

SHARPS BIN FOR A DESIGN STUDIO

Lily Butler

SEMANTIC DIRECTION

SEMANTIC DIRECTION

Angular



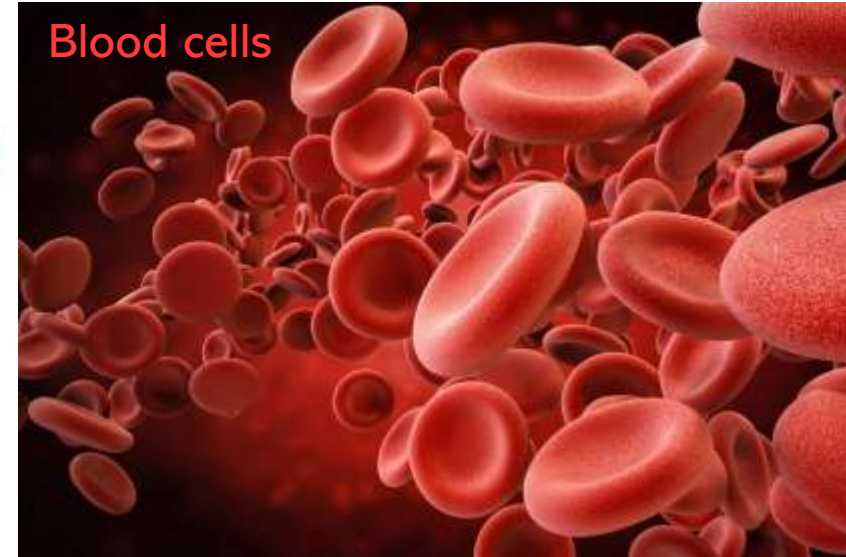
The shape
of staples



Needs
space
for
label

Needs to have an orange lid to label the
type of waste it collects!

Blood cells



What sharps could there be in a
design studio?

- Scalpels
- Anti cutter blades
- Broken or contaminated glass
- Broken or contaminated plastic
- Scissors
- Sharp knives
- Pins
- Staples
- Metal wiring



Could have
a blade
removing
feature in
lid

Metallic



Scalpel-like



SEMANTIC DIRECTION

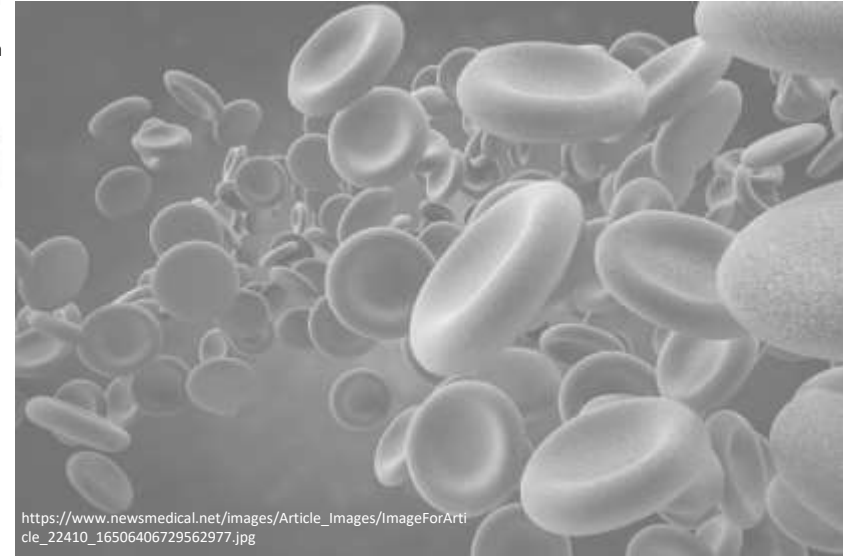


<https://www.upholsteryshop.co.uk/wp-content/uploads/2021/07/2-staples-2-plates.jpg>

https://www.britishhardwood.co.uk/media/catalog/product/cache/6138ad00cb88da41d9ce4fb11d775af1g/a/galvanised_staples_-_stakes.jpg

https://m.media-amazon.com/images/I/61PwceDuuoL._AC_SL1500_.jpg

<https://www.safetyfirstaid.co.uk/images/products/large/Q2053.jpg>



https://www.nwetch.com/images/easyblog_articles/10/Eli za-Light.jpg



<https://i0.wp.com/cdn.makezine.com/uploads/2009/09/coca-cola-can-redesign-01.jpg?resize=600%2C359&ssl=1>

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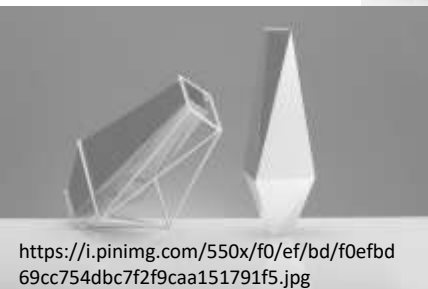
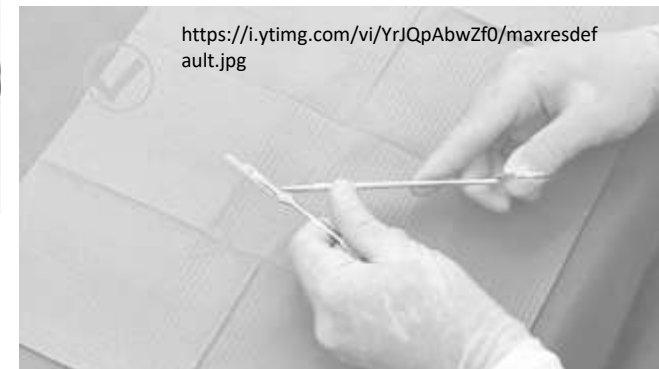
<https://udvabony.com/wp-content/uploads/2019/05/Anti-Cutter-Knife-18mm-1.jpg>

<https://media.istockphoto.com/id/1131564904/photo/damaged-black-electric-cord-on-white-background.jpg?s=612x612&w=0&k=20&c=FC3xucB3AcWpPxcdiS0xEo0A4JheyJoWqpZnVyeKqk=>

https://res.cloudinary.com/rsc/image/upload/b_auto,c_pad,dpr_1.0,f_auto,h_758,q_auto,w_1350/c_pad,h_758,w_1350/F8477596-01?pgw=1&pgwact=1



<https://www.qlicksmart.com/wp-content/uploads/2019/01/BladeSingle-1.jpg>



MATERIALS SELECTION

MATERIALS AND MANUFACTURE SELECTION

Linseed Flax for composite use:

Flax has recently be rediscovered as a brilliant, renewable fibre source for use in resin composites. It is even possible to use a high percentage of bio-resin making a structure almost completely carbon neutral. Unfortunately I believe that this material would not be appropriate for the shape and size of my sharps bin, nor would it burn as pollution free as I would want, however it is exciting to see its use spreading for large construction projects.



https://static.euronews.com/articles/stories/04/24/31/48/828x555_cmsv2_b9335ef9-d4f2-539c-bddb-6da2691c0ea9-4243148.jpg

Espresso Polymer:

Espresso polymer is a really interesting new material. I first saw that coffee grounds were being used was in a new in-flight meal tray designed by PriestmanGoode exhibited in the design museum in London. After investigating this further I found out that: "The material is fully recyclable and an industrial compostable. You can let your product be recycled to a new product or let it be degraded by industrial composting.

The Espresso polymer is a blend of coffee grounds and sugar canes. This carefully developed blend results in a very stiff material that can be processed in wall thicknesses from 1 to 10 millimetres.

The material can be processed by every injection moulding, rotation moulding or extrusion company."

I will consider using PLA too however I wanted to try out researching a material less known about.



Soy Protein polymers:

According to the United States Environmental Protection Agency, soybeans are able to create a simple polymer that is easy to process, biodegradable and renewable. Unfortunately, to date, there are no products that have been no commercial products that use this material.



Bamboo:

Bamboo is one of the fastest growing plants and therefore is a brilliant sustainable wood alternative. It is great for the farmers and deforestation but unfortunately "Bamboo contains lead and other heavy metals like chromium, arsenic, cadmium, copper, nickel. Burning of bamboo produces Lead Oxide and other toxic oxides in gaseous form which are harmful if inhaled." Therefore since this product is incinerated, bamboo is not a good material choice!



MATERIALS AND MANUFACTURE SELECTION

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<https://www.scottishconstructionnow.com/articles/and-finally-flax-rediscovered-as-new-building-material>



<https://www.bcomp.ch/wp-content/uploads/2020/03/581D72C2-5EA3-4ED7-AF0E-5DE4BF8345B3.png>



https://static.euronews.com/articles/stories/04/24/31/48/828x555_cmsv2_b9335ef9-d4f2-539c-bddb-6da2691c0ea9-4243148.jpg



Espresso Polymer:

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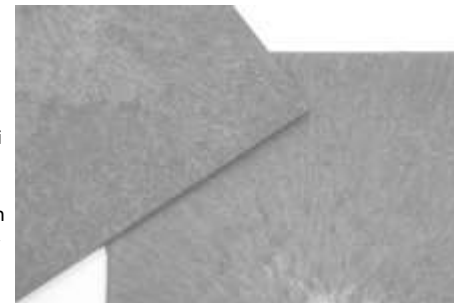
The Espresso polymer is a blend of coffee grounds and sugar canes. This carefully developed blend results in a very stiff material that can be processed in wall thicknesses from 1 to 10 millimetres.

The material can be processed by every injection moulding, rotation moulding or extrusion company. I will consider using PLA too however I wanted to try out researching a material less known about.

<https://materialdistrict.com/material/coffee-polymer/#:~:text=The%20Espresso%20polymer%20is%20a,rotation%20moulding%20or%20extrusion%20company.>



<https://materialdistrict.com/wp-content/uploads/2019/04/ovdesigns-coffee-polymer-ona820-7-600x400.jpg>



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https://cfpub.epa.gov/si/si_public_record_Report.cfm?Lab=NCER&dirEntryID=188277#:~:text=Plastics%20made%20from%20soybean%20protein,incineration%20and%20fossil%20fuel%20dependence.



<https://soynewuses.org/wp-content/uploads/DuPontSoyPolymersBind-Personal-Care.jpg>



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<https://www.sentinelassam.com/melange/burning-of-bamboo/>
<https://www.essshelf.com/what-is-the-manufacturing-process-of-bamboo-timber/>



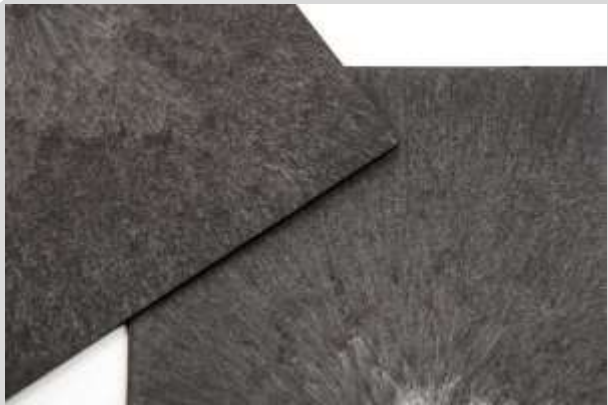
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<https://materialdistrict.com/wp-content/uploads/2019/04/ovdesigns-coffee-polymer-ona820-4-600x400.jpg>



MATERIALS AND MANUFACTURE SELECTION



There are different methods that can be used to create polymers from coffee.

One is to use the by-products of coffee eg: coffee pulp (CP), mucilage (CM), parchment (CPm), husks (CH), silverskin (CS) and spent coffee grounds (SCG). This method however requires the addition of

The torrefaction of SCG increases the hydrophobicity of PBAT/SCG-based composites

CS powder alkali treated and esterified with palmitoyl chloride has a HDPE polymeric matrix that forms composites with decreased water absorption

Acrylonitrile butadiene styrene (ABS) is a high-impact modifier once used in CH powder. ABS is a common thermoplastic polymer. Its glass transition temperature is approximately 221 °F (105 °C). ABS is amorphous and therefore has no actual melting point. ABS has high rigidity, good impact resistance, good abrasion and resistance, and high dimensional stability

Plastic Material Type, Abbreviation & A or C Structure			Close Welding	Distant Welding	Inserting	Spot Welding	Staking
Acetal Co/Homopolymer	POM	C	Good	Fair	Good	Fair	Fair
Acrylic	PMMA	A	Good	Fair	Good	Good	Fair
Acrylic - Impact Modified	PMMA	A	Fair	Poor	Poor	Fair	Fair
Acrylonitrile Butadiene Styrene	ABS	A	Very Good	Good	Very Good	Very Good	Very Good

Close Welding = ultrasonic welding where the horn is applied **close to** (<6.35mm) the assembly joint - good for welding materials whose low modulus of rigidity dampens vibrations a short distance away from the horn.

Distant Welding = ultrasonic welding where the horn is applied **away from** (>6.35mm) the assembly joint - good for welding materials whose high modulus of elasticity propagates vibrations without dampening them.

Inserting = ultrasonic embedding of metal components like inserts into preformed holes in the moulding - provides high strength & speed, no stress build up & reduced moulding cycles.

Spot Welding = ultrasonic assembly of parts without premade holes or energy directors - good for large parts.

Staking = melting and reforming a post on the moulding to mechanically lock dissimilar materials in place - provides short cycles, good appearance & tight assemblies

<https://www.toolcraft.co.uk/ultrasonic-welding/advice/help-ultrasonic-welding-of-plastics.htm>

Table 2

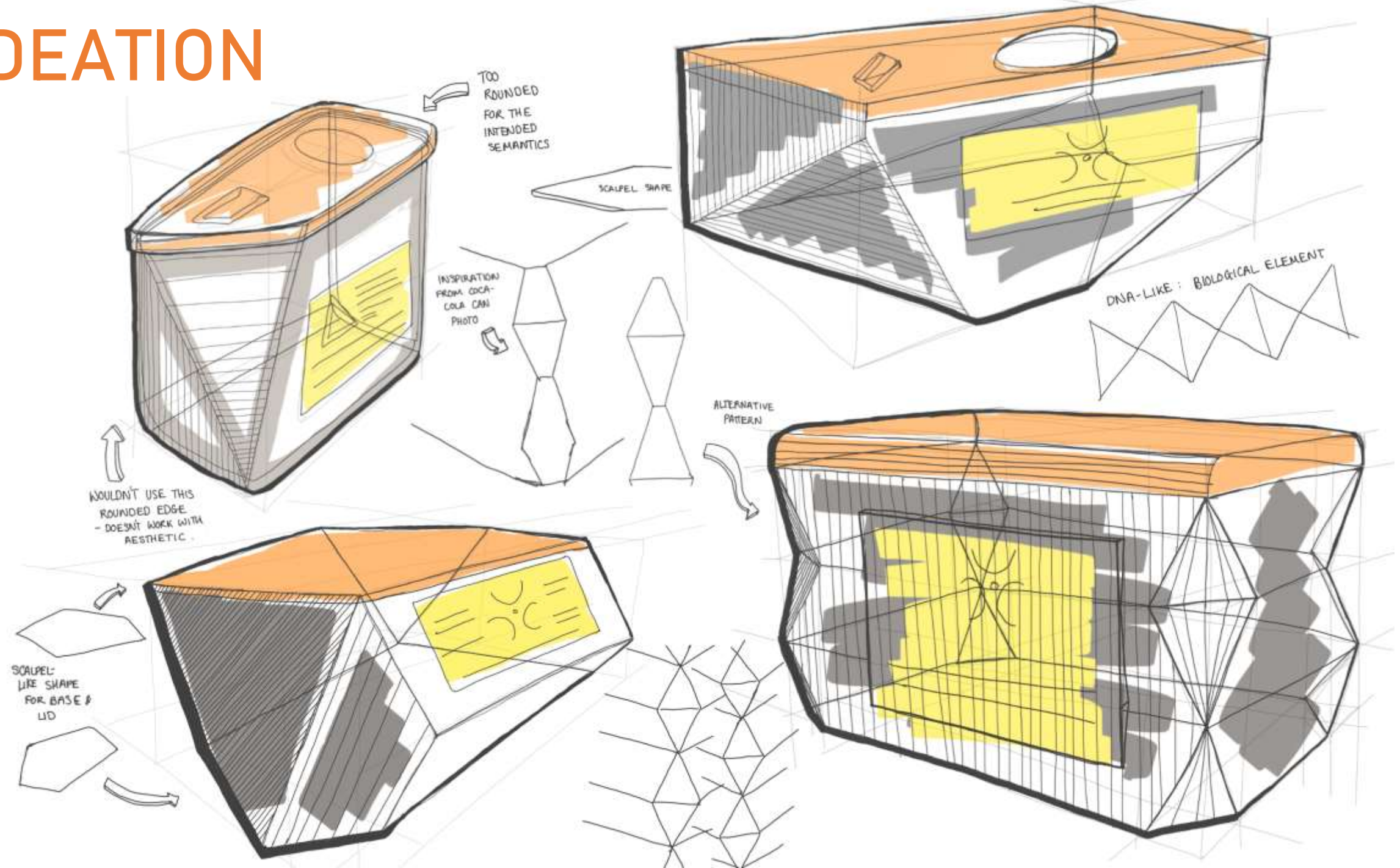
Functional additives for nonbiodegradable plastic formulations using crude coffee by-products.

By-Product	Coffee-Based Powder	Polymeric Matrix	Developed Materials and Main Properties
CH	CH powder	PP	Composites with poor interfacial adhesion between CH and the polymeric matrix
		PP (plus maleic anhydride grafted PP)	Composites with good interfacial adhesion
		HDPE (plus maleic anhydride grafted PE)	Composites with good interfacial adhesion
		PP (plus maleic anhydride grafted PP)	Composites with decreased susceptibility towards fire
		PP (plus maleic anhydride grafted PP)	Composites with decreased carbon footprint
CS	CS powder	CH powder alkali treated	Composites with improved mechanical and thermal performance
		HDPE	Composites with poor interfacial adhesion between CS and the

All data given sourced from: <https://www.ncbi.nlm.nih.gov/pmc/articles/PMC8005104/>

IDEATION

IDEATION



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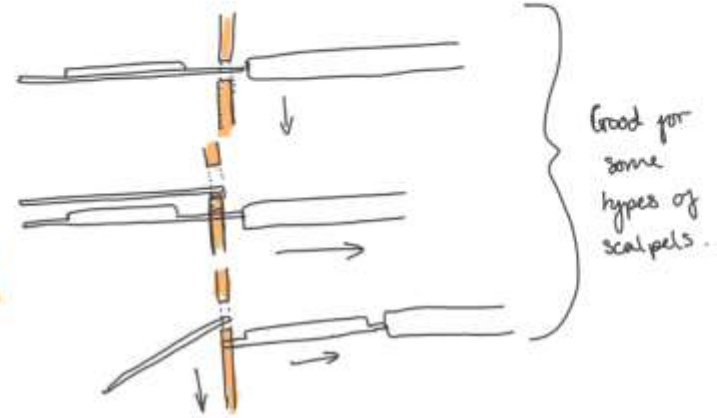
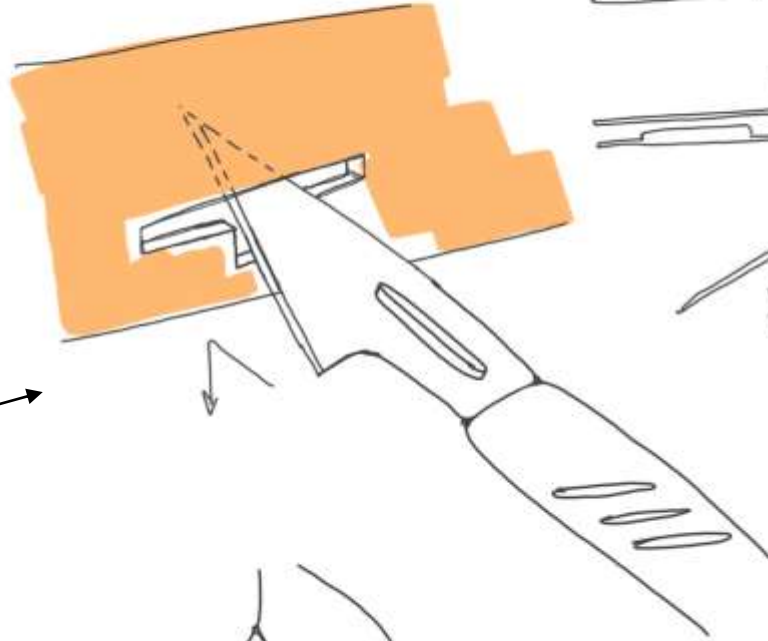
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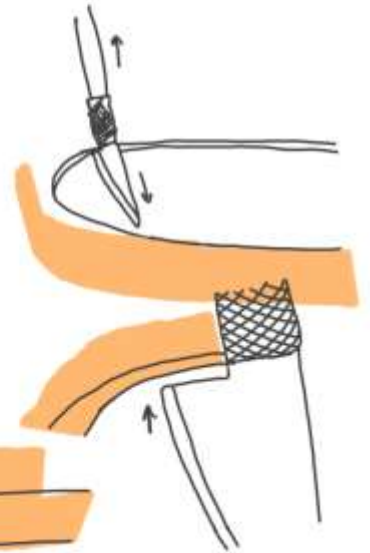
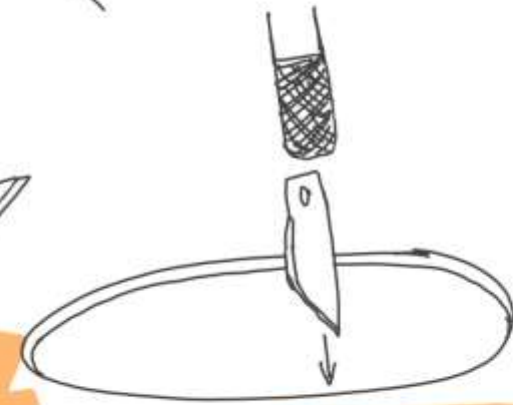
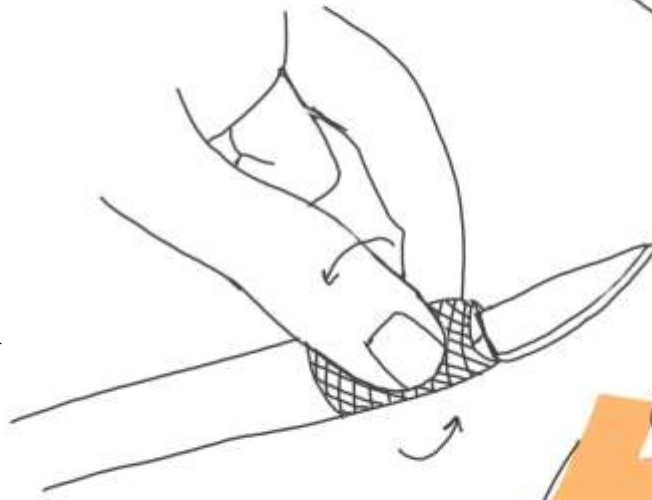
<https://indigo.co/media/ecom/prod/g/swann-morton-handle-4.jpg>



Scalpel blade removal:

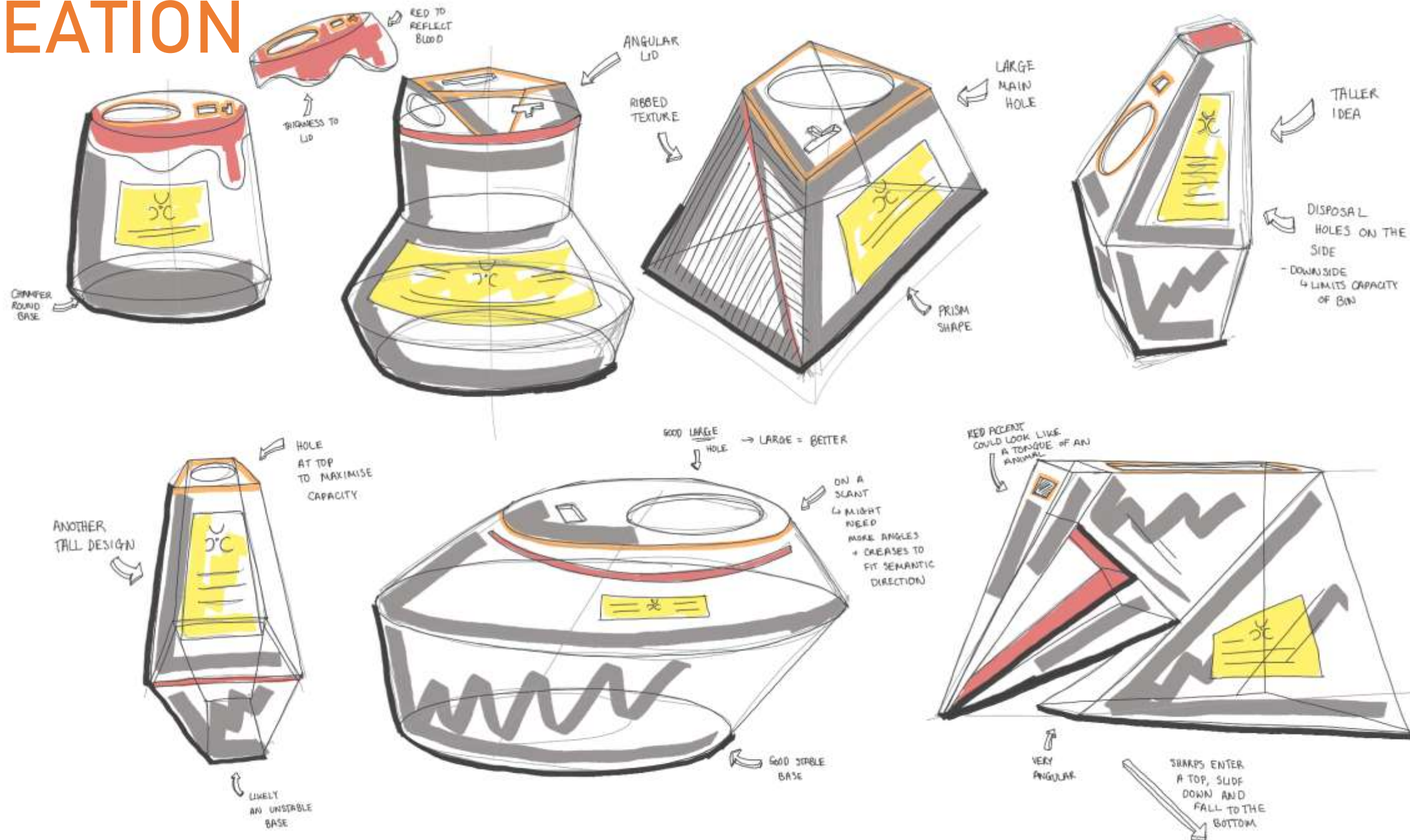


Good for some types of scalpels.



[https://uk.rs-online.com/web/p/scalpels-craft-knives/6756699?cm_mmc=UK-PLA-DS3A_-google_-CSS_UK_EN_Hand_Tools_Whoop_-Scalpels+%26+Craft+Knives_Whoop+\(2\)_OMNISerpNov-6756699&matchtype=&pla-341048091276&cq_src=google_ads&cq_cmp=10110438194&cq_term=&cq_plac=&cq_net=g&cq_plt=gp&gclid=CjwKCAiA_vKeBhAdEiWAFb_nrePkj80thUDQuKqjT10meQYmtIEysc1XA_IJlUySxS6FImkHk5PIRoCqiAQAVD_BwE&gclid=aw.ds](https://uk.rs-online.com/web/p/scalpels-craft-knives/6756699?cm_mmc=UK-PLA-DS3A_-google_-CSS_UK_EN_Hand_Tools_Whoop_-Scalpels+%26+Craft+Knives_Whoop+(2)_OMNISerpNov-6756699&matchtype=&pla-341048091276&cq_src=google_ads&cq_cmp=10110438194&cq_term=&cq_plac=&cq_net=g&cq_plt=gp&gclid=CjwKCAiA_vKeBhAdEiWAFb_nrePkj80thUDQuKqjT10meQYmtIEysc1XA_IJlUySxS6FImkHk5PIRoCqiAQAVD_BwE&gclid=aw.ds)

IDEATION

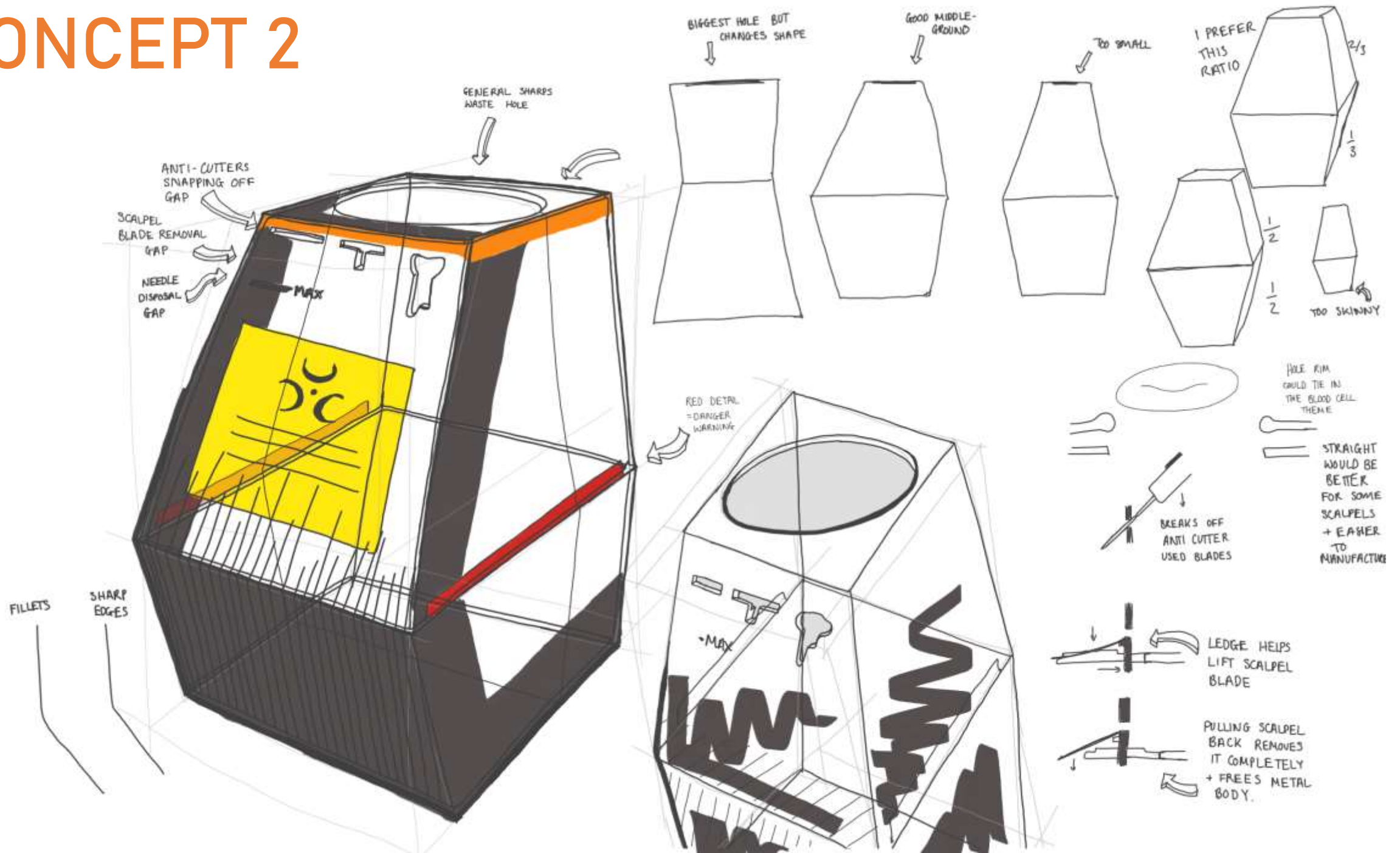


CONCEPT DEVELOPMENT

CONCEPT 1

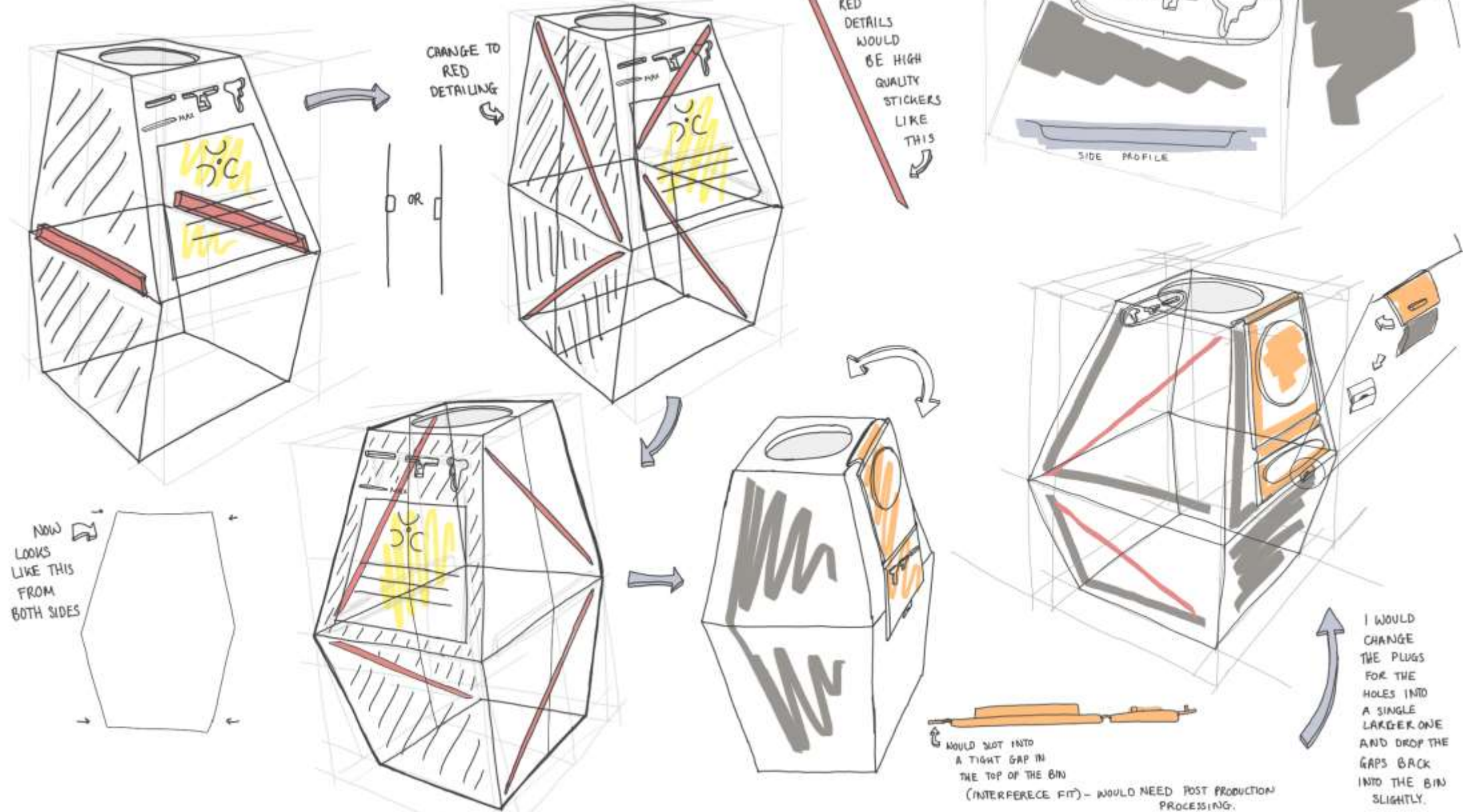


CONCEPT 2

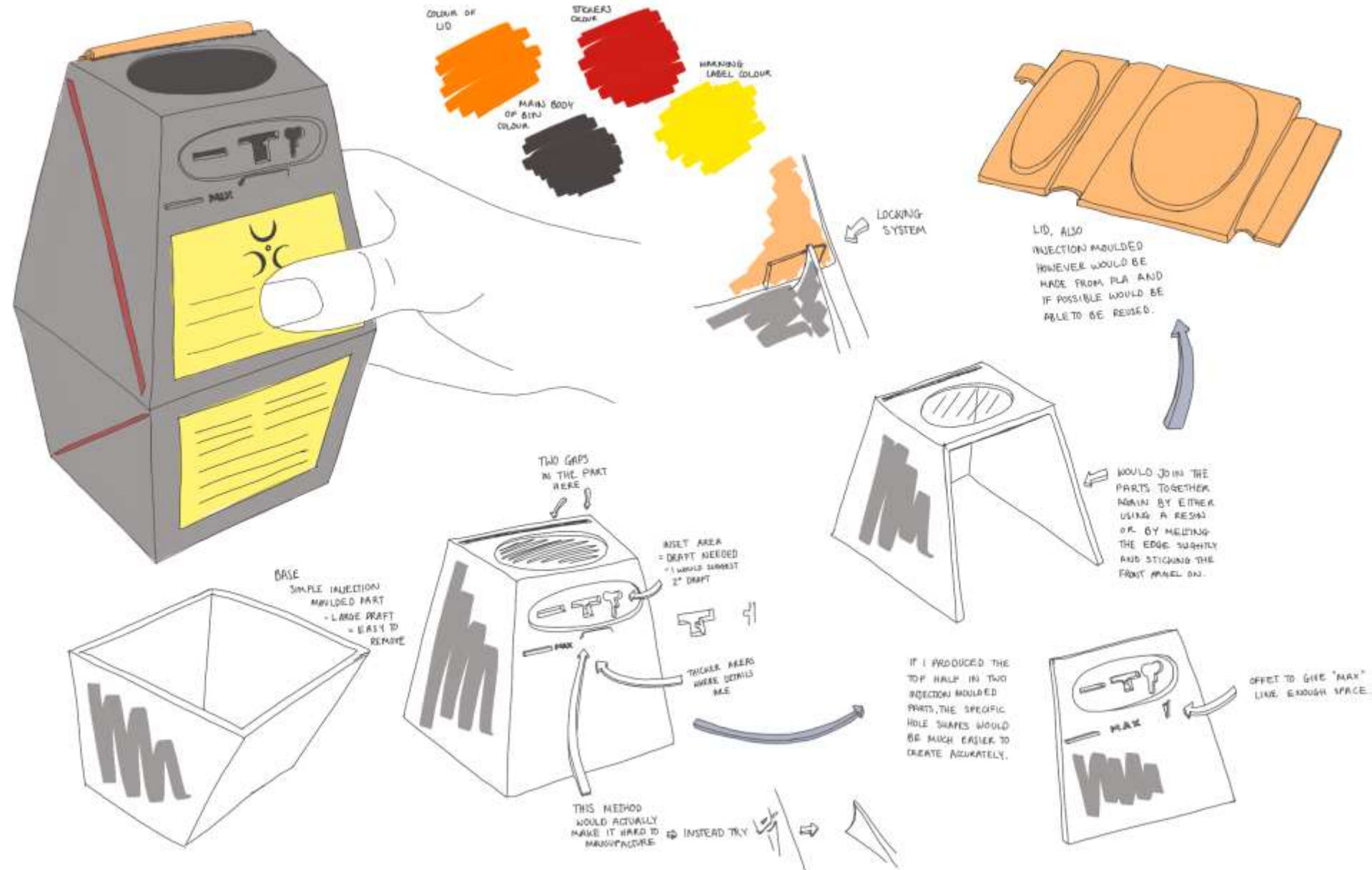


CONCEPT REFINEMENT

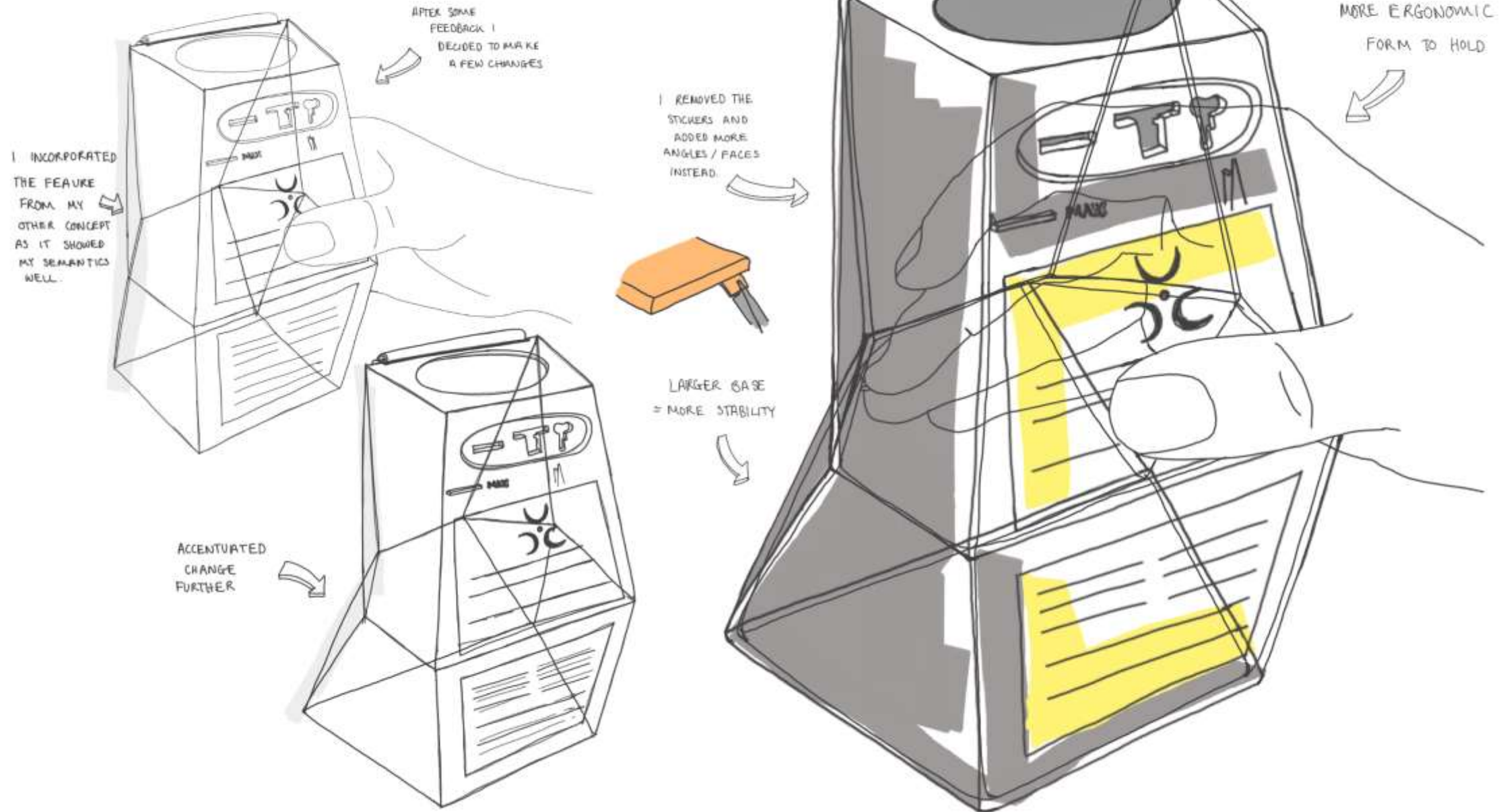
CONCEPT REFINEMENT



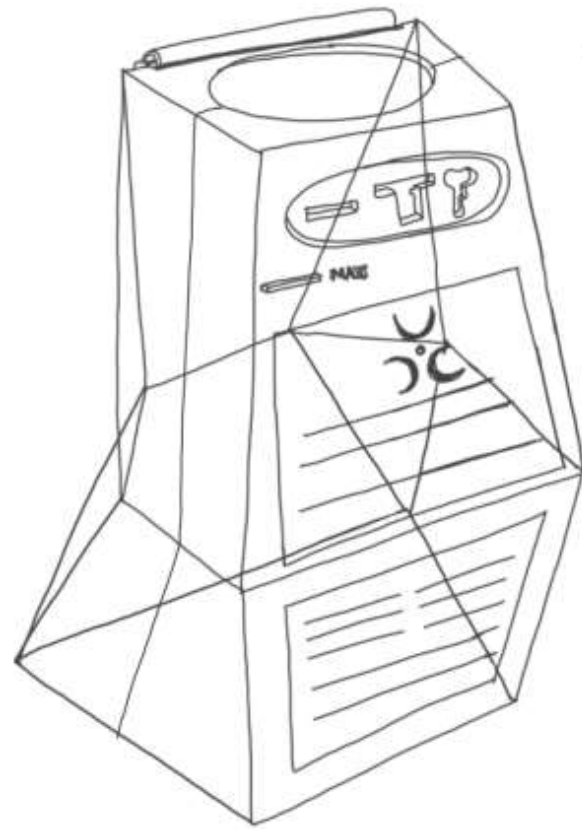
CONCEPT REFINEMENT



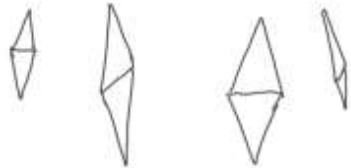
CONCEPT REFINEMENT



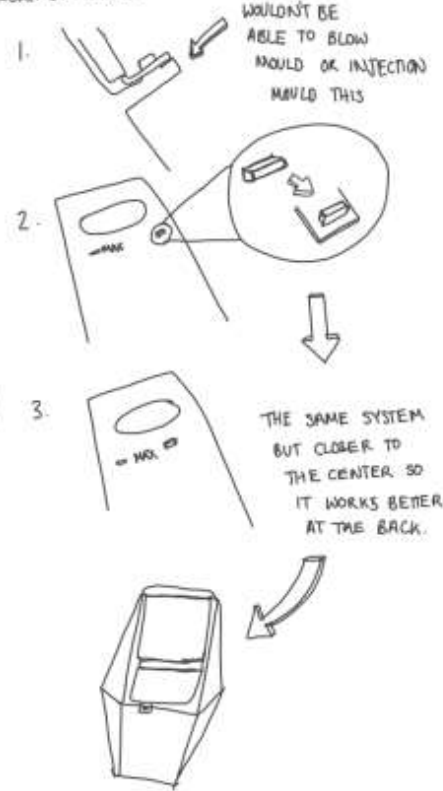
CONCEPT FINALISATION



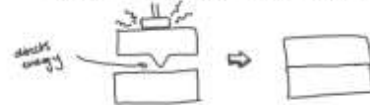
WHEN I MODELLED THIS IN SOLIDWORKS, I FOUND THAT THE FRONT LOOKED QUITE BORING → SO I ADDED MORE FACES



LOCKING METHOD:



I'VE DECIDED TO INJECTION MOULD THE FRONT AND THE BACK AS TWO SEPARATE PARTS AND THEN SONIC WELD THEM TOGETHER, SINCE THE ABS POLYMER WELDS WELL SO THIS SHOULD WORK.



FINAL DESIGN:



SINCE EACH SIDE HAS EXTRUDING DETAILS, INJECTION MOULDING THE PRODUCT AS A WHOLE WOULD NOT WORK, AND NEITHER WOULD BLOW MOULDING.

ADDED FACES TIE TOGETHER THE FRONT AND BACK OF PRODUCT

I ADDED 0.1 mm RADIUS TO EACH FACE TO SOFTEN IT SLIGHTLY AND TO PREPARE IT FOR MANUFACTURE.

CMF SPECIFICATION

CMF SPECIFICATION

Final material choices:

After all my research and CAD modelling of my product, I have decided I would make the **main part (the bin)** from Acrylonitrile butadiene styrene) (**ABS**) **reinforced coffee husk powder (CH)**. This will create a very strong, injection mouldable material that can also be sonic welded. I would specify a **D1 SPI** for the body, as this would be an attractive and shiny finish which would accentuate the angles and faces of the form, as well as the natural beauty of the material. There would be **no colouring added** since the material has a very strong natural colour and grain.

D-1 Dry Blast Glass Bead Satin finish 0.80-1.00

ABS, PP, PS, HDPE, Nylon, PC, TPU

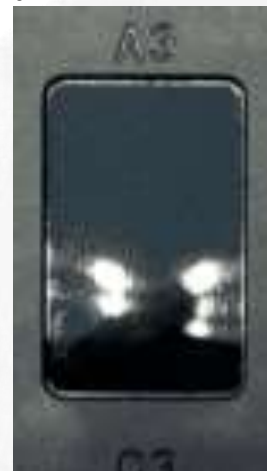
<https://xometry.eu/en/injection-moulding-surface-finishes-spi-and-vdi/>

For my **product's lid** I would opt for a polymer more easy to colour. I would therefore use PLA since it can be easily injection moulded, coloured and is also a great material environmentally speaking. I would colour it **PANTONE 16-1356 TCX** as shown in my Keyshot renders. This vibrant orange is great as it contrasts the coffee brown really well and signifies the type of waste disposed in the sharps bin. I would a slightly shinier finish for the lid as it needs to feel pleasant to touch and it would express the duality of the two parts further. Therefore I would settle with a **A3 SPI** finish as it is very glossy and shiny.

From researching the properties and restrictions of injection moulding PLA I found that it was possible to give PLA a shiny finish, which was something I was concerned could be a restriction.

Information sourced from:

<https://www.moldplasticinjection.com/pla-plastic-injection-molding>

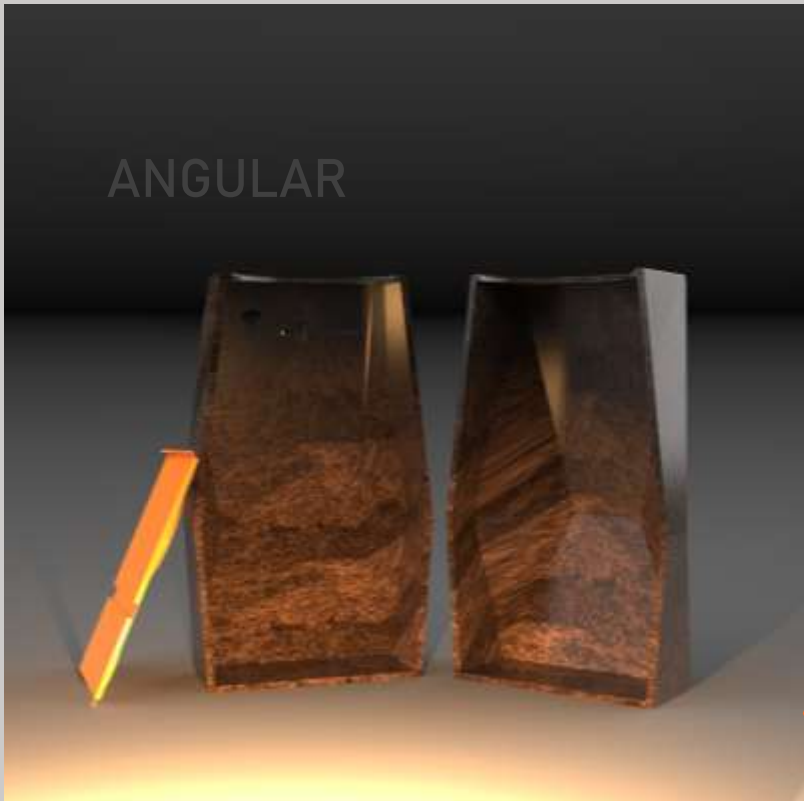




DESIGN STUDIO SHARPS BIN

SHARPSPRESSO

CHISELLED



3 SPECIFIC HOLES FOR
BLADES AND NEEDLES