



Product Design

PORTFOLIO

Matthew Hornsby

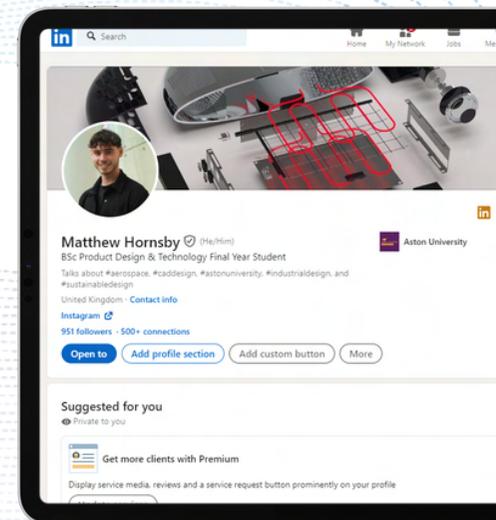
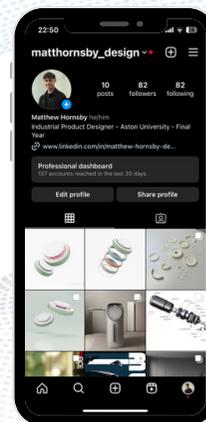


Hi

Driven by user-centred design, I create products that solve real problems.

Dive into my portfolio, showcasing projects from my Product Design & Technology studies at Aston University

Want to chat about design, discuss potential collaborations, or just share your thoughts? Let's connect! Find me on Instagram or LinkedIn and let's get our creative juices flowing.



matthornsby_design



www.linkedin.com/in/matthew-hornsby

DESIGN SKILLS & EXPERIENCE

Adobe Software

Experienced User of Photoshop, Illustrator, and Indesign.



CAD Software

Experienced User of Industry Standard CAD Software Solidworks & Catia.



Render Software

Experienced User of Advanced Render Software Keyshot.



Analogue Skills

Conceptual Sketching

Foam Modelling

Card Modelling

Clay Modelling

R&D Product Testing

Plastic & Metallic Working

Specialist Skills

Injection Moulding

Sheet Metal

3D Printing

CNC Machining

BS 8888 Engineering Drawings

Education

Hedingham School and Sixth Form (2013-2018)

9 GCSE's including Maths & English

Hedingham School and Sixth Form (2018-2020)

A Levels in Physics, Maths, and Product Design & Technology

Aston University (2020-2024)

BSc in Product Design & Technology

Grades Acheived

1st Year : 73%

2nd Year : 75%

3rd Year : (Sandwich) 78%

4th Year : Current

Experience

Ipeco Holdings Ltd (2022-2023)

Aerospace Design Engineering Intern

*Offered Graduate Role with Sponsorship

As an Engineering Intern at Ipeco, I played a crucial role in the research, development, and innovation of new galley products.

Through my internship at Ipeco, I gained valuable hands-on experience in the engineering design process, from initial concept ideation to prototyping and testing. I also developed strong communication and collaboration skills, enabling me to work effectively with team members and stakeholders.

PORTFOLIO CONTENTS

ONE
Sora



2023 (4th Year)
Ongoing

TWO
EcoFlame



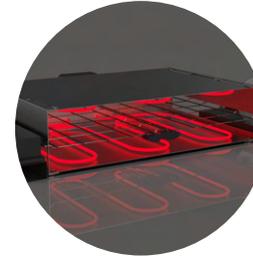
2023 (4th Year)
12 weeks

THREE
JustPark IOT



2024 (4th Year)
12 weeks

FOUR
Muirra Toaster



2022 (2nd Year)
12 weeks

FIVE
University Placement Year



2022 (3rd Year)
60 Weeks

SIX
Aston Inspired

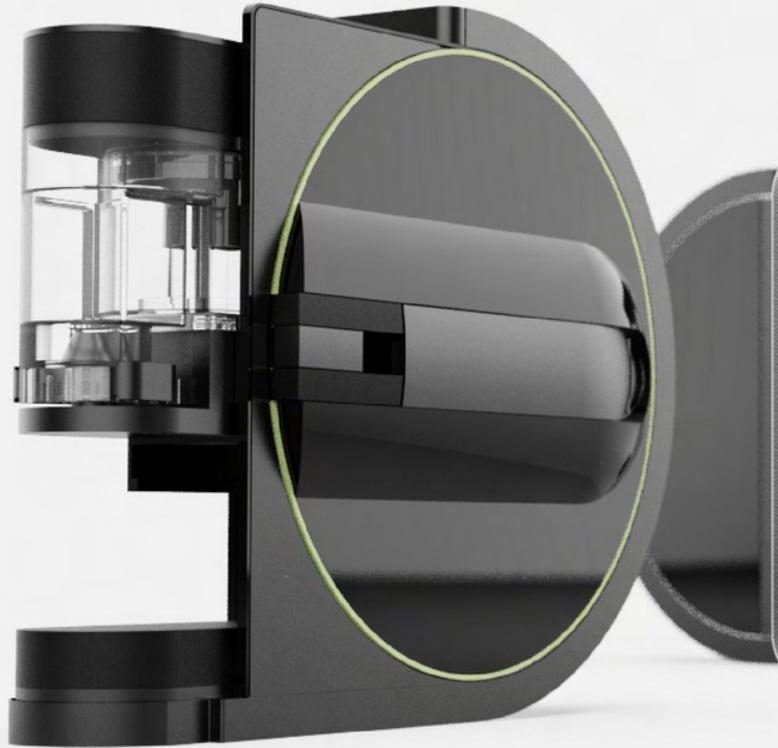


2024 (4th Year)
2 weeks

SEVEN
CDIO



2021 (1st/2nd Year)
12 Weeks/24 Weeks



1 SORA

This innovative system combines traditional matcha preparation methods with modern technology to bring fresh, high-quality matcha to aircraft, offering a unique and premium beverage service.

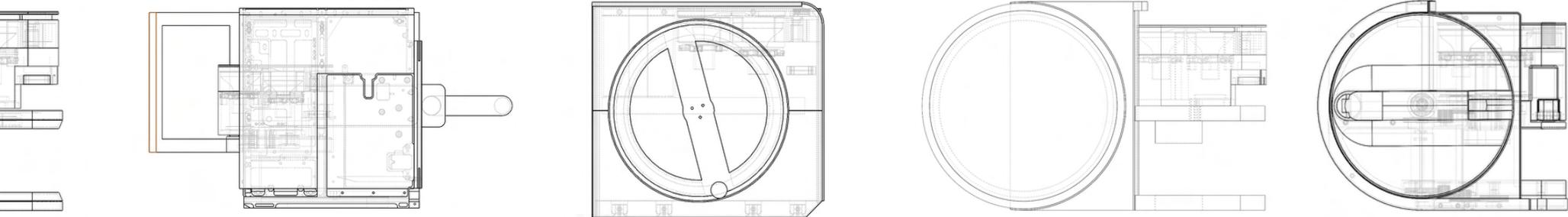
This project showcases:

- Prototyping
- User Centred Design
- Test Rigs
- Technical Application



DESIGN DEVELOPMENT

Extensive card modeling refined the concept through a user-centered approach, guaranteeing a seamless user experience.



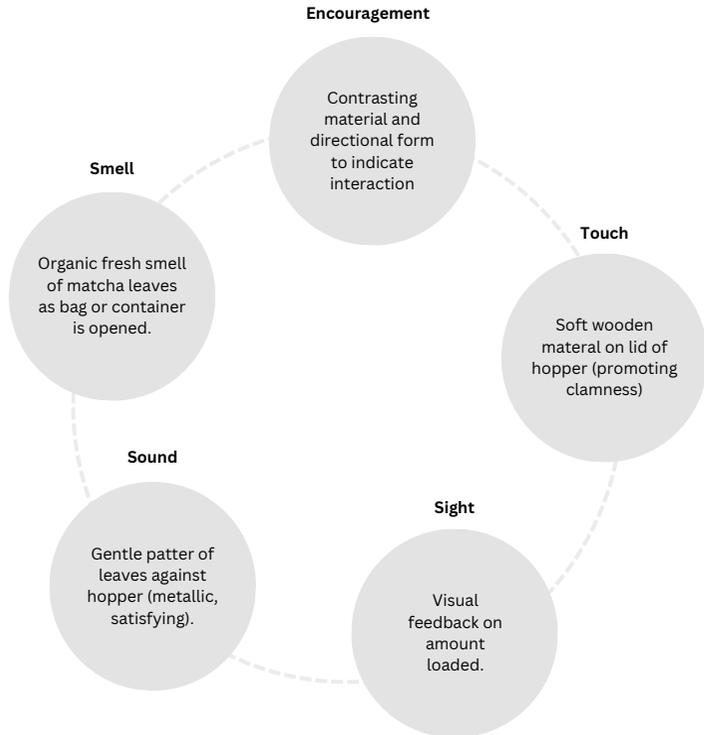
USER CENTERED DESIGN

Understanding Consumer

Empathy Map

Conducting an empathy map ensures the design resonates with the user, building upon the product experience.

Empathy Map example for a Air Steward for one process step.



Understanding Task

Process Steps

Identifying and recreating the process steps of the product helps to highlight any potential areas of improvement

ONE: Fill Cup With Water or Milk



TWO: Secure and Lock Cup on Stage



THREE: Twist Lid and Fill Matcha Hopper



FOUR: Activate Crank



FIVE: Wind Crank to Grind & Whisk Matcha



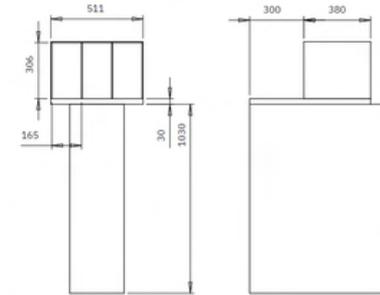
SIX: Remove Cup



Understanding Environment

Prototype Modelling

To ensure the product can be seamlessly intergrated into the air stewards workflow its important to understand and replicate the galley environment.



THEORY TO PROTOTYPE

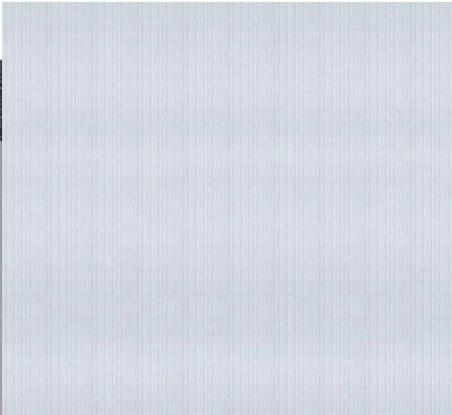
Aircraft Specs AS8057

Understanding and complying to aircraft regulations to achieve airworthiness.

Material Selection

PPSU (Radel R-5100/5500)
FDA Compliant
High Temperatures
Mold Release
Flame Retardant UL94 v0 rated

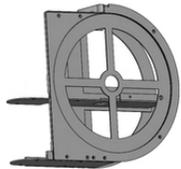
Polyphenylsulfone



Polycarbonate

LEXAN 940 resin
10MFR Polycarbonate
Mold Release
Flame retardant UL94 v0 rated
UL746C f1 rated

Aluminium



Structure Testing

Meeting the rigorous AS 8057 airworthiness standard requires comprehensive structural testing. An aluminum chassis is employed for its strength, ensuring compliance.

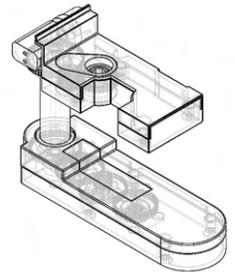
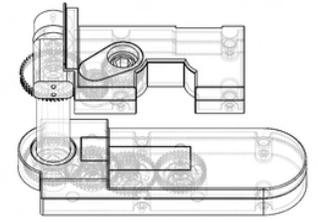
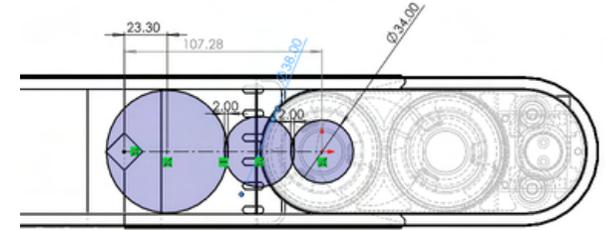
Operation Research

Testing existing matcha grinders to find optimum operation conditions



Operation Design & Testing

Testing gear trains and materials to find optimum performance.

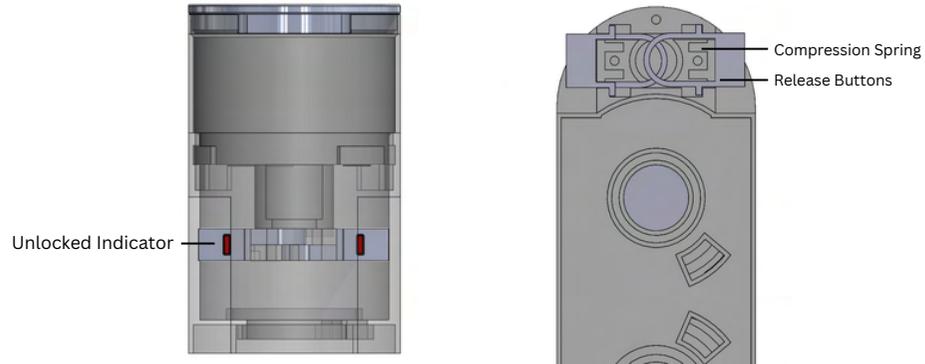


COMING SOON

Prototype Testing

Next Steps

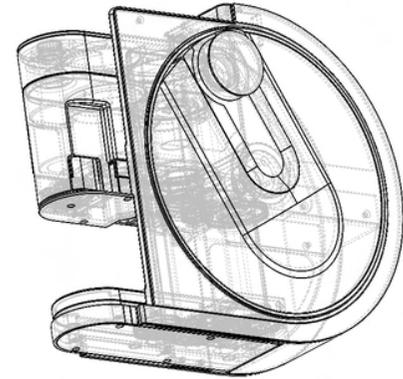
Grinder Quick Release Design



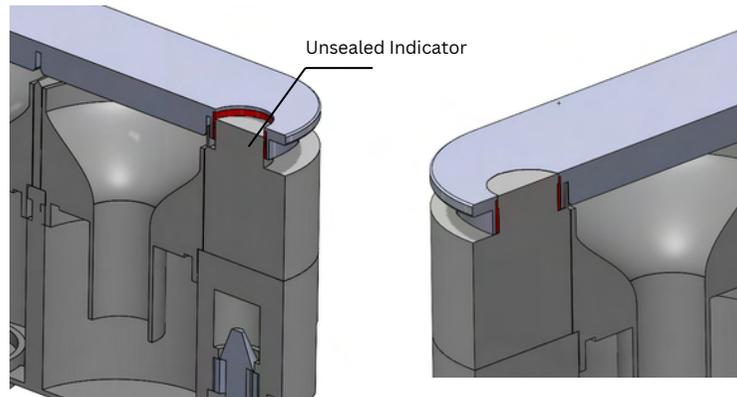
3D Print Test



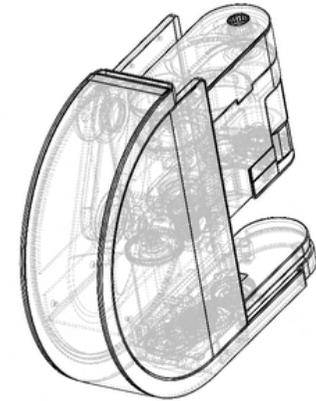
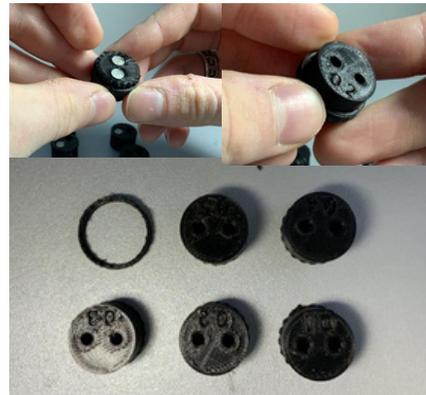
Working Prototype Development



Grinder Lid Pivot Design



3D Print Clearance Test





2 ECO FLAME

This revolutionary communal waste-to-energy system transforms business park's waste into usable electricity, powering operations sustainably and cost-effectively.

This project showcases:

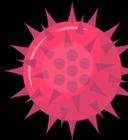
- Problem Solving
- Technical Application
- Critical Thinking





Heavy Metals

Lead, cadmium, chromium, and arsenic are commonly found in Leachate posing serious health risks to humans and wildlife.



Organic Contaminants

Ammonia, volatile organic compounds (VOC) and volatile fatty acids can harm aquatic ecosystems in many ways such as Neurotoxic effects, oxygen depletion and reproductive and hormonal disruption.



Leachate Contamination

Liquids released from decomposing waste can migrate through soil and ground water.



Pathogens

Bacteria, viruses, and parasites are commonly found in Leachate posing serious risks to human health.



65,000 Km²

of land occupied by landfills, this is equivalent to the size of Denmark.

>75% ↑

increase of global power generated from renewable sources if this land was utilized with renewable energy generation methods.

30%

of current global warming coming from methane emissions.

25x

Methane is 25x more potent than carbon dioxide at trapping heat in the atmosphere.

11%

of global methane emissions are generated from landfills.



10x

of global greenhouse gas emissions will come from the world's landfills by **2025**

80x

more effective at trapping heat in the atmosphere over a 20-year period.

PROBLEM TO TACKLE

LANDFILL



photo credit: Picto...
<https://www.behance.net/gallery/86565997/Globe>



Payatas
123 acres
Phillipiens
>200,000 litres of leachate per day



Gramacho
321 acres
Brazil
>600,000 litres of leachate per day



38/50

largest landfills threaten to pollute the sea.



64 million

people are affected by landfills often suffering with severe health problems.

40%

Worldwide Waste ends up in **Uncontrolled Dumpsters**

In developing countries waste is carted into mountain like dumpsites where methane causes fires.



Contamination

Contamination can endanger local wildlife and habits in many ways such as:

- Smothering with sediment - preventing corals from receiving sunlight for photosynthesizing.
- Chemical Contamination - increasing coral susceptibility to disease and bleaching.



Economic

- Reduced tourism and recreation - pollution deters visitors and tourists impacting local businesses.
- Fisheries and agriculture - reduced fish populations and agriculture productivity due to contamination of water and soil.
- Reduced Land value - due to concerns about health, smell, and degradation.



OPPORTUNITY

Communal Energy - to - waste incinerator

CURRENT TECHNOLOGY



SYSAV waste-to-energy (WtE) plant in Sweden is one great example of a solution to tackle the unsustainable growth of landfills while addressing other issues such as climate change.

Waste-to-Energy (WtE) plants efficiently convert municipal waste into usable energy, with modern technology minimizing harmful emissions. While some environmental and social concerns remain, advancements are making WtE a more positive solution.

Municipal solid waste that ends up in landfills.



53%



<1%



Replace the need for russian gas.

Waste to Energy Plant In Copenhagen, Denmark. It is also a recreational area with a ski slope and rock climbing.



80%

reduced greenhouse emissions compared to 1990.



5.5x

Burning all waste currently in landfills could produce 5.5x the global annual energy consumption in 2022.



\$100 million

generated revenue from imported waste and savings on fossil fuel prices.



2.2 million tonnes

reduced CO2 emissions by burning waste.

CURRENT ISSUES



Air Pollution harms health and environment.



Ash Disposal requires careful handling to avoid contamination



Community Opposition concerns about pollution, noise, and traffic make siting difficult



Cost expensive compared to renewables



Efficiency Challenges energy output depends on waste type

COMMUNIAL ENERGY - TO - WASTE INCINERATOR

OPPORTUNITY

NEW IMPLICATION

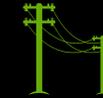
ECOFLAME

Proposal: Develop small-scale WtE incinerators for business parks.



Advantages:

- Reduced reliance on fossil fuels: Promotes carbon neutrality.
- Localized solution: Minimizes waste transport and energy loss.
- Improved waste control: Reduces harmful emissions through stricter input management.
- Advanced technology: Utilizes latest filtration and energy generation.

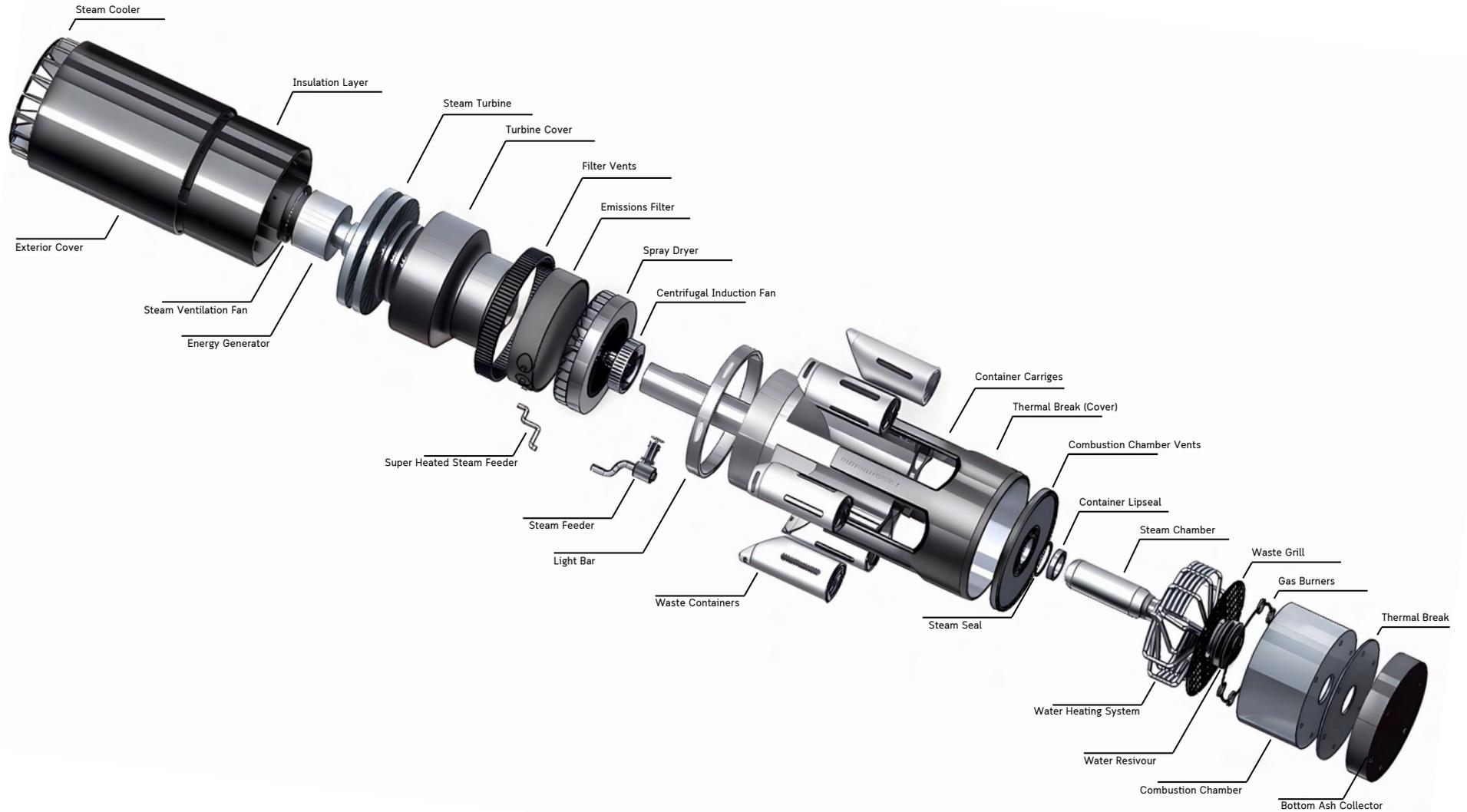


Focus: Eco Flame addresses key WtE issues for sustainable implementation.



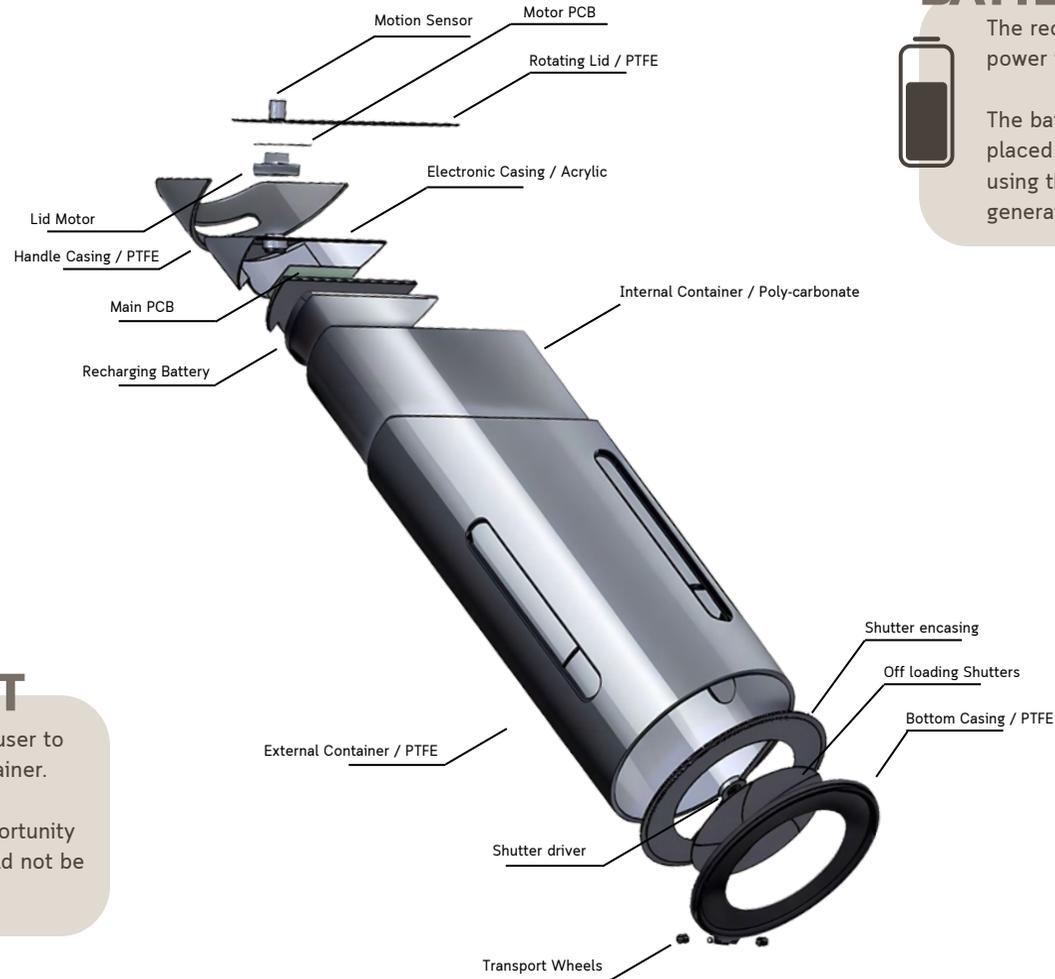
TECHNICAL DESIGN

Waste Incinerator



TECHNICAL DESIGN

Waste Container



VOLUME

Container Volume: 0.76 m^3
Office Waste Density: $\sim 8.6 \text{ kg/m}^3$
Office Waste Mass: $\sim 20 \text{ kg}$
Office Waste Energy Capacity: $\sim 15 \text{ MJ/kg}$
Energy Generated per Container: $\sim 300 \text{ MJ}$



50hrs



25miles



20hrs

WINDOW SLOT

The window slot allows the user to see the fullness of the container.

The slot also allows the opportunity to spot any waste that should not be placed in the incinerator.

BATTERY



The rechargeable battery is used to power the motor and sensor.

The battery is recharged when placed in the incinerator overnight, using the renewable energy generated from burning the waste.

NOBINBAG

The use of the container design will eliminate the need for bin bags reducing massive plastic waste.

The self-cleaning system utilizes excess steam from the steam turbine to steam clean the internal container.





The Ecoflame can dispose of common waste found on business parks such as:



Plastics



Food Waste



Paper/Cardboard



Landscape Waste

The Ecoflame can dispose 6 containers at a time, producing enough energy to power:



14.4 hrs

Heating Energy usage of an average house (UK).



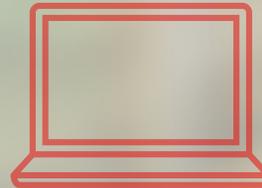
30hrs

Aircon Energy usage of average house (UK).



296hrs

Average energy usage of a lightbulb.



120hrs

Average energy usage of a laptop.





3 JUSTPARK IOT

This JustPark IOT device seamlessly integrates with your car, making finding, paying for, and accessing private parking a breeze - all without needing your phone.

This project showcases:

- Brand Analysis
- Visual Analysis - Form Analysis
- User Interaction
- Design for Manufacture
- Engineer Drawings
- Physical Prototype



STORY BOARD - DRIVER



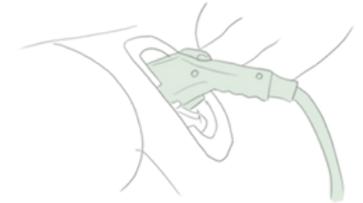
- 1. Device Activation**
The driver requires direction to his pre-booked parking space. He awakens the device by clicking the pop up dial.



- 2. Easy Interaction**
The device is designed for seeming-less interaction to minimize distraction whilst driving.



- 3. Device Direction**
Using a combination of visual and audio instructions the driver is directed to his destination without the use of any screens.



- 4. Specialized Parking**
The driver reaches his destination safely, and his specific requirements (eg EV parking) is fulfilled.

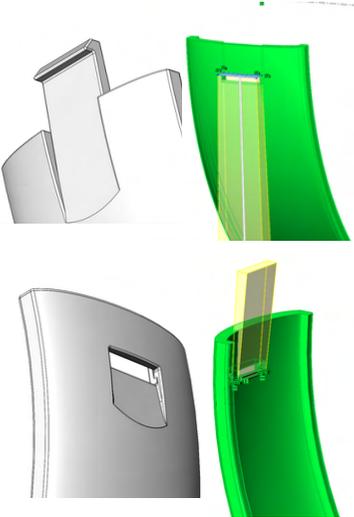


DESIGN FOR MANUFACTURE

Injection Moulding

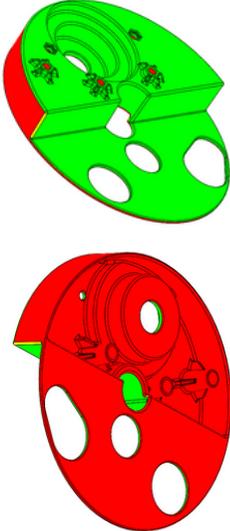
No Side Action

Each part design was careful thought out to reduce the use of any side action during manufacturing process reducing tooling complexity and part cost.



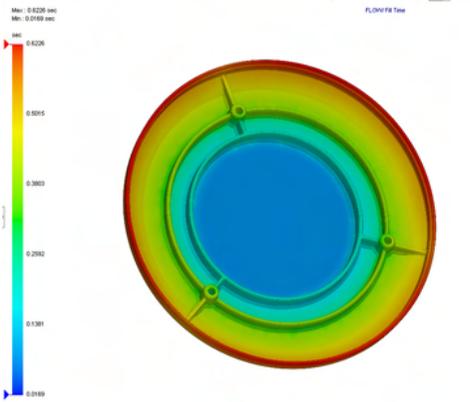
Draft Analysis

Each part had draft angles required for removal from tool and to achieve required surface finish.



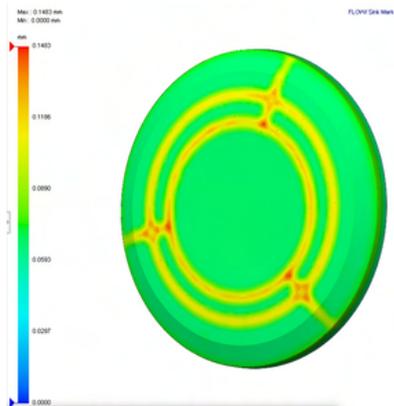
Flow Analysis

The flow analysis was explored in each part to determine optimum gate position and any issues in geometry formation.



Sink Mark Analysis

Potential sink marks were explored to ensure significant ribs and consistent wall thickness was applied for the highest quality surface finish.



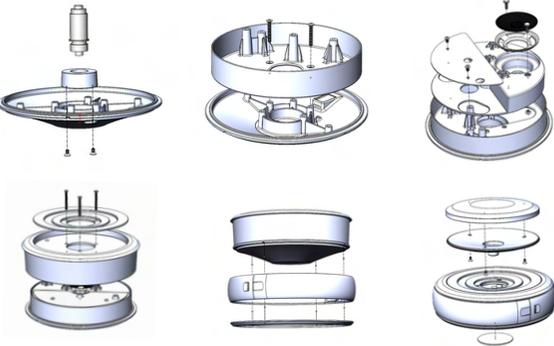
PROTOTYPE DEVELOPMENT

3D Print

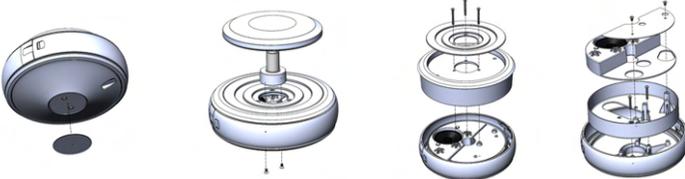


Assembly

Assembly Design



Disassembly Design



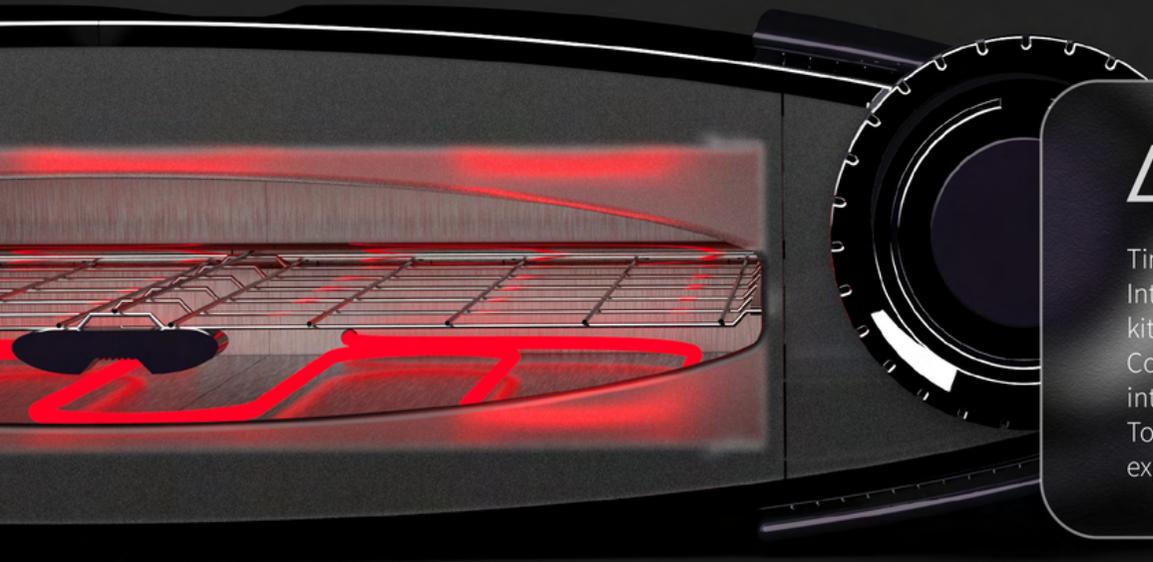
Final Prototype







Parking Assistant **JustPark**



4 MUIRA TOASTER

Tired of toasters that break after a year? Introducing the Muira Toaster, a revolutionary kitchen appliance built to last a lifetime. Combining smart internal design, intuitive interaction, and sustainable materials, the Muira Toaster elevates your everyday breakfast experience.

This project showcases:

- Sketching
- Existing Solution Analysis
- Internal Design
- Design for Sustainability

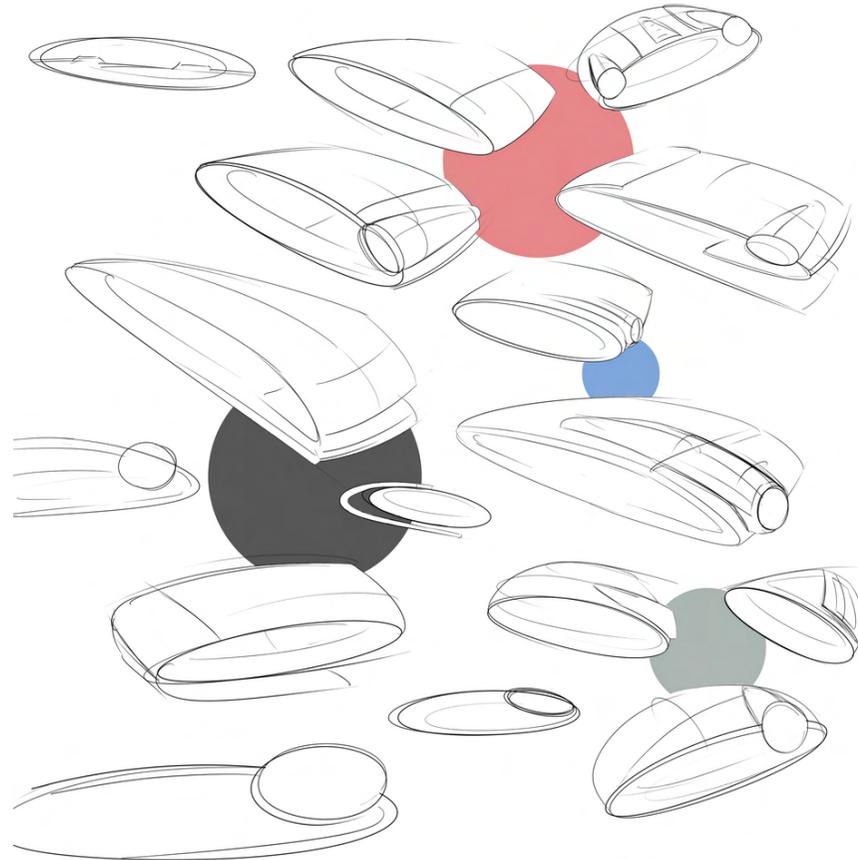


DEVELOPMENT

Form Analysis

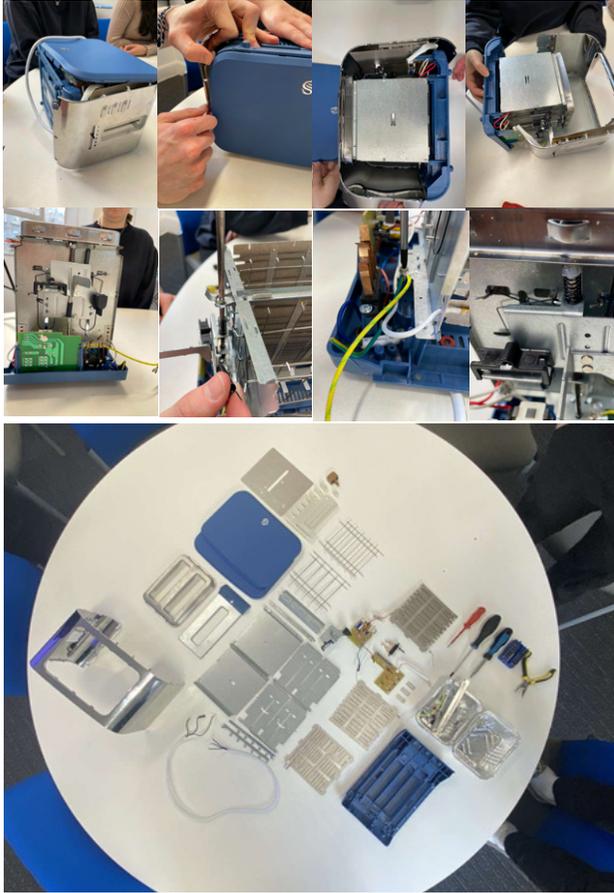


Sketching

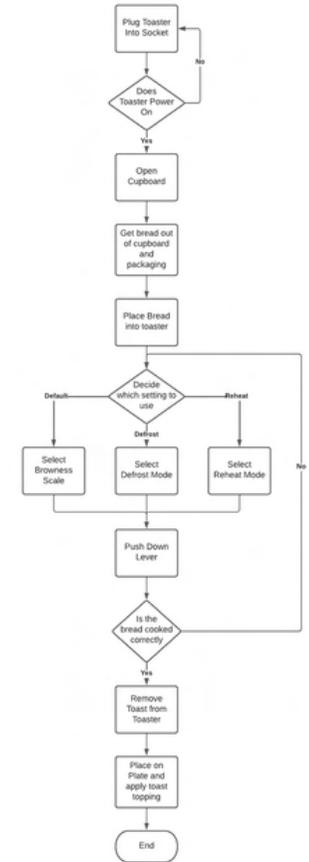
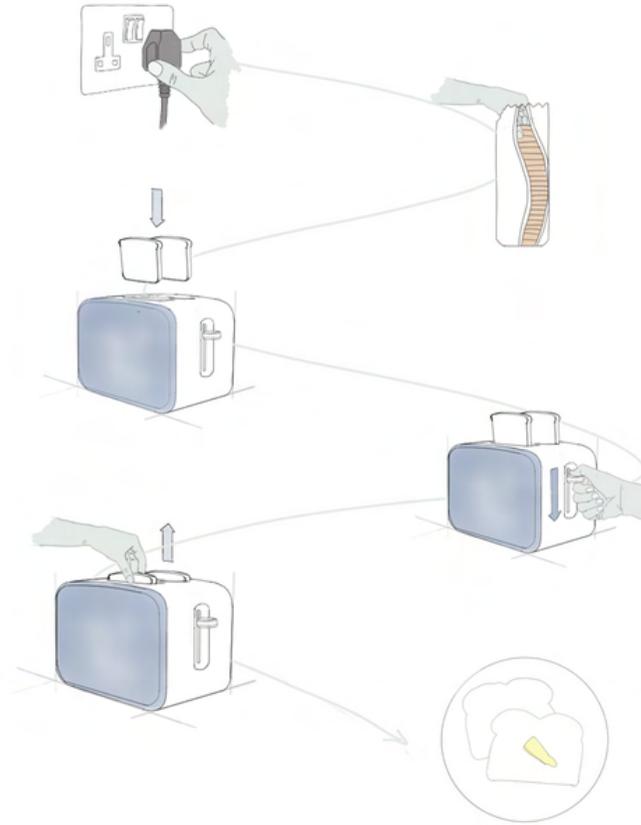


CURRENT SOLUTION ANALYSIS

Existing Product Deconstruction



Existing Solution Task Analysis



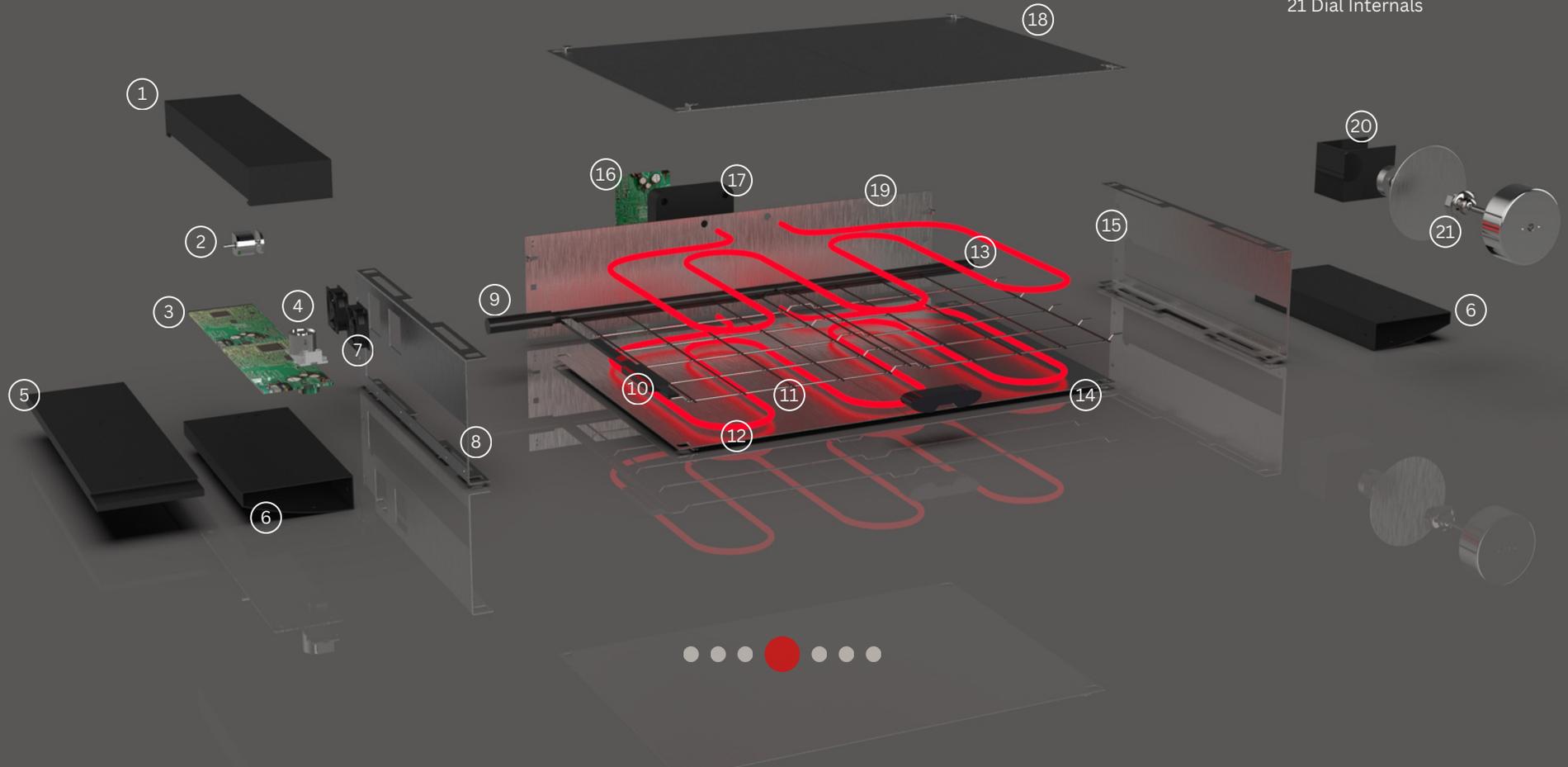
BUILT TO LAST

Internal Design of Toaster Mechanics

The Mura Toaster removes points of common failure in existing toasters replacing them with longer lasting mechanics and durable materials creating a toaster to last the target of 25 years.

- 01 Electrical Casing
- 02 Motor
- 03 PCB Board
- 04 Electromagnet
- 05 Electrical Casing Fixing
- 06 Outer Casing Fixing
- 07 Extraction Fans
- 08 Side Heating Chamber (Left)
- 09 Motor Fixing
- 10 Magnetic Connection

- 11 Grill
- 12 Filament
- 13 Grill Pivot
- 14 Bottom Heating Chamber
- 15 Side Heating Chamber (right)
- 16 PCB Board
- 17 Filament Back Fixing
- 18 Top Heating Chamber
- 19 Back Heating Compartment
- 20 Dial Casing
- 21 Dial Internals

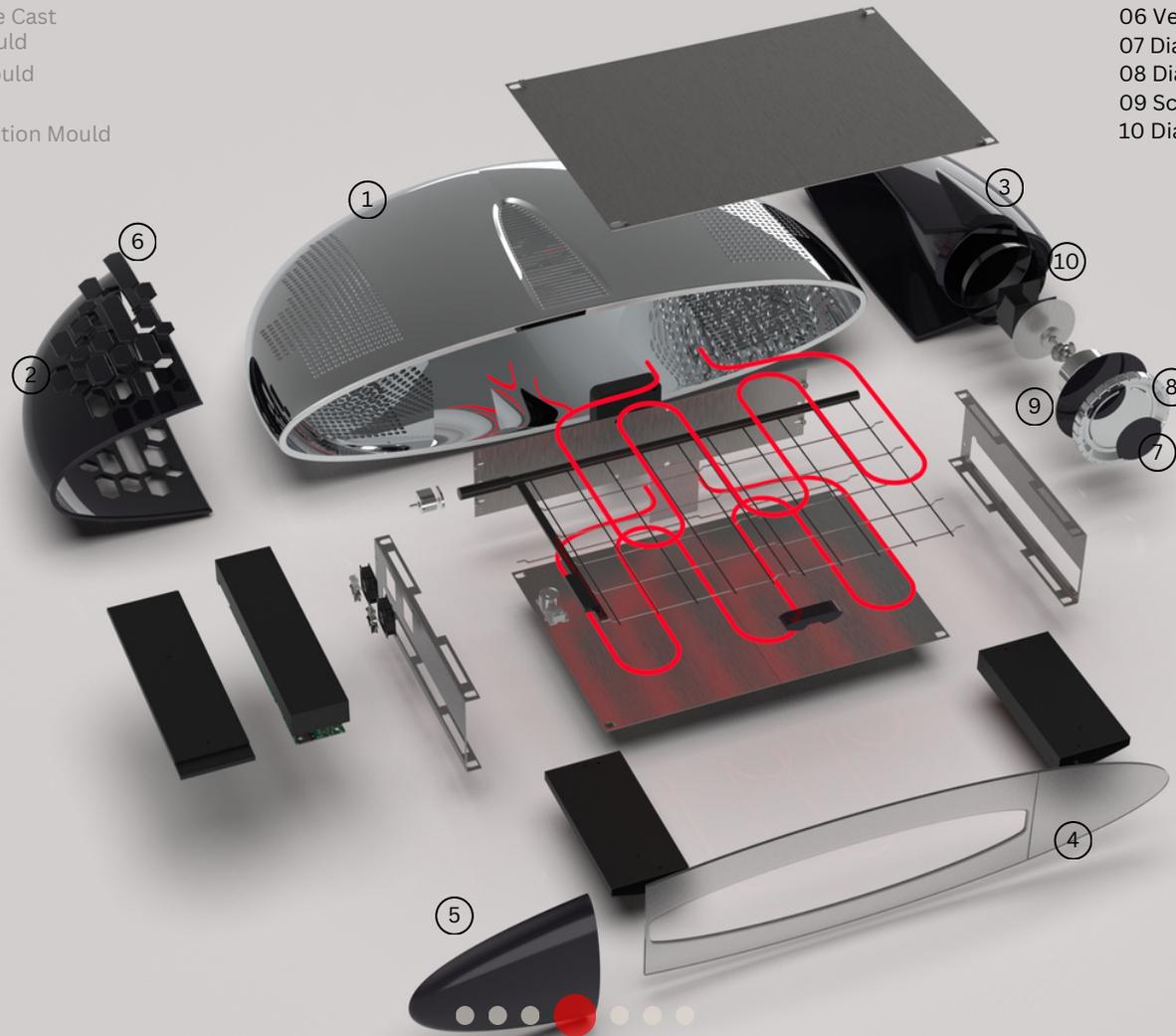


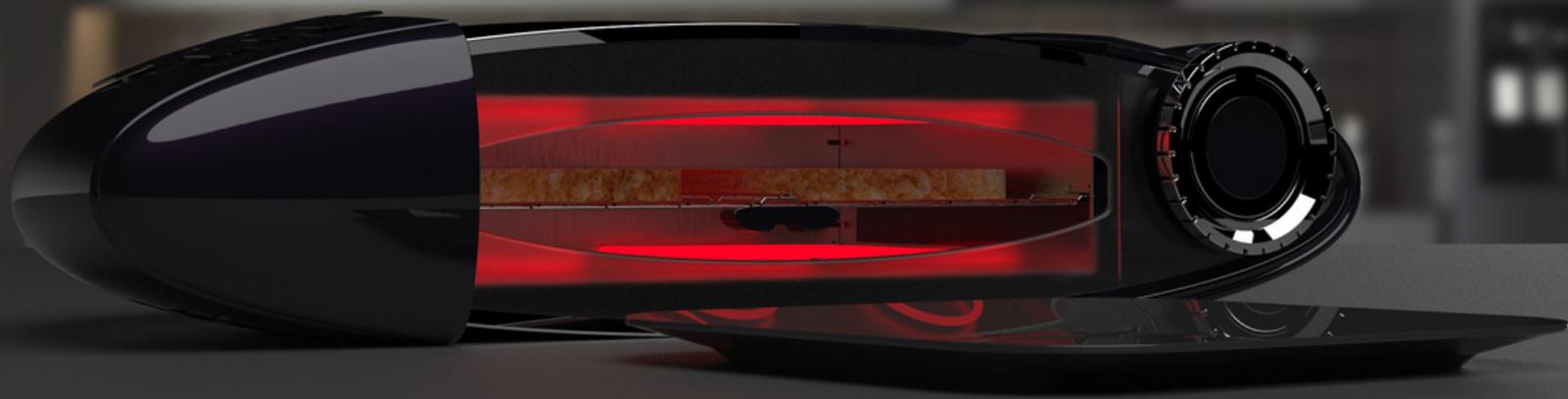
BEYOND STYLE

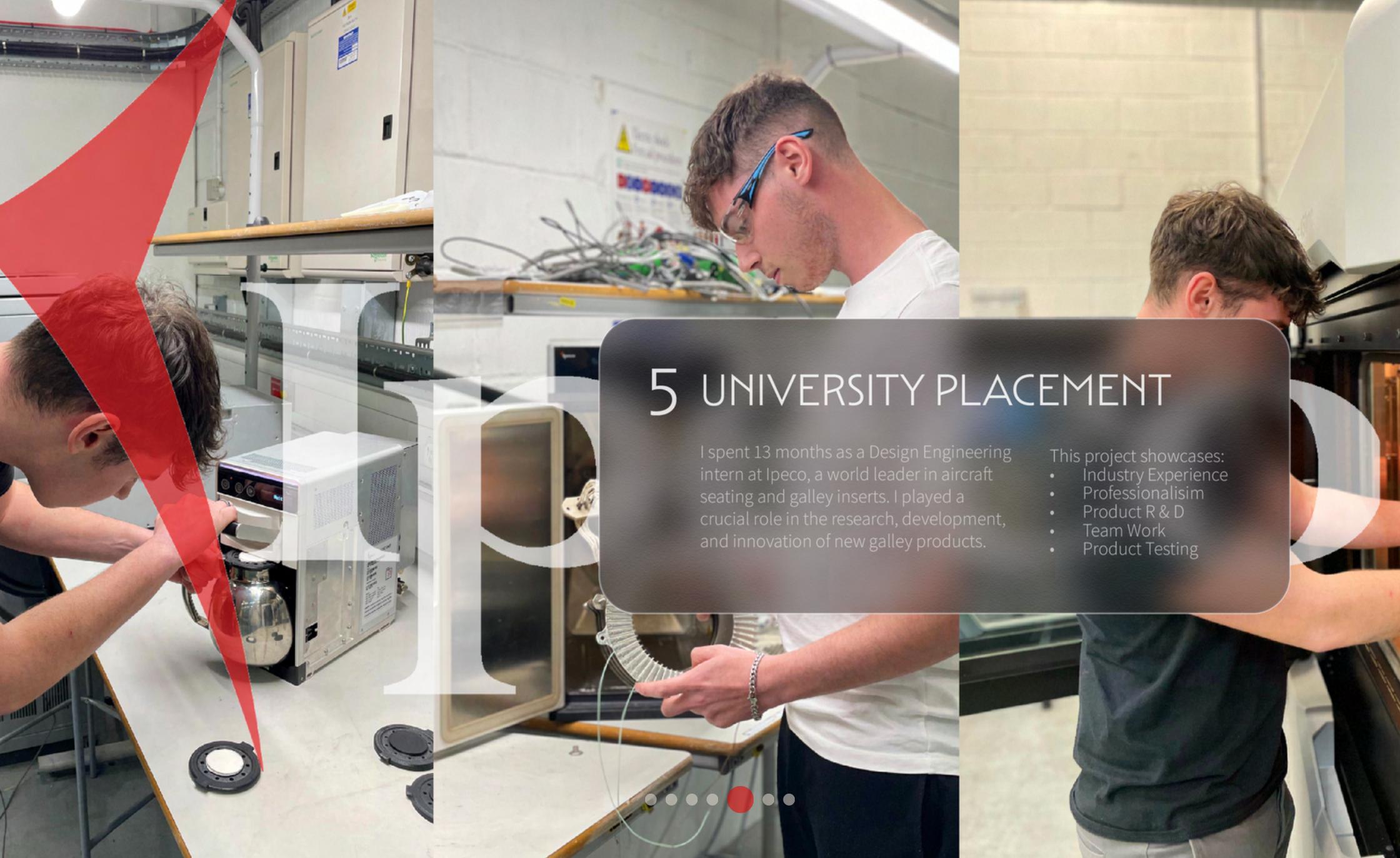
Use of Durable Materials

- 01 Inner Casing Mould Aluminium - Die Cast
- 02 Left Outer Casing PC - Injection Mould
- 03 Right Outer Casing PC - Injection Mould
- 04 Front Cover Frosted Glass
- 05 Component Access Cover PC - Injection Mould

- 06 Ventilation Cover PC - Injection Mould
- 07 Dial Digital Screen O/S
- 08 Dial Grip Stainless Steel - CNC
- 09 Screen PCB O/S
- 10 Dial Fastner O/S







5 UNIVERSITY PLACEMENT

I spent 13 months as a Design Engineering intern at Ipeco, a world leader in aircraft seating and galley inserts. I played a crucial role in the research, development, and innovation of new galley products.

- This project showcases:
- Industry Experience
 - Professionalism
 - Product R & D
 - Team Work
 - Product Testing

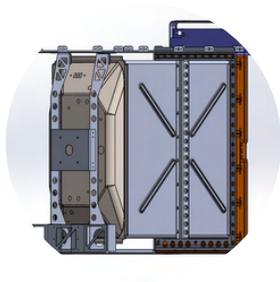


PLACEMENT EXPERIENCE

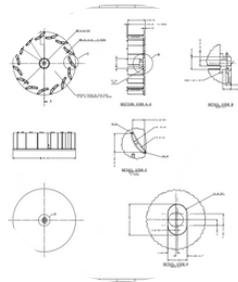
At Ipeco, I played a key role in developing their new Saros range of galley inserts. My responsibilities included:

- **Generating CAD data:** I created advanced assemblies, parts, and production drawings to industry standards, ensuring accuracy and efficiency in the manufacturing process.
- **Leading hydraulic design:** I spearheaded the hydraulic design of the new oven, conducting thorough testing and presenting my findings to company leadership. This required strong technical skills and clear communication abilities.
- **Mentoring apprentices:** I fostered a welcoming and informative environment for apprentices, encouraging them to pursue careers in Ipeco's engineering department. This demonstrates my leadership potential and commitment to team development.

Advanced CAD Design



Industry Standard Production Drawings



Product Testing



Design Presentations



Apprentice Mentoring



6 ASTON INSPIRED

Extra curricular design challenge, to design a logo and brand identity for the Aston Inspired Degree Show.

This project showcases:

- Brand Language
- Illustrator Skills



Voted 3rd Place



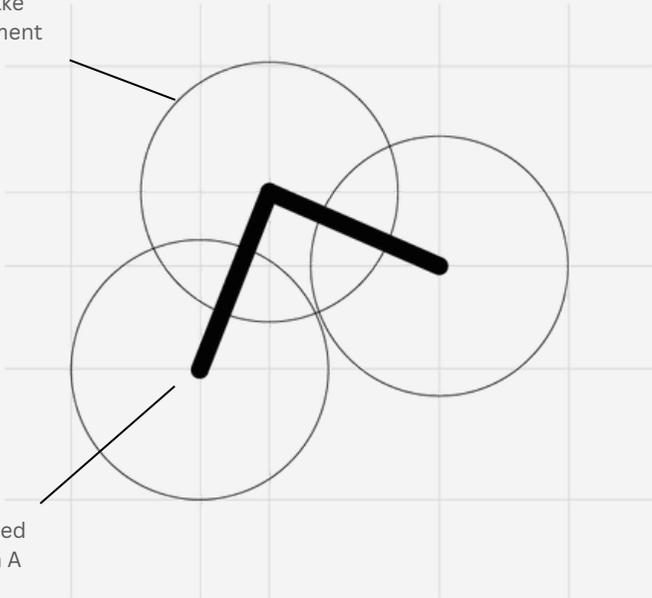
BRAND MANIFESTO

Connecting People Through Design

The design team at Aston has a strong focus on connecting people through sensory experiences, catering for a range of users' needs and desires. To celebrate this the 'Aston synergy' logo is a symbol of the three departments in design interweaving and coming together to collaborate and create. The colour gradients represent the diversity of cultures and personalities merging to create something beautiful and interesting.

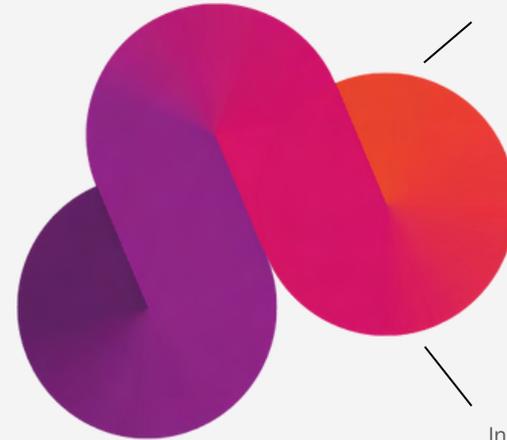


3 circles represent the three courses that make up the design department



Circles are arranged in the shape of an A representing the university - Aston

Colour Gradient celebrates diversity in cultures and backgrounds



Interwoven circles represents the connectivity of the department



LOGO INTEGRITY

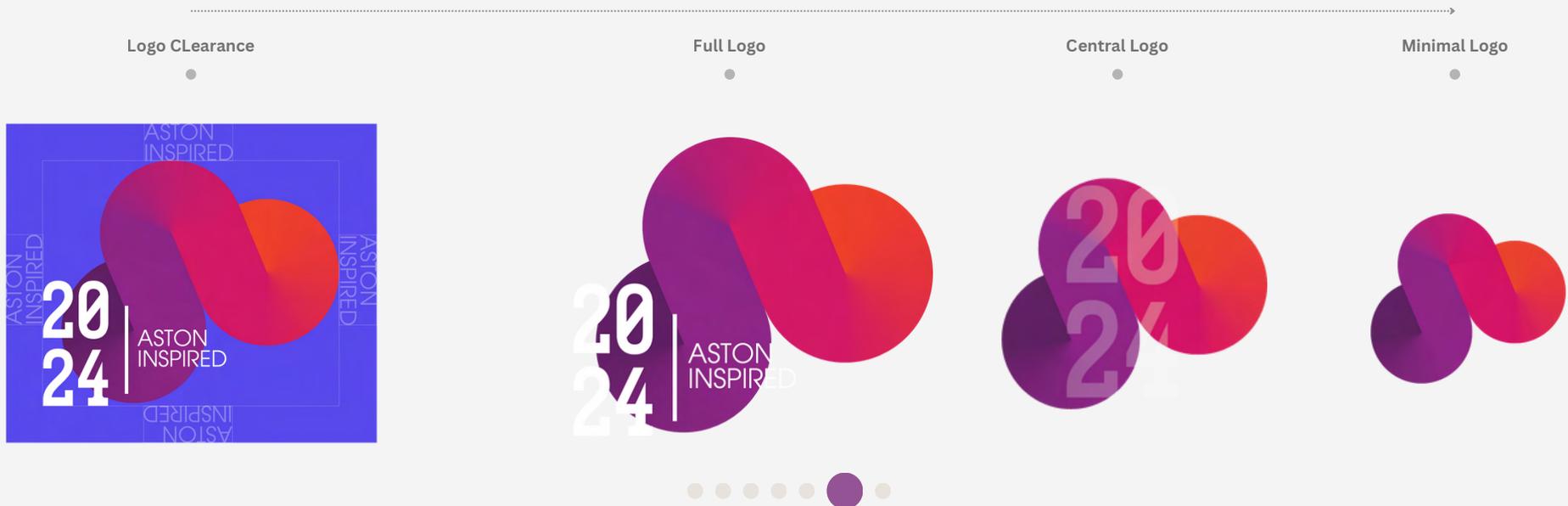
Logo Scalability

To allow clear communication of the logo in all applications the logo has been designed to be scaleable.

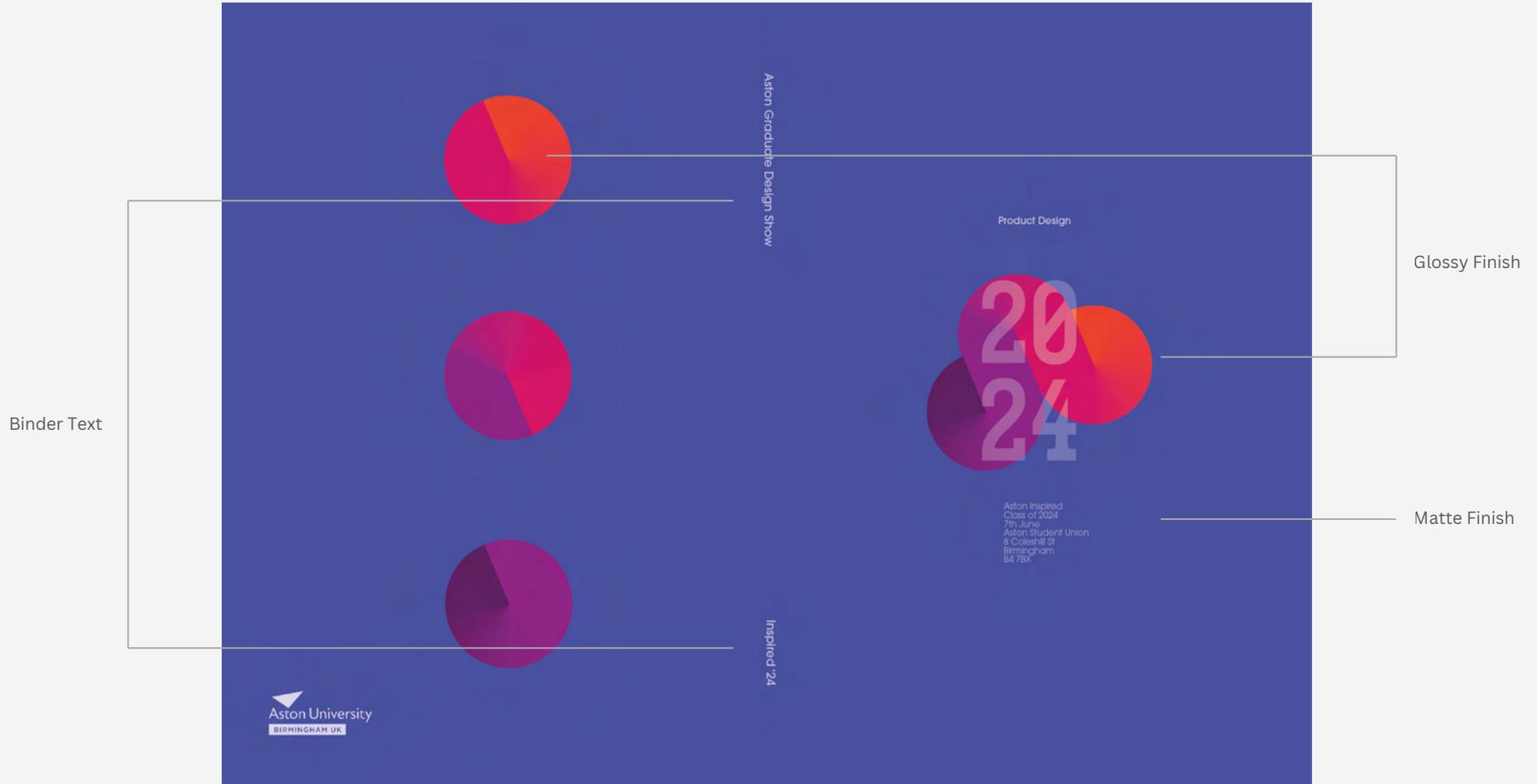
1. Full Logo: Full logo must be used in the corner/offset application when the logo can be at a minimum of 1:1 scale while meeting clear space requirements.
2. Central Logo: This variant must be used on any central application of the logo, and when the logo can be a minimum of 1:2 scale.
3. Minimal Logo: This variant must be used for an application where the logo has to be below a 1:2 Scale.

Logo Clearance

The logo needs to be surrounded by an area of uninterrupted clear space to protect legibility and integrity and to allow it to remain prominent in all communications. Clear space has been defined as equal to 1x height of Aston Inspired for both height and width of bounding box.



BROCHURE DESIGN





7 CDIO - GROUP WORK

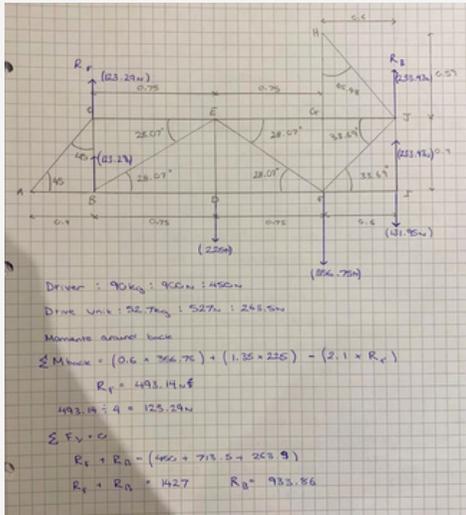
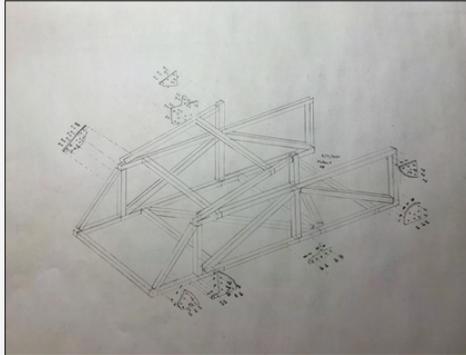
Throughout my first and second years, I participated in several multidisciplinary projects within the CDIO curriculum, fostering collaborative problem-solving across various engineering disciplines.

This project showcases:

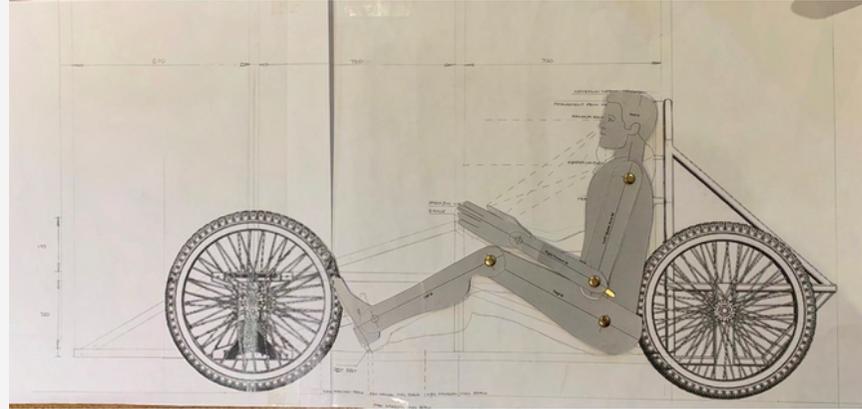
- Project Management
- Adaptability
- Collaboration
- Communication

ELECTRIC GO-KART (FIRST YEAR)

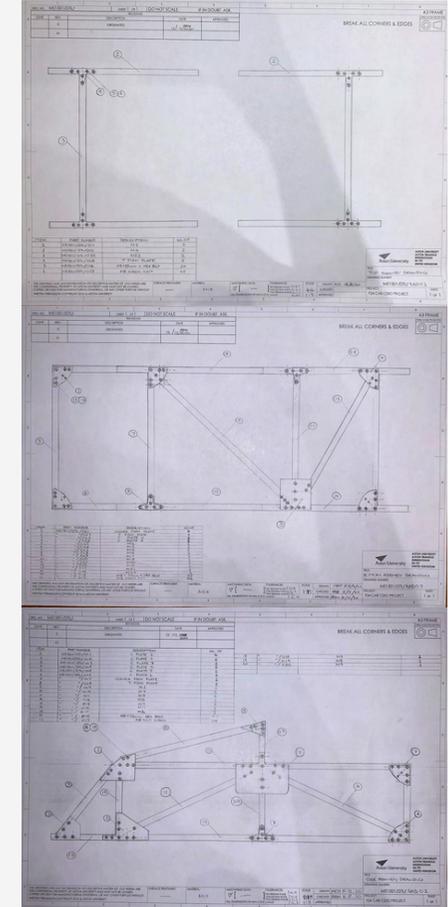
Truss Calculations



Ergonomic Design



Engineering Drawings



ELECTRIC GO-KART (FIRST YEAR)

Working Prototype



MEDICAL DEVICE (2ND YEAR)

Working Prototype



Aston University



BEST PROTOTYPE AWARD

IS PRESENTED TO:

MATTHEW HORNSBY (GROUP 14 - PURE AIR)

IN

ME2501: DESIGN AND ENGINEERING FOR
THE USER

ON

18TH JANUARY 2022

Dr Jose Sodre

Head of Department of Mechanical, Biomedical & Design Engineering

Bye

Thanks for taking the time to look at my portfolio, feel free to contact me using one of the platforms below.



matthornsby_design



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