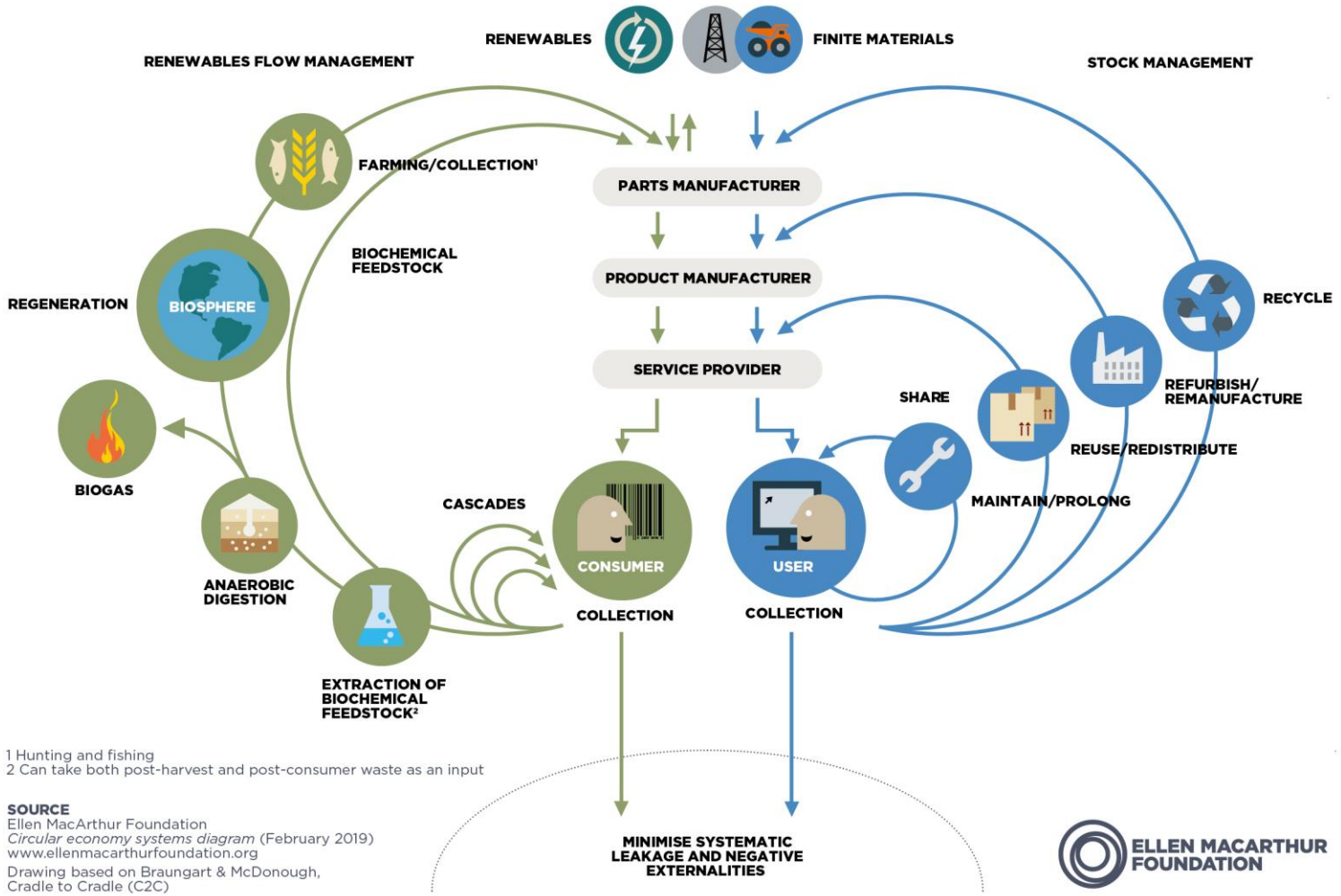

Upcycling

Upcycling

Reusing discarded objects and/or materials to create something new.

It is remanufacturing rather than upcycling because it does not involve destroying the donor material or part.



1 Hunting and fishing
2 Can take both post-harvest and post-consumer waste as an input

SOURCE
Ellen MacArthur Foundation
Circular economy systems diagram (February 2019)
www.ellenmacarthurfoundation.org
Drawing based on Braungart & McDonough, Cradle to Cradle (C2C)

Circular Economy

Circular Business Models

Designing a business model – not just a product.

Long Life Model	Hybrid model	Gap exploiter	Access	Performance
High-quality products that are sold at a premium with a focus on after-sales support	The initial product is often sold at a loss, profit is driven by the sale of consumables e.g: printer ink / coffee pods.	Offers services that aren't being made accessible by the manufacturer. Maintenance, repairs and refurbishment.	Making profit by providing access to a product, e.g: leasing a car. Only works with expensive products where renting may be preferable to ownership.	Providing a service, users are exclusively interested in the quality of the service and not the product fulfilling it. E.g: Network infrastructure, printing equipment.

Which applies to your Product?

Circular Business Models

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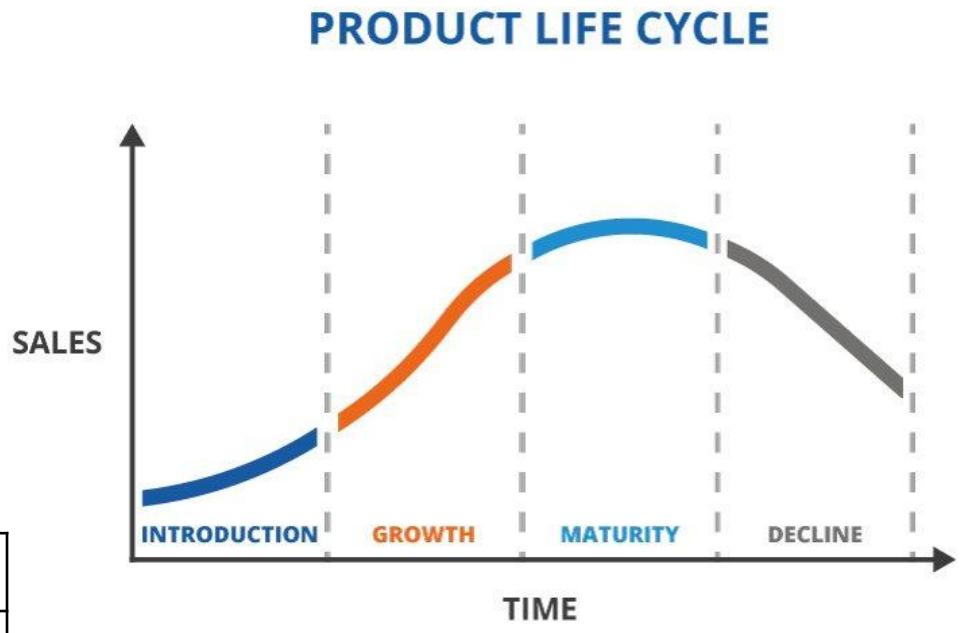
Product Category Life Cycle

All products have a lifecycle, and where you're product is within its lifecycle will greatly affect design priorities. Products that are in the introduction phase such as VR Headsets may not be focused on product durability, as they will quickly become outdated.

Whereas a product in maturity such as a wristwatch may have a great focus on attachment, trust and serviceability.

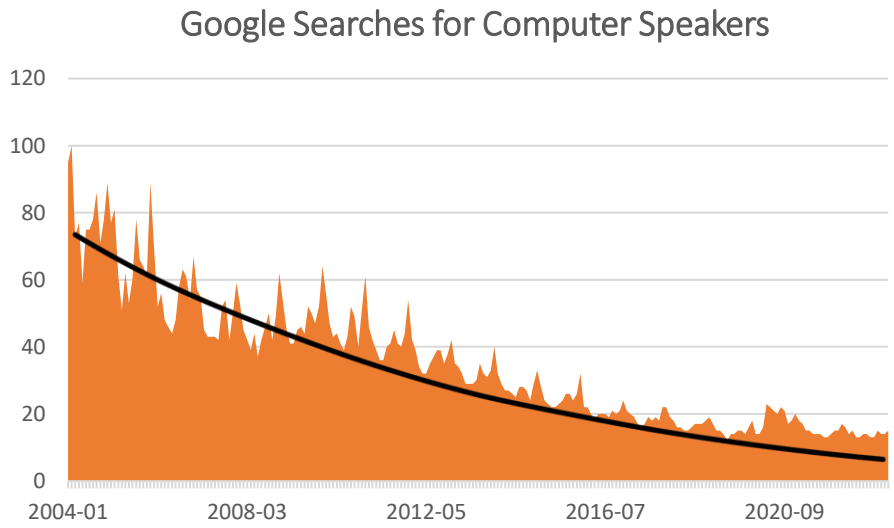
Life Cycle Phases and Priorities:

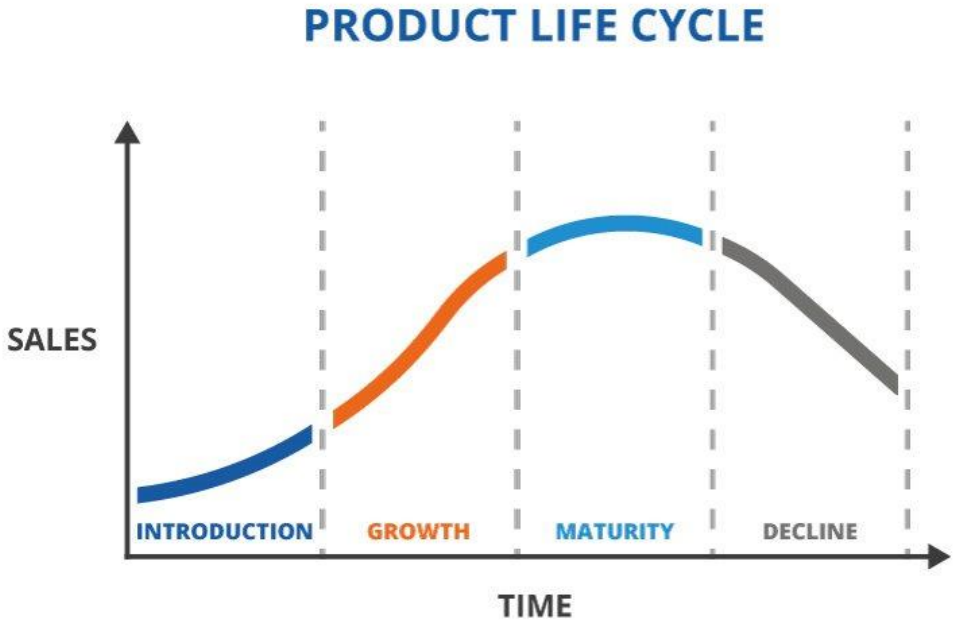
Introduction	Growth	Maturity	Decline
• Attachment and trust • Standardisation and compatibility • Upgradability • Dis- and reassembly	• Attachment and trust • Standardisation and compatibility • Upgradability • Dis- and reassembly	• Attachment and trust • Product Durability • Standardisation and compatibility • Maintenance and repair • Upgradability • Dis- and reassembly	• Product Durability • Standardisation and compatibility • Maintenance and repair • Dis- and reassembly



Where is your product on this Journey?

Product Category Life Cycle





I have used google trends to identify where my product is within its lifecycle, my product (Desktop computer speakers) has entered its decline and therefore my design priorities should be the following:

- Product Durability
- Standardisation and compatibility
- Maintenance and repair
- Dis- and reassembly

Where is your product on this Journey?

Design for Circular Economies

Cheat Sheet

Attachment and Trust	Durability	Standardisation	Ease of maintenance and repair	Upgradability	Dis- and Reassembly
• Products that age • Tactile and Auditory sensations Reactive to their environment • Maintain brand and reputation	• Real-world testing • Computer simulation • Easy maintenance	• Ensure widespread compatibility • Set standards when none are available • Standards do not have to be universal, they can relate to one product line or company	• Scheduled servicing • Monitoring of part degradation • Simplicity • Maintenance should be a source of revenue: 3D files for printing could be sold on a pay-per-print basis • Availability of maintenance information and replacement parts	• Modular design • Designed for future use cases • Software upgrades	• Avoid the use of glue, nails and rivets where it affects disassembly • Lower barrier to entry, avoid the use of specialist tools for disassembly • Fasteners and sub-assembly should be able to be undone within 30s.

Industry Stakeholders

Industry Stakeholders

Existing Connections

- Noise, Vibration and Harness (NVH), Audio and Environmental at Jaguar Land Rover
- English Acoustics

UK Based Speaker Manufacturers

- Paul Hilditch, Product Manager at Q Acoustics
- Chris Browne, Junior Product Designer at Q Acoustics
- Simon Matthews, Industrial Design Director at Bowers and Wilkins

Are they stakeholders just being interviewed or is there additional involvement?
Are we engaging with just one industry stakeholder or several?
When will we be conducting interviews?
Are they In-person or online?
Can we visit stakeholders or would they have to come to us?
Is there a suggested list of questions for the stakeholder interviews?

Primary Research – User testing

Should I fill out the ethics form now, even though I am unsure of exactly what my user testing will entail?

I have some initial ideas, mainly user observation:

Testing how discoverable the product is by asking the user to do something, e.g: play music without any instruction

Similarly, I would like to ask the user to fix a fault with the product (which I will induce) to see how easy it is to fix for someone not familiar with how the product internals

More subjective feedback:

What do you think of the product? How does it look? Would you buy it (yes/no + why)

Initial ideas

- 3D printed body using recycled material
- Focus on modularity and design for repair
- Detachable fascia panel made from reclaimed wood or leather

Secondary Research

Designing for repair and serviceability is a short-sighted approach.

Most products that are thrown away still work, the problem is consumers lose interest and become unsatisfied before the product has fulfilled its service life.

I see two responses to this problem, either shorten the service life and place greater emphasis on disassembly and end of life or try to engage the consumer for longer. By doing this we are treating the cause, not the symptoms.

Jonathan Chapmen argues that the subject-object relationship is like romantic relationships and they need to grow and evolve together

He stressed the importance of character in building this relationship which he argues is achieved through relinquishing user control – through randomness and chance discoveries

People are consumers of meaning not materials, people consume to fulfil their ego needs. They assimilate the products they buy into their identity. Identity changes and evolves making the old subject-object relationship obsolete. The user should be able to change the product to reflect their identity and (hopefully) reinvigorate that relationship.

Secondary Research

Another point he makes is that many of the anonymity and convenience of newer products remove the emotional element from the user experience. Reintroducing a ritual into using the product, the user-product relationship is strengthened.

This idea of ritual reinforces the need for tactile, audio and visual feedback mentioned in design for circular economies

Products should age, Bridgens (the design journal) stress the need for “a surface patina that tells the story of the object”, this is reflected through classic cars and the teddy bear factor where attachment grows as the fabric ages.

This is why I am attracted to the prospect of using reclaimed wood or leather in my product. Materials that age and weather.

Next steps

Research product specifics:

- What makes a good speaker?
- How are they manufactured?

Bring research down to earth:

- Break into actionable goals

Disassemble existing product :

- Conduct primary research using the existing product to establish a datum?
- Carry out eco-audit of existing product
- Investigate the efficiency of the existing product, which may need help from Abishek

Circular Economy

Designing a business model – not just a product.

Identified applicable business model for my Product as “Long life”:
High-quality products sold at a premium with a focus on after-sales support

Identified product category life cycle as “Decline” which shaped design priorities:

- Product Durability
- Standardisation and compatibility
- Maintenance and repair
- Dis- and reassembly

Produced a Cheat sheet on achieving these priorities

Emotional design

- Most products are thrown away before they have fulfilled their service life therefore Design for repair and EOL is a short-sighted solution
- Products are bought for ego needs – Self Actualisation and Identity
- Products need to build attachments with their users to prolong their relationship with the user
- This can be achieved through ritual: Audio, Visual / Tactile feedback and Servicing
- Adaptation: Allowing the product to evolve with the user's identity
- Empathy: Allowing the user to connect with the product emotionally, 'Teddy bear factor', graceful ageing – commands respect

'Honest Materials'

Materials that reflect their process of manufacture may help bolster empathy. Departure from Hylomorphic thinking – form and material are inseparable.

Willow baskets – Stone tools – Wooden bowls

Modern examples: Machined metal, 3D prints

Industry Stakeholders

I have Identified Industry stakeholders:

Existing Connections

- Noise, Vibration and Harness (NVH), Audio and Environmental at Jaguar Land Rover
- English Acoustics
- Nick Rowan - Acoustics background

UK Based Speaker Manufacturers

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Speaker Design

- Frequency response dictates the sound characteristics of the speaker
- It is very hard for one driver to cover all hearable frequencies, so multiple will be needed.
- What makes a good speaker is highly subjective
- For an audiophile the perfect speaker would have a completely flat frequency response and play the input signal without any deviation
- Where as the average consumer may prefer a stronger low-end frequency response (producing more bass)
- Enclosure size and style can affect frequency response

Initial ideas

- 3D printed body using recycled material – Honest materials

- Focus on modularity and design for repair – Adaptability / Design for Repair
  -Tool changer style plate to change frequency response and sound characteristics?

- Detachable fascia panel made from reclaimed wood/leather/denim – Graceful ageing, Empathy and Adaptability

Next steps

- Write product brief/specification
- Write questions for industry stakeholders
- Dissemble the product and test
- Research speaker design further
- Complete ethics form
- Write methodology for user testing
- Develop a methodology for testing efficiency

Stakeholder Interviews

Waning interest from original stakeholders
-JLR
-English Acoustics

I have organised Interviews with (new) relevant stakeholders

Abby Hatch – Sustainable Design Engineer
Nick Rowan – Senior Lecturer Product Design – Extensive Audio background

Tentative Interview with Harrison Martin – Design Engineer at Dyson

Stakeholder Interviews

Questions:

- How would you do redesign a speaker to fit better fit circular business models and upcycling?
- What are the barriers preventing businesses from adopting more sustainable business models?
- In your opinion is industry adopting sustainable design practices, if not, why?
- Are their any innovation gaps within your industry preventing sustainable designs coming to market?
- Where do most Sustainable design projects fail or fall short?
- Why do consumers through away products that work?
- One of my main focuses is to allow the speaker to evolve with the users identity with the goal of establishing a deeper emotional connection with the product and extending its service life. I aim to do this through customisation and modularity, what do you think of this idea?

Stakeholder Interviews

Questions - Nick:

- What standards would you expect in a speaker in terms of connectivity and features?
- I have an idea for a tool-changer style module that would allow the user to change the sound characteristics of the speaker and quickly replace broken components, what do you think of this idea?
- Would using screw terminals to wire drivers introduce noise?
- Likewise, would using pin headers for the audio amp circuit board add noise?
- Are their standard connectors for wiring speakers? Are they easy to remove and durable? If not are there any alternatives you are aware of?
- Are there any common pitfalls when designing a speaker?
- Do you know of any good resources for Audio-Amplifier design?
- Are passive radiators worth using?

Reverse Engineering

Lessons learnt:

A nightmare to dissemble!

- Small screws are easy to strip
- Snap hooks
- Glue
- Seals

Two “Dummy speakers” / Passive radiators – Used to improve bass

Two midrange drivers – asking a lot from two drivers and therefore struggles with mid+high frequency response. (Use more drivers/driver types)

It has USB C but it does not meet USB C standard, it is used only for power and not for data

Impressive PCB design – fit a lot into small spaces but they use a daughter board that is soldered directly onto the main board.

Research Report

When is it due?

What is in it?

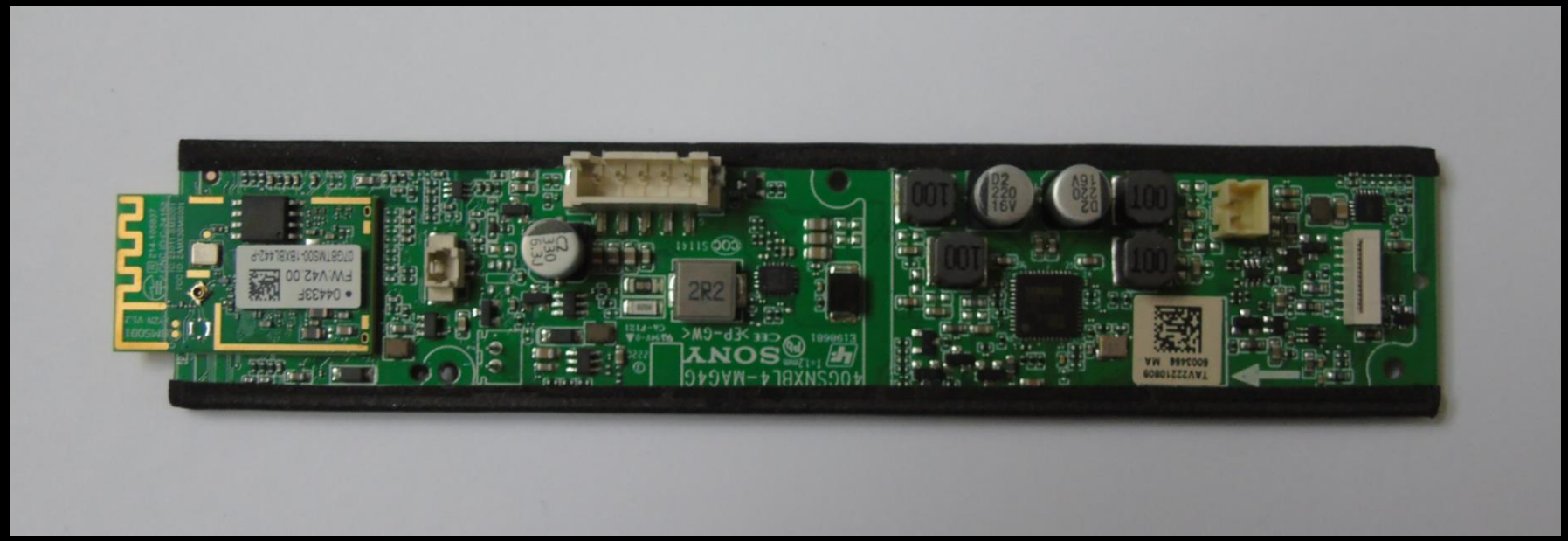
What citing system do we use? Harvard, APA, ect…

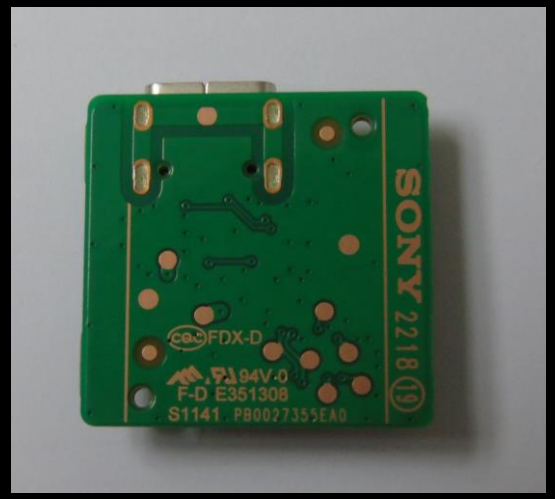
Is there an example or template we can follow?

To do

- Finish writing interview questions and get feedback on them
- Eco-audit and photograph speaker parts
- Finalise dates for Interviews
- Start research report

Product Analysis – Sony SRS-XB23



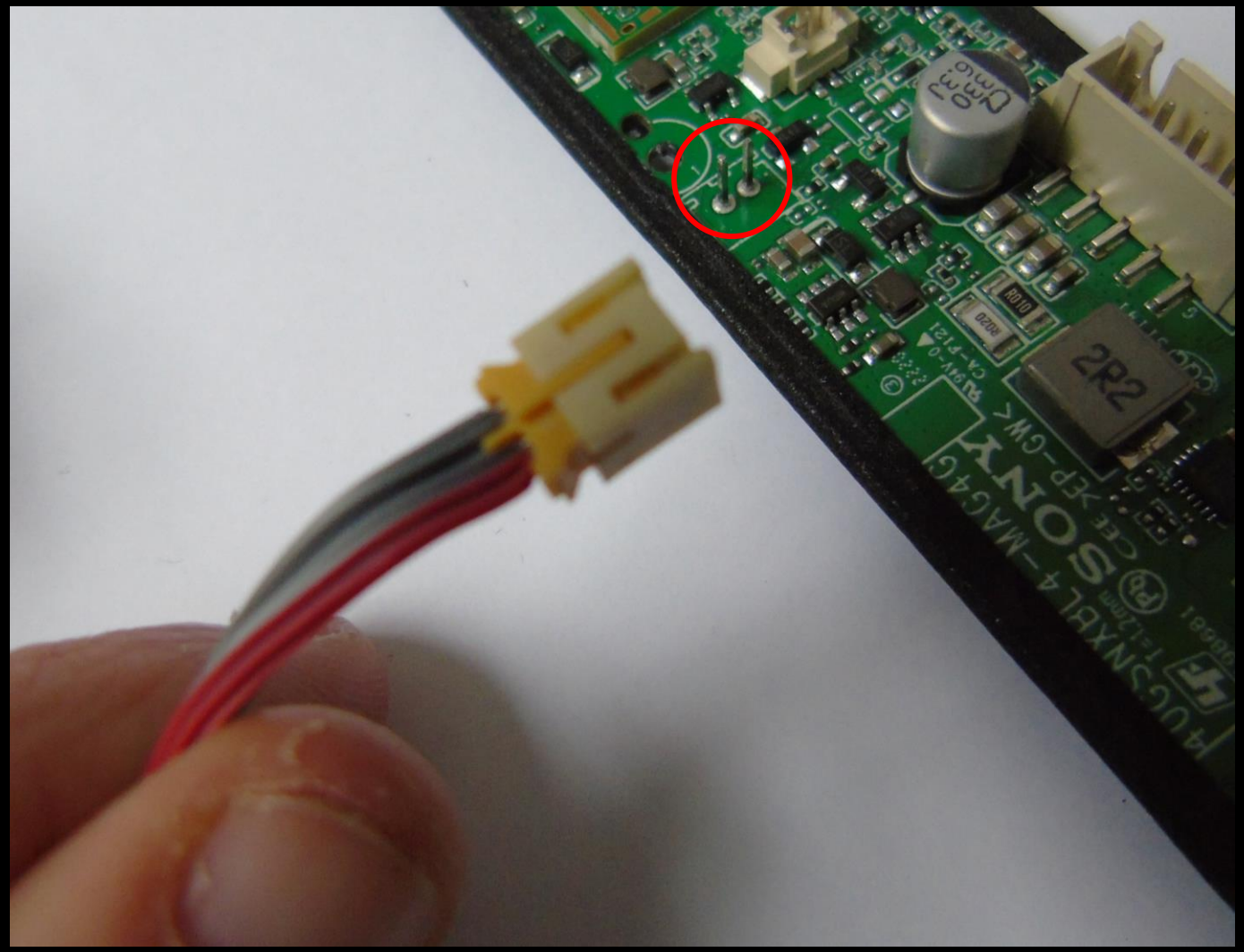


Notice anything about these PCBs?

All of the Components are SMD, even the ones that really shouldn't be!

Cost saving measure – makes components fragile as they are more easily levered off the board

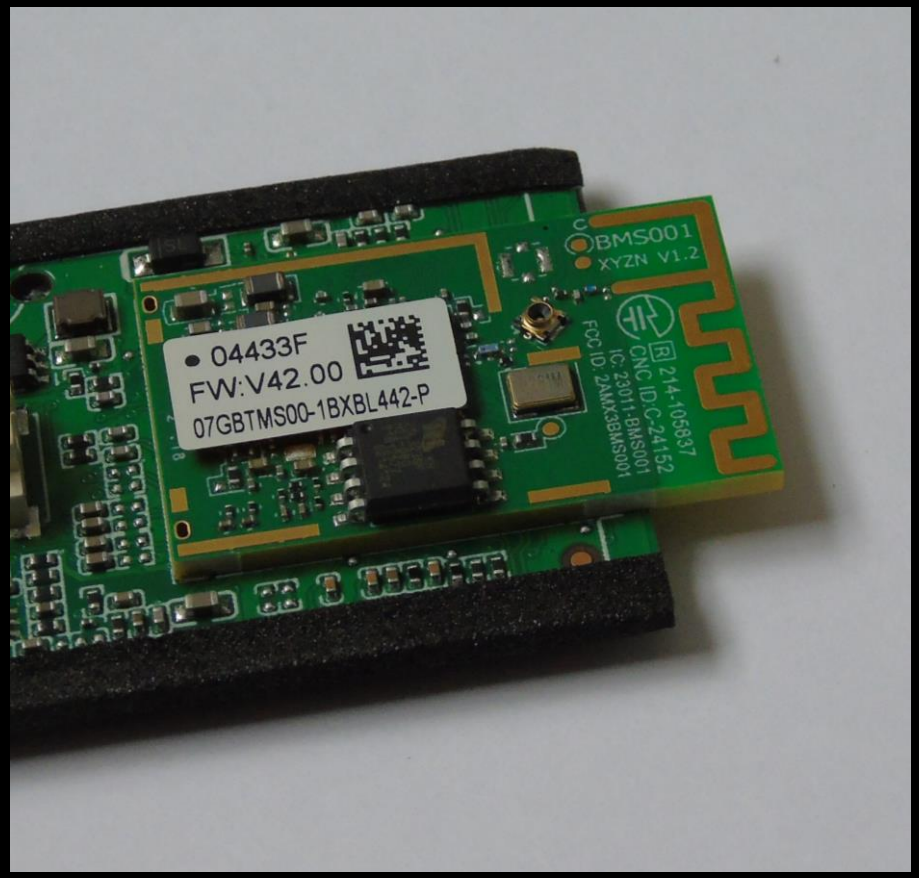
Product Analysis – Sony SRS-XB23



This is why we use Thru-hole components for connectors!

How is it acceptable for a connector to have a duty cycle of 1?

Product Analysis – Sony SRS-XB23



Missed opportunity – Why is this Bluetooth daughter board Soldered on?

It could be a modular component

USB-C Standard not properly implemented only carries power and not Data, no way to update firmware without Bluetooth

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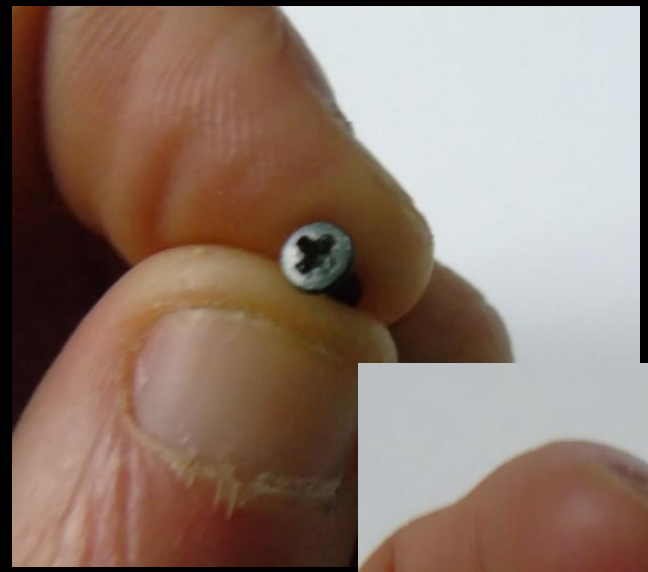
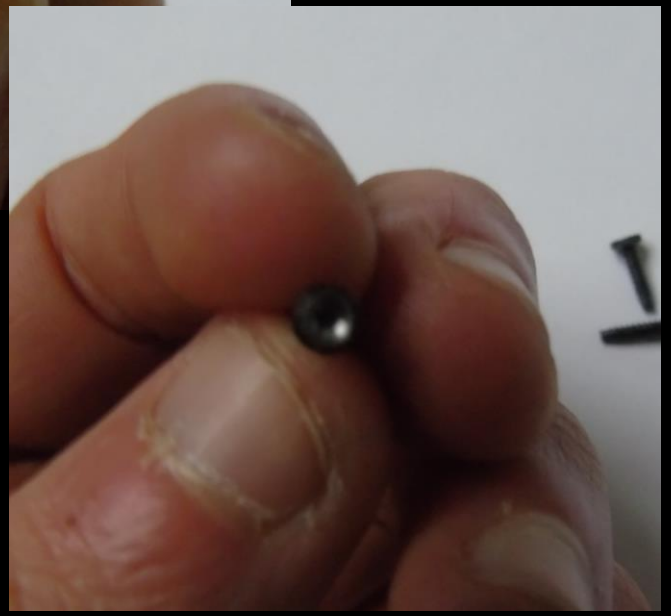




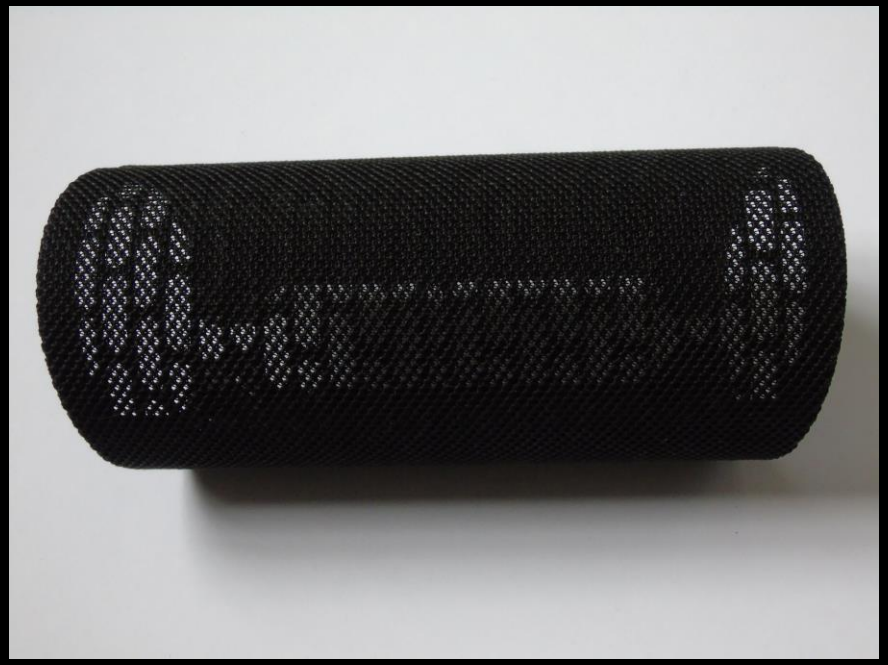
Tiny pan head screws are very easy to strip and one had to be drilled out

Several glued components

Product Analysis – Sony SRS-XB23

EOL Disassembly is complicated by ABS + Nylon/Poly Mesh

“Monstrous Hybrids” these materials have been mixed in such a way they can only be downcycled, and are lost to the Technosphere and cannot be recirculated.



Recycled Filament

Secured FDM Machines in Queens

Prusa I3 MK3S(s) Available – 210x210x250mm Build Volume

Prints can’t be run overnight due to fire hazards but Pause-and-Resume is in place.

Lead time can be high but there should be good availability after Easter

Files provided as STLs or Presliced Gcode

Filament needs to be ordered through CEM Orders:

- They need product URL and Research code
- Order Sooner rather than later
- Prefer UK Suppliers – 3DJAKE rPLA looks to be the best option
- Any other components we should order as well due to exceptionally high lead times

We need to know who wants to Utilise these facilities so we can order correct amount of filament

Stakeholder Interviews

Abby Hatch – Sustainable Design Engineer
Nick Rowan – Senior Lecturer Product Design – Extensive Audio background

Trying to organise a third interview with Seb Ward – Industrial Designer at Mixx – Recently worked on a Speaker

Nick highlighted that I hadn't properly identified my target audience and suggested that I avoid targeting enthusiasts because by making a speaker more sustainable there would inevitably be compromises that affect audio quality.

We did talk about possible ways of changing the sound to suit particular users and other options rather than changing audio-amp electronics. By manipulating the shape of the speaker (which could be done through modular accessories) you could change the reverb or frequency response but again this might not appeal to the mainstream user.

Instead, Nick suggested that the narrative of the speaker would be more important to the consumer and that it should proudly display its upcycled status and spark conversations.

Interestingly, he argued that there are two classes of products perpetual/disposable and that speakers are perpetual products and are not 'consumed' for ego needs and therefore wouldn't need to be refreshed through customisation.

Stakeholder Interviews

Abby disagreed on this point and was a strong advocate of the idea of customisation, she particularly liked the concept of changing the material of the fascia panel.

On modularity, Abby suggested that connectors and standards should be drop-in components which could be changed out if a new standard is introduced. She pointed out fairphone as a source of inspiration that comes with a guarantee to meet future standards.

Something both stakeholders pointed out is the danger of gimmicks. Customisation should not be a gimmick, it needs to be well executed and the user should get enjoyment/satisfaction from the process. Abby suggested good design, ‘timeless design’, is simple and that I should keep the same core layout and features with each customisable element of the speaker.

Something that Abby highlighted and I feel is of particular concern is safety, by upcycling, we are introducing various unknown materials and chemicals into our product so it is important to properly vet all the materials used for potential health hazards.

We should also make it clear to the end user what exactly the speaker is made up of to help with the future reuse of the material, I like the idea of an “upcycling passport” as suggested in cradle-to-cradle which contains all the relevant information need to reclaim as much material from the product as possible.

Stakeholder Interviews

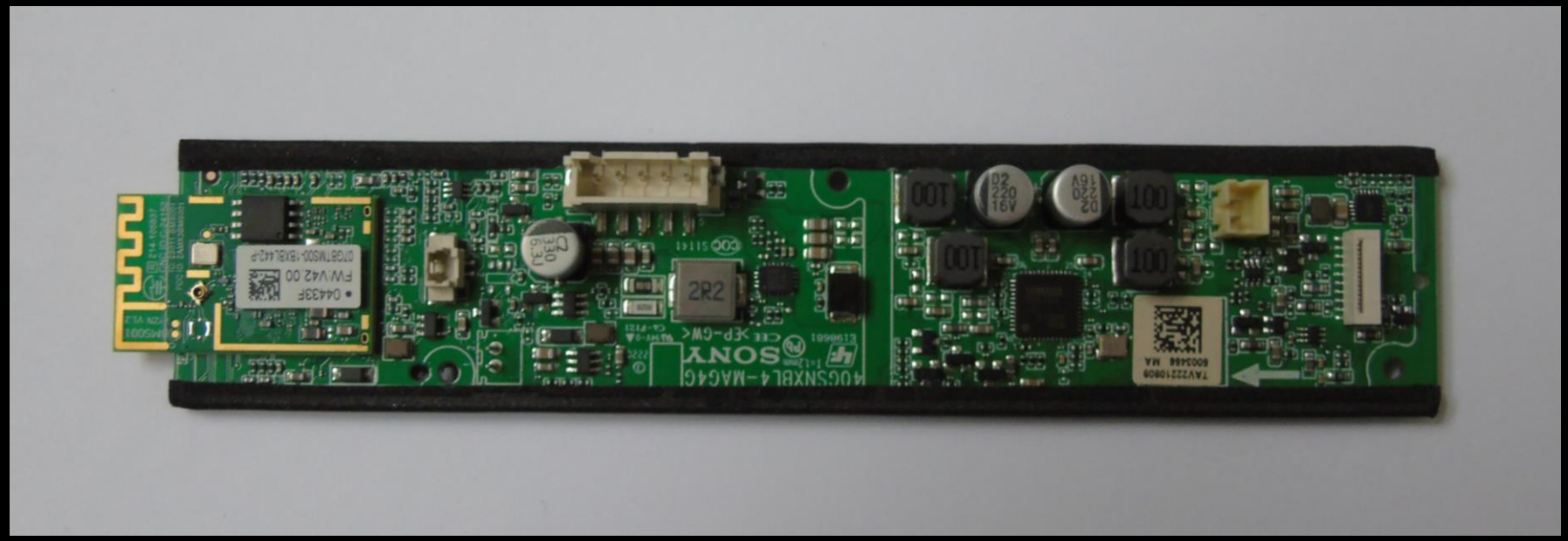
One of the key barriers to sustainable design, as Abby highlighted, is infrastructure such as recycling plants. Therefore, I feel it would be best to research what infrastructure currently exists locally and build the product around it.

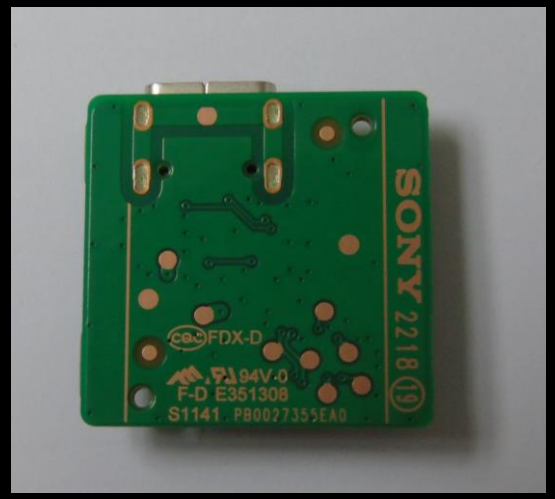
Both highlighted the need to prioritise the user, what are their pain points and what do they want? Why did they throw away or stop using their last speaker? This is an area I should look into more.

Product Analysis – Sony SRS-XB23

- Compact portable speaker
- 1.25 litres
- 12-hour battery life - Incredibly low power usage, less than 1 watt.
- 2,700mAh Li-ion Battery
- USB-C Interface
- Bluetooth connectivity
- Waterproof and dustproof

Product Analysis – Sony SRS-XB23





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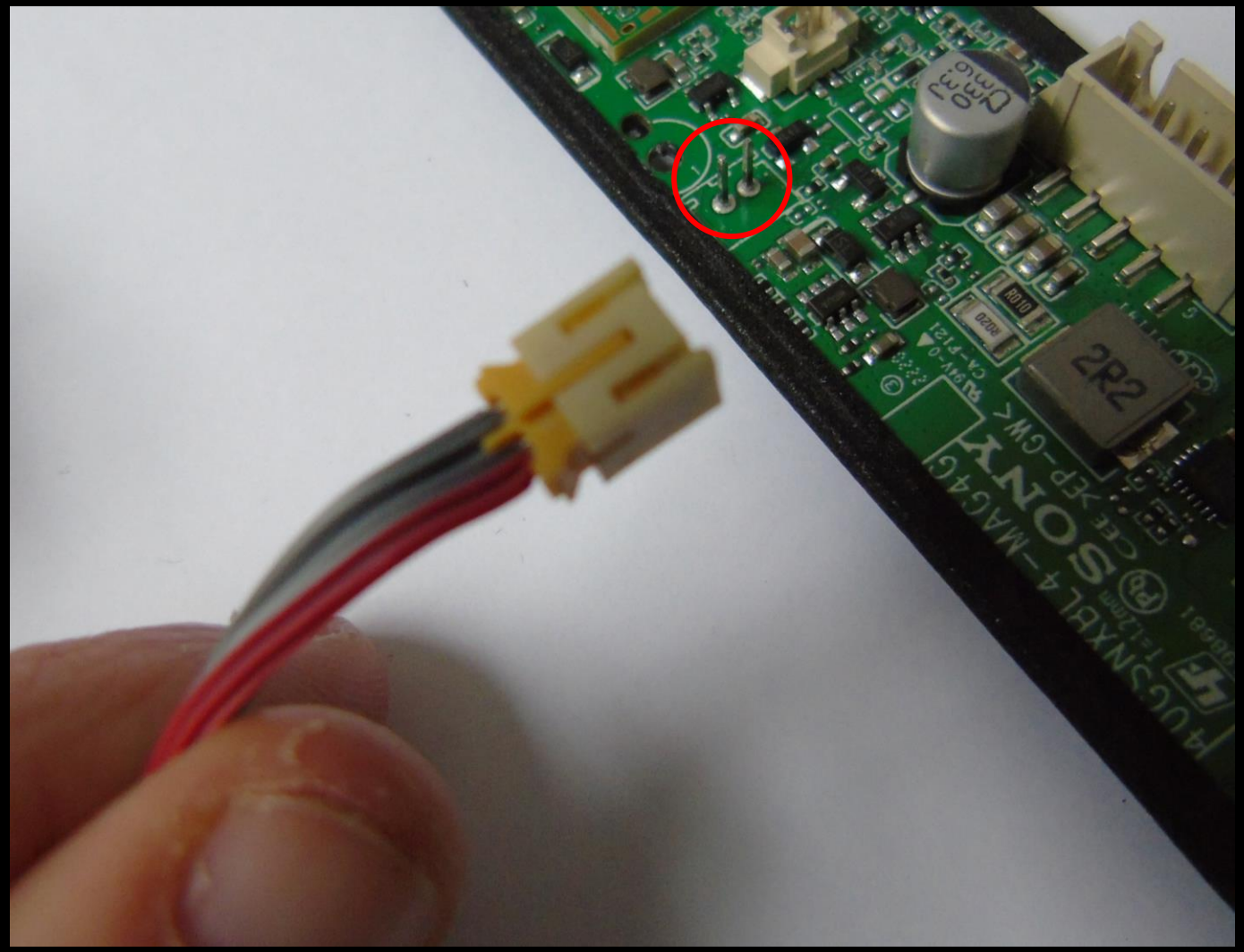

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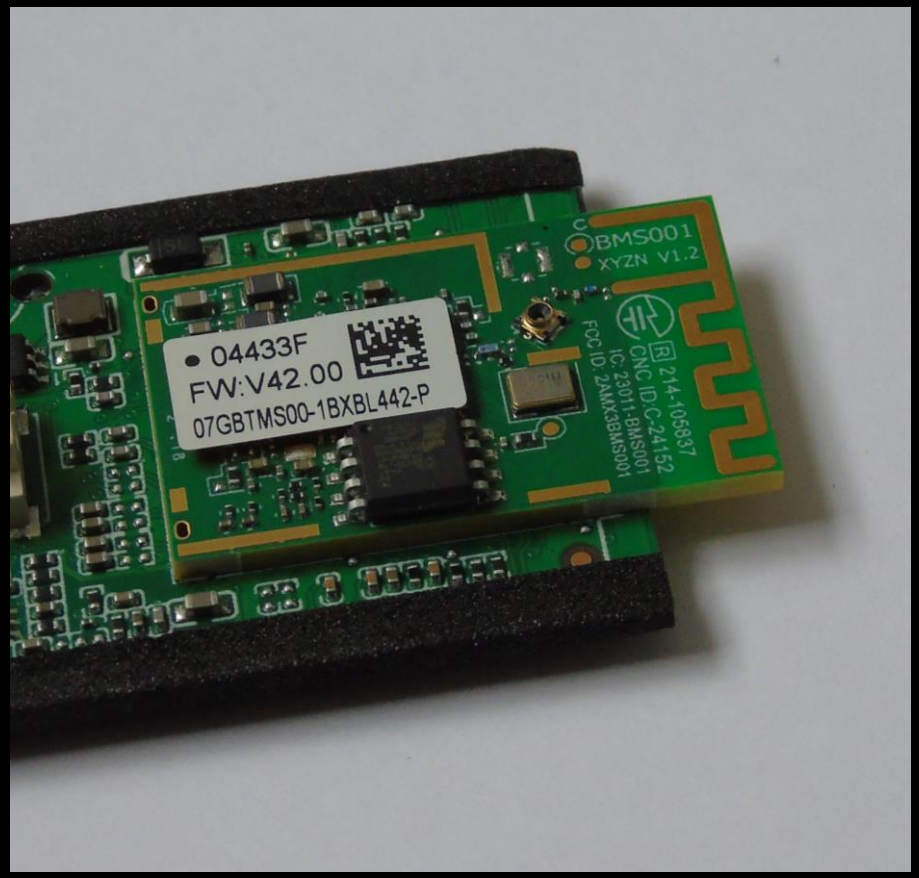

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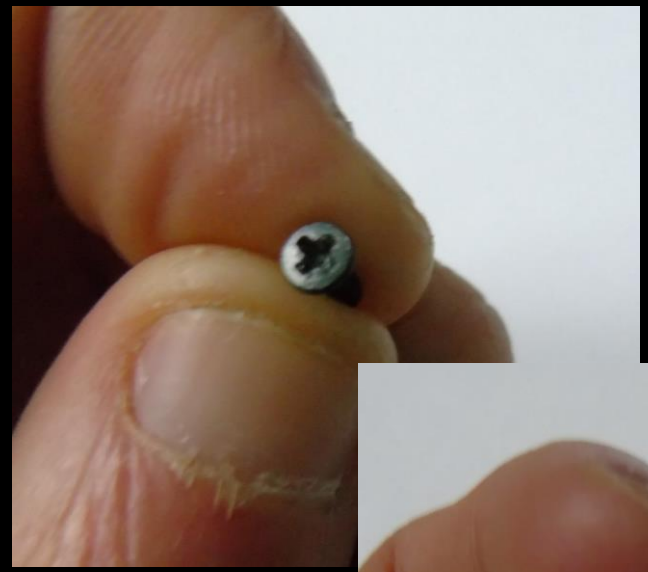
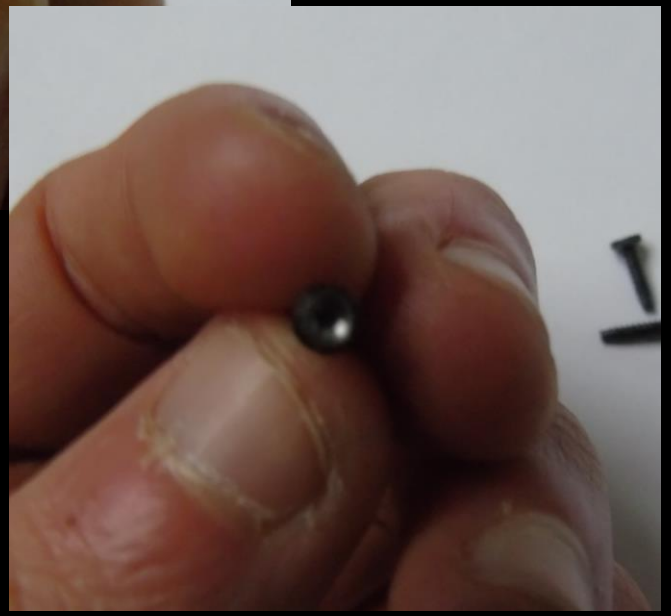




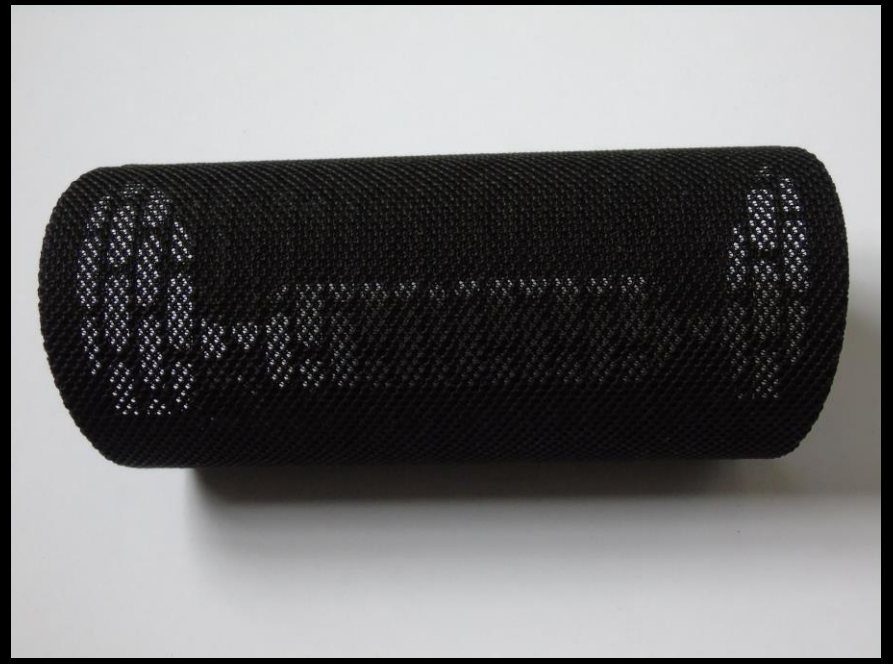
Tiny pan head screws are very easy to strip and one had to be drilled out

Several glued components

Product Analysis – Sony SRS-XB23

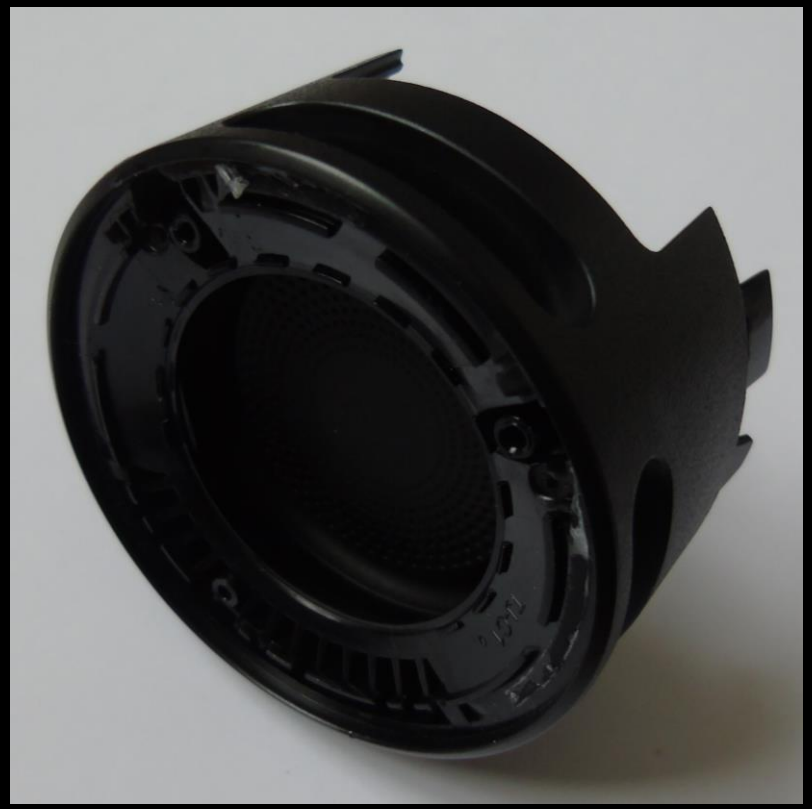
EOL Disassembly is complicated by ABS + Nylon/Poly Mesh

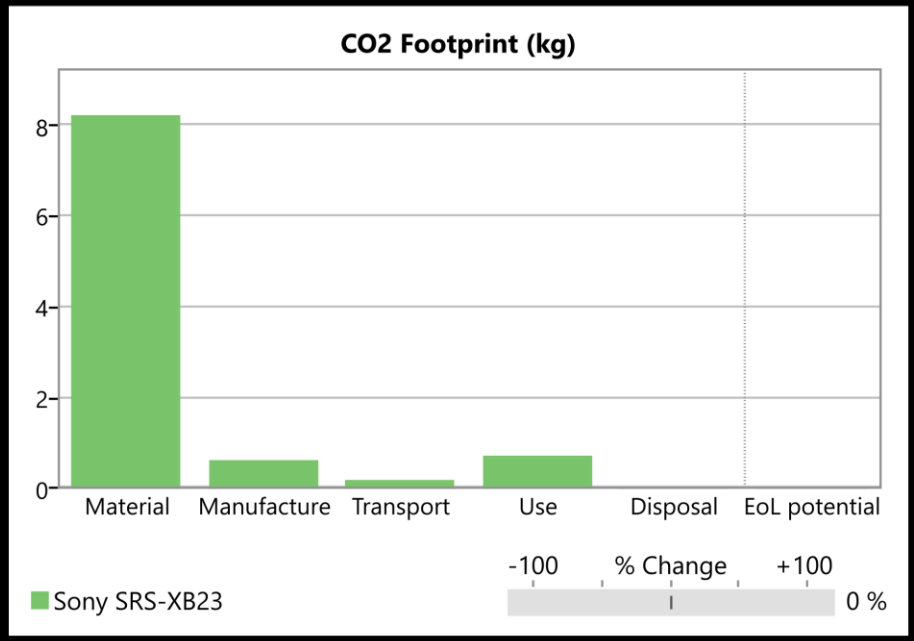
These combined materials have been mixed in such a way they can only be downcycled into lesser-quality blends of plastics reducing their usefulness to industry.



Product Analysis – Sony SRS-XB23

Similar issues with the Passive Radiators which are ABS + Synthetic rubber (SBR)





Product Analysis – Sony SRS-XB23

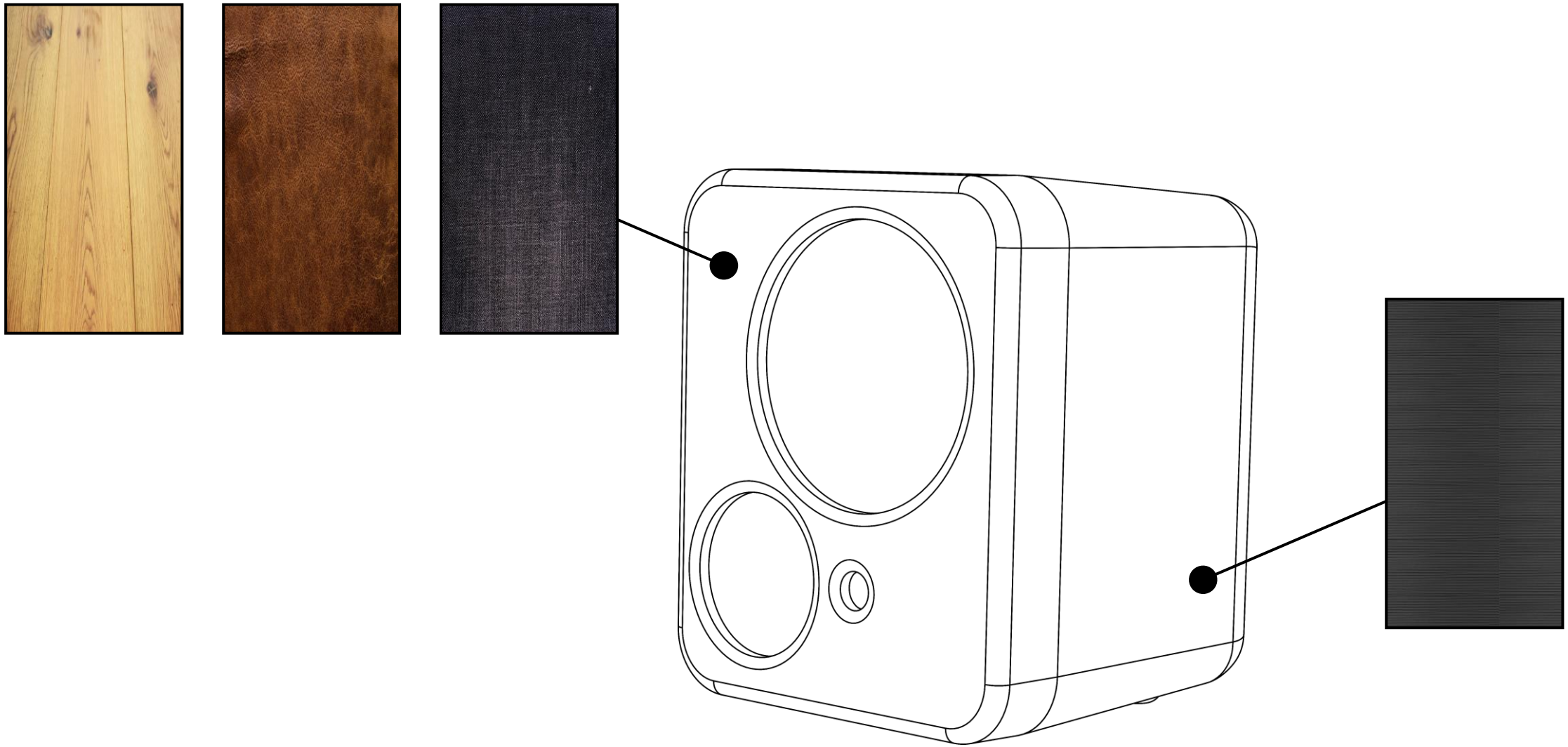
Summary:

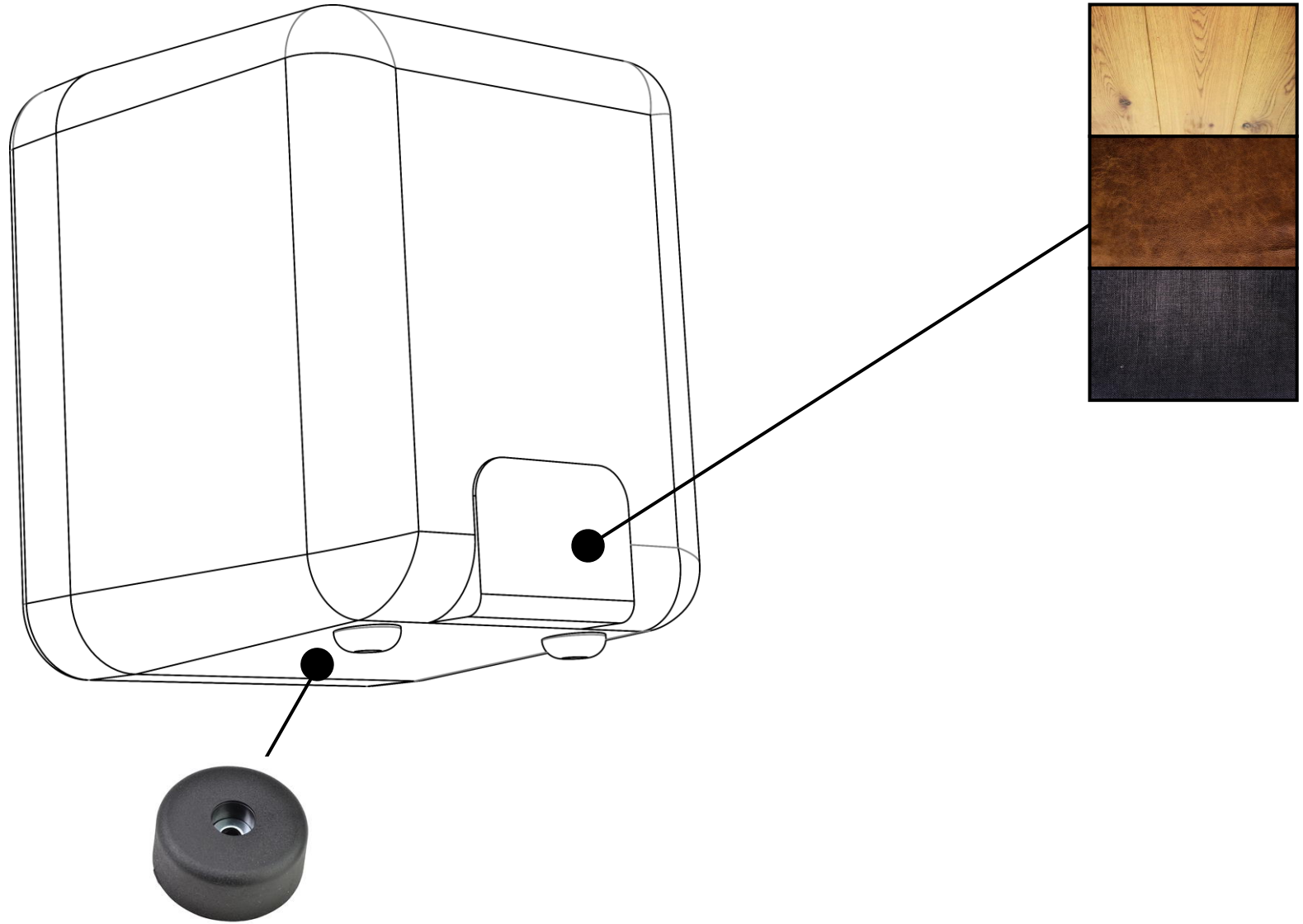
- Over-reliance on SMD Components
- Hard to reclaim materials that have been combined
- Missed opportunities for modular components
- Small screws that easy to strip
- Not properly implemented standards (USB-C)
- Impressive use of space
- Very efficient design

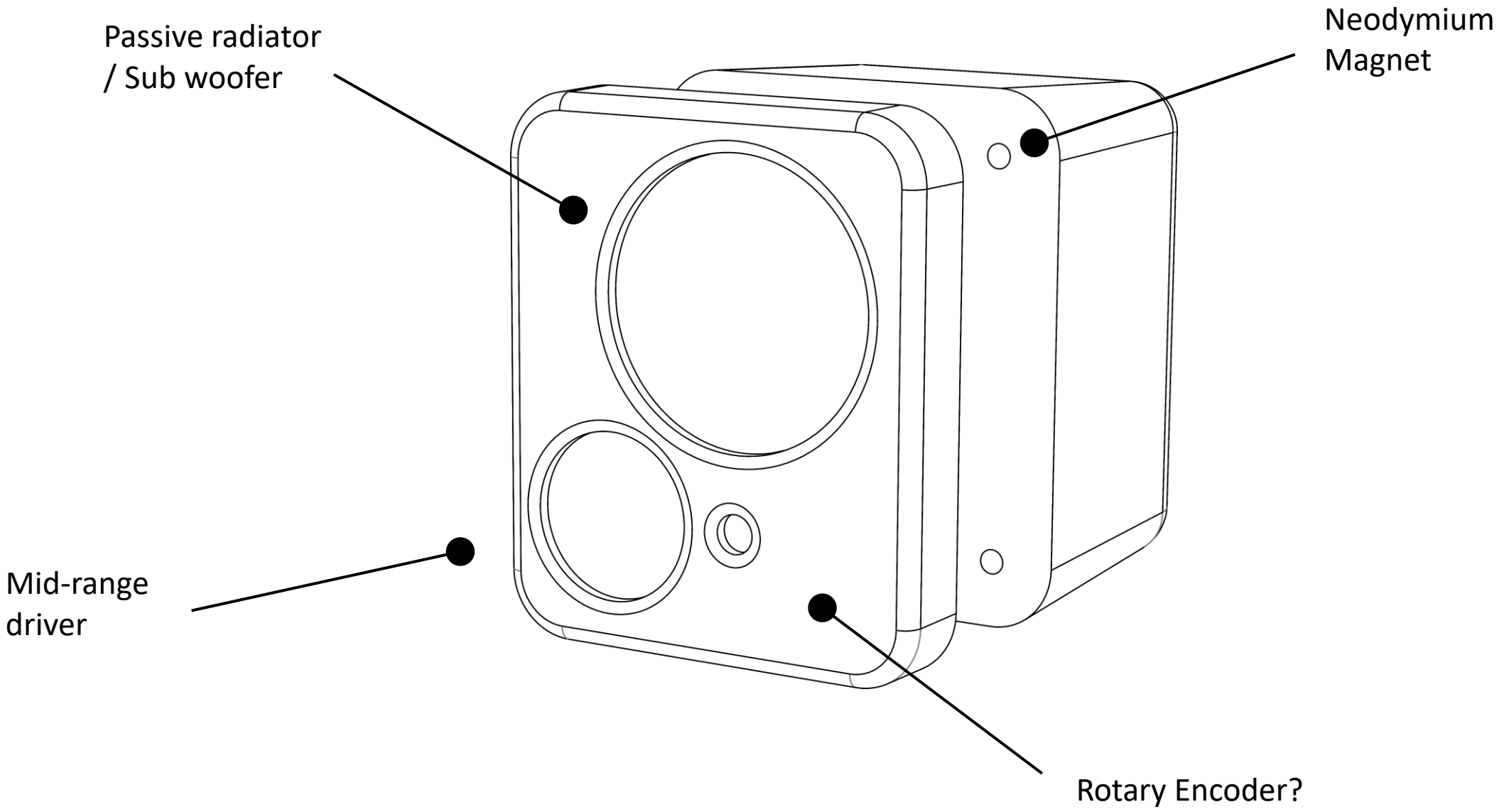
Next Steps

- Organise final stakeholder interview
- Research report
- Rewrite brief and product specification considering stakeholder feedback
- Concept generation!

Feedback?



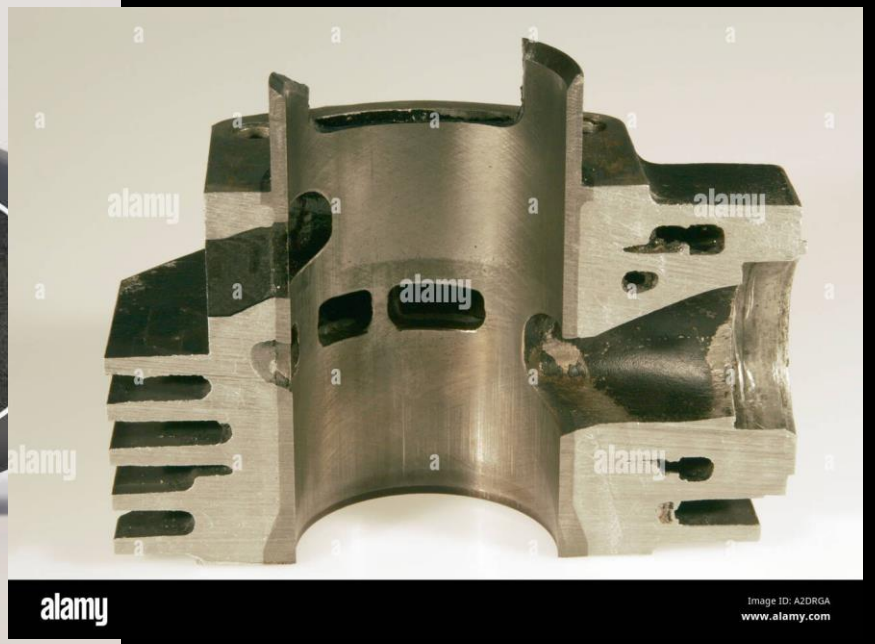



Passive radiator
/ Sub woofer
Neodymium
Magnet
Mid-range
driver
Rotary Encoder?

NP4DCE: Catch up

Concept 1:


dyson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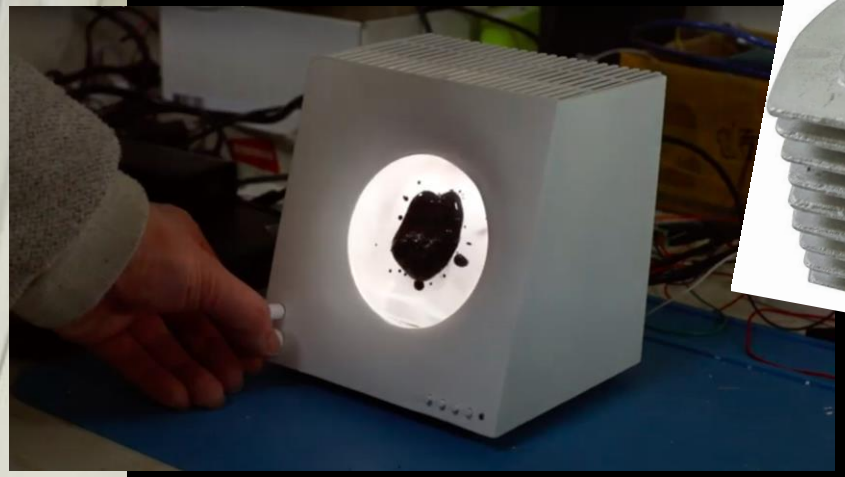
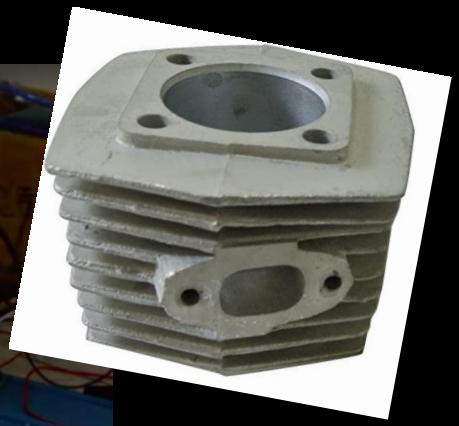
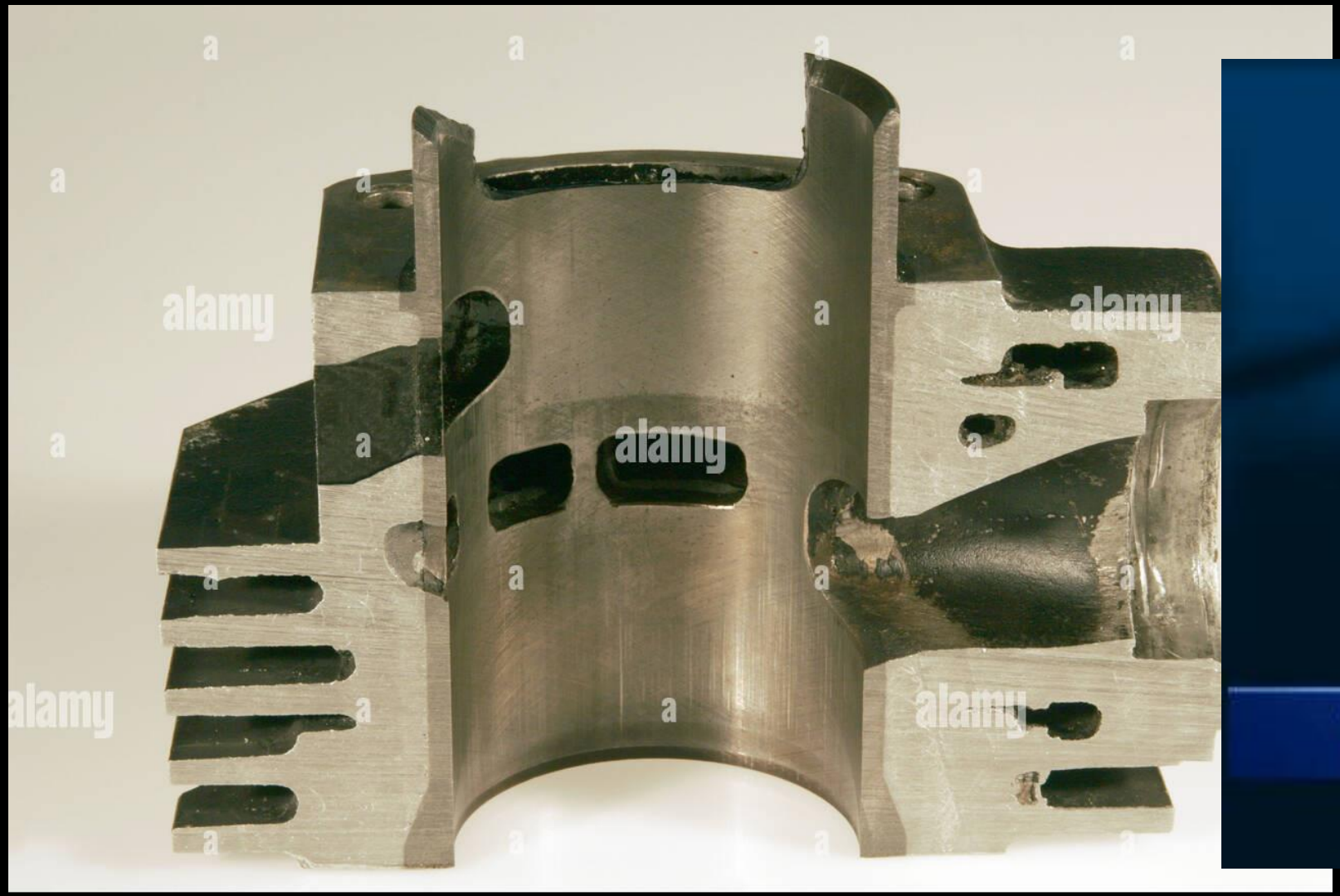
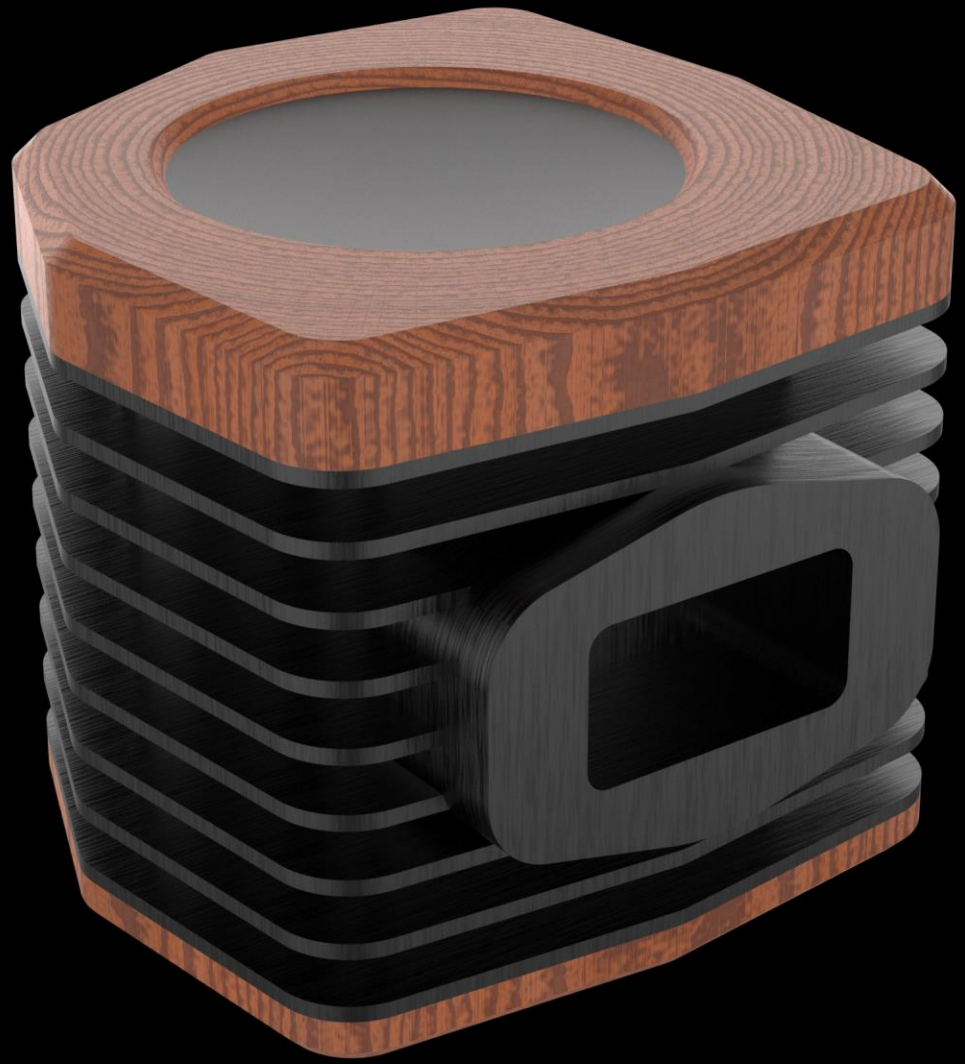
Glenfiddich

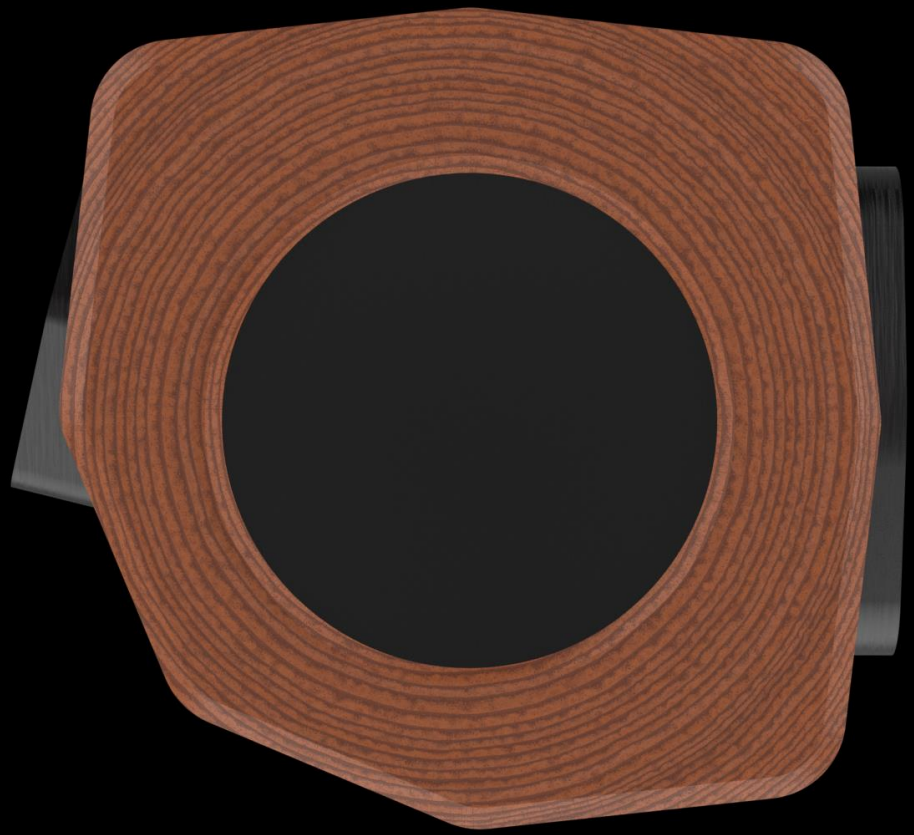







Two Stroke
OUTBOARDS

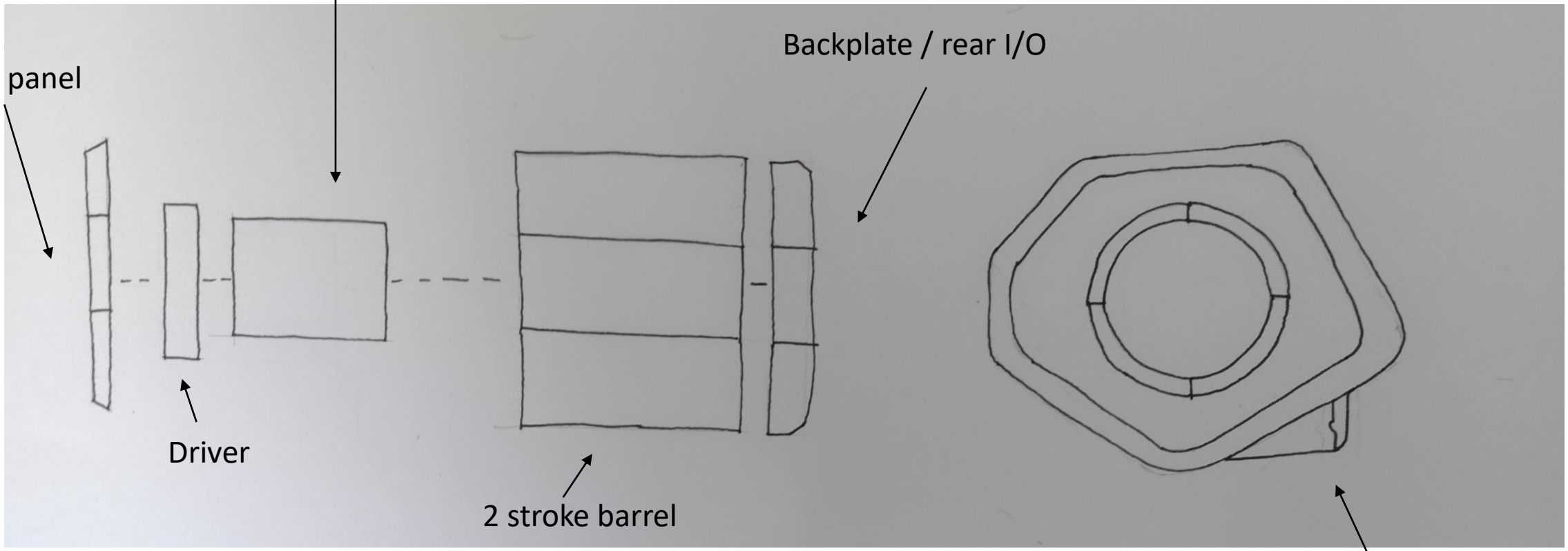




3D Printed / found
object cylinder

Front panel

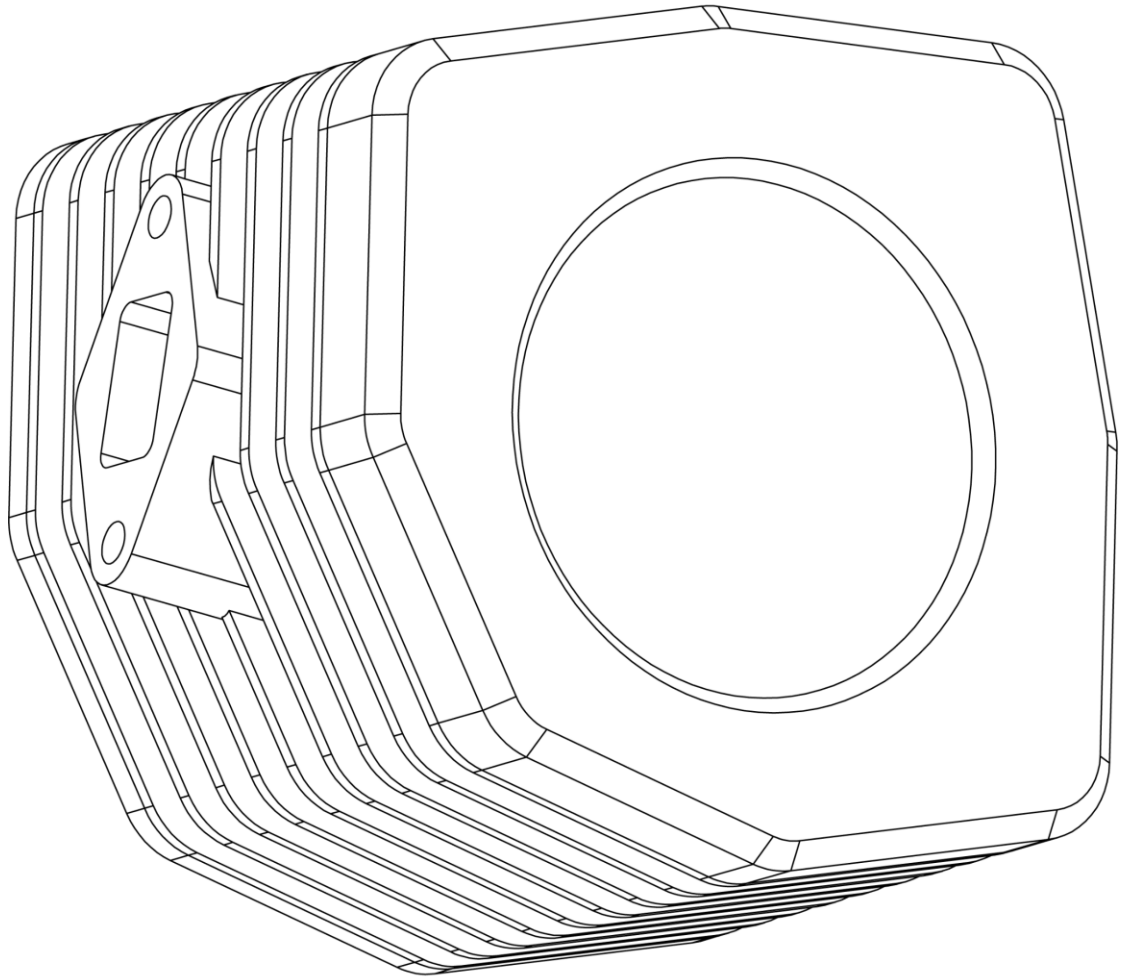
Backplate / rear I/O

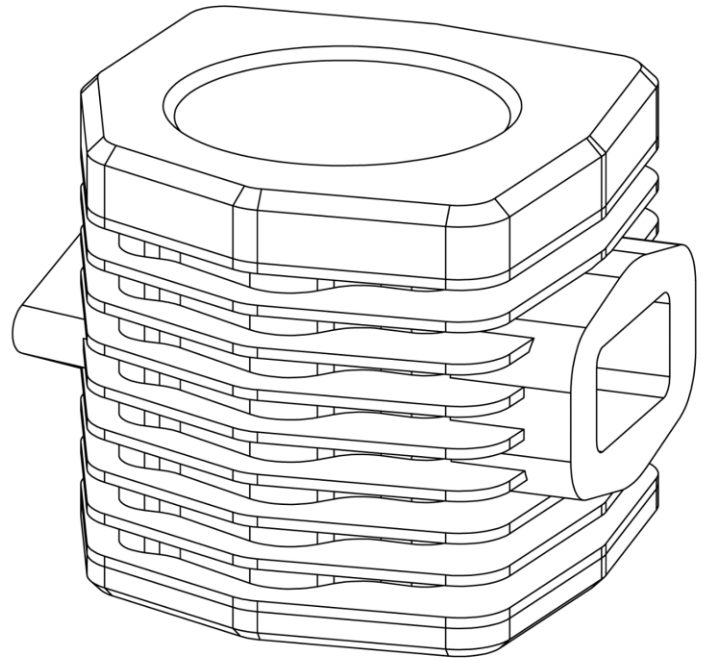


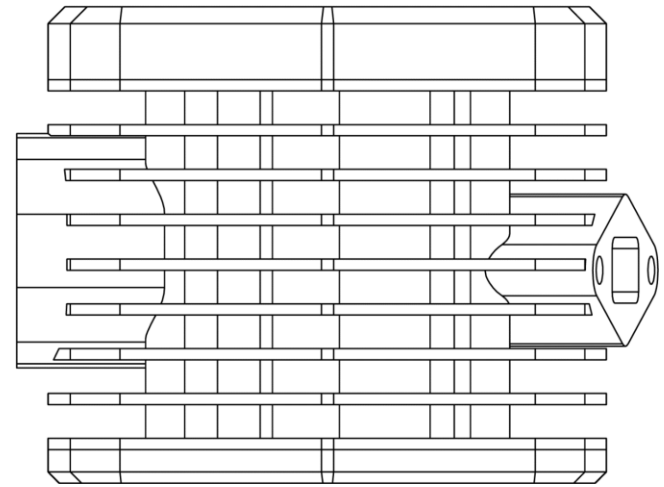
Driver

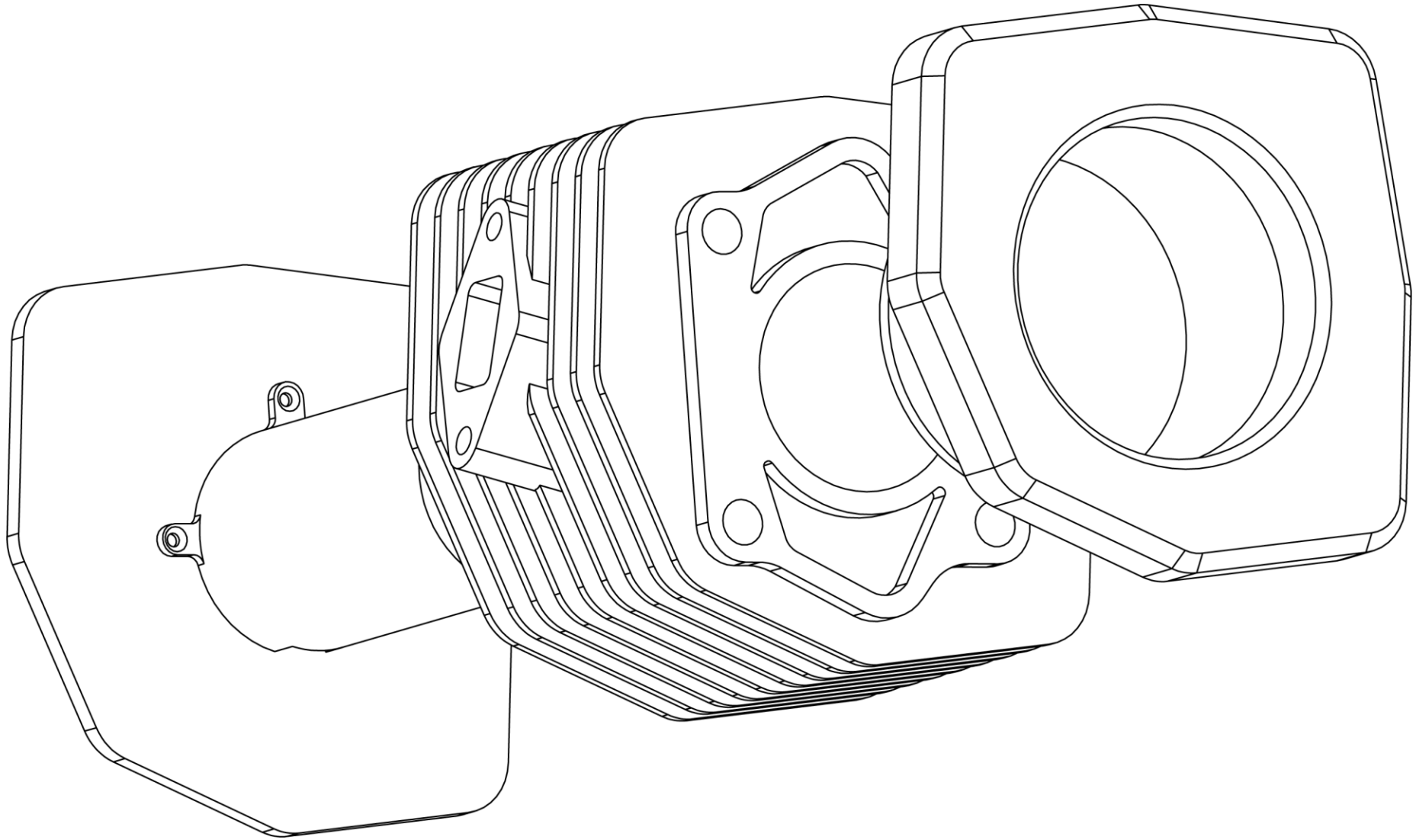
2 stroke barrel

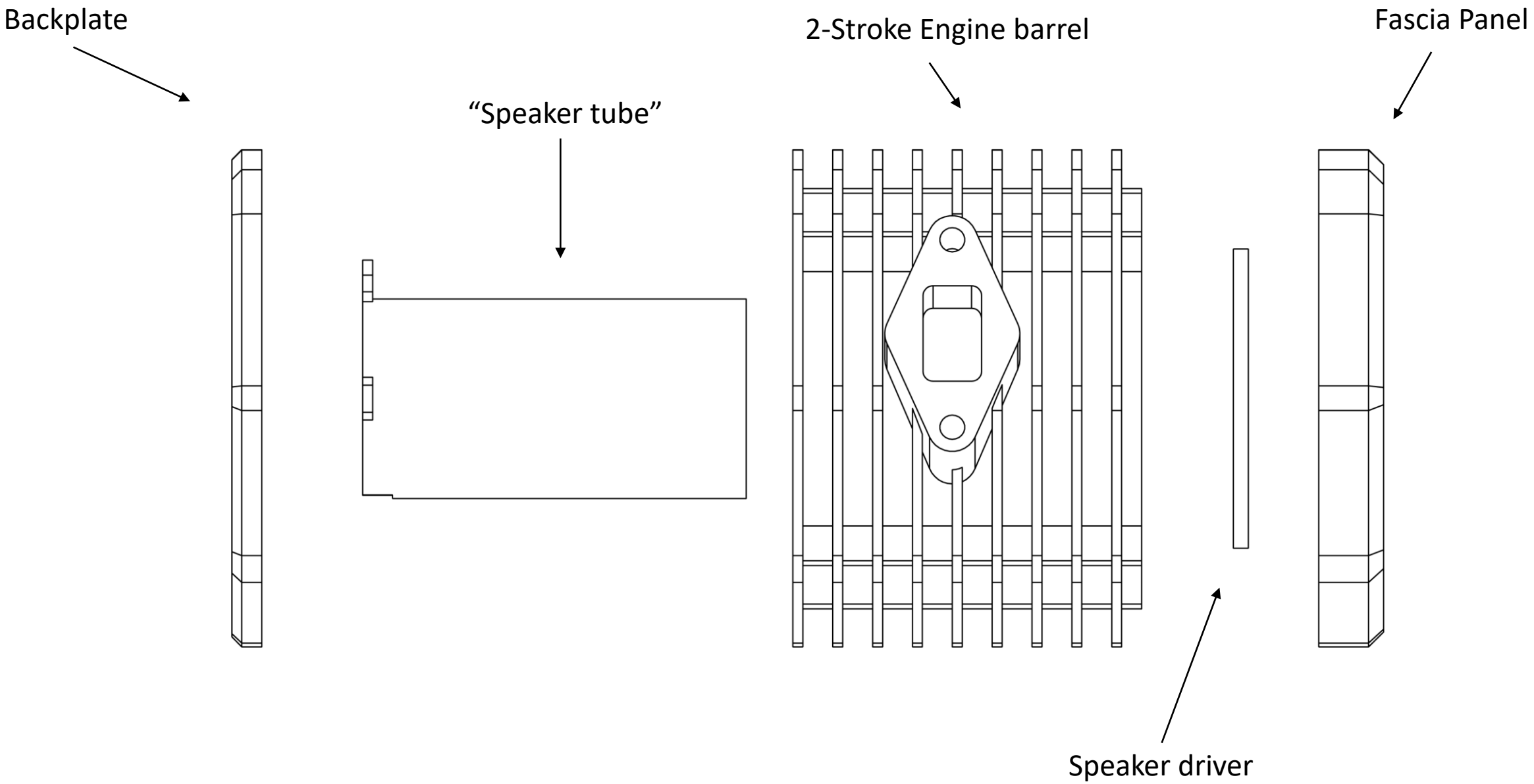
Exhaust port
(passive radiator?)



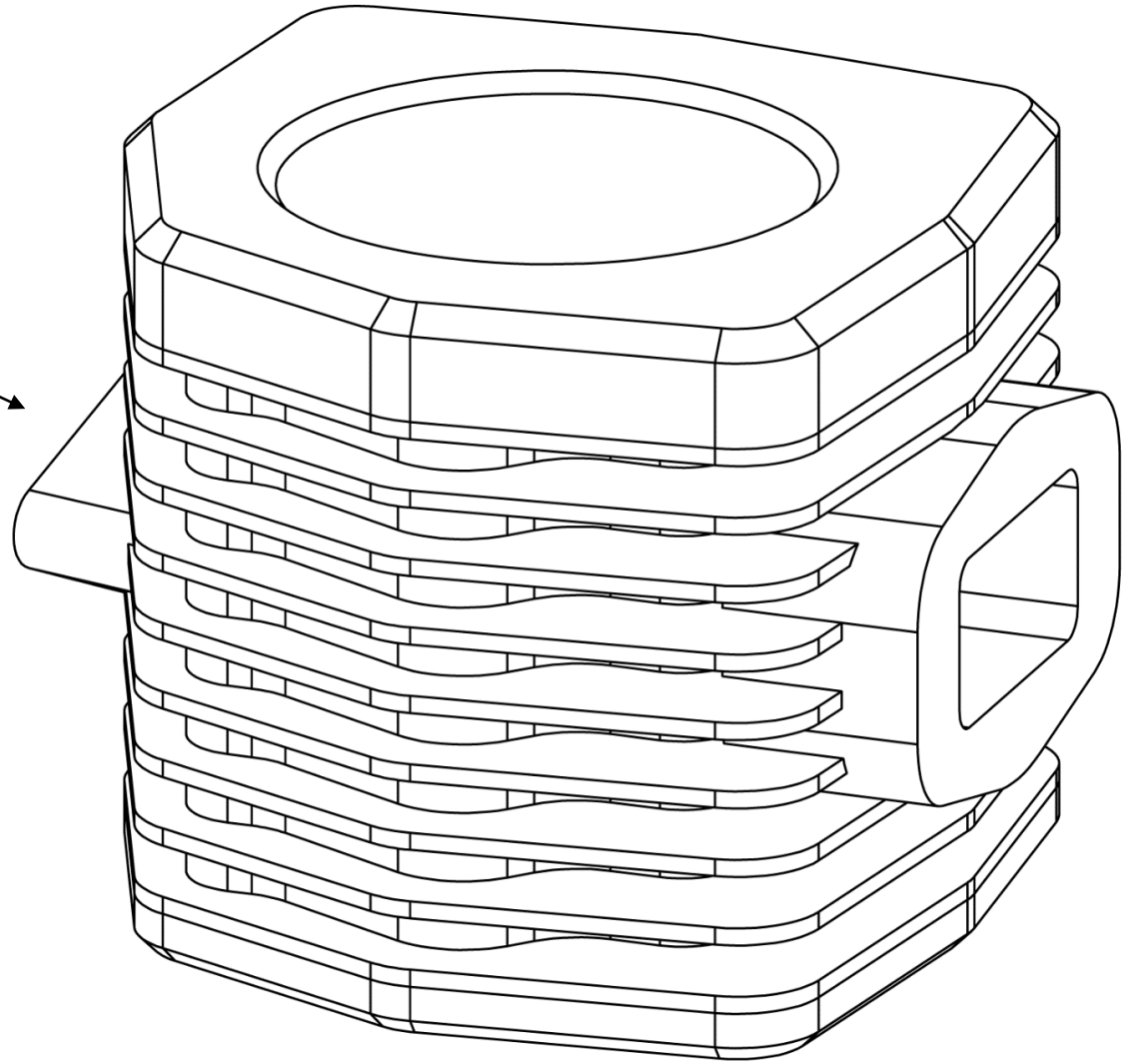


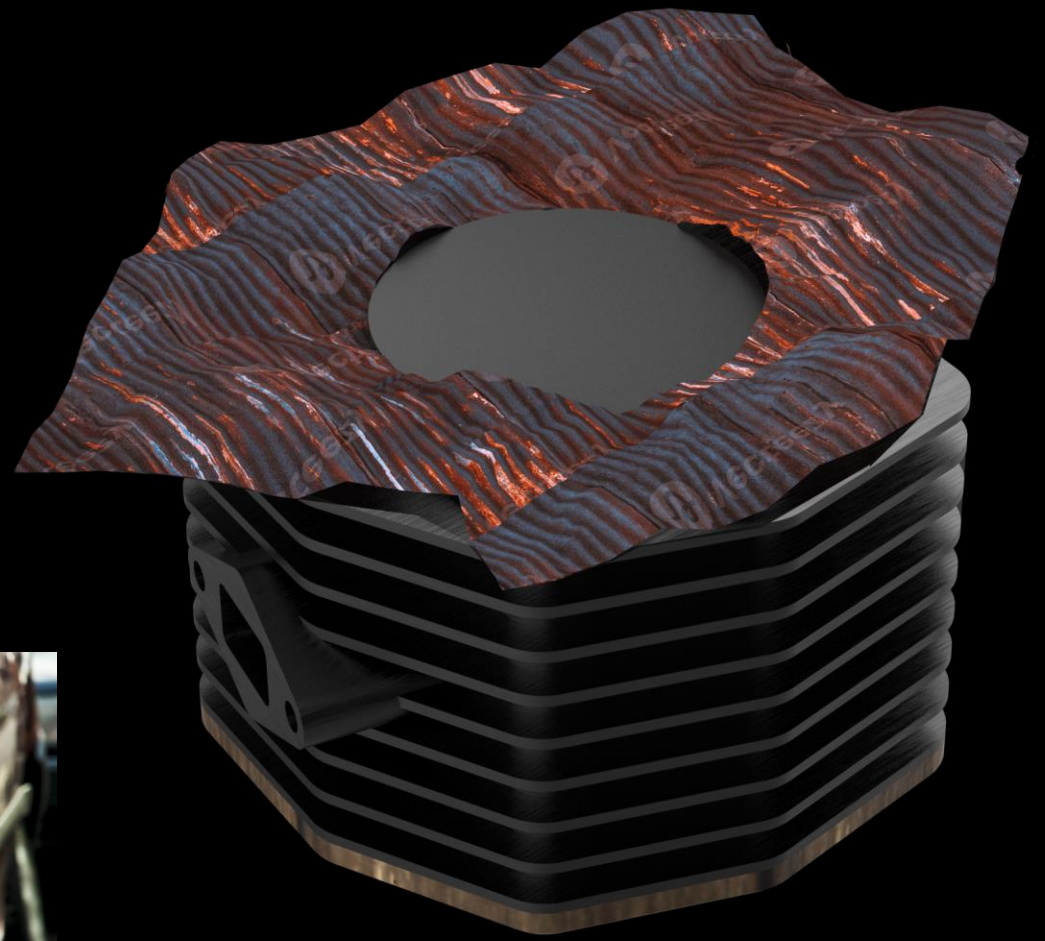





Backplate
“Speaker tube”
2-Stroke Engine barrel
Fascia Panel
Speaker driver


TowerPro™
Continuous 360°
Digital 9g
SG90-HV





LTC4056

Battery / Recharging circuit
Daughterboard

Electromagnet to manipulate ferrofluid

Arduino

Servo motor

Audio Filtering

I/O Panel

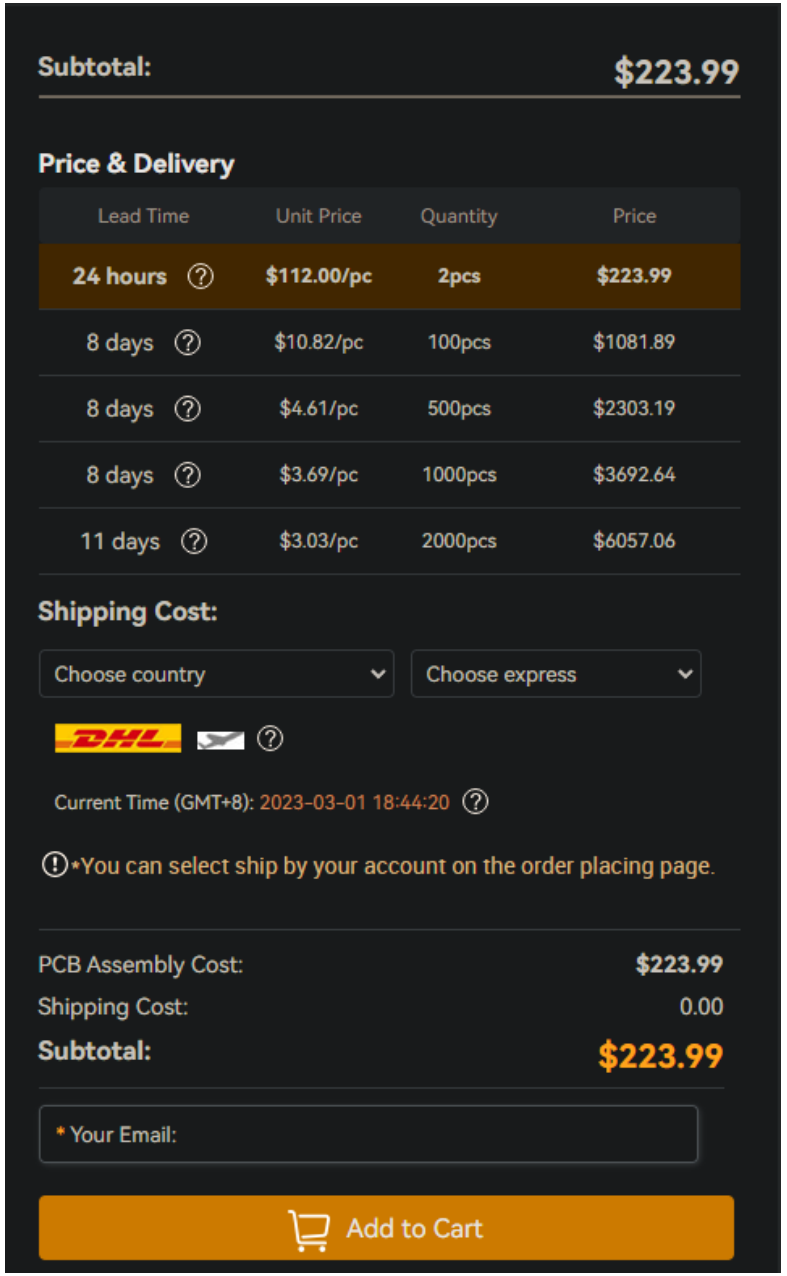
Distribution PCB

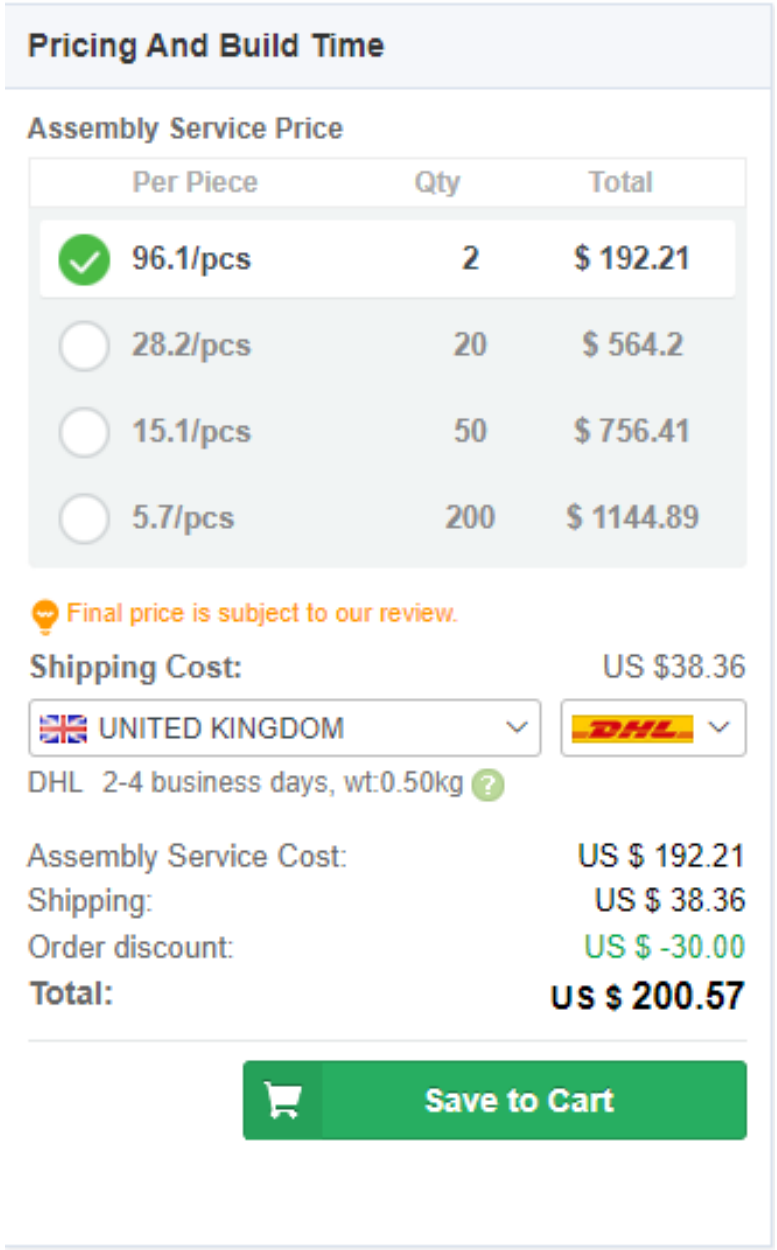
DC-IN

Aux

PCB Mount Wago connector

Tool-free assembly/disassembly





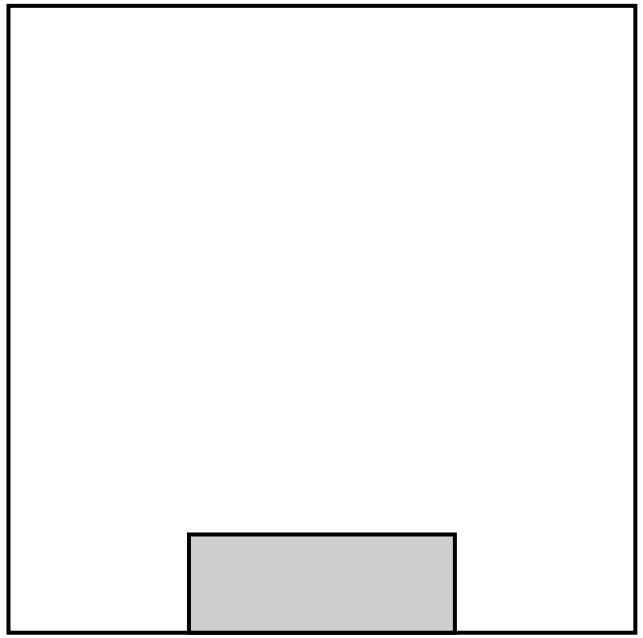
- MOQs
- Set up fees
- Time and added complexity
- A blank distribution PCB avoids expensive setup fees.

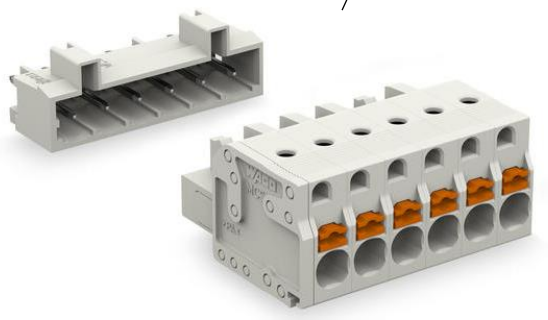
What works and what doesn’t

- Strong upcycling narrative
- Could potentially be quite heavy (2-5kg)
- Found object component limits design freedom
- Could make modularity harder to pursue
- Weight of the barrel could cause the fascia panel to snap?

Concept 2:

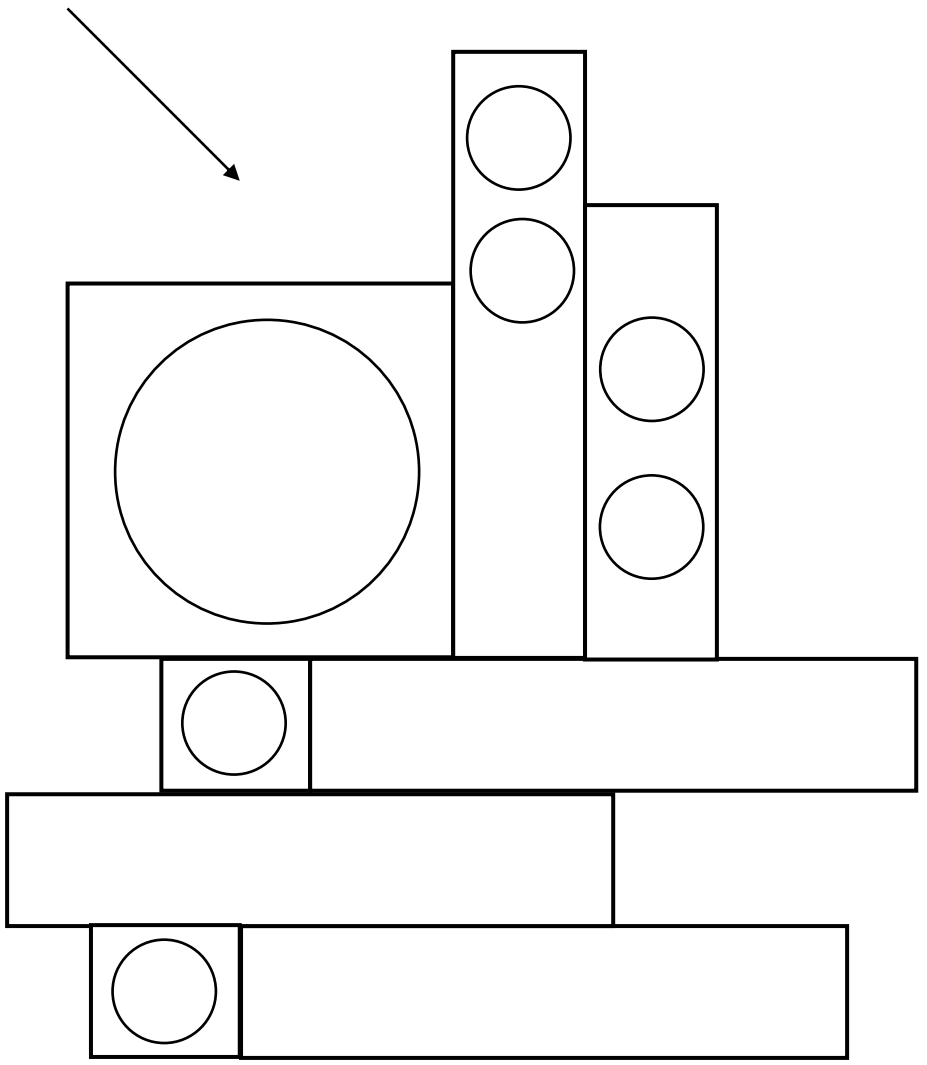

SHOP
ZH
AWS

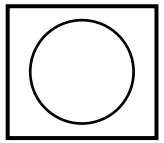




Discrete speaker units connect to the central controller/distribution backplate

Found object as speaker housings

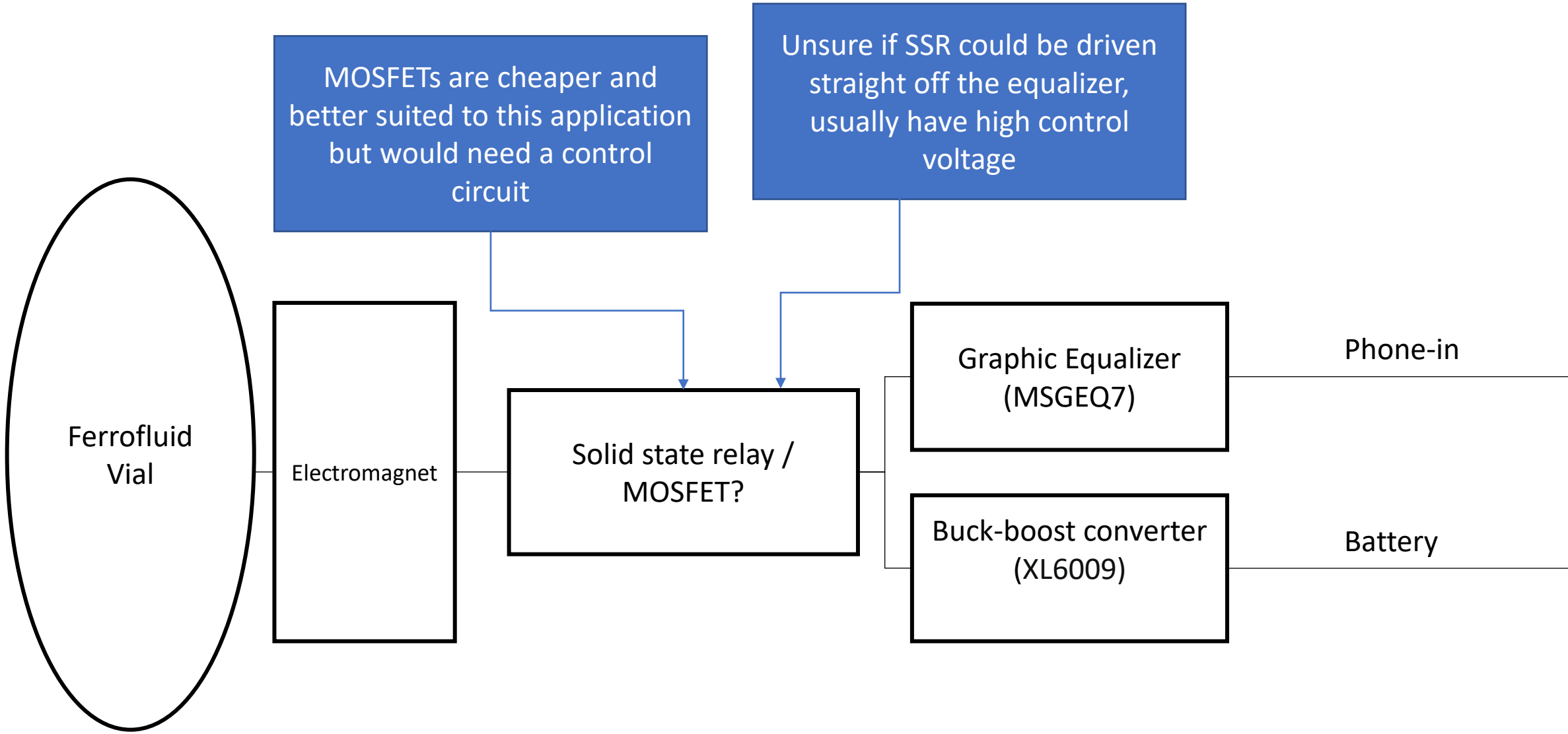




Individual speakers can be removed from the stack and used as a discrete device.

What works and what doesn’t

- Strong upcycling narrative
- Stand out piece
- Added complexity
- Budget limitations
- Party mode issues
- Fire hazard?


MOSFETs are cheaper and better suited to this application but would need a control circuit
Unsure if SSR could be driven straight off the equalizer, usually have high control voltage
Ferrofluid Vial
Electromagnet
Solid state relay / MOSFET?
Graphic Equalizer (MSGEQ7)
Buck-boost converter (XL6009)
Phone-in
Battery

LTC4056

Battery / Recharging circuit
Daughterboard

Electromagnet to manipulate ferrofluid

Arduino

Servo motor

Audio Filtering

I/O Panel

Distribution PCB

DC-IN

Aux

PCB Mount Wago connector

Tool-free assembly/disassembly

Buck boost to reduce from 24v – 12v

Remove audio filtering and run straight off AMP?

Electromagnet to manipulate ferrofluid

Audio Filtering

DC-IN

Aux

Speaker driver would use around 8 Watts

Battery is only 1000mah (around 3Wh) / 22 minutes of audio playback without ferrofluid visualisation.

I need more battery capacity but this would entail a more expensive charging circuit with battery balancing for multiple cells.

Will exceed budget, will need to reduce features

1. Speaker functionality
2. Ferrofluid display
3. Portability
4. Exhaust port valve

Part	Quantity	Cost	URL
rPLA filament	1 kg (138g)	£20.50	3djake
2 Stroke barrel	1	£58	ebay
33-100 ohm resistors	2		
BT Amp circuit	1	£17	Amazon
Electromagnet	1	£7	Amazon
Speaker driver	1	£16.50	RS Online
Ferrofluid vial	1	£37	Amazon
Arduino Uno REV3	1	£26.20	Amazon
Charging circuit	1	£8.00	Amazon
Battery (1000mah)	1	£15.99	Ebay
Servo motor	1	£8.00	Amazon
Graphic Eqaulizer	1	£3.00	Sparkfun
Buck-boost converter	3	£13.00	Amazon

Total	£230.19

Change of direction

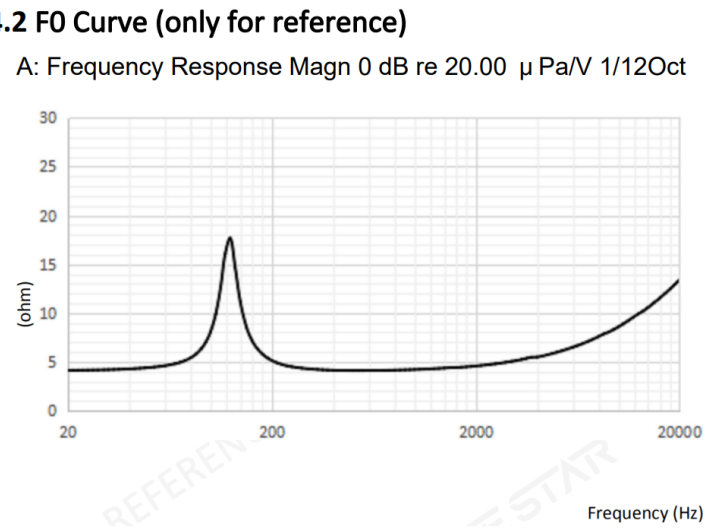
- Working prototype
  - Better proof of concept
  - More exciting/rewarding
- Scrapping ferrofluid visualiser
  - Reduces complexity and cost
- Static, not portable
  - Would exceed battery power
  - Reduces complexity and cost
  - Removes fire risk

Sourced parts

- Speaker (Delivered)
- BT-AMP (Tested - Working)
- Power supply (Tested - Working)
- 2-stroke barrel (Delivered)
- Speaker wire

Speaker drivers

- 2 Speakers, Stereo instead of mono audio
  - Should Improve audio quality and make wiring easier
- Full-range drivers
  - Reduces complexity, no need for signal filtering (to split sound out to multiple drivers)
  - Should produce a comprehensive sound (covers all frequencies)
  - “Smiley face” frequency response

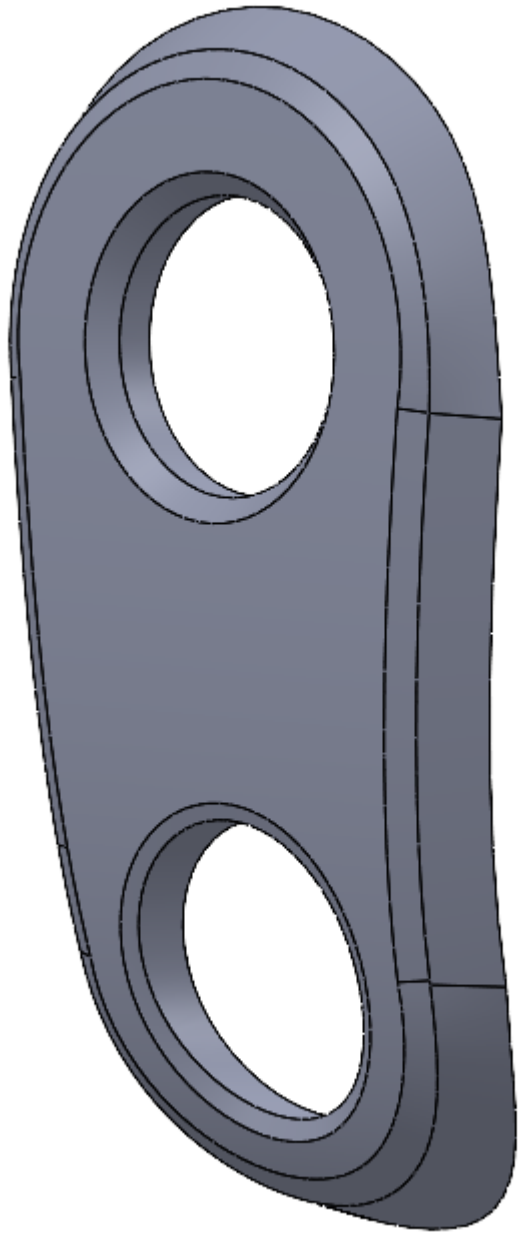


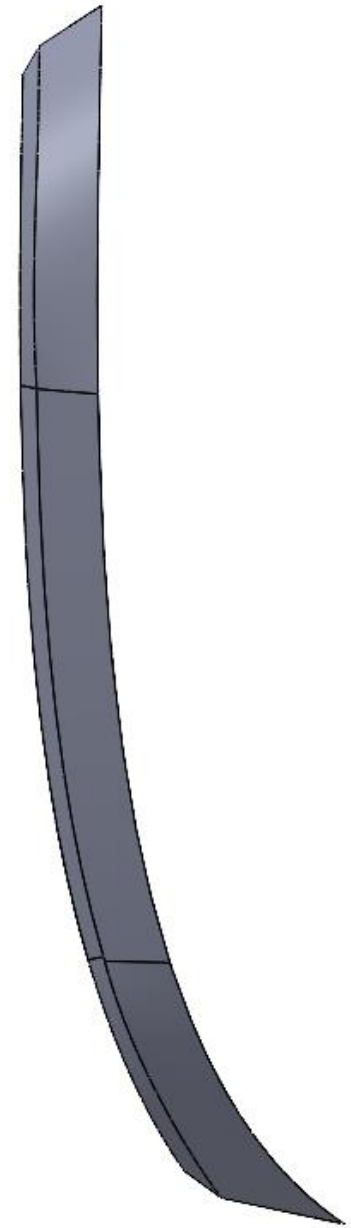
BT-AMP

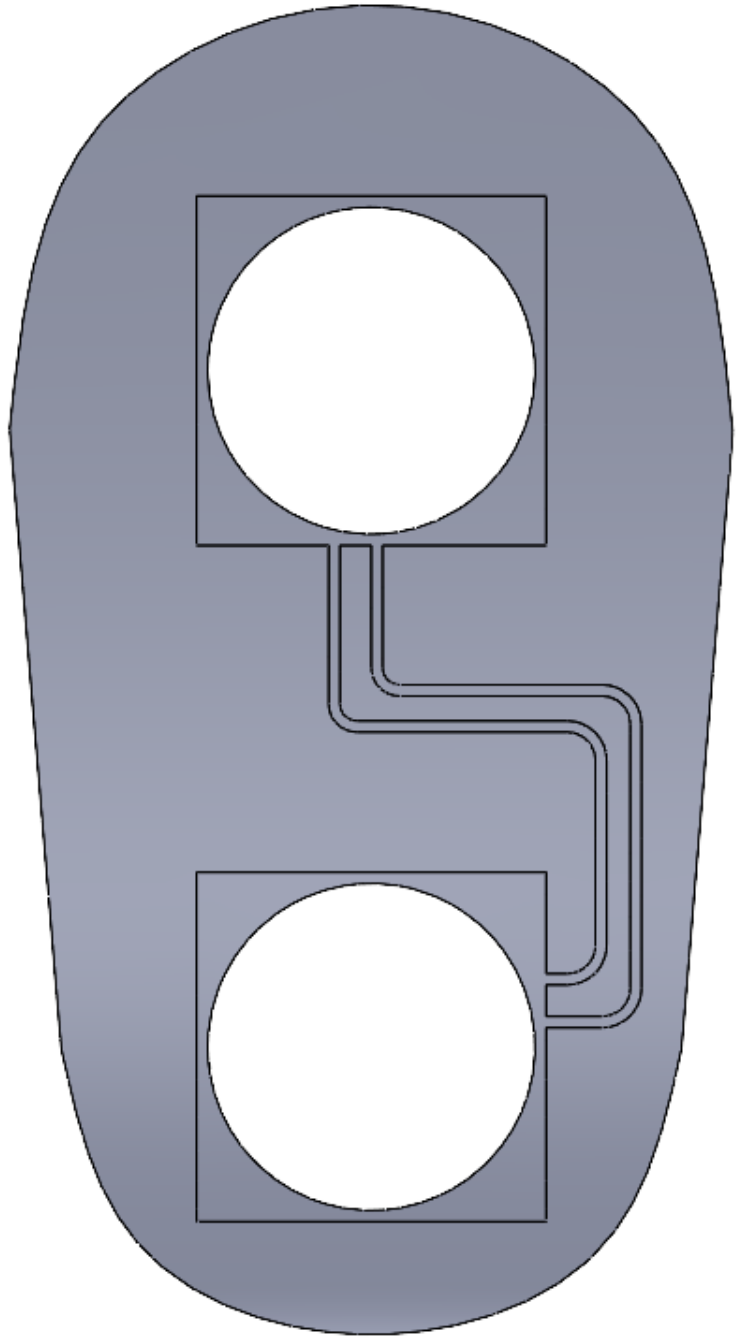
- Stereo Audio
- AUX / Bluetooth
  - Meets current connectivity standards
  - Can easily add 6.5mm Jack
- DC-IN
  - Dated but still standardised
  - No easy way to add USB-C power
- 50W
  - Shouldn’t distort at higher volumes
- Small
  - Easy to package

2-Stroke Barrel

- 63 mm bore
  - Easier to fit speaker drivers
- Air cooled
  - Should be lighter due to fins
- British-made part
  - Interesting history
- Surface patina
  - Adds character (used in this context) and exploits teddy bear factor / graceful aging





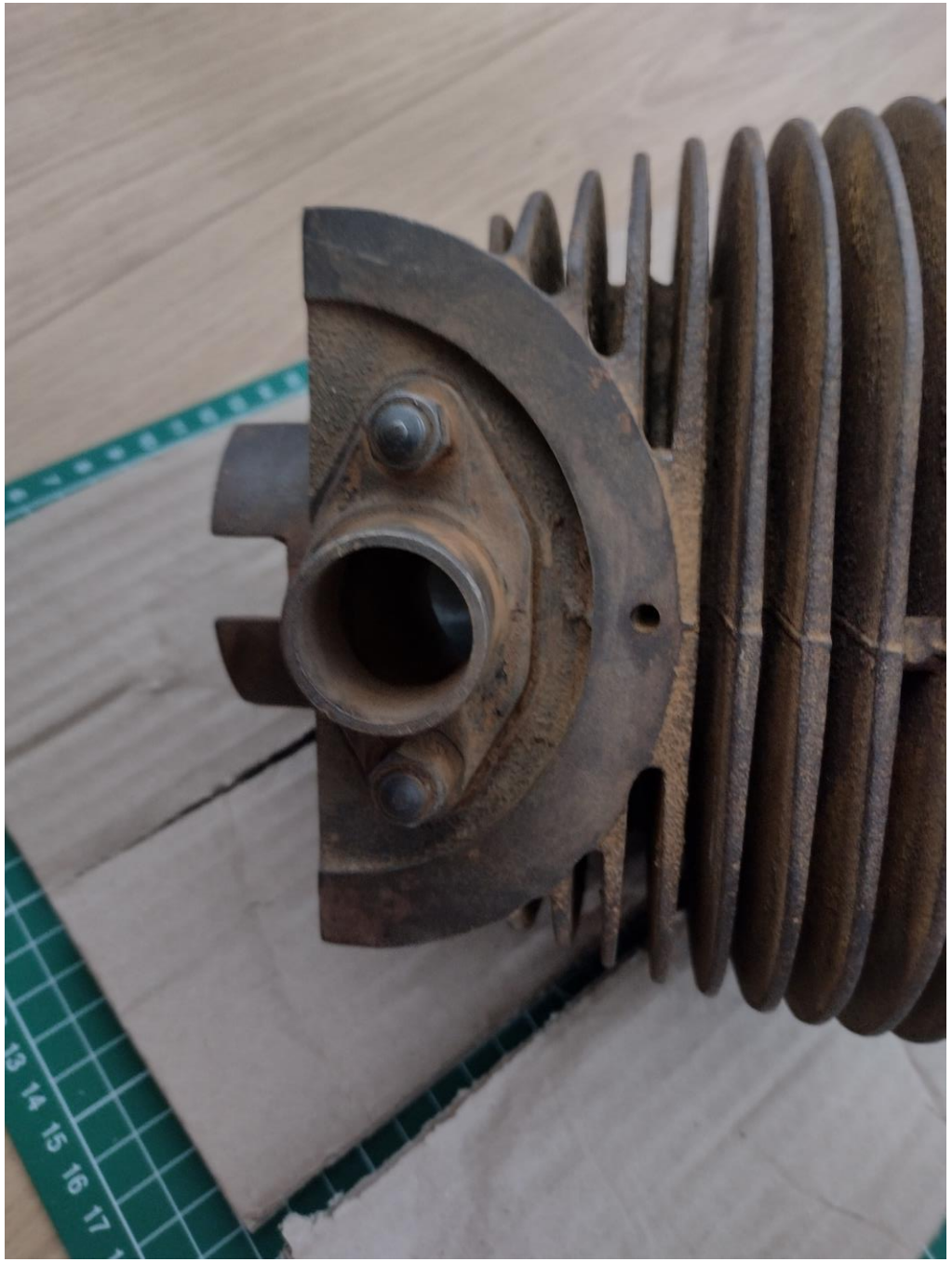


2-Stroke Barrel

- Cleaned
- Good colour
- Broken fin – not sure If I should keep it?
  - Adds character, tells the history of the object
  - Should round off to prevent injury
- Heavier than expected ˜7kg
- Will remove surface rust with metal polish

2-Stroke Barrel

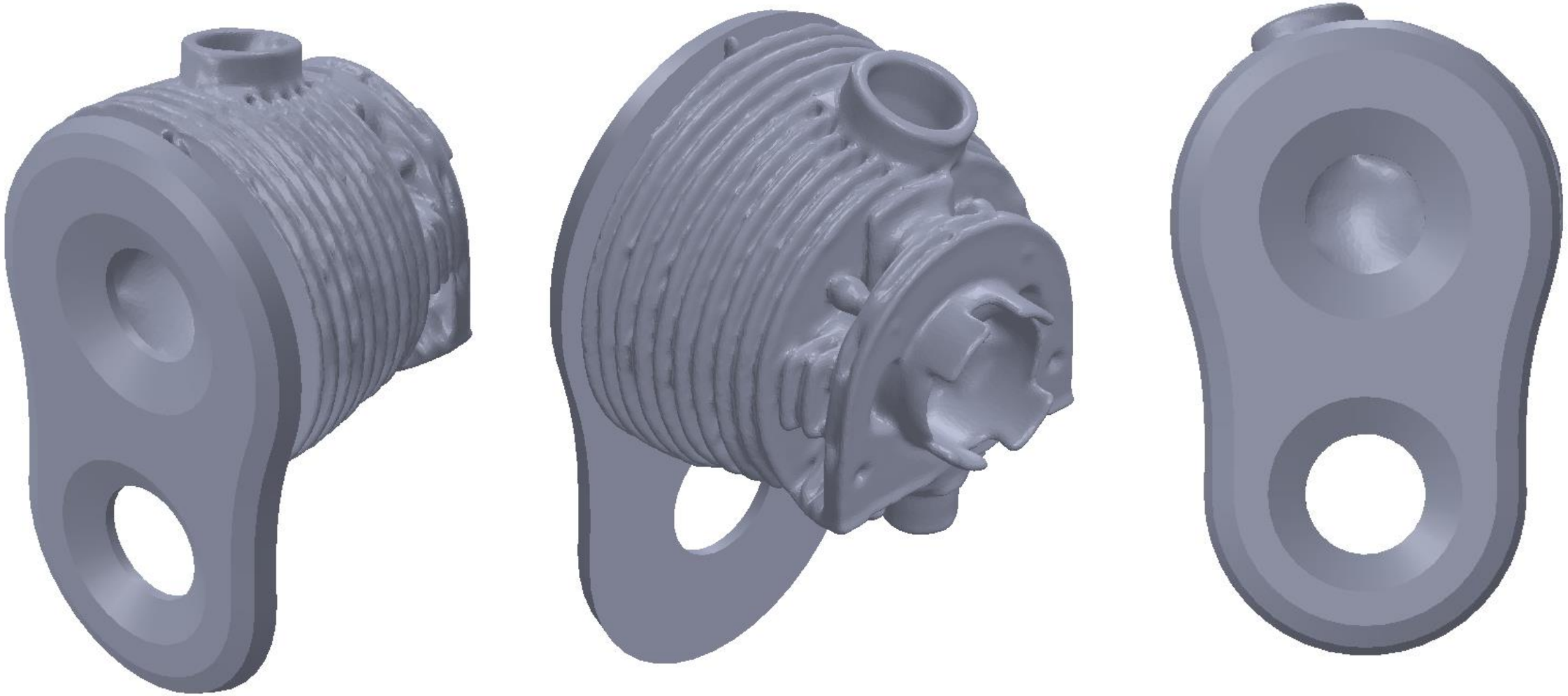
- Bore is slightly larger than expected
- Might get a bigger driver



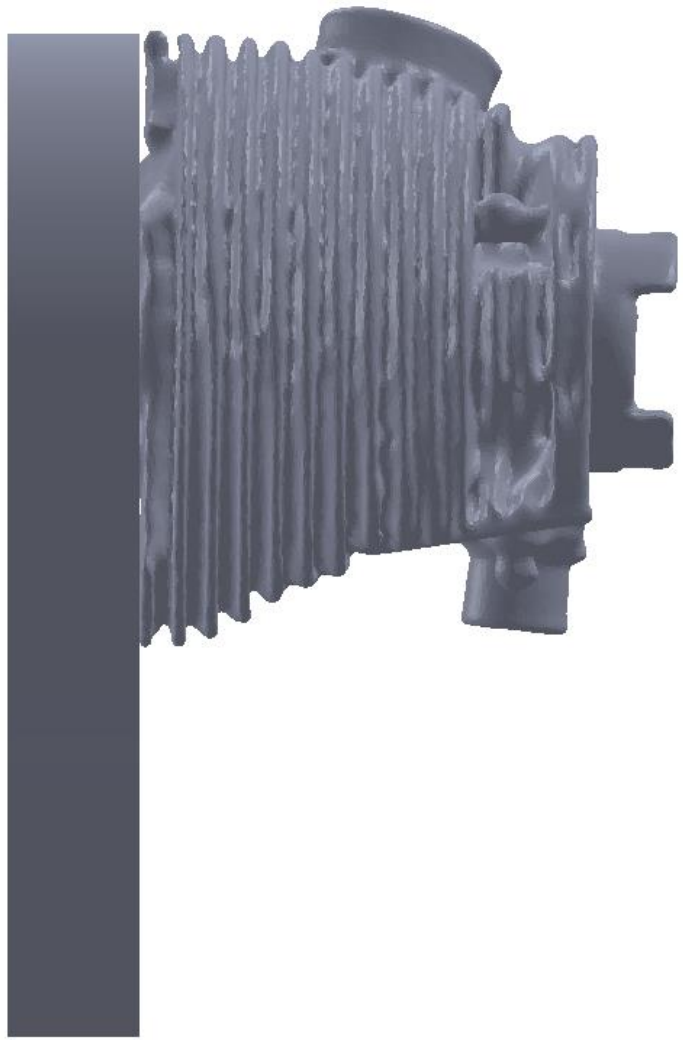
Next steps

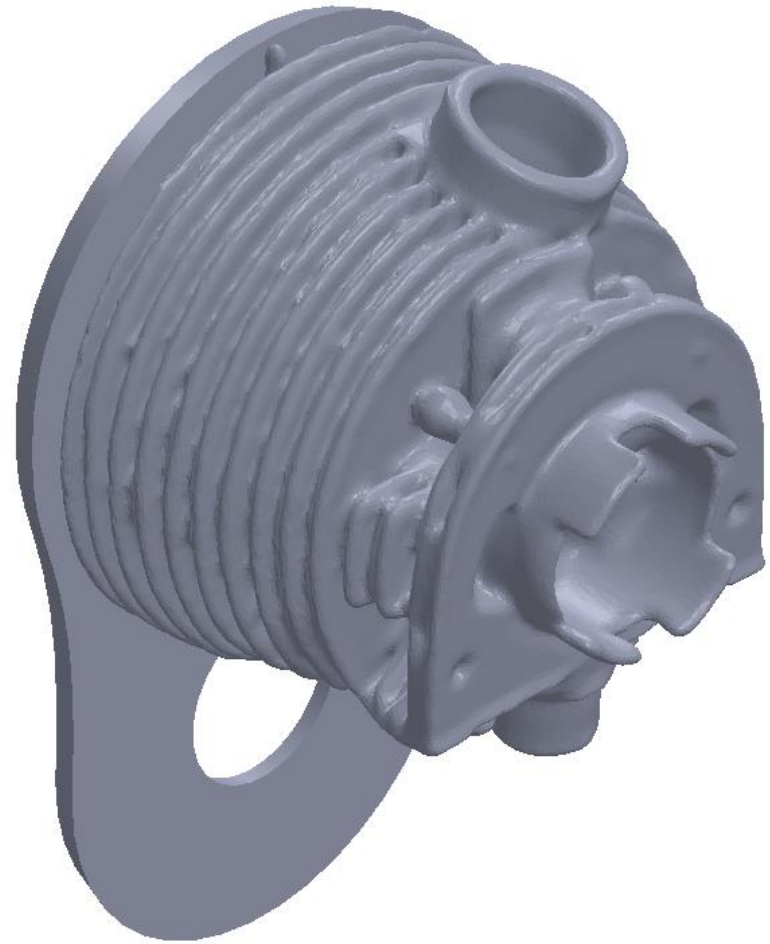
- Test speaker drivers
- Scan + CAD barrel
- Create full CAD model

3D Scanned Engine block:

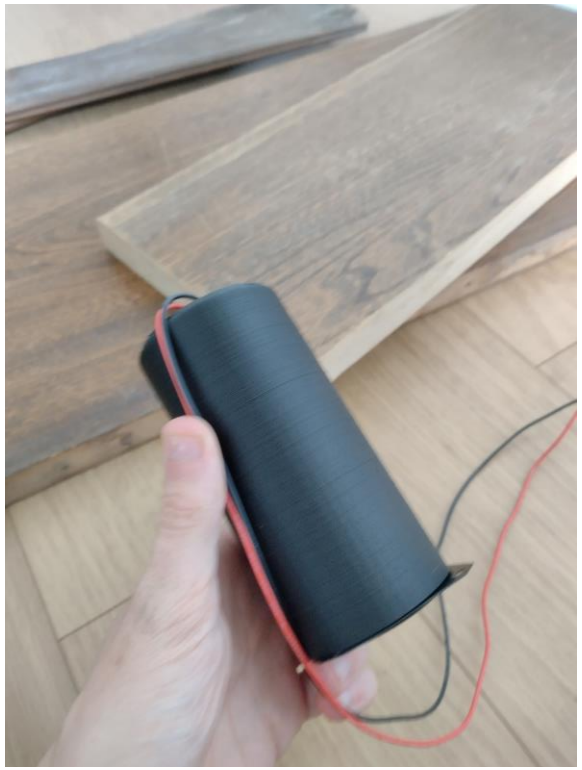


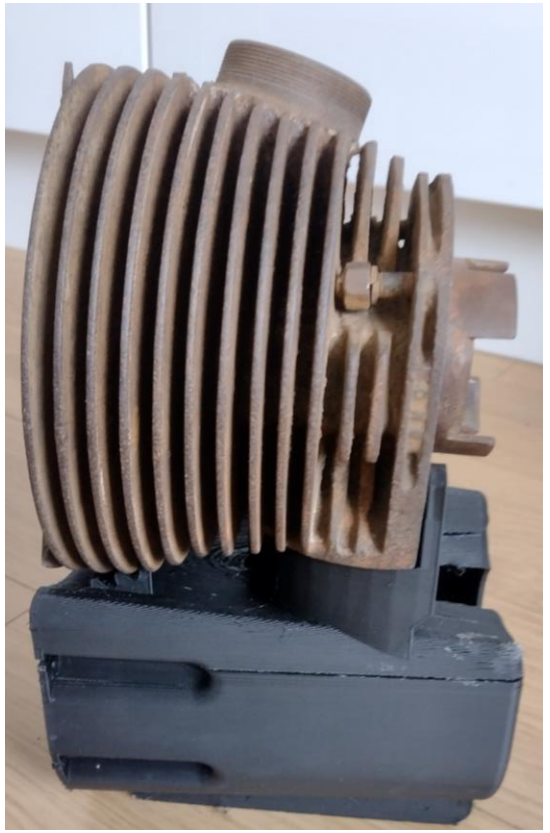
Sourced Materials





Drivers + Amplifier tested working





NPD4CE
2023

New Product Development for Upcycling + Circular Economy

BOOKSHELF SPEAKER

WHAT ARE WE DOING?

- Redesigning electronic products with an aim to find innovations in product development for both upcycling and the circular economy
- Speaker

WHY ARE WE DOING IT?

- Poor EOL outcomes for existing products
- Very hard to disassemble, repair, upgrade, remanufacture or recycle
- Woefully short service life
- Massive ecological harm

HOW?

First Step - Research

- Desk research
- Reverse Engineering of an existing product
- Expert Interviews

FINDINGS – DESK RESEARCH

- Circular business models
- Product lifecycle categories
- Product attachment and emotionally durable design

CIRCULAR BUSINESS MODELS

5 Discrete Business Models:

- Classic Long-life: Products are built to last and sold at a premium
- Hybrid Model: Profits are driven by the repeat sale of consumables
- Gap Exploiter: Providing a service to fill a gap in the market (e.g: repair and maintenance)
- Access model: Provide access to the product
- Performance: Provide the service / utility

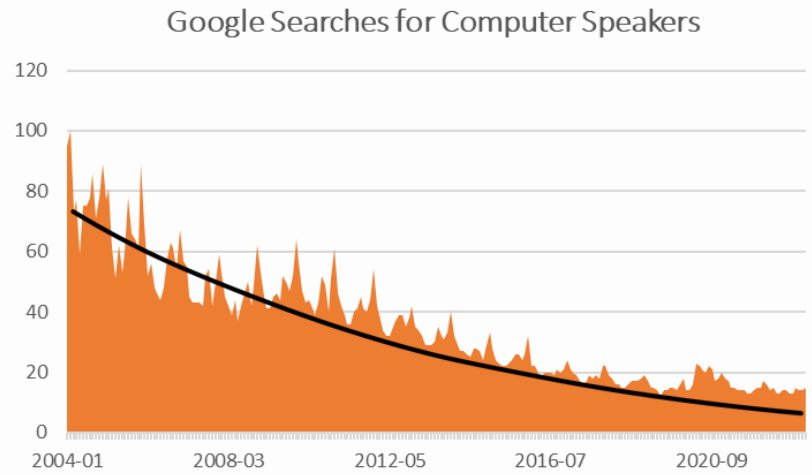
PRODUCT LIFECYCLE CATEGORIES

How developed a product or technology is.

Four categories:

- Introduction
- Growth
- Maturity
- Decline

Which effect design priorities.



Computer Speakers are identified as being in the decline phase.

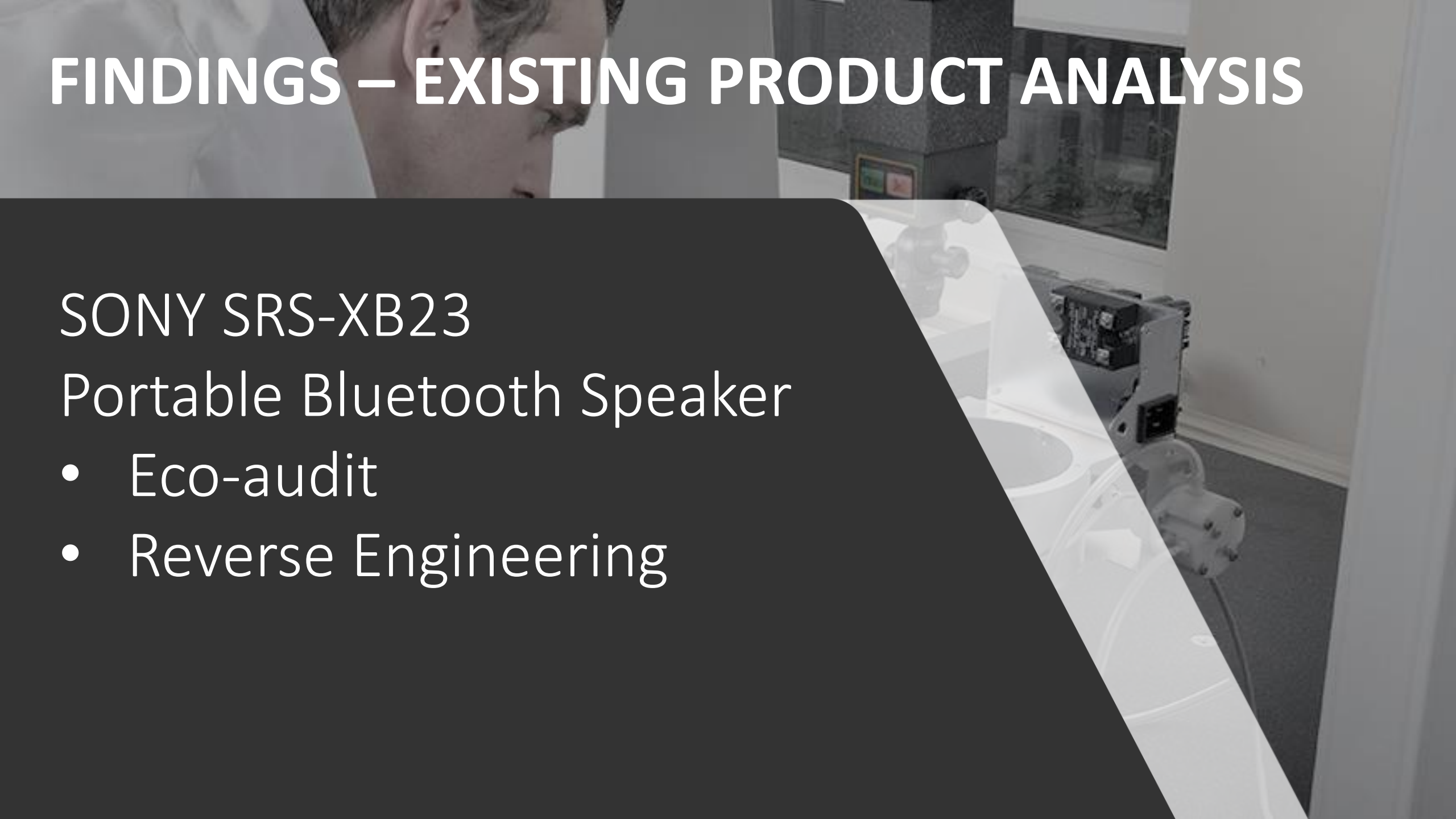
Therefore, the factors are a priority:

- Durability
- Standardisation and Compatibility
- Maintenance and Repair
- Dis- and reassembly

PRODUCT ATTACHMENT

- Teddy bear factor – develop a narrative history with the product
- Graceful ageing – the ageing process adds character and value
- Ritual – Developed through rich tactile experiences

FINDINGS – EXISTING PRODUCT ANALYSIS



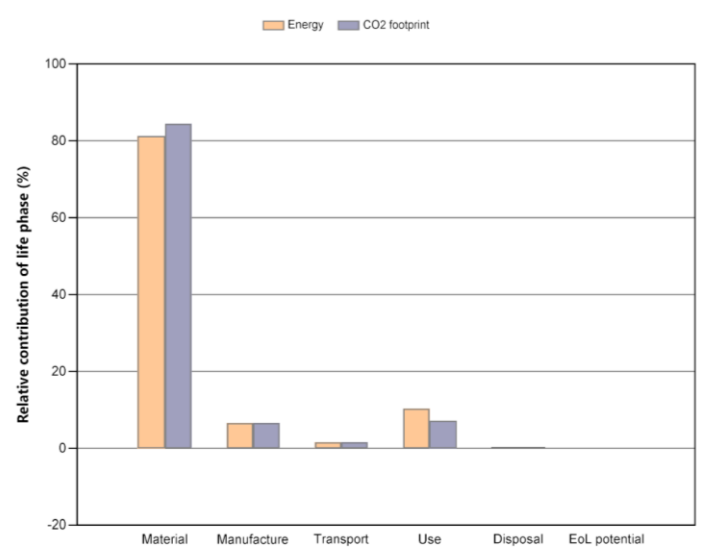
SONY SRS-XB23
Portable Bluetooth Speaker

- Eco-audit
- Reverse Engineering

ECO-AUDIT

Assumptions:

- Transport from Shenzen – Felixstowe via Ocean Freight
- 1 hour of Daily use
- Service life of 5 years



High Embodied Energy (84.5%) of CO2 Emissions

Incredibly power efficient
>1 Watt in operation

REVERSE ENGINEERING

Very hard to disassemble

- Small and Easily Stripped Screws
- Snap-hooks and one-way fasteners
- Over-reliance on SMD components

FINDINGS – STAKEHOLDER INTERVIEWS

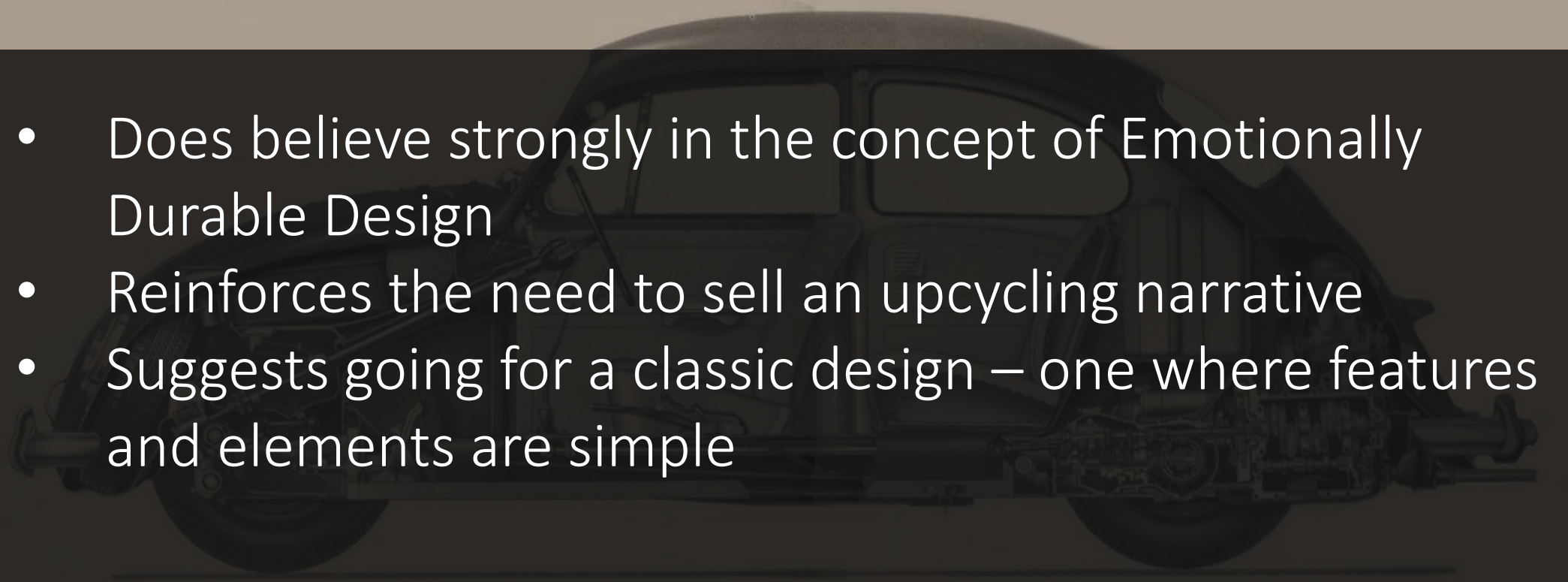
Three Interviews

- Nick Rowan – Senior Product Design Lecturer
- Abby Hatch – Sustainable Design Engineer
- Seb Ward – Design Engineer at MIXX

NICK ROWAN

- Don’t go for the Audiophile market, upcycled designs are inherently compromised
- Sell the narrative
- Disagreed with the theory of Emotionally Durable Design
- 2 Classes of Products
  - Perpetual
  - Disposable

ABBY HATCH



- Does believe strongly in the concept of Emotionally Durable Design
- Reinforces the need to sell an upcycling narrative
- Suggests going for a classic design – one where features and elements are simple

SEB WARD

- Antiques as a source of Inspiration – Needs to be desirable
- 3D Printing as an excellent technology to utilise
- Ease of use

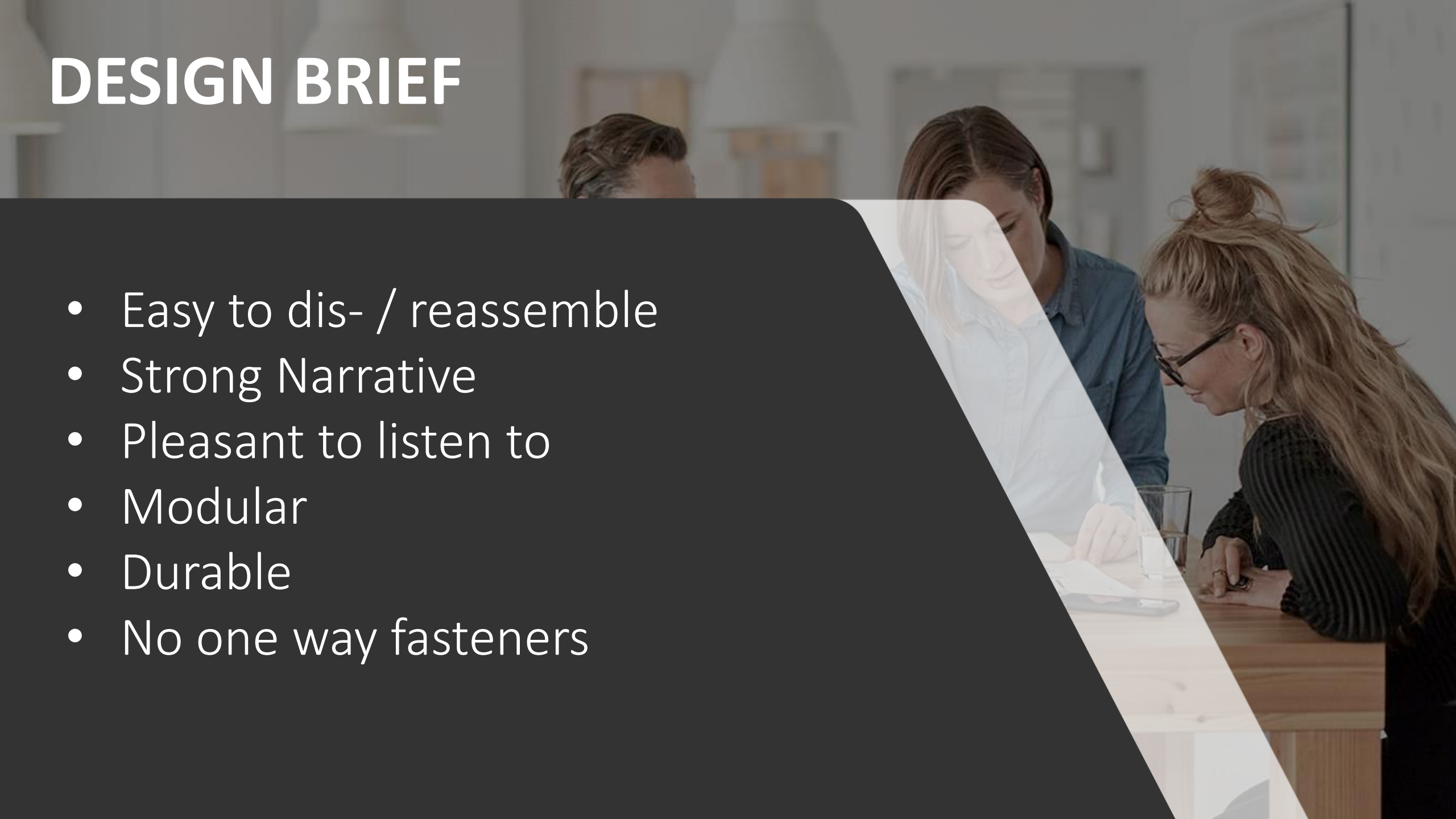
KEY CHALLENGES

Making upcycled products desirable – Narrative

Prolonging Service life – Emotionally Durable design / Maintenance and Repair

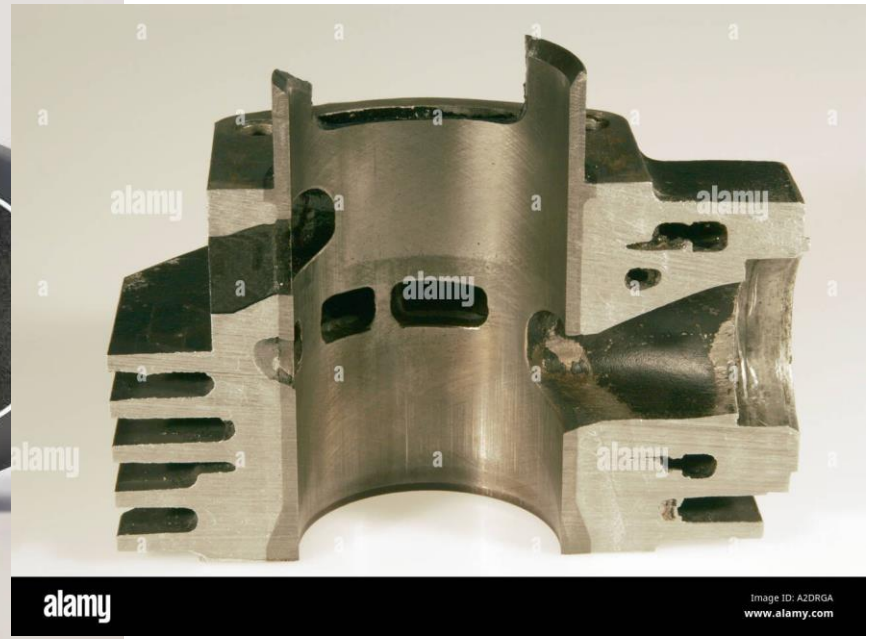
Improving EOL outcomes – Dis- and reassembly

DESIGN BRIEF



- Easy to dis- / reassemble
- Strong Narrative
- Pleasant to listen to
- Modular
- Durable
- No one way fasteners


dyson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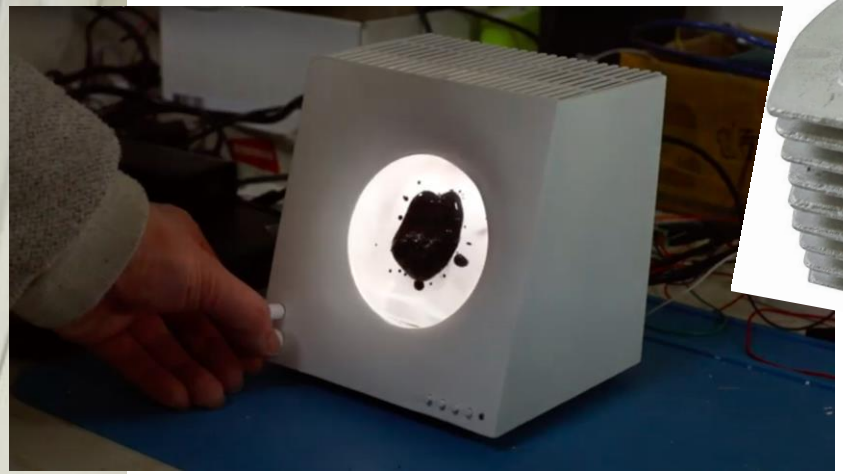
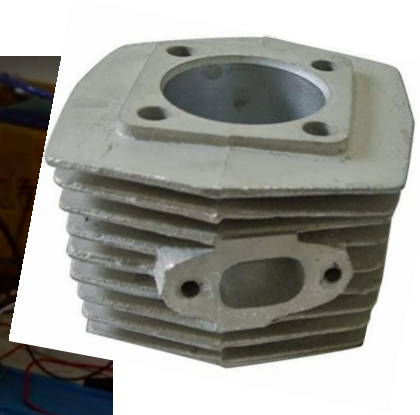
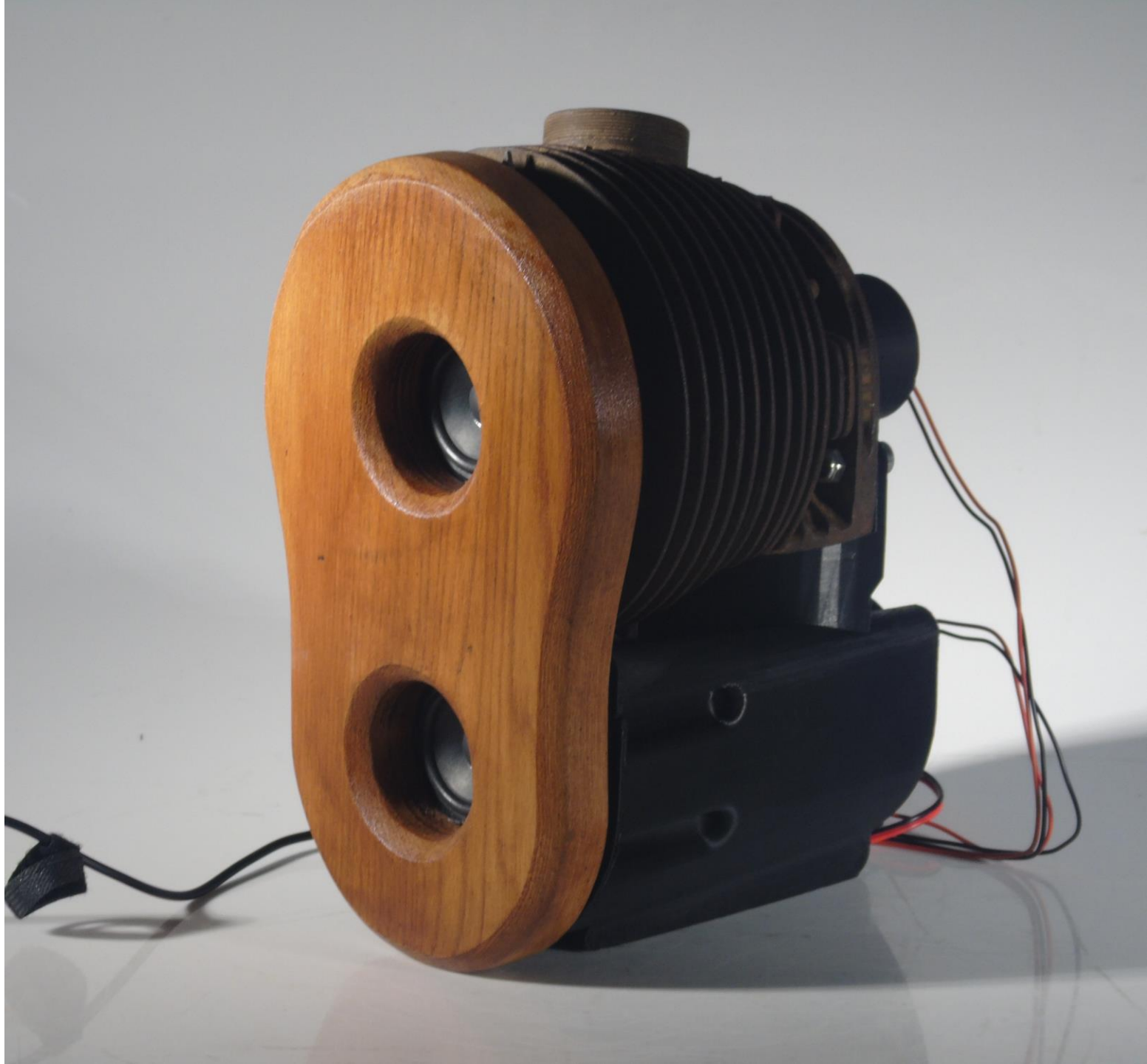
Glenfiddich






SHOP
ZH
AWS

2-Stroke Barrel Concept



CONCLUSION

- Entirely possible to make a working product from reused / remanufactured parts with few compromises
- A strong narrative is vital to make upcycled products appealing
- More research needs to be done on upcycling/remanufacturing at a commercial scale

GUIDELINES

- Focus on narrative
- Stick to industry standards and conventions, especially for input/output, controls and user-interaction
- Design for long service life with repair and maintenance in mind
- Environment as a user