



ABRIDGED PROCESS BOOK

EMILIA ZIOLEK



WE ARE THE HINGES FOR THE DOOR
THAT OPENS UP TO A BETTER WORLD.



INTRODUCTION

ABOUT

I am a final year Product Design and Technology student at the University of Limerick, passionate about sustainability, intuitive physical design, and the intersection between people and the natural world. My work often challenges passive consumption habits, favoring analog, human centered solutions inspired by biomimicry and circular systems.

I believe design is a way to return to nature — to move in step with its rhythms, learn from its intelligence, and work with its materials — valuing presence over convenience, and participation over automation.

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PROBLEM STATEMENT

FOOD WASTE

29% OF ALL FOOD WASTE IN IRELAND IS GENERATED AT A HOUSEHOLD LEVEL.

FOOD WASTE accounts for 9-10% of all green house gas emissions. This waste is often driven by over-purchasing, poor storage habits, and confusion around best before dates—leading to edible food being thrown away prematurely. In Ireland alone, households waste an estimated 250,000 tonnes of food annually, costing consumers around €700 each.

Globally, **61%** of food waste comes from **HOUSEHOLDS**, contributing significantly to methane emissions as food rots in landfills. Addressing this issue through better preservation and prevention strategies presents a major opportunity to reduce environmental harm and promote more sustainable consumption habits.



RESEARCH METHODS & STAKEHOLDERS

METHODS



This project used a mixed-methods approach, combining 8 interviews, 59 survey responses, 3 in-depth field studies, and 18 observational sessions. Together, these methods provided valuable insight into everyday food behaviours, storage habits, and attitudes towards waste.

STAKEHOLDERS



RESEARCH INSIGHTS

01 AESTHETIC-DRIVEN CONSUMPTION IS REAL —FOOD GETS WASTED FOR NOT LOOKING PERFECT.

83.8% of people threw out bruised but edible produce. **73%** discarded wilted lettuce that could be revived, and **67.6%** chose to bin a small amount of peanut butter, revealing a pattern of waste driven more by appearance, perceived inconvenience, and a disregard for small quantities than actual food safety or usability.

SURVERY CONDUCTED WITH 37 PARTICIPANTS



KNOWLEDGE GAPS LEAVE PEOPLE UNEQUIPPED TO MANAGE FOOD EFFECTIVELY. 02

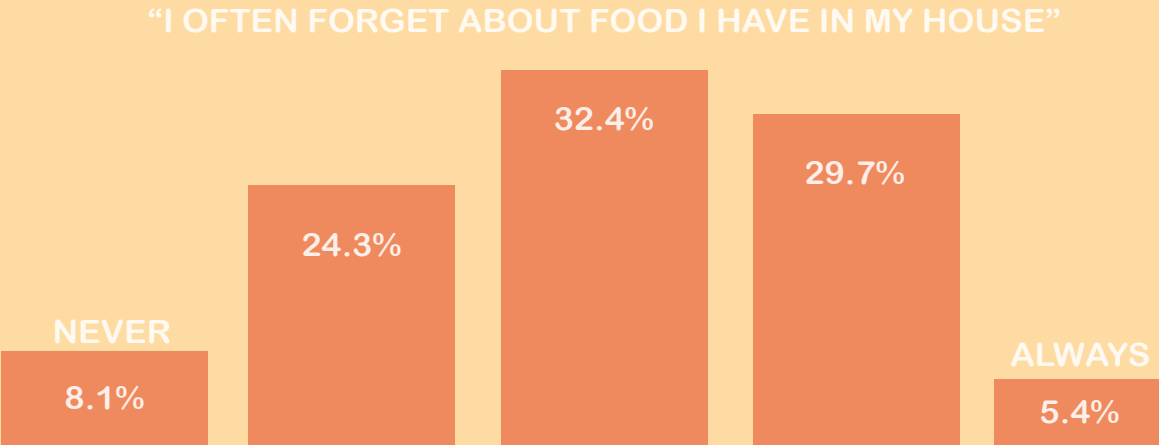
Only **25–35%** of participants could answer basic food storage questions—like where bread should go, what ethylene gas does, or how fridge zones affect freshness—revealing just how much confusion shapes everyday waste.

SURVERY CONDUCTED WITH 22 PARTICIPANTS

03 KITCHEN SPACES PRIORITIZE STORAGE, **NOT** FOOD PRESERVATION.

Over **60%** of participants admitted they often forget about food in their homes, suggesting that visibility and routine, more than intention, play a major role in why food goes to waste.

SURVERY CONDUCTED WITH 37 PARTICIPANTS



COOKING CHALLENGE

USER STORIES



LOW SKILLED



MEDIUM SKILLED



HIGH SKILLED



Across the three participants, distinct patterns emerged: the low skilled cook relied heavily on packaging and had little awareness of what was already in the fridge, often discarding unused portions. The medium skilled cook used experience to guide decisions, managing food fairly well but still producing waste due to lack of planning and limited space. The high skilled cook showed confidence, adaptability, and strong food awareness, resulting in minimal waste and intentional use of leftovers.

CONVERSATIONS ABOUT THE PROBLEM

HEALTH PERCEPTIONS



“PROVINCIAL TOWN IRELAND IS
NOW ESSENTIALLY ONE BIG
TAKEAWAY...”

“SOME PEOPLE JUST DON’T
HAVE THE COOKING SKILLS
TO MAKE ANYTHING DECENT.”

“EVERYONE ELSE IS GOING
DOWN THE SHOP OR WHATEVER.
ABSOLUTELY INSANE.”

Many people feel trapped between convenience and health. Cooking is seen as time-consuming or unappealing, while takeaways and processed food are the default; easy, addictive, and everywhere. Underneath this, cultural habits also shape how we waste —routines like overbuying or associating full fridges with care and comfort make excess feel normal.

THE FUTURE OF FOOD



SWARMS OF LOCUSTS — PROVOKED BY UNUSUALLY HEAVY RAINS — ARE DESTROYING CROPS ACROSS LARGE SWATHS OF EAST AFRICA AND SOUTHWEST ASIA, DISRUPTING FOOD SUPPLIES.



BLISTERING HEAT AND SEVERE DROUGHT ACROSS FRANCE HAVE WREAKED HAVOC ON AGRICULTURAL PRODUCTION AND PROMPTED FARMERS TO CALL ON THE GOVERNMENT FOR HELP.



YIELD GROWTH FOR WHEAT, MAIZE, AND OTHER CROPS HAS BEEN DECLINING IN MANY COUNTRIES DUE TO EXTREME HEAT, SEVERE WEATHER, AND DROUGHTS.



NEARLY 750 MILLION PEOPLE EXPERIENCED SEVERE FOOD INSECURITY IN 2019 AND THE NUMBER OF UNDERNOURISHED OR FOOD INSECURE PEOPLE IS RISING

80% OF FOOD WILL BE CONSUMED IN CITIES BY 2050.

There is a big shortfall between the amount of food we produce today and the amount needed to feed everyone in 2050. There will be nearly 10 billion people on Earth by 2050—about 3 billion more mouths to feed than there were in 2010. As incomes rise, people will increasingly consume more resource-intensive, animal-based foods.

SO HOW CAN WE DESIGN FOR FOOD RESILIENCE IN A CHANGING WORLD?

DERIVED FROM NEED STATEMENTS

DESIGN GUIDE & IDEATION

MUST HAVES

FDA COMPLIANCE FOR FOOD SAFETY The design must adhere to food standards for hygiene and safety, ensuring that all materials and preservation methods are safe for food contact	EDUCATIONAL COMPONENT The product should offer guidance or visual reminders about storage best practices, addressing knowledge gaps that lead to spoilage.	TASTE LEVERAGE Emphasize the value of seasonal freshness, ensuring food flavor is enhanced by preserving its natural taste through sustainable storage techniques.	ACCESSABILITY The system must prevent food from being "lost" in clutter by emphasizing clear, accessible solutions.	CONVENIENCE FOR USER The design should prioritize easy access to food items while promoting engagement.	VARIABLE CONTROL Incorporate natural methods of variable control of food to keep it safe.	HOUSEHOLD INTEGRATION The solution should be able to be put into the household environment naturally and without other consequences.
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NICE TO HAVES

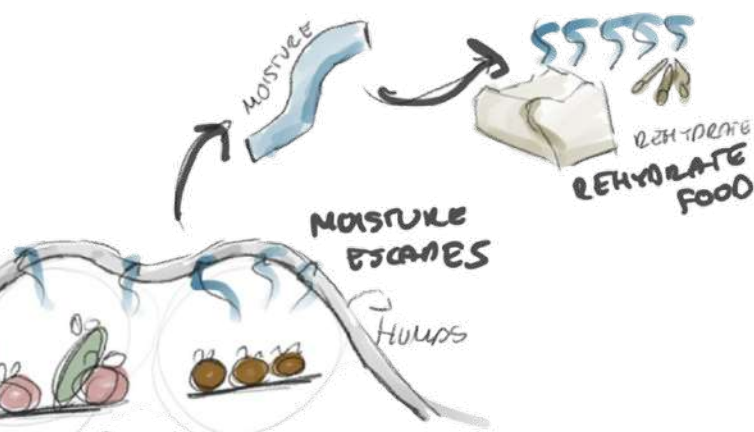
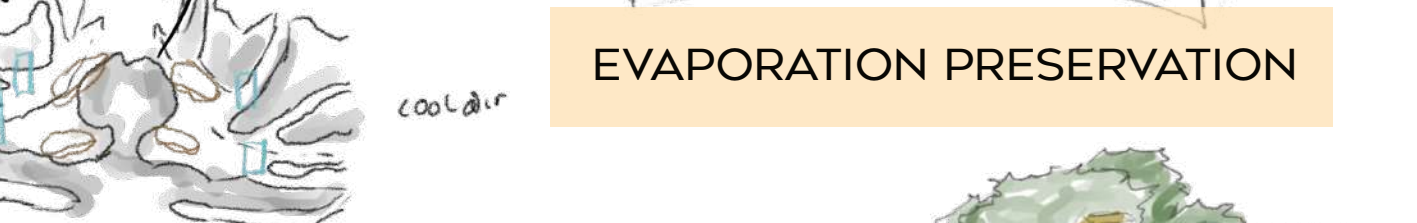
LONG-TERM ENGAGEMENT The solution should encourage long-term engagement, creating a habit of sustainable food management and consumption	ZERO WASTE The product should allow/or be a closed-loop system where nothing goes to waste.	DESIGN FOR RESILIENCE Solution should withstand the everchanging resources and demands of people.	BIOMIMICRY Allow nature to guide the design to becoming efficient and made with natural engineering.	HEALTHIER EATING HABITS The solution should encourage healthier eating habits.	DISPOSAL OF FOOD The solution should offer a green method of repurposing any additional food waste or proper disposal.	TRANSFORM ATTITUDES The design should transform the user's relationship with food by encouraging awareness, appreciation, and a long-term commitment.
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EMPOWERING HOUSEHOLDS TO APPRECIATE AND LIVE MORE SUSTAINABLY WITH FOOD BY FOSTERING A DEEPER UNDERSTANDING OF FOOD VALUE AND ENCOURAGING MINDFUL CHOICES THAT PROMOTE LONG-TERM SUSTAINABILITY.

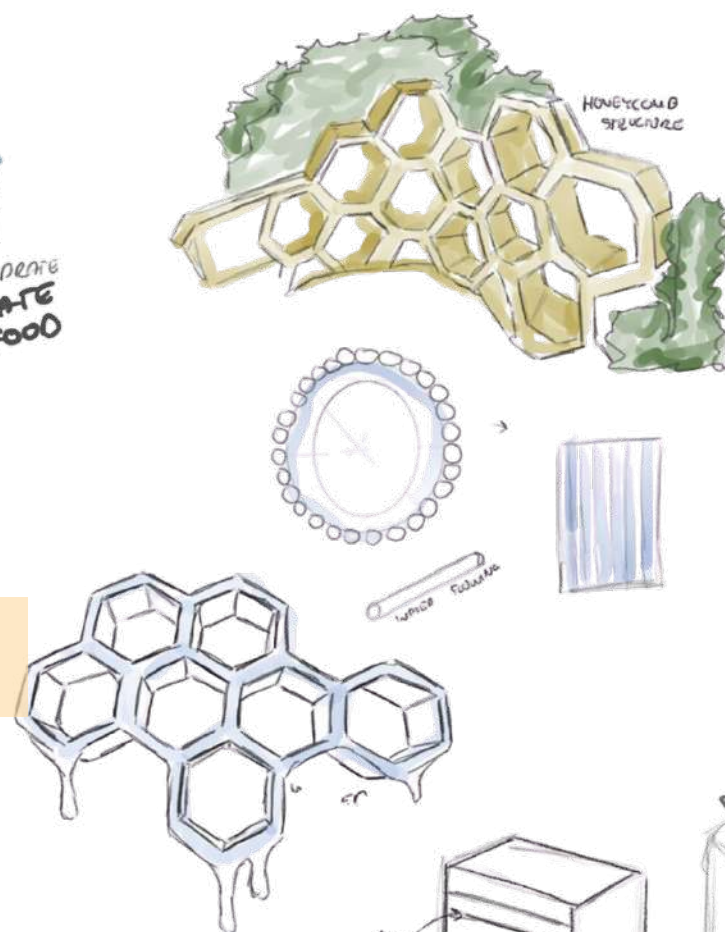
ZERO-ENERGY VARIABLE CONTROL



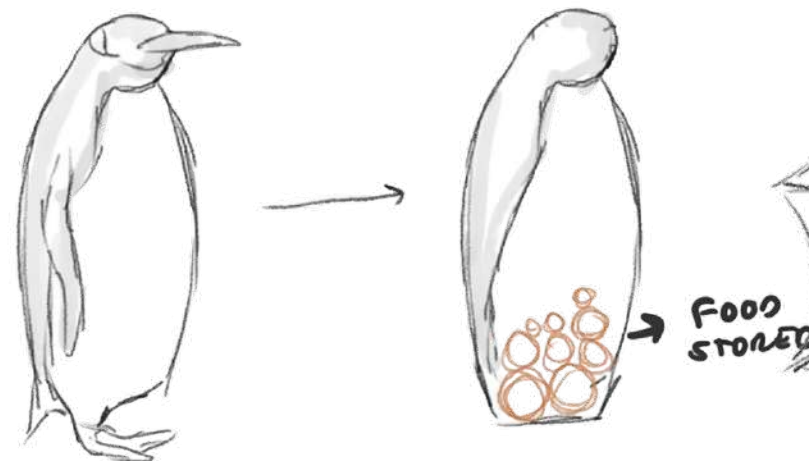
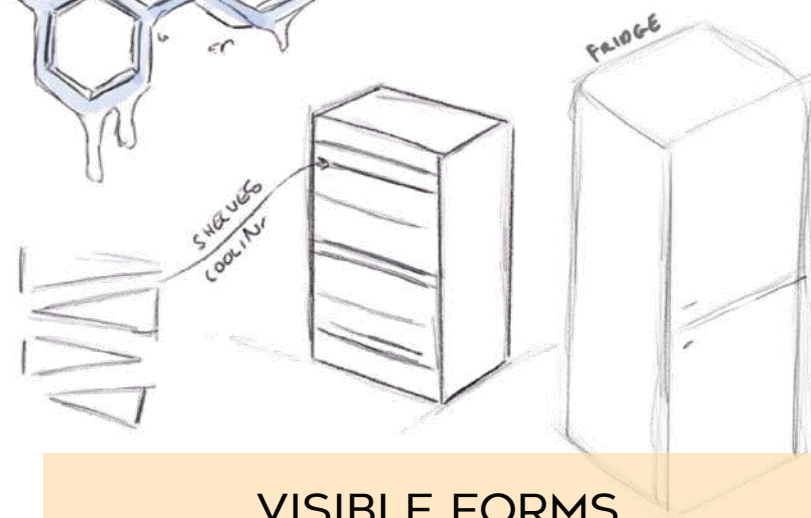
EVAPORATION PRESERVATION



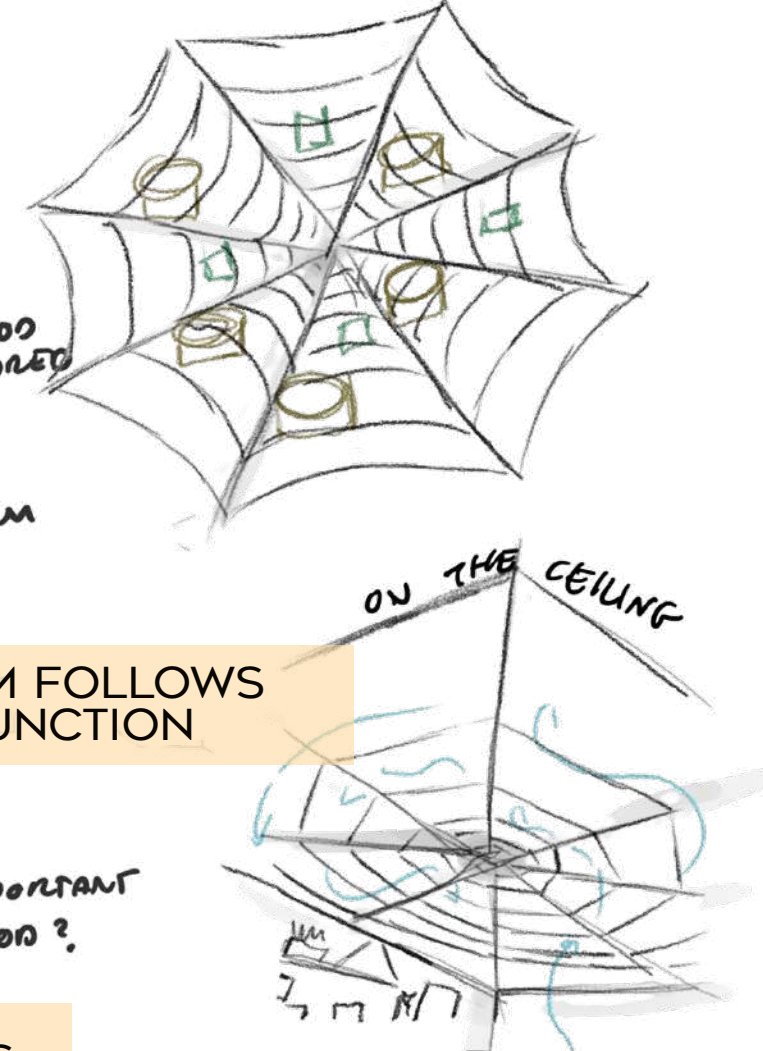
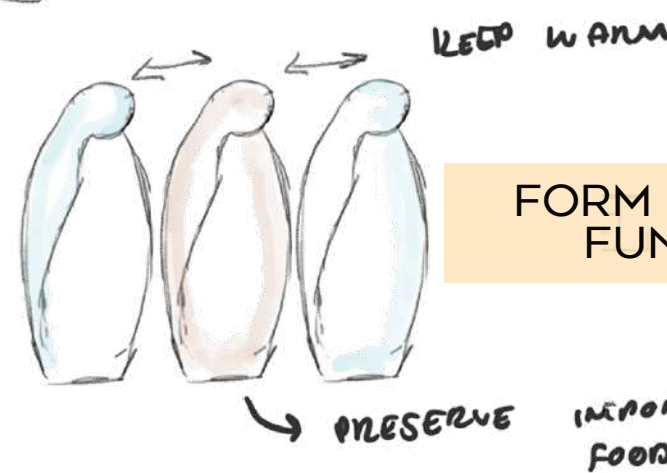
NATURAL MOISTURE STORAGE



VISIBLE FORMS



FORM FOLLOWS FUNCTION



PASSIVE COOLING SYSTEMS

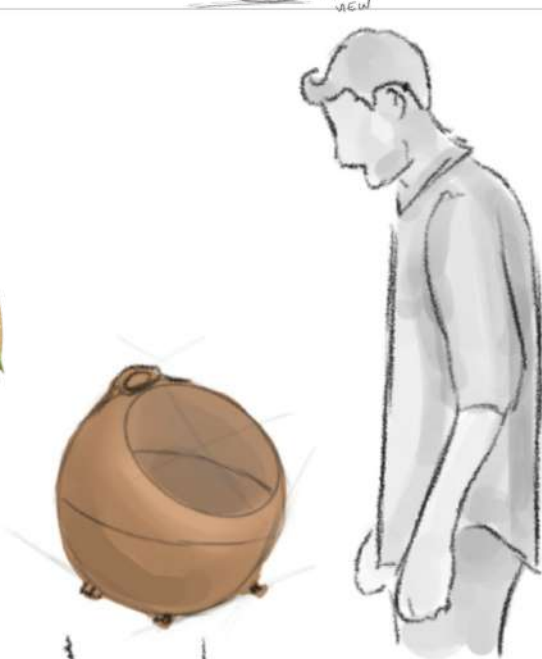
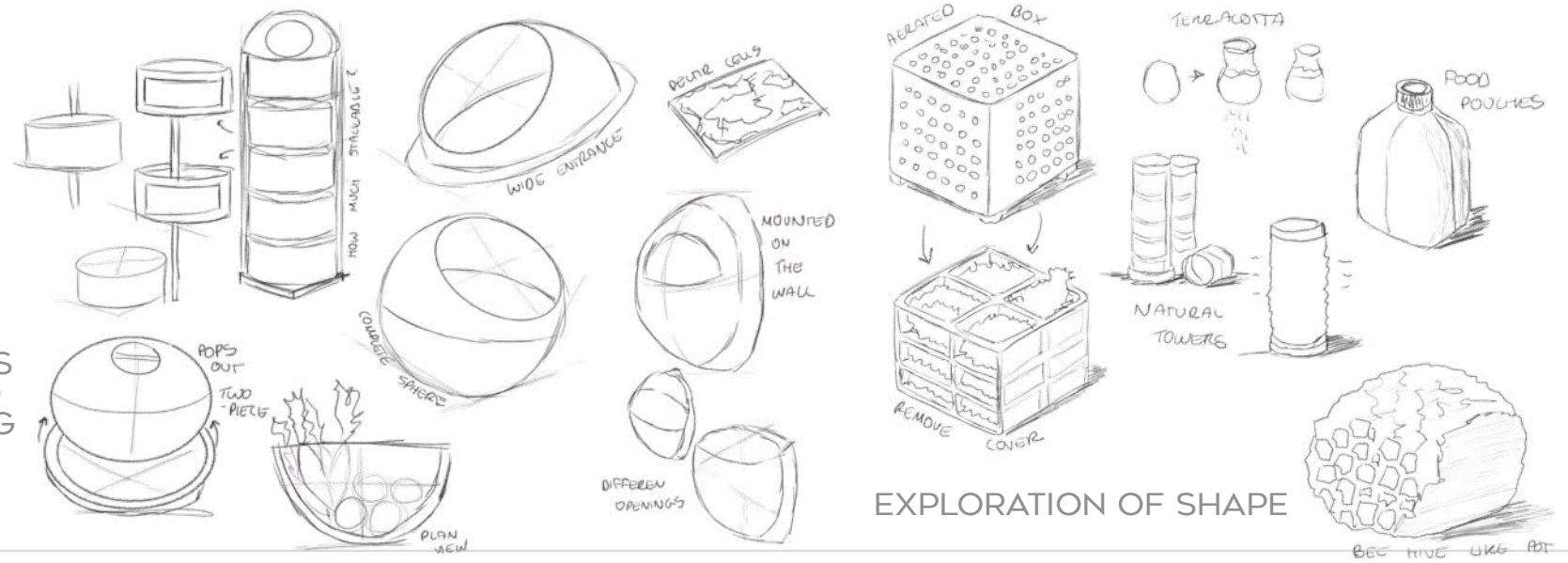


CERMAIC 3D PRINTING

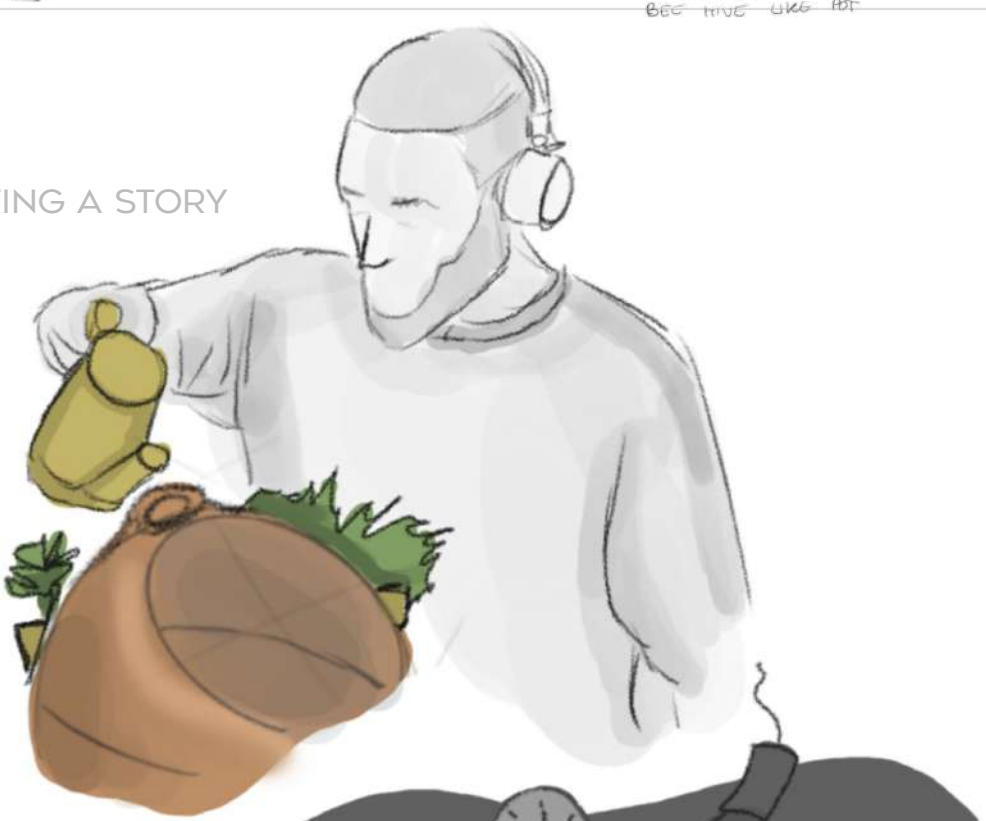
CONCEPT DEVELOPMENT



THE CONCEPT BEGAN WITH EARLY FORM AND FUNCTION EXPLORATIONS USING DOMES AND NATURAL MATERIALS TO TEST VISIBILITY AND COOLING PRINCIPLES.

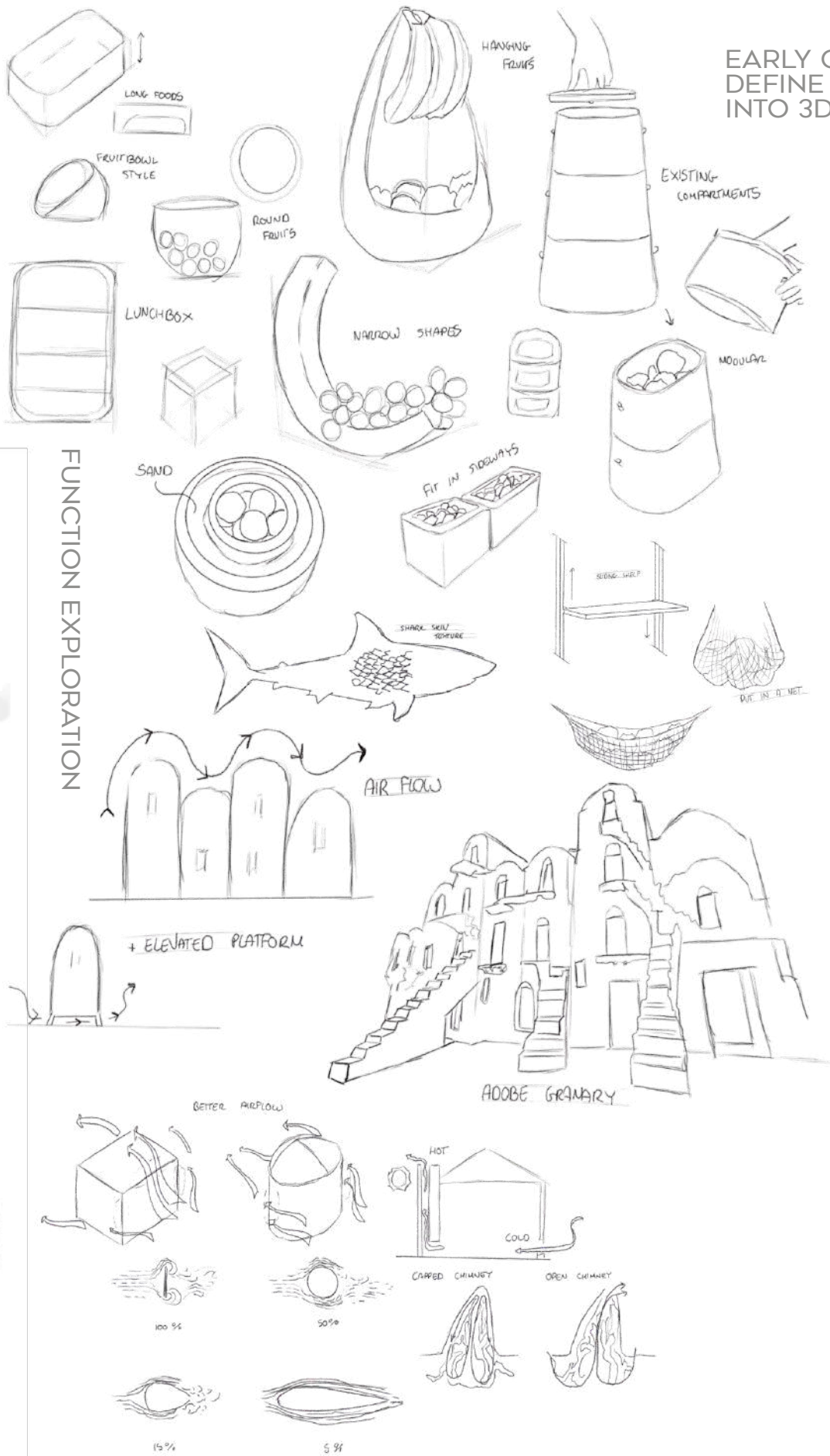


CREATING A STORY



JOURNEY TO ZEER

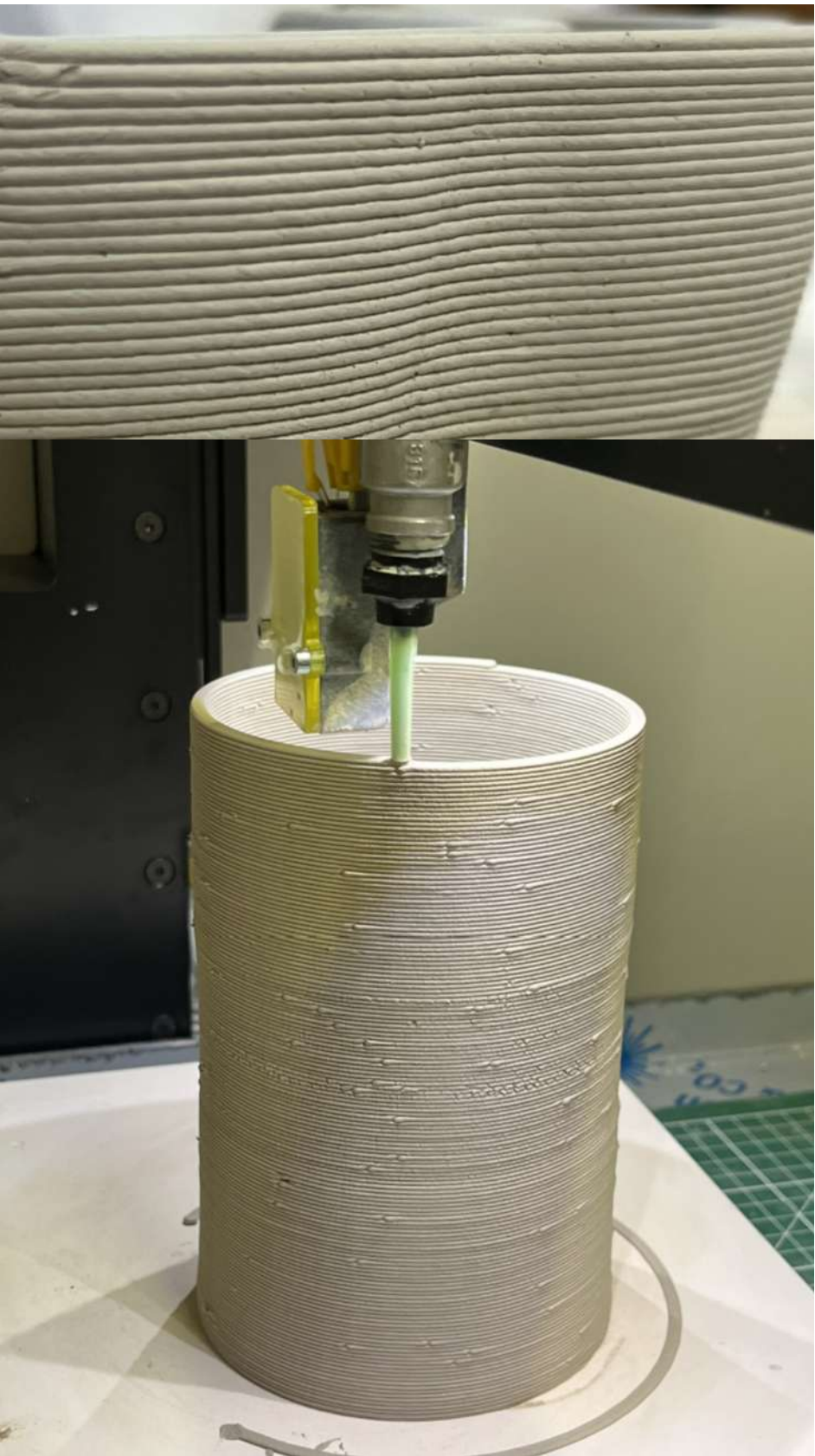
EARLY CLAY AND COOLING EXPERIMENTS HELPED
DEFINE THE FEASIBILITY AND INFORMED THE TRANSITION
INTO 3D CERAMIC PRINTING FOR FINAL PROTOTYPING.



FEATURES INTERPRETATION



TECHNOLOGY TESTING



3D CERAMIC PRINTING TESTS

CERMAIC 3D PRINTING

BRINGING ZEER TO LIFE



THE MODEL WAS PRINTED ON THE LUTUM 5 CERAMIC PRINTER.



1. BASE AND WALL SECTIONS

2. JOINING PARTS

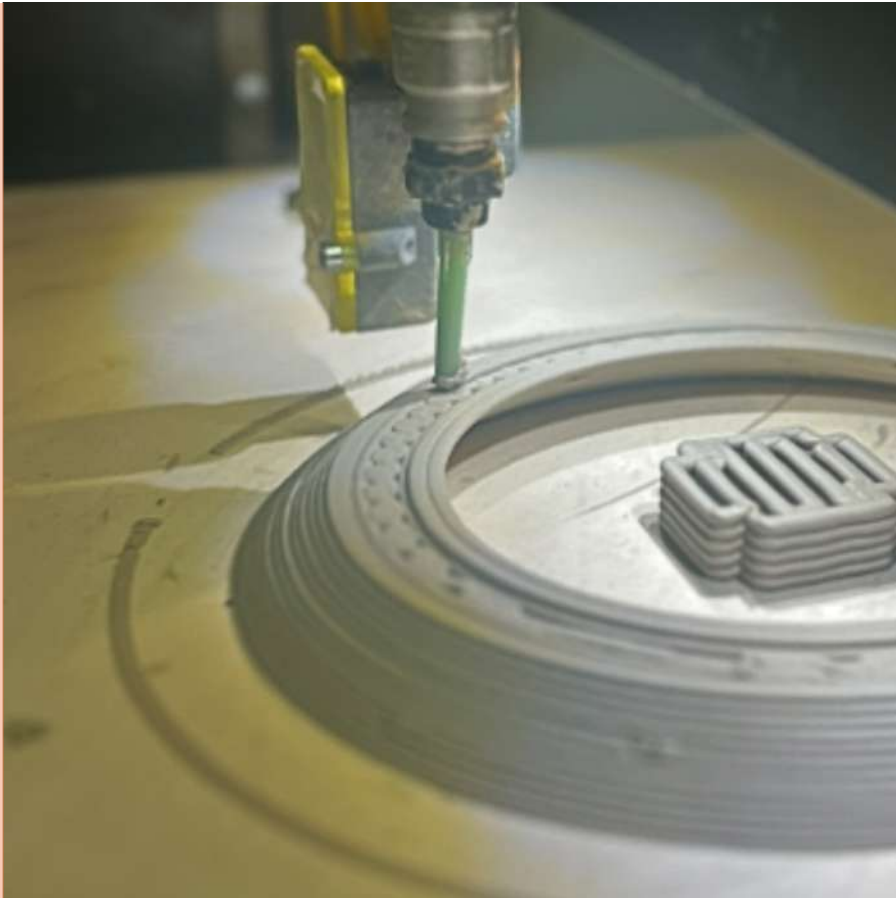


3. MORE JOINING TOP AND BOTTOM



4.

TOTAL PRINTING AND ASSEMBLING TIME WAS 35 HOURS.





MATERIAL - STONEWARE CLAY

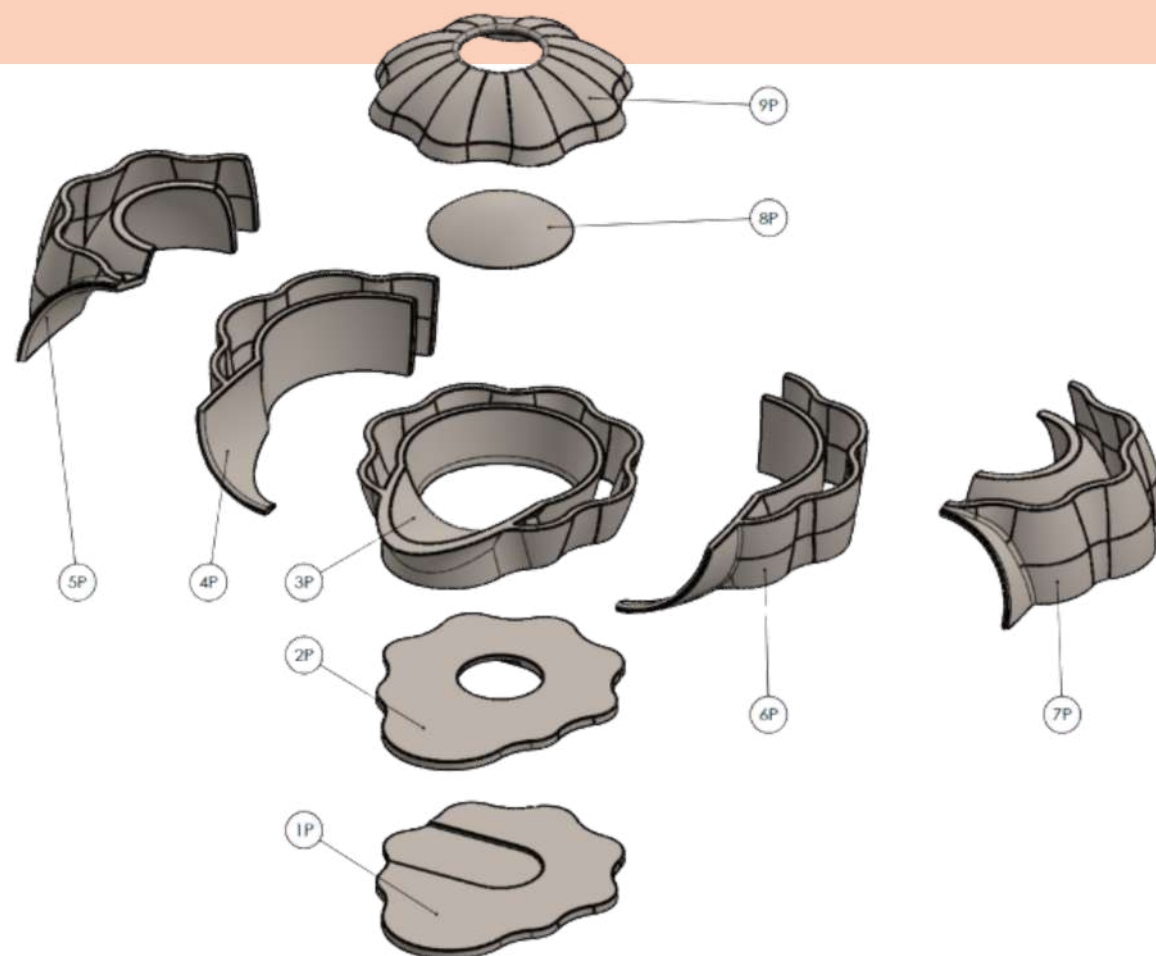
FIRING - FIRE TO ~1000 DEGREES CELSIUS TO RETAIN POROSITY FOR EVAPORATIVE COOLING

GLAZING - GLAZE INTERIOR ONLY FOR BETTER INTERNAL HUMIDITY

SAND FILLING - FILL CAVITY BETWEEN THE WALLS WITH ~4-5KG OF CLEAN SAND.

SALT SHELF - FILL PULL-OUT TRAY WITH ~100G OF COARSE SALT FOR HUMIDITY CONTROL

FINAL ASSEMBLY AND DRYING



NINE 3D PRINTED SECTIONS



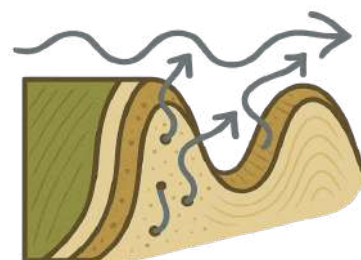


FINAL DESIGN

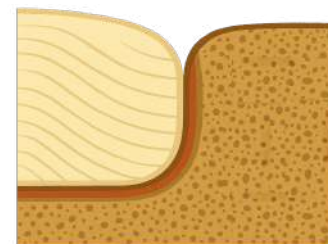
ZEER (ريز)

We've built kitchens that hide food away — out of sight, out of mind, and often out of date. This disconnect distances us from the food we have, how we store it, and how we value it.

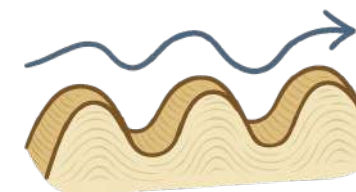
ZEER creates space to store food more naturally — keeping it visible, within reach, and a conscious part of everyday life.



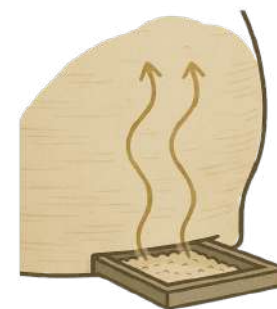
EVAPORATION



CORK SEAL



RIDGED TEXTURE
FOR AIRFLOW



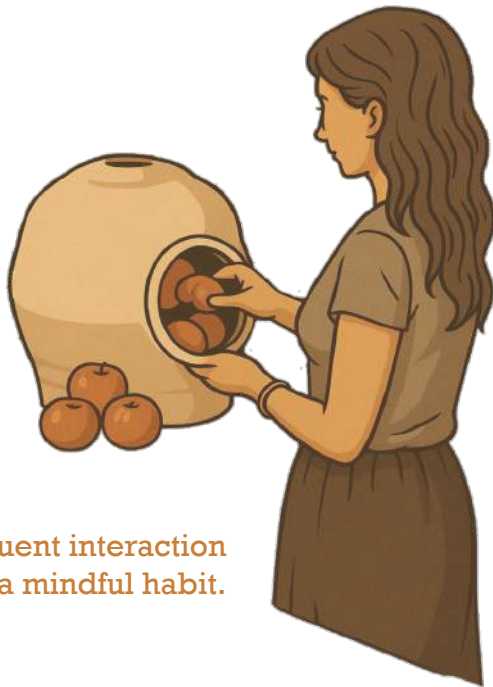
HUMIDITY
CONTROL

STORYBOARD & FEATURES



1/3
of food globally is
thrown away by
households.

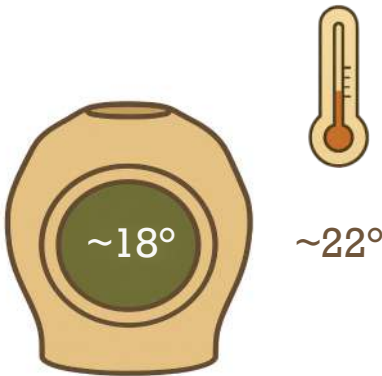
ZEER brings food back into view - always present.



Daily and more frequent interaction
makes food care a mindful habit.



Watering sustains cooling and
disrupts convenience of current
kitchen systems.



Food kept around **4°C** cooler
than room temperature.



SALT



WATER



CORK

FINAL DESIGN

HOW IT'S MADE

- The model can be 3D printed or slipcast from terracotta/stoneware clay.
- Laser-cut cork and wood lid with inset glass window.
- Pre-fabricated zinc alloy handles mounted to lid.
- Removable salt shelf 3D printed from recycled PLA.
- Hand-mounted mesh shelf for airflow and separation.

BIOMIMICRY BEHIND THE DESIGN



MOISTURE
STORAGE
(SALT SHELF)



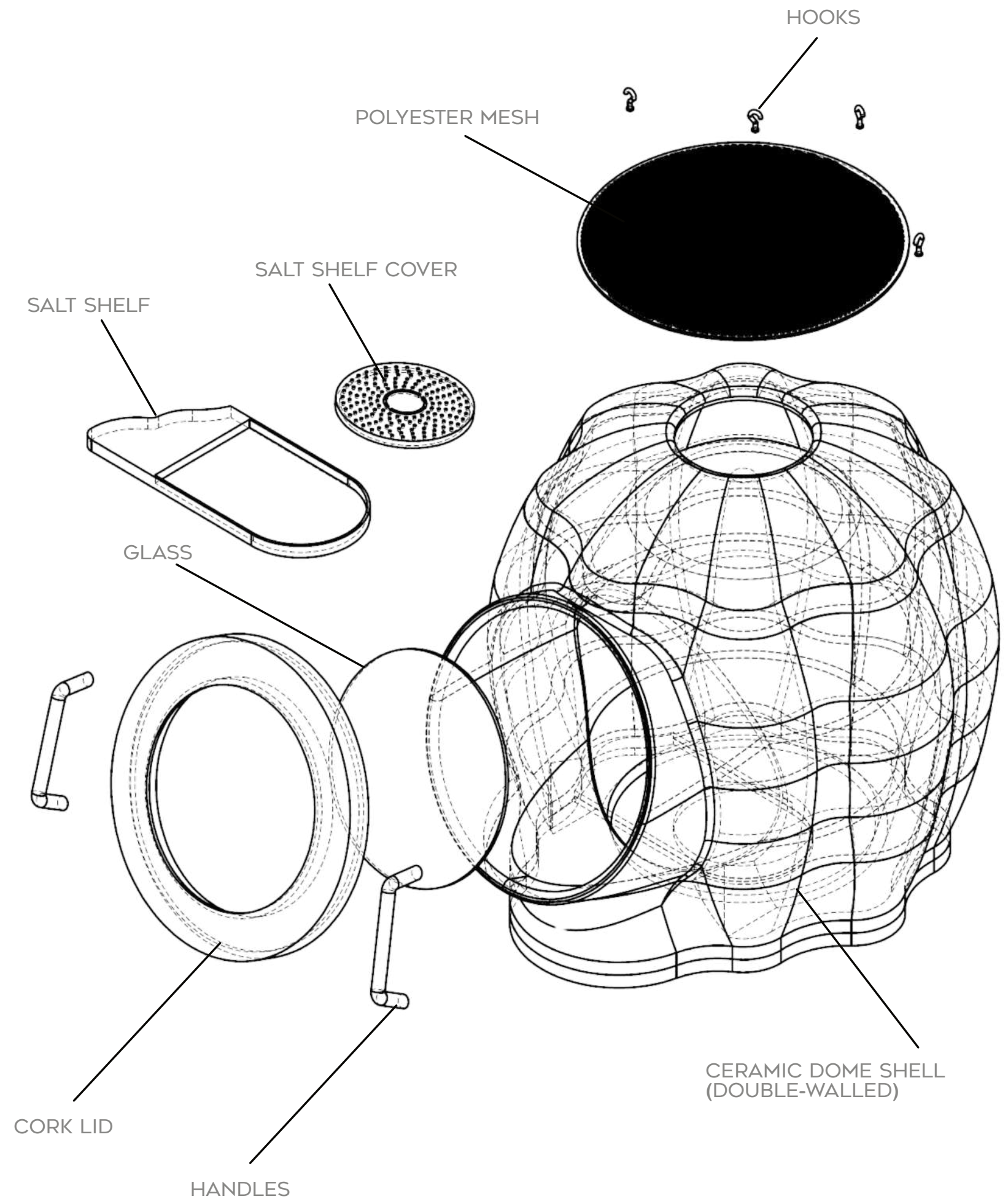
CORRUGATED
SKIN
(OUTER
SURFACE)



TERMITE
MOULDS
(WATER
HOLE)



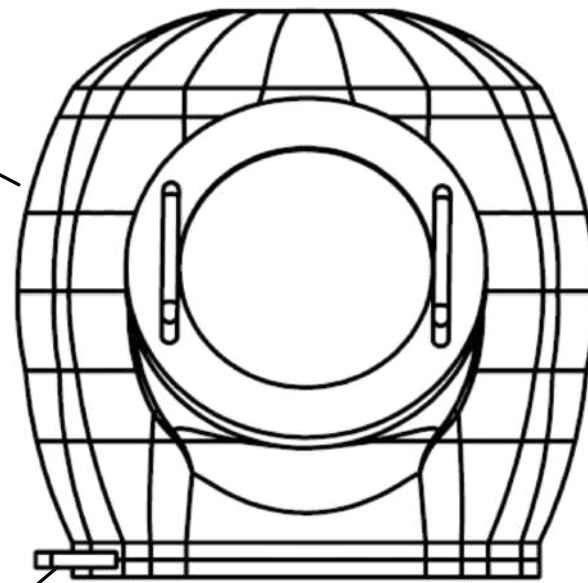
CURVITURE
(FORM)



FINAL DESIGN

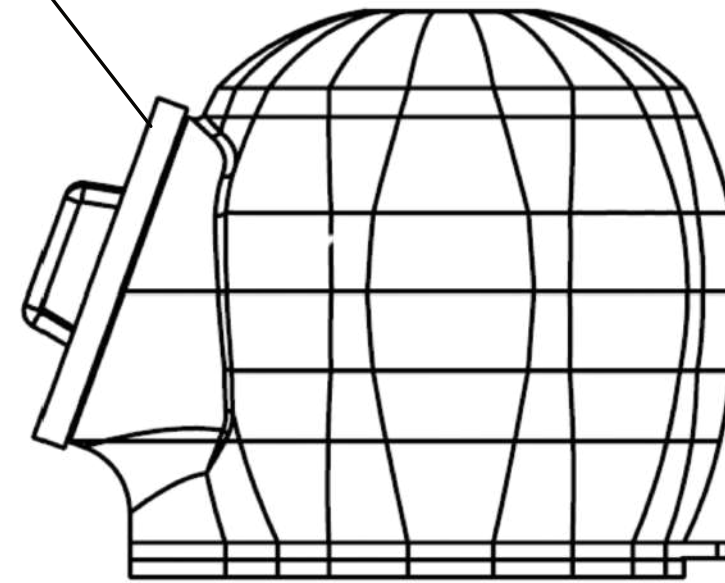
DESIGN DETAILS

THE CLAY BODY IS INTENTIONALLY LEFT UNGLAZED TO RETAIN MOISTURE AND ENABLE EVAPORATION THROUGH IT'S SURFACE



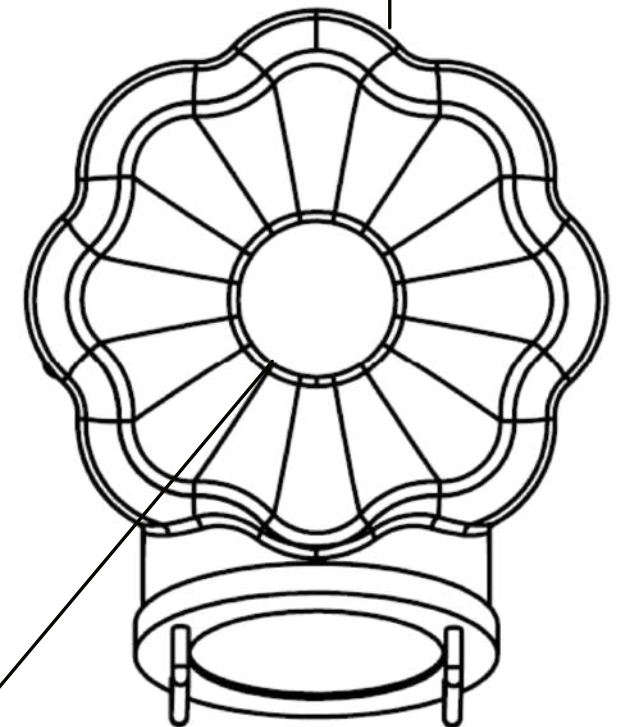
QUICK ACCESS TO SHELF FOR REPLACEMENT OF THE SALT

20 DEGREE ANGLE OF THE DOOR ALLOWS THE USER TO SEE MORE INSIDE



OPENING AT THE TOP TO WATER THE SAND, HOLE LEFT OPEN FOR THE USER TO VISUALLY SEE WHEN THE SAND IS DRY AND NEEDS TO BE WATERED.

CURVATURE AND UNEVEN SURFACE ALLOWS FOR MORE EVAPORATION AREA AND GREATER COOLING EFFECT



4°C COOLER THAN ROOM TEMPERATURE WITH NATURAL HUMIDITY REGULATION.

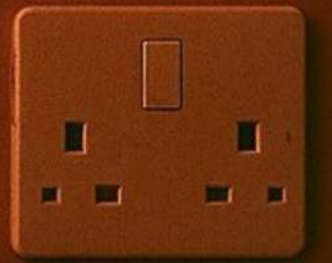
The main feature of the design is the evaporation system. Water poured into the top seeps into the sand between the walls. As it evaporates through the porous ceramic surface, it draws heat out from the inner chamber—naturally cooling the food inside. The moisture and airflow are balanced in the design to slow wilting, softening, and spoilage.



LET IT LIVE IN YOUR KITCHEN,
AND LET IT CHANGE YOU—

NOT WITH NOISE,
NOT WITH SPEED,
BUT WITH STILLNESS,
WITH PATIENCE,
AND THE QUIET REMINDER

THAT NOT EVERYTHING MUST BE PLUGGED IN
TO MATTER.



A dark wooden shelf with a green plate and a small orange object.

WHY ZEER?

This design is important for the food waste problem because it offers a passive, electricity-free way to extend the life of fresh produce. By creating the right conditions for slower spoilage—cooler temperatures, balanced moisture, and airflow—it helps reduce the likelihood of food being thrown away too soon, especially in homes with unreliable refrigeration or poor food visibility like our modern kitchens.

THANK YOU FOR FOLLOWING ZEER'S JOURNEY—
TOWARDS LESS WASTE,
AND MORE MEANING.

EMILIA.