TEXAS A&M UNIVERSITY
Engineering

Final Project Presentation

MEEN 601: Advanced Product Design

Team 7

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- Simon Padron
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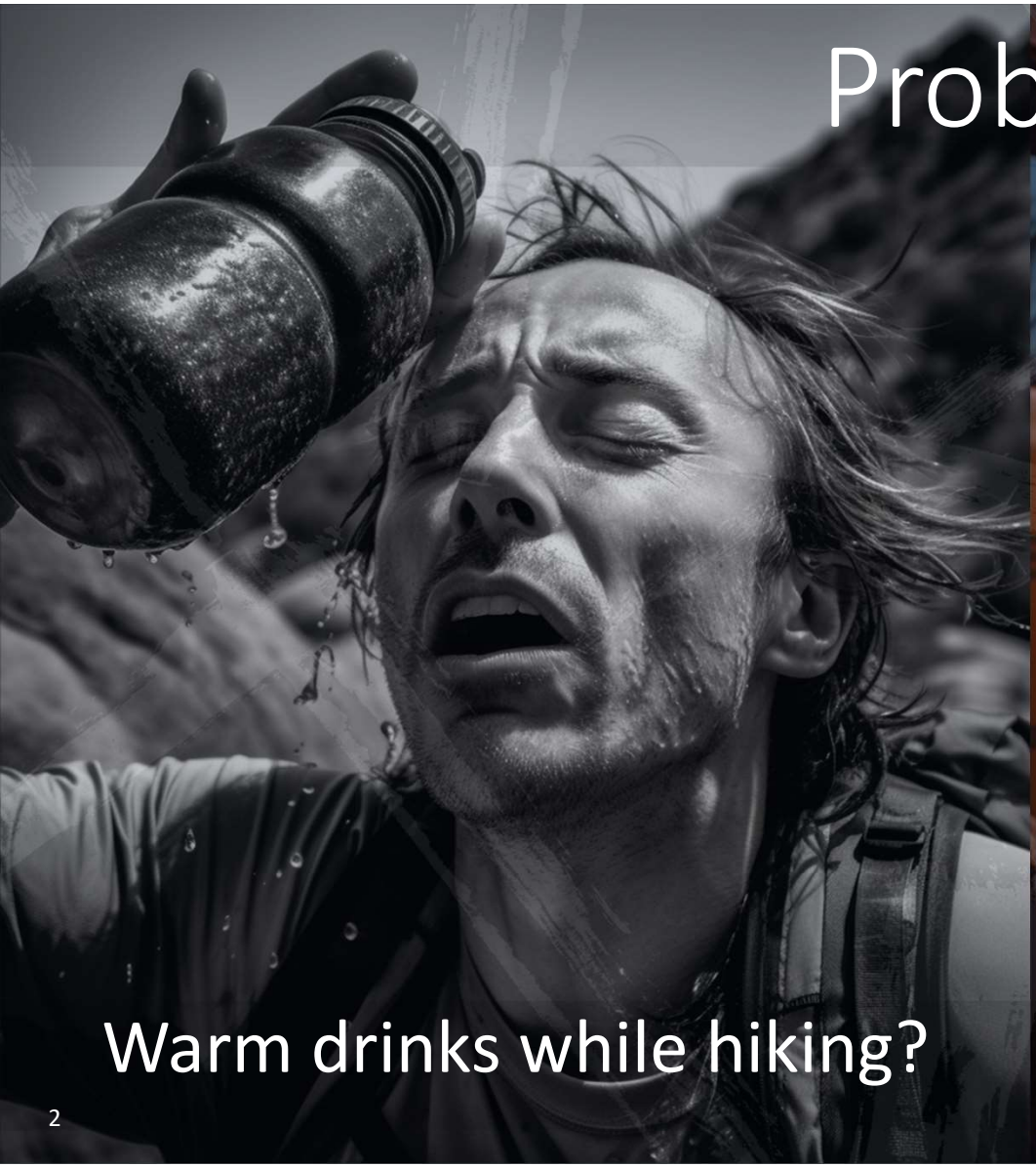
- Samuel Afolabi

Spring 2023

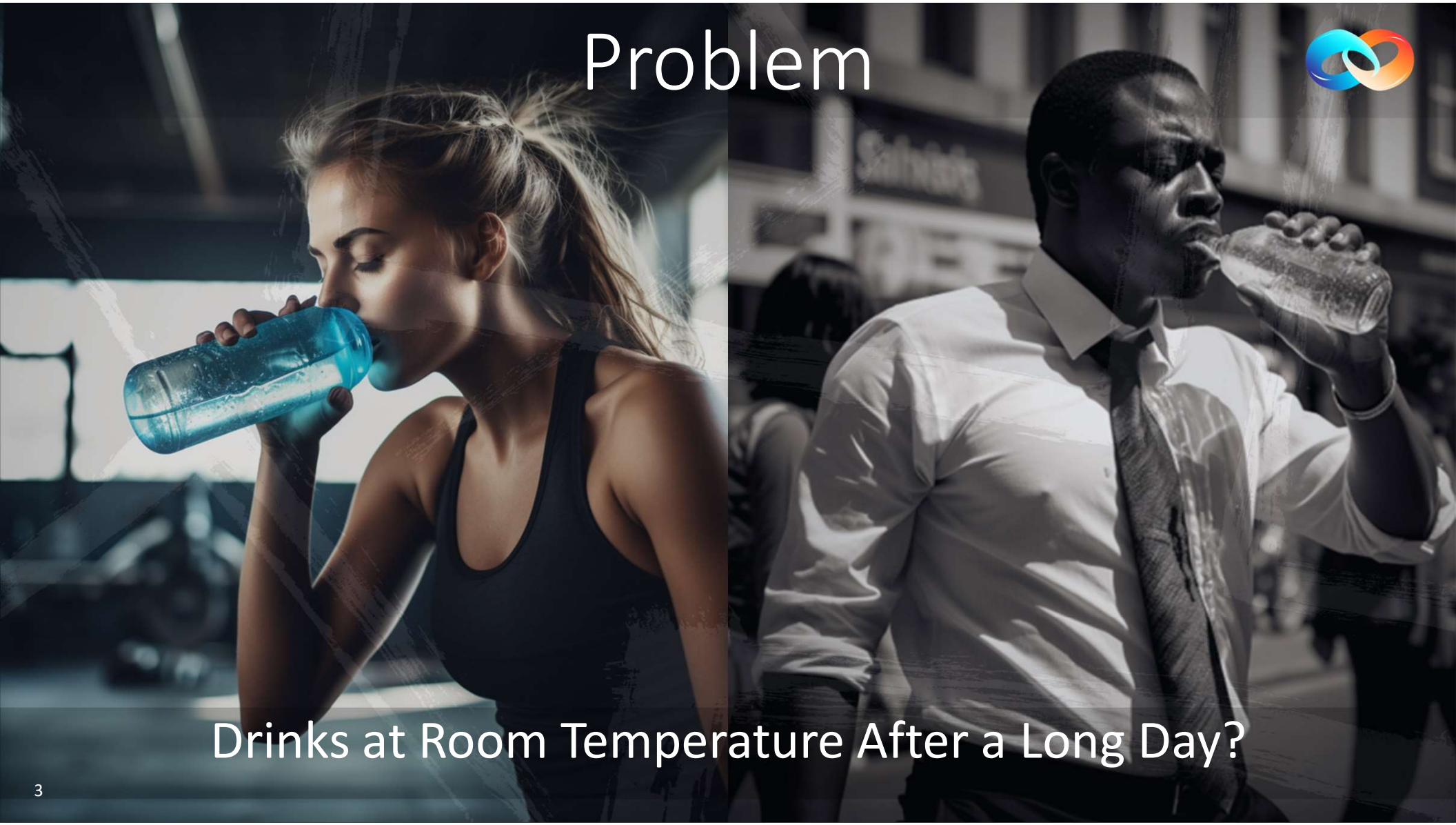
Problem



Warm drinks while hiking?

Cold coffee on camping trips?

Problem



Drinks at Room Temperature After a Long Day?

Introducing…

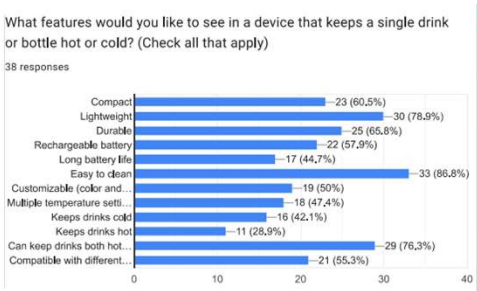
Infini7emp

- Sleek design
- Multiple color options
- Modular system
- Active Heating & Cooling

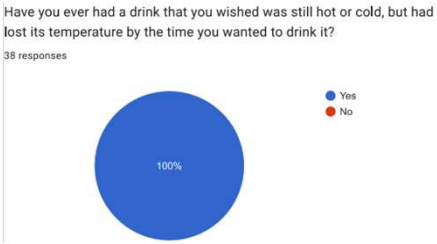
Development Process

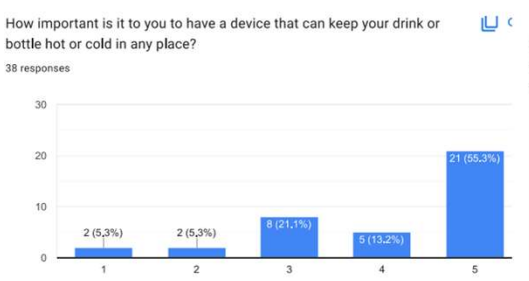
- Idea generation
- Customer surveys
- Competitor analysis
- Patent Review

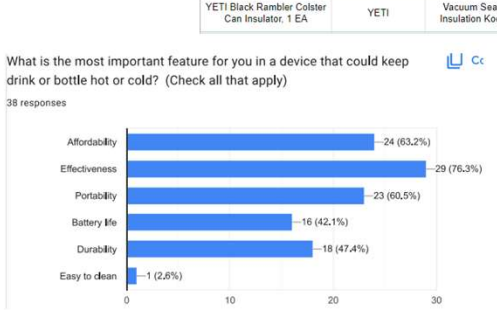
	Criteria	Weights	Opportunities SP#3	CE#2	CRC#5	SA#4
Desireability	Human-centric	3	5	5	5	5
	Usefulness/Utility	3	4	4	4	3
	Potential Creativity	3	3	4	4	4
Feasibility	Complexity of the Product	1	3	4	4	4
	Production Technology	3	3	4	4	4
Viability	Potential for Market Success	1	4	5	4	4
	Production Cost vs User Affordability	1	3	4	3	4
	Profit Potential	2	3	4	4	4
	Production Time	3	3	3	4	3
	Expected Contribution from the Team Members	3	4	4	4	4
	Total Score:		78	88	90	88

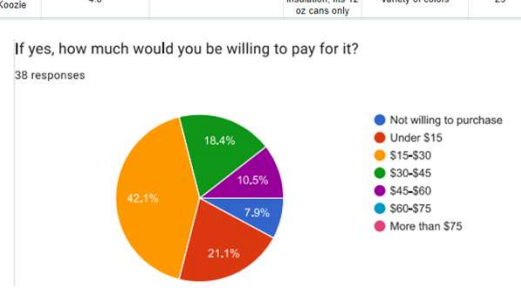


Product Name	Company Name	Product Type	Customer Ratings	Strengths	Weaknesses	Features	Pricing, $
Hydro Flask Wide Mouth Straw Lid	Hydro Flask	Vacuum Sealed Insulated Water Bottle	4.8	High-quality materials, excellent insulation, durable, sturdiness, easy to clean, easy to hold, leak proof	Limited size options	Stainless steel construction, vacuum insulation, variety of colors	50
YETI Rambler	YETI	Vacuum Sealed Insulated Tumbler	4.8	High-quality materials, excellent insulation, durable, sturdiness, easy to clean, easy to hold, leak proof	Limited size options	Double-wall vacuum insulation and a "no sweat" design	38
HidrateSpark PRO Smart Water Bottle – Insulated Stainless Steel for Hot and Cold Drinks – Tracks Water Intake with Bluetooth, LED Glow Reminder When You Need to Drink – Flip Lid, 21oz, Black	Hidrate Spark	Vacuum Sealed Insulated Water Bottle	2.9	Water Level Sensor	Bad reviews with electronics, sensor only works with water	Water Level Sensor, Bluetooth connectivity, LED color options, hydration reminders.	80
DOMETIC CFX3 55-Liter Portable Refrigerator and Freezer with ICE MAKER, Powered by AC/DC or Solar	Dometic	Compressor Cooling	4.6	Can be powered by AC, DC, or solar power	Heavy and bulky, making it less portable	Features a digital display and app control, temperature control, can work as freezer and ice maker	1200
YETI Black Rambler Colster Can Insulator, 1 EA	YETI	Vacuum Sealed Insulation Koozie	4.8		Limited insulation, fits 12 oz cans only	Variety of colors	25





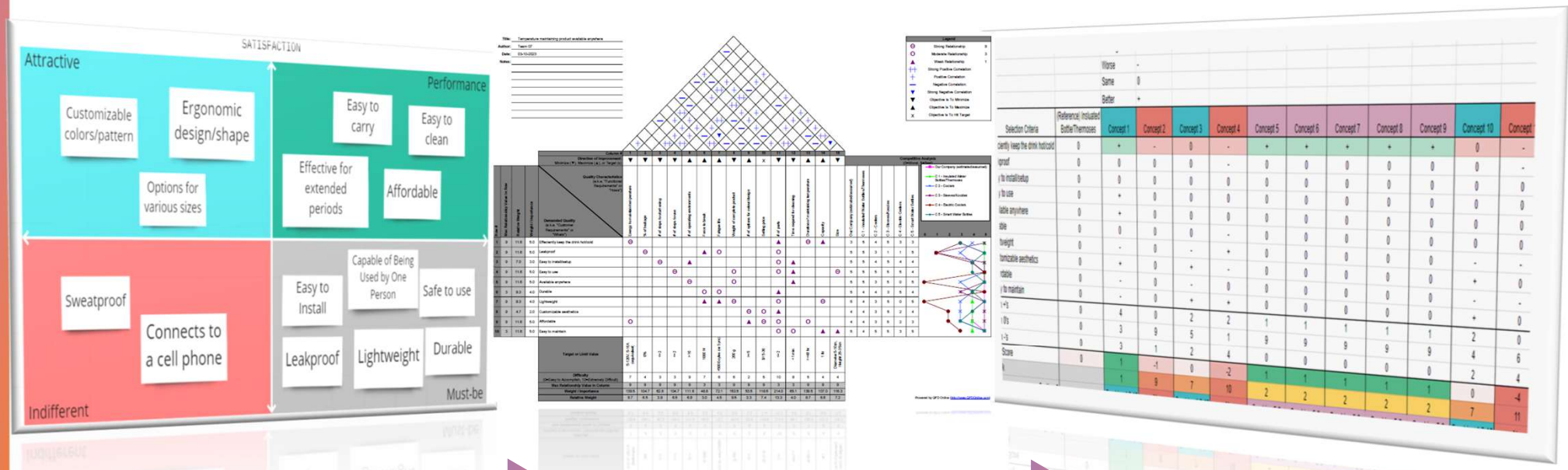




"A product that maintains drinks at a desired temperature in any location"

Engineering Metrics & Customer Needs

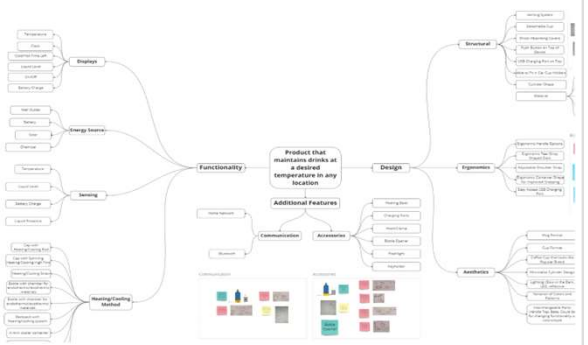
- Thorough requirement analysis
- House of Quality and Pugh Chart

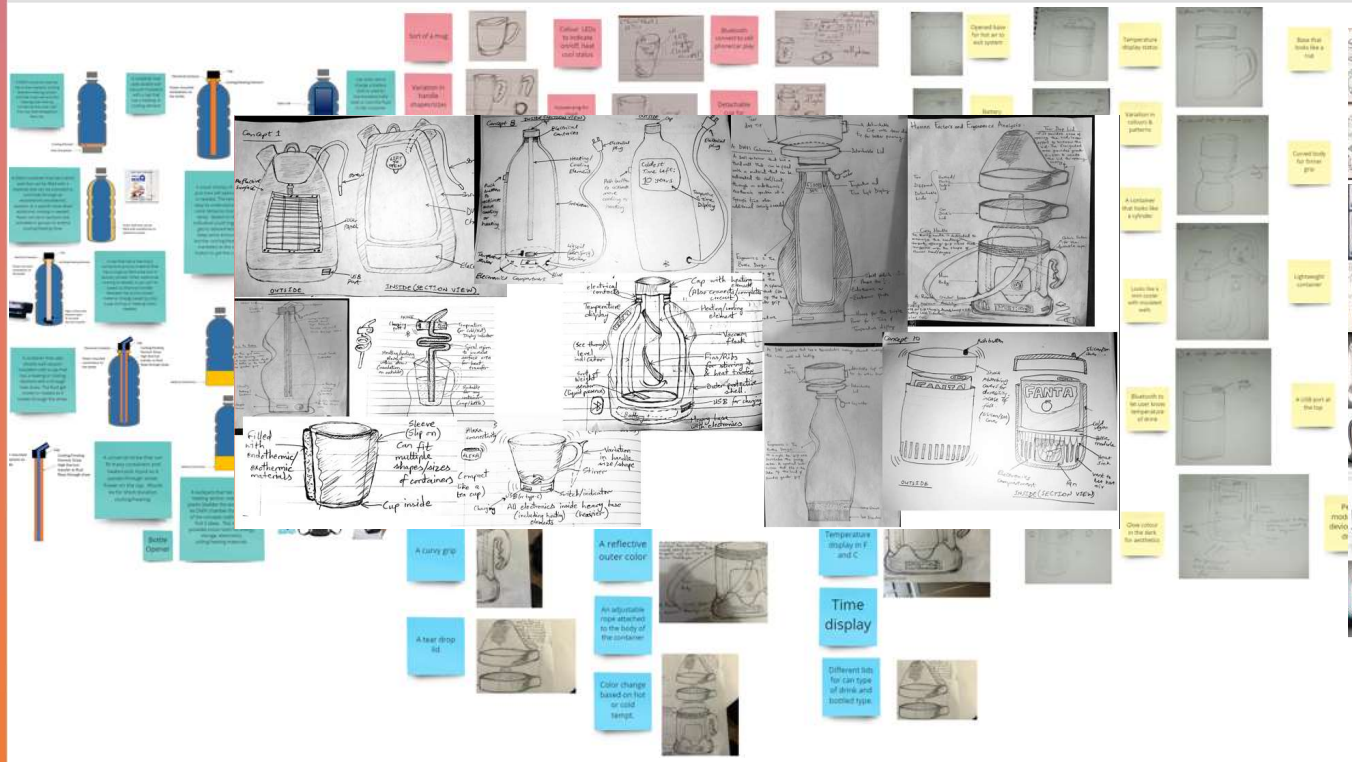


Customer Needs → Engineering metrics → Conceptualization

Conceptualization

- Brainstorming sessions
- Mind Mapping
- Hand-drawn sketches
- AI-driven idea visualization





Prototype & Challenges

- FMEA Assessment
  - Safety Proofing
  - Design iterations
- Virtual Reality Visualization

FMEA

Starting RPN	Final RPN
480	240
360	21
320	40
320	40
320	16
240	16
140	20
128	16
128	16
126	18
100	75
100	18
84	84
80	10
72	8
70	10

Top Improvements

- Water resistance
- Thermal Protection
- Fault alerts
- Quality check
- User manual instructions

Prototype & Challenges

- Modular System
- Sipper cap & cap with cup
- Cooling & heating modules

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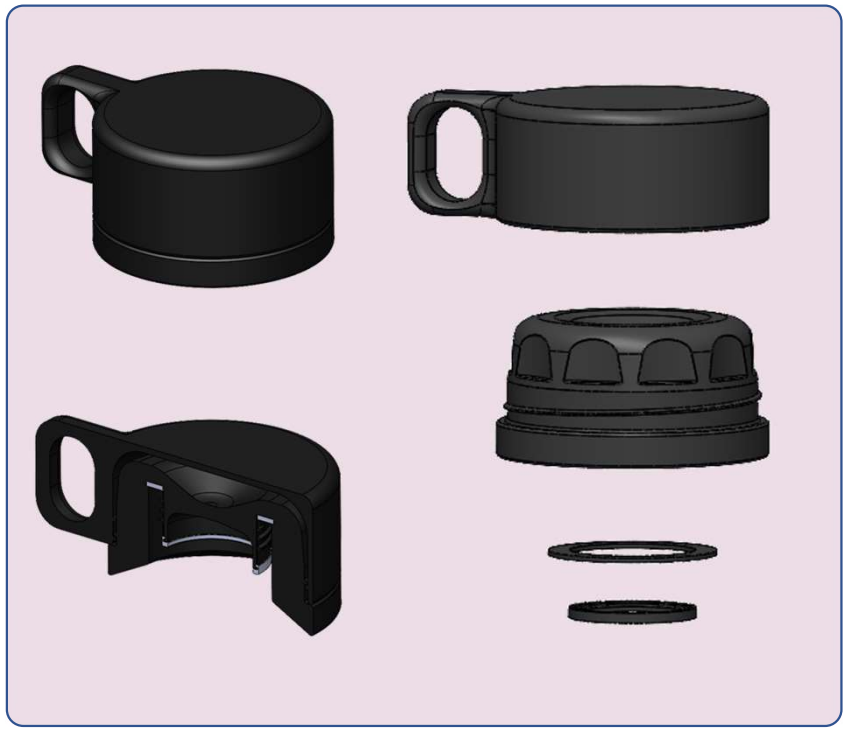

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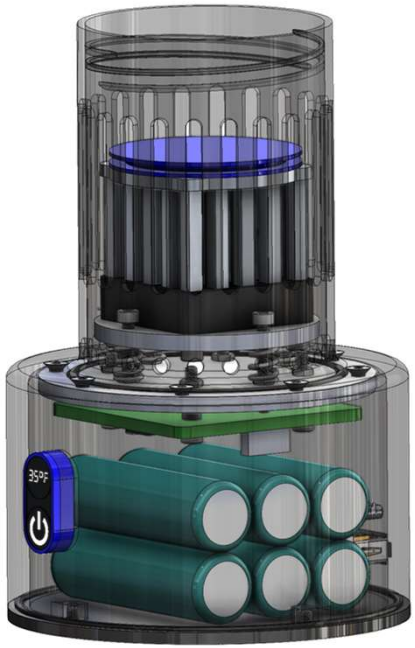

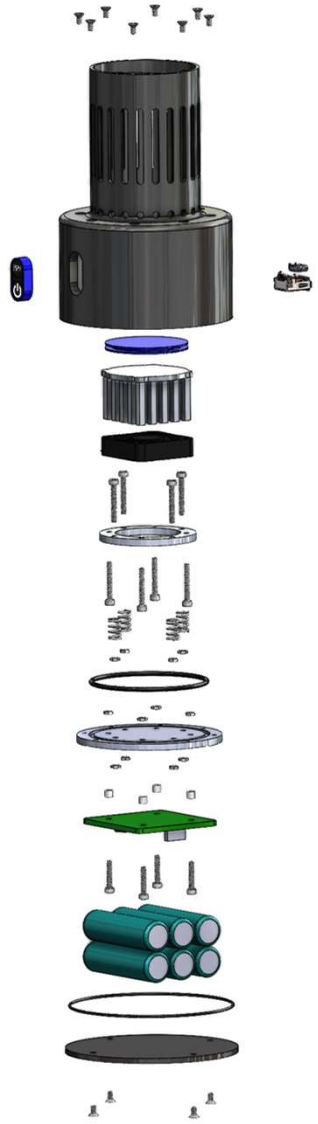

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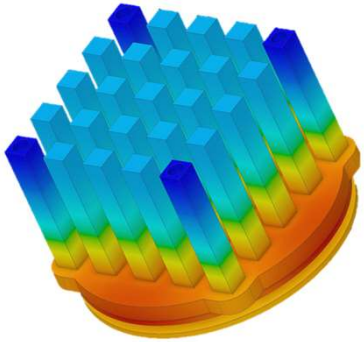
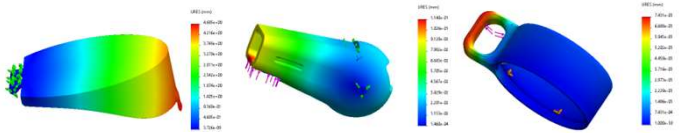
Analysis & Calculations

- Heat transfer & FEA simulations
- Theoretical Calculations
- Experiments

Heat Transfer Simulation: Heat Sink



FEA Simulation: Caps



Heat Transfer/Energy Equations

$$Qt = c * m * \Delta T$$

$$Qt = \left(\frac{4190J}{kg * °C}\right) * (1kg) * (3°C - 4°C)$$

$$Qt = -4190\,J\ (cooling)$$

$$Time = \frac{Qt}{Peltier\ Power * Efficiency}$$

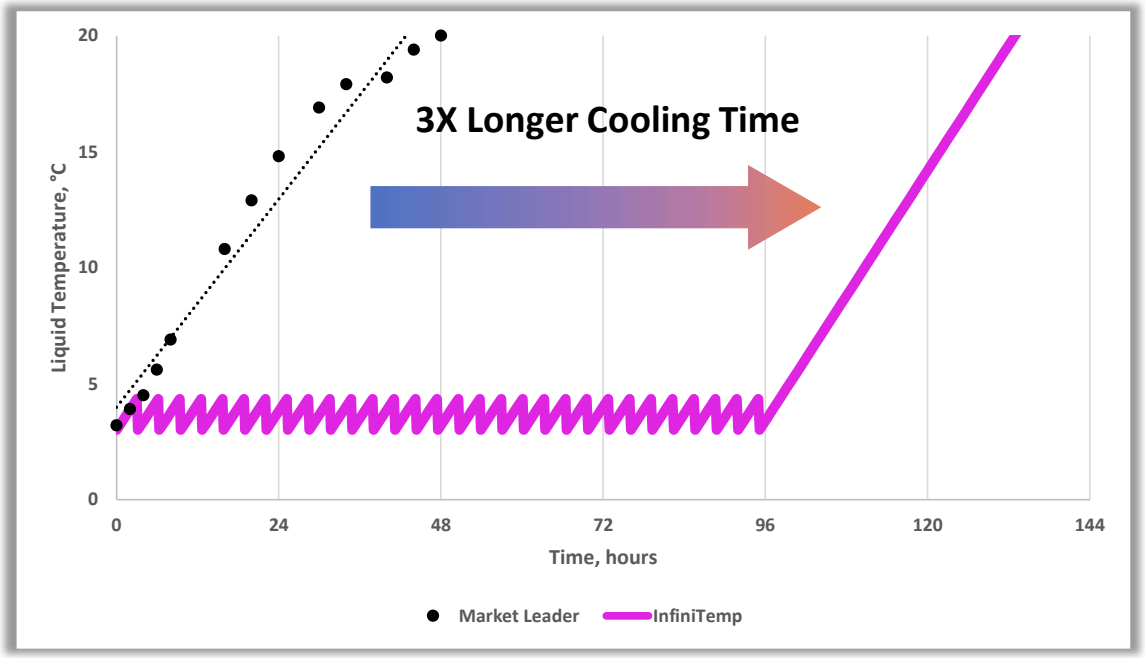
$$Time = \frac{4190\,J}{44.4\,W \times 0.30}$$

$$Time = 315\,s\ (5\,\text{min}, 15s)$$

Experiments

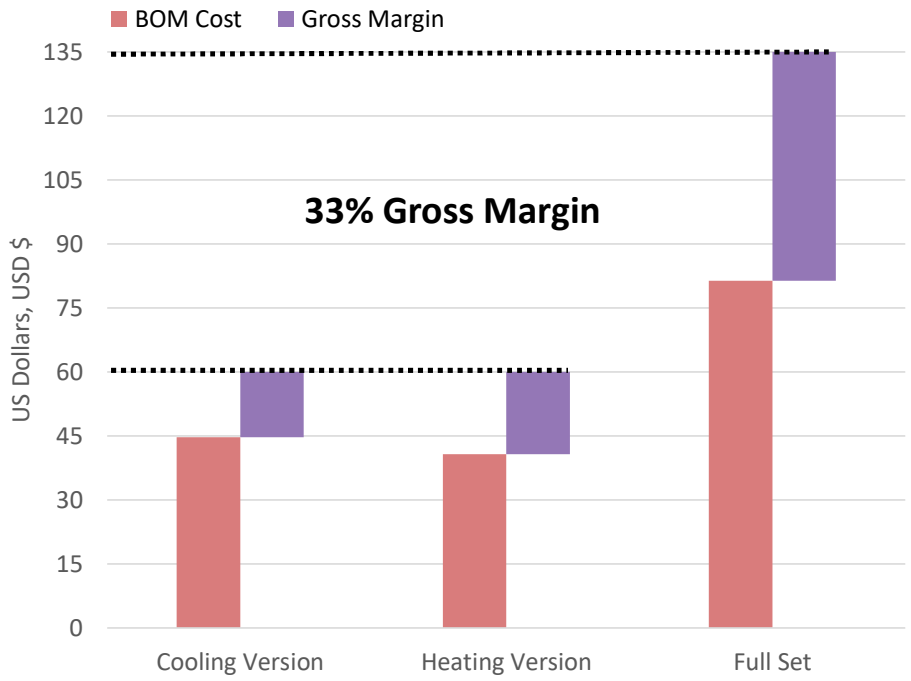
Analysis & Calculations

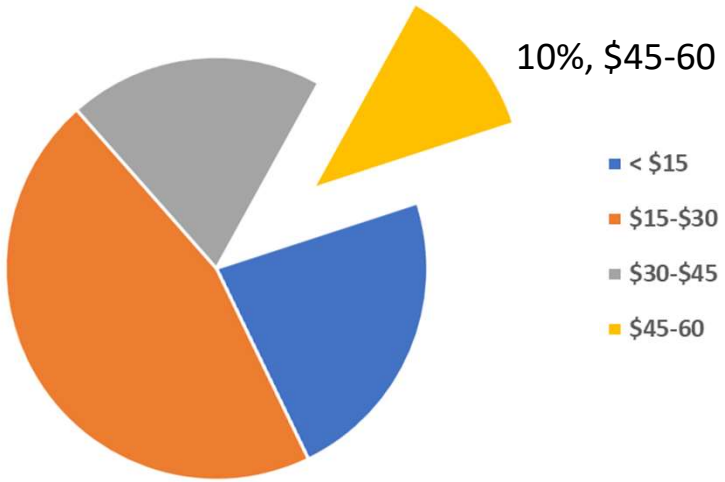
- 3X Longer Cooling Times
- Approximately 5.5 days of cooling on single charge
- Versus 2-days max for Market Leader



Cost

- $45 BOM cost per configuration
- Retail Price: $60 base cooling or heating version
  - 33% Gross Margin
  - Target: Premium buyers, 10% of Customers surveyed
- Retail Price: $135 full set





Risks & Future Plans

Risks

- Manufacturing
- Profit Margins
- Saturated Market
- Intellectual Property

Plans

- Product optimization
- Manufacturing partnerships
- IP Generation
- Marketing & distribution

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THANK YOU!

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