an ipod.

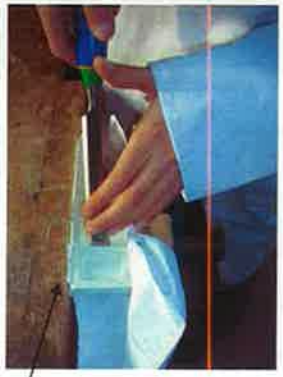
8. Next I sprayed the model with an aerosol of spray primer.

For health and safety precautions I made sure I wore a mask and did it in a well ventilated area. As I was not able to use a fume cupboard, I opened windows and doors.

9. Once dried, I gently rubbed it down with wet and dry paper until smooth and repeated the process again.

As the car body filler and the spray primer would add and extra thickness to my model, I wanted to check the measurements again to make sure the acrylic would still fit.

The screen did not fit as well as before, I used a chisel to gently scrape out some of the excess filler.



When using a chisel I made sure I was completely safe with the blade pointing downwards and my fingers behind the blade. I also wore goggles for protection in case the chisel broke while I was using it.

Production continued

11. To make the marking on the acrylic stand out, I painted it with grey paint and then rubbed off the excess. This meant that the paint would only dry in the indented marking which I didn't rub off.

12. With all the separate parts, now I needed to assemble them.

Firstly I took a image off the internet and printed it off for the display behind the clear acrylic. I placed this in the screen and then around the edges of the screen, I used contact adhesive to glue the screen in place.

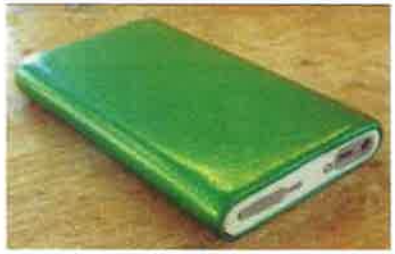
Using some 3D software on the computer, I created an ipod to with the same measurements and colours so that I was able to compare it to my model.

13. I then used the contact adhesive to glue in the wheel and the end profiles.

When using contact adhesive, I had to make sure to be quick as it dries very quickly. I also wore gloves for health and safety practice.

For health and safety precautions, I always made sure that my hair was tied back and that I was wearing no jewellery.

14. My model ipod is now finished.



Risk Assessments

Laser Cutter






Hazard	Risk	People at risk	Control Measure
Electric shock	Potential to present an electric shock if faulty or exposed to water	Teacher/ student	1. Run thorough control checks to search for any electrical faults in the machine 2. Do not expose the machine to any water 3. Care should be taken to ensure the leads are in good condition 4. Power has to be isolated during repair/maintenance
Tripping	Leads left on uncovered on the floor could cause someone to trip over	Teacher/ student	1. Make sure the leads are positioned to prevent tripping or snagging
Dust- respiratory irritant	Effects of prolonged dust inhalation	Teacher	1. Wear a dust mask 2. Ensure local exhaust ventilation is provided and there is dust extraction
Laser brightness	Looking into light source when working on reflective surface could potentially cause major eye damage	Teacher/ student	1. Check that the correct power of laser is being used 2. Always ensure the cover guard is on 3. Follow the manufactures specific instructions for particular materials, especially reflective materials
Fumes- may be toxic	Effects of harmful fumes being inhaled	Teacher/ student	1. Follow the manufactures specific instructions for particular materials 2. Ensure local exhaust ventilation is provided 3. If toxic fumes are known to be present, wear a gas mask
Projectile- dust or debris	Dust or debris being propelled into eyes	Teacher/ student	1. Always keep the guard/cover down during the laser cutting
Dust-skin irritant	Effects of prolonged contact with the dust could cause minor skin damage	Teacher	1. Wear gloves or use barrier cream

Hand tools (chisel)

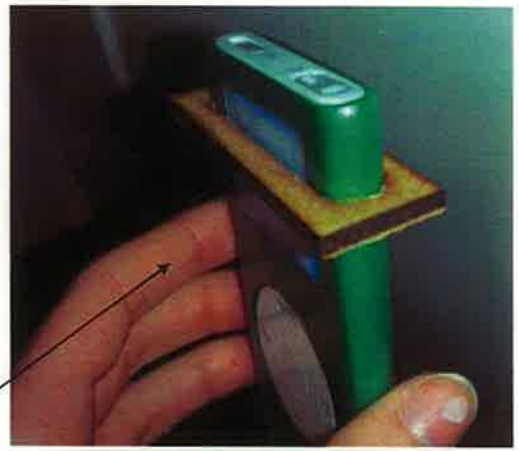
Hazard	Risk	People at risk	Control Measure
Injury from sharp blades	Sharp tools present a danger, as being used incorrectly it could cause injury	Teacher/ student	1. Instructions should be given on the correct use of the hand tool 2. The teacher can ban some students from using certain sharp hand tools 3. Sharp tools should be handled with care, the blade pointing downwards or cutting edges protected
Falling tools	Tools stored at height or tool that is dropped could cause injury	Teacher/ student	1. Tools should be stored at a suitable height for access
Tools breaking	A tool coming apart in use could cause injury or parts being propelled when breaking could cause injury	Teacher/ student	1. Safety goggles are worn when using the tool 2. Regular checks are preformed on the tools to check that they are in good condition
Slipping of tools	When pressure is applied, slipping could cause injury	Teacher/ student	1. Tools should be kept sharp and in good condition 2. Sharp tools are used in the correct manner, pointed downwards, handled with care and hands behind the blade
Tools carried incorrectly	If tools are carried in a dangerous manner it could cause injury to the person or to someone else who they come in contact with	Teacher/ student	1. Tools not carried in pockets or under belts 2. Never run with any hand tool
Tools used incorrectly	Using tools the wrong way could potentially cause injury	Teacher/ student	1. Instructions should be given on the correct use of the hand tool

Evaluation

Test each point of the Specification

The model must be:

1. completed with a tolerance of ±1mm.
2. as realistic as possible.
3. finished to a high standard.
4. made from the materials given.
5. be completed in 15 hours.



Completed with a tolerance of ±1mm

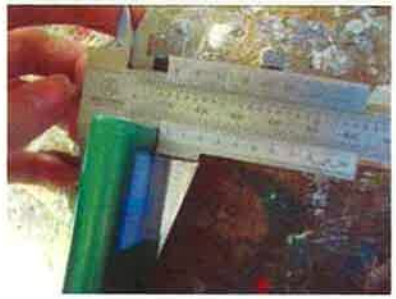
As I was making the model, I constantly kept checking the measurements to make sure that I was not exceeding the ±1mm tolerance by measuring it with the Vernier Calipers. When I had finished making my model, to test that it was in within ±1mm tolerance, I cut out the exact measurements of the end profile from the 2D CAD on the laser cutter. I then used this to test that it was still the correct measurements by sliding it down the ipod. I was very pleased as I measured my ipod to be within ±1mm tolerance and therefore fit with the specification. I also found that the testing shape fitted perfectly through the block model proving that the measurements were within ±1mm.

As realistic as possible

I managed to make my ipod as realistic as possible by using the exact measurements of an ipod, using a realistic colour spray paint, adding small detailing on the controls and adding a realistic display. To test that it was realistic, I showed it to an adult and asked there opinions. I also compared the photos that I had taken of it with the 3D model made on the computer. My tests showed that the adult thought it was very realistic and that it looked almost identical to that of a real Ipod.

Finished to a high standard

I finished my model to a high standard by taking care and time to gently rub it down with wet and dry paper until it was extremely smooth. I confirmed there were no scratches or dents and I made sure that the acrylic fitted perfectly and flush with the model by chiselling out the excess car body filler. All the fine details contributed to a high quality block model. To test this, once again I took photos and gave the model to an adult who commented on its quality. The adult thought that it glassy green finish was of very high quality.

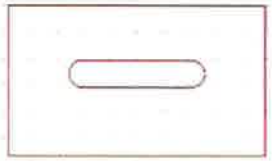


Made from the materials given

I made sure I only used the materials that were given to me. I tested this by checking over the materials given to me and made sure I had not used any other materials. I found that I had complied with the specification as I had only used the allocated materials.

Be completed in 15 hours

With the three weeks I had set out on my plan, and the 15 hour deadline, I made sure that I did not use more than the allotted time. I finished my ipod within the 15 hours and therefore I had followed the specification.



Evaluation continued

Third Party Testing

Jessica Rhodes: I think that the model looks very realistic as it has the real ipod menu display and the wheel has the correct buttons. It feels really smooth and flat, like the real metal/plastic ipod would feel. It has been made to a high standard as the curves are perfectly shaped and the acrylic parts sit flush with the model. I really like the small details of the HOLD button and the headphones engraved on the acrylic on the end profile.

Olivia Brown: I love the deep, rich green colour as I think that it looks very realistic. I also think it has an interesting metallic sheen. It is the correct size of an ipod and the connection parts are very realistic.

My Opinion

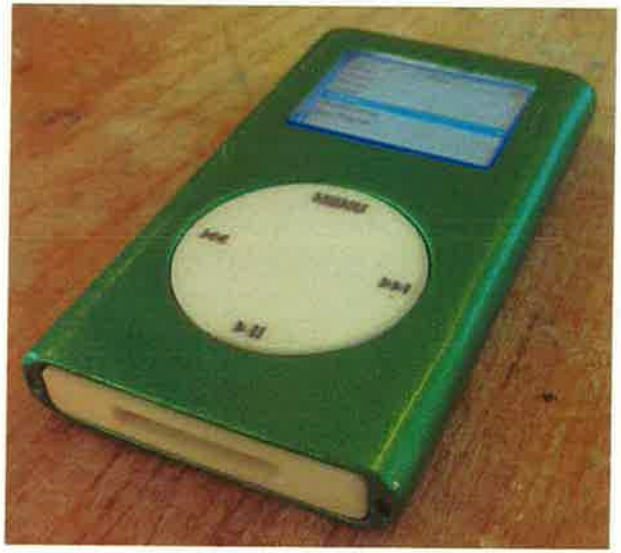
I am very happy at how my block model turned out. Although I had a few times when I found it difficult to achieve the smoothness that I wanted to make it realistic, in the end, it turned out extremely well.

I was not sure that I would get the ±1mm tolerance however, with thorough measurements and sanding, I managed to achieve the correct measurements and therefore, it complied with the specification.

By listening to the comments from the adults in the third party testing, and my photos taken, I feel that it has been very successful as the Ipod looks very realistic. I like the metallic, glassy green shine in contrast with the white acrylic for the wheel. I feel that the controls and writing like the MENU button in grey stands out really well against the white acrylic. By using the laser cutter to engrave the writing into the acrylic, it has improved the overall quality compared to what it would have looked like with stickers stuck on.

I am very pleased that it looks of high standard as it took a lot of time to achieve this quality, however with more time given in the specification, I feel that I could have achieved an even better standard.

Overall, I think my model was very successful as it fitted with all points in the specification, it was made to a high standard and it actually looks like an ipod which was the intention of the project.



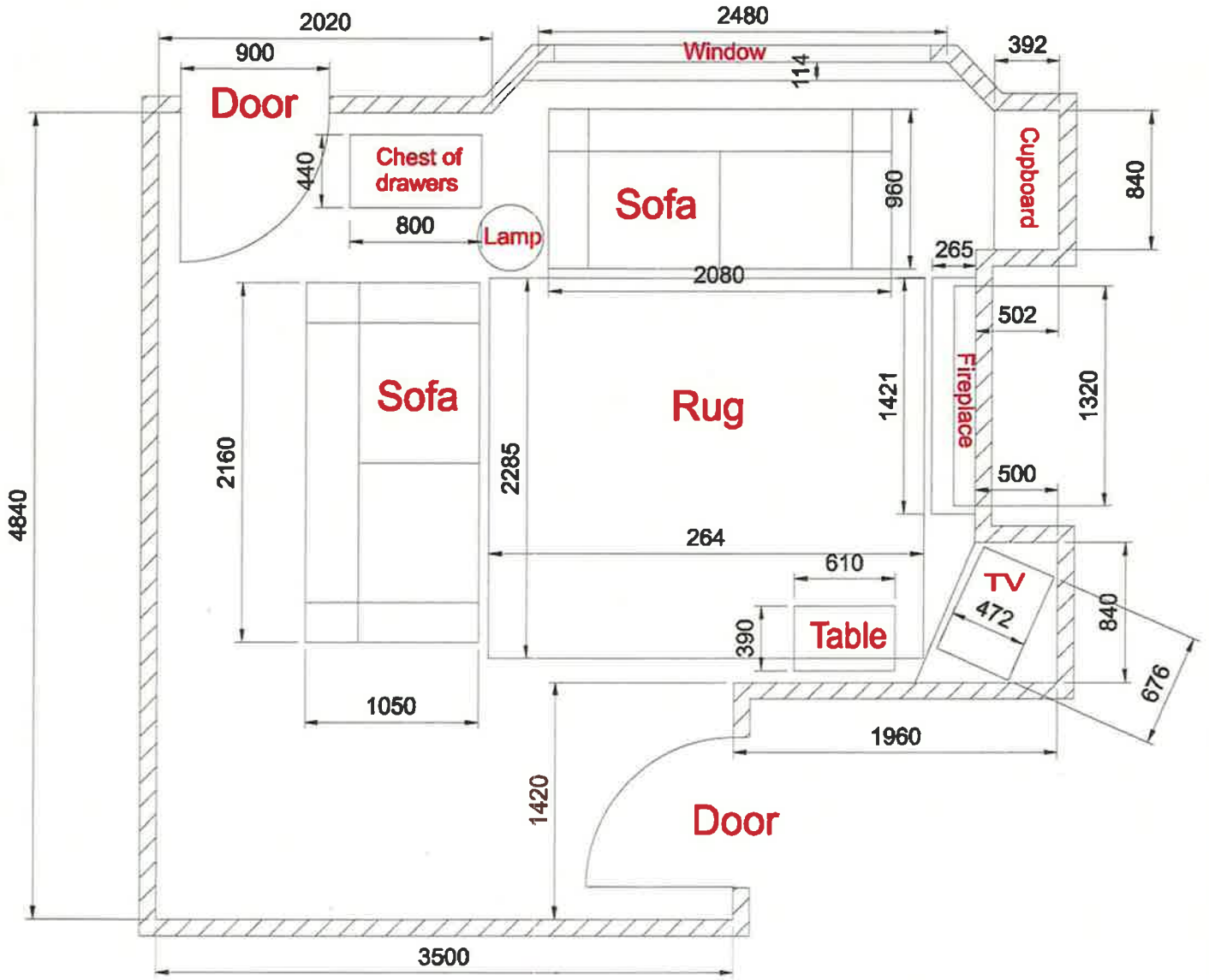
Task 2: Room Interior

Plan view of my room

Specification

Your model must:

- have a footprint of no larger than A3
- have 2 joining walls
- be as realistic as possible
- be completed by Thursday 2nd April
- use a range of materials and processes appropriate to the task



Pictures of my Room

More pictures of my room



















My Room

Justification

I used the pillar drill to drill holes in the four corners of the window. I then threaded the hegner saw through one of the holes and cut out the square window. I sanded it down with files and sand paper. I then cut out three pieces of MDF which I glued in with PVA glue. I used the laser cutter to cut out the square piece of acrylic. I then used 2D CAD to make the pattern of the lead window frames. I used the vinyl cutter to print out the design onto black stickers which I transferred onto the acrylic and stuck in the window.

I used brass wire for the curtain pole. I then sewed material onto it for the curtains and stuck it to the room.

I used 5mm thick MDF to make the cabinet. I used the hegner saw to cut it and the disc sander to flatten the edges. I then used the laser cutter and cut out the detailing on veneer.

I used jelutong for the fireplace and cut it out on the hegner saw. I then painted it white.

The TV was made out of jelutong which I sanded. I then cut clear acrylic out on the laser cutter.

The picture frames I cut out of veneer and painted. For the painting, I took a photo of the real paintings and scaled it down to print off and stick on with PVA glue.

For the doors, I used 5mm thick MDF and cut it out on the hegner saw. I then used veneer to make the panelling.

The door handle and light switch is made out of brass which I polished on a machine and cut to the correct size using sharp wire scissors. I glued them on with super glue.

To make the walls, I took 12mm MDF and cut out the required dimensions. To make the diagonal walls, I used a saw to cut the shape and then sanded them down on the disc sander. I then painted the walls the correct colours and stuck them individually to the base. After each wall had stuck and the PVA glue had dried, I used a small hand held drill to make holes on the back. I then hammered in nails to reinforce the PVA for extra strength.

I used the lathe to cut the brass pole and the aluminium base. I then made the screw pattern and fitted them together. I also used the lathe to shape the wooden lamp shade, drilling a hole in the bottom and hammering the two parts together. I sewed the material to make the lamp shade.

The light is made out of metal which I cut and shaped to the correct design. I used super glue to stick it together and orange plastic to show the lights.

The tiling on the floor is made from thin veneer. I individually cut out each tile using a craft knife. I then stuck them on with PVA glue and varnish the floor in a dark brown.

To make the chest of drawers, I cut up a block of MDF on the hegner saw and then used the disc sander to make a smooth edge. I used 2D design to draw out the detailing of the draws and laser cut the detailing out on veneer. I stuck it on with PVA glue and varnished it brown. I then took some brass wire and cut out the handles which I stuck on with super glue.

For the sofa, I used the hot wire cutter to cut out the shape of the sofa onto foam. I then stuck the foam together with PVA glue. I then cut out some material and stuck it onto sofa, hand stitching the edges. I then repeated the same for the cushions and the arm rests.

The pillows were printed off the computer onto transfer paper which I ironed onto some material. I then stuffed them with padding and hand stitched them together.

To make the rug, I took a picture of one corner and replicated it four times on the computer. I then printed it off onto transfer paper which I ironed onto some material. I then frayed the edges.

My Room

Justification

I used MDF for the walls as it comes in different thicknesses and can be finished to a good standard as it has no grain.

I used jelutong for the TV as it is easily shaped and can be finished to a high standard.

I used acrylic for the TV and the windows because it is clear and can be cut to the correct dimensions on the laser cutter.

I used brass for the door handle and the light switch because it was easy to cut to the correct shape and looked realistic. It could also be super glued to me model.

I used vinyl stickers for the window as I could get the correct sizes and it looks realistic.

I used a brass pole for the curtains as it was most realistic. I was able to get the correct thickness of the pole to then cut to the correct size.

I used transfer paper for the rug because I could then iron it onto material to make it look realistic.

I used a brass pole for the lamp as it was most realistic. I could then cut it on the lathe and make a thread for the aluminium base to be screwed to.

I used MDF for the doors and the chest of draws because it can be cut to the correct sizes on the hegner saw.

I used EPS foam for the sofas because it could be shaped very easily and then glued together.

I used veneer for the flooring because it comes only a few millimetres thin and I could cut it out the single tiles with a craft knife. I could then varnish it to a really high finish.

Making










I wore gloves for protection when painting and gluing the walls.












I wore a coat and goggles when sawing. I also had my hair tied up for safety precautions.



Hair tied back with goggles on when using the pillar drill.
My hands were away from the sander.


Clamped to hold the wood securely.

Making









When drilling, I put scrap wood underneath so not to damage the table.









When using the hegner saw, I wore goggles, a apron and had my hair tied back for safety precautions.



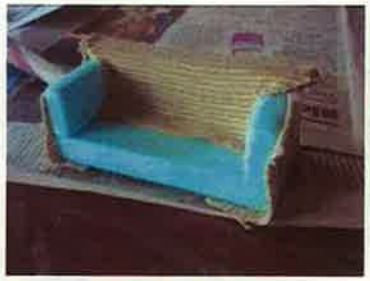



Making

When using the laser cutter, I always kept it attended for safety.

When using super glue, I had to quickly stick things together as it dries very fast. I also wore gloves so I didn't get any on my fingers.

Making


















I had to be careful when using the iron.

Making

















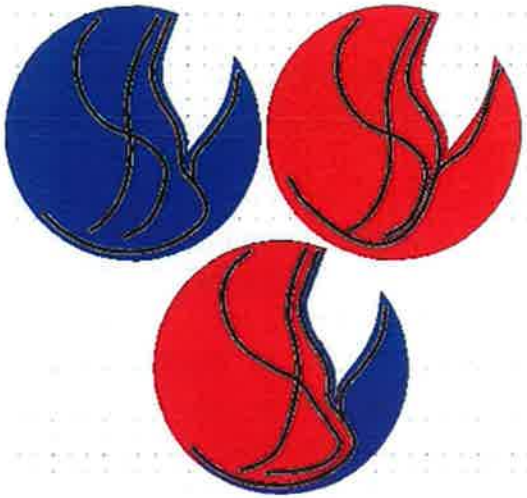


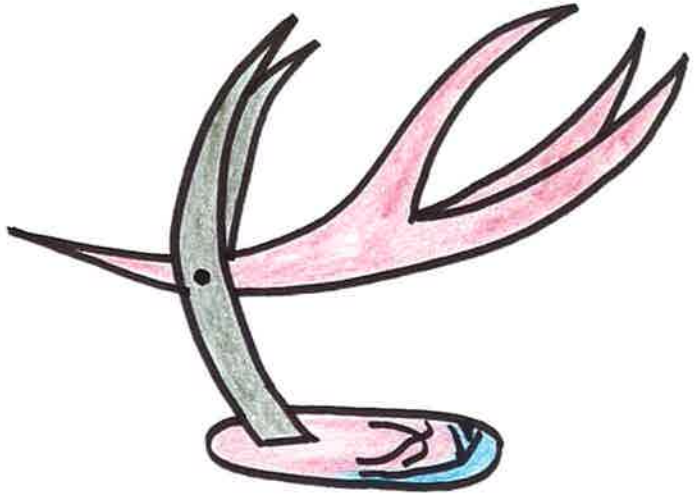


Making

Finished Room

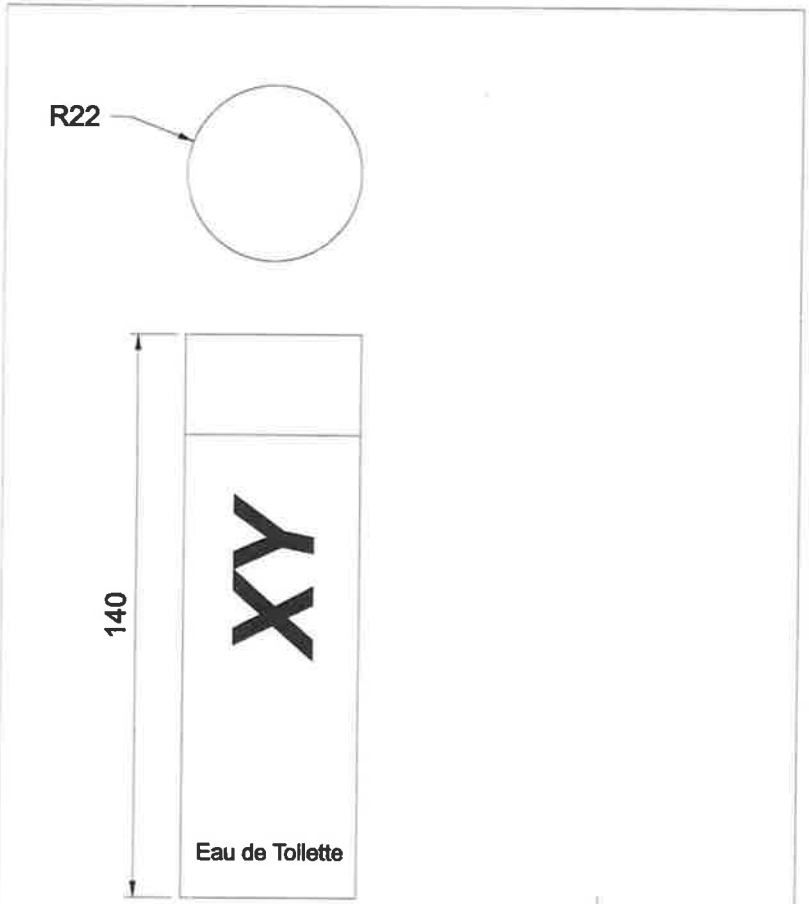
Task 3: Point of Sales Display





Specification

- must hold the bottle but allow it to be easily removed and replaced by customers as required
- be supplied as a flat pack and assembled at the shop without the use of tools
- when assembled, have a footprint of no larger than A5 and a height of 200mm
- be designed and have graphics which clearly reflect the XY brand name and unisex of the nature
- appeal to the 18-30 market segment
- be made using materials and processes suitable for batch production

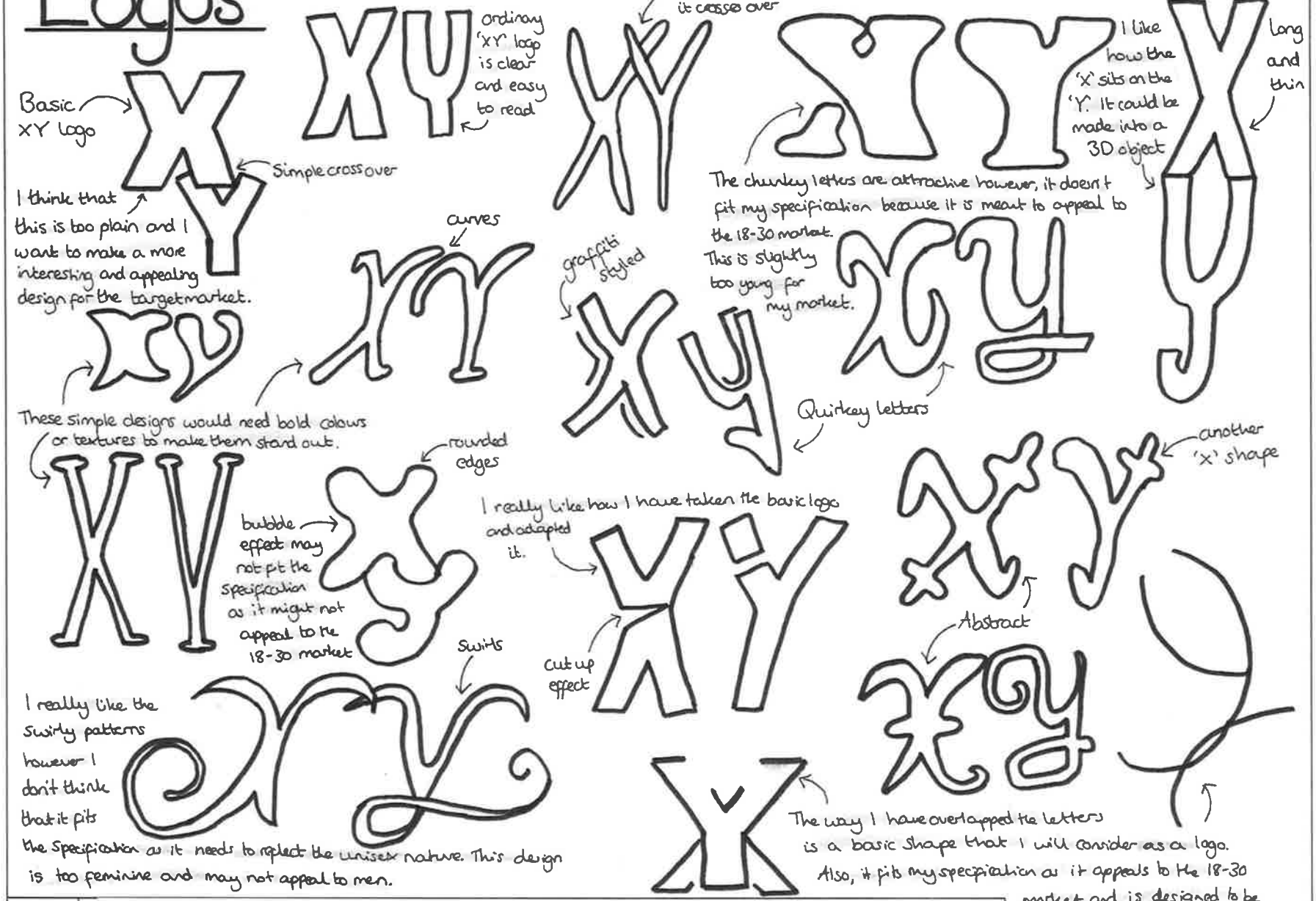


Scale 1:1

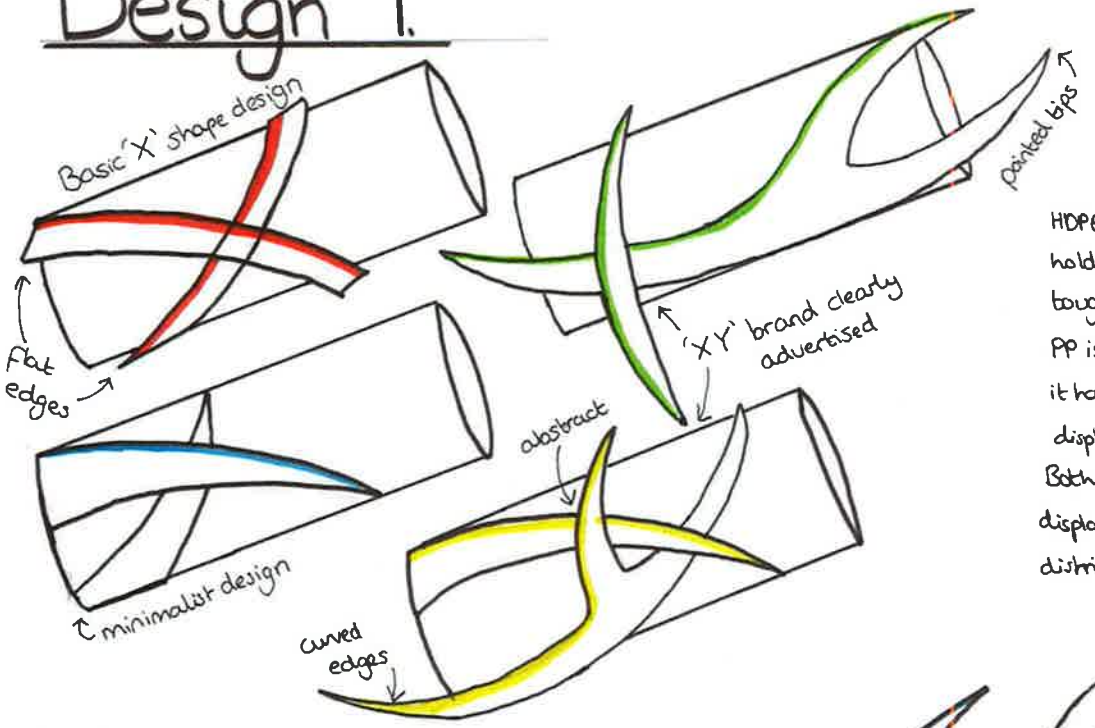
ALL DIMENSIONS IN MM

XY EAU DE TOILETTE BOTTLE

Logos


Basic XY logo
Simple cross over
I think that this is too plain and I want to make a more interesting and appealing design for the target market.
ordinary 'XY' logo is clear and easy to read
double 'X' effect where it crosses over
I like how the 'X' sits on the 'Y'. It could be made into a 3D object
Long and thin
The chunky letters are attractive however, it doesn't fit my specification because it is meant to appeal to the 18-30 market.
This is slightly too young for my market.
curves
graffiti styled
Quirkey letters
These simple designs would need bold colours or textures to make them stand out.
rounded edges
bubble effect may not fit the specification as it might not appeal to the 18-30 market
I really like how I have taken the basic logo and adapted it.
another 'X' shape
Abstract
cut up effect
Swirls
I really like the swirly patterns however I don't think that it fits the specification as it needs to reflect the unisex nature. This design is too feminine and may not appeal to men.
The way I have overlapped the letters is a basic shape that I will consider as a logo. Also, it fits my specification as it appeals to the 18-30 market and is designed to be unisex.

Design 1.



Materials

The 'XY' holding section could be made out of thermoplastics, either HDPE (high density polyethylene) or PP (polypropylene).

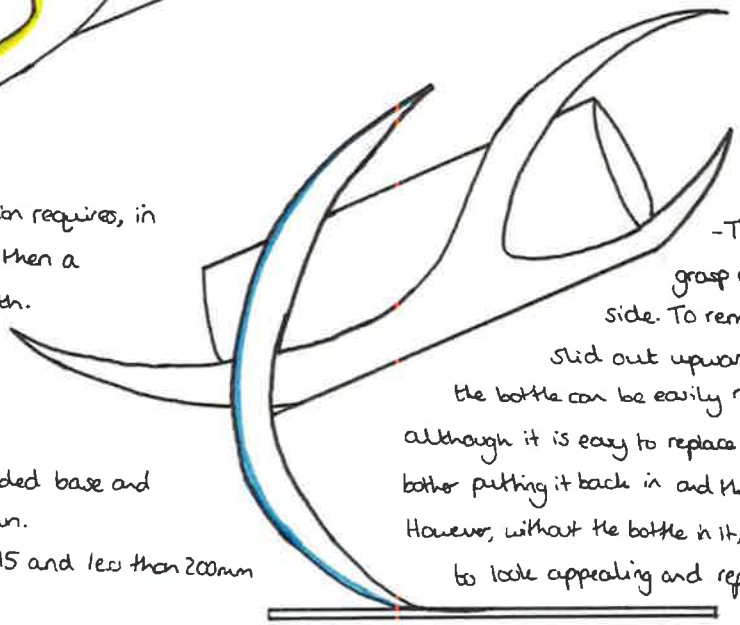
HDPE is rigid and strong which is good as it will be able to hold its shape and support the weight of the bottle. It is tough so it can withstand alot of handling.

PP is also rigid and can be stiffer than polyethylene. Furthermore it has a good impact resistance so it is ideal for a point of sales display as it won't break if it is dropped.

Both HDPE and PP are lightweight so transport costs of the display will be reduced as less fuel will be needed when distributing it around the country. This fits the specification as the point of sales unit has to be cheap because it is only used for a short length of time.

Assembly method

- The display arrives flat pack, as the specification requires, in three parts. The 'Y' part slots into the 'X' part and then a cylindrical pin is slotted in to add extra strength.
- This set up requires no tools, following the specification, and with simple instructions, can be put together by anyone.
- This frame 'XY' is now slotted into the rounded base and clicks into place. It now can stand up on its own.
- The total size of the display is no larger than A5 and less than 200mm in height so it fits the specification.



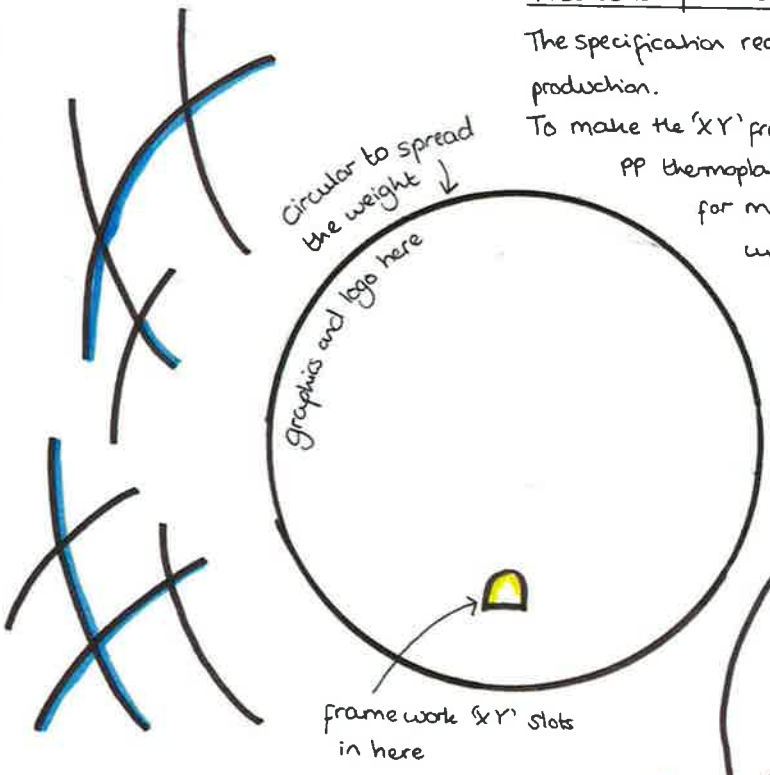
Holding method

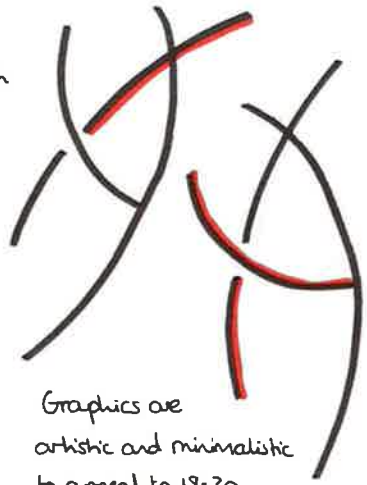
-The bottle rests safely within the grasp of the XY design, clasping it on either side. To remove the bottle, it is carefully slid out upwards. This meets the specification as the bottle can be easily removed and replaced. However, although it is easy to replace the bottle, some customers may not bother putting it back in and this is something I will have to consider. However, without the bottle in it, the display is artistically designed to look appealing and reflect the XY brand name.

Production process

The specification requires the display to be made through batch production.

To make the 'XY' frame which holds the bottle, the HDPE or PP thermoplastics can be injection moulded. This is ideal for mass production, giving a low cost per unit for high volumes. It can also production fine detailing as needed for the joining of the components of the display. The only negative is that it is a high start up cost to produce the mould but if large quantities are needed, it is a suitable process and fits the specification.





Graphics are artistic and minimalistic to appeal to 18-30 market and unisex → following the specification.

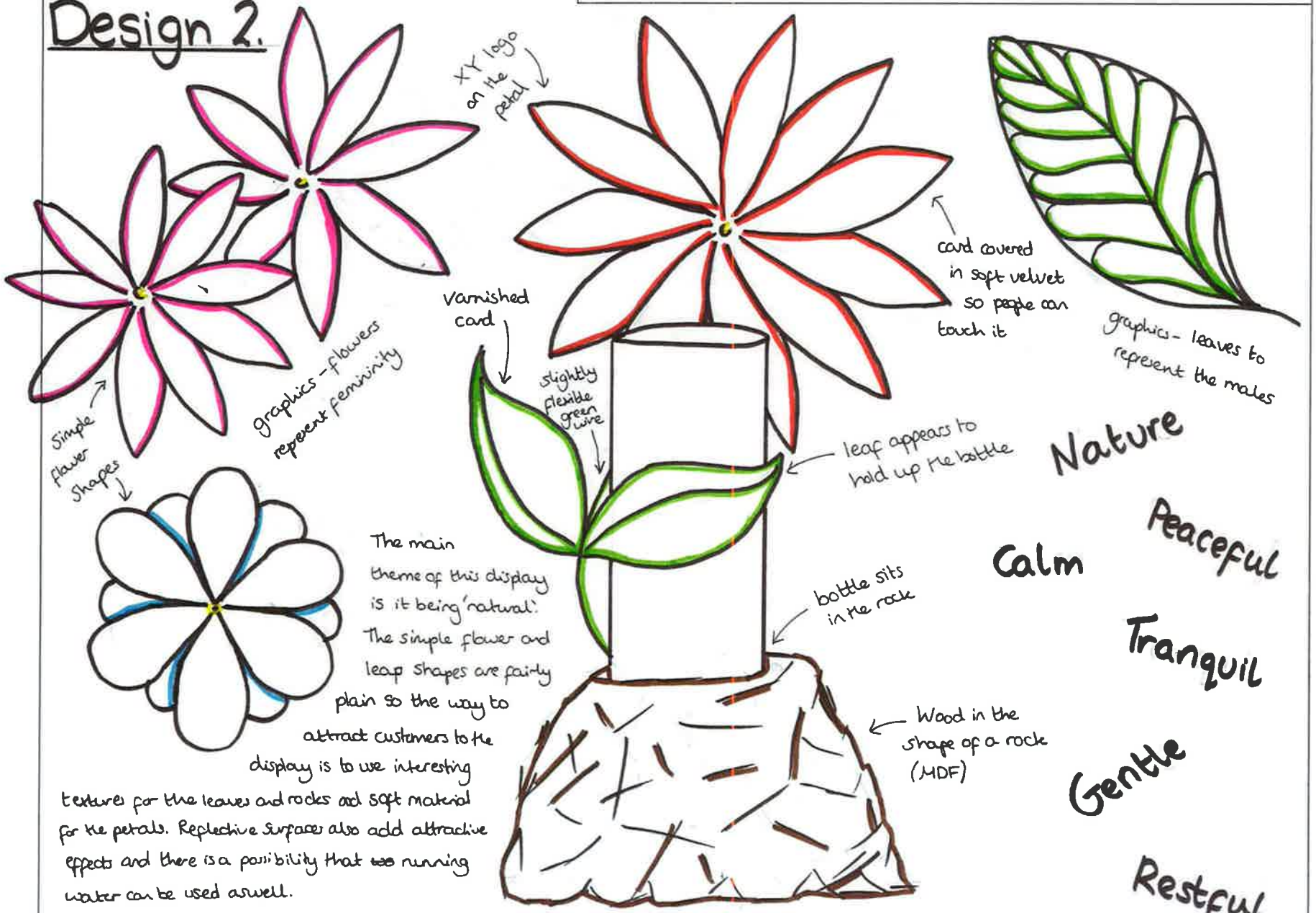
The base of the display has to be a heavy material to stop it falling over. It could be made from a dense metal / alloy or a thermoplastic which is weighted to make it heavier. The main graphics and logo will be on the circular base so either a label can be stuck onto it or card can be stuck to it.

Customer appeal

As the only graphics are on the base of the display, they need to be eye-catching to attract both male and female customers to the bottle. With the graphics printed onto a piece of card which is then stuck to the base, the process embossing can be used to create a 3D effect, raising some of the graphics off the card. This can then be finished with UV sparkle varnish which will be attractive to the customers. The effect of 3D and sparkle aims to draw people in and make them want to touch and feel the display, then to use the bottle.

For added effect, some of the printed graphics could use fragrance lost inks which would give off the scent of the XY perfume when people scratch it.

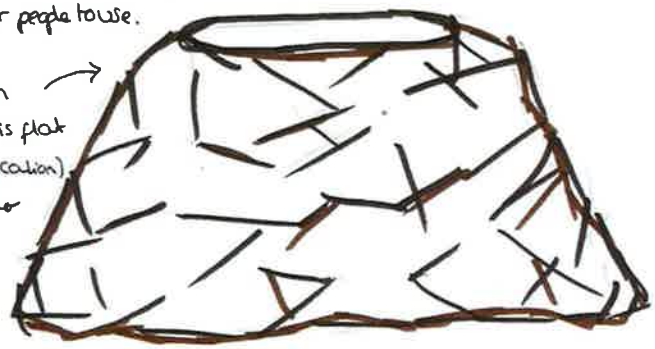
Design 2.



The main theme of this display is it being 'natural'. The simple flower and leaf shapes are fairly plain so the way to attract customers to the display is to use interesting textures for the leaves and rocks and soft material for the petals. Reflective surfaces also add attractive effects and there is a possibility that the running water can be used aswell.

Holding method

- The bottle sits in the rock. The fairly deep hole where the bottle is placed holds it upright. Because it is easy to place the bottle into this, it fits the specification and is ideal as it is simple for people to use.

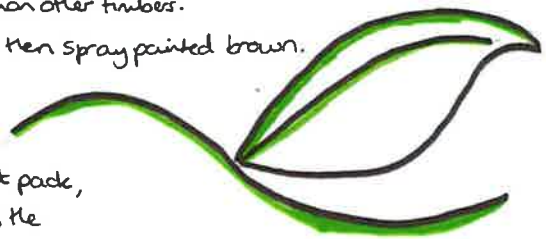


Either thin MDF so it is flat pack (specification) or use another material

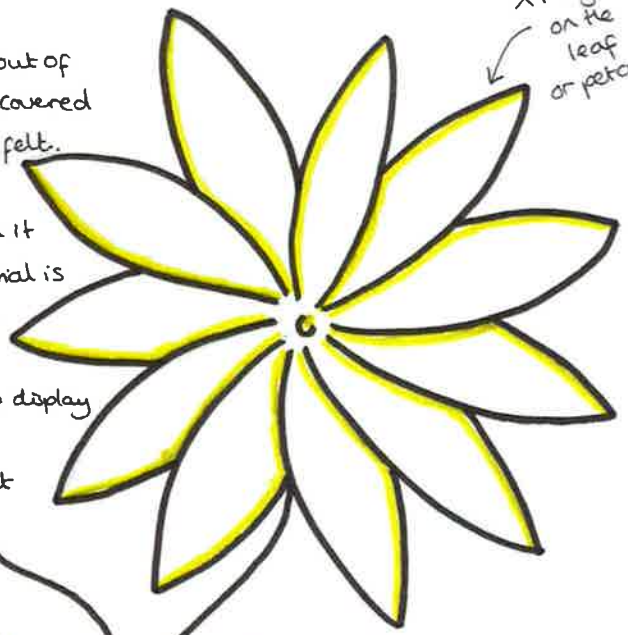
Material:
MDF is used to make the rock. It is easy to create fine detailing and is much cheaper than other timbers.
Process: MDF shaped then spray painted brown.

Assembly method

The flower comes flat pack, ready made as it fits the specification. It is then slotted into a hole behind the rock and cello tape for extra strength. This fits the specification as no tools are needed to assemble the display.



Material:
The petals are made out of card which has been covered in a soft material eg. felt. The card is to stiffen the material and hold it upright, while the material is to reproduce a soft feel of a petal and attract people to the point of sale display to touch the petals.
Process: The card is die cut on a machine and then the individual petals are stuck on.



Material:
Metal wire which is slightly flexible. Cut to the correct size on machine.

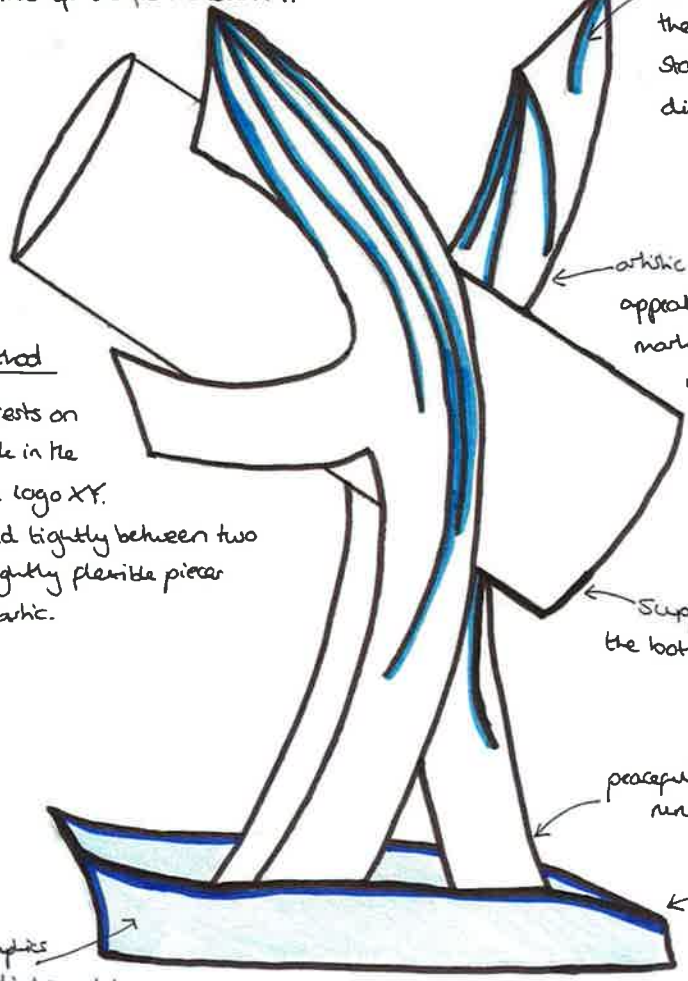
Material: The leaves are made out of card which has been printed onto. It is green with leaf markings. It is then varnished to give a glossy, shiny finish to reflect the oily shine of a real leaf. It will also be eye catching and attract people to the display.

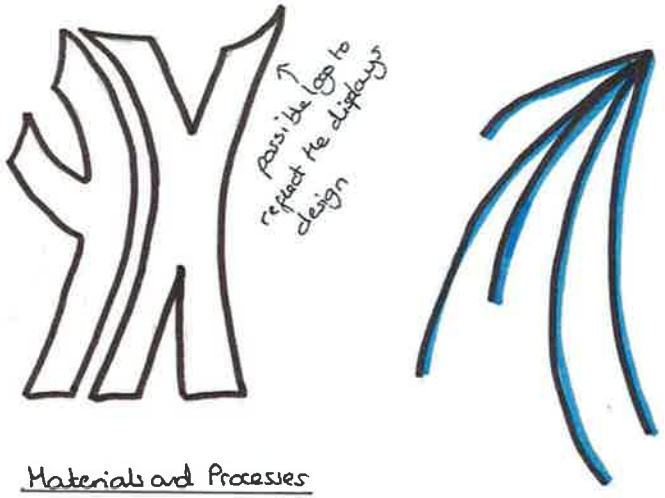
Process: The card is die cut, using offset lithography or flexography they are printed onto, then it is varnished using UV for quick production.

The concept of this point of sale display is natural growth and conveys the beauty of nature. However, although some men may be enticed, it may mainly appeal to women and therefore not fit the unisex specification. This is something I will have to consider when adapting designs. However it would appeal to the age 18-30 targets and follow the specification.
The size of the display is no bigger than A5 or 200mm tall and therefore fits the specification.

Design 3

This design is themed around water. The concept is that water can be pumped up through the design and trickle down the sides of the framework 'XY'.





Holding method

The bottle rests on a framework in the shape of the logo XY. It is clasped tightly between two firm but slightly flexible pieces of thermoplastic.

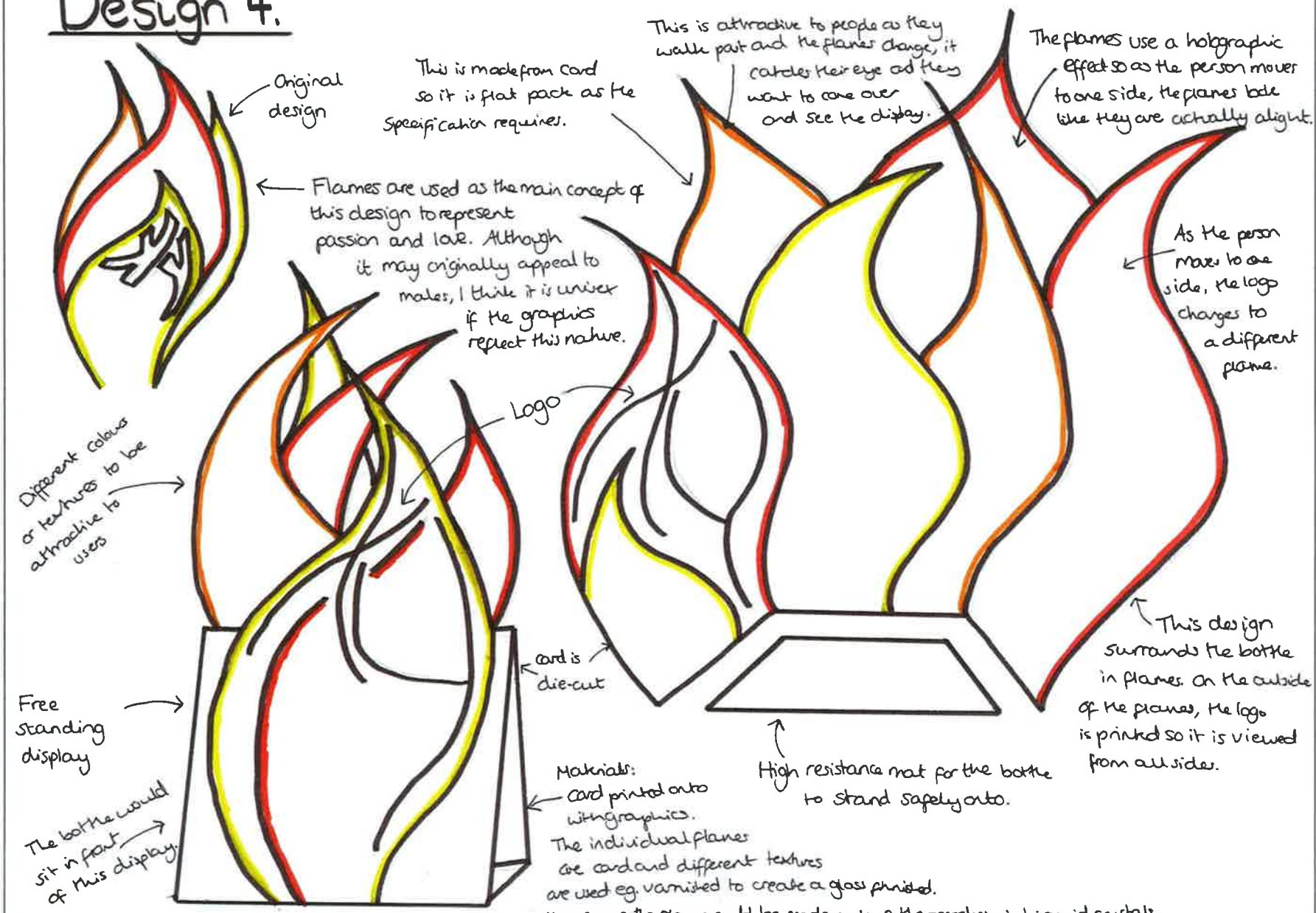
Materials and Processes

The holding method in the shape of the 'XY' logo could be made out of thermoplastic, either HDPE or PP. To create to detailed shapes and grooves as required, it would have to be manufactured by injection moulding. These materials are relatively cheap and lightweight to transport. Once the start up cost has been recovered, the cost of making it by injection moulding is cheap, therefore fitting with the specification to be a point of sale display, used for a short length of time.

Assembly method

The frame is slotted together with precut slots. The holding method sits in the bowl and the pump is connected to a plug. Water is filled in the bowl. A disadvantage of this display is that it uses electricity to run and costs quite a bit to make and run the pump.

Design 4.

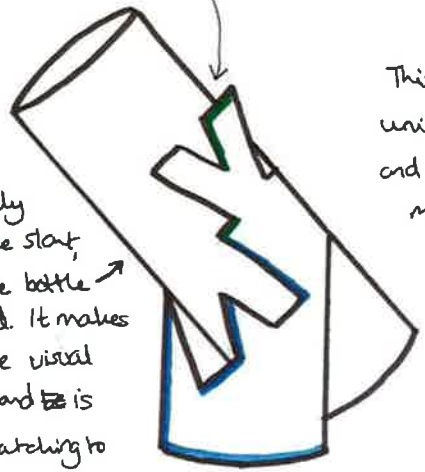

Original design
This is made from card so it is flat pack as the specification requires.
This is attractive to people as they walk past and the flames change, it catches their eye and they want to come over and see the display.
The flames use a holographic effect so as the person moves to one side, the flames look like they are actually alight.
Flames are used as the main concept of this design to represent passion and love. Although it may originally appeal to males, I think it is universal if the graphics reflect this nature.
As the person moves to one side, the logo changes to a different flame.
Logo
Different colours or textures to be attractive to users
Card is die-cut
This design surrounds the bottle in flames. On the outside of the flames, the logo is printed so it is viewed from all sides.
Free standing display
High resistance mat for the bottle to stand safely onto.
The bottle would sit in front of this display.
Materials:
Card printed onto with graphics.
The individual flames are card and different textures are used eg. varnished to create a gloss finish.
Also one of the flames could be made out of thermochromic liquid crystals.

Design 5.

Basic design which I will develope

card which has been die cut

To make the holding method stand out as an XY logo, the bottom of the Y has been filled in using hot foil blocking. This creates a metallic sheen, adding appeal and value to the display which will attract people to the bottle.



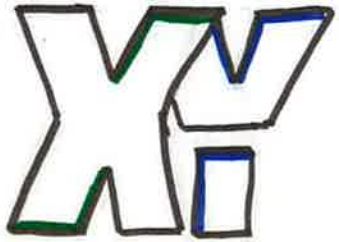
I really like the slant, how the bottle is held. It makes a more visual effect and is eye-catching to customers.

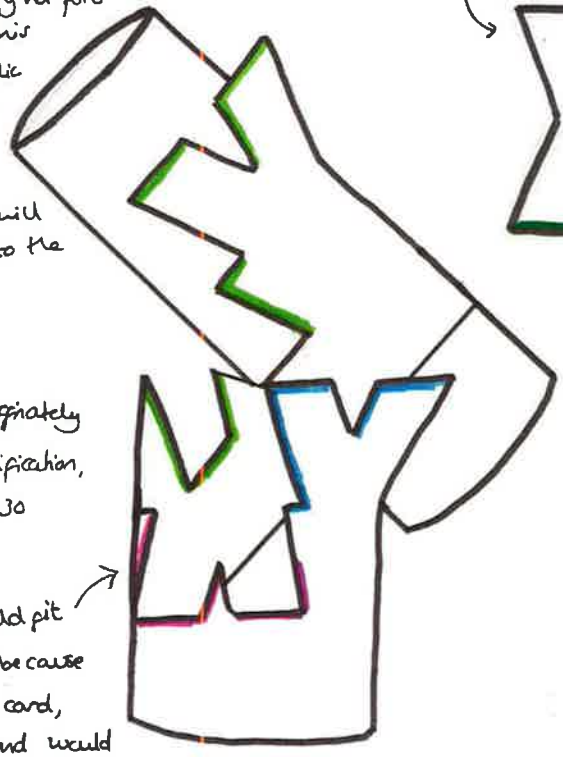
This simple pattern is definately unisex, following the specification, and would appeal to the 18-30 market.

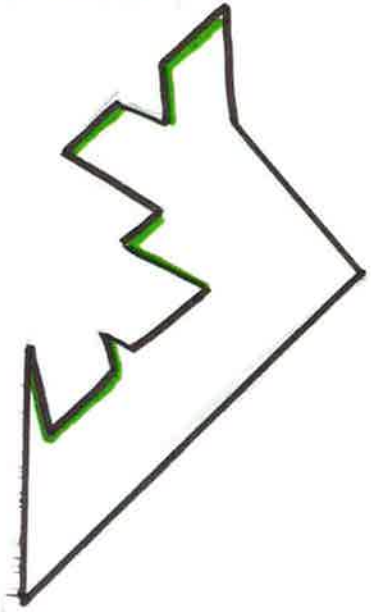
This design would fit the specification because it is made out of card, a cheap material, and would be supplied as a flat pack. Furthermore, it would need no tools to be assembled.

Basic XY pattern that I can use

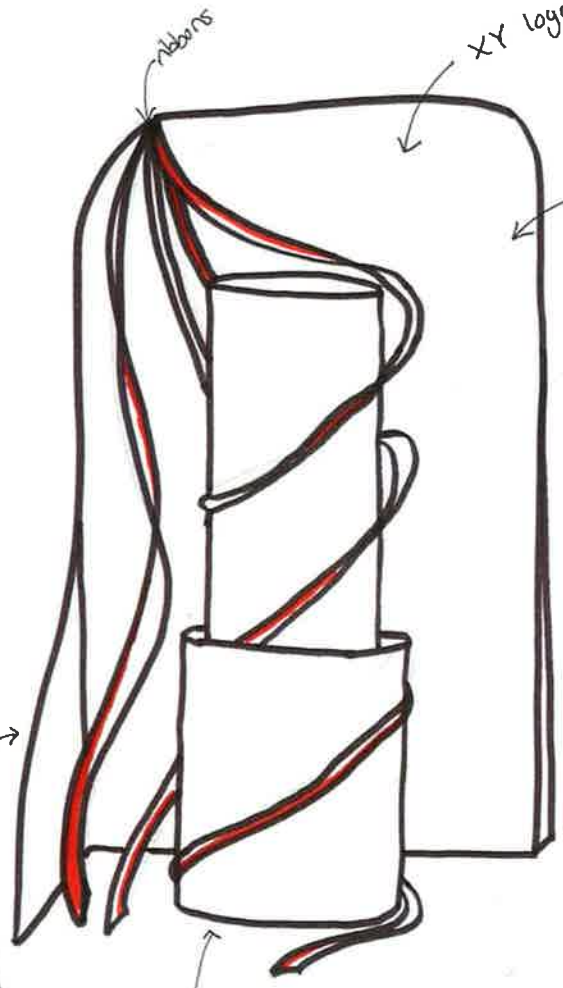
This logo reflects the design







Design 6.



The bottle sits in a holder, raising it off ground level so that it is eye-catching to the customer. It also follows the specification as it can be easily removed and replaced.

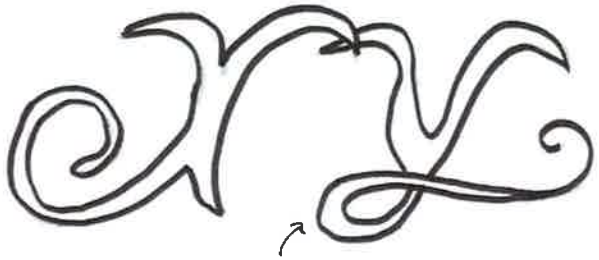
Materials

The display is made out of card which has had graphics printed onto it by offset lithography or flexography. It fits the specification as it arrives flat packed and can be assembled without the use of tools.

Processes

The card is printed onto and then it is die-cut.

I like the design, however, I think that it may not appeal to men and therefore not fit with the specification. Although, this depends on the graphics and colours used.



Evaluating My Designs

Scoring against the specification, 5 (the highest), 1(the lowest).

Specification	Design 1	Design 2	Design 3	Design 4	Design 5	Design 6
1. Must hold the bottle but allow it to be easily removed and replaced by customers as required	5	5	4	4	4	4
2. Be supplied as a flat pack and assembled at the shop without the use of tools	4	3	3	5	4	3
3. When assembled, have a footprint of no larger than A5 and a height of 200mm	4	4	4	5	4	4
4. Be designed and have the graphics which clearly reflect the XY brand name and unisex theme	5	3	4	3	4	2
5. Appeal to the 18-30 market segment	5	4	4	3	3	3
6. Be made using materials and processes suitable for batch production	5	3	3	4	4	4
Total	28	22	22	24	23	20

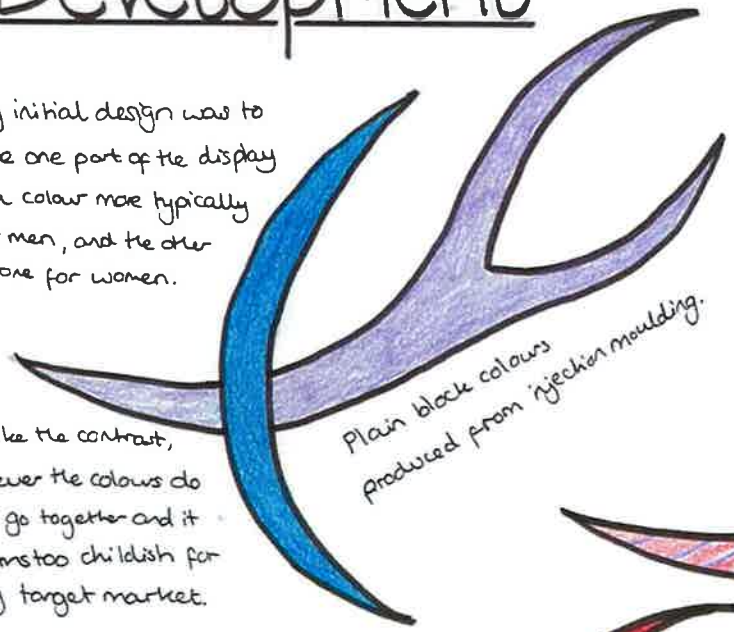
Overall, my design 1 scored the highest against the specification. Compared to the other designs, it scored the highest for specification points 4, 5 and 6. It clearly reflects the XY brand name as the whole display is design around the letters XY. It also the best for being aimed for the unisex and 28-30 market as it has an artistic, abstract design which would appeal to both genders. The materials used are easy to use and manufacture so would be suitable for batch production.

The only concern which I would have to look at is whether it can be supplied as a flat pack and be assembled without the use of tools. Also, I would have to adjust the size so that it has a footprint of no larger than A5 and a height no taller than 200mm. These things are not so much of a problem as when I develop the display, I will take them into consideration.

Therefore, I will develop **Design 1.**

Development

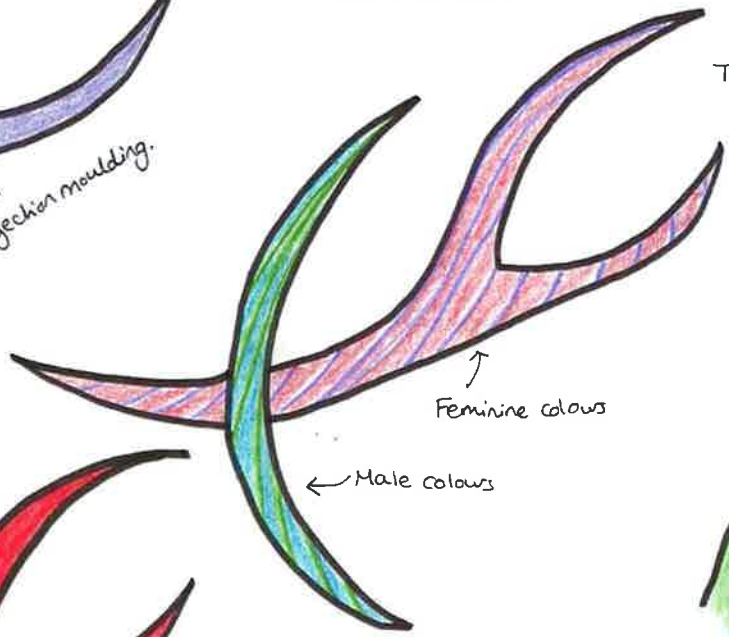
My initial design was to have one part of the display in a colour more typically for men, and the other in one for women.



Plain block colours produced from injection moulding.

I like the contrast, however the colours do not go together and it seems too childish for my target market.

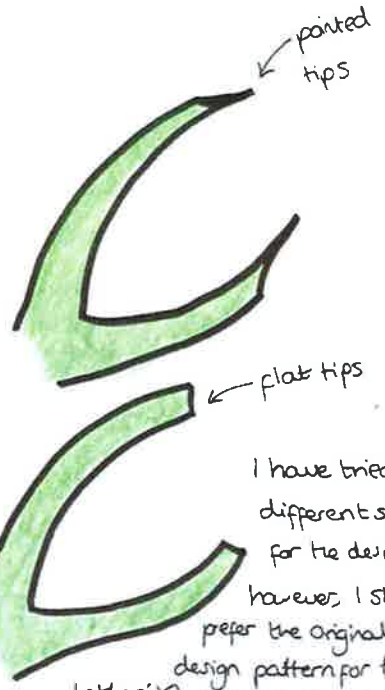
I tried to make each part a mixture of colours. This is done by stripes. I like how there is a variety of colours however I think there is too much.



Feminine colours

Male colours

The stripes would be very hard to produce when making it out of thermoplastics by injection moulding.

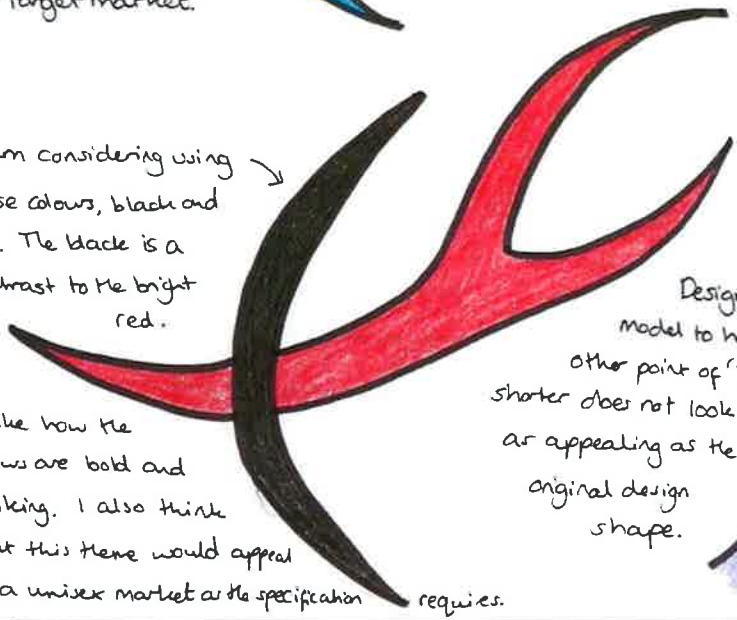


painted tips

flat tips

I have tried out different shapes for the design, however I still prefer the original design pattern for the letter 'r' and have decieded not to change this part.

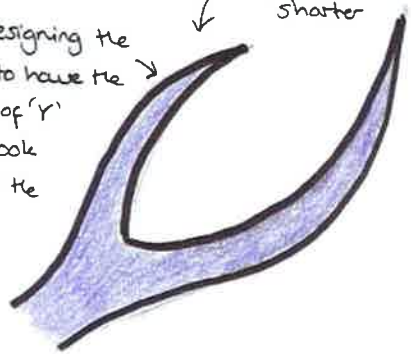
I am considering using these colours, black and red. The black is a contrast to the bright red.



I like how the colours are bold and striking. I also think that this theme would appeal to a unisex market as the specification requires.

Left arm shorter

Designing the model to have the other point of 'r' shorter does not look as appealing as the original design shape.



Development

The base

side view

My original design was for the base to be made either from thermoplastic or metal. It was also going to be flat.

This design is my favourite and I will consider using this.

plan view

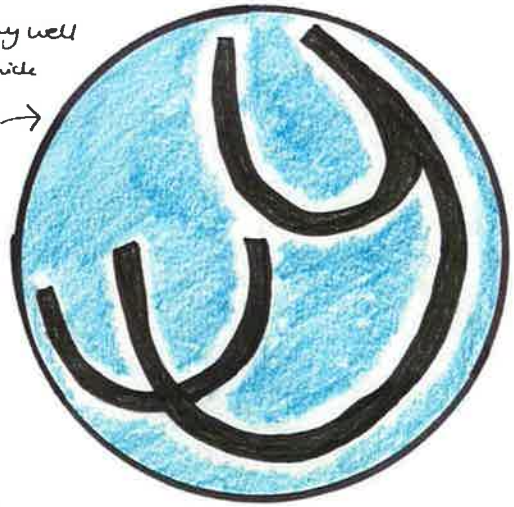
Having a thicker base would raise the display off the ground and make it more eye-catching.

circular

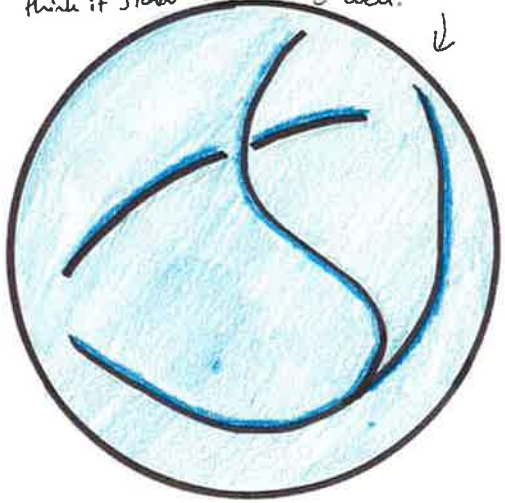
I like the sloping sides

I could consider using a square base, however, I think that it doesn't fit with the curves on the rest of the display. Therefore, I will not use a square base.

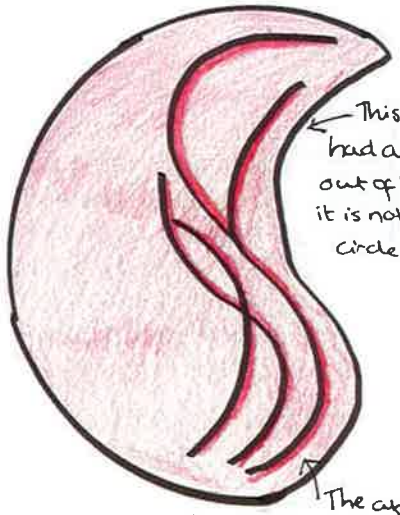
The 'XY' logo stands out really well on this base because of the thick letters in black. However, I may not use blue as I think it doesn't represent the under market.



I really like the abstract lettering on this design and with a paint background colour, I think it stands out really well.

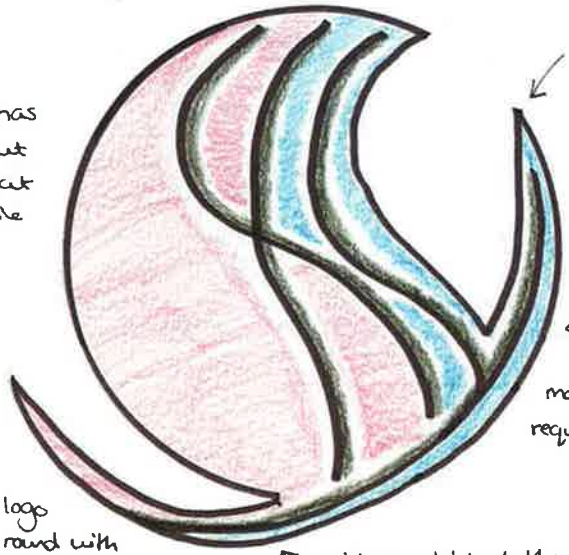


Development



This base has had a part cut out of it so that it is not a whole circle.

The abstract logo has been made to curve round with the shape for an artistic design.

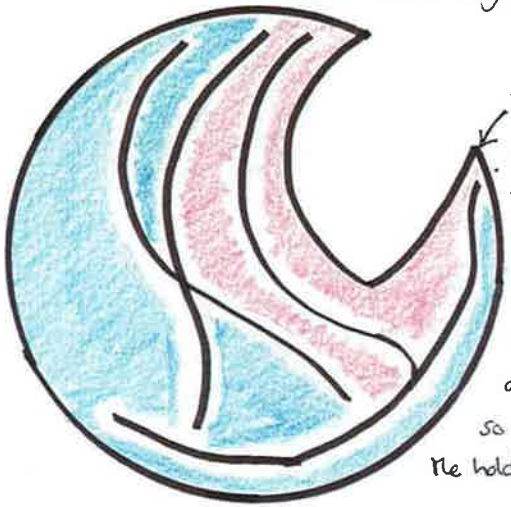


I really like the bold X Y logo. I have made it so that the circle is partially cut out where the 'Y' is to improve on the design.

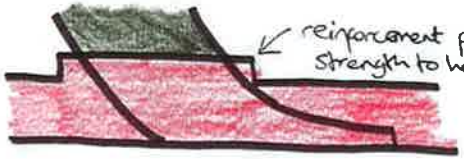
I like the contrast with the colours, representing male and female like the specification requires.

↑ Originally I liked this part of the design but now I think I won't use it.

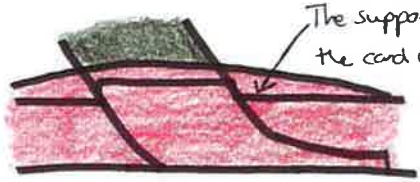
Original holding method where the foot is placed into a hole in the base.



This is the best design as it combines the cut out part for the Y but remains a circle. I would like to make the lettering more bold and also switch around the colour so that the majority is red to match the holding method.



reinforcement for strength to hold up the framework



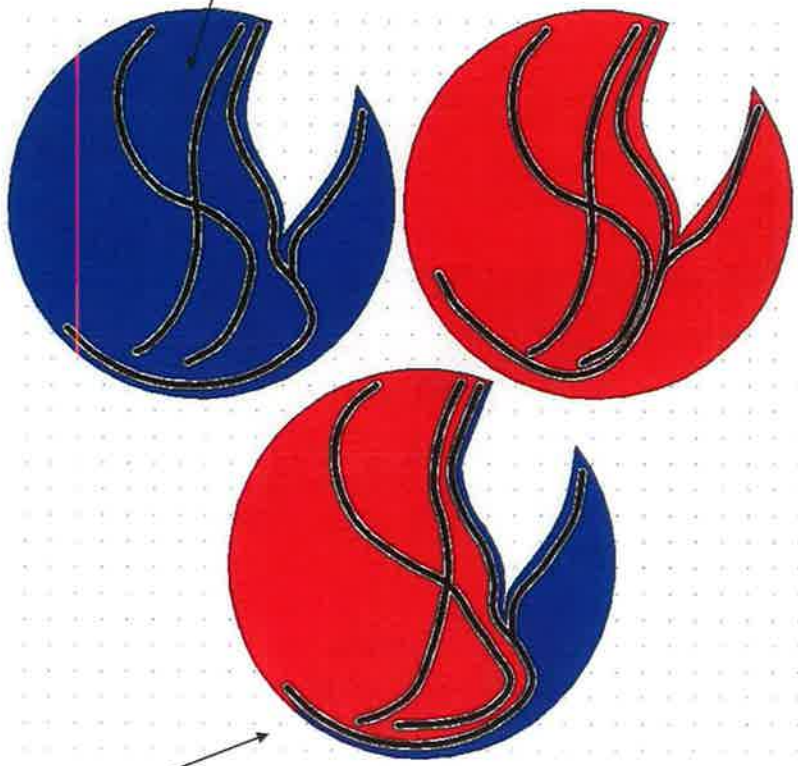
The support is hidden by the card with graphics to create a sleek, minimalist design.

Modelling

I produced this model to test my design. I made it out of cardboard which I sellotaped together.

I found that the design worked well and could stand up on its own. The only thing that I had to adjust was where the base connected to the frame, I had to add support. In my point of sales display, I should not have this problem as the frame will be made out of thermoplastic and can support its own weight, being light and flexible. However, if it did need support, this could be hidden by the curved card with the graphics on.

I used CAD (computer aided design) to model my graphics on the base of my design. I used it to test out colours and shapes.



I like the mix of red and blue as I think it would appeal to a unisex market. However, I would make the XY stand out more.

Modelling

Back and front view of my model.

The design is meant to be minimalistic and sleek so that it is relatively thin from side on so that only the bottle will be in view. However, once made from thermoplastic, the walls will be slightly thicker.

This is a view from the top of my model. From this angle, the design looks very abstract and it is only when it is viewed from front on that the XY theme can be seen. However, from above, the XY logo on the base and the graphics will be on display.

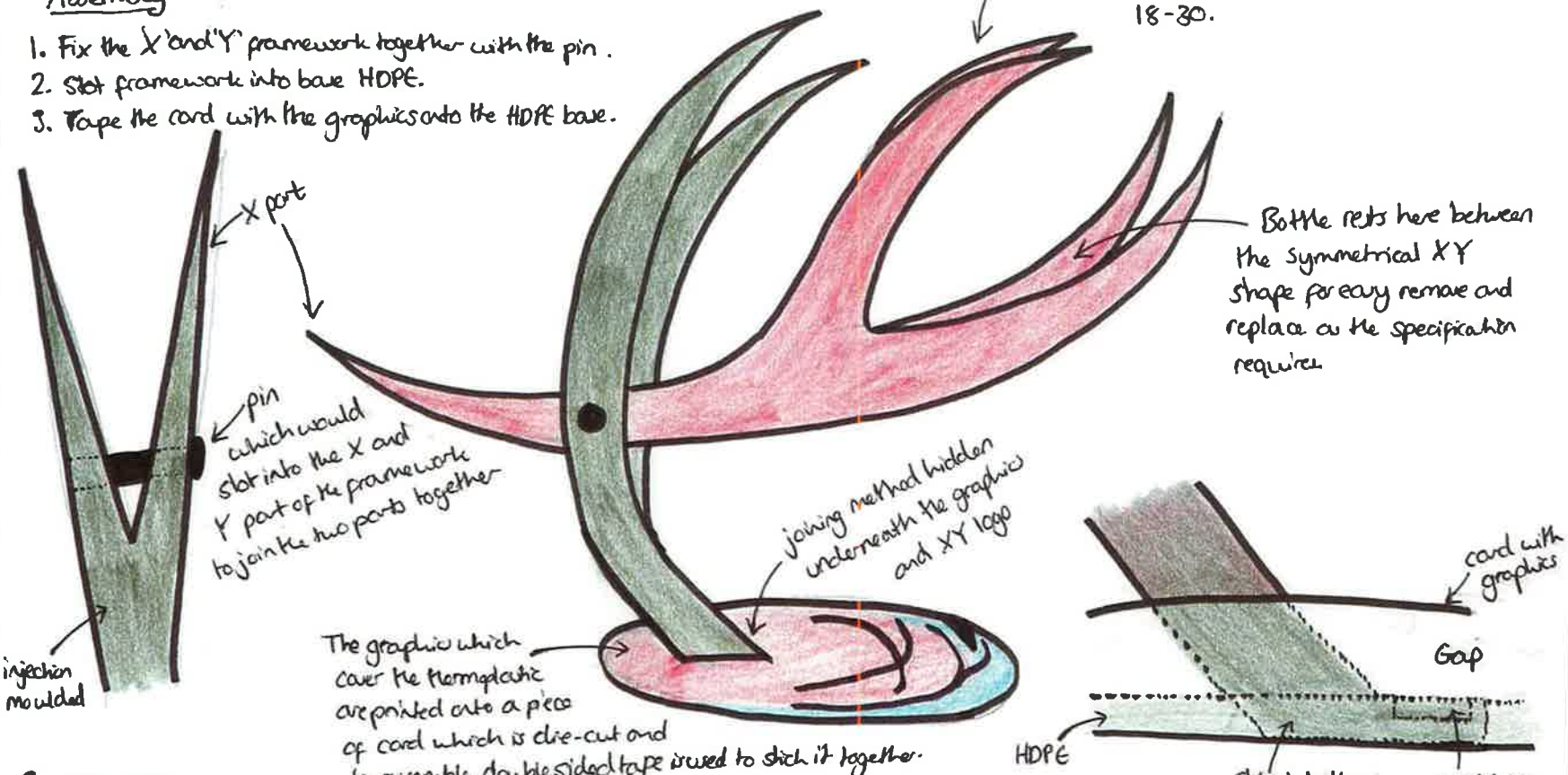
For my model, I did not make the actual shape for the framework to slot in as I made my model out of card. However, it did make me consider how much support would be needed to hold the structure up so therefore, I have changed my design so that there is some support, hidden under the card with graphics on, to hold up the structure.

Final Design

Artistic design which would appeal to a unisex market and the age range 18-30.

Assembly

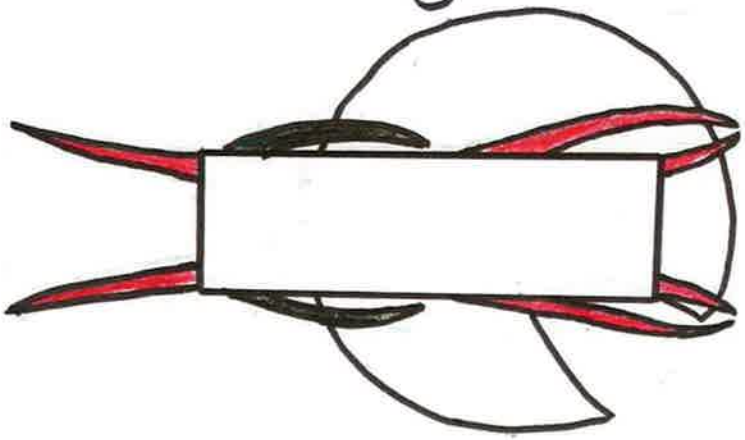
1. Fix the 'X' and 'Y' framework together with the pin.
2. Slot framework into base HDPE.
3. Tape the card with the graphics onto the HDPE base.



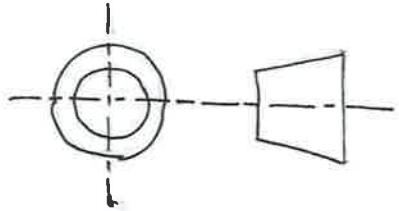
Specification

- bottle can be easily removed and replaced by customers – simple holding method
- supplied as a flat pack and can be assembled without the use of tools – slots together without the use of tools
- it has a footprint smaller than A5 and a height of 200mm – fits the required dimensions
- graphics reflect the XY brand and unisex nature – clear XY theme with use of colours and design for the unisex market
- appeals to the 18-30 market – artist, abstract design appealing to the target market
- can be batch produced – injection moulding and use of offset lithography with cardboard and HDPE is ideal for batch production.

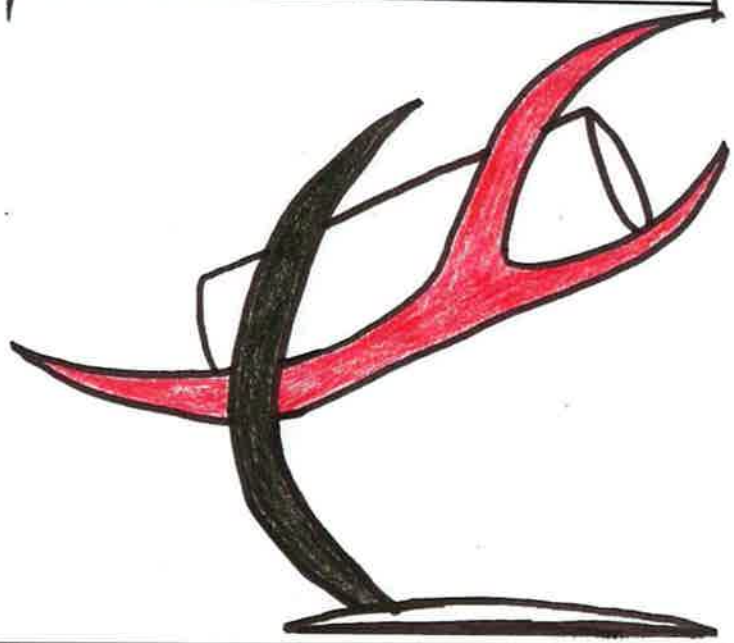
Final Design



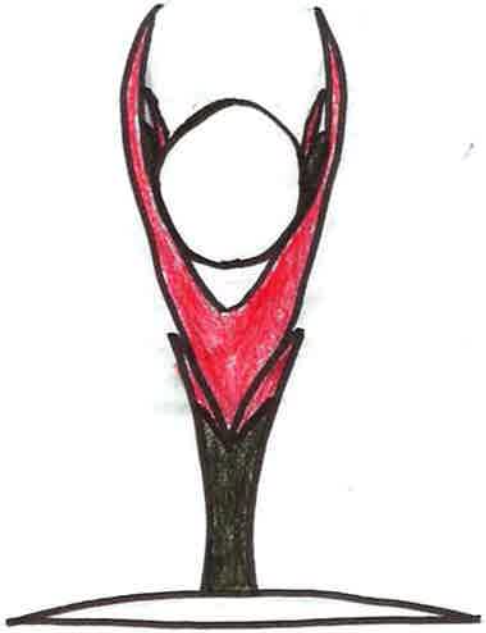
13cm



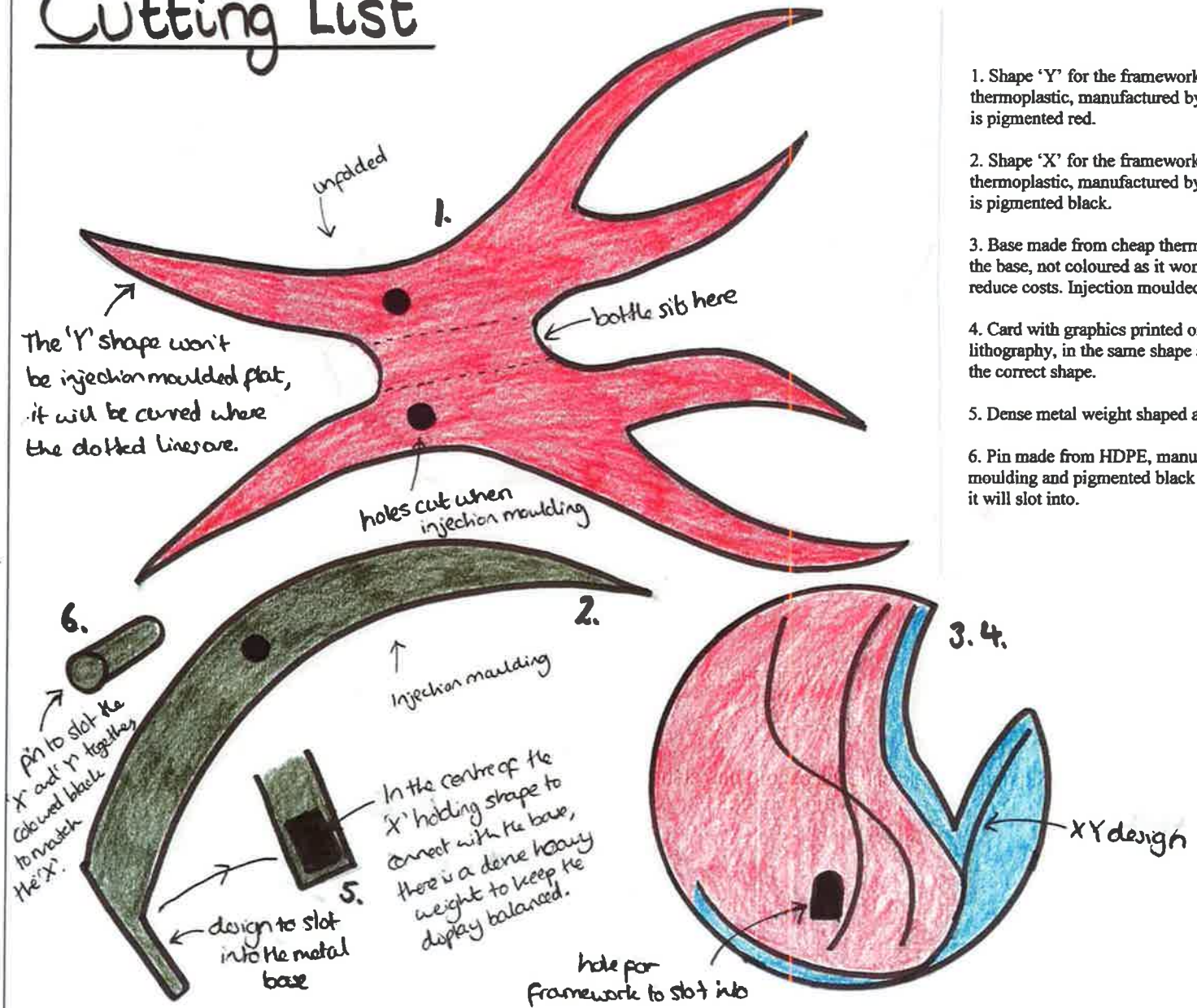
21cm



20cm



Cutting List



1. Shape 'Y' for the framework, using HDPE thermoplastic, manufactured by injection moulding. This is pigmented red.

2. Shape 'X' for the framework, using HDPE thermoplastic, manufactured by injection moulding. This is pigmented black.

3. Base made from cheap thermoplastic in the shape of the base, not coloured as it won't be on view and so to reduce costs. Injection moulded, radius 7.5cm.

4. Card with graphics printed onto it by offset lithography, in the same shape as the base. It is die-cut to the correct shape.

5. Dense metal weight shaped as a rectangle.

6. Pin made from HDPE, manufactured by injection moulding and pigmented black so to match the 'X' which it will slot into.

Evaluation

Overall, I am very happy with how my Point of Sales Display turned out. I like the design and think that it specifically suits the unisex market segment.

A positive aspects of my design is that it fits the minimalistic abstract design which I wanted to achieve. I like the design as it fits the specification and is appealing to look at.

To improve my design, I would have added some more artistic graphics to suit the target market. I would have also designed the holding method so that it would be easier to assemble as it needs a pin to join it together.

I would also consider using different materials as HDPE is more expensive than materials like card.

SPECIFICATION

• must hold the bottle but allow it to be easily removed and replaced by customers as required

I designed the display so that the bottle could be easily removed and replaced. The use of thermoplastic allowed me to create any shape and made it so that it would clasp the bottle when it is replaced. Because of its slight flexibility properties, the holding method can then be slightly opened to release the bottle.

• be supplied as a flat pack and assembled at the shop without the use of tools

The three components of the display can arrive as a flat pack to the shop. To assemble the display, the 'Y' section is gently bent into position and then attached to the 'X' part with the use of a pin to connect the parts through a ready cut hole.

• when assembled, have a footprint of no larger than A5 and a height of 200mm

The display has a footprint smaller than A5 and has a height below 200mm to fit the specification.

• be designed and have graphics which clearly reflect the XY brand name and unisex of the nature

The base of the display is covered with a piece of cardboard with the graphics of the XY logo printed onto it. The overall design has an artistic concept so to appeal to both men and women. I also uses colours which are not biased to either gender. I think the design works well as a unisex design as it has an abstract design which either men or women can find attractive.

• appeal to the 18-30 market segment

The display appeals to the 18-30 market segment as it is artistic and has a simple, modern but minimalistic design.

• be made using materials and processes suitable for batch production

The holding method is made out of thermoplastics by injection moulding. Once the initial cost is recovered, this is a cheap way of producing point of sales. It is also a process which is done under batch production.

The cardboard is die cut and printed onto by offset lithography which is also a batch production. The metal base can be produced in batch productions as well.

Task 4: Product Investigation

Performance Analysis

Specification

Function:

- The purpose of the soap dispenser is to deliver a controlled amount of hand wash to the user when the top is pressed.

Form:

- The dispenser is shaped as a rounded bottle so that it can be easily held.
- It has been designed to stand up on its own so that it can be placed on a counter without falling over.
- The top is shaped as a large rounded lever so that it can be easily pressed to dispense soap.
- The spout has been shaped to deliver a controlled amount of hand wash when the lever is pressed.

User Requirements:

- It should be lightweight so that it can be easily held and controlled when dispensing the hand wash.
- It should be simple and easy to use/dispense so that young children can also use it.
- It should have eye catching graphics so that it is appealing to the user.
- The plastic used is clear so that the colour hand wash can be seen and is appealing to the user.
- The bottle is not reusable so should be recyclable when the user wants to throw it away.

Performance Requirements:

- The lever should use a spring mechanism so that when it is pressed, it returns to its original position.
- The bottle should hold at least 250ml of hand wash.
- The bottle should be able to be printed onto or have a label stuck on which can have graphics printed onto it.
- The label used for the bottle must be waterproof so that it can within stand water over a long period of time.

Material and Component Requirements:

- The materials used should be light so that the bottle is easily transported.
- The materials should be readily available and relatively cheap so that production costs can be minimised.
- The materials and components used must be tough and long lasting so that they can withstand use over a fairly long time.
- The materials used for the bottle must be capable of being formed into complex shapes quickly, so that the production time of each bottle is short.
- The bottle should be made out of recyclable materials so that it is good for the environment.
- The plastic should be clear so that the user can see how much hand wash is still left in it.

Scale of Production and Cost

- The bottle will be designed to be batch produced in relatively high numbers rather than mass produced, as the design may need change quickly to accommodate market trends.
- The design must be simple enough to be produced using fast automated processes, so that costs to users can be kept as low as possible.
- The cost of the bottle in this analysis is £1.50-£24

Comparison with a Similar Product

Function:

- The purpose of the soap dispenser is to deliver a controlled amount of hand wash to the user when the lever is pressed.

Form:

- The product is shaped as a large rounded plastic dispenser so that it stands out and can be used by all ages.
- It can be fitted to the wall so that it can't spill or fall over.
- It has been designed to also appealing in its design to the user. My product has a simpler and more of a commercial design because it is designed to be used in public toilets.
- The lever is on the bottom of the product so that it can be easily pressed to dispense soap.
- The front of the product has clear plastic so that the user can see how much hand wash is in it.

User Requirements:

- It has a large lever so that it should be simple and easy to use/dispense so that young children can also use it.
- It should have a simple and modern design so that it is attractive to users.
- It should have a lever so that a controlled amount of hand wash can be dispensed.
- The dispenser should be refillable so it can be used over a long period of time.

Performance Requirements:

- The lever should use a spring mechanism so that when it is pressed, it returns to its original position.
- The product should hold at least 500ml of hand wash.
- The dispenser should be able to have graphics printed onto it or stuck to it so it is attractive to the users.
- The label used for the bottle must be waterproof so that it can within stand water over a long period of time.

Material and Component Requirements:

- The materials should be readily available and relatively cheap so that production costs can be minimised.
- The materials and components used must be very tough and long lasting so that they can withstand use over a very long time. This product is meant to last a much longer time than my product as it is going to be used by a lot of people.
- The materials used for the bottle must be capable of being formed into complex shapes fairly quickly, so that the production time of each bottle is as quick as possible.

Scale of Production and Cost

- The dispenser will be designed to be batch produced in relatively high numbers rather than mass produced, as the design may need change quickly to accommodate market trends.
- The design must be simple enough to be produced using fast automated processes, so that costs to users can be kept as low as possible.
- The cost of the bottle in this analysis is £8-34

Materials and Components

Bottle

The material used in manufacturing the bottle is Polyethylene terephthalate (PET). This material has properties that make it suitable for this product such as:

- Lightweight – having a low density it saves energy as packaging requires less fuel to manufacture and transport than compared with other materials.
- Cost-effective - economic as it can be produced in custom-made forms when blow moulding.
- Transparent - customer can see into the product.
- Durable - lasts a long time after a lot of handling.
- Good impact resistance – shatterproof so it can't break if user drops it.
- Good resistance to chemicals – when user washes their hands, it will come into contact with chemicals which may reduced the quality or properties of the bottle if it wasn't resistant to chemicals.
- Can be pigmented and is available in a range of colours – attractive to users and a range of different designs can be produced to appeal to the customers.
- Very tough.
- Good flow characteristics - suitable for blow moulding.
- Low water absorption – plastic bottle will come into contact with water so being water resistance is good.

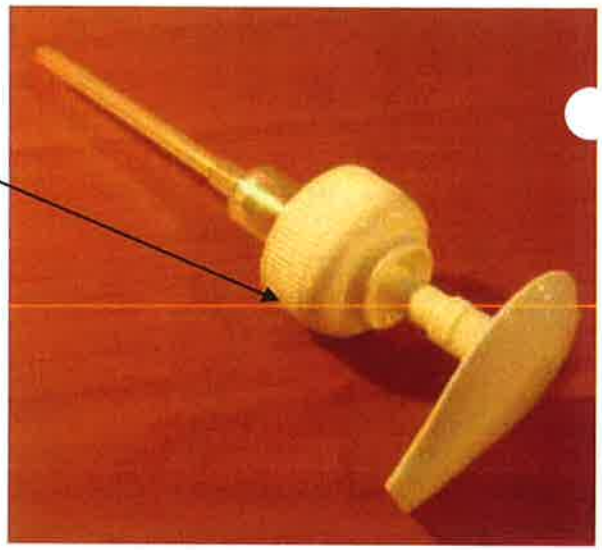
A suitable alternative material for the body could have been Low density polyethylene (LDPE), which has the following properties:

- Flexible – easy to bend and transform its shape if the bottle needs to be squeezed.
- Soft plastic – can be easily shaped and squeezed if used in a bottle.
- Good chemical resistance – the plastic will come into contact with chemicals so good to have a resistance.
- Tough and hard wearing.
- Low water absorption – plastic bottle will come into contact with water so being water resistance is good.
- Cost-effective - economic as it can be produced in custom-made forms when blow moulding.
- Transparent – customer can see into the product.

When comparing PET and LDPE for use in manufacturing the plastic bottle, PET is the preferred choice for the following reasons:

- Although both plastics are tough and shatterproof, PET is still a lot stronger than LDPE and therefore is a better material to use when producing the bottle through blow moulding. PET will be stronger and stand a higher pressure without shattering or cracking.
- PET is preferable for this product compared with LDPE because it is more rigid and less flexible. Although being slightly flexible is a good quality for a bottle, when the bottle is constantly pressed to dispense the hand wash, it needs to be strong to withstand this impact over a long time and hold its shape.
- PET is more cost effective because LDPE is more flexible plastic, thicker walls for the bottle would be needed to withstand the impact and therefore, the cost to use LDPE with the thicker walls would be greater than the thinner but still tough walls of the PET.
- Both are resistant to chemicals however, PET is more resistant and will therefore be less corrosive and withstand a long time being used.

Bottle top



The material used in manufacturing the bottle top is Polypropylene (PP). This material has properties that make it suitable for this product such as:

- Lightweight - saving energy as packaging requires less fuel to manufacture and transport than other materials.
- Very tough- the plastic has to be very strong so it can withstand the impact of being pushed down over a long period of time.
- Cost-effective - economic as it can be produced in custom-made forms when injection moulding. Thousands of these bottle tops can be produced in a batch very quickly.
- Durable - lasts a long time after a lot of handling.
- Good impact resistance – shatterproof so it can't break if user drops it.
- Good resistance to chemicals – when user washes their hands, it will come into contact with chemicals which may reduce the quality or properties of the bottle if it wasn't resistant to chemicals.
- Can be pigmented and is available in a range of colours – attractive to users and a range of different designs can be produced to appeal to the customers.
- Good flow characteristics - suitable for injection moulding.
- Low water absorption – plastic bottle will come into contact with water so being water resistance is good.

A suitable alternative material for the body could have been High density poly(ethene) (HDPE), which has the following properties:

- Flexible – easy to bend and transform its shape if the bottle needs to be squeezed.
- Lightweight - saving energy as packaging requires less fuel to manufacture and transport than other materials.
- Soft plastic – can be easily shaped and squeezed if used in a bottle.
- Good chemical resistance – the plastic will come into contact with chemicals so good to have a resistance.

- Low water absorption – plastic bottle will come into contact with water so being water resistance is good.
- Cost-effective - economic as it can be produced in custom-made forms when blow moulding.
- Transparent – customer can see into the product.

When comparing PP and HDPE for use in manufacturing the plastic bottle top, PP is the preferred choice for the following reasons:

- Although both PP and HDPE are resistant to chemicals, PP is has a greater resistance which is good for the bottle lid as it will come into contact with different chemicals when the customer uses it.
- Both PP and HDPE are tough, rigid plastics however, some forms of PP are much more stiffer than polyethylene. This is preferable for the bottle lid as it has to be hard wearing and last a long time with the force acting on it.

Environmental Considerations

The extraction and production of the raw materials used in the bottle impact on the environment in the following ways:

- Plastics are usually produced from fossil fuels, which are gradually becoming depleted.
- The plastics production process involves energy consumption which is bad for the environment as it uses more fossil fuels for produce the energy.
- During production, emissions are output affecting water, air and soil – heavy metals, chlorofluorocarbons, hydrocarbons sulphur oxides and dust are typical.
- When producing plastics, CFCs and other harmful gases are produced, depleting the ozone layer.
- Carcinogens, smog and acid rain are caused when producing the plastics. Carcinogens cause cancer, smog is bad for the environment and acid rain destroys the environment and buildings.
- Polymers derived from hydrocarbons required energy to extract and purify them.

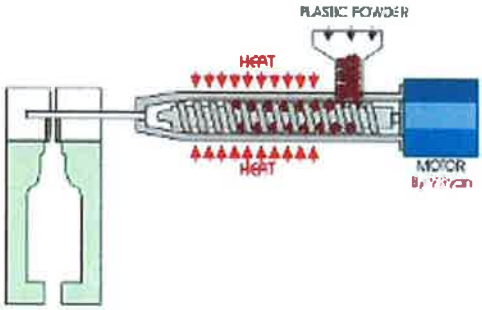
However, most thermoplastics can be re melted and reshaped and PET is relatively easy to recycle.

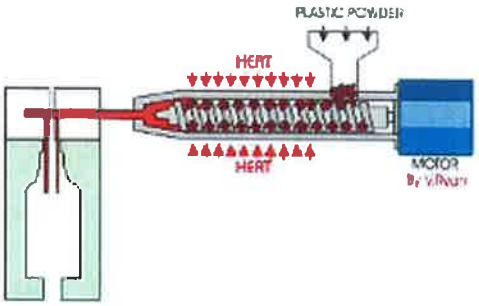
Manufacture

The bottle

The production process for the bottle is *Blow Moulding.*

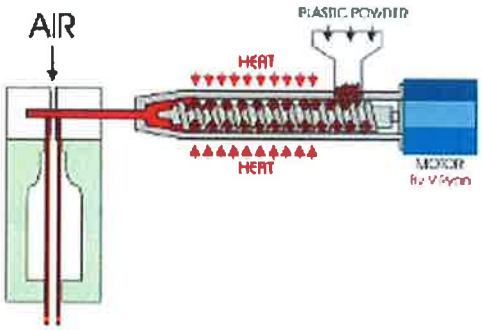
The Process

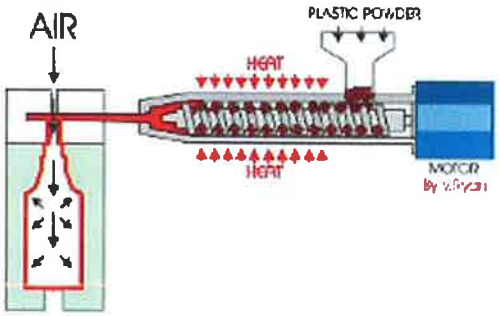




1. The plastic is fed in granular form into a 'hopper' that stores it.

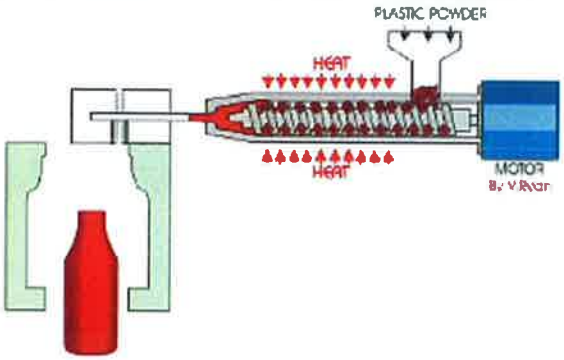
2. A large thread is turned by a motor which feeds the granules through a heated section.





3. In this heated section the granules melt and become a liquid and the liquid is fed into a mould.

4. Air is forced into the mould which forces the plastic to the sides, giving the shape of the bottle.



5. The mould is then cooled and is removed.

The advantages of Blow moulding are:

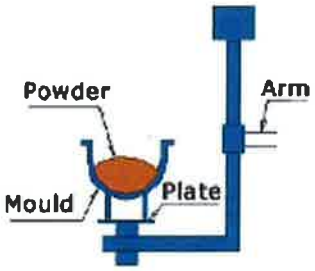
- It can produce hollow shapes with thin walls to reduce weight and material cost.
- Almost all thermoplastics can be blow moulded.
- Cycle times are low so production cost is low.
- Many bottles can be made from the same single mould – continuous production as millions of parts per year can be produced.
- Rejected bottles can be recycled and reused so no waste is produced – good for the environment.
- As the plastic is pigmented, little finishing is required saving production time and costs.
- Can produce threads for the top of the bottle.

- Surface decorations and designs can be added to the mould to make the bottle attractive to the customer.
- Machines are usually automated, so are cheap to run.
- Cost per bottle is cheap once the cost for the expensive mould has been recovered.

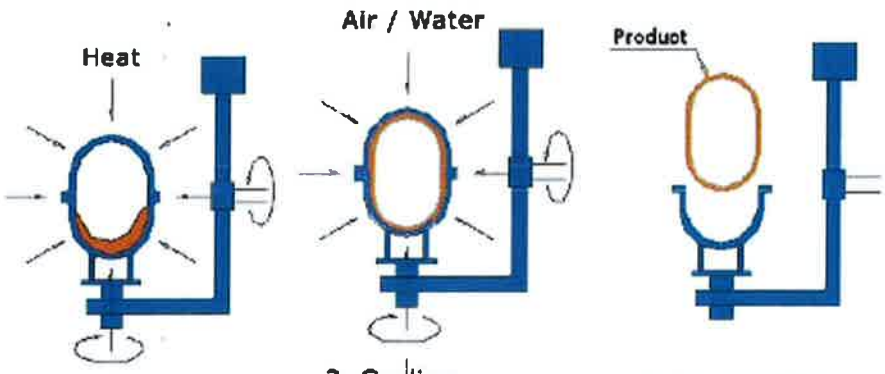
The disadvantages of Blow moulding are:

- Capital equipment and set-up costs are high.
- Mould costs are high, so low volume manufacture of parts is uneconomic – most parts produced exceed batches of 100,000 per year.
- Because of expensive moulds, development of the bottle design is not cost effective.

An alternative production process for producing the bottle could be Rotational moulding. A plastic resin is put in a mould. The mould is heated and causes the plastic resin to melt. The mould is then slowly rotated causing the plastic to flow into the mould and stick to its walls. In order to maintain even thickness throughout the mould, it continues to rotate while cooling.



1. Mould charging



2. Heating

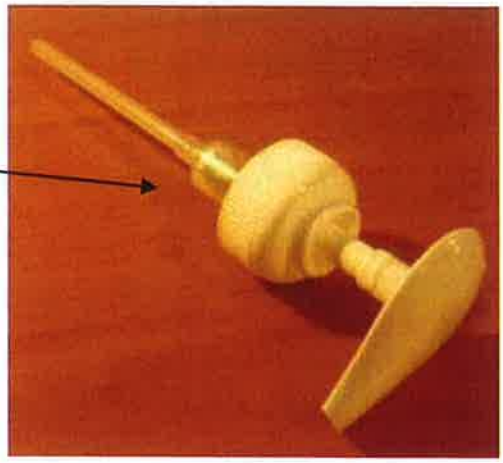
3. Cooling

3. De-moulding

Blow moulding is used to produce the bottle instead of Rotational moulding because:

- Low pressure in the rotational mould means that it is hard to get the plastic in some areas of the mould- it is sometimes not possible to make sharp threads like on blow moulding bottles.
- In rotational moulding, unlike blow moulding, the actual mould itself has to be cooled as well – production time is long and costs are therefore high.
- Although the start up cost for the mould in blow moulding is high, the cost per bottle is very low.

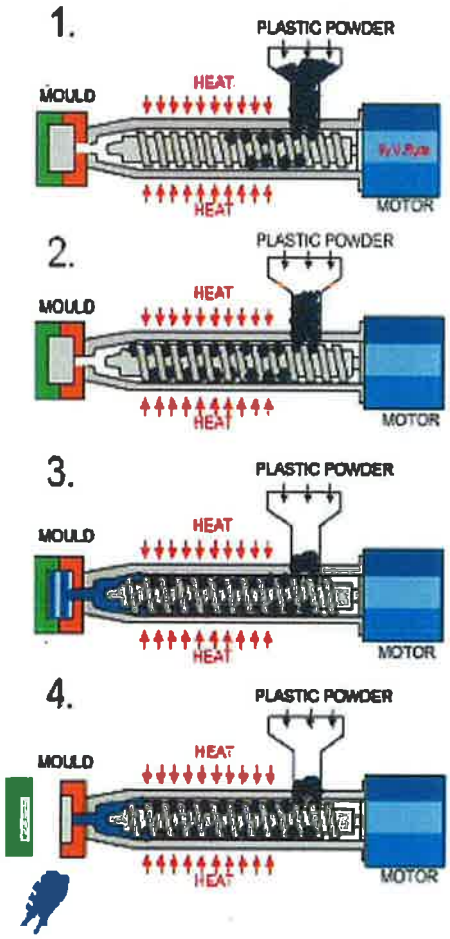
- It is a lot quicker to produce bottles by blow moulding than rotational moulding and therefore is it much more appropriate for my bottle.



The bottle top

The production process for the bottle top is *Injection Moulding*.

The Process



1. Granules of plastic are poured or fed into a hopper which stores it until needed

2. An induction heater heats op the injection tube and when it reaches a preset temperature, a screw starts turning.

3. A motor turns the screw which pushes the granules along the heated section which melts them into a liquid. The liquid plastic is forced under pressure into a mould, where it cools to shape.

4. The mould opens and the unit is removed.

The advantages of injection moulding are:

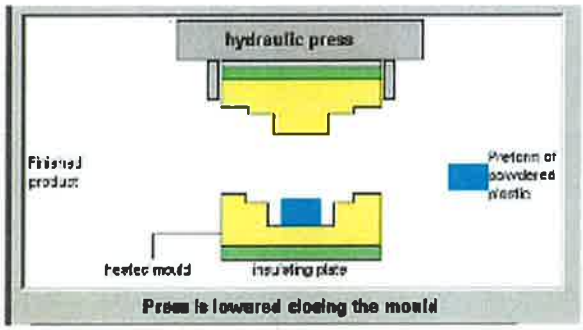
- Almost all thermoplastics can be injection moulded.
- Complex geometry and fine features of the bottle lid are easily produced because very high pressures are possible.
- Very thin walled parts are easily produced.
- Cycle times are very low – only a few seconds so it is time effective when producing the bottle lids.
- Many parts can be made from a single mould – millions of bottle lids per year are possible so it is cost effective.

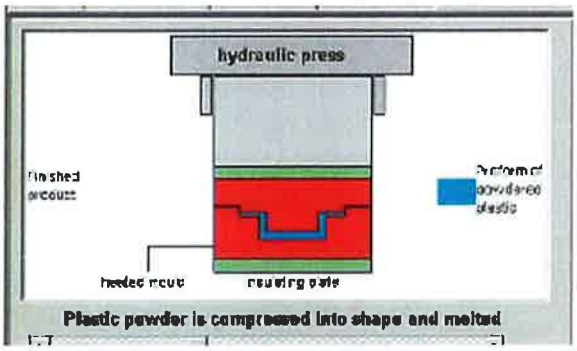
- Very little finishing is required beyond removal of runners.
- Reject components are recycled and reused – no waste.
- Injection moulding machines are usually automated, so are cheap to run – a single operator can look after more than one machine.
- Costs per bottle lid are small once mould costs are recovered.

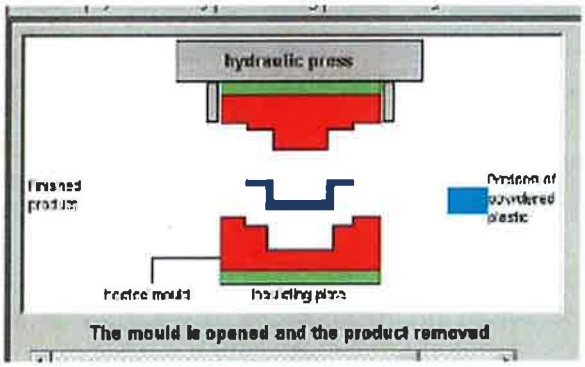
The disadvantages of Injection moulding are:

- Large undercuts cannot be formed e.g. bottle shapes.
- Capital equipment and set-up costs are high.
- Mould costs are high, so low volume manufacture of parts is uneconomic – most parts produced exceed batches of 100,000 per year.
- Machinery requires skilled maintenance, which can be costly – down time means that production halts.

An alternative production process for producing the bottle top could be Compression moulding. A piece of plastic is placed into a mold. The plastic is heated and a hydraulic press presses the pliable plastic against the mould, resulting in a perfectly moulded piece. After the hydraulic press releases, an ejector pin in the bottom of the mold quickly ejects the finish piece out of the mould and then the process is finished. Also depending on the type of plunger used in the press there will or won't be excess material on the mould.







Injection moulding is used to produce the bottle top instead of Compression moulding because:

- Injection moulding is quicker and therefore more time effective because there is no waiting around for the mould to cool down like there is in compression moulding.
- Injection moulding can produce intricate detailing and sharp threads for the bottle top. Compression moulding is not able to produce this fine detailing.
- Although the start up cost for injection moudling may be high, once the initial start up cost is reclaimed, the cost per bottle top is cheap.

Environmental Considerations

The processes involved in manufacturing the bottle can have detrimental effects on the environment and these include:

- Using valuable non-renewable resources such as fossil fuels.
- Contributing to global warming through emissions of greenhouse gases.
- Packaging and transportation contribute to resource wastage and pollution.
- Using 'new' materials instead of recycling and re-using.
- During production, emissions are output affecting water, air and soil – heavy metals, chlorofluorocarbons, hydrocarbons sulphur oxides and dust are typical.
- CFCs and other harmful gases are produced, depleting the ozone layer.

Quality

During manufacture, the bottle will have been put through a range of quality control checks to ensure that at each stage, component parts were manufactured to the highest standards possible. These include:

- Raw materials checked for quality and consistency – uniform colour and pellet size of PET/PP.
- Check machine for correct function and set-up – correct settings for material delivery, heat levels and pressure.
- Check mould for perfect internal finish, defects, debris – ensure it opens, closes, aligns properly.
- Check the bottle can withstand a force impacting on it – to replicate the force the user may exert on the bottle over a period of time, non-destructive testing.
- Check there are no leaks in the bottle – submerge the bottle in water and blow air into it. If bubbles of air can be seen, it has leaks and will not hold the hand wash as it is faulty.
- Check the finished bottle and top, making sure that it screws together tightly.
- Check the quality of moulding when produced visual check – computer check for dimensional accuracy and shape.
- Check bottle for required qualities of toughness, flexibility resilience.
- Check lever assembly for function – leverage, ease of use, robustness.
- Check assembled bottle for function as designed – if it dispenses a controlled amount of hand wash.
- Check stability of bottle when it stands up on its own.
- Check the bottle holds the required volume of hand wash.

Quality control is part of a 'quality assurance' system which is designed to ensure that the product leaving a factory is of the highest all round quality possible. A quality assurance system could be designed as follows:

- Codes of practise- comply to commonly agreed principles of good practise, rules, standards relating to specific manufacturing intustry.
- Customer requirements- understand current and future customer needs, strive to meet and exceed customers expectations for the bottle.
- Focus groups- quantitive research where groups of people are asked about their opinons towards the bottle.
- Regulations compliance – ISO, consumer association, trade association, health and safety executive.
- Benchmarking- comparing the cost and quality of one company's bottle against my bottle.

Standard Considerations

All manufacturing companies must comply to certain standards and regulations during the management and manufactutre of their products. During the manufacture of the bottle, some of the standards that would be in place are:

- International Organisation for Standardisation (ISO) – ensures compatibility, quality and conformity
- ISO 9000 – refers to quality management
- ISO 14000 – sets standards on quality and the environment
- ISO 294: 1996
- ISO 1873: 2007 } Standards for plastic moulding and extrusion
- ISO 15103: 2007

British Standards Institute (BSI) kitemark and the CE mark are important standards of quality that manufacturing companies strive to be awarded. The CE mark confirms that products meet EU directives.