00 Glacier

Project Theme
Lifestyle product for making ice

Project Period
02 - 02 - 2015 to 10 - 06 - 2015

Project Team
Master thesis, group 2
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Number of pages: 20

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Appendix on USB

Preface

The aim of the project has been to create a product that provides a new experience and value to the process of making and serving ice. In cooperation with the Aalborg based company AndICE, the vision have been to develop a product that re-introduces ice in the everyday life. The project is build on the believe that the use of ice decrease due to the use inconveniences in the existing products on the market. The product report presents the final product proposal, Glacier. Glacier is designed for an extreme user group with the purpose of creating a quality product durable for adventures in the wild and hereby making a strong product identity and marketing value appealing for everyone.

The development process behind Glacier is found in the process report.

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present

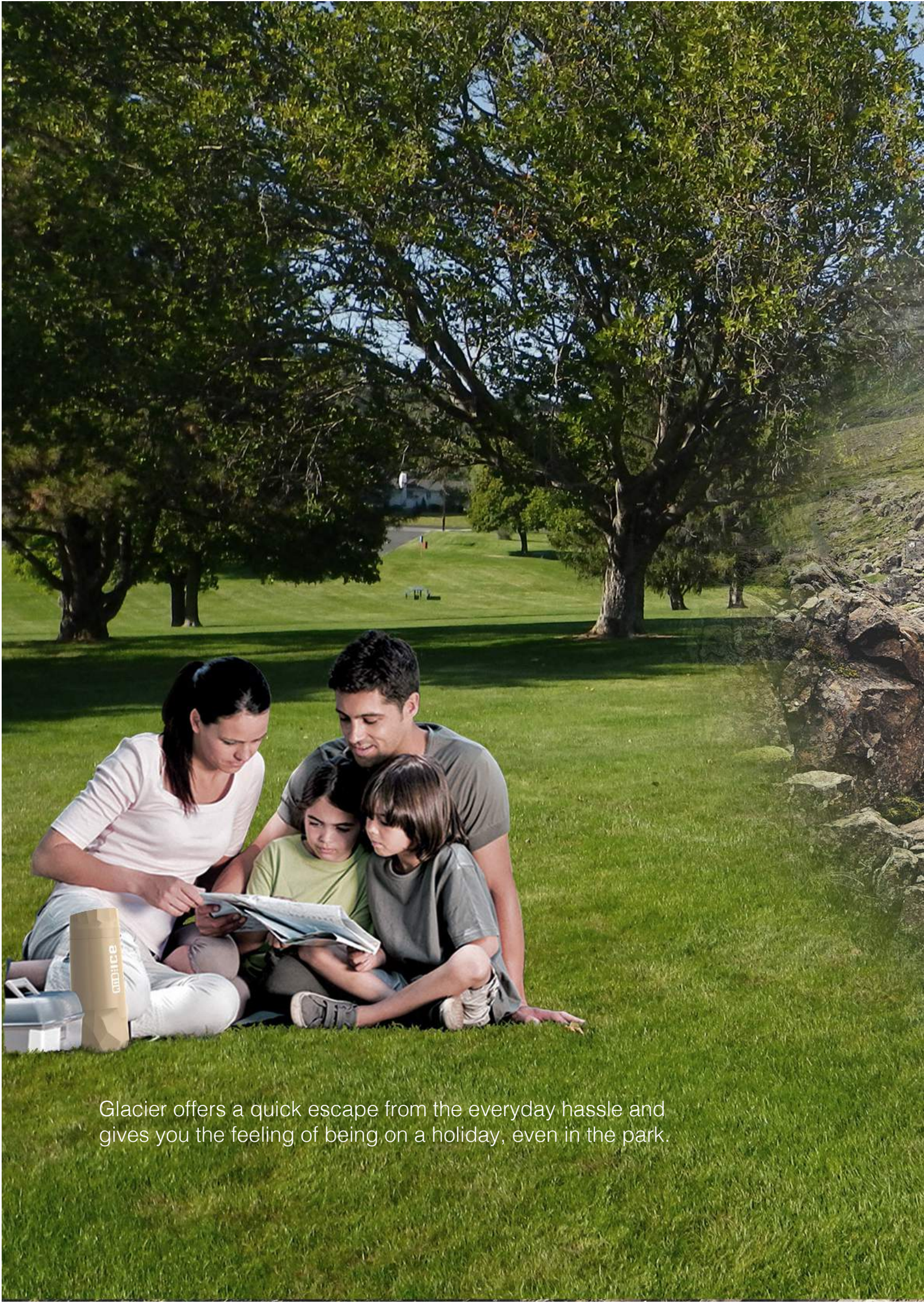
GLACIER

Abstract

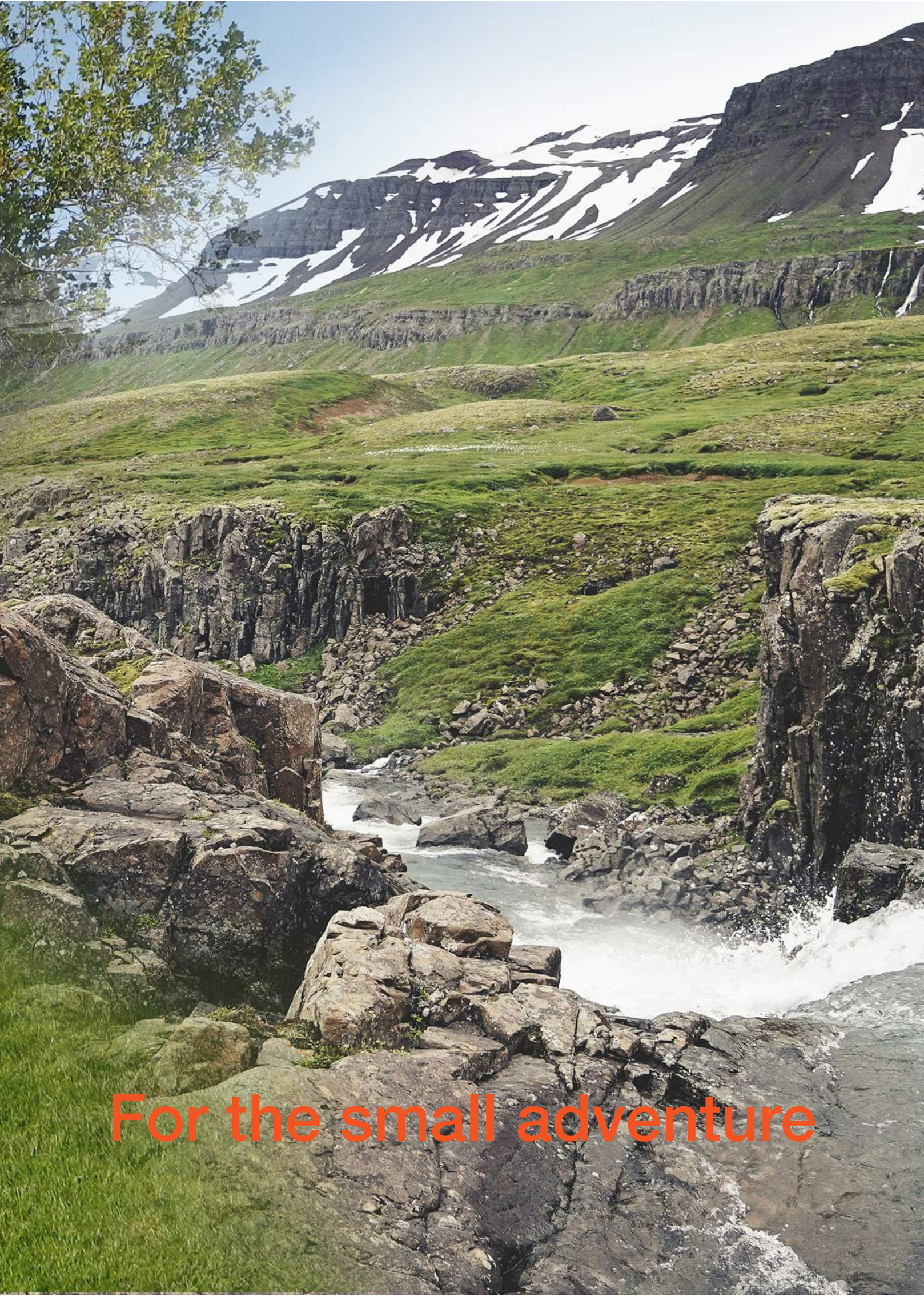
The product report is a presentation of the final product proposal of the master thesis project. The product Glacier is an outdoor product designed to re-introduce the ice cube in the everyday life, by making it possible to create, bring and enjoy ice cubes anywhere. In a collaboration with the company AndICE the motivation has been to propose something new for the respective market and making a product with a high use convenience. Through an integrated design process the lifestyle product has been developed with the intention of creating a strong identity and business plan. An advanced mechanical inner layout the product relieves the user from many unwanted process steps and interactions.

Glacier is a durable product that provides ice cubes for the adventurous. With its insulating features it keeps ice cubes frozen for 24 hours, so you can enjoy them in your favourite scenery.


AMDICE



Glacier offers a quick escape from the everyday hassle and gives you the feeling of being on a holiday, even in the park.


For the small adventure

Grab it

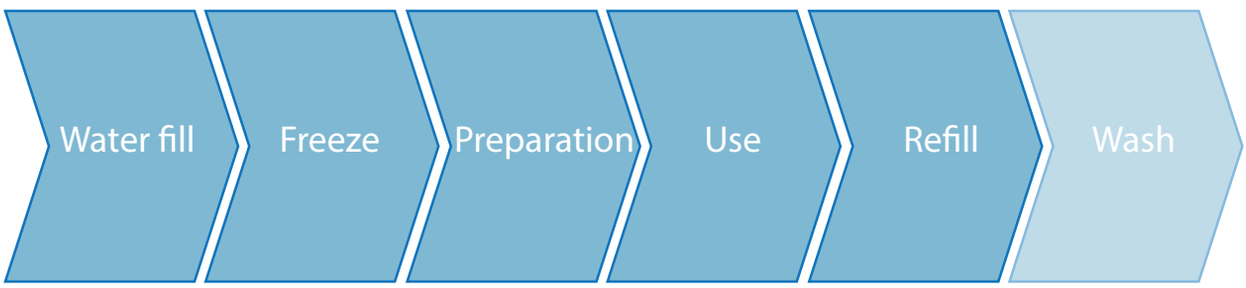
Pack it

Fill it

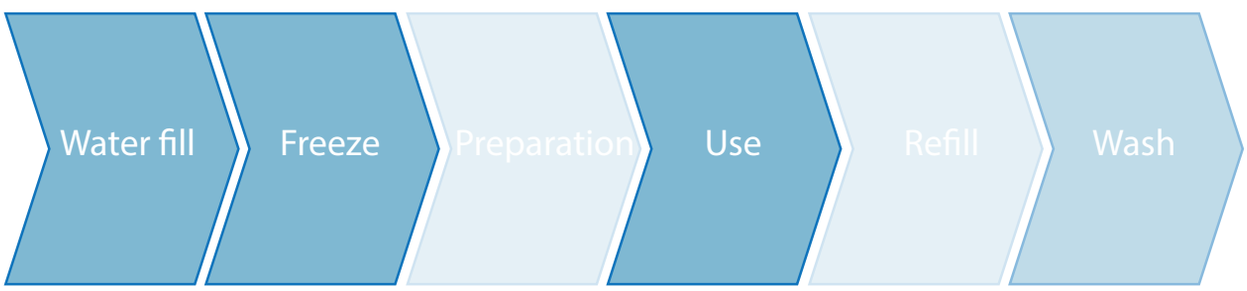
Freeze it

The process of making ice

The process of making ice today



The process of making ice with Glacier



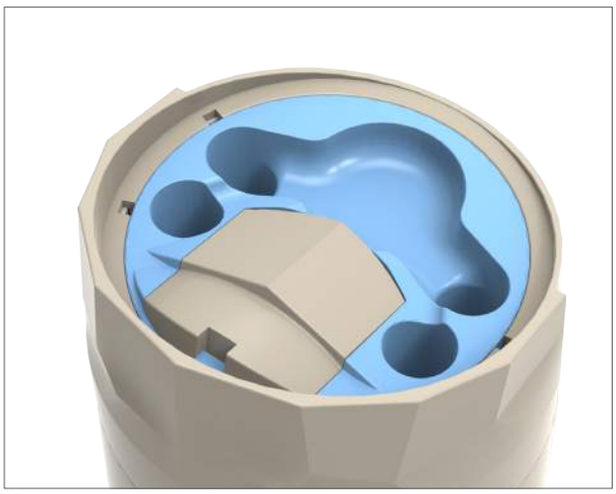

qnD:ice

A simple 3-step interaction

Confidential information

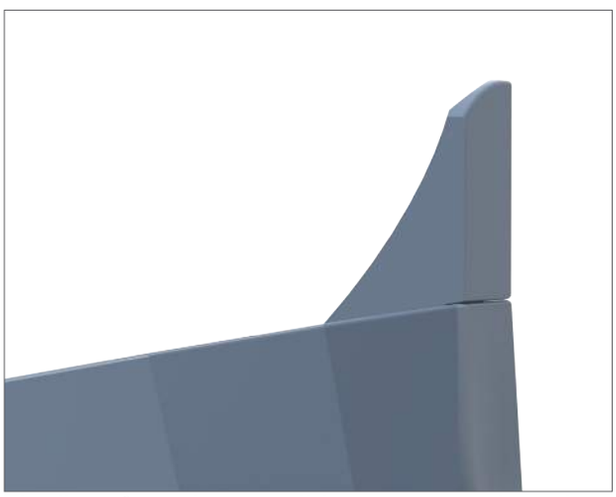
Easy cleaning

- Turn the lid
- Seperate components
- Wash it in the dishwasher

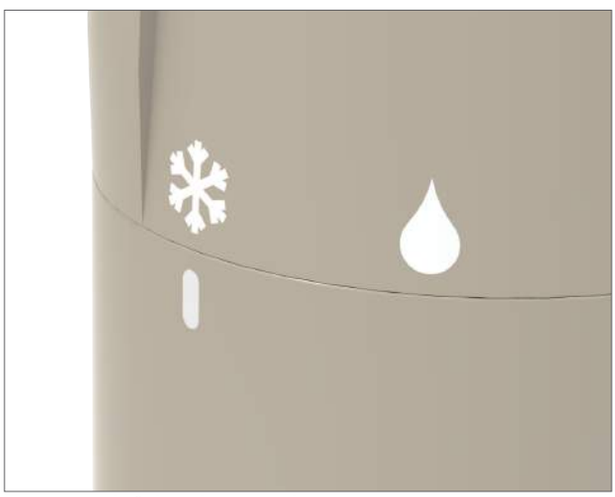


Seamless fitting lines throughout the design.

Easy, satisfying interaction.



The lines from the open lid creates a trademark



Easy, satisfying interaction.

Aesthetics communicating ice

Two variations


amDice
amDice

Bill of materials

The materials of Glacier has been thorougly selected to match the demands of an high-end outdoor product. All components in direct contact with water and ice is in EFSA (European Food Safety Authority) and FDA (Food and Drug Administration) approved materials.

This bill of materials presents Glaciers different components present in the product, their material, production methods and manufacturing cost. Finally a manufactuing cost with assemply is presented.

	Component	Pieces	Material	Production method	Price
1	Outer shell	1	PE-HD	Blow moulding	6.04 DKK
2	Inner shell	2	PP	Injection moulding	2.75 DKK
3	Turner	1	PP	Injection moulding	2.85 DKK
4	Tray	2	POM	Injection moulding	2.75 DKK
5	Tray frame	1	PP	Injection moulding	2.32 DKK
6	Tray lids	1	PP	Injection moulding	1.79 DKK
7	Rubber lids	2	Latex	Extrusion	0.72 DKK
8	Turning ring	1	PP	Injection moulding	1.09 DKK
9	Ring lock	1	PP	Injection moulding	0.96 DKK
10	Top	1	PP	Injection moulding	2.26 DKK
11	Top plate	1	PP	Injection moulding	0.96 DKK
12	Lid	1	PE-HD	Injection moulding	1.85 DKK
	Total production cost				37.33 DKK

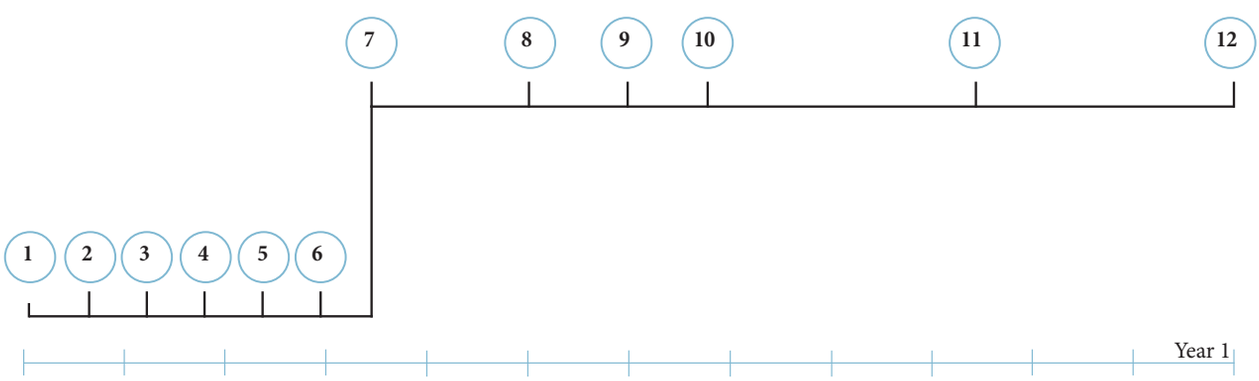
Confidential information

Business strategy

Glacier is a product with many use-possibilities. It breaks the current limited understanding of the use of ice that exist due to the ice product selection on the market today. The product is designed for an outdoor group of people and their extreme adventures on different expeditions. Glacier is the first ice-producing product that offers an insulated serving unit and dispensing function in one product. The mechanics wrapped in an insulated bottle and an easy dispense function makes it possible to use ice outdoors without inconveniences. A high-end product introduction in the outdoor channels of Friluftland, Eventyr Sport and Spejdersport targets a very specific way of life. Ordinary people living ordinary lives have a tendency to buy a part of their dreams of another life. A dream of getting more out and freely travelling the world without being bound by jobs, small apartments and routines. Glacier offers a quick escape from the everyday life. The free luxurious holiday feeling and break from daily life is only a minute away with Glacier. Below is the course of action plan for the first year. The year ends with an evaluation of the market response to the product. This evaluation is important in order to establish when the market is ready for the product to be introduced in other channel categories and hereby expand the exposure towards the mass market.

The course of action for the first year is characterized by two overall steps. The first one representing what it is possible for the thesis group and AndICE to prepare for a market launch. This work is at same point dependent on a financial lift in order to fund a totally functional prototype. An investor lifting the project to the next level could for instance be Kickstarter. Regarding to the market introduction the market desire and demand is presumably highest in the a late summer period.

Course of action - year one



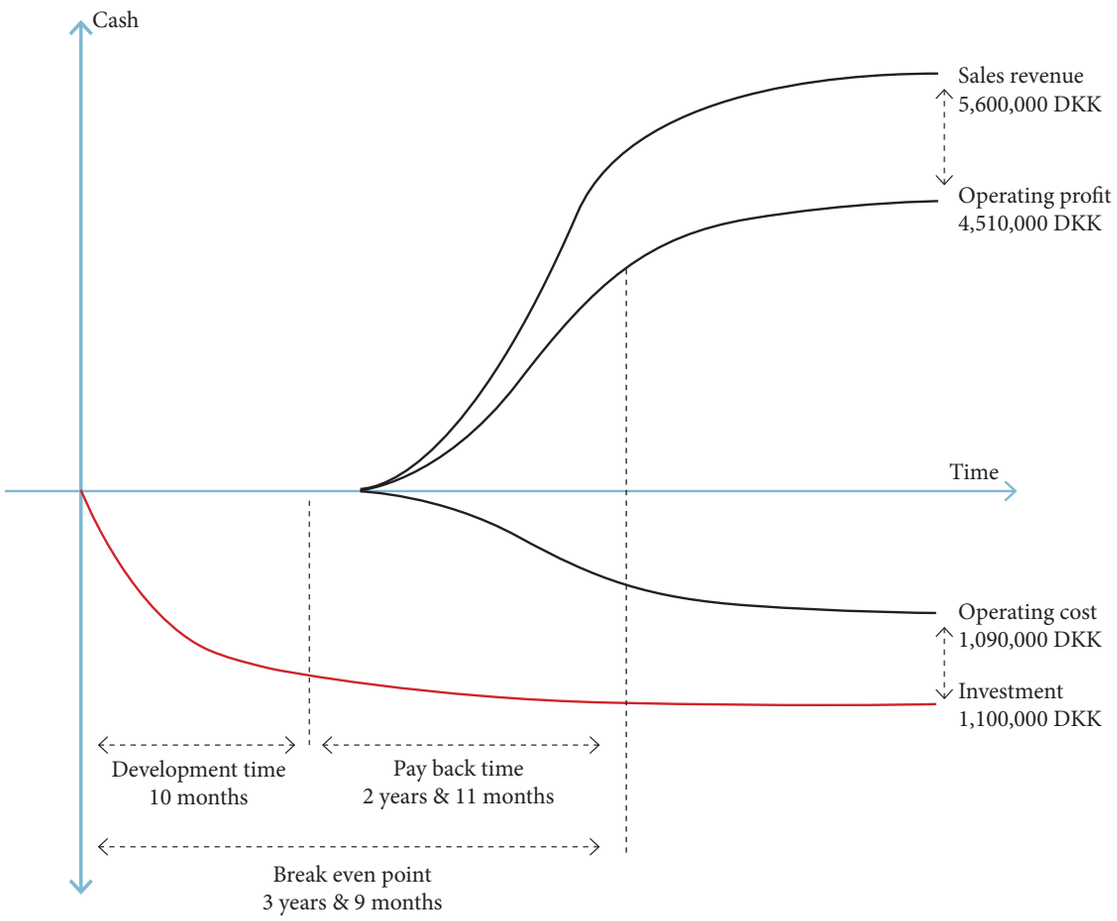
1. Product presentation - AndICE
2. Thoroughly testing the individual mechanical principles
3. Test principle assembly in possible extend - and make simulations
4. Material and product application for food-use approval
5. Search for investors and sponsorships
6. Establishing contact to manufactoring companies
7. Investor contact
8. Total functional prototype
9. Testing and refining
10. Production outsourcing
11. Market introduction
12. Evaluation of market response

Working with AndICE

The thesis project has been a part of a joint venture with the company AndICE. The two instances work under the same vision of re-introducing ice in everyday life but through two different product proposals. The Glacier proposal reaches a high technical refinement level with production methods and constraints taken into account. In the project handover to AndICE a product proposal is offered on a high development stage and a course of action plan of estimated initiatives that is needed for the product to reach the step of market introduction.

Cash flow

Based on the different estimations from tools, materials and operating costs in the production to the assessed sales of the first five years, a cash flow is outlined. The cash flow shows an estimation of when the break even point is reached.
The mechanics constitutes high tooling prices and with a factor 10 and the attempt of keeping the retails price on a relatively minimum, the break even point is reaches after 3 years and 9 months.



Significant figures

Sales within 5 yrs.	- 50,000 products	Retail price	- 350 DKK
Investments	- 1,100,000 DKK	Store mark up	- 250%
Operational cost	- 1,090,000 DKK	Operational cost per prod.	- 21,8 DKK
Operational profit	- 4,510,000 DKK	Operational profit per prod.	- 90,2 DKK
Sales revenue	- 5,600,000 DKK		

Based on estimates

00 Glacier

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Preface

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Appreciations are paid to the skilled supervisors Christian Tollestrup and Poul Kyvsgaard. Furthermore we thank AndICE for an inspirational collaboration and skilled supervision on the project.

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0.1 Abstract

The process report is a documentation of the product development of Glacier. Glacier is an outdoor product designed to reintroduce the ice cube in the everyday life, by making it possible to bring and enjoy ice cubes anywhere. The process consists of five phases that cover a broad spectrum of an integrated design process, like business, marketing, identity and manufacturing aspects. Throughout the report, methods, experiments and processes are evaluated according to the overall project and the results presented. The final presentation of Glacier is found in the product report.

0.2 Table of contents

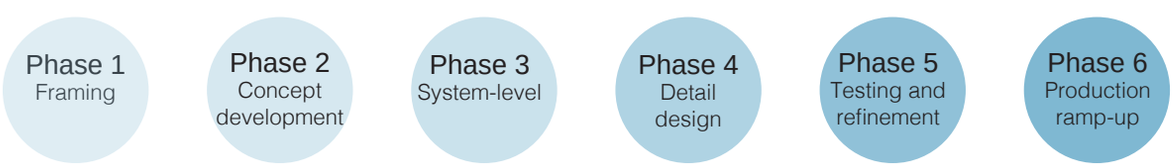
0.3 Reading guide

The thesis project is reported in two different reports. One describing the process and product development and the other presenting the final product proposal and the business strategy of a market introduction. Through the process report the work continuously refers to the project appendix that supports the findings and conclusions of the project by further elaboration. The appendix is available on the accompanying USB.

The process report is, as the design process, punctuated by status seminars that reflect upon the prior work and defines the next steps in the process. The process report is initiated by a project alignment considering the cooperation with the company AndICE and gatheres a brief of the foundation of the project. Between each punctuation, by the seminars, the process documentation is divided into different tracks. These tracks represent the variating work areas and studies needed to feed the progress of the process. In the end a conclusion and reflection gather the main findings and sums up the project and how the process have been tackled and approached. The applied references are through the report listed after the Harvard Method [Jensen, 89] which indicates the surname of the author and the year of literature publication. In a reference list, in the back of the report, the full information of the applied literature is available.

0.4 Introduction

Ice cubes is a luxury that everyone in the western world can afford. For just 17,- DKK you can buy a roll of ice cube bags to produce 640 ice cubes. Yet it is a messy and cumbersome experience and people often tend to make ice cubes for the special occasions only. Ice is therefore seen as an extravagant and luxurious accessory to a party or a hot summer evening instead of being a part of everyday life. The project seeks to develop a lifestyle product that introduces ice cubes in everyday life. As an integrated design process the different aspects of a product are sought individually solved in regard of the whole. The process deal with the technical development, business plans, aesthetics and identity of the product illustrated in the project framing seen below. The six phases each represent a part of the project that needs to be researched and developed to be able to present a finished product in the end. This model is an interpretation of Karl T. Ulrich and Steven D. Eppingers generic product development model [Ulrich&Eppinger, 2004].



0.5 Project alignment

Cooperating with AndICE

This project is made in collaboration with the Aalborg based company AndICE. AndICE is working with the vision of re-introducing the ice cube and is owned and run by CEO Kim Jensen, IP agent Marc Munzer and marketing manager Enrico Kaarsberg. The vision of AndICE originates from the hassle of using existing products for producing and dispensing ice cubes and at the moment the company already has numerous patents on solutions and concepts. The knowledge and skills internally at AndICE are centered on acquiring and maintaining patents, market and business ventures as well as technological- and solution development. To further strengthen the project, a need to expand the scope of the project has led to a joint venture with industrial design students at AAU. Besides the study regulations and curriculum, the project alignment is set with foundation in a design brief, a user survey and the shared vision with AndICE.

A joint venture

Design brief

- A joint venture between AndICE and the thesis group.
- AndICE keeps rights and patents of their material and concepts.
- The thesis group keep rights for own material, AndICE have first-buyer-right for any concept in the given project.
- The project takes starting point in the vision and product ideas of AndICE.
- The thesis group chooses to start the process with out any knowledge and detail specifications of the patens and concept material from AndICE.
- Contact is continuously kept between collaborating parties with the purpose of sharing insights and to supervise the development process.

Shared vision

To re-introduce the ice cube in everyday life

- To create an innovative product
- To create a solid patent platform and secure market share
- To make a product series possible
- To change and improve behavior patterns regarding use of ice
- To introduce new users
- To make the use of ice easier
- Set off in the danish market with potential of launching internationally.

User survey

- Most of the 362 participants make ice cubes in ice cube bags and trays.
- 25% using ice cubes with a single glass of water.
- 14% use ice cubes daily.
- Among the respondents, there are only 12% using an automatic ice machine.
- Only half of the participants use ice cubes to parties and drinks.
- 88% have had bad experiences with bringing ice cubes to the table.
- A wish to bring ice outside

AndICE concept

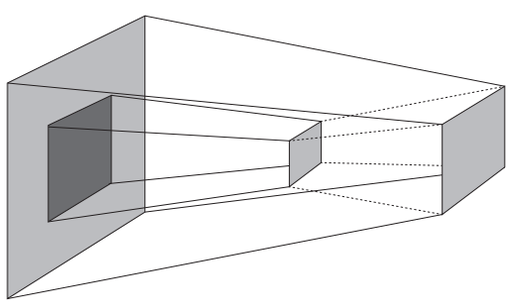
Ill. 2 AndICE concept

A concept consisting of the following functions:

- A closed container with easy dosage of ice
- Allows random positioning in freezer, no spill
- Functions as a serving unit, to bring at the table
- Easy refill
- Targeted at the modern familiy and home use

The projects initial start is based on consumer and market research. In october 2014 an online survey was conducted with 362 people, to map the use, problems and opinions of current solutions on the market. The survey, performed by AndICE, creates a picture of the use of existing products and the current use habbits of ice cubes among the users. [Appendix 1, User survey] However, the survey does not clarify in what specific steps of the process the problems occur. Neither does the survey provide a clear direction to the project. It is therefore estimated that the project based on a latent problem in greater extend benefits from another approach than the Aalborg problem-based model.

The problems, regarding ice, stated in the survey are not crucial or urgent enough to support a product development, nonetheless to support branding or sales of a product. However, when considering the type of product as a result of lifestyles and trends in society, it opens up for an entirely new product universe to feed the development process and to create a foundation of demands and process guidelines. In order to create a solid framework for the design process it is needed to take a few steps back



Ill. 3 The value focused decision framework

to question the material from AndICE. Even though, the research of the thesis group may result in the same conclusions, the process contain important learnings. The new insights might add to the project foundation and the creation of a bigger picture. See illustration 3.

The highlighted extractions (listed above) from the full user survey will function as important initial insights in the project.

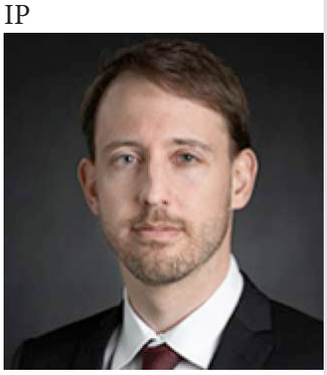
0.6 Knowledge sharing

Key resources of the two teams

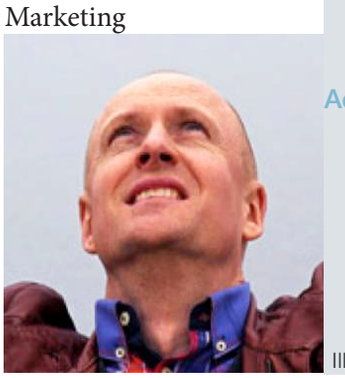
The cooperation between AndICE and the thesis group leads to a shared knowledge pool and gathering of interdisciplinary competencies. Compared to the Design Compass model [Stokholm, 2008] that illustrates a variation of important aspects in the integrated design process, the competencies of the two teams are favorably divided. Ill. 4. The competencies in the illustration reflect the main competencies of the two groups relatively to their inputs to this project.

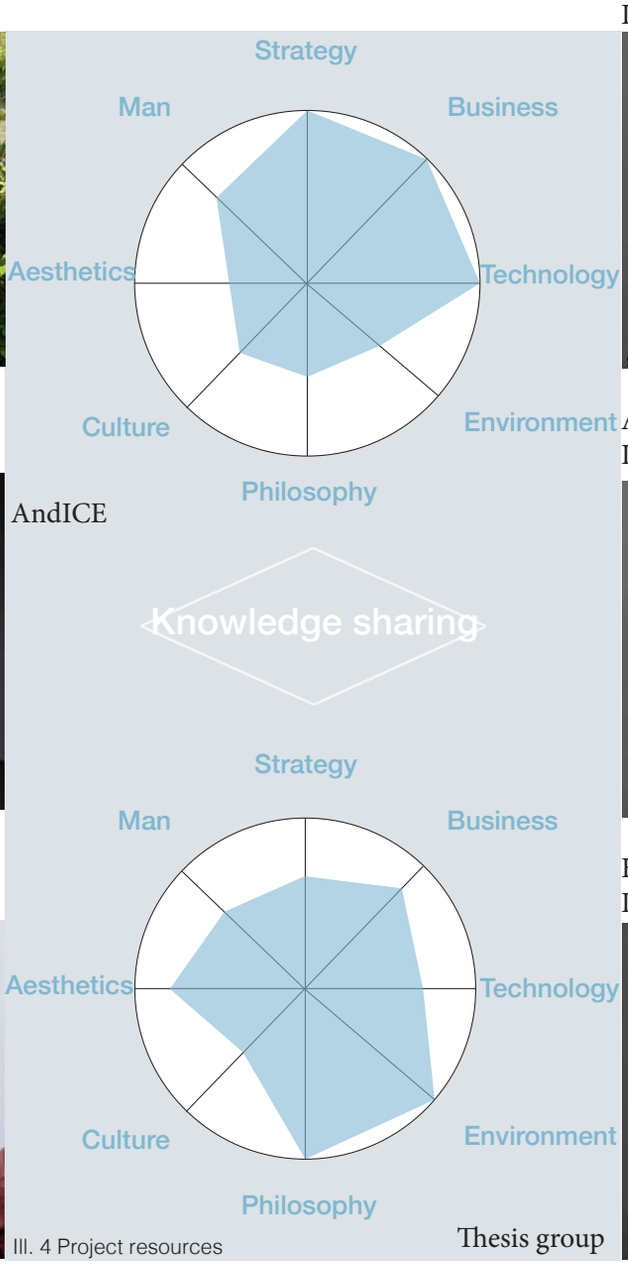
Kim Jensen, CEO
Mechanical Engineer

Marc Munzer
IP



Enrico Kaarsberg
Marketing



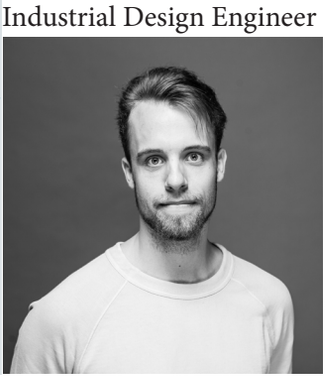


Ill. 4 Project resources

Brian Overgaard Kristensen
Industrial Design Engineer

Andrea Kjær Blach Jensen
Industrial Design Engineer

Hans Erik Høgh
Industrial Design Engineer



0.7 Working hypothesis

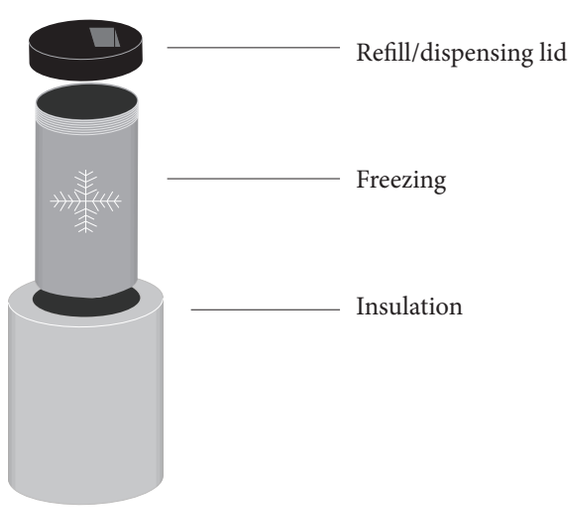
The project is working with the overall vision of re-introducing ice in everyday life. Based on the alignment and insights from the user survey, performed by AndICE, the further work is based on a hypothesis.

Hypothesis:

The interest of ice cubes, and hence the use, declines due to the hazzle and inconvenience of making it!

The working hypothesis is to create an ice producing product that excels ice cube bags and trays. Overall, it is the belief that this can be done by making the process of making ice easier. This is done by minimizing the steps in the preparation process in order to minimize the time spend and to encourage a specific use-, wash- and refillcycle, to make sure there are always ice cubes when needed. The situations where ice is appreciated are not always planned, which means that the spontaneous arisen situations often must do without.

The product should have a dosage function to avoid uncomfortable cold hands when preparing or serving ice. With an insulated ice product it can be brought to the table and receive an entirely new function. (Ill. 5.)



Ill. 5 A generic overview of a product concept

Problems

Products need specific positioning in the freezer
Takes up a lot of space in the freezer, not stackable
Causes a lot of spill and cleaning after preparation
It takes a lot of time to fill the ice cube bags
It is unhygienic to place an open product in the freezer
The handling of the frozen cubes is unhygienic
It is difficult to control the slippery cubes
The handling of frozen ice cubes is uncomfortable
The ice cubes melt fast when out of the freezer

Context

Within the home

Target group

The family

Functions

Must be able to freeze ice cubes
Must dispense the cubes
Product must be insulated

Channels

Hardware and lifestyle stores with starting point in the danish market

Time of use

All year round

Technologies

Mechanics and materials

01 Framing

In this section of the process report it is sought to create the project framework and foundation of insights and information to support the navigation in the process.

The use of ice cubes creates enjoyment in a wide span of events and occasions. Reaching from the improvement of a single glass of water after work to the special occasions with drinks shared with guests and friends. Still a survey shows that only 14 % of Danes enjoy ice cubes on a daily basis. The existing products on the market are basically well functioning, and succeeds in providing ice cubes. Yet the process of preparing the ice in time for the desired use, the dosage and general handling is difficult and time-consuming. With a knowledge foundation set in the design brief and survey made by AndICE, the project seeks to create a framework for the concept development. The framework differs from the problem-oriented approach and is initially based on work with scenarios, studies of lifestyles and trends in society and market analyses. The respective studies are made with the purpose of painting and visualizing different aspects of the universe and context of an ice product.

The framing section is divided into three tracks performed in parallels bringing different insights to the design process. Firstly the track called 'market and opportunity,' secondly, 'product and environment' and thirdly 'brand and product universe'.

1.1 Market and opportunity

It is sought to create a picture of the current market situation by investigating the ice related product selection in accordance to online purchase offerings as well as in supermarkets, design- and hardware stores. This provides an overview of the functions, pricing and values of the supply and helps a market related positioning and a market strategic vision of the project. Different products are categorized in to low-end market, high-end market, niche market and industry and briefly sum up the values, pricing and the respective acquisition channels.

Low-end market

Pricing: 15 - 70 DKK
Channel: Supermarkets and wepshops
Purpose/value: Cheap ice production

High-end market

Pricing: 1 000 - 25 000 DKK
Channel: Home appliance stores
Purpose/value: Minimal effort, easy access at all times

Low-end market

Pricing: 50 - 111 DKK
Channel: Wepshops
Purpose/value: Design value, humorous design items

Niche

Pricing: 405 - 1850 DKK
Channel: Wepshops
Purpose/value: The perfect ice ball, and cooling items without dilution

Industry

Pricing: 240 DKK pr. 25 kg
Channel: Gas stations and wepshops
Purpose/value: Large quantity ice, no effort paid

Ill. 6 - 18 Market products

Ill. 6 - 18 Market products

Through a positioning exercise of the analyzed products in the span of DIY to automatic on the horisontally axis and a use convenience estimation on the vertically axis, it is concluded that a gap exist between the automatic products and the "do it yourself" products. All products succeed in making ice cubes, nevertheless the use convenience of the DIY products is rather poorly. Relatively to the before mentioned hypothesis based on the user survey, a product with an added value of an improved use convenience could help the overall project vision of re-introducing ice. This convenience is present in the automatic high-end products. Yet only a few in the user survey chooses this more expensive solution. It therefore seems that there is a gap for a semi-automatic and convenience improved product that relatively to both axes is positioned in the middle and in the price range of 100 - 400 DKK.

Working with trends

Another important aspect of investigating the market is in regard of making of a lifestyle product. Such a product cannot be sold exclusively on the solving of a problem. The respective problem is simply not big enough to create a need by the customers to culminate in a purchase. Most people live with the irritations and hazzles when they want ice. The added value and affect of a product must revovle around something else both with the purpose of creating a sale-skilled product and to create a strong direction of the project. It is following interesting to investigate the current trends in society in order to understand how other life-style products are branded and brought to market.

Three dominant trends

Sustainable living - back to basics	Diet/exercise	Adventure/action

Through the trends ordinary people live for a brief window of time the extreme lifestyles they dream of.

The lifestyle stores

Through an internet search the three dominant trends are found. The trends represent a variation of lifestyles and welcomes ordinary people to try out these lifestyles they sometime dream of. In the different stores the supply as well as availability and product presentation are assessed in interplay with the found trends. The visited stores are selected on basis on their connection to specific lifestyles. [Appendix 2, Visiting lifestyle stores]

Inspiration

- Rough style, back to basic
- Untreaded wood, “natural” cut
- Slate stones
- Porcelain and pottery
- Steel and metals, warm
- Robust, durable

Buyers profile
- Woman
- Approx 35 years old
- Care about decor

Ill. 19

Bahne

- Geometry as form and graphic
- Light colours, pastel
- A lot of containers/dispensers to products already coming in a functional container/dispenser, like butter and soap.

Buyers profile
- Woman
- 25 - 45 years old
- Aware of trends and brands

Ill. 20

Friluftsland

- Travelling gear
- Quality is more than price
- Not only extreme adventures
- Practical and functional
- Aesthetics plays a bigger and bigger part in the designs

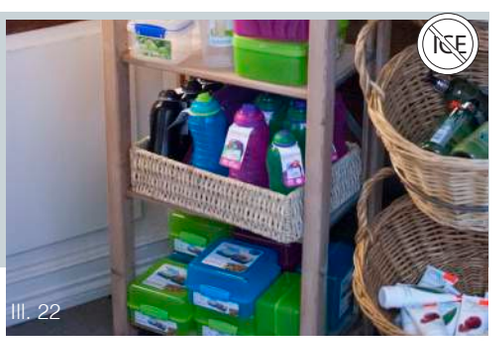
Buyers profile
- Hikers, travellers
- All ages
- Quality concious

Ill. 21

Helsam

- Healthy food and chemical safe products
- Focus on correct nutritrious diets
- Personal guidance and advise
- Health concious

Buyers profile
- Both the extreme athletes and the average person
- All ages



Ill. 22

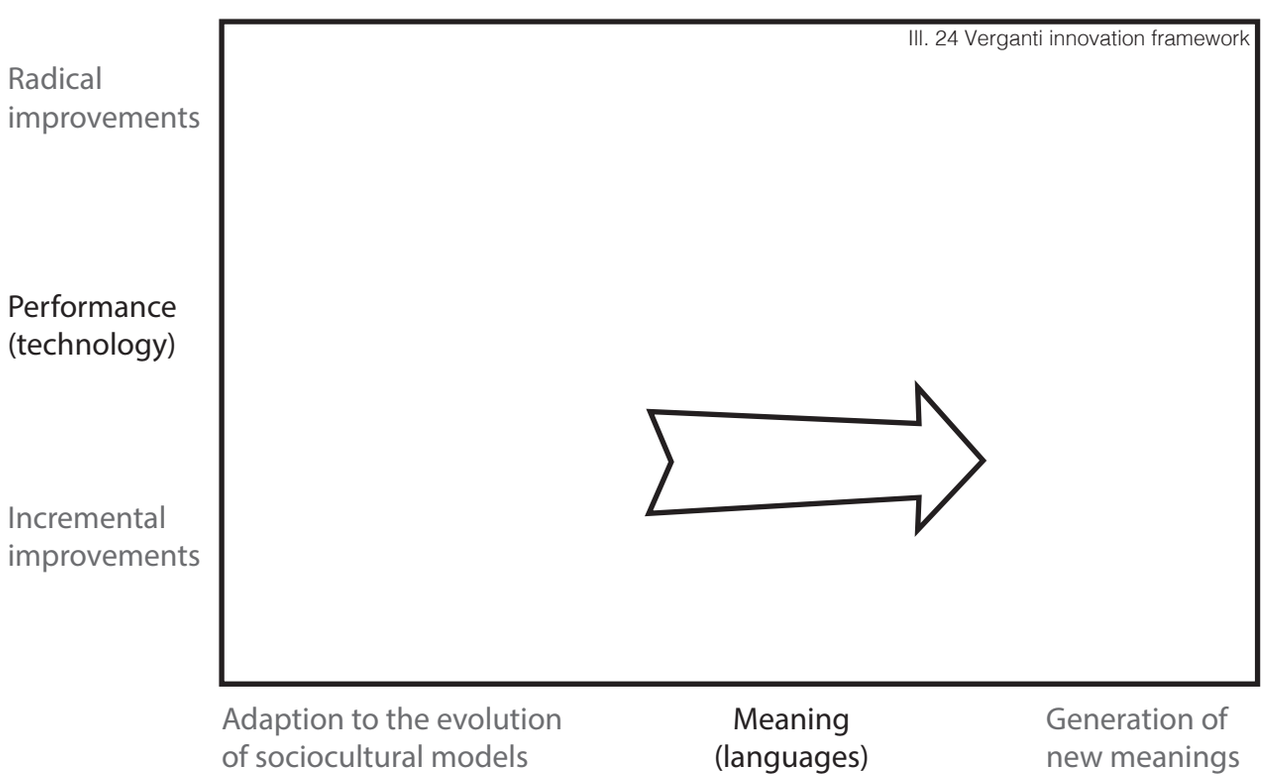
Conclusion

It can be concluded, that people are willing to buy more expensive products if the products offer more than their functional values. The signal values and belonging to a certain lifestyle are important means in order to the self-image and public image of the user. (Ill. 23) The product selection in the visited stores clearly support the findings of three trends in society. It is not enough for a drinking bottle to be sturdy it also appears as a military accessory, which helps communicating the lifestyle choice and image of the user.

Among the visited stores, only one, has an ice related item, a Stelton ice bucket. Ice products are seasonal goods and not for sale all year round, due to lacking demand.

The findings help the communication of the project vision of generating new meanings and offering the customers a new type of product. (Ill. 24) The project vision is not to technologically improve the process of making ice radically, but to create a product that offers a new way of experiencing the use of ice. [Appendix 3, Technology research]

Ill. 23

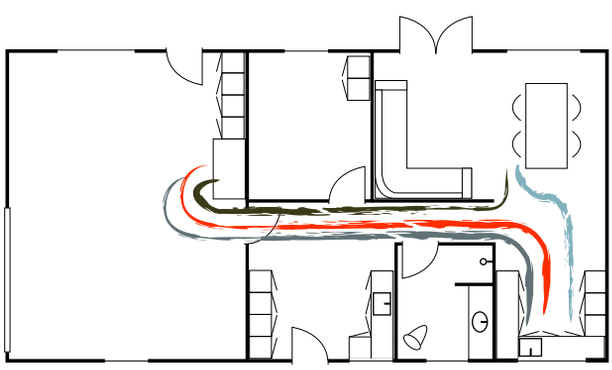


Ill. 24 Verganti innovation framework

1.2 Product and environment

The before mentioned hypothesis that the use of ice is declining as a result of the inconvenient process of making it, is a theory difficult to verify. Yet, the process of making ice can be analyzed and systematically broken down in order to understand the frustrations and when and where they arise in the use habbits and - patterns. The user survey made by AndICE highlights different frustations in this process, nevertheless the process is tested and acted out by group members and by objective parties under observation to obtain the full picture. The experiments are based on ice cube bags and trays. Different use scenarios are developed in order to imagine the potential use situations and context of the product. The deduced conclusions of the different scenarios are gathered categorized according to the six process steps of preparing ice. [Appendix 4, Use scenarios]

Movements in house regarding use



Ill. 25 Movements in house based on scenario work

Occuring frustrations in the process

Water fill

- Wet hands
- Takes a long time
- Bags must be wiped
- Difficult to balance tray to the freezer

Freeze

- Require careful positioning
- Not stackable
- Not waperproof, result in freezer cleaning
- Hard to find room
- Never ice when needed

Preparation

- Need to wipe the table after
- Difficult to loosen ice
- Cold hands, contact with ice is unhygienic
- Difficult for children
-Removes you from the party

Use

- Dosage trouble hitting the glass
- Melting fast
- Needs serving bowl, extra cleaning

Refill

- Must go to the freezer many times for new ice
- Hard to open it again
- Start the process all over again

Wash

- Hard to know when the ice cube tray needs to be cleaned

Conclusion

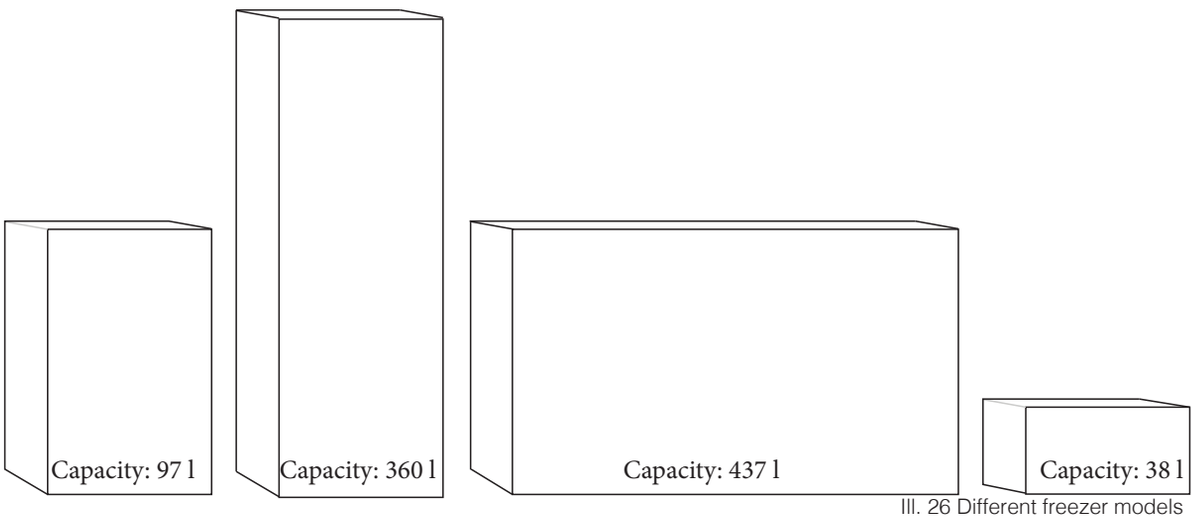
No matter if ice cube bags or trays are used, the making process is long and frustrating. Compared to the preparation process the enjoyment time seems exceptionally short if an insulated serving bowl is not used. From the different types of scenarios of social events and singlehandedly use, the road and movement have been tracked as seen on illustration 25. This shows how a lot of effort is put into the process and is time taken away from the actual happenings. A set of product demands is deduced in order to improve the product interactions and needed steps.

Deduced design requirements

- No contact between water/ice and the user during use
- Product use without wet hands
- The product should dispense in an area no larger than 5 cm diameter to hit a glass
- No condensation on the outside of the product
- Must be waterproof
- Should be able to be disassembled for cleaning
- Water fill opening bigger than the faucet opening
- A closed product with no water balancing between faucet and freezer

Home environment

Pictures are collected to understand the "home" environment of the product regarding freezer size and possible product exterior dimensioning. All the collected pictures show small freezer compartments with crowded shelves and drawers. [Appendix 5, Freezer investigation] When only having a small freezer compartment people become very economical and tend to use all the space on special offers with good savings. It is therefore important to consider the size of the product and have it stackable or randomly placeable to be space saving. The illustration with a variety of freezer models show their individual capacities. In this project the measurements of the smallest freezer and a freezer drawer are taken into account. A freezer drawer is 12 x 35 x 35 centimeters, which is a capacity of 14,7 Liters.



Ill. 26 Different freezer models

Ill. 27 - 29 Collected photographies of freezers

The ice experience

In this section the values of using ice in beverages are defined and evaluated. The approach is through testing, act it out and brainstorming.

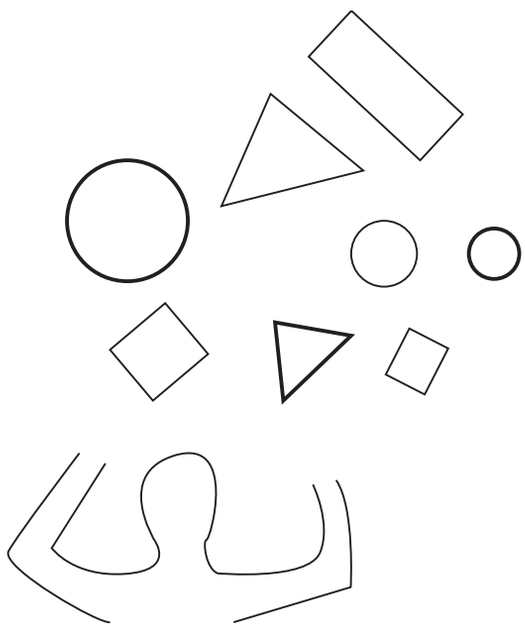
In a busy and fast-running day a thousand things fight for our attention. When thirsty, water is poured in a glass, but the mind is busy thinking of what next to do or the work presentation tomorrow. The taste and satisfaction is forgotten. Most times it is to satisfy a physical need, but when ice is added the focus lies on the experience and the little something extra you are making for yourself. The ice have multiple functions in a glass. See boxes below.

Cooling effect

Physical stop blocks

Increase focus

The cooled drink becomes difficult to drink fast and the cubes become physical stop blocks that call for your attention. The presence in the situation and the awareness of the drink rises and enhances the enjoyment. Ice adds a luxury to the beverages and a relaxed atmosphere.

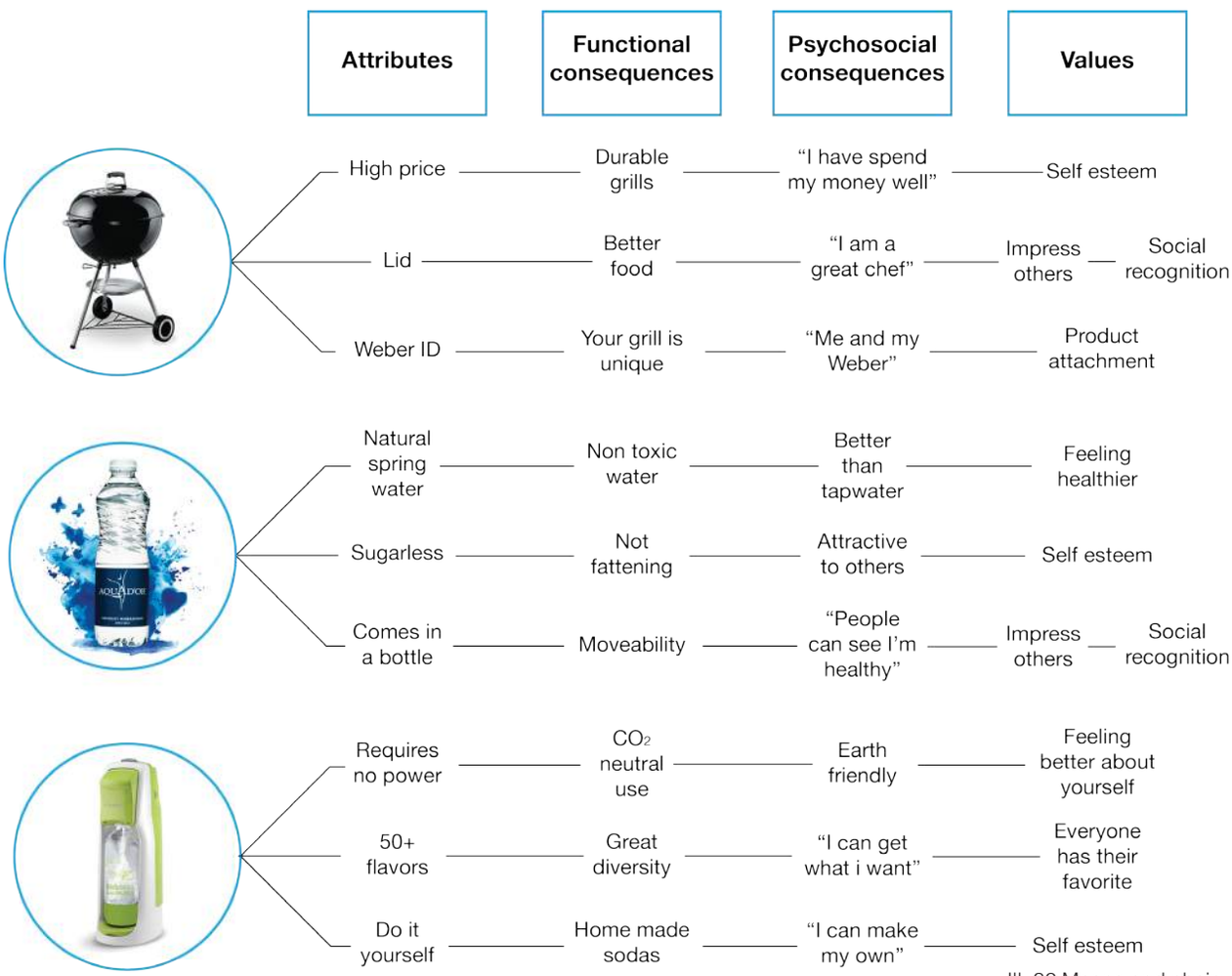


Ill. 30 Overwhelm of everyday impressions

Ill. 31 Cool ice drink

1.3 Brand and product universe

To create a strong product identity, product universe and framing for the product development, the focus is now changed from the practicalities and contextual requirements to the project direction and identity of the product. Inspiration is found in other products to understand how they succeed in creating a strong identity and connection to specific lifestyles. The analysis illustrates how simple attributes of a product can trigger psychological consequences and add value to the users. [Peter and Olson, 2010]



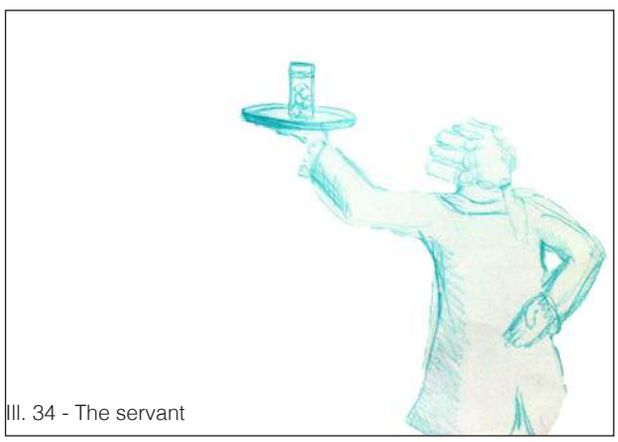
Ill. 32 Means end chain

The analysis shows how the signal values of being healthy and achieving social recognition are promoted in the products through simple attributes. For instance the Weber grill with the special design trademark in the globe shape and lid, become both a product ID and an user image of being a great chef. These are important means to notice in the design process performed under the vision of offering new meanings. The current scope and working hypothesis does not provide a clear product universe or identity. The shared vision with AndICE is to create a product that reintroduces ice in the everyday life, yet the approach with everyday scenarios become plain, lack depth and challenges to provide the creative tension in the process. The scenarios work offer insights in regard to practicalities and issues to solve, but does not provide the abstract methaphors and the needed set of values to create a significant product flavour and ID.

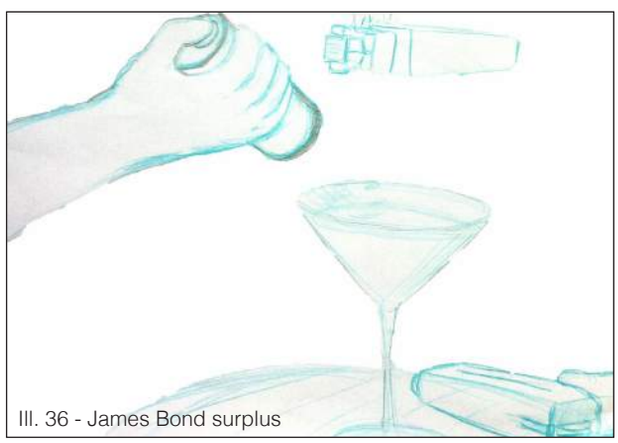
The process is consequently diverged to open up for other project directions. In reference to the working hypothesis the targeted audience and the context is initially challenged. This is done by brainstorming sessions and visualizations of methaphors to describe the product. It is performed with focus on creating a setting and a specific world for the product to participate in. The work is concentrated on bringing the luxury aspect of ice into the development.

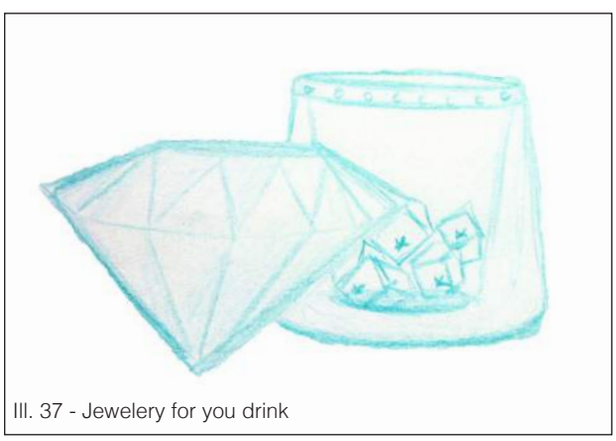
Potential directions


Ill. 33 - Luxury in a bottle


Ill. 34 - The servant

Ill. 35 - Champagne on a tuesday


Ill. 36 - James Bond surplus


Ill. 37 - Jewelery for you drink


Ill. 38 - The perfect host

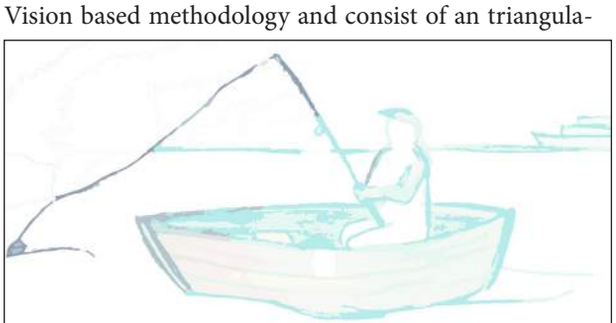
Ice unlikely brainstorm

In accordance to developing an identity for the product it is necessary to incorporate the context. Like the James Bond themed methaphor on illustration 36 the setting is an exploding truck in the background, which encourages an action-like product. Relatively to the luxury brainstorm, on page 19, an ice unlikely brainstorm is commenced to find a direction standing out and being beside what is expected. The brainstorm words can be divided into two themes of "mobility" and "outdoor space" more specificly; anywhere hot or far away from freezer capabilities. This is an interesting opportunity of creating new meanings and breaking the current understandings of the use of ice.

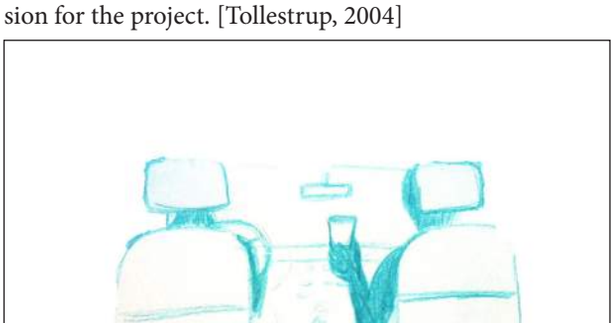
On the sea	◇	The dansefloor
In space	◇	Playing sports
The desert	◇	On the beach
Road trips	◇	The mountains
The jungle	◇	On the move

Ice outdoor

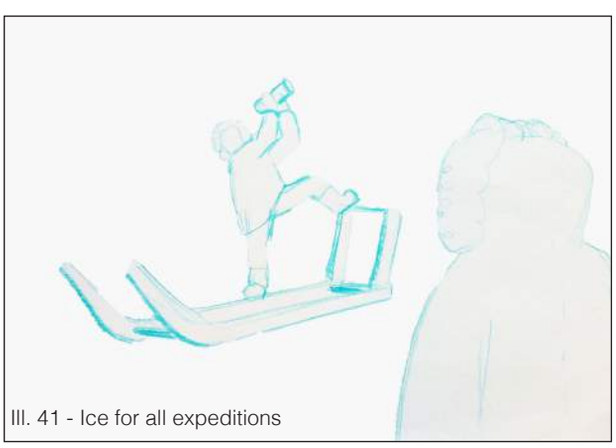
The work with methaphors is continued relatively to the mobility and outdoor themes. The methaphors below show different situations wherein the ice could be luxury enhancing. The work is based on the Value and Vision based methodology and consist of an triangulation of methaphors in statements, poetic images and scenario play. [Tollestrup, 2004] The purpose is to achieve a shared understanding in the group of situations and emotions to be able to formulate a value mission and vision for the project. [Tollestrup, 2004]



III. 39 - Fishing



III. 40 - Road trip

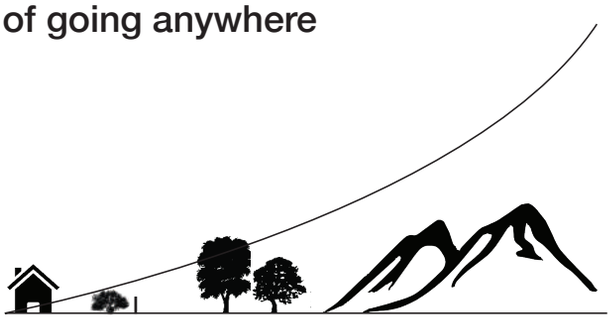


III. 41 - Ice for all expeditions

III. 42 - Enjoying ice anywhere

Today the use of ice is bound to the house by a radius defined by the melting time of ice. Existing ice buckets could help this situation and expand the radius and "use span", but are not designed for travels and the outdoor life. The offering of ice on the go or in outdoor environments provides a freedom of having quick escapes from the everyday life. The feeling of luxury is enhanced when being outdoors as a result of the strong contrast of the wild and refined. A product that serves and preserves ice outdoors stands out and offers something beside regularities. A clear chance of creating luxurious situations with cold beverages with a holiday feeling in the park, on roadtrip or anywhere.

Luxury rises with the freedom of going anywhere



Ill. 43 Luxury rising

It requires less to create a luxurios feeling outdoor

Ill. 44 - Luxury can be a blanket in the park

1.4 Working hypothesis alteration

Through the work on the different tracks, market and opportunity, product and environment and brand and product universe, the intial working hypothesis has shifting been verified and questioned. The intitial work have not provided a satisfying and interesting project direction until the work with methaphors provided the outdoor setting as an interesting subject. The outdoor settings make it possible, through insulation, to create a luxurious ice product with new meanings in contrast of the existing product selection on the market. A convenience improved product that mechanically relieve the many user required interaction steps in the process of making ice and targets the price gap in the market of 100 - 400 DKK. The initially intended functions are lifted to a higher meaning and significance in the project. With the freezing stage at home and the dispense and insulation as important functions of adding value outdoors. A high insulation quality to give freedom to go anywhere and a controlled dosage to avoid unhygienic handling of ice cubes and loss of cubes.

The product should appeal and attract customers through a strong lifestyle connection reflected in the aesthetics of the design. The new project methaphor is “luxury on the go”.

Problems

Products need specific positioning in the freezer
Takes up a lot of space in the freezer, not stackable
Causes a lot of spill and cleaning after preparation
It takes a lot of time to fill the ice cube bags
It is unhygienic to place an open product in the freezer
The handling of the frozen cubes is unhygienic
It is difficult to control the slippery cubes
The handling of frozen ice cubes is uncomfortable
The ice cubes melts fast when out of the freezer

Context

~~The home~~

Target group

~~The family~~

Functions

Must be able to freeze ice cubes
Must dispense the cubes
Product must be insulated

Channels

Hardware and lifestyle stores with starting point in the danish market

Time of use

All year round

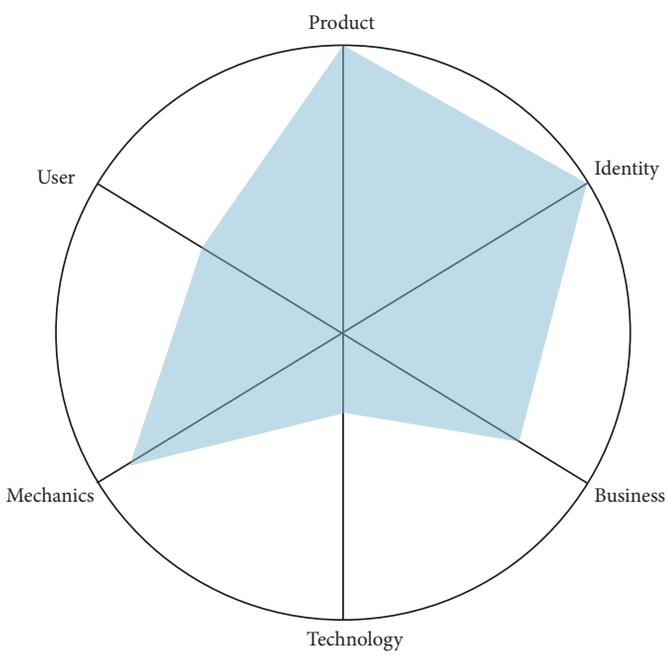
Technologies

Mechanics and materials

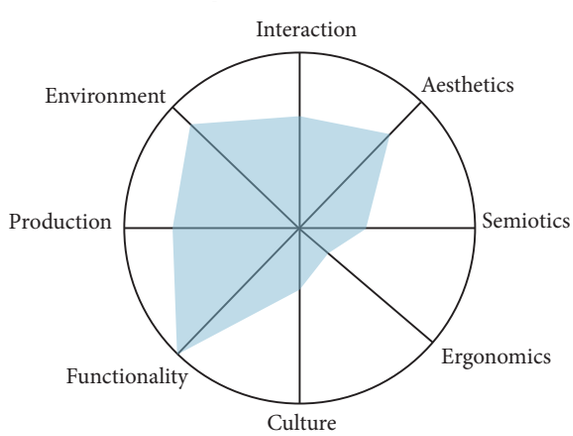
1.5 Project scope

The illustrations below show the relevant areas of the project and how the thesis group chooses to priorities within this set. An important thing still missing in the framing is a specific target group. The project is not based on a profound need owned by a well defined group of people and it is following difficult to place the project anywhere specific. There is a project need of finding an interesting lifestyle and target group that will provide content to the development and qualities and values to the users. The project scope illustration shows the main focus of creating a product with a strong identity in cohesion with a business plan of bringing the product to the market under the cooperation with the company AndICE. The mechanical development possess a high priority to obtain a high level of convenience in the product.

Project scope

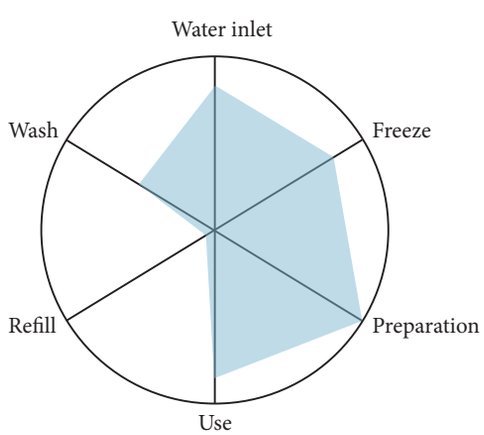


Product scope



The product scope indicates the project focus regarding different product aspects in the development process.

Product use areas



The product use areas reflect the found steps relatively to the product usage and how the project priorities the steps.

Ill. 45 - 47 Scope diagrams

1.6 Out of scope

- The project is limited from a product making large quatities of ice at the time. The physical scalability of the product will however be considered later in the process.
- Fully automated machines requiring electrical power.
- In order to compete with the general products such as ice cube trays and bags the niche market is out of scope.
- Any technologies that replace the regular freezer and makes a self-freezing product.

1.7 Design requirements

Divided into the framing tracks 1, 2 and 3

Need to have

- Must target the market gap of a semi automatic product
- Must have a higher convenience level than the existing low-end market products

Nice to have

Must be in the price span of 100 - 400 DKK

1

Need to have

- No contact between water/ice and the user during use
- Product use without wet hands
- The product should dispense in an area no larger than 5 cm diameters to hit a glass
- No condensation on the outside of product
- Must be waterproof
- Should be able to be disassembled for cleaning
- Water fill opening must be bigger than the faucet opening
- No balancing trouble from faucet to freezer
- Can be placed randomly in the freezer
- Must fit within a third of a freezer drawer of 14,7 L.

Nice to have

- Indicates a specific use cycle - refill after use
- Must be applicable for children and elderly (force)
- One hand operated

2

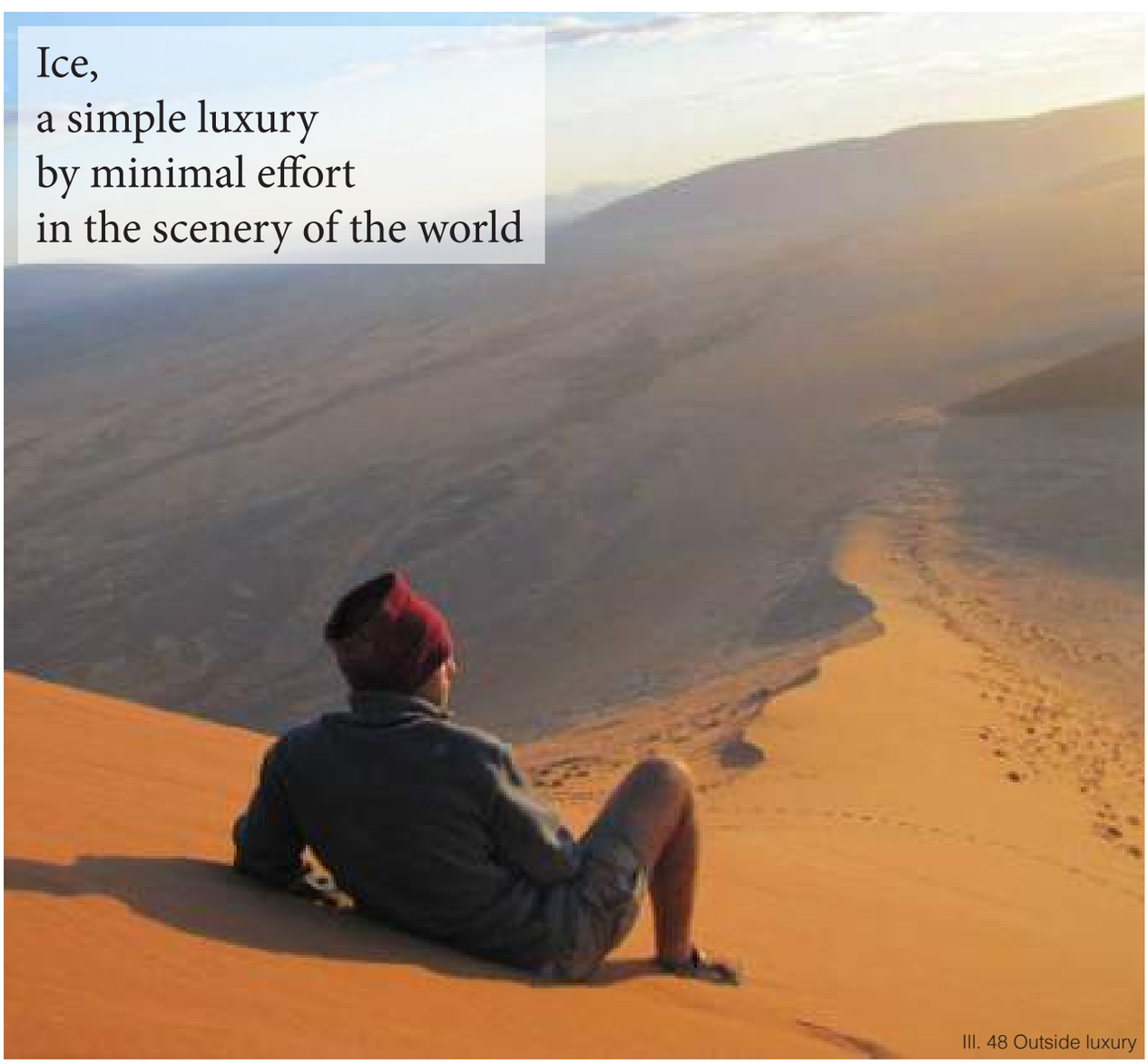
Need to have

- Material must be suited for outdoor use
- Must be able to carry and have a maximum weight of 500 gram

3

1.8 Value mission

The work with the value mission has resulted in a short formulation that describes the mission of the project on an abstract level. This work can be complicated by the individual perception of statement words and meanings. In order to make the intention clear the luxury term has been brainstormed to make sure that the thesis group have a shared understanding of the word and following the project direction. The methaphors have been a deliberate chosen tool to add nuances to get a shared grasp and picture. The minimal effort term is a result of the luxury brainstorm and the influenced project aspects are highlighted. The minimal effort term in relation to the ice process includes a product interaction in relation to water fill, freezing and enjoying ice. This urges an asthetically expression supporting the interaction. Through the report the minimal effort relatively to these aspects is defined.

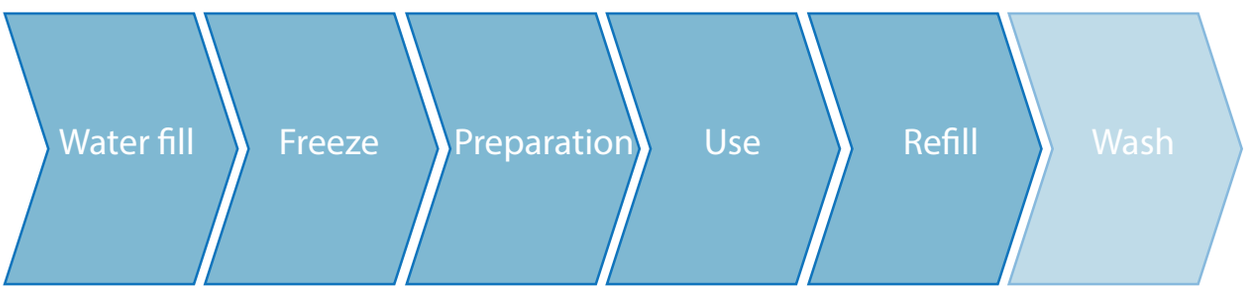


Ill. 48 Outside luxury

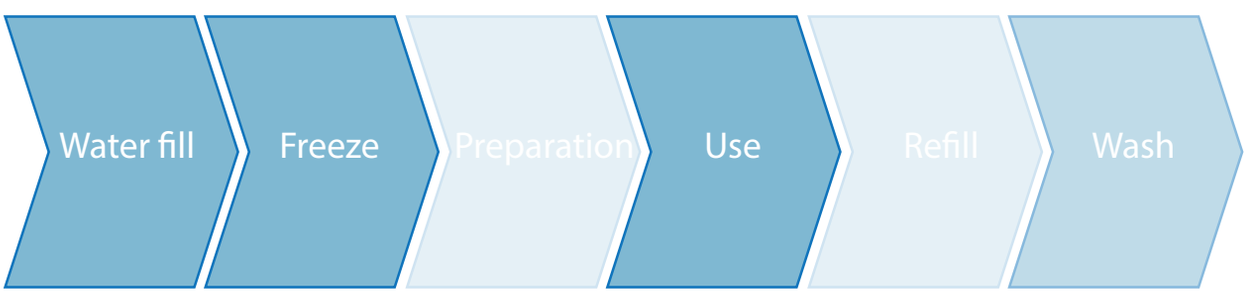
1.9 Interaction vision

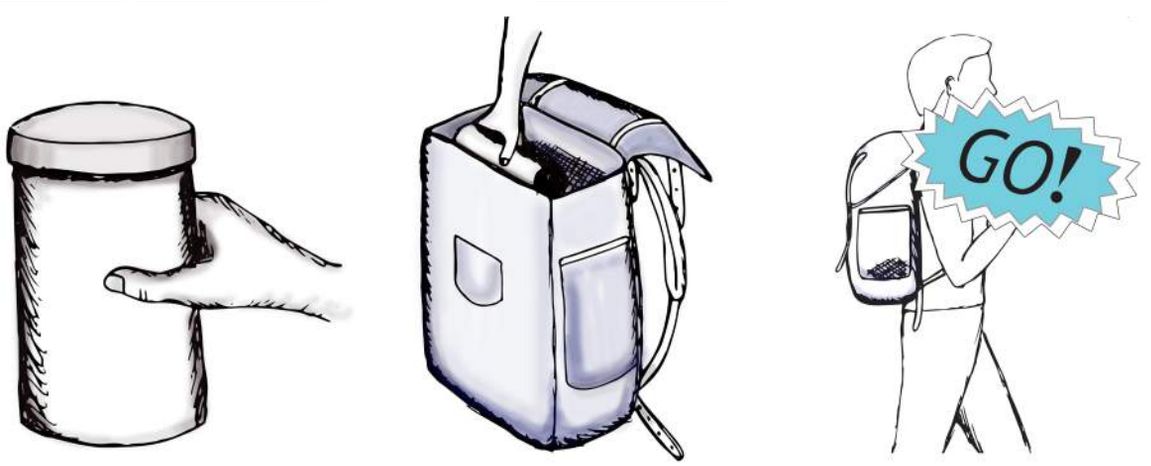
Through scenario play and act it out methods the overall steps in the process of making ice are mapped. These overall steps do not take the specific use scenario into account, but focus on the general steps necessary for any scenario case. The wash step is blurred to indicate that this does not necessarily follow the other steps in every scenario. The most irritations are present in the preparation process and handling of the cold ice cubes and it is therefore the vision to remove this step. With the insulated product the refill step will become needless. In extention of the value mission and the used minimal effort term, it is intended to keep the scenario steps of 'water fill, freeze and use' to maintain a focus on what is important - the outdoor experiences. With no preparation after the ice is frozen the product is quickly grabbed out of the freezer into the bag and out on the go!

Existing overall scenario steps



Wanted scenario steps





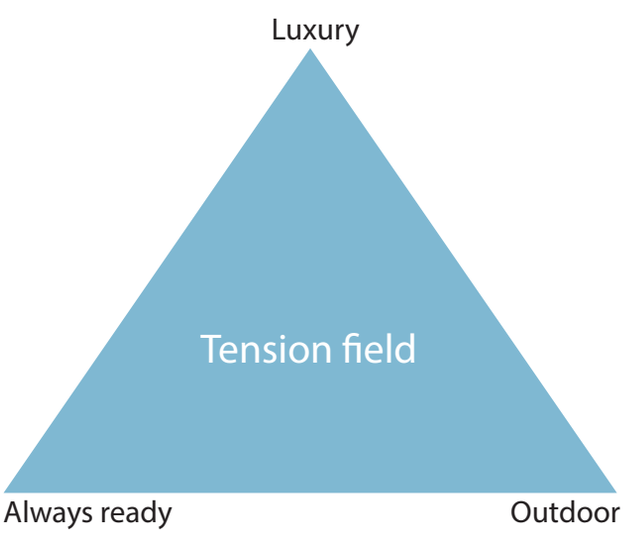
grab it, pack it, go!

Ill. 49 - 51

1.10 Identity

When considering the identity of the product it is important that it fits the different contexts of use. The product role is both in the home and out on the go and therefore consist of two different personalities. The relation to the user within the home should be as the luxury provider of the little something extra in the everyday life. On the go it should be the gathering point as a cozy bonfire. The important part of breaks to sweeten the trip or outdoor event. In correlation to the interaction vision of the product, being easy to take, ready from the freezer, the product offers a shortcut to the park and minimize the preparation process in making the decision of going and actually doing it. It uncomplicates the transition and enables the quick escape from the home in the daily life.

Multiple personality product



The multiple-personality of the product creates a tension field in the development process by the three roles of the product. The product must be experienced as the 'something extra luxury' in the home and always be ready to bring out. In the outdoors the product should be experienced as the gathering point and the identity providing luxury.

Ill. 52 Umbrella in your drink

Ill. 53

Ill. 54

02 Conceptualization

An ideation and conceptualization of a product is begun. The aim is to create a strong concept based on functional principles that enable the abstract values defined in the framing

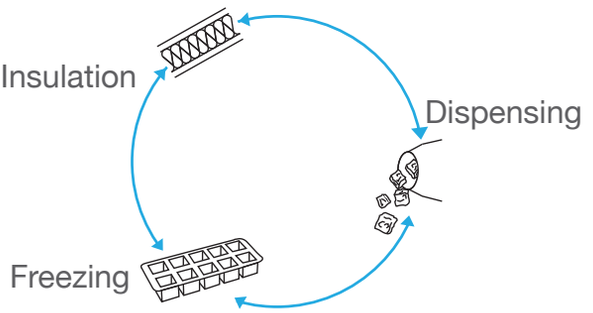
The framework and the guidelines of the value mission and interaction vision are created and the conceptualization of an ice making product can begin. This phase documents the conceptualization process including the areas of technique, form and interaction. The purpose is to develop principles that represent the DNA of the product. The process differentiates between the diverging ideations and continuous converging evaluations of the proposals. The evaluations link back to the list of design demands. In this process it is important to differ between the two mindsets of diverging and converging in order for the demands to be constructive in the forward process to progress and not as negative limitations in the ideations. A lot of the deduced demands are not relevant to consider until the concept has reached a higher development level.

The conceptual work initiates through sketches and thinking the technical principles theoretically. Due to the complex mechanical level, 3D modelling and physical testing of principles through rapid prototypes, are necessary tools for the further development.

Different studies and research sections are run simultaneously if the process lack information in the development.

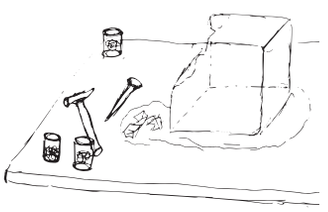
2.1 Ideation

An ideation process is started regarding to the three initial functions. See illustration 55. Creative tension arises in the work with these functions because they are contradicting. The development needs to constantly balance and evaluate how the highest value is created within the three subjects and following integrated in one functioning concept. For instance the contradictory of a fully insulated product to keep the heat out and the freezing process of letting the heat out and cold in.

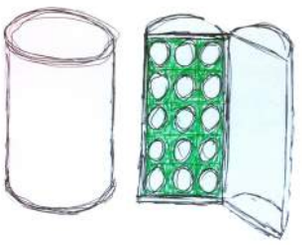


Ill. 55 Creative tension

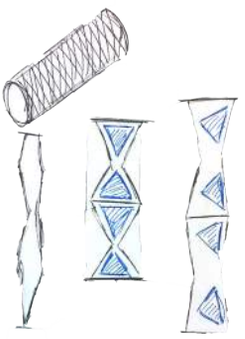
Freezing



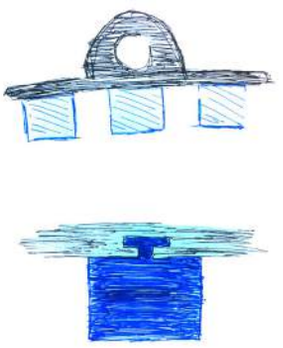
Ill. 56 - A block of ice



Ill. 57 - Bihive structure

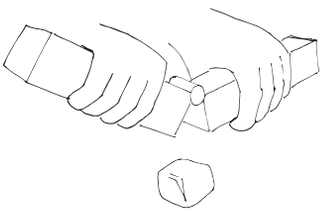


Ill. 58 - Origami freeze structure

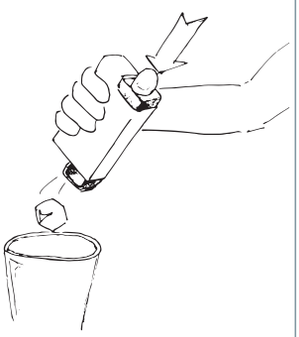


Ill. 59 - Ice lifting off with lid

Dispensing



Ill. 60 - Crack interaction

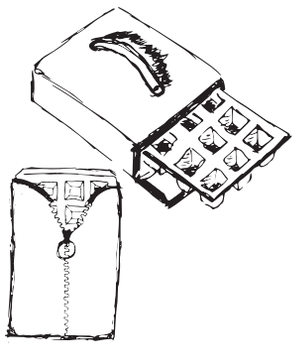


Ill. 61 - Ice dispenser

Ill. 62 - Snap a piece

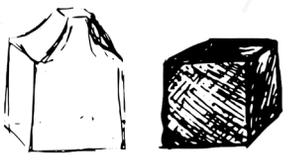
Ill. 63 - Ice planer

Insulation

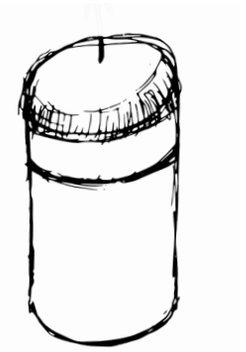


Ill. 64 - Neoprene coating

Ill. 65 - Neoprene on glass



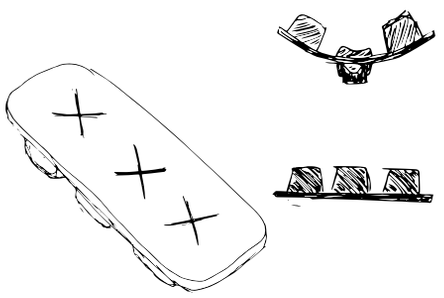
Ill. 66 - Possible to take off



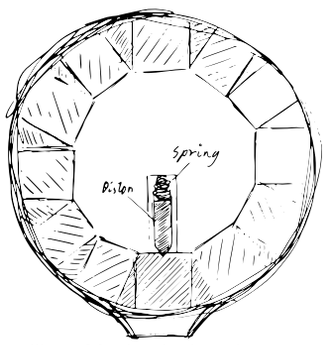
Ill. 67 - Regular thermo

The proposals of the initial ideation are very different and bring ideas variating from technical principles to identities and feelings of a product. In the creative tension circle a new challenge has revealed it self. The freezing of water to ice must be in a freezing structure to avoid the water freezing into one block of ice. In order to dispense the individual ice cubes these must be loosened from the structure. An ideation round show different principles.

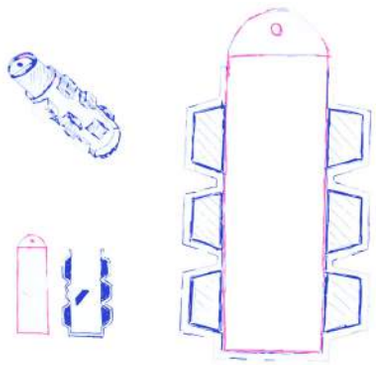
Loosen



Ill. 68 Soft material



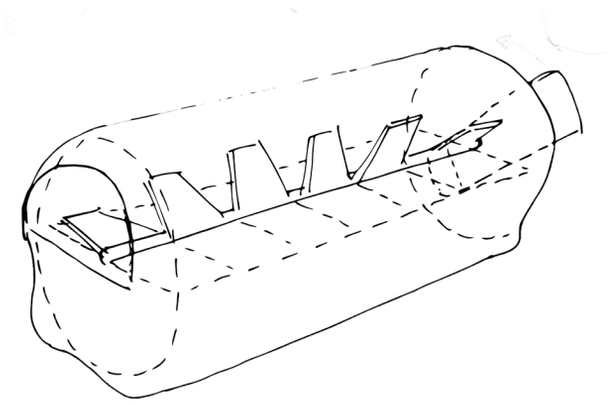
Ill. 69 Mechanical push



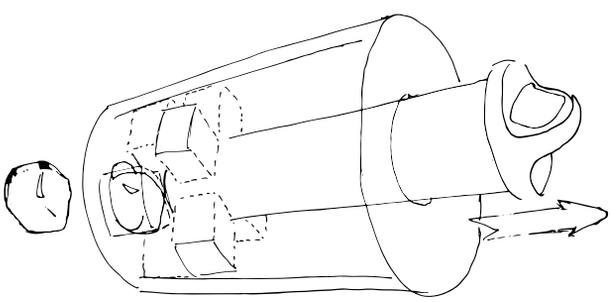
Ill. 70 Individual push

The ideation highlights different mechanical principles and materials as solutions to the loosen challenge. The material consideration therefore becomes interesting. The silicone material enables simple push interactions. This principle does not comply with the design requirements of not having contact with ice, getting wet hands and getting uncomfortably cold hands in the process. The contrary to this is a mechanical solution to push the silicone ice chambers or to loosen the ice cubes from a fixed structure. An option is to free the ice cubes by heat and the thermal conductivity of the freeze structure material. This is however conflicting the insulation qualities and delimited from the potential solution. The two material possibilities of soft and hard material are investigated further in the process.

Focus on loosening relatively to hard and soft materials



Ill. 71 - Inspired by ice machines



Ill. 72 - Stamp concept

The proposal on illustration 71 has found inspiration in the mechanics in the integrated ice machines in refrigerators. The centered axis functions as a shovel that scoops out the ice cubes from a fixed chamber structure.

The proposal on illustration 72 shows a central axis as a stamp. Individual ice cube chambers of silicone are attached to the stamp and the ice cubes are pushed out when the stamp is removed from the cylinder.

Conclusion

Even though the design requirements are previously set, it is not possible to evaluate any of the ideation proposals on this ground. The knowledge of the potentials of success and errors in the principles are very difficult to evaluate on a foundation of sketches. The initial ideations have been very overall and not helped providing any insight to the direction or the DNA principles to help construct a concept. The individual principles have to be tested since the complicated mechanical work in 3D is hard to imagine and evaluate in 2D. Furthermore it is concluded that the process needs to be more systematically approached in order to gain insights of the specific technically challenges within the project.

It is concluded that a product moved from being inside in the freezer to the outdoors in warm weather and consist of movable mechanics, needs to have a high quality level. Concerning the proposal on illustration 72, the friction level due to the silicone chambers being pushed repeatedly, a fast reduction of the performance ability and product lifespan is feared.

Reflection

The ideation have been initiated on too loose terms. The overall approach have led to proposals varying from specific principles to an overall idea of using neoprene coating as an insulation method. When trying too much at one time it becomes difficult to judge the outcomes and what foundation they have appeared from.

2.2 An extreme user group

The attempt with the initiated ideation of a product has resulted in a need of creating a certain quality level in the product due to the advanced mechanical proposals. The intention of a high convenience level in the product calls for mechanical solutions to take over some user interactions, which following urges a high quality to obtain a luxurious feeling. This quality search is furthermore supported by the wish of bringing the product outside. The previous methaphors show different more or less extreme outdoor situations. Through inspiration from the design firm IDEO it is chosen to select an extreme user group within the outdoor life for the project. Designing for an extreme user group automatically include the needs of the moderate users. [Samalionis, 2009]

IDEO

"Our experience is that these exteme users are inherently predictive of mainstream needs"

- Fran Samalionis, IDEO

[Samalionis, 2009]

Outdoor enthusiasts

On basis of a brainstorm of people possessing the characteristics of the different project direction aspects, of high quality products and enjoying life outside, the extreme group of hikers, campers, fishermen and hunters are chosen. This group live for the next outdoor adventure and cares about the right equipment and gear in order to spend many hours out in the wild nature. This market area is a classic example of products being adopted by more moderate users even though they are designed for a specific outdoor lifestyle. See illustrations 73 and 74. It is the intention to implement the same market strategy of designing for one group in the attempt of attractning another - to use the outdoor lifestyle and society trend of action and adventure as the dream for ordinary people to buy part of.

Ill. 73 Fjällräven branding

Ill. 74 Lifeventure branding

User description

2.3 The user universe

In order to dive deeper into the user universe and understand their needs a new set of scenarios are formed. The work have been challenging due to the large time span from the decision-making of going on a trip to the return of the outdoor adventure. The scenarios have therefore not been acted out through scenario plays this time, but instead been created on basis on empathy and imagination. Below is the gatherings and important findings from each scenario that contribute to the list of design requirements regarding the extreme user group. The full scenarios can be seen in the Appendix 6, Extreme user scenarios.

Fishing

- Product can be dropped from persons height
- Material durability - might be placed in sand and gravel
- Inside needs to be closed off from dirt and mud
- Waterproof inside (can be dropped in water)
- Heat resistant material (long time in direct sunlight)
- Product should be able to be emptied for ice and water
- Should be able to be disassemblied for cleaning

Camping

- A maximum of 12 hour freezing time.
- Should be able to open product without touching inside
- Melted ice (water) should not be poured with ice cubes.

Hunting

- Product stay cool even if placed in hot car
- No condensation water, must be in backpack

Hiking

- Ice cube shelf time of 24 hours
- Possible to dispense only one cube at the time
- Possible to see if the ice outlet is dirty

The product family

An internet search provides an insight in the product family belonging to the extreme user group. The product family is analysed to find recurring aesthetical aids or use of semiotics. These are important in the aesthetically design of the product in order for the product to resembles this family and reflect the values appreciated by the user group. Appendix 7, Product family. A recurring visual and functional aid is the attachment opportunity of cabin hooks. In appendix 8 the positioning of the product regarding to the backpack is analyzed.

Ill. 75 - 77 Product family

Applied visual aids

Visible logos and brands

Contrasting colours to highlight function

Overdimensioned details for strength

References to machinery

Rounded edges

Focus on functionality

Robust expressions

Rough detailing

Reflection

In the work with scenarios and the product family relatively to the extreme user group it would have been benificial to have actual contact to representants of this group. The contact might have provided important insigths, that cannot be predicted. The process is driven by an abductive approach and draw many conclusions in the process that later on is tested on the relevant user group. For instance, the analysis of the product family and the respective characteristics in the designs are at this moment evaluated as being appreciated by the user group. The actual user attitude towards the applied visual aids will be tested in the final design proposal.

2.4 Business Canvas

With a chosen extreme user group and the design strategy on foundation of the IDEO approach a Business Canvas can be formed in order to create an overview of the resources behind the project in collaboration with AndICE. By this overview the business opportunities and market launching strategies of the product can commence. In the business development, on the basis of a lifestyle product, storytelling and branding are essentials of winning market interest. [Osterwalder, 2010] The product cannot be sold alone on solving smaller problems and the prior learnings of the work with lifestyles and trends therefore becomes important in the communication of the product universe and identity as illustrated in the Weber example. The story of the product, lifestyle and dream must be very convincing to succeed. It is following decided to have the initial market introduction of the product in the outdoor lifestyle stores to emphasize the product connection to this segment.

Key Partners	Value proposition
AndICE Key Activities	Ice as an outdoor luxury The dream of adventures and outdoor experiences Customers
Product development Brand development Patent platform Key Resources	Mass market Channels
Brand proprietary knowledge Patent platform	SPEJDER SPORT Friluftsland EVENTYR SPORT

Status 1

From the beginning the project have provided many challenges in gaining insights to support a nuanced and rich framing for the product development. Since the process is not build on a specific problem alone, the framing and product universe now created have been put together of a lot of pieces. It has taken a long time to put the pieces together. Yet the framing, to an extend, is based on a gut feeling. The project illustrate a lot of supporting hints and references of the potential success of such a direction. Nevertheless it depends in a high extend on the thesis groups ability of telling the story and creating a trustworthy sale of the direction and product universe. This have at this point already been tested several times relatively to a status seminar, student intern mini status seminars and a presentation to AndICE.

The process is based on an abductive approach and needs to get several informations and conclusions confirmed by the user group to gain validity.

The inital work with the concept ideation have been very shallow and needing specific informations and challenges that occur in such a product. In the following section, the conceptualization is approached systematically to break the functions and needed steps down to individual principles for thoroughly testing. The aim of this is both to obtain useful principles for a product concept but also to reach insights of the critical points and challenges in the tension field of freezing water to ice, loosening ice, dispensing ice and insulating a product.

Problems

Products need specific positioning in the freezer
Takes up a lot of space in the freezer, not stackable
Causes a lot of spill and cleaning after preparation
It takes a lot of time to fill the ice cube bags
It is unhygienic to place an open product in the freezer
The handling of the frozen cubes is unhygienic
It is difficult to control the slippery cubes
The handling of frozen ice cubes is uncomfortable
The ice cubes melts fast when out of the freezer

Context

Outside

Target group

The extreme outdoor group of hikers, hunter, fishermen and campers.

Functions

Must be able to freeze ice cubes
Must dispense the cubes
Product must be insulated

Channels

Outdoor lifestyle stores - Friluftsland, Spejdersport and Eventyrsport

Time of use

All year round

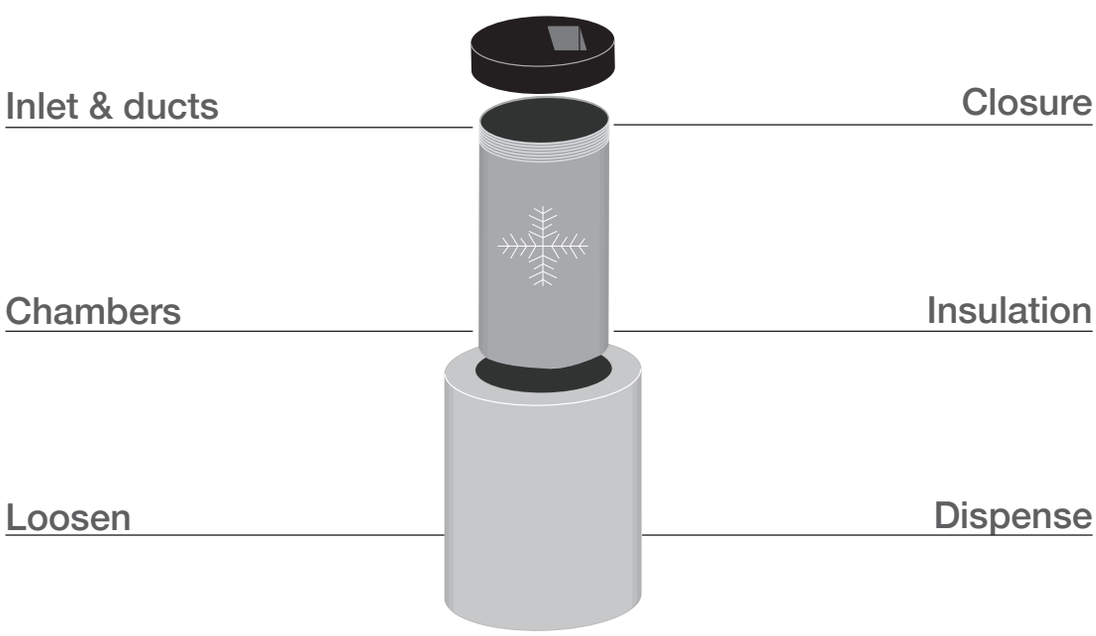
Technologies

Mechanics and materials

2.5 Working with principles

Principles of the concept

As stated in status 1, tensions exist between the three functions of dispensing, freezing and insulation. These tensions are unlikely to be fixed through ideations on an overall concept level as they are simply too complex. It is therefore decided to break the concept content into the principles for individually testing. The principles are found on basis on the prior ideation work and more added through a brainstorm. The work with principles is divided into six different principle categories, representing the mechanical process steps of making ice. The categories will be worked through one by one with the aim of finding one or two principles per category for further development. By this approach the focus on the overall concept is momentarily replaced by a thoroughly testing and weighting of each principle. Continuously, integration possibilities of the respective principles of each category are tested. The workspace of each principle are slightly overlapping. In the following section the principles will be presented sequential, in the order the principles are connected in the ice process. The aim is to find individually working, strong principles and subsequently to integrate them into a concept covering all mechanics of the product.



Ice related facts

Water expands almost 9 % when it freezes

Ice expands equally in all directions

Typical ice cube trays are made in PP

Ice cube size 25 x 25 x 35 mm

Principle categories

Inlet / water fill

Freeze structure

Loosen

Dispense

Insulation

Closure

Inlets & fill

The first step in the ice process is to fill the product with water. The inlet principle focus on filling the product from a faucet and into the ice forming chambers. It concists of an inside product and outside product perspective and both need to be explored for the inlet principle to work properly. The outside perspective is about different sizes and shapes of water intakes to find the best solution for leading the water. The inside perspective will focus on water flow after inlet. Two principles are tested in this section. They are called the balloon and the funnel principle.

Two principles

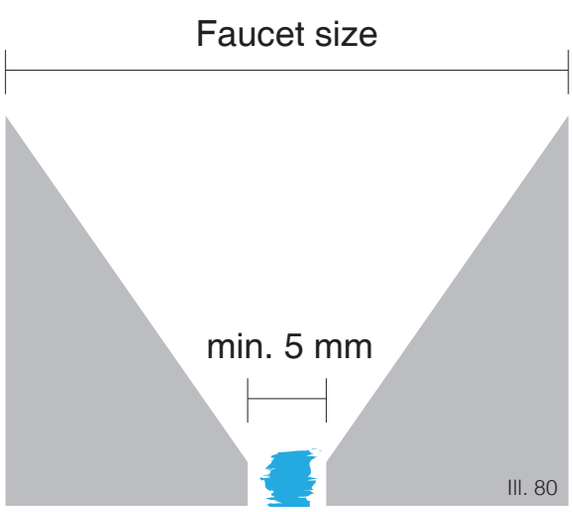
Ill. 78

The idea with the balloon principle is to control the water and have a tight secure fit around the faucet. The funnel is the classic way to lead and control water without requirering a perfect hit into an opening or hole. (Ill. 78)

The balloon principle is tested through a prototype that shows how the air-flow out of the product is very important for the water running smoothly into the chambers. Due to hygiene considerations the ballon principle is deselected and the testing continues relatively to the funnel.

The outside perspective

Ill. 79



Ill. 80

The inside perspective

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Conclusion

The optimal size of the inlet is summed up to be as large as possible. Yet, it needs to fit with other principles and it is found that the hole size into the product must be minimum 5 mm i diameter with angled sides to remove horizontal facets.

Chambers

After concluding on the initial experiments of water inlet the focus can shift to the chambers. The chambers are the freezing structure that secure the water freezing into a specific shape. The chamber shape and materials are significant factors in the ice releasing ability after freezing. The first step is to look at existing ice cube trays. An experiment is set up, see appendix 10, where four ice cube trays are tested in producing and releasing ice. The experiment looks at the ice trays materials, the chambers shape and how these handle the expansion of ice. The focus is to test the products in a technical perspective in order to see what limitations or options exist of forming the ice.

Experiment

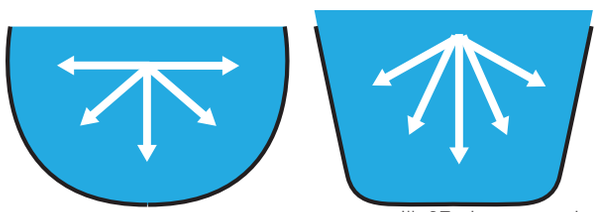

Ill. 83


Ill. 85

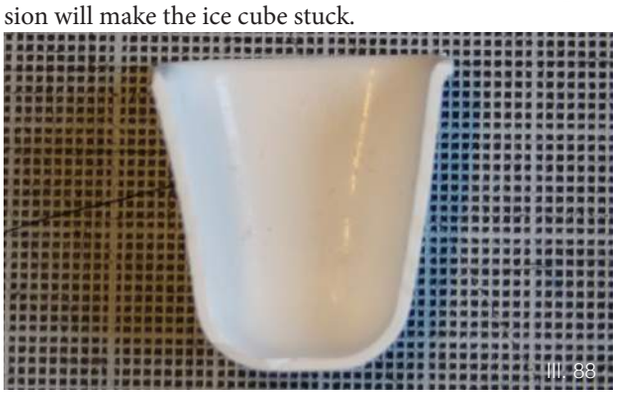

Ill. 84


Ill. 86

Results


Ill. 87 - Ice expansion

When water freezes it expands equally in all directions. This means in a chamber shape as the rounded with almost vertical sides on illustration 87 to the left, the expansion will make the ice cube stuck.


Ill. 88

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Conclusion

In this experiment the focus have been on the material and shape of the chambers. Shapewise the trapez shape with the draft angles is the best solution for an ice cube chamber, illustration 88, as it exploits the expansion ability to push it self out of the chamber. Soft materials as silicone and rubber tend to stick to the ice which complicates a mechanical loosening from the chamber. The best material in the experiment is the PP tray, which seems to be a good blend between flexible and stiff. The results of the technical perspective limits the creativity in forming the ice cubes in other shapes. The project direction does not encourage a specific ice shape at this moment, which means that the technical demands dictates the ice shape.

Loosen

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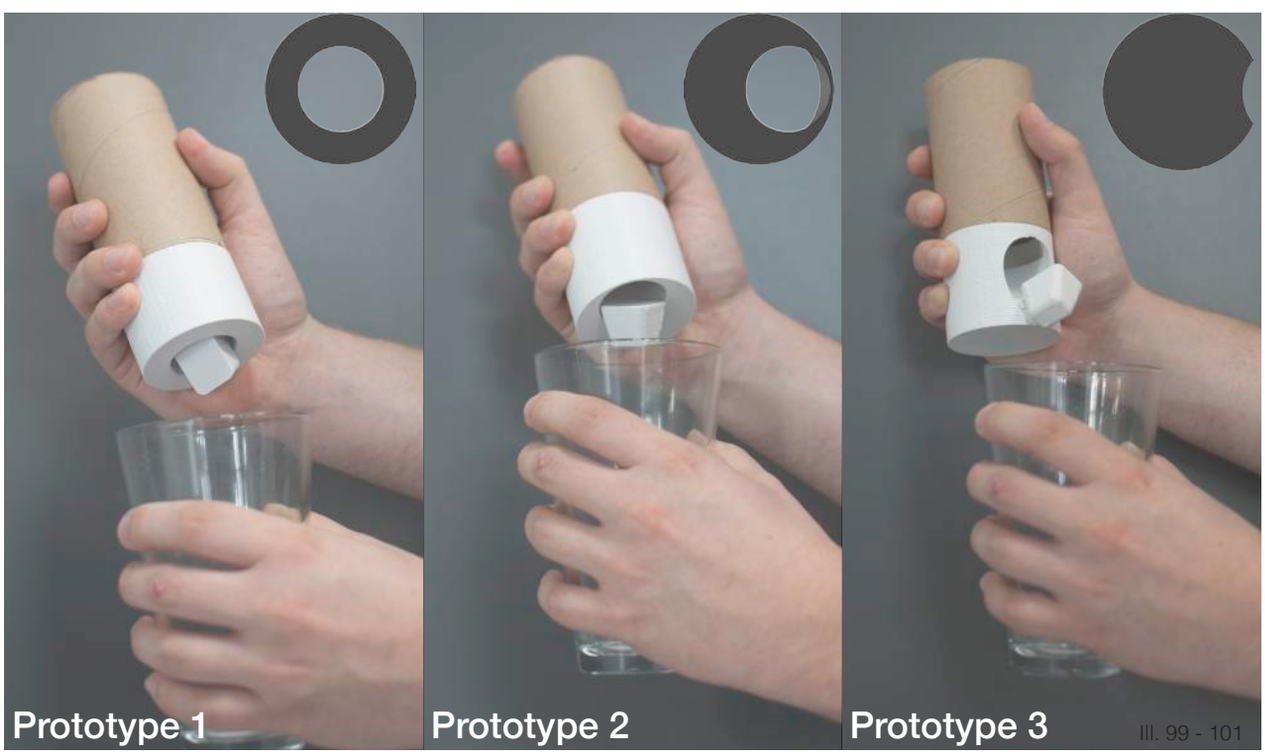
Dispenser

After the water is frozen and the cubes are loosened, the ice is to be dispensed from the container. In this section different principles are tested. The chosen principles, inspired by other products, are the spiral, water mill, double doors and sugar dispenser. Once again it is needed to differentiate between the inner and outer perspective. The inside perspective is the technical solutions for dispensing one ice cube at the time while the outside perspective is the interaction of getting the ice cube out of the product. Firstly the outer perspective is tested through an interaction experiment. The interaction is required to land ice cubes within the area of a drinking glass, which is set to an area of 50 mm. Three different prototypes (ill. 99- 101) are created to mimic different placement of outlets of the product and an experiment is conducted to test these prototypes to find the most suitable solution. Appendix 12.

The outside perspective



Ill. 99 - 101

Results

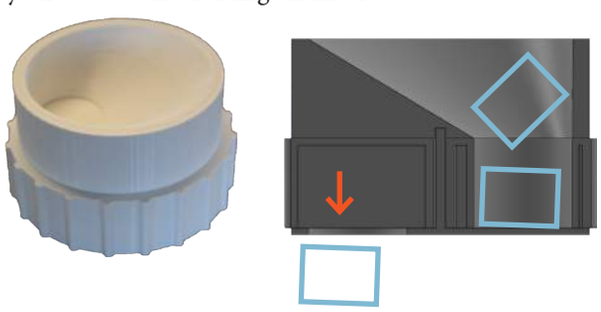
Prototype 1 and 2 have a very presize aim with their bottom outlet and dispense the ice cubes in the glass almost everytime. Prototype 3 is difficult to use and the force of gravity tend to make the ice cubes fly out of the side making it even more difficult to hit the target. Prototype 1 offers the most natural interaction, since it does not need an indication of the outlet positioning as it is centered.

The inside perspective

With the centered hole in the bottom as a starting point, the testing of the inside perspective can commence. The principles of the spiral, water mill, double doors and the sugar dispense, are 3D modelled and rapid prototyped to fully understand the functioning and disfunctioning aspects of the individual principle.

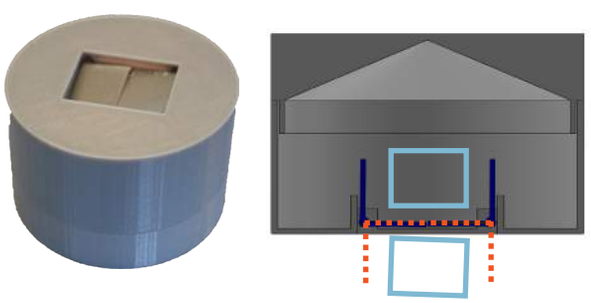
The spiral

The spiral principle consist of a spiral shaped funnel leading the ice cubes to a rotational piece divided into chambers. When turning the piece the cubes are dispensed one by one due to the dividing chambers.



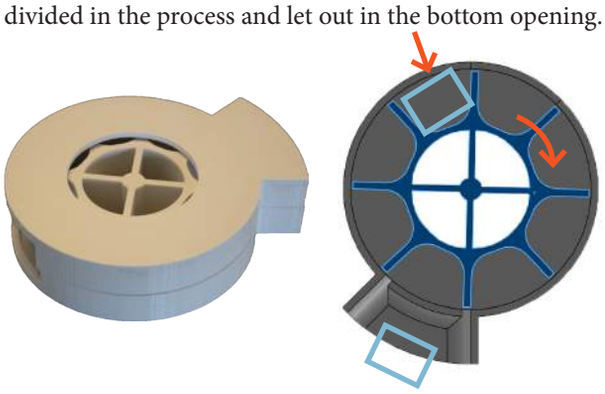
The double doors

The double doors principle is inspired by a cat flap. Two doors swing open when pushed from the inside. The 90 degree angles on the doors keep other cubes from moving through in the same pour-movement.



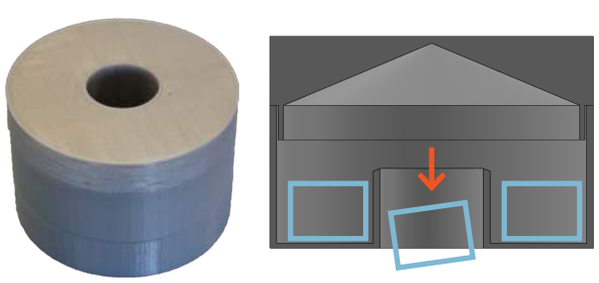
The water mill

The mill principle consist of an internal rotational fan moving inside of a closed cell. The mill is positioned in the bottom of the product and the cubes will, due to gravity, be divided in the process and let out in the bottom opening.



The sugar dispense

The sugar dispense is inspired by a classic sugar serving unit. A small tube secures that only one cube is caught at the time and hereby controls the dispense flow.



Ill. 102 - 109

Conclusion

None of the prototypes can seperate the ice cubes properly due to the uneven form of the cubes. Even though the principles could be refined to dispense the cubes, a well functioning dispenser is not enough. It has to be in tune with the project direction and add to the value of the product. The lack of demands for the product interaction makes it difficult to choose and weigh the principles. The interaction vision does not provide enough insight to help the evaluation of principles. Furthermore, when 3D printing the principles in prototypes, they turn out bigger than expected. The construction adds substantially to the size of the product. This initiates an important question of the value of the different principles in relation to the rising complexity level of the product. A balancing of what the individual principle is worth in the whole of the product needs to be considered.

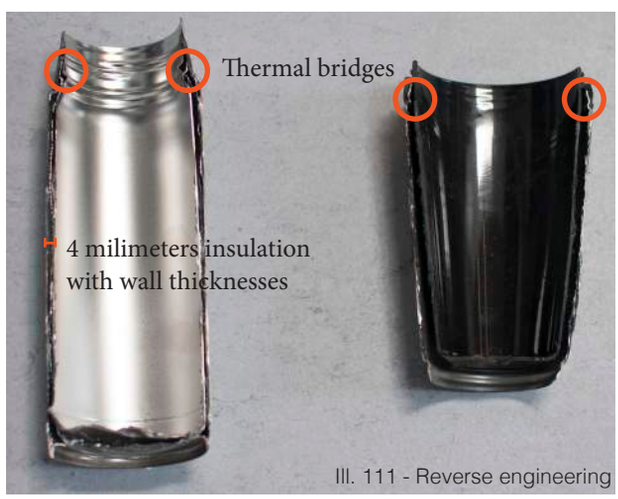
Insulation

One of the demands for the product is keeping ice cubes frozen for 24 hours. To find out if this is even possible with ordinary insulation or it will require more effort, an experiment on existing thermo cups is performed. See the full experiment in appendix 13. The experiment is set up with a controlled quantity of ice put in different insulated products. The containers are kept closed under the experiment and tested every hour by carefully shaking the container to hear if there is still ice.

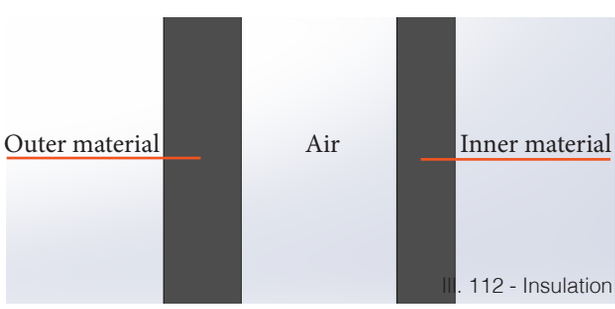
Ill. 110 - Tested insulation bottles

Reverse engineering

Following, insulated containers are cut in halfs to study the component assembly and what thermal bridges might be present in the different products. The measurements of the insulation space consisting of air standing still, is noted for further development.



Ill. 111 - Reverse engineering



Ill. 112 - Insulation

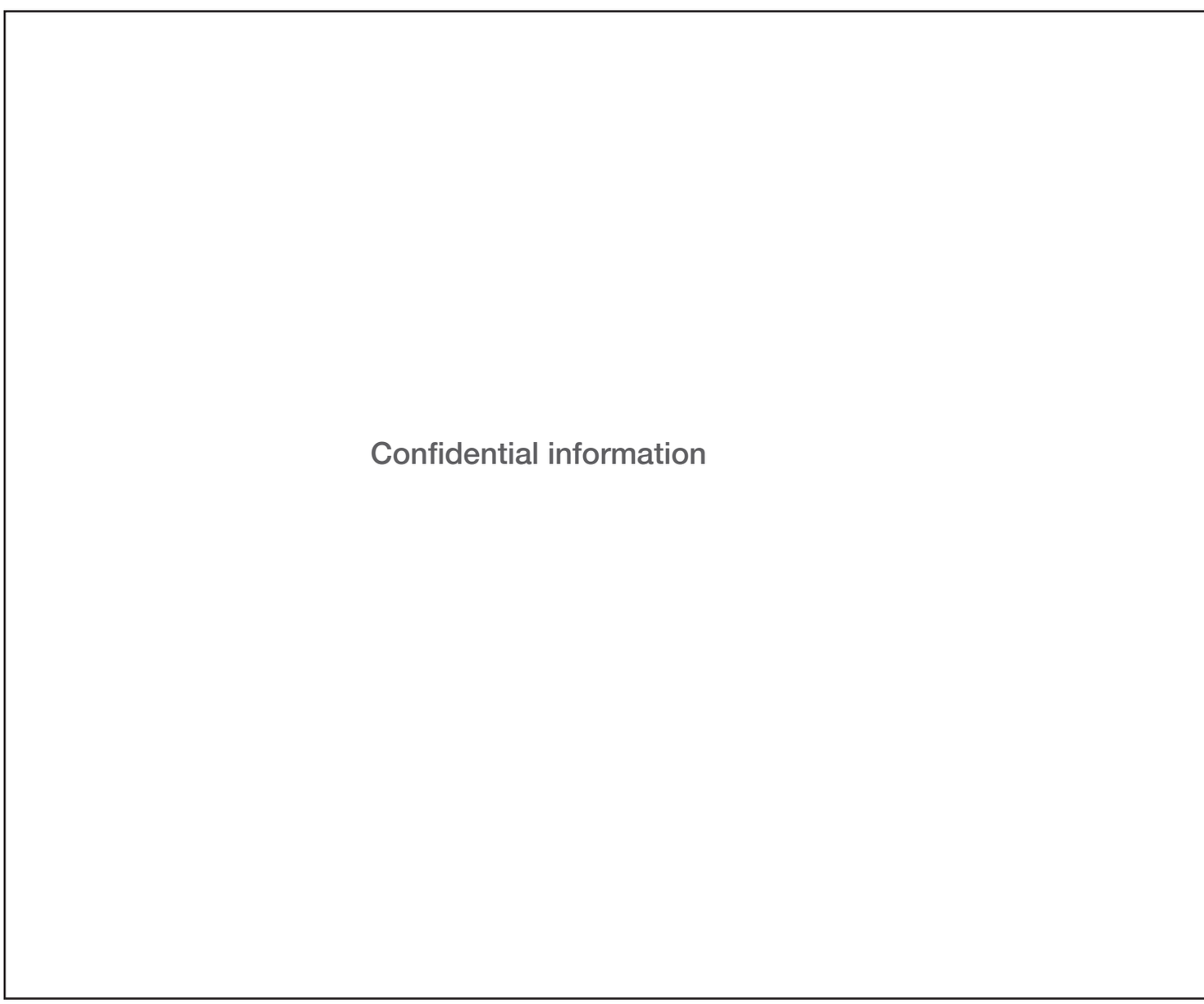
Conclusion

The experiment shows that it is possible to keep ice cubes frozen for 24 hours, but it does require an intelligent construction that minimizes thermal bridges. It is therefore concluded that the product will use the same ordinary construction of a sealed off airwall between two pieces of material, a specification of the sizes will come further on.

At this moment it is difficult to continue the development on the insulation principle. In order to continue the development the process needs a shape or design to relate to. When speaking of thermal insulation there are different methods of neoprene coatings and the one treated in this section, the ordinary airwall. Another possibility is the Aero Gel technology. The Aero Gel is an rather expensive solution, but could be beneficial in complex shapes that challenges the double wall system of a classical insulation. [Aerogel.dk, 2015] The insulation development is resumed when the product is formed.

Integration of principles

In a workshop it is sought to integrate the deduced principles. The workshop primarily focus on the integration of the three firstly presented principles. They are integrated in a concept so that the concept now handles the water inlet, freezing structure and loosen functions. The work with dispense and insulation have not been completed or resulted in any specific principles estimated to be useful at this point. In order to finish the dispenser development and how the ice cubes are to exit the product, the process needs to revisit the interaction vision in order to clarify more specificly what the interaction should provide of value to the product handling. Like the insulation work, the question of how to close the product tight and secure to make it waterproof is postponed until an aesthetically concept is set for the project. These two principle categories are simply too dependent on the shape to make sense at this point. A development attempt now would only result in a diffuse and overall ideation, like the initial conceptual work.



Reflection

The work with the technical principles may not represent the entire potential solution span within this field. Nevertheless, the complexity level and the overall time-schedule of the project have accelerated the decision-making process. Aware of the fact that there might be more clever principles to implement in the concept, the current principles have been chosen despite of the many challenges and uncertainties that follows. The unexpected technical advanced level have through the project been the cause of unreached deadlines yet resulted in the determined focus of solving the challenges of the chosen principles and making them succeed. It is the believe that no matter what principles are chosen there will be many challenges and obstacles in the integration of multiple mechanical principles in a relatively small space.

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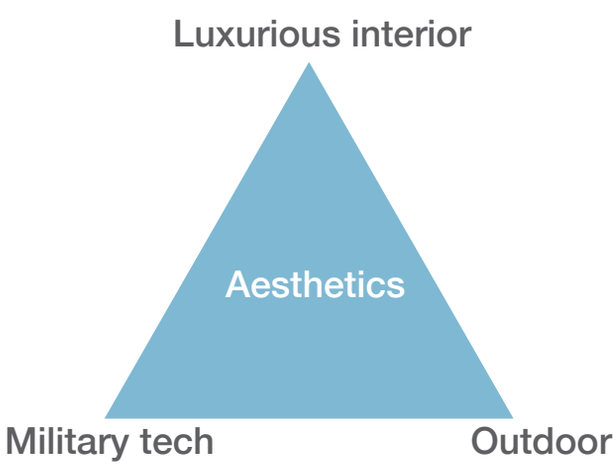
2.6 Initial aesthetics

Even though the process and following the process report are divided into tracks of different project subjects, the tracks are individually depending on each other. The process is performed in loops and iterations and the tracks are run in parallels. After the work with the technical principles a few of the categories did not end in a usable principle, due to a need of aesthetically and interactional information. The inital steps in the aesthetically process is therefore started.

Based on the findings in the previous sections, the aesthetics of the concept is found within the tension field of three aesthetical values, military tech, outdoor robustness and luxurious interior.

The three qualities represent the boundaries of the product aesthetics and are based on the direction of the project of the product being a durable high quality product for outdoor use serving ice to create a feeling of luxury in the wild. To translate the tension field into actually design guidelines an ideation is begun. The ideation is focussed on creating visual aids and is therefore consisting of small features on a generic shape. A span in a diagram is created to adjust the expression level of a military technological product versus the outdoor robustness and luxurious interior.

The point of the diagram is to use it as a base for interviews to find a balance in the tension field and understanding the impact of the applied visual aids - do they communicate what is intended.



Ill. 117 - Military tech inspiration

Military tech

Ill. 118 - Outdoor robust inspiration

Outdoor robust

Ill. 119 - Luxurious interior inspiration

Luxurious interior

Ill. 120 - Aesthetical diagram

User interviews

Without presenting the intention and the aesthetically words behind the diagram, the diagram is presented to different users. They are asked to explain what products they see and what use they are targeted for.

User feedback

It looks like a thermal cup

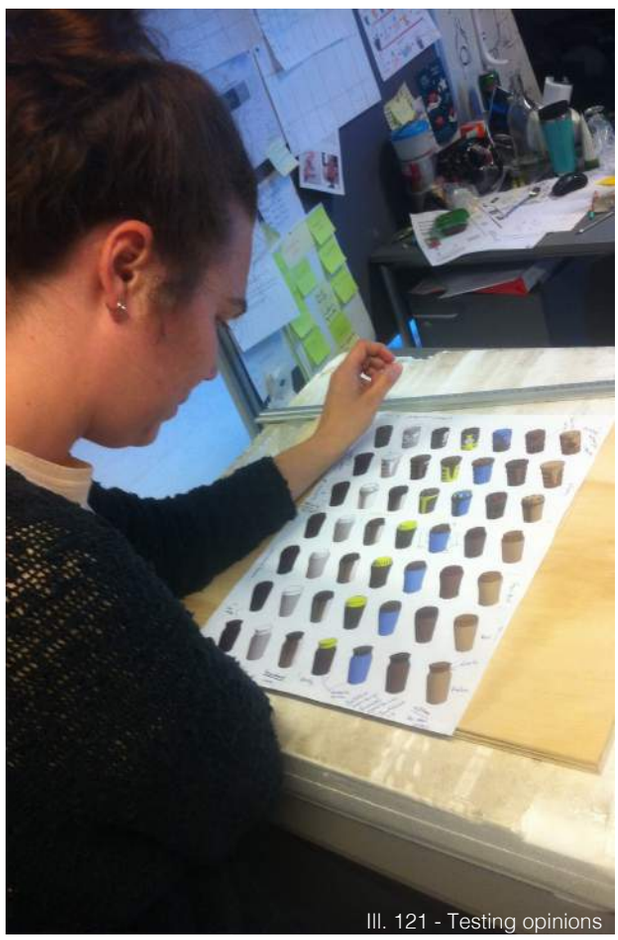
It contains something hot

Girls like the bottom half of the diagram

Boys like the top half of the diagram

The main theme division is in general understood.

Another similar round is initiated to test how important the colours are in the attempt of signaling a 'cold' product. The approach have been with the same generic shape and to use blue cold colours as well as warm earth colours inspired by the Fjällräven brand. The main conclusion is that the colour alone cannot create the perception of a 'cold' product. The product form has to contribute to generating this understanding. See appendix 14 for the second diagram. According to the product family analysis the two extremes of the horisontal axis are deselected, since they do not apply any visual aids of communicating product functions.



Ill. 121 - Testing opinions

Conclusion

It can be concluded that the overall attempt of visualizing the different aesthically words is succeeded. It is nevertheless needed to create a shape and form of the product that combined with colours moves away from the thermal cup expression and instead expressing something cold. It is the believe that the product does not have to be in a cold colour to express that it it contains something cold. There have been a clear division of the preferred products of boys and girls, which indicates that the middle section of the chart is the area to target in order to capture interest of both groups. The basis for this have been the level of applied visual aids. The top row is not appealing to anyone and has been commented as impractical due a potential collection of dirt in the many ornaments. The insights of this analysis have to be implemented in another aesthetical process.

2.7 Developing a business strategy

In order to determine, which business strategy is better suited for the initial, danish market introduction of the product a set of scenarios are formed. There is a challenge lying in the tension field between the creation of a company brand that is trustworthy of its abilities and skills to make a quality outdoor product, and reaching the intended target group of ordinary people. It is sought how a brand can be established within a certain lifestyle and group of people while reaching interest by another. These so-called ordinary people represent the mass market and it is the belief that the product is bought by these on the foundation of its outdoor-qualities and the belonging to a more extreme lifestyle. It has been exemplified several times that people buy into lifestyles and dreams even though they do not perform and live the implied lives of these lifestyles. The target group of the project can be categorized into three groups of people. A brief analysis is mapped with the purpose of understanding their interest and purpose of buying outdoor products and their preferred channels in order to reach them.

Target groups

Outdoor Group

Represent the extreme user group of the project. Lives and breaths for the next outdoor adventure.

Knows the brands and what he/she wants. Browse magazins and follow the development and market supply.

Channels

Potentially reached through: Outdoor stores, Friluftsland, Spejdersport, Eventyrsport and wepshops.

Boy Scout Group

Live common lives but explore the outdoors on a hobby level. Exercise small outdoor trips and adventures.

Learning about the respective product universe and have interest in the market selection.

Channels

Potentially reached through: Outdoor stores, Friluftsland, Spejdersport and Eventyrsport.

Ordinary Group

Ordinary people with no connection to outdoor lifestyles, but who buy quality products designed therefor.

Follow tv commercials, advertisements and notice the offerings in the visited stores.

Channels

Potentially reached through: Lifestyle stores, interior design shops, sporting good stores, malls and DIY stores.

The Ordinary group

The Outdoor and Boy Scout group are used as medias to brand and to reach the Ordinary group. The Ordinary group presumably represent the biggest sales, the estimated sizes and sales within the other groups are therefore not calculated. The main focus is to reach the Ordinary group. The Ordinary group may consist of a lot of different types of people and the market potential is following great. It is needed to make a market assessment to evaulate the potentials of the business plan. This assessment is based on danish garden owners even though future customers might as well be living in apartments in the cities.

Approximate 1 million garden owners in Denmark

- An assessed market potential is 10 % of Danish garden owners - 100,000 persons
- 1 product/garden owner/family
- The average product lifetime of 5 years gives a corrected market potential of approx. 20,000 products/year

[Herningvand.dk, 2015]

Ill. 122

Scenarios

Three business scenarios are formed based on the scenario of the product as the first product AndICE is introducing to the market. AndICE is a relatively new name and company and this is an important factor in the scenarios. AndICE is working on their own product and this is to be introduced firstly on the market, nevertheless this is not taken into account in the business scenarios at this point. The work with the scenarios is based on the intention of targeting the ordinary group. This is the assessed largest customer group of the targeted and it is a wish to expand to the more general stores that in a higher level reaches this group. The three scenarios illustrate three different approaches to the market introduction of the product. A sensitivity analysis shows for the individual proposals the assessed investments. The numbers are calculated on different offers from printing houses, magazines and mark up factors from a store representative from each store category. The calculations are furthermore based on a product retailprice estimate on 350 kr. It is therefore important to emphasize the roughness of the investment assumptions. See appendix 15 for retailprice estimation and appendix 16 for applied numbers.

The product name as a marketing strategy

In relation of making a strong product identity for the process the identity and name of the product create a strong marketing value. The name therefore has to reflect the strong outdoor value as long as the refined luxury of ice. Through a brainstorm different potential names are suggested.

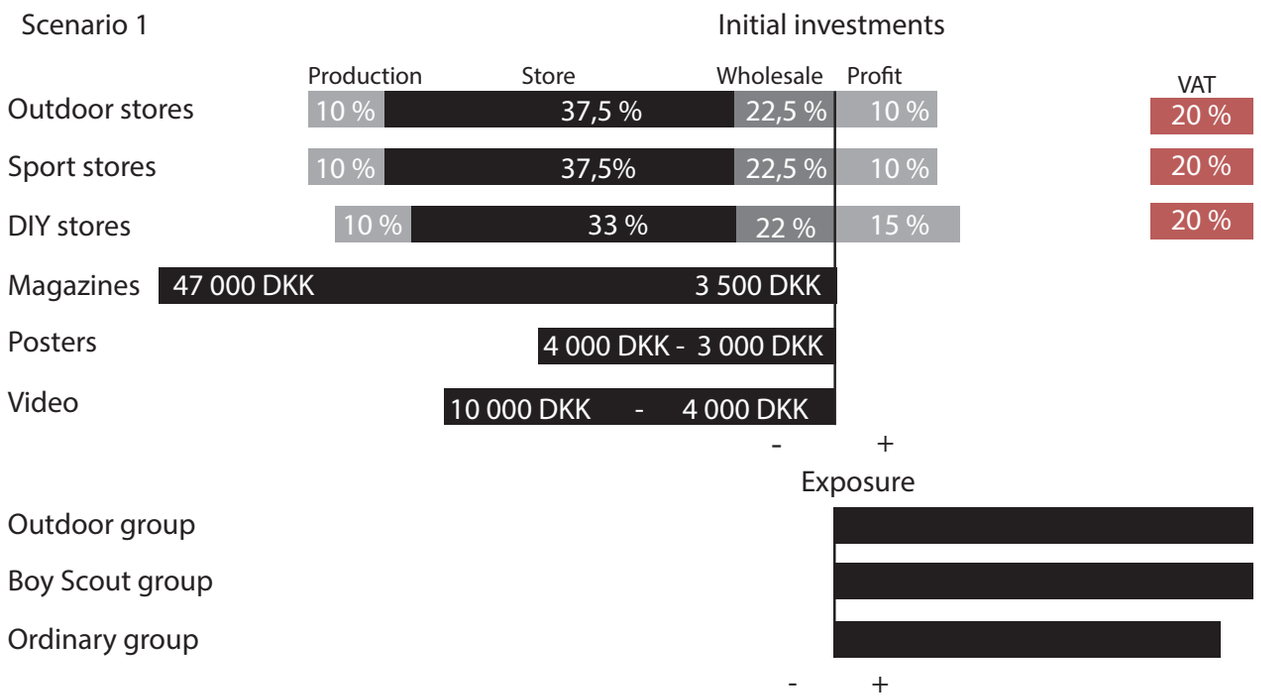
The name Glacier is selected. It represent a natural force of ice cutting through the landscape with an increatible strength. For an outdoor product serving ice this seems as a suitable choice.

GLACIER

Scenario 1

The first scenario is to introduce the product simultaneneously on the market through a broad variety of channels. For a new brand this calls for a lot of branding and storytelling to support the sales, since there are no prior history or awareness of the product and AndICE brand. The dream and story of ice as a simple luxury to take on adventures need to be very visual and clear in the selected channels. Nevertheless the product is launched and presented to the market with a lot of exposure towards all the targeted groups and goes from an unknown product to a product that is present everywhere in a very short time.

Assessed initial investments of Scenario 1



Conclusion

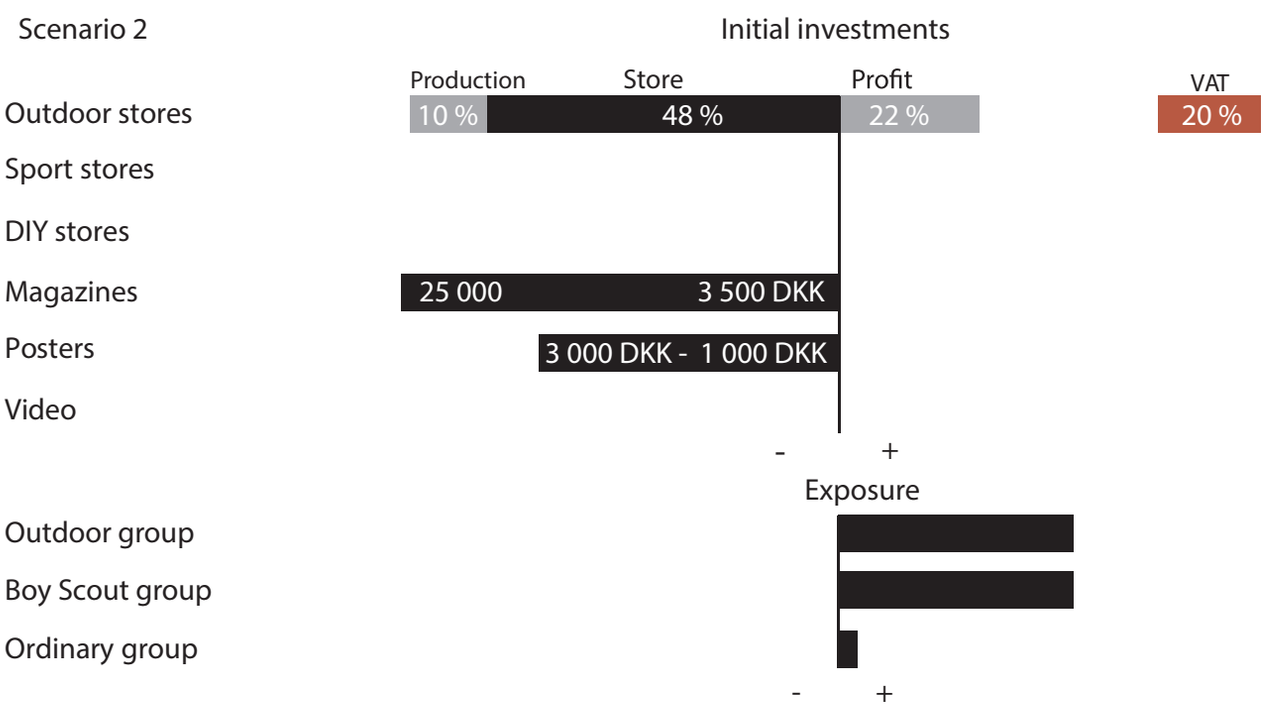
Do to the many channels, in this scenario, it is necessary to use a wholesale to help organize and administrate the contact and deliveries of products to the stores. This means that the profit for AndICE is minimized caused by the extra expense. The initial exposure of the product is high and aimed at all the targeted groups, which are estimated to result in a higher sales curve from the beginning. The business strategy of this scenario is to create an explosion of marketing and hopefully start a general awareness and focus on the new product. Due to the lack of prior trust and brand recognition on the market, it may result in an impaired buyer-willingness among the customers. For a new company the high investment of the scenario constitutes a higher risk. Furthermore, internally in the company, the trust towards the quality and functional success of the product must be total, since the product is presented to a lot of people through different channels at the same time. If the product turns out to be unsatisfying in some area the consequences could be damaging to the brand. The scenario contain no time for continuously evaluating the market response or save potential errors in the market introduction process.

Eventhough the magazines are chozen to fit the targeted groups, there are no proof of positive customer influence on this large investment post. Furthermore the development time of the marketing material is not included in the price estimations. The work time might add significantly to the cost since the material in a high extend stand alone in the stores with fewer sales clerks to inform and guide the customers.

Scenario 2

In order for the product to be sold by the branding of a quality outdoor product designed for the extreme user group, it is the premise that the product is introduced in the directly related stores firstly. The purpose is to establish the brand quality through the interest of the first movers and then wait for the remaining market interest to follow. A loyal market introduction enhances the trustworthyness of the product and belonging to the outdoor segment. The initial exposure of the product is concentrated through magazines and channels relatively to the extreme outdoor group. In the following years the product is introduced and launched in new channel sections of sporting good stores and DIY stores in order to broaden the exposure and expand the targeted groups.

Assessed initial investments of Scenario 2



Conclusion

In the second scenario the service of the wholesaler is left out and the AndICE profit is following higher per product. This requires a lot of groundwork of AndICE to negotiate the contracts and sales agreements for each desired sales channel. With the concentrated focus on the outdoor channels, only two of the intended three customer groups are targeted. The exposure towards the Ordinary group is minimal and it might take time for the mass market to catch on. The incubation time of this scenario is estimated to be a longer time than the previous scenario. The exposure through magazines only reaches the Outdoor group and the Boy Scout group. Since these groups are mainly used as marketing medias in the pursuit of the mass market, it means that the initial sales curve starts off slow. Nevertheless, by only presenting the product in a few channels in the beginning it is easier to maintain a high informa-

tion level towards the customers. The stores have more sales clerks on the floors and AndICE would be able to be more present to attract attention and to build the trust with the customers and follow-up on any product errors. This business strategy is financially safer, but builds on a slow and steady approach, which requires time, in order to create a trustworthy brand name, and eventually reach the mass market with a larger number of sales. The scenario allows the company AndICE to continuously evaluate the progress and adjust the strategy if needed. Furthermore it makes it easier to control the demand and supply balance to following manage the suitable production number.

The development time of the marketing material is again not included in the price estimations.

Scenario 3

The third scenario is to create a cooperation with an already established brand that is known to and quality-proved on the market by the extreme outdoor group. This strategy would avoid spending time on establishing this for the new brand AndICE. Furthermore it will be possible to exploit the channels and customer group of the chosen brand. For instance this brand could be Primus, which is known for its quality products and impact on specificly this market. Primus exists in the before mentioned outdoor channels.

Creating a license agreement

The advantages of creating a license agreement with an already established company are listed. The company relieves the already performed investments and provides capital for the final development and production start-up investments. The list does not include the long process of negociating the license agreement that might put the fast market introduction and market advance in jeopardy. [Opfind.nu, 2015]

1. NDA - Non disclosure agreement
2. Minimize risk and avoids a search for investors to provide capital for the final refinements and production
3. Fast access to markets that otherwise would have taken long time to establish connection to
4. Markets in other countries
5. Paid by a royalty or license fee
6. Secured by a minimum clause

Conclusion

Working with an established brand as Primus, means that the product will be sold through their channels and to their established customer group. The cooperation Primus-andICE would result in a Primus product with the mechanics and technique provided by AndICE. The business structure is already created and the quality brand name and knowhow would reflect upon the AndICE name. The initial sales curve is estimated to be higher than starting alone with an unknown name, that if is the license negociation is fast. It would create a great exposure towards the Outdoor and the Boy Scout group and reach a high level of trust instantly. Nevertheless the AndICE brand should still work on standing alone on the market, which is significantly more difficult in this situation. The business scenario does not contain a lot of risk for AndICE; nonetheless they would stand in the shade of Primus and have less impact on the shared product. AndICE will receive an unknown royalty of each sold product.

Sum up

As a conclusion on the work with the business scenarios and with the AndICE company size, resources and advise taken in to account it seems as an obvious choice to introduce the product to the market with the strategy of the second scenario. It constitutes the least risk and requires the full attention of the company with pop-up visits, participation in the stores and a good customer contact. A good way to meet customer value requirements. [Lamb, Hair and McDaniel, 2006] The slow brand and trust establishment is estimated to pay off in order to later capture the interest of the mass market on the foundation of an quality outdoor brand and the product as an everyday luxury provider. Furthermore the strategy of the first scenario might result in the creation of a negative trend feeling on the market that the product is a temporary item. The intention and hope is to create the classic design product, that will last and stay on the market to broaden the ice product selection with a higher convenience level. There are many benefits in the third business scenario which could constitute a good future business cooperation for the AndICE brand. As an initial introduction is seems that AndICE would give up many opportunities of creating their own brand.

Scalability

During the many visits to the different lifestyle stores it has become clear that there are several possibilities, both in a small and high extend, of scaling a product to the market. The boxes below show different options. Accessories, the physical scaling and providing different series of the same product, are describing scalability in a small extend. By changing the lid design and making it an accessory purchase that helps transforming the product, it becomes a customizing possibility for the customer. Through clever product architecture, a business platform can be created based on add-ons. Furthermore it creates small aftersales that secure an income after the actual sale of the product.

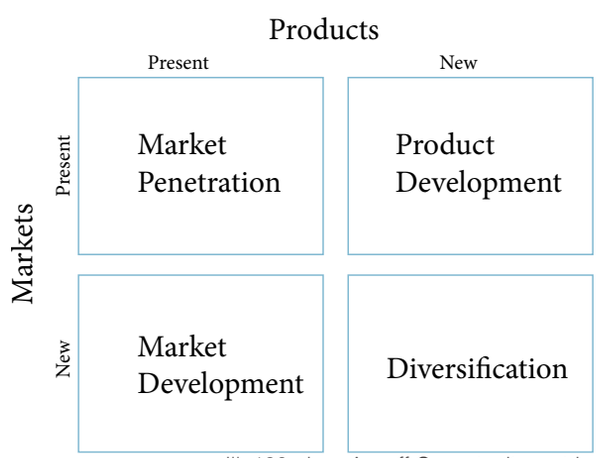
Accessories	Physical	Family	Series	Customer relationship
Lid	Size	Crushed ice	Fashion	Feedback service
Coating	up-scaling	AndICE	Party	"Develop your own"
Chambers		PrimusAndICE	Kids	
Cabin hooks		SeniorAndICE		

Ill. 123

Ill. 124

Through a close connection with the customers it is possible to identify future requests and needs. [Lamb, Hair and McDaniel, 2006] The product design enables a physical scaling to meet potential needs of larger quantities of ice. The stores offer a variety of series based on the same product; this is a chance to adjust the product to other channels. The scalability options are important to prolong the lifespan of the business and product concept. In relation to the opportunity matrix of Igor Ansoff (illustration 126) the scalability options focus on the Market Penetration and Market Development. These are respectively to increase market share among the existing customers and attract new customers to already existing products to secure business until new products are developed. [Lamb, Hair and McDaniel, 2006] The technique of the product represents the essense and signature model that is scalable relatively to price and for low-end market introductions. The current plan for market introduction is as a high-end product.

Ill. 125



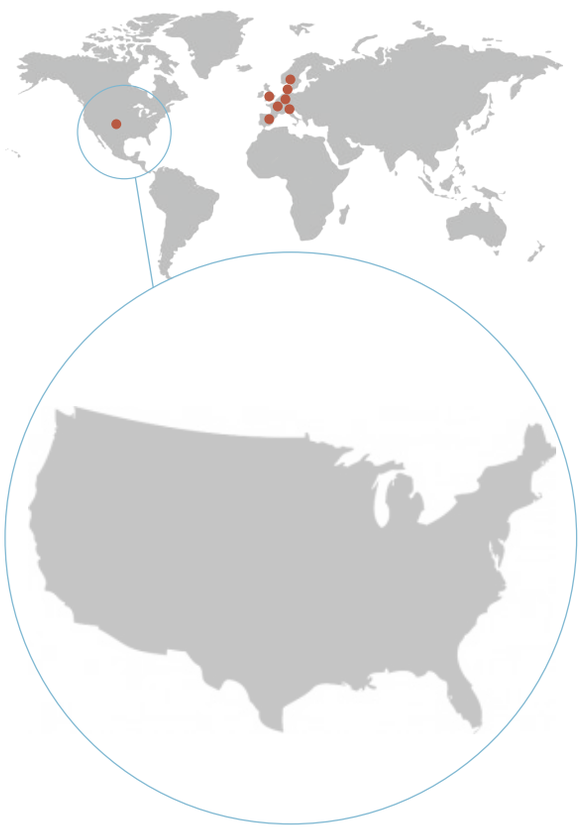
Ill. 126 - Igor Ansoff Opportunity matrix

Targeting other markets

As a starting point the focus of the project is to develop a product for the Danish market. Still there is a great opportunity to introduce the product to the countries surrounding Denmark without requiring a lot of alterations.

When making an ice producing product a very interesting market to investigate is the United States of America. There is another attitude existing towards to use of ice and it is more frequently used both in restaurants and in the homes. American fridges, the refrigerators with in-built ice machines are commonly seen in american homes. For many people the convenience of ice cold beverages have become indispensable.

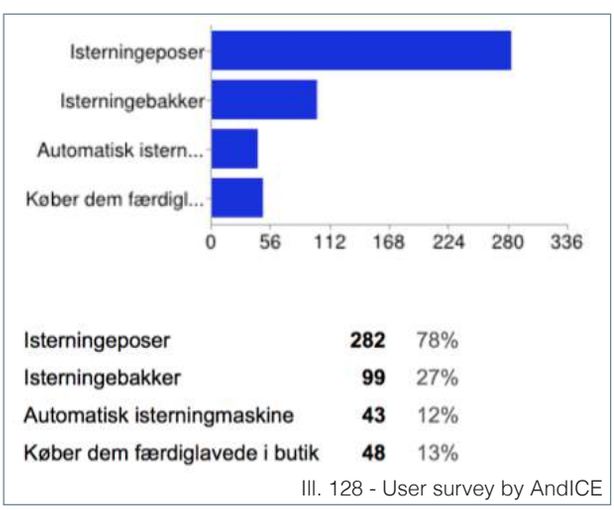
To adjust the product to fit the American market the ice chambers and mechanical structures inside could be removed and hereby making it an ice cooler product. With great insulation properties and easy dosage the product could be sold on the same outdoor branding. Bring it to the beach and on your picnic.



Ill. 127 - Market opportunities

Competitors

In Denmark there are no competitors offering the same type of product with a similar value proposition as the product of this project. As earlier established in the project a gap is present, in the market, both regarding price and product offerings. Nevertheless, the product adds to an existing product selection that succeds in the overall target of producing ice and the product is therefore competing with the ice cube bags and - trays for the same customers. From the AndICE user survey performed in october 2014, the numbers show that only 12 % of the participants own an ice machine and 13 % buy premade ice cubes from stores. [Appendix 1] The project product can not compete with the premade ice cubes since these are presumably purchased for special events with a need for large quantities of ice cubes. Yet the majority of the participants uses the simple and cheap solutions whilst expressing frustrations of the inconvenience and lack of use possibilities in the products. With the increased convenience level and the possibility to bring and preserve ice outdoors the product is a solution that brings something new to the market.



Ill. 128 - User survey by AndICE

With the broad patent platform and the extensive development time, the AndICE strategy creates a strong business case that will prevent new actors entering the market with a competing product.

Status 2

The main focus and special qualities in the project is present in the functions of insulation and dispensing. These are the functions truly offering a new meaning in regard to the existing product selection on the market. Nevertheless the basic success criteria is lying in the development of the functions of water inlet, freeze chambers and loosen in order for the product to work. So even though these do not represent the main focus and the most important to distinguish the product from the rest, these are still the essentials of an ice product.

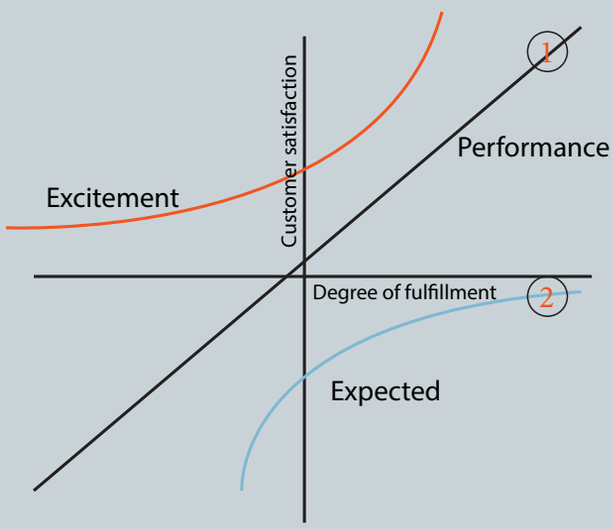
The focus of the principle categories can be illustrated in the Kano model. The ambition is to reach a high level on the performance curve with the dispense and insulation functions.

Nevertheless the work with the individual principles provide a good insight in the specific needs in each of them, nevertheless in the implementation to a gathered product concept there is a significant rise in the complexity level. They question of how complex a product can be before it becomes ridiculously advanced and overpriced, occur. In the further process the individual value offering of each principle to the product whole needs to be considered.

Regarding this work rapid prototyping has been an important method that enabled testing and evaluation that otherwise would have been difficult to perform. The constant consideration of tolerances in the different components have brought an insight in the critical areas of the product and components and connections needing higher tolerances. Nevertheless severeal problems have been present in the combination of the rough surfaces of the prototypes and freezing ice. The ice gets stuck and freezing into the prototypes making it difficult to test the principles. Furthermore the preparation of the 3D prints in an additional job, since these must be prepared in another way than it is supposed to be manufactured in real life.

In the further process the interaction vision needs to be revisited to create a more precise guidelines for the mechanical and aesthtically development.

The Kano Model



1 - Dispense and insulation

2 - Water inlet, freeze and loosen

Ill. 129 - The Kano Model

03 Detailing

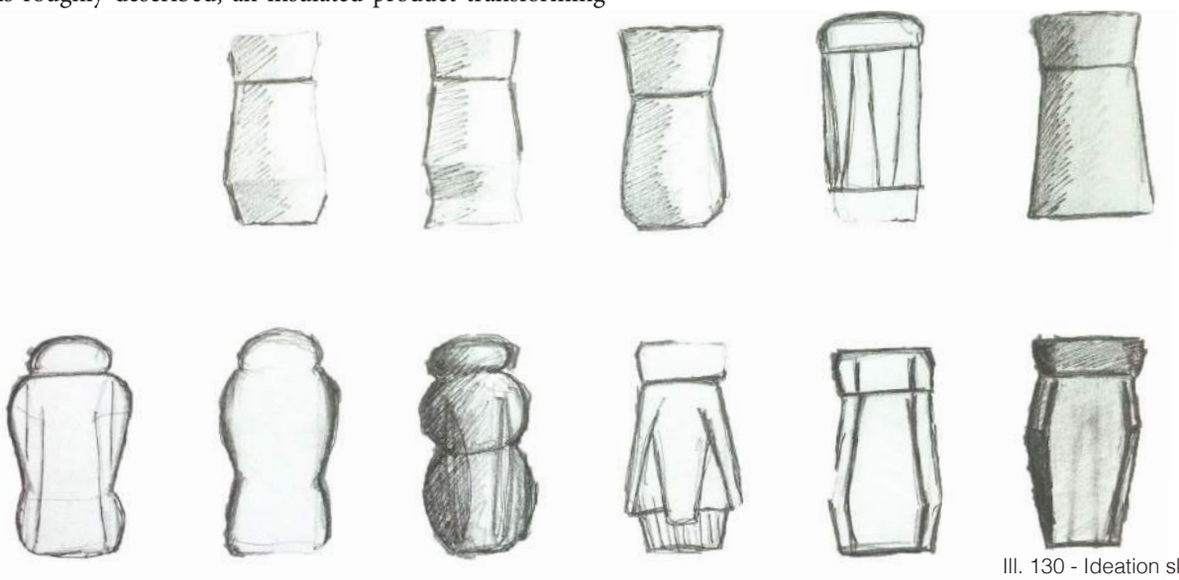
The aim in this section is to take the project from a conceptual level to the specific development.

In this section of the process report the focus is moved to the detailing and specification of the product. Even though the aesthetically development not yet have reached a final concept level, the concretization of the mechanical concept can begin. This step is needed since the high complexity level of the mechanics and it is necessary to take it to the next level in order to evaluate the functional success of the concept and continue the integration of the different principles. Through the process and development of the mechanics the detail level has to be high in general in order to reach the insights of new challenges and problems occuring in the product. This work in this section is characterized by a lot of different studies to collect missing information needed for the dimensioning of the mechanics. For instance, the information of how many ice cubes the product can contain within the chosen principle of chambers without the product exceeds the maximun size. Moreover to take specific scenarios into account of how much ice does a potential scenario call for. The process in general therefore becomes much more focused on gaining specific informations to solve specific challenges. It is intended to create an quality product with the smooth feeling in the mechanics, which encourages a detail-oriented work relatively to the production of the individual components and the tolerences in the assembly.

3.1 The transformation of water to ice

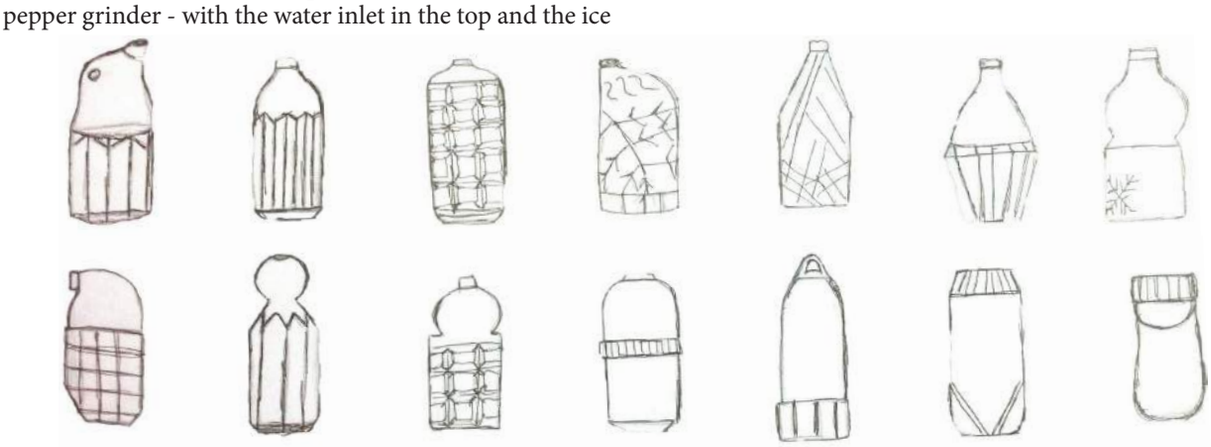
Product aesthetics

Besides implementing the balancing between the aesthetically values of luxurious interior, military tech and outdoor robustness, the product should move away from the expression of a thermal cup and water bottle. The product is roughly described; an insulated product transforming water to ice. In an ideation it is sought to find a form expression communicating this transformation, to both distinguish the product from a thermal cup and to express the ice relation.



Ill. 130 - Ideation sketches

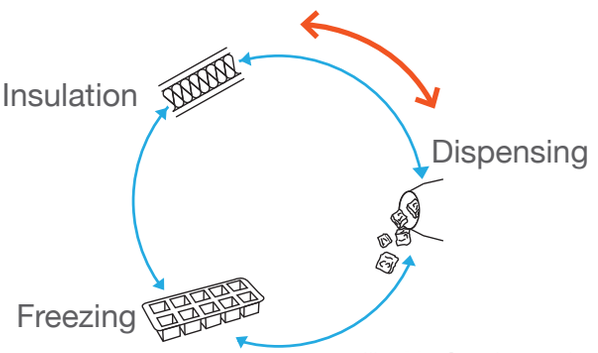
The initial ideation round concentrates on creating a shape that differs from the themal cup expression with a slightly larger top and tilt in the product. The rotational interaction of the mechanics provides an interaction like a pepper grinder - with the water inlet in the top and the ice outlet in the bottom of the product. The rotational movement in the product means that the turning device is not a lid. This item therefore has to communicate that it is not removable.



Ill. 131 - Ideation sketches

The second ideation round concentrates on the communication of filling liquid water and transforming it to solid ice cubes. The water fill is therefore, in some cases, resembling to regular screw caps of a drinking bottle. By inspiration from the book *Modsætninger* of Thomas Jaeger the idioms are moving from the organic soft to the structural strict geometrics. [Jaeger, 2011] With the two-end interaction it means that one end is placed in the dirt when being outside. This seems unhygienic even though the screw-cap-end is not needed until the trip is over and they return to home.

Regarding to the tension field of dispensing and insulating at the same time and the hygienic consideration, the two-end interaction is deselected. If only having one opening with both water inlet and ice outlet, it becomes easier to maintain a high insulation value by minimizing the amount of thermal bridges and openings in the product.



Ill. 132 - Creative tension

Results

- The mechanical rotational piece is to be placed in the top.
- The transition of the interaction piece and the container has to be smooth to indicate a belonging, as a pepper grinder - not a removable lid.
- One-end interaction.
- Showing the ice transformation by moving in a span of a random structural pattern and geometrical strict - to imitate the structure of ice.
- Different visual expressions of the different openings - if it is to small to dispense ice you will not try it.
- The interaction item must not be too small.

Based on the findings from the initial ideations a new ideation process is commenced. Four different sketches are highlighted from the attempt of communicating the ice transformation and one-end interaction.

Ill. 133 - Prismatic shape

Ill. 134 - Rising icicles

Ill. 135 - Melting ice expression

Ill. 136 - Soft structures

Conclusion

The proposals of illustration 133, 135 and 136 do not communicate a direction in the product. This direction is clear and fastly decoded in the proposal of illustration 134. With the rough outdoor related top of illustration 134 and the idiom of 133 a concept is reached. The design language indicates the freezing process of something fluent suddenly freezing in a mix of geometrical and random structual facets. When the dramatic expression is kept in the bottom of the product it becomes very elegant with the slim cylindrical shape slightly tilting inwards as the product reaches the top. The design language fits the aesthetical diagram from the initial aesthetical work but lack the outdoor connection and robustness.

In order to continue the aesthetically development an interaction study needs to be performed. The process lacks information in order to design the interaction point and how to create a ritual that suits the striving after a luxurios feeling.

Ill. 133 - Selected aesthetically concept

Ill. 137 - Section of diagram

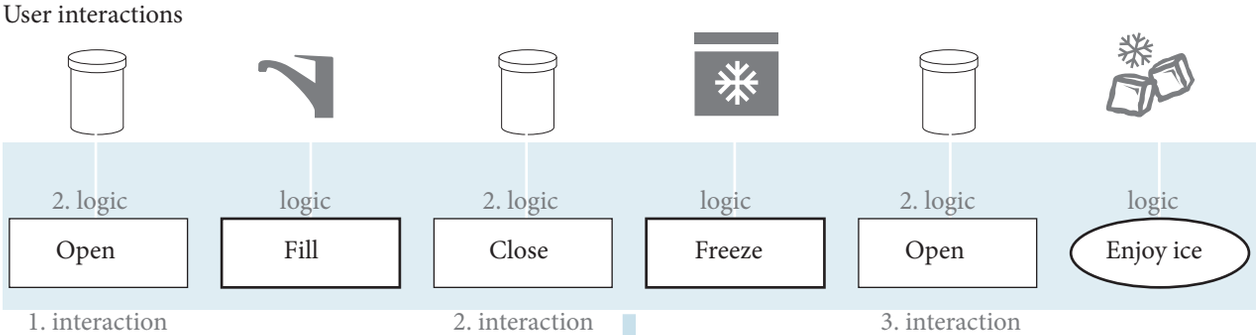
3.2 Product interaction

The aim of this study is to find a product interaction vision that can assist and guide the mechanical development of the product. In order to prevent a mechanical solution is found without any considerations paid to the use-situation and needed interaction, different models and scenarios are made. The work with the product interaction vary from an abstract level that seeks to support the established feeling and identity of the product and a practical functional level that provides the necessary interaction details of use. The interaction study takes starting point in the logically steps in the ice making process, to freeze water and enjoy ice. The interaction study seeks to find the balance in what mechanical insights should be shared with or hidden from the user.

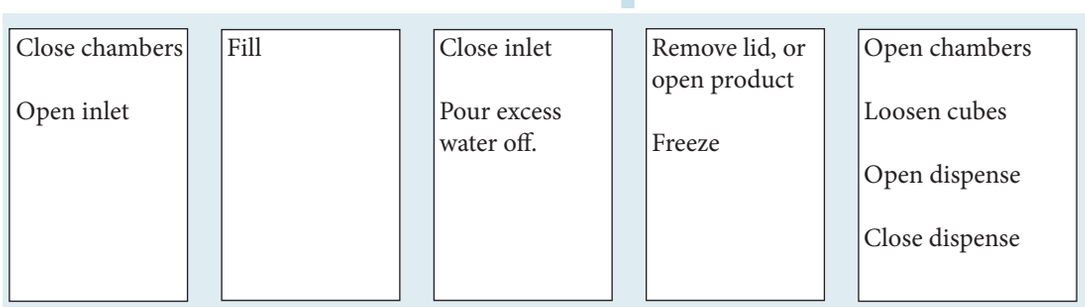
Important parameters

- Trustworthiness – secure closure of the product
- Intuitiveness – decoding the product
- Simplicity to pursuit the luxury feeling
- Force application
- Smoothness of mechanics
- Avoid any wrongdoings

User interactions



Mechanical steps



As the scheme shows, the user interaction steps include three direct product interactions of open water fill, close water fill and open for dispense. Behind every of the five steps is a mechanical challenge. Based on the current technical development in the process the interaction steps must trigger the described mechanisms. Different interaction movements are tested to define the most natural open/close procedures in a cylindrical product. The water and ice in- and outlet are both in the top of the product.

With the different interactions it is investigated how a direction in the product can be indicated.

Ill. 138 - Interaction models

Familiartity in movements

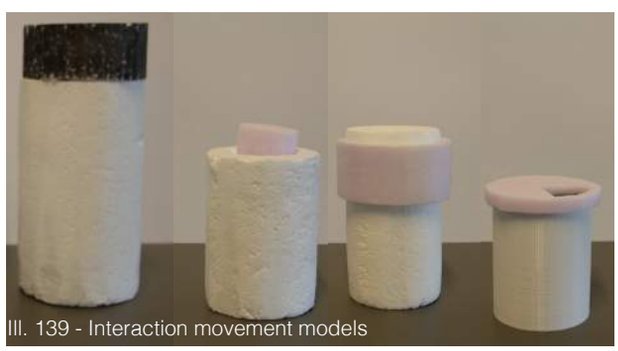
- The rotational movement is the most natural
- The screw cap generates the most trustworthy waterproof closure solution
- The screw cap model indicates a removable lid

Product response

- The participants constantly seeks feedback
- Important with visible openings after an interaction
- Disagreements in product direction (up and down)

A mix of movements

Eventhough the rotational movement is the easiest read interaction, the different other movements provide the opportunity to distinguish between the different interactions/mechanical steps of the product. Meanwhile it also challenges the user in decoding and analysing the semantics and interaction order to use the product. The participants are presented for four interaction models encouraging different interaction movements. They are asked to solve three simple tasks of opening the product for water fill and close it again. After a few seconds they are asked again to open the product to dispense ice.



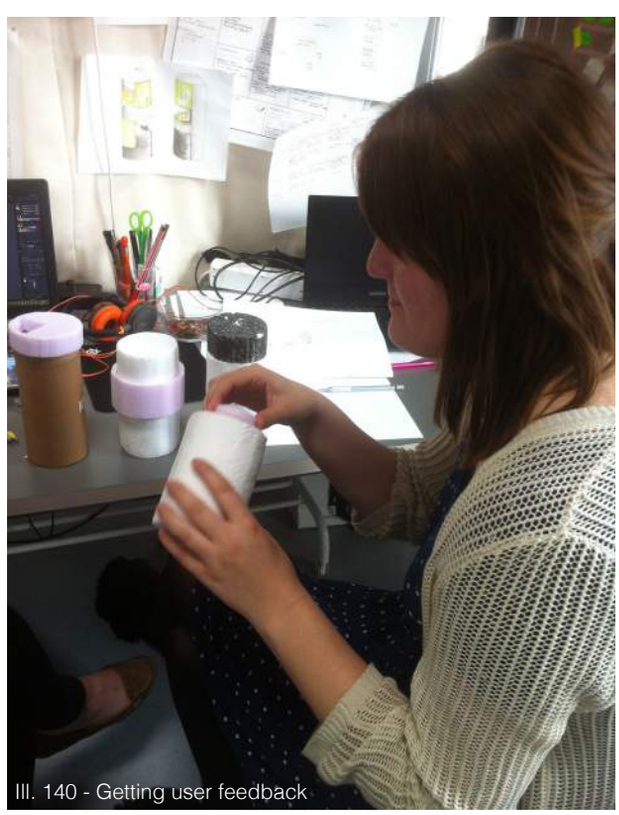
Ill. 139 - Interaction movement models

Different interaction possibilities

- The different movement posibilities create a confusing in the interaction order.
- Fill opening should become visible after the correct interaction
- Seeks mechanical insight of whether the ice cubes are loosened.

Sum up

From the different tests it is concluded that the rotational movement in the most natural relatively to the cylindrical product. The variety in movements should be minimized to one or two. An instant feedback shall occur after a correct interaction; a visual opening for fill, a visual opening for dispense and a feedback of the mechanical sound of releasing the ice cubes. This is to immediately support the decoding of the product and urge the correct order in interactions. It should be impossible to do it wrong. For instance, it should be impossible to fill the product with water before the chambers are closed.

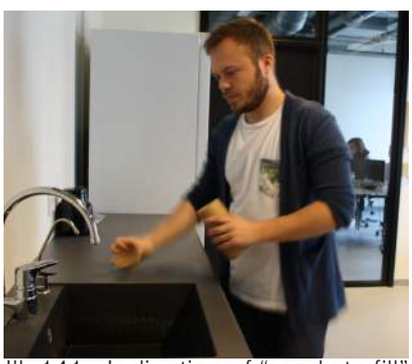


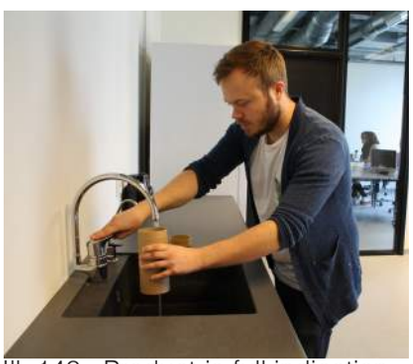
Ill. 140 - Getting user feedback

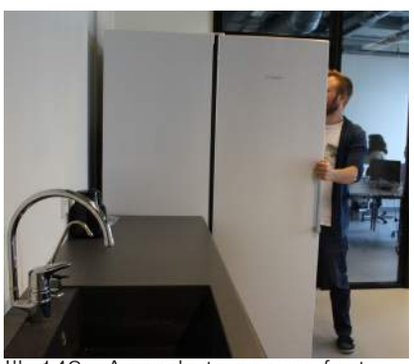
3.3 Act it out and body storming

Through the methods “Act it out” and “Bodystorming” different use scenarios are outlived in order to find the wanted interaction vision of the product. Through the values of the product, the product interactions are evaluated in different indoor and outdoor situations. This approach provides insights that otherwise might have been left out and overlooked on paper. The interaction simplicity and ease is important to achieve the luxury feeling in the product. The use of the product is divided into three stages presented below.

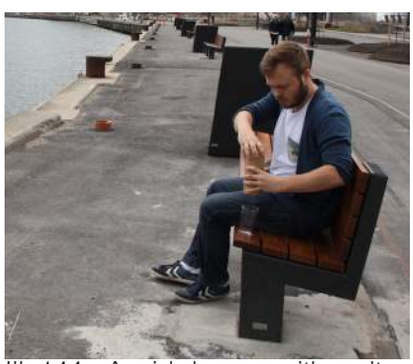
Scenario play highlights - preparation stage

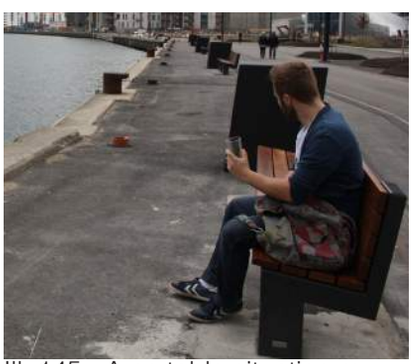

Ill. 141 - Indication of “ready to fill”

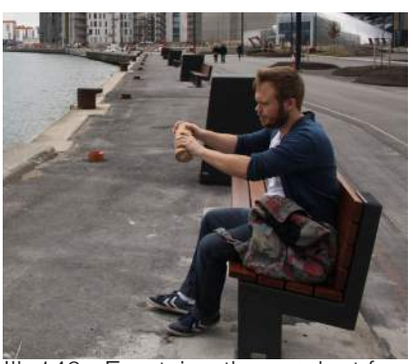

Ill. 142 - Product-is-full indication to avoid filling the entire product


Ill. 143 - A mode to secure fast freeze in spite of insulation

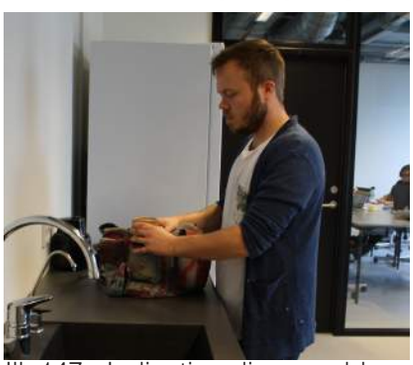
Scenario play highlights - outdoor-use stage

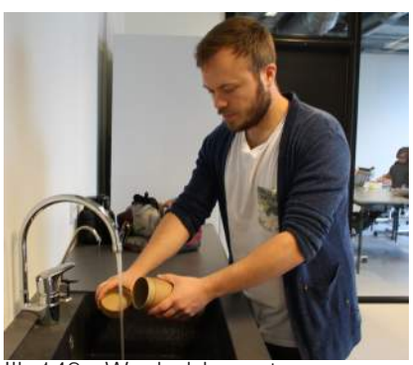

Ill. 144 - Avoid dosage with melt-water dilution

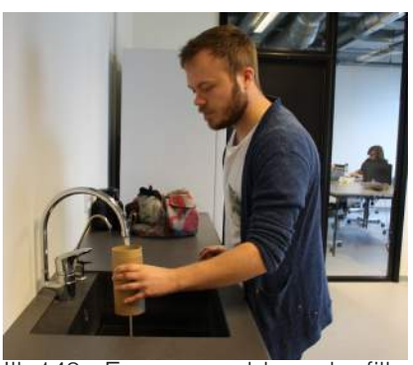

Ill. 145 - A no table situation requires a one hand dosage


Ill. 146 - Emptying the product for ice before going home

Scenario play highlights - wash and refill stage


Ill. 147 - Indicating disassembly


Ill. 148 - Washable parts


Ill. 149 - Easy assembly and refill

From the different experiments a set of demands are deduced to make sure the mechanical as well the aesthetically development meet the requirements of the product use and interaction. The requirements are formulated in the end of this section along with a formulated interaction vision. The demands reflect a product action course and usage that is needed to avoid the inconveniences of the existing ice products on the market. The project scope have repeatably been discussed and reframed in the process, yet the overall project vision shared with AndICE have remained the same. To re-introduce ice in everyday life by minimizing the inconveniences in the making and preparation process and optimizing the accessibility of ice.

Grip and rotate

An experiment is executed to secure the grip in situations of climbing and cycling where gloves might be used. The size and grasp ability of the interaction point are evaluated. See appendix 17 for full experiment.


Ill. 150 - Smooth surfaced lid


Ill. 151 - Simple line structures


Ill. 152 - Smooth surfaced top and with light textured surface

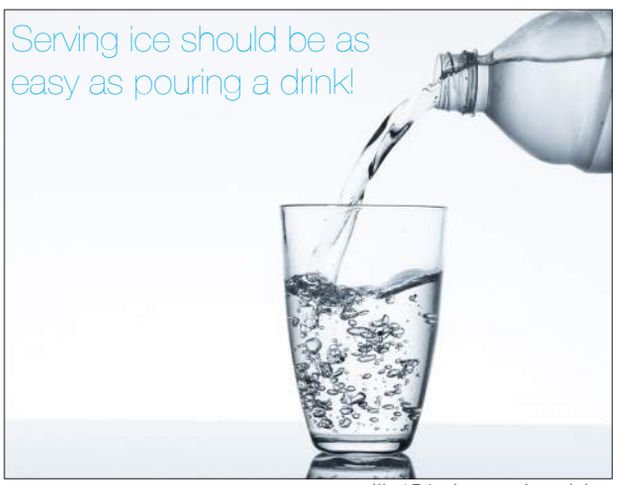
The glove experiment is to highlight the grip complications that might occur in the outdoor scenarios. Situations with gloves or greasy hands after sunscreen applied on the beach might impede the grip ability. The turning part of the product must have a tactile surface with a reference in the illustration 151 as a minimum case. This picture also functions as a reference of a lid minimum of size. The glove grip is significantly more difficult on the smaller lids. Through the experiment the hands are placed approximately on the same location regardless of the bottle shape. The indication of a specific product handling might clarify a direction and emphasize the interaction point in the top. This observation is relevant for the further aesthetically development.

In the appendix 18 a study is defining the product force application. A span is made with the minimum force to create the needed feedback of, for instance, “product correct closure” and the maximum force to make sure the product is serviceable by everybody. The span differs between long and short interactions for instance a long rotational movement and a short to loosen the ice. The span is from 0,2 N - 5 N in the long interaction and 2 - 9,5 N in the short.


Ill. 153 - Force span study

3.4 Interaction vision

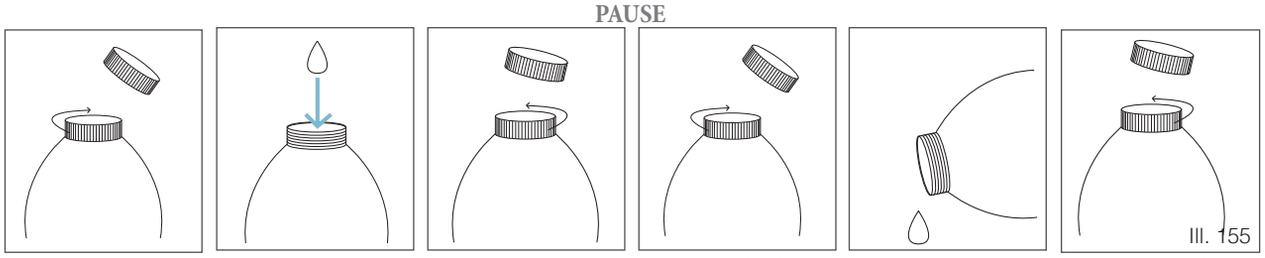
The work with the product interactions in different scenarios take the varying contexts into account. To aim is to find a formulation that in a brief sentence highlights how the role and identity of the product interacts with the life of the user. In many ways the product draw references to the classic water bottle. When you pour water in a water bottle you also expect water to come out. The challenge in this project is to communicate the transformation of water to ice without unnecessarily complicating the use to the user. The interaction vision is therefore to make the preparation and serving of ice as easy as pouring a drink from a bottle. In many use scenarios the water bottle and the product Glacier are cooperating and the lines between are therefore obvious to draw. A product to co-exist with and improve your beverages. The kit for luxurios outdoor adventures.



Ill. 154 - Interaction vision

Water bottle interaction

PAUSE


Ill. 155

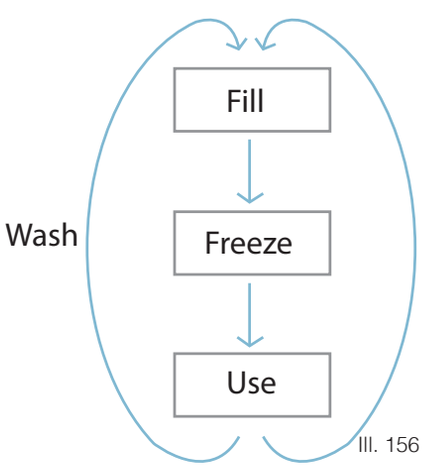
Open and lift lid | Fill with water | Lid on and close | Open and lift lid | Pour the drink | Lid on and close

The interaction vision is to have the before mentioned three product interactions in the five step course, as rotational movements. The dispensing of ice is done by a pouring movement like pouring water from a bottle. The interaction ritual and routine therefore becomes simliar to the one of a water bottle which is operational and intiutive to everybody.

The use cycle

This ritual makes is easy to refill the product with water after use and once again place it in the freezer until it is needed again. The storing of the product should always be in the freezer in order for the product to always be ready for the next outdoor adventure.

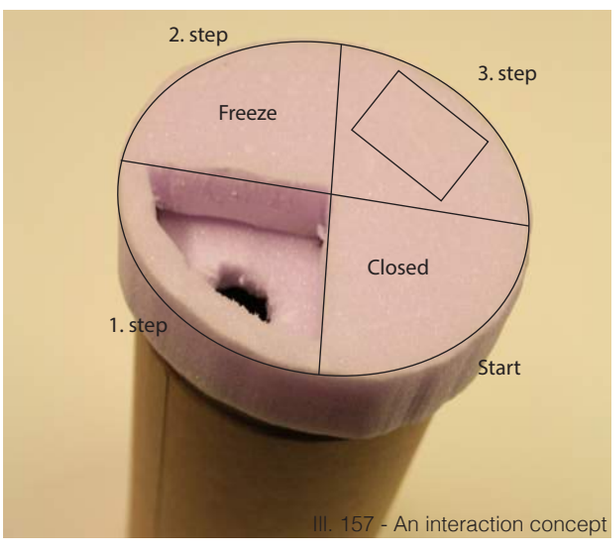
The use of ice occurs as a result of both planned and sponatious events and it is therefore important to encourage a specific behavior after use. A behavior to refill the product right away and store it in the freezer.



Ill. 156 - The use cycle

An interaction vision concept

If only applying a rotational movement in regard of the product interaction an interaction concept is created by only turning in one direction. The top of the product is divided into four equally sized squares and each interaction step is reached by turning 90 degrees. The interaction ritual therefore becomes a simple one direction turn.



Ill. 157 - An interaction concept

Reflection

The work with the interaction vision is based on scenarios and different use environments. This evokes a lot of requirements for the product that is divided upon the development of mechanics, aesthetics and semiotics. This urges a balancing of what product area should solve the challenges. For instance is it enough to indicate a specific use by aesthetics and semiotics or is it necessary to create a mechanical blockage of certain interactions to promote a correct use. It has been attempted to find a balance of mechanical feedback and the deliberate decision of keeping the user in the dark in order to spare them from unnecessary mechanical insight. The shifting work on an abstract and a concrete level is an attempt to give a full view of the product experience from the intended identity to consideration of the specific details in the different interaction steps. Nevertheless the model work have been quick and dirty to allow a fast user feedback. This approach entails many sources of error and the further development therefore requires further testing. It is for instance difficult to test the trustworthyness towards a waterproof closure in a foam model.

Deduced requirements

- Interaction by a rotational movement
- The lid stays on to have one hand dosage
- Feedback after correct interaction regarding fill opening, ice loosening and dispense opening
- One opening visual at the time
- Maximum of two different interaction movements
- Indication of grip in the middle of the cylindrical shape
- Clear turn direction
- Ribbed structured surface at grip point at interaction point in the top
- Freeze mode to secure fast freeze
- Indication of when product is full (in water fill situation)
- Excess water should be poured off
- Material should handle manual wash
- Interaction required force must be in the span of 0,5 N - 5 N for long interactions and 2 N - 9,5 N for short interactions

3.5 Technical refinement

In this section the development of the technical design is continued. In order for the product to reach a development level that enables the further design of the principles of dispense, insulation and closing the product to make it waterproof. The development in this section is concerning the inlet design, material selection and insulation calculations. From the conceptual work with the different principles the three initial functions of water inlet, freeze chambers and loosen are integrated in a concept. The concept at this level without any aesthetically means beside the one-end interaction is presented on illustration 158.

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Material selection

When moving to the technical detailing and refinement of the product it is necessary to consider different material properties to take production methods and tolerances in to account. Through the process different material requirements have been determined and will now become an active part in selecting the most suitable materials for the product. However, one specific area have not been investigated. Even though the Danish legislation does not dictate any restrictions of use of the plastic softner BPA there is a rising market attitude towards the use of specific materials in food products, including BPA. [Efsa.europa.eu, 2015]

The EFSA (European Food Safety Authority, EU) and FDA (Food and Drug Administration, USA) is responsible for all health regulations including approving materials for the food industri. The EFSA for example, created in 2004 a directive called EC 1935/2004 that restrict the use of certain additives in materials. This directive is always being updated according to new findings and researches. For manufactores it is a reference point for chosing materials as this directive works as a "positive list" for approved materials. [VINK, 2015] Some additives are safe to use but is still being removed from product due to public opinions. BPA (Bisphenol A) a softner additive used for decades has not been prohipited by the EFSA [EFSA, 2015]. Yet more and more products brand themself as a BPA free product. There is basically no baby bottles and sports bottles left with BPA, which is only because of the market attitude it and not caused by regulations. This is a trend there will be seen affecting more and more additives in course of the following years. [Science20, 2015] As it is hard to predict the next additive affected by consumer opinions, the restrictions for this product is set to comply with EFSA and FDA regulations and to avoid BPA.

For material selection the product can be divided into four areas that require different materials based on their different demands, see the fact-box. The first material area is the chambers that need to be flexible to loosen the ice cubes. The outer shell is the visible are and interaction point and is connected to the aesthetic concept of the product. The next area is the inner construction, it covers mechanical parts and the inner shell. The last material area is for the expandable lid. Each of these areas needs to be looked at individually to meet the demands that apply to each of them. See appendix 19 for the detailed process.

Material demands

Valid for all areas

- Must be resistant to temperatures between -25 to 70 as a minimum
- Limited water absorption in the material
- Must be resitant to 100 degree celcius water (during cleaning)

Chambers

- Comply with the EFSA and FDA
- BPA free
- Flexible to loosen ice
- Nonstick surface
- High tolerances needed for the lid closure design

Outer shell

- No condensation on the outside of product
- Must be resistant to UV exposure
- Outershell must be shock proof

Inner parts

- Comply with the EFSA and FDA
- BPA free
- Stiff and durable for mechanical moving parts
- High tolerances on the mechanical parts

Rubber lids

- Comply with the EFSA and FDA
- Be BPA free
- Extreme flexibility.
- Nonstick surface.

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Product insulation

An area that has not been visited before is the number of ice cubes needed in the product. To determine this a quick estimation is done on a fictional scenario. See appendix 20 for full scenario. The scenario is based on four factors, which can be scaled up or down for other scenarios if need be. The four factors are numbers of ice cubes in a drink, the lifespan of the ice cubes, the length of the scenario and finally the numbers of people in the scenario. Other factors that would matter under real circumstances, like outdoor temperature and exposure to the sun are not taken into consideration. The conclusion can be seen in the fact box of scenario results. It is concluded that 12 ice cubes are enough to supply two persons with ice cubes for three hours. For more people or longer stretches of time more ice cubes will be needed and it is therefore a wish to have as many ice cubes in the product as possible.

The demand of keeping the ice cubes frozen for at least 24 hours are proven plausible under the second concept development iteration. However, to determine how this insulation timespan can be reached in this product a calculation on the insulation properties is initiated.

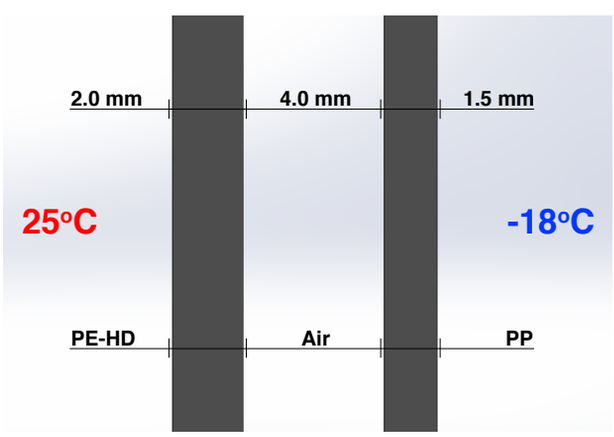
Scenario results

- 2 persons
- 3 hours
- 1 hour lifespan of ice cubes
- 3 portions of ice per person
- 2 ice cubes per portion
- 12 ice cubes needed

Insulation calculations

The insulation calculations consist of two parts. First an calculation on the needed energy to lower the ice cubes temperature from -18° to 0° C and secondly a calculation of the products thermal transfer effect, simplifyed by only focusing on its air wall.

The calculation takes starting point the ideal state of a floating inner capsule surrounded by an insulated layer with no openings. The calculation does therefore not verify the ability of the current insulation layer of the product, but indicates combined with the insulation test in the concept phase, that it is possible to reach the aim of 24 hours. The result of the calculations are far from any realistic results and contain many sources of error. Nevertheless, it does however show the importance of minimizing thermal bridges in the constuction of the product since an ideal state with no openings based on the amount of ice (12 cubes) can be kept frozen 16 days.



Ill. 162 - Insulation specifications

3.6 Packaging design

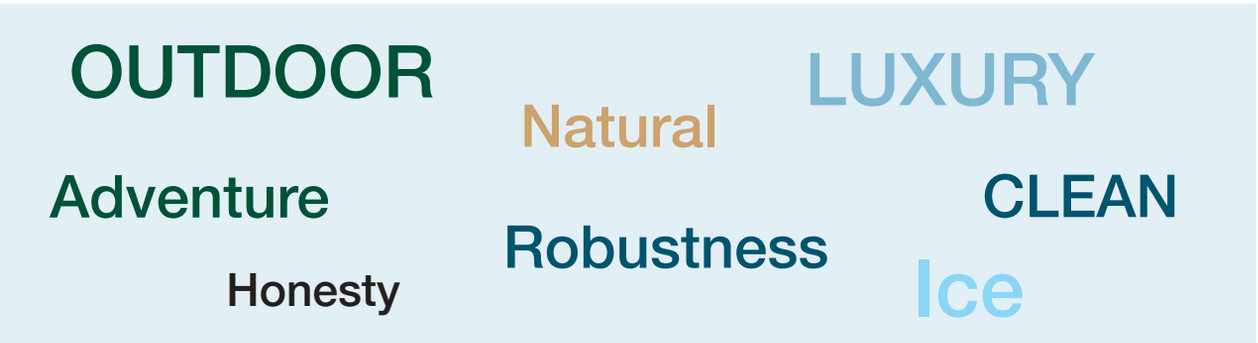
In connection to creating a lifestyle product, which market success in a high extend relies on the branding value and marketing, it is important to take the packaging design and eye catching value into account. Based on shop visits to Spejdersport and Friluftsland, an analysis of different packaging solutions of the liquid drinking section shows a very direct and straight to the point branding and packaging strategy. See appendix 21. The products are mostly sold with an open or semi-open packaging solution, letting the products aesthetics tell the story of the product. Showing that the products can endure being presented with no wrappings supporting the focus on the a functional outdoor product that is ready for use. Relatively to the aesthetically values of this project, which revolves around the words 'luxury, military tech and outdoor robustness", the packaging design finds inspiration in a few of the mentioned examples presented in the inspirational board. See illustration 163.

The inspirational board shows some of the "tools" these packaging designs use to sell their products. With inspiration from these tools a list of words comprising the values wanted presented for the product is made.

Packaging inspirational board

Ill. 163 - Packaging design from outdoor channels

Packaging design

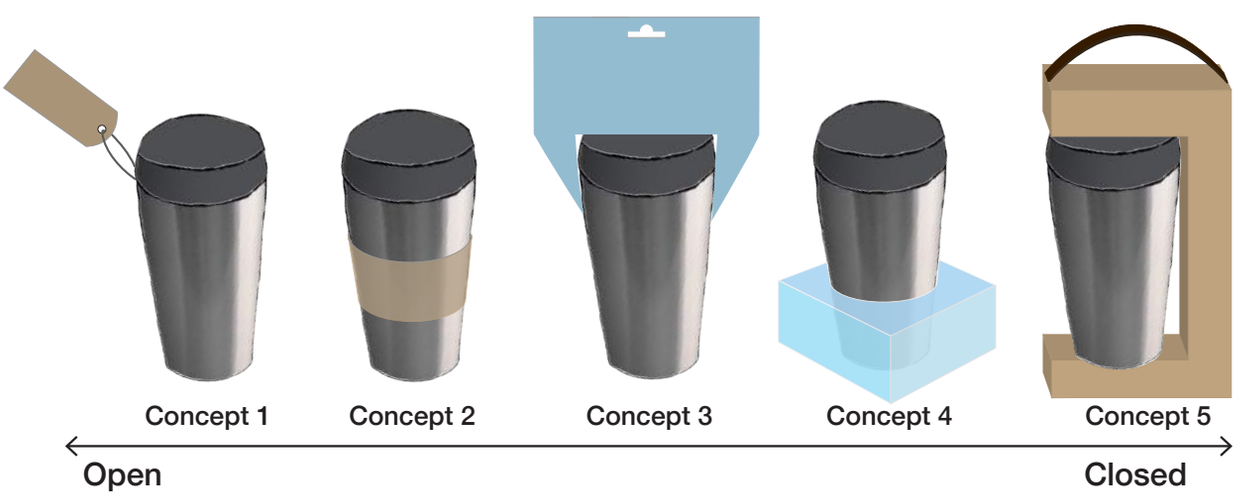


The ideation phase is intented to create a packaging design that captures the eye of the customer and that, together with the product, explain the the use and functions of the product. The packaging shall be partially closed or completely open for direct visual contact to the product, as the adventure should start already in the store - catch the eye and following encourage the customer to investigate the product. The packaging design shall communicate a strong belonging to the product family of the store and convey the story of ice as a luxury in the wild.

These demands combined with the wanted values fuel the ideation phase resulting in the five concepts seen below. The illustration presents the five packaging designs from open to closed with a generic product design.

Models of the five packaging designs show that the best concept proposal is concept 4. However this is in relation to a generic product concept and to further develop on the packaging design, the aesthetics of the product should be fully developed.

Working with packaging concepts



Ill. 164 - Packaging concepts

Status 3

Through the process it have been challenging to navigate the large set of design information and to keep a close parallel work with the different tracks. Due to this challenge the process have some times been running sequentially which significantly slows down the progress. The progress in the process have constantly been in need of material from the different project areas and the work has following aquired shifting mindsets and a constant juggling of all tracks to keep the process momentum.

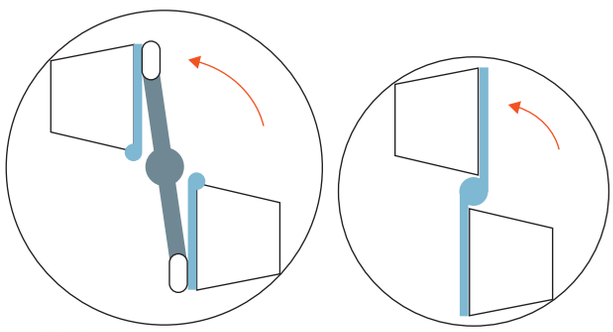
The status seminars are functioning as important punctuations of the process that require the process work to stop for a minute and communicate the findings and current direction. The helicopter-view obtained by pausing the work and receiving critique from the others, have helped redirecting and seeing the missings.

The wash step, in the wanted scenario steps of the initial interaction vision, has only been adressed briefly in the altered interaction vision. In a product containing a lot of mechanical parts it is important to include the disassembly and how the product is going to be washed after use.

The mechanical principles in the product are not very space optimized. At this moment the mechanics only exploit 1/2 of the space within the insulation cylinder. The following section therefore concentrated on respectively mechanical optimization and joining the vision of interactions with the mechanics. With this design of interaction, the turning mechanism can be designed and the final aesthetical work can commence.

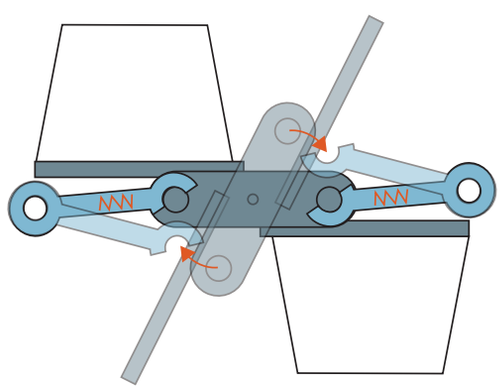
3.7 Product detailing

The current locking system suffers from taking up unnecessary space in the cross section. The space used for the locking mechanism is increasing the diameter of the product or reducing the size of the ice cubes. Neither of these are wanted. It is therefore sought to reduce the cross sectional area in relation to the size of the ice cubes. The current cross section (ill. 165) is reduced in size by moving the locking to another plane. Furthermore the lids are joined, rotating around a single axis. In order for this to work a new locking mechanism is needed.



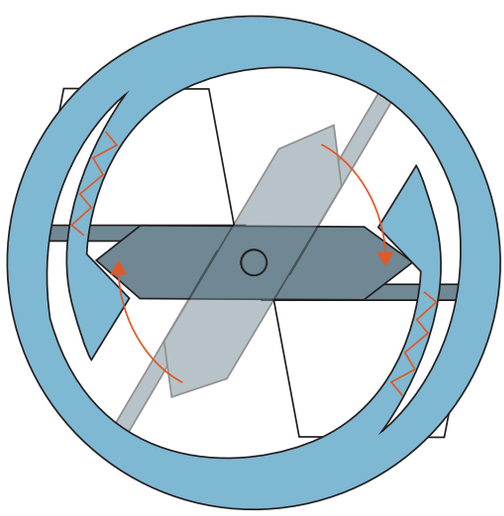
Ill. 165 - Space optimization

The first iteration (ill 166) is based on the original. When closing the lids, small knobs (orange arrows) are caught by hooks (light blue) and held shut by the tension of the arms (orange scribble). This principle is 3D-printed and tested. It is discovered that there is a huge demand for precision and the lock does not work consistantly. These are problems that need to be resolved.



Ill. 166 - Focusing on the lock

For the second iteration (ill 167) the amount of moving components is reduced thus giving the construction both strenght and reliability. The tension that holds lids shut are now is longer springy arms (orange scribble). This solution is very consistent in testing and is chosen as a working principle.



Ill. 167 - Chosen principle

Improvement of inlets

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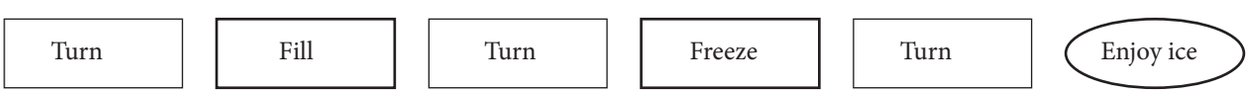
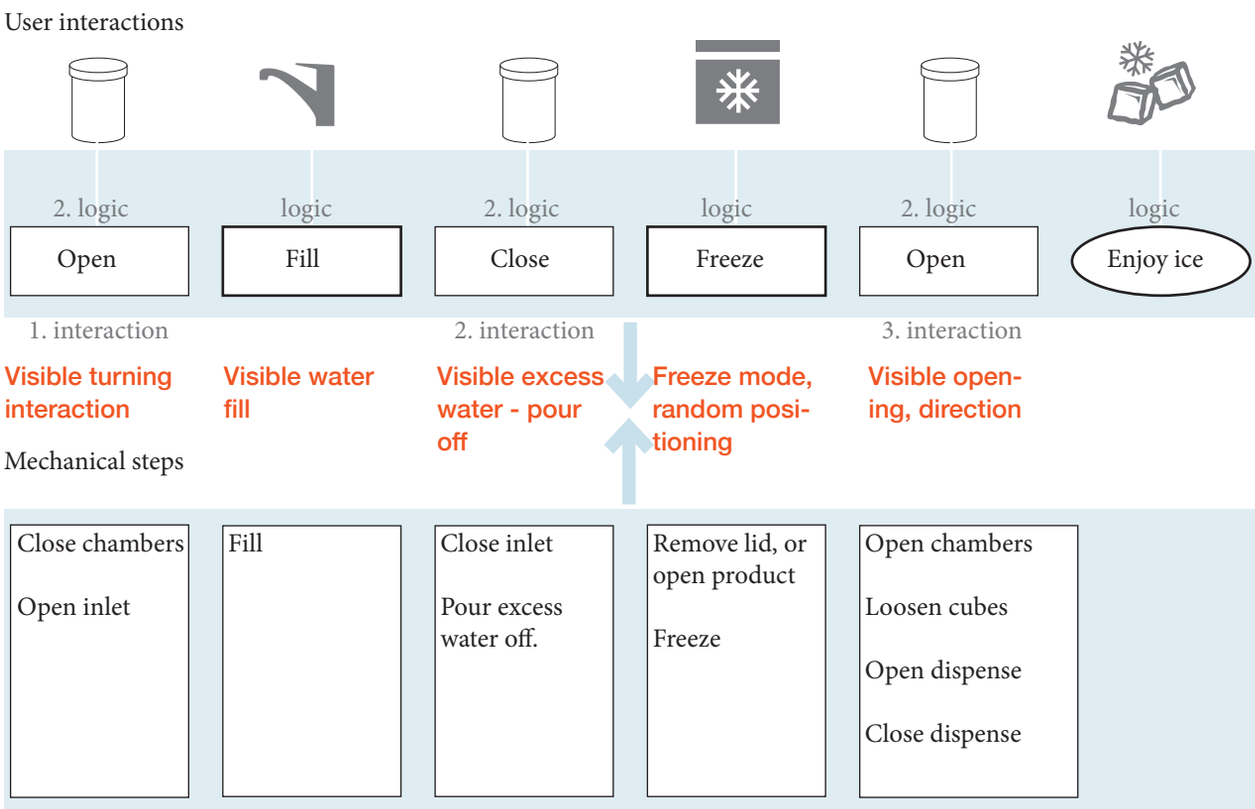
3.8 Mechanics meeting interaction

After many of the mechanical principles have been refined individually and in correlation with the collaborative principles they need to respond to the interaction vision and remaining demands of the project. The vision of only having five interaction steps in total and three direct product interactions is sought implemented in the mechanics. This requires a balancing of the sensitive mechanical principles and the ambition of avoiding a preparational step by only demanding interactions from the user relatively to the logically steps of water inlet, freezing and opening for the ice. Below it is possible to see the needed interactions from the user. In the scheme on page 77, it is possible to see the interaction steps and following what mechanical steps they must trigger. Inbetween is the deduced communicational demands, from previously in the aesthetically iterations, regarding the aethetics going to indicate these user steps.

Needed interactions

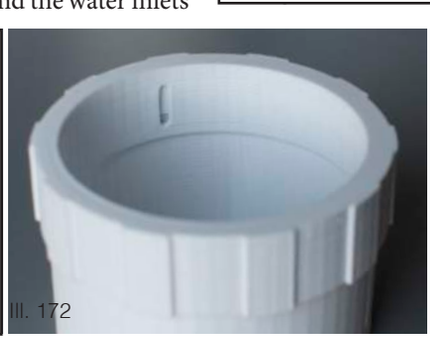


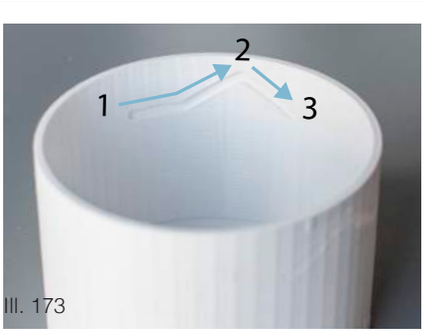


Due to the refined vision of interaction a set of new mechanical demands need to be fulfilled.

Firstly the opening of the water inlets need to be integrated into the same movement which closes the trays, preventing the user from pouring water into open trays. This means that the revolving motion also needs to open the inlets with a translational motion. This is done by mounting the inlet lids on a base that rotates with the trays (ill. 171). The base is mounted on a ring that has knobs running in tracks (gray). The mechanism is rotated by an exterial ring (ill. 172).

The mechanism results in 3 settings of the product (ill. 173). At setting 1 the ice trays are open and the water inlets are closed (ill 170 , left), this is for ejecting the ice cubes. Turning to setting 2 closes and locks the trays, releases the grip from them while raising the ring (ill. 171, gray) to open the water inlets (ill. 170, right), this is for filling the chambers with water. Setting 3 closes the water inlets, here everything is sealed and the product can be randomly placed in the freezer.


ill. 172

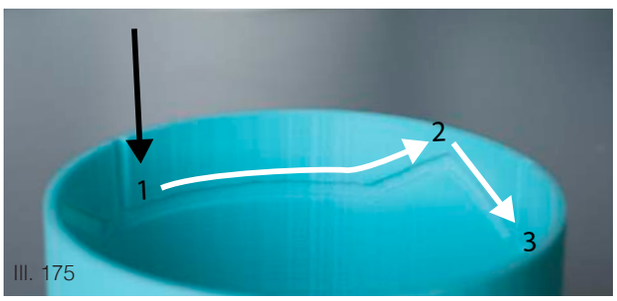


ill. 173

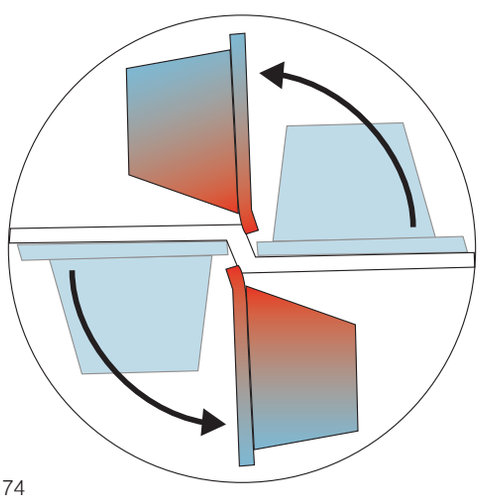
Loosening cubes by shearing

In order to assemble the mechanism the track is cut through to the top of outer shell (ill. 175) and the slid in the top ring as well (ill 176).

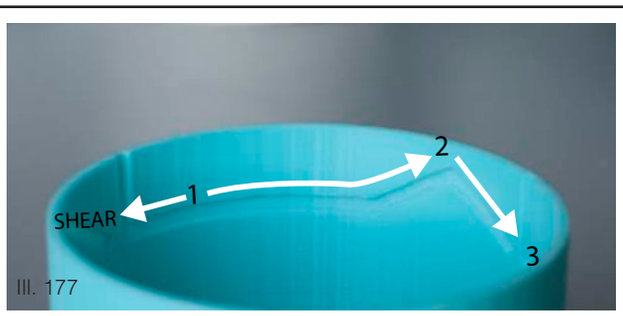
To eject the ice cubes the trays has to be sheared. The shearing of the trays is done by rotating them further than setting 1 (ill. 177) until the tips of the trays hit the center part of the lid construction (ill. 174).



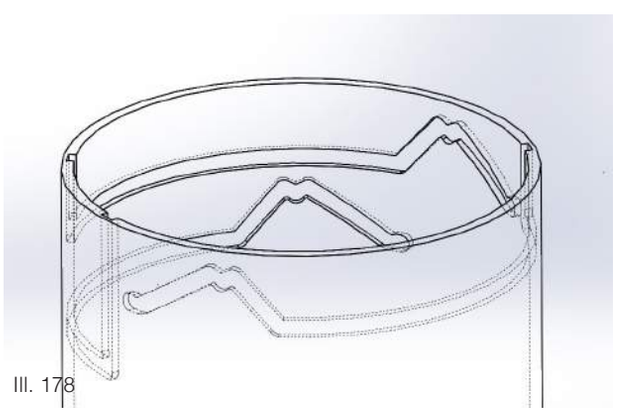
Ill. 175


Ill. 174

In order to shear the trays in the same point of interaction the tracks need to be longer (ill 177). This is achieved by moving one of the three tracks down one layer (ill. 178), making it possible to turn the ring 150° up from 115°.

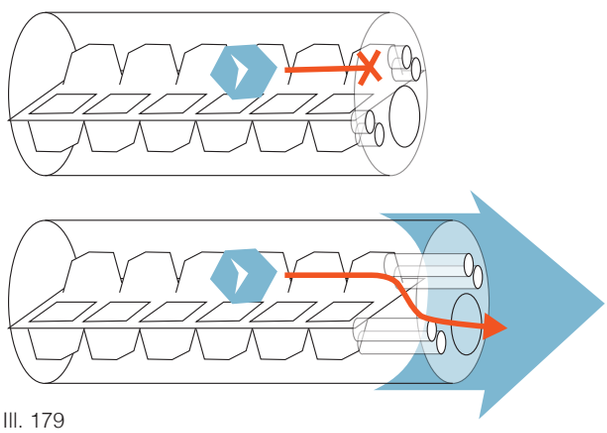


Ill. 177


Ill. 178

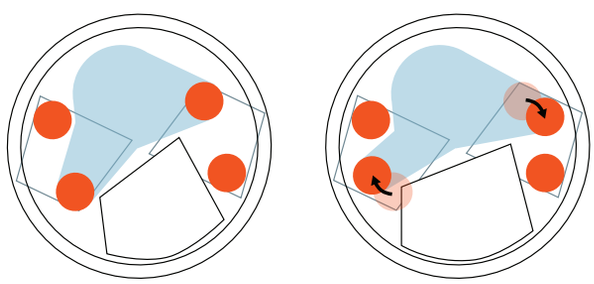
The revisited requirements state that the product should only have an opening in one end to optimize the insulation, by making less draft through the product. Also, the user should be unaffected by the products internal layout, resulting in making the ice cubes from each row come out of one opening.

In order to have the ice cubes come through one opening in the top, the rows must be merged. This is done by moving the opening and extending the inlets (ill. 179) until there is room for an ice cube between the top and the trays, no matter its orientation. This has the consequence of delaying the feedback from filling the trays with water. However, due to the narrow water channels the effect is very small.

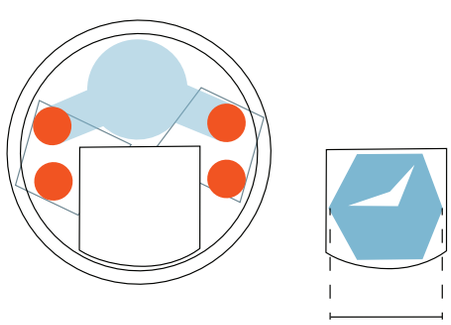


Ill. 179

The next challenge is to make room for an opening that fits an ice cube in the top, while still leaving space for the tub that makes it possible to fill both trays at once. The inlets are moved (ill. 180). Optimally, the water inlet should be placed in the lowest corner of the tray and the air outlet in the highest corner. This change can result in leaving small air bubbles blocked in the trays, but this is overruled importance of making sure the ice cubes can come out. A more drastic change that has to be made to make room, is to switch the in- and outlet in one of the trays (ill. 181). This change can result in air blocking the inlet slightly before the chambers are filled (ill. 182). However, the water in the channel will sink in and fill up the chamber leaving only little to no air. By the switch the expression of the top becomes more symmetric and less cluttered.



Ill. 180

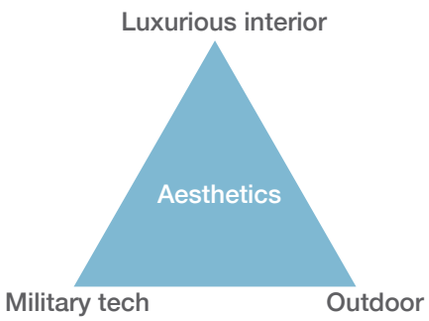


Ill. 181

A design demand from the scenario work in the beginning of the process states that the water fill hole has to be larger than the faucet head. This demand is to secure a hit and avoid pouring water outside the product. The inlet system cannot fill the chambers as fast as a large water flow, nevertheless it should not be a problem to aim. Since the inlet canals are rather small a tub is formed in the top piece to direct the water by the funnel principle and control the inlet.

3.9 Aesthetical development

In this section the development of the aesthetically expression continues regarding to the form concept of the bottle and designing the important interaction piece in the top. This piece should contain several information regarding the use and how to interaction with the product. Furthermore the design should provide the outdoor robustness connection to the selected channels and the respective product family. The section takes starting point in the refinement of the aesthetically expression of the container.



Designing the product bottle

An ideation round is started to seek an refinement of the form concept. With basis in the findings from earlier aesthetic iterations and other requirements the process is initiated. The sketches below are all within the overall expression of the aesthetical concept with a smooth transition from bottle to interaction piece and with different proposals of the facet design balancing between a random structural expression to the strict geometrical.

Ill. 183 - Refining concept

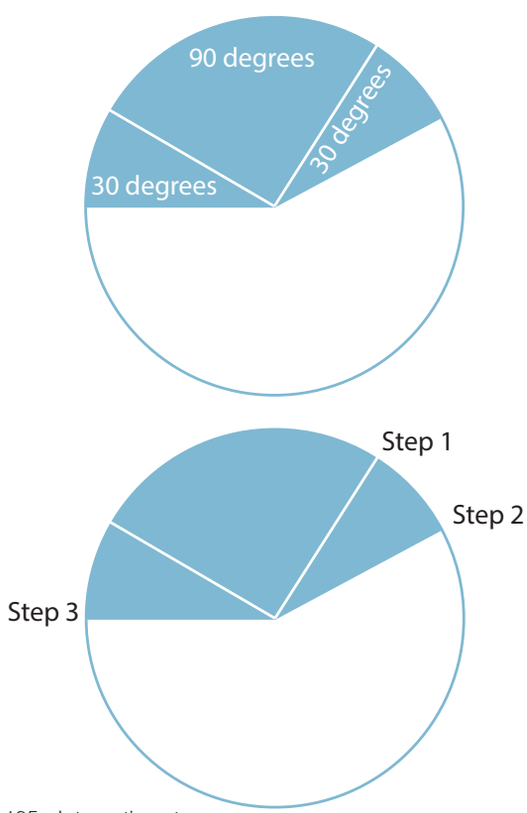
Rapid prototyping

The framed proposal is selected for further refinement due to the elegant expression and the contradicting slopes. Still it needs a stronger belonging to the outdoor robustness. The refinement is continued in rapid prototypes since this process can add valuable insights regarding the real expression in the actual size and whether the product is gripable.

Ill. 184 Process of further refinememt

Product top and interaction point

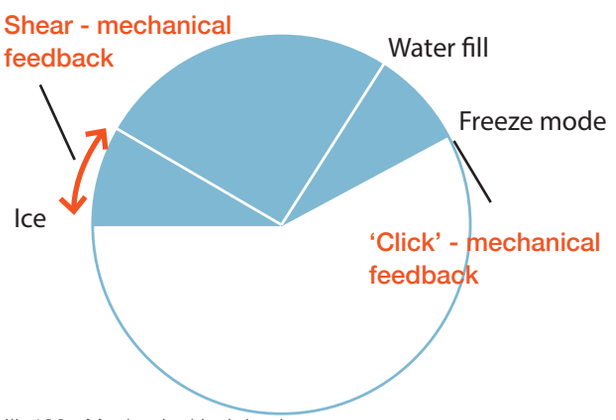
The top design should reflect a strong connection to the bottle design to indicate that the turning mechanism is not removable. The top connection to the bottle is inspired by the classical pepper grinder shape. As mentioned in the 'interaction meeting mechanics' section the mechanical principles now succeeds in complying with the three-step product interaction. The three steps are open to fill water, close to freeze, and open for chambers to release ice. The steps are therefore in tune with the wish of reaching the logically interaction steps and the minimal effort of making ice. Fill water, freeze and getting the ice out. In order to communicate this to the user, the three steps are name in this regard. Water fill, freeze mode and ice! The aesthetics must indicate the range of the rotational movement of 150 degrees. If the movement is forced beyond this range the mechanics is in risk of breaking. (Ill. 185)



Ill. 185 - Interaction steps

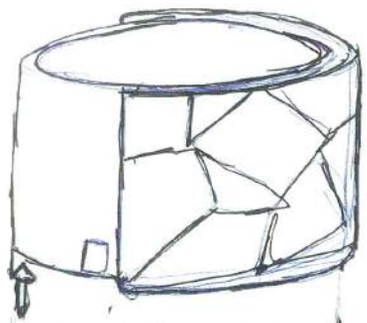
Design process

An idea of making a tangible differentiation in the design emphasizes the limited movement of 150 degrees. When moving from the second step to the third, the final 30 degress offers the mechanical feedback of ice loosening and the required force application rises. In the section step the feedback of a satisfying 'click' appears when setting the product for freeze mode ensuring the user that the product is locked. (Ill. 186)

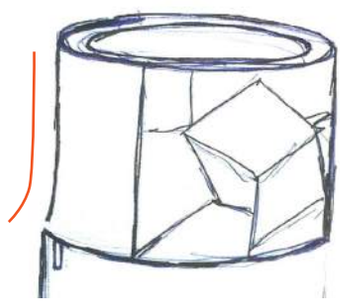


Ill. 186 - Mechanical insights in steps

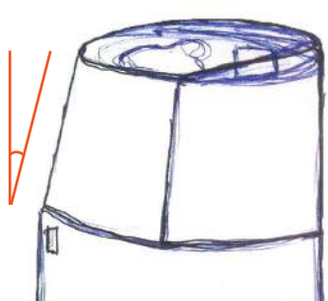
From the glove experiment in the section of the interaction vision a grip demand occurs. Regarding to the interaction point the grip point must be in a ribbed structured surface. By only applying a grip structure to one side of the rotational piece, it enhances the clean turning area and indication of grasp.



Ill 187 - An physical difference in the materials thickness to make a clean interaction area.



Ill. 188 - By smoothning the transition to the bottle a small slope is needed to keep the clean turn area of 150 degrees.

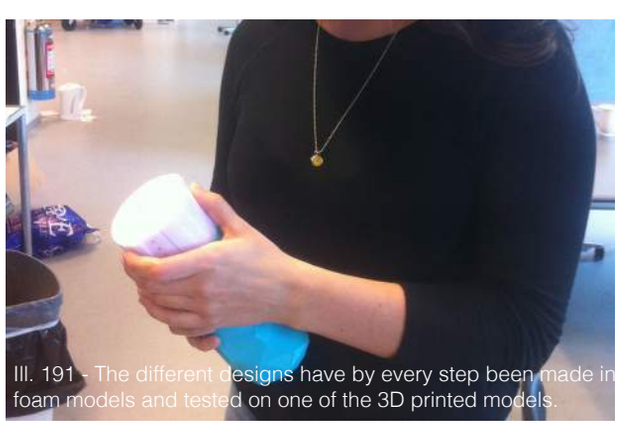


Ill. 189 - By adding an angle to this area it adds a tilting feeling to one side and indicates a pouring direction with a slightly raised top.

Use of semiotics

The three different steps in the 150 use range has to be communicated in order for the user to know what to do when. A small semiotics research is commenced and can be seen in appendix 22. The three best found indicators of respectively water fill, freeze mode and ice is presented below. The icons are simple and testings reveal that the semiotics and required interaction steps are correctly decoded.

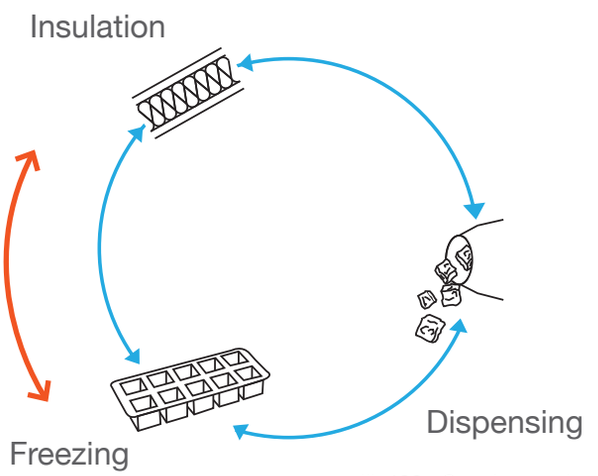
Water fill Freeze mode Ice Ill. 190



Ill. 191 - The different designs have by every step been made in foam models and tested on one of the 3D printed models.

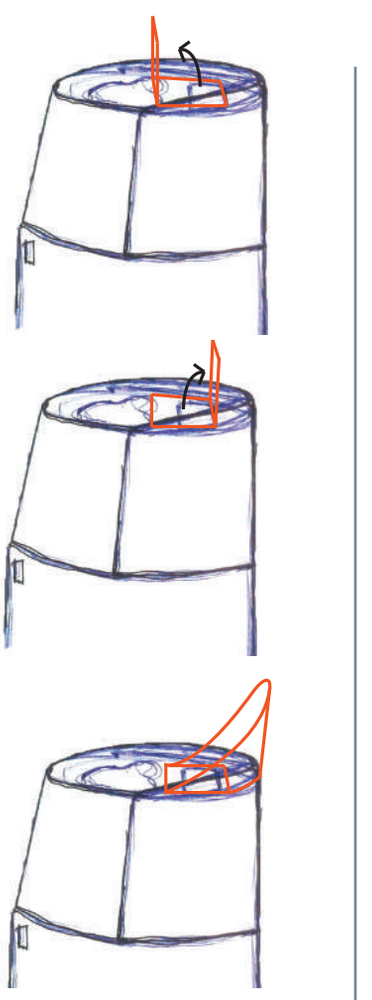
Creating a design trademark

It has been the intention to develop an individual functioning dispensing principle to integrate in the remaining mechanics. Even though this have been an attempt through several work iterations this have not succeeded. The project has therefore reached a compromise of an opening in the top opened and closed by a simple lid. This is contradictory of the three step interaction and requires an extra interaction. Nevertheless the additional lid can be exploited for the freezing mode of the product. In order to avoid the insulation quality affecting the freezing time the product needs to be opened. It have been considered whether the insulated bottle should be removed from the lid holding the mechanics, but even if this could mechanically succeed it will seem unhygienic to place the open mechanics in the freezer. The lid can therefore be used as an opening to enter a freeze mode and secure a regular freezing time without an unhygienic feeling.



Ill. 192 - Creative tension

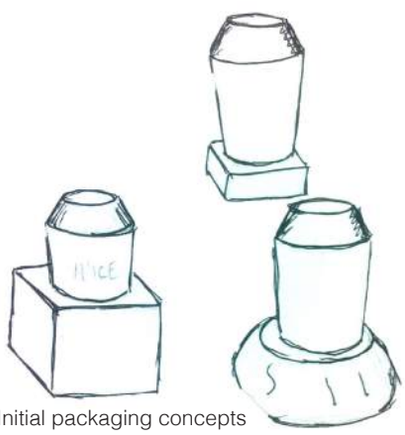
The initially forming of the lid is a simple construction with the basic function of letting the ice out of the ice container. (Ill. 193, top) Through a fast ideation round the lid turned 180 degrees with the idea of using the flap as a slide for the ice. (Ill. 193, middle) The concept is refined to be an extension of the raised top to enhance the Glacier feeling and the rocky environment around a glacier be a significant expression as a part of the use. (Ill. 193, bottom)



Ill. 193 - Designing the lid

3.10 Packaging design

From the last iteration and work with the packaging design, the process reached an open packaging design with the possibility of potentials customers investigating the product in the store. See illustration 194. The purpose with the ice cube shaped packaging was to catch the eye of the customer and to fast distinguish it from products slightly resembling. In a new iteration the design have changed. A carbin hook or string holds a small folder with information of the product family and purchase offerings of colours and accessories. A simple white sleeve with product information is placed around the middle of the product. This is to highlight the design of the product and invite customers to interact and get a feeling of the product interaction and smoothness of mechanics.



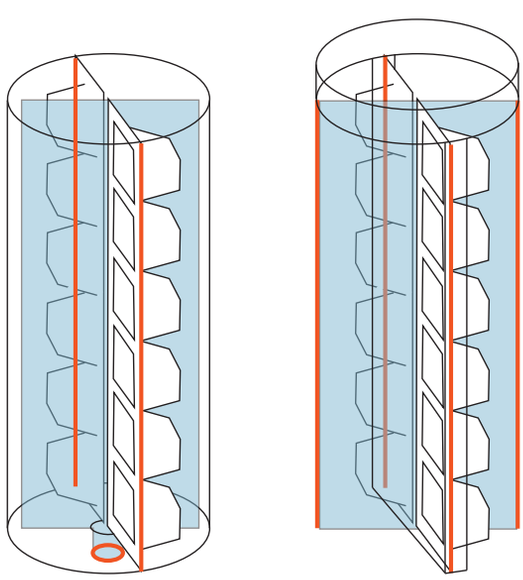
Ill. 194 - Initial packaging concepts

Ill. 195 - Final packaging proposal

3.11 Refinement

This chapter seeks to take the concept to a product level, by refining the way the it is assembled. One part of it is to make it easy to assemble on a production line, another to make it more convenient to disassemble and reassemble for the consumer, when cleaning the product. Lastly the product is refined in regards to production, simplifying the manufacturing tools and thus reducing the production cost.

In the concept so far, the trays have been mounted inside a cylinder (ill. 196) and the lids mounted in the bottom of the outside cylinder, setting big strength demands and a potential uneven distribution of pressure to keep the trays sealed. It is therefore sought to solve this. By simply removing most of the cylinder and thus removing excess material, the lids can be mounted on the inside of the outer shell instead.

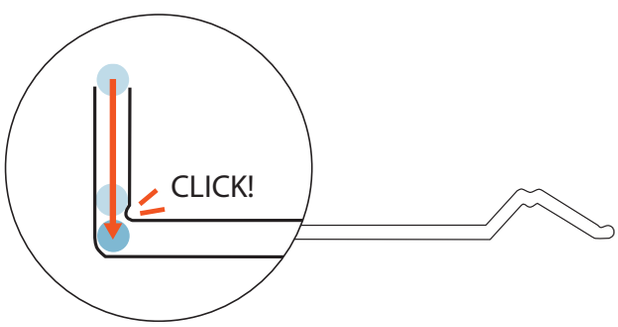


Ill. 196

Product assembly

There are two main demands for the assembly. One; is to make it possible for the user to disassemble the product into seperate parts in order to clean it thoroughly. This is narrowed down into disassembling it into four parts (ill. 198) and furthermore to seperate the trays from the lids. The second demand is that the individual groups of parts should be permanently joined from the production line, and not intended for the user to disassemble.

Everything needs to be held together by the top lid and inlets part. This is achieved by making a small knob on a track that the part runs in, which provides a small amount of resistance. This, combined with the fact that the trays are sheared on the last part of the track, makes sure it does not come of unintentionally.



Ill. 197 Holding everything together

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The top part of the product is in four parts (ill. 199). The top lids axis, of which it revolves, is held by the inlets part and the bottom insulation plate, as shown left on the illustration. These two parts are glued together to make a tight seal for the insulating air in-between. The ring with knobs has to turn independently of the other parts. This is achieved by attaching the edge of it to small hatches on the bottom plate, as show to the right on the illustration.

The trays have to be allowed to be sheared and can therefore only be attached on the outer and the bottom edge. To hold them firmly, they are slided into a track shaped like a hook (ill. 200). These two parts can rotate freely inside the inner shell and are held in place by the top part (above).

Confidential information

Confidential information

The inner and outer shell need to be assembled, so that the inner shell is hovering from the bottom of the outer shell, creating no thermal bridges. This is achieved by a one-way locking system (ill. 201, bottom right), the inner shell being the blue part and the outer shell the red.

The ring lock is held in place inside the inner shell (ill. 201, middle left) by the same tracks which hold the lids (top right). Both these parts can be removed for the purpose of cleaning. The sealing membranes are glued to the lids part.

Conclusion

The assembly on the production line is simplified by limiting the number of components that need to be glued. Relying on tracks, clicking components together and other mechanical assemblies saves both time and resources. The other benefit of having components mechanically attached is to make it possible for the user to disassemble and thoroughly clean the parts. The assembly allows the user to disassemble the product by a simple twist and pull in the top part.

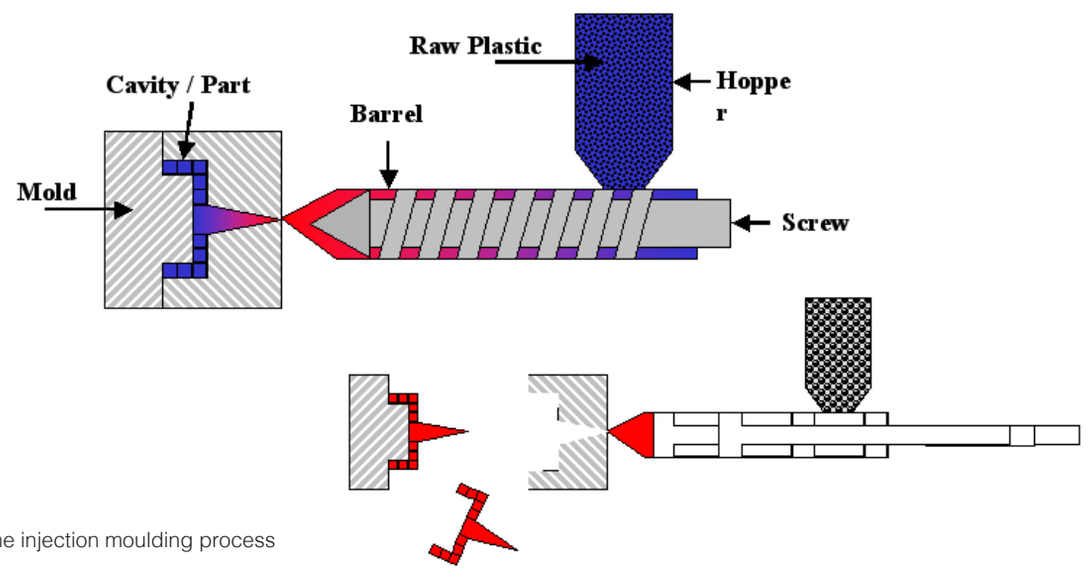
3.12 Manufacturing considerations

Production methods

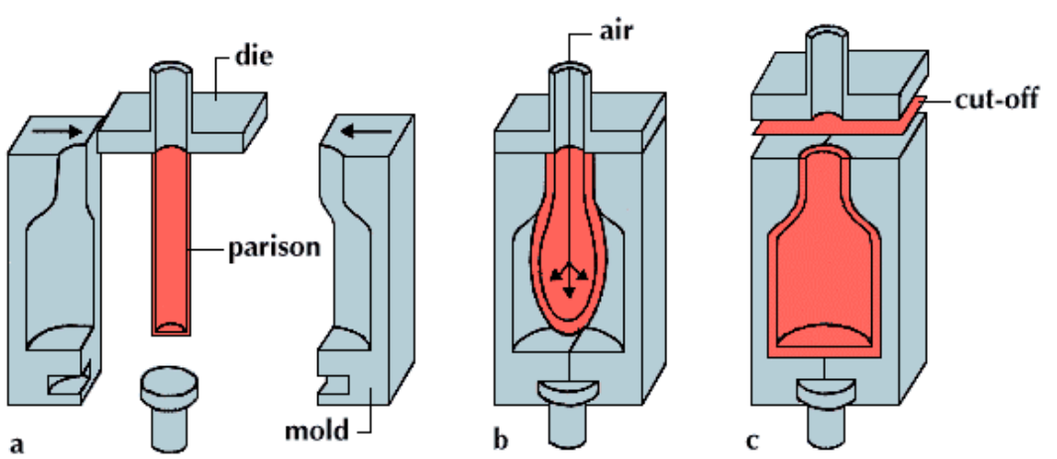
With materials selected in a previous phase, the only thing left in order to estimate the manufacturing costs for the product are the production methods used. The product consists of 12 different components that all need to be manufactured individually. This section is based on a production selection [Appendix 23] which dives into the different production methods and reflects upon the manufacturing processes suited for the different components.

Most of the components are going to be injection molded (ill. 202) simply because it is the only production method that can handle the form and structure. The inner shell require a different approach. Its cutouts make it impossible to injection mold the component without huge costs for tooling. It is therefore decided to divide the component into two halfs, which is possiple to injection mold. It then require a plasticwelding to combine the two halfs again.

The outer shell of the product is prismatic because of the mesh of unregular squares and triangles that adorn the bottom part of the shell. The irregular form creates problems with injection molding. It will be possible to injection mould the outer shell if it is divided into three shells, however this gives unwanted cutting lines in the surface of the component.



Ill. 202 - The injection moulding process



Ill. 203 - The blow moulding process

Because the shell only have one opening like a plastic bottle, blow moulding is a good alternative for producing the component while avoiding flaws in the aesthetics. (Ill. 203) The chosen material PE-HD is possiple to manufacture with blow moulding, but it is impossible to reach the same finish in details as with injection moulding. Blow moulding leaves tool lines as well, yet the visibility of these can be limited to the bottom of the product. Another important rule when dealing with blow moulding is the requirement of a hollowing of the bottom (Ill. 204) as a flat bottom would result in a dome, making the product unstable when placed. These manufacturing considerations are based on a talk with the mechanical engineer, Peter Martin Harslov at SKOV A/S and Søren Andersen from PLM Group. See appendix 23.

Ill. 204 - The bottom of a blow moulded part

Component cost

With both materials and production methods selected, the manufacturing cost can be estimated. See appendix 24. It is called a manufacturing estimation because some of the numbers, like tooling costs and production times are estimations and can vary. These estimations are slightly exaggerated to account for the sources of error that can occur and manufacturing costs like welding is not known at this point. The product is estimated to be produced in Denmark, which create some of the highest operation costs, but minimize transportation costs. The production number is set to 50,000 products, which is estimated as a minimum units number to justify mass production and tooling prices. A simplified bill of material is listing each components manufacturing cost showing the result and the estimated manufacturing cost of the product.

Manufacturing costs

1 - Outer shell	6.04	DKK
2 - Inner shell	2.75	DKK
3 - Turner	2.85	DKK
4 - Tray	2.75	DKK
5 - Tray frame	2.32	DKK
6 - Tray lids	1.79	DKK
7 - Rubber lids	0.72	DKK
8 - Turning ring	1.09	DKK
9 - Ring lock	0.96	DKK
10 - Top	2.26	DKK
11 - Top plate	0.96	DKK
12 - Lid	1.85	DKK
The assemply cost per product is set to:	11	DKK
Manufacturing cost per product:	**37.33**	**DKK**

Confidential information

Cash flow

The manufacturing cost of Glacier is now calculated, but to estimate the cash flow of a potential business other factors will influence the numbers. Transportation costs, payment for warehouse and marketing are all part of the key numbers needed to generate a thorough cash flow analysis. Nevertheless besides the production cost and tooling investments the analysis only include the warehouse expenses.
To actually make the estimation it is necessary to divide the expenses into investments and operational costs. Two cash flows are estimated based on two scenarios, see below, both running over a 5 year course. Scenario 1 is based on the 50,000 sold products, also presented in the manufacturing cost calculations and scenario 2 based on 20,000 sold products. It is estimated to be realistic to sell 50,000 products in 5 years due to the wish of expanding the markets and introducing the product outside of Denmark within this timespan.

Scenario 1:

Sales within 5 yrs.	- 50,000 products	Retail price	- 350 DKK
Investments	- 1,100,000 DKK	Store mark up	- 250%
Operational cost	- 1,090,000 DKK	Operational cost per prod.	- 21,8 DKK
Operational profit	- 4,510,000 DKK	Operational profit per prod.	- 90,2 DKK
Break even after	- 3,75 years		

Appendix 23

Scenario 2:

Sales within 5 yrs.	- 20,000 products	Retail price	- 350 DKK
Investments	- 1,100,000 DKK	Store mark up	- 250%
Operational cost	- 487,000 DKK	Operational cost per prod.	- 24,4 DKK
Operational profit	- 1,753,000 DKK	Operational profit per prod.	- 87,7 DKK
Break even after	- 4,6 years		

Appendix 23

Scanario 2 represent a worst case scenario, presenting what the outcome will be if sales are not as expected. The break even point estimated from the two scenarios, show a clear difference between them and emphasize the need for high sales numbers within the first years. The cash flow estimations are, as mentioned, based on production in Denmark, which means that a lower production price could be found elsewhere resulting in an earlier break even point. The break even point after 3,75 years does however verify Glacier as a feasibe business case.

GLACIER

III. 206 - Final product proposal

Illustration 206 represent the final product proposal of the project. In the sandy colour the product relates to the outdoor product family and outdoor lifestyle. The clear blue colour in the top provides a feeling of a 'clean' area and makes it easy to see if the product is dirty. Two different colour proposals are chosen for the design. Another in a dark blue. The colour decision-process can be seen in appendix 25. Through several attempts the expression have been balancing between the words of luxury interior, military tech and outdoor robustness.

Conclusion

The development of a lifestyle product within the overall vision of re-introducing ice in everday life have resulted in the product Glacier. The process have been guided by the formulated vision of serving ice should be as easy as pouring a drink and the value mission of ice as a simple luxury possible to enjoy anywhere in the world. In the process these have been important tools and even though the process several times have redirected and altered these project guidances it has been experienced how necessary a clear framing is in the development of a lifestyle product. Initially the project started with inspiration in the generic product development model, but it was quickly established that the sequential steps and phases replacing each other was not the right approach for this project. The rich universe and framing was difficult to create, yet needed to back up the otherwise shallow and minor problems. The process have been performed in different tracks regarding mechanical development, aesthetics, business, market and identity. These have continuously been overlapping and running in parallels in order to keep the process going. It has been a challenge to navigate in the multiple information deduced from various studies, experiments and scenarios. At times the process overview have been lost and resulted in an unstructured process until the picture was recreated. The status seminars and inputs from other students, AndICE and supervisors have been very valuable to the process.

The product have resulted in a cylindrically shape with a special facet design indicating a freeze and transformation of water. The design contain a lot of possibilities of scaling for different channels and markets by changing colours and adding small accessories making it even sturdier. Through a simple three step interaction to fill, freeze and loosen the ice the project have succeded in designing an interaction ritual similar to a water bottle interaction. The needed interaction meets the demands of cutting off the preparation step in the existing process and succeeds in meeting the minimal effort definition and logical step of the user.

The project have succeeded in working in regard of the overall vision shared with AndICE, yet have managed to proposed a very different product. Even though the product meets the found gap in the market there is no proof of success. The work with extreme users and a lifestyle product indicates that there are no real problem to solve or need to satisfy. Following, there are no real owners of the product. It is therefore difficult to predict how the product is going to be received on the market and whether the product will capture interest by the mass market. Nevertheless it is the believe that with the unique value proposition and breaking of the current use understanding of ice that the product is a good business case. The approximately 24 hours insulation time and dispensing function offers new ways of experiencing the use of ice.

In the process there have been a creative tension relatively to the initial three main functions of the product. Freezing, insulation and dispense. The conceptual work and mechanical development have failed in making a dispense principle separating the ice cubes. Yet the design of the current solution is integrated in the product have been an answer to other problems regarding freeze-mode and offering a trademark design for the product.

Reflection

At the current development stage of the product there is still a lot af mechanical principles that need to be further tested in order to proof their worth and quality. In the initial conceptual stage the proposals were very diffuse and without any attention paid to the specific challenges in the needed mechanical steps and specific ice challenges. After breaking the process down and having a more systematically approach the actual insights provided foundation for a more focussed development. In this stage the rapid prototyping method have, inspite of the many difficulties regarding ice and rough models, given ground for more justified evaluations and feedback of functional success of the tested principles. Even though the rapid prototyping implies a quick method of testing designs, it has required a special mindset and development. The preparation of prints has required working differently and differing from the actual production considerations. Nevertheless the constant printing of principles have provided important learnings of functional success and given insight in the needed tolerances in the critical areas.

After the insulation calculations and experiments it is experienced that the current design and dimensioning of the bottle of the product can be minimized by 4 mm in the bottle diameter. The diameter now is rather large and seems a little to big to have a nice eased grip. The height of the product have reached 24 centimeters and might result in water filling difficulties under low placed faucets.

A very important area that have been neglected in the process is the wash and use cycle. The project have not actively been working on this area even though it states that it is an imporant part of the product identity of always being ready to go and offering the quick escape from the daily life. Furthermore the number of components in the dissassembly for wash could be beneficial to minimize. The luxurious aspect implemented in many of the other process steps should also apply for the wash situation.

In general the project needs to be commented by the users, to be tested thoroughly by 'moderate people' and by the chosen extreme user group. The many assumptions thoughout the process get tested and verified before reaching validity.

The retail price is estimated to be too high and it should be considered whether the mark up factor should be minimized in order to reach a price level more competitative and attractive. It is hard to analyze and estimate the potential outcome of the business plan when the product development is partly build on trends and lifestyles in society. These are not exact and constantly moving and different supporting market analysis are needed to evaluate when the market is ready for a product like Glacier.

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Illustration list

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Ill. 155 - 206	Own illustrations and photographies