

SYMPHONY PRODUCT REPORT

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Aalborg University
Industrial Design
Master thesis

TRIAKT
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May 2016

This product report is targeted at
Miele Denmark and other kitchen
appliance brands with interest in
producing the product.

WHAT WILL WE FOCUS ON IN 2025?

With a curiosity for the future, with a strong drive to shape radical change, we have created a harmonious combination of elements for the cooking area based on future tendencies. It has been given the name Symphony.

Ten years from now, the world will be different. Which direction are we going and how does that influence us and our lifestyles? What does that mean for design of kitchens?

Our lives become more and more digital, technologies emerge faster and faster. The number of distractions and things competing to get our attention are increasing, we are constantly exposed to new information and impressions our brains have to process, making it harder to be present in what we are doing and focus on what is important.

Eventually, this will create a longing for simplicity and mindfulness. The living-with-less movement has already started growing as an increasing number of people feel the need to live a more minimalistic life, where unnecessary elements are cut out and focus is on living in the present.

Reassessing our values and searching for purpose in a globalized world, where everyone is connected and social relations are formed in all directions, make people more aware of the impact they have on the planet and the importance of caring for each other and the environment.

Symphony is an elegant, harmonious proposal for a future cooking system, made with care for the coming generations.

Symphony, joyful cooking, designed for the future.



SYMPHONY

Symphony is a system for the cooking area with a mechanical, self-adjusting cooker hood that communicates wirelessly with an induction hotplate, which is hidden underneath the tabletop.

The movement of Symphony adds a minimalistic and discreet, yet joyful and lively touch to the Scandinavian kitchen when the wave opens up for the air flow.

Symphony differentiates itself from the competitors as it self-adjusts to the actual need for suction by opening the front in an expressive, elegant wave motion.

To activate the system, simply press the button placed on the side and a white light around the button lights up.





COOKING SCENARIOS

The kitchen is often the heart of the home and the base for social activities, whether it is family dinner or friends gathering for a party. Symphony makes it a joy to do social cooking as the length of the cooking area makes it pleasant for more than one person to use the induction zone at a time.

The self-adjusting cooker hood frees the users from having to pay attention to the operation of the cooker hood by offering an automatic solution, which makes room for being present in what is important; cooking and the social activities.

The induction hotplate is divided into three heat zones, which each has a fixed temperature, making the heat regulation simpler for the user. The user regulates the heat on each piece of cookware by moving it to the most suitable heat zone for the specific task.

The high temperature heat zone is placed near the wall, while the low temperature heat zone is closest to the user, giving the user the opportunity to utilize the table space on the low heat zone for other tasks while using the other heat zones.



COOKING SCENARIOS

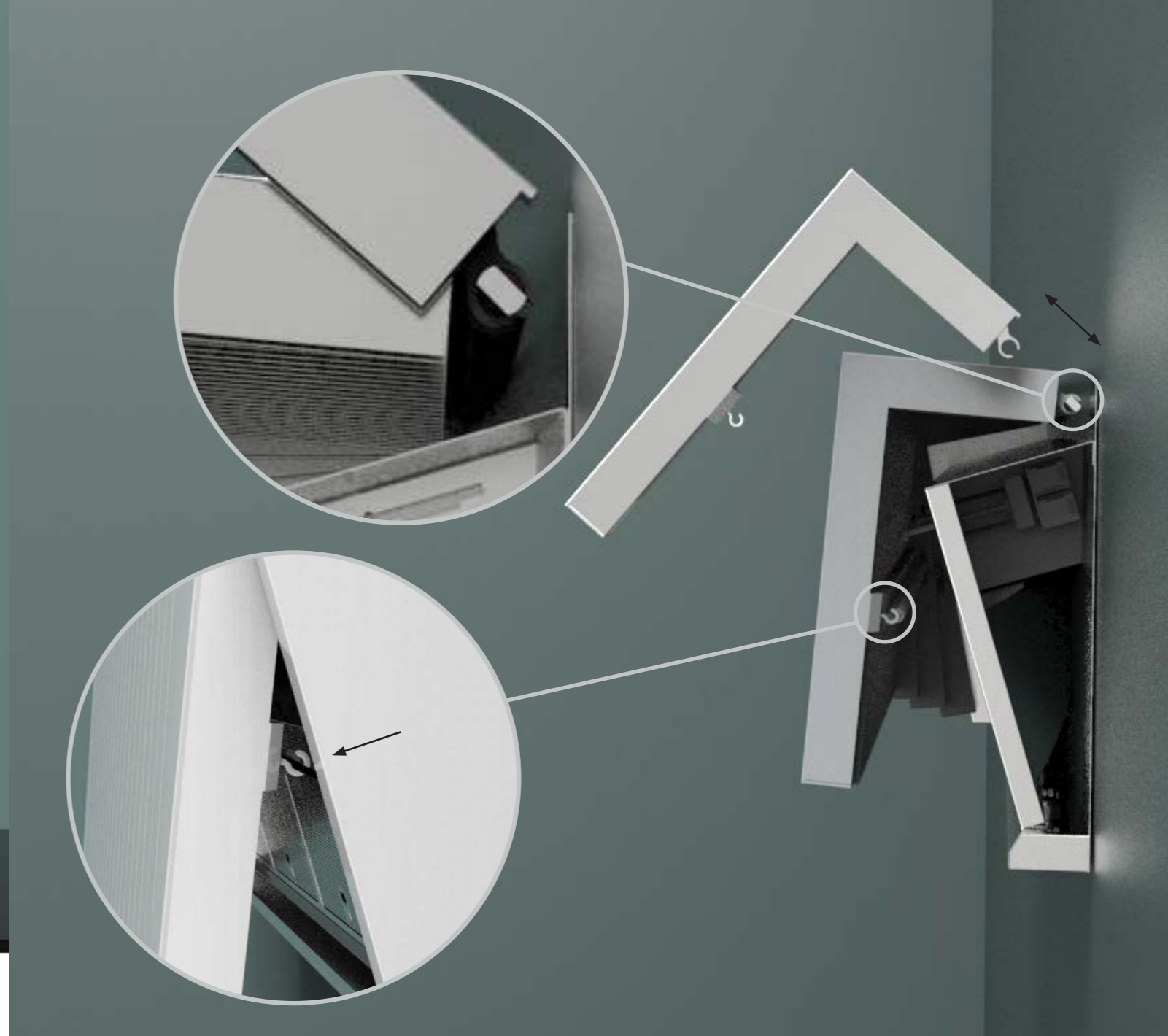
When the cookware is removed from the heat zone, a red laser light will light up and cover the hot surface, warning the user about the heat until the surface temperature is below 50 degrees.

To secure removal of steam generated during cooking, the cooker hood will continue the suction until 15 minutes after ended cooking, after which it will turn off automatically.

The nearly invisible induction hotplate invites to use the tabletop area for other purposes when not cooking, and emphasizes the simplicity of living-with-less.



SYMPHONY
by NIGHT



MAINTENANCE

Open lamellae

When the lamellae need cleaning, the user should press the power button for five seconds to activate the motors, so all lamellae are pushed out, which gives the user access to the inside of the cooker hood.

Take elastic band off

To enable detachment of the lamellae, the user should take the elastic band, which connects the lamellae, off the hook on the backside of the lamellae. The lamellae can now be moved independently of each other.

Pull lamella up

After releasing the elastic band from the lamellae, the user should push each lamellae upwards until the lamella can be lifted off the beam in the top of the cooker hood body. The lamellae are made of POM, which makes them dishwasher safe.



Front

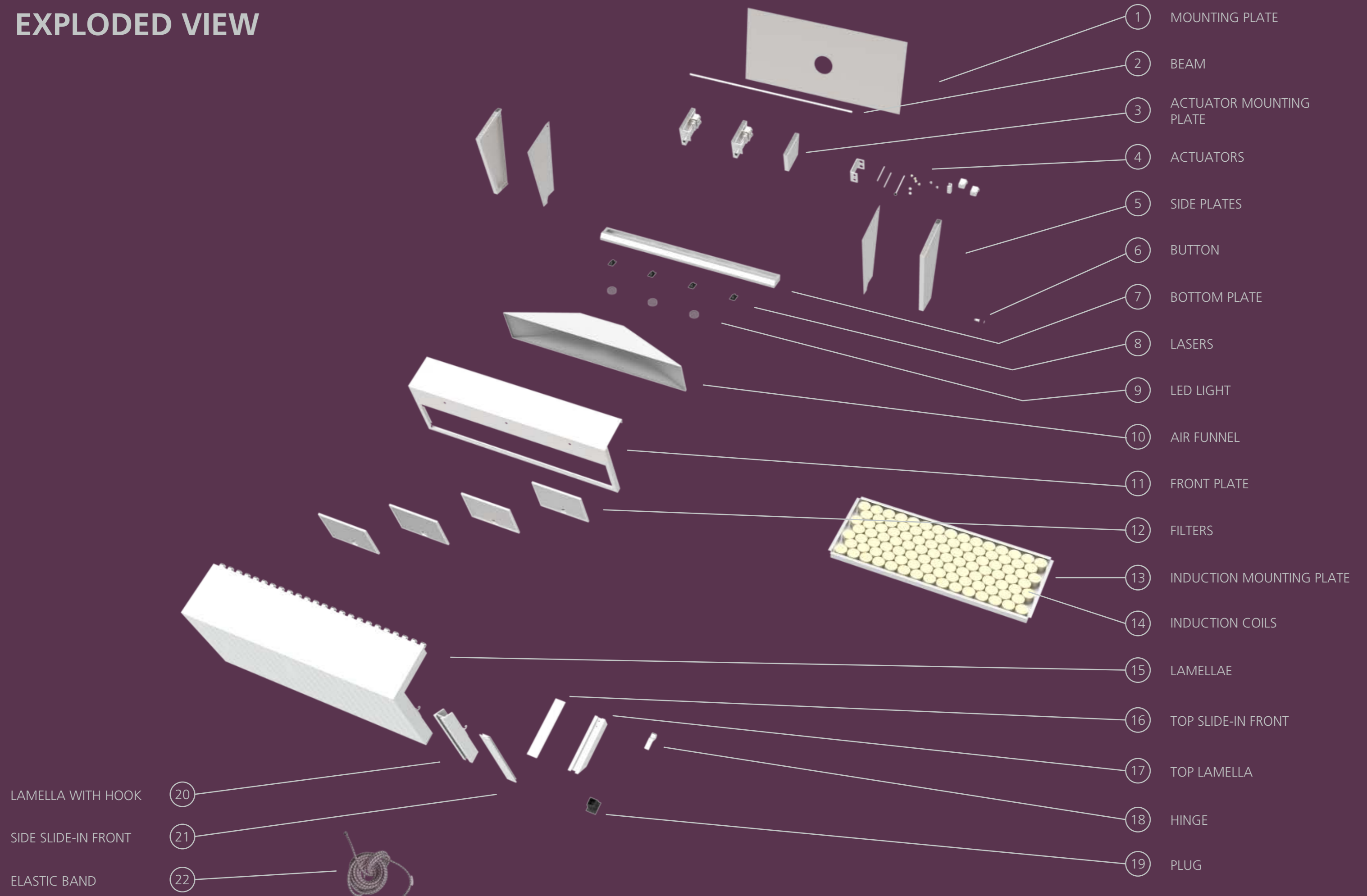
The fronts of the lamellae can be detached easily by sliding them off each lamella, if the user wants thorough cleaning or if the fronts are made of a material that cannot go into the dishwasher, but need to be washed by hand. Subsequently, the fronts can be cleaned or given treatment depending of the material.



Filters

When it is time to clean the filters, a yellow light will light up a circle around the power button on the side. The user should press the button for five seconds to make the cooker hood open, so the user can get access to the filters, click them out and put them into the dishwasher.

EXPLODED VIEW



- 1 MOUNTING PLATE
- 2 BEAM
- 3 ACTUATOR MOUNTING PLATE
- 4 ACTUATORS
- 5 SIDE PLATES
- 6 BUTTON
- 7 BOTTOM PLATE
- 8 LASERS
- 9 LED LIGHT
- 10 AIR FUNNEL
- 11 FRONT PLATE
- 12 FILTERS
- 13 INDUCTION MOUNTING PLATE
- 14 INDUCTION COILS
- 15 LAMELLAE
- 16 TOP SLIDE-IN FRONT
- 17 TOP LAMELLA
- 18 HINGE
- 19 PLUG

- 20 LAMELLA WITH HOOK
- 21 SIDE SLIDE-IN FRONT
- 22 ELASTIC BAND

SPECIFICATIONS

COOKER HOOD

DIMENSIONS

1310mm x 320mm x 610 mm

MODEL

WALL-MOUNTED

WEIGHT

≈ 45 KG

MATERIALS

POM
STAINLESS STEEL
PLASTIC

NUMBERS OF LAMELLAE

25

NUMBER OF LIGHT SOURCES

24 (2x12) LASERS
3 LED LIGHT

BUTTON DIMENSIONS

Ø24

FILTERS

4 METAL FILTERS
(300mmx250mmx10mm)

HOTPLATE

DIMENSIONS

1200mm x 496mm x 55 mm

MODEL

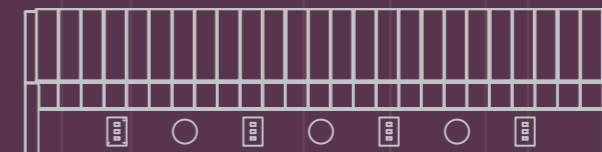
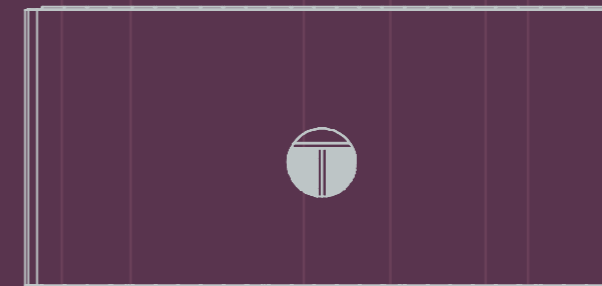
INDUCTION HOTPLATE

NUMBER OF HEAT ZONES

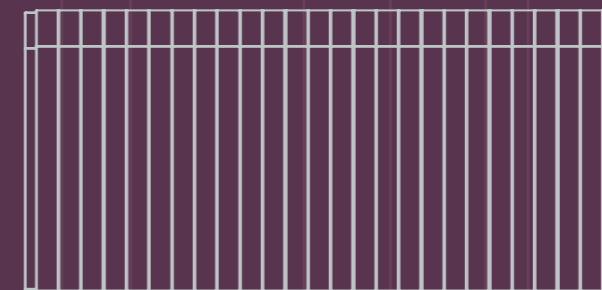
3 (High, medium, low)

TABLE TOP OUTLINE

1200mm x 520mm



—
BUTTON

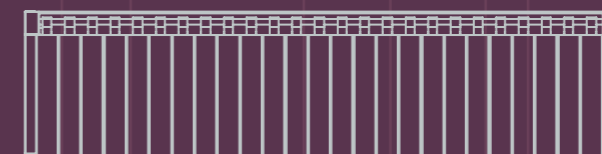


1310 mm



610 mm

320 mm





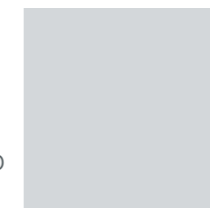
CUSTOMIZATION

The detachable lamella fronts enable customization of the cooker hood to fit the customer's individual taste and kitchen interior.

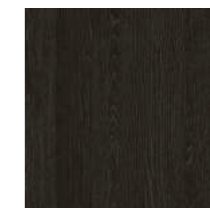
The lamella fronts, which easily can be changed if wanted, comes in six different looks from the classic brushed stainless steel or pure white coated steel over elegant black stained oak or natural stained oak to glass fronts in soft stone grey or a tinted havana brown.



PURE WHITE COATED
STAINLESS STEEL



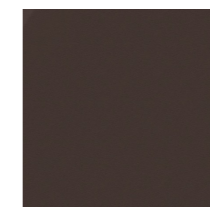
STONE GREY
SILICA GLASS



BLACK
STAINED OAK



BRUSHED
STAINLESS STEEL



HAVANA BROWN
SILICA GLASS



CANTERBURY
STAINED OAK



WHAT DOES SYMPHONY DO?

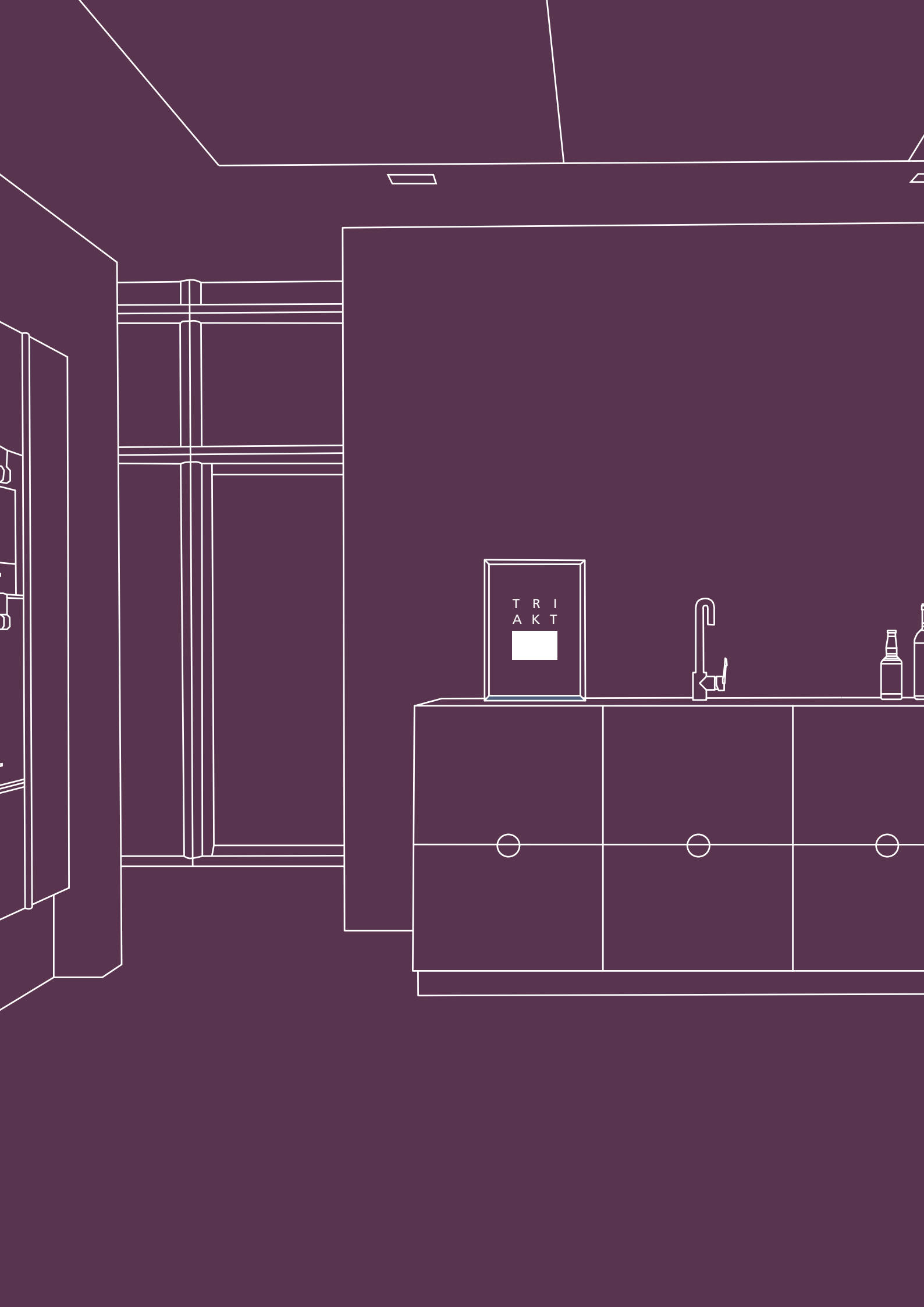
Self-adjusting cooker hood
Offer solutions instead of options
Fixed heating zones
Invites to social cooking

HOW DOES SYMPHONY WORK?

Wireless communication between cooker hood and hotplates
Induction hotplates underneath the tabletop
Detachable lamellae for easier cleaning
Light indicators: active spot, after-heat and working light

HOW DOES IT FEEL TO USE SYMPHONY?

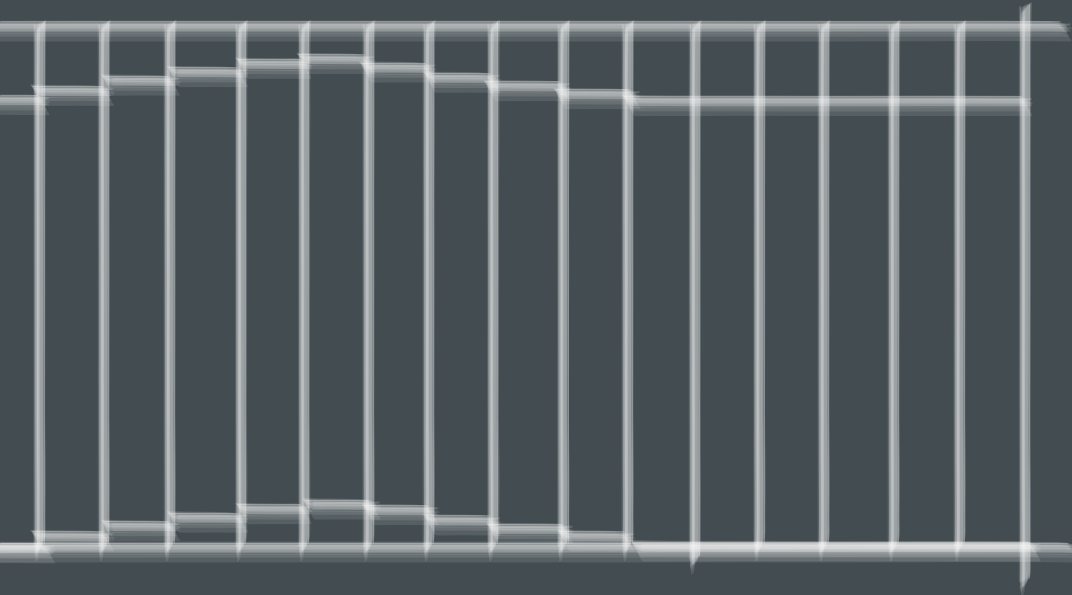
It frees the user from thinking about suction in the cooking area
Simple and easy user interface with only one button
Minimalistic, yet lively expression
Social cooking becomes a joy



T R I
A K T



SYMPHONY PROCESS REPORT



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TITLE PAGE

Aalborg University
Industrial Design

Project Module: Master Thesis in Industrial Design
Title: Symphony
Theme: Future Miele Kitchen

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Head Supervisor: Kaare Eriksen
Technical Supervisor: Mikael Larsen

Collaborator Company: Miele Denmark
Contact person: Asger Bache Jensen

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ANNE ØSTERGAARD



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TORBEN JØRGENSEN

RESUMÉ

Dette projekt har taget udgangspunkt i en konkurrence om design af fremtidens Miele-produkt med fokus på et produkt til køkkenet. Research på fremtidstendenser har resulteret i en retning, hvor produktet tilbyder enkle løsninger i stedet for at give brugeren utallige valg at tage stilling til under madlavningen. Derudover har fokus været på at ændre oplevelsen af hårde hvidevarer i køkkenet og at øge nydelsen ved at lave mad sammen.

Det endelige produktforslag, Symphony, er et kogeområde, hvor emhætte og induktionsplade kommunikerer trådløst og emhætten tilpasser sig brugen af induktionsområdet, så brugeren ikke skal tænke over indstilling af emhætten. Emhættens front åbner sig i en bølgebevægelse afhængig af hvor meget sug, der er behov for. Induktionsområdet er opdelt i tre zoner, der hver har en fast temperatur, så interaktionen med kogeområdet foregår på en ny måde, hvor brugeren flytter gryden til den ønskede temperatur i stedet for at skulle skrue op og ned og dermed har færre valg, der skal tages. Kogeområdet er desuden forlænget for at gøre plads til social madlavning uden gener.

Med Symphony kan brugeren fokusere på det sjove ved madlavningen uden at skulle tænke på at betjene emhætten.

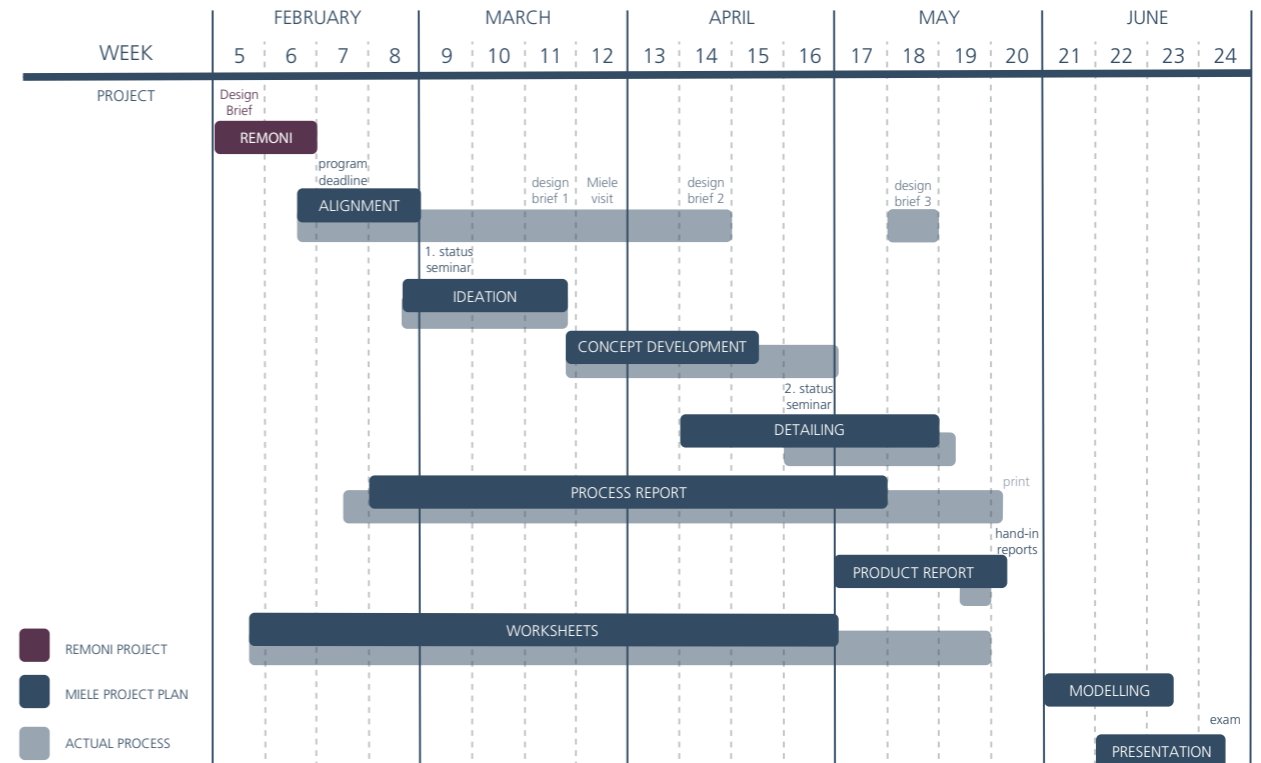
ACKNOWLEDGEMENTS

A special thanks to Kaare Eriksen and Mikael Larsen for useful supervision, feedback and motivation during the project. The team would like to express gratitude to Asger Bache Jensen and Miele Denmark for the opportunity to participate in their design competition.

The team also wants to thank Britt Klug from Interstudio, Sandie Lindholm Johannessen from Unoform, Dorthe Due Theilade and Claus Guldberg from Boform for sharing their thoughts and experiences.

PREFACE

This master thesis project documents and presents the semester project done by TRIAKT - a group of students at 4th semester of the Industrial Design Master, Institute of Architecture, Design and Media Technology at Aalborg University. Acquired knowledge and methods from previous semesters and courses are applied throughout the process of development.




READING GUIDE


The project consists of a printed package containing a process report, a product report and technical drawings. Digital versions of the reports and supplementaries such as worksheets and appendix can be found on the attached USB-stick.

The process report has served as a learning tool within the group and thus includes documentation for the execution of and reflection on the design process, while the product report targets Miele Denmark and readers with no prior knowledge.

The process report is structured in six main sections; Discover, Ideation, Concept development, Detailing, Business & Marketing, and Epilogue. The process report is not structured chronologically, as some of the phases have been running simultaneously during the process.

Throughout the process report the following indicators are used:

 The task lead to one or more requirements for the product.

 The task gave new insights that needs further exploration.

All references are stated by the Harvard method in-text; (Author, year). Full references are generated in RefWorks and are listed alphabetically in References on page 98. Illustrations are numbered (ill. X), a full list can be found at page 101. Worksheets are referred to as (Worksheet X) and can be found on the USB-stick.

TIMELINE

The timeline shows the expected duration of each phase (Miele project plan), the actual time spend on each phase and deadlines during the semester.

Before starting the Miele project, we worked on a different project Remoni, change of subject is described in appendix 1.

During the project we kept a journal to keep track of the process, which can be found in appendix 3.

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DISCOVER

This section covers the main research phase and contains the information gathered about kitchens, trends and consumers, which has helped the team define the direction of the project. The information has been condensed into a design brief containing a description of the direction of the project, the target consumer, areas of priority, initial requirements, and the vision for the project. The design brief, which acts as a guideline for the team during the development process, is updated throughout the process.

“Miele has also won dozens of **sustainability awards**”

- Asger Bache Jensen, Marketing Director at Miele Denmark

“Miele has **no debt**, and you should have in mind that Miele is a company operating in **47 countries**”

- Asger Bache Jensen, Marketing Director at Miele Denmark

1.1 MIELE DENMARK

As we participate in a Miele competition, research on the brand, its values and history is necessary to get an understanding of the recipient and the environment the product concept should fit into. The research is done through interviews with Miele, kitchen salespersons from multiple kitchen stores and users, as well as desk research.

To mark the 50th anniversary of Miele’s business in Denmark, Miele Denmark has arranged the competition about a vision for Miele’s future. The purpose of the competition is that Miele gets a collection of new ideas and inputs from the outside to get inspiration for their future business (Bache Jensen, 2016). Consequently, this means that there is a different take on this project compared to earlier projects, as this project is more focused on the future and therefore can be even more visionary and futuristic in its concepts. As the starting point is a vision for the future, instead of a specific problem, it is likely that the project will be less problem-based. This also means that the project does not target a specific user, but a broader group.

HISTORY

Miele was founded by Carl Miele and Reinhard Zinkann in the city of Herzebrock in Germany in 1899. Miele’s first product was a cream-separating machine, followed by a butter machine, washing machine and a car. Throughout the 20th century Miele has dealt with many different product groups in various fields

such as dairy machinery (cream separating machines and butter churns), transportation (cars, motorcycles, bicycles and pushcarts), cleaning (vacuum cleaners, washing machines, dryers and dishwashers) and cooking (ovens, microwaves, stoves and refrigerators) (Miele, 2016). Today Miele focuses on clothes- and floor cleaning and kitchen products, both in the private and the industrial sector (ill. 1). All products are made under the same slogan as the company was founded on: “Immer besser”.

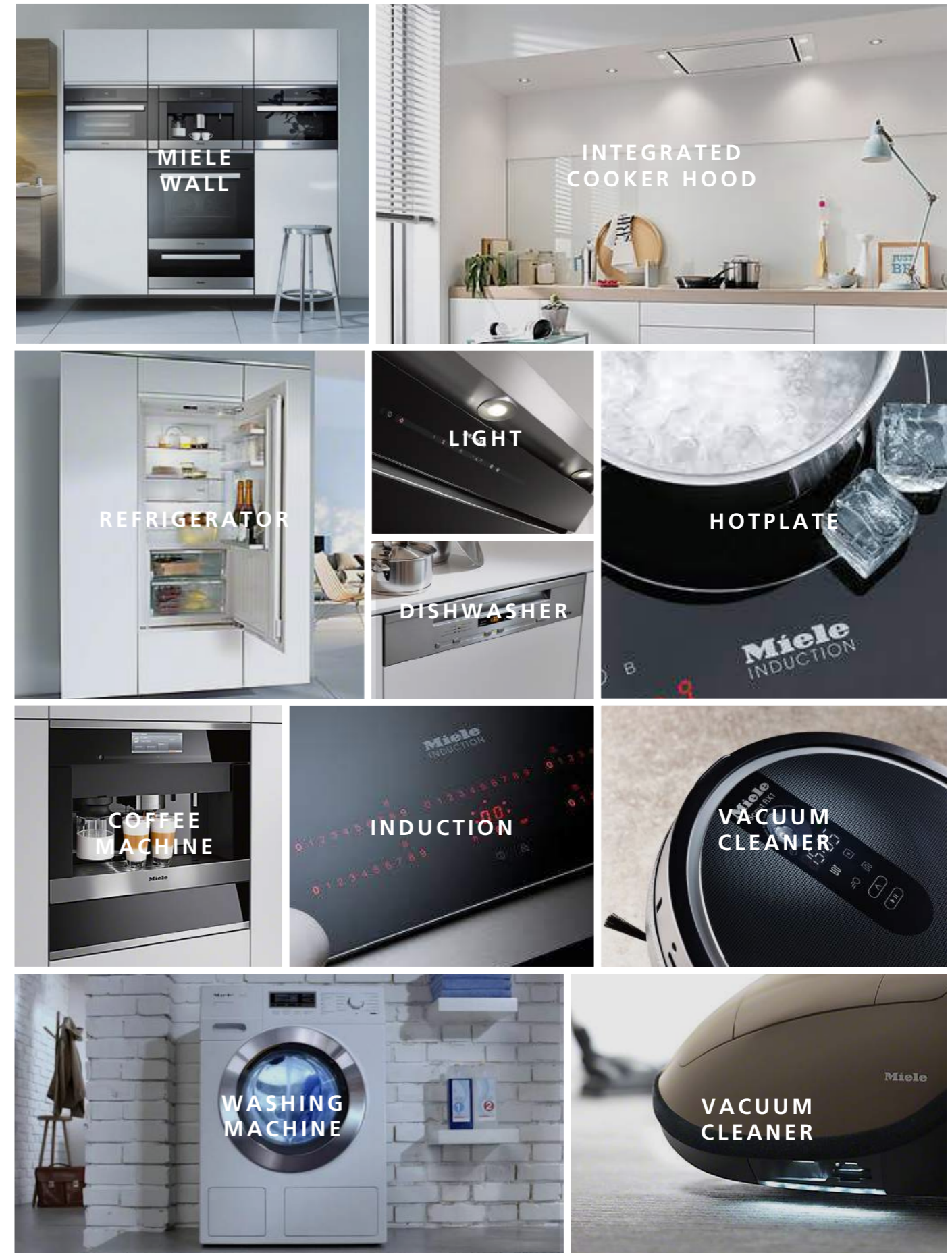
We have decided to focus on the kitchen in this project. Earlier, Miele also produced kitchen elements, but as this caused conflicts with the kitchen companies, who felt that Miele entered their domain, Miele decided to stop production of kitchens and focus on the white goods (Bache Jensen, 2016). Hence, the focus of the project is on the development of appliances for the kitchen.

1.1.1 SWOT ANALYSIS

To get an overview of what characterises Miele as a company, we structured the gathered information into a SWOT analysis (ill. 3), which highlights the most important aspects to consider during the project.

STRENGTHS

As a brand, Miele is known for their high quality, reliability and durability. Their products are tested



ILL. 1: MOODBOARD MIELE’S CURRENT PRODUCT CATEGORIES

“In my opinion, Miele has **not developed much** on their ovens lately as the last 3 series have been **almost identical**”

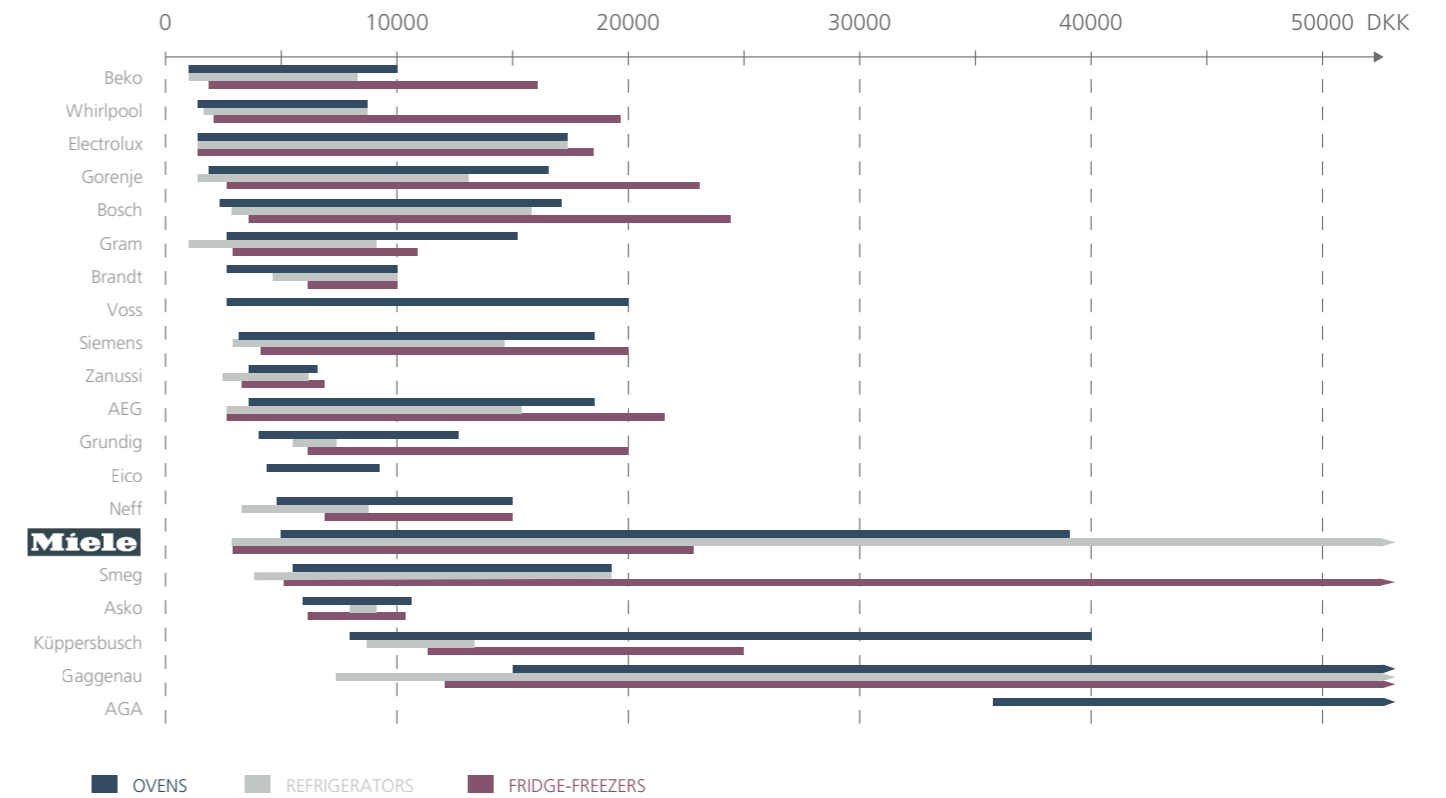
- Jannie Kjær, Joint Owner and Interior Designer at Multiform, Aalborg

“They [customers] **can’t feel** the difference in quality in this... on paper it is **easy to match** our specifications”

- Asger Bache Jensen, Marketing Director at Miele Denmark

“The difference between Miele and Gaggenau is that Miele products often have **multifunctions and are more technically advanced** than Gaggenau, which focus on pure function and less is more principles”

- Dorthe Due Theilade, Architect at Boform, Aalborg



ILL. 2: COMPETITORS - PRICE COMPARISON

thoroughly before entering the market, resulting in long-lasting products and loyal customers, which is also caused by their continuity strategy, as the customers know what Miele represents, that it is a solid company and that these things do not change overnight.

Miele’s values are centered around sustainability and social responsibility, so the company is very aware of the ‘ecosystem’ of their production to secure a high quality in all aspects. Miele have their own production plants and are generally producing everything themselves, which means that Miele is able to control the processes from start to end in order to maintain a high level of quality. Furthermore, Miele have their own bank, meaning that the company does not have any debt, which also strengthens the stability of the company (Bache Jensen, 2016).

WEAKNESSES

The ability to be self-financed is not only a strength, as it is more expensive to develop and produce everything from materials and technologies to tooling for production on their own. In many cases it could be beneficial to lease instead of buying, e.g. company cars.

Having the majority of the production facilities inside the company is in many cases an advantage. However, it is also a very expensive strategy regarding innovation, as the production facilities might have to be changed in order to implement an innovation, which is more demanding than just replacing a supplier or outsource some of the production.

The high amount of quality control also require a lot of resources spent on logistics, as quality controllers travel around the world to follow the production from suppliers to finished product (Bache Jensen, 2016). All these aspects contribute to the price of Miele products, which are in the higher end of the scale, when compared to competitors on the market.

MARKET

According to the salespersons at the visited kitchen stores, Miele’s prices are in the middle of the price range and are thus able to reach customers from both lower-end and high-end segments (Johannessen, 2016, WS6). For customers in the lower-end segment, Miele is an expensive high-end brand, while it is more average regarding price in the high-end customer segment, who buys expensive kitchens from e.g.

Unoform. However, Miele stands for quality and durability in both segments, especially regarding water-related products, such as dishwashers and washing machines (Theilade, 2016, WS6).

To confirm the information from the kitchen salespersons, we made a comparison of prices on ovens, fridges and fridge-freezers from the most common brands in domestic appliances (ill. 2). The prices are based on searches on pricerunner.dk, which gave almost 1000 hits in each product category. 20 brands were chosen for this comparison.

As seen on ill. 2 Miele has a lot of competitors in the lower-end, while there is only a few competitors in the high end of the scale. The majority of brands are in the price range up to 20000 DKK. Miele differs from the majority, as they are the only ones covering a much wider price range from 2700 DKK up to almost 64000 DKK (Worksheet 31). Gaggenau, which is one of Miele’s strongest competitors according to the research in kitchen stores, is the only competitor with a price range higher than Miele in all product categories.

We have decided to address the high-end segment, as the customers in this segment often are front runners regarding purchase of new and innovative products, which fits the future aspect of the project. Furthermore, this also gives us better opportunities in relation to use of new technologies, which tend to be expensive at first.

OPPORTUNITIES

As previously mentioned Miele are self-sufficient in most areas of their production. As an example they have developed their own hardware and software system for digital connectivity with some of their products, but is currently working on implementing existing Wi-Fi-solutions from other manufacturers, as this self-sufficiency strategy is time-consuming and expensive. Outsourcing smaller parts of the production in areas where Miele is not competitive is an opportunity for Miele to explore.

When considering opportunities, it can be valuable to look at trends in society and consumer behaviour to identify certain directions, which can create opportunities for the company. According to research (IKEA and IDEO London, 2015, WS5) the

living spaces will be smaller and the population density will increase because of urbanization and increasing population. Even though this megatrend is worldwide, there is a tendency in Denmark of the opposite regarding kitchens, as they tend to become bigger and bigger (Worksheet 10), which gives some opportunities as to what the kitchen can be used for, hence the kitchens are used for other purposes than just cooking nowadays. Another opportunity-creating factor is that Scandinavia is a trendsetter, when it comes to kitchens (Bache Jensen, 2016), making it an obvious opportunity to look into trends emerging here (Worksheet 3), as they might affect kitchens and kitchen products, e.g. the Danish health promotion wave is likely to affect the use of the kitchen. Moreover, studying future lifestyles (Worksheet 24) might give an indication of possible opportunities related to future product development.

THREATS

The consequence of Miele's extensive quality control and own production is a slower product development process compared to competitors, who are able to release new products with new technologies faster. Thus Miele is a step behind their competitors regarding innovation. In relation to this, another threat is that the quality difference between Miele and competitive products might not be obvious for the customers to begin with, causing the customers to buy a cheaper alternative as they seem just as good as Miele at first. Another threat is legislation. A recent example is that cooker hoods from summer 2016 will be required to have a vent, which means that cooker hoods with recirculation will become prohibited to install in new houses in the future.

Finally, changes in the market conditions can be a threat, however, Miele is not as sensitive to market fluctuations because of their principle about self-financing and no debt (Bache Jensen, 2016).

CONCLUSION

Miele has a huge focus on sustainability and their brand values about social responsibility, trustworthiness, quality and continuity are factors that should be considered throughout the project to ensure that the final product would be able to fit into Miele's product portfolio.

We should also be aware of legislation regarding kitchen products, which might influence the limits for what will be possible in the future. Moreover, we should look into the opportunities identified in the SWOT analysis.

REFLECTION

This section is mainly based on an interview with the marketing director from Miele, who naturally is biased and very positive about the company and the brand. However, interviews with kitchen salespersons, users (Worksheet 16) and an installer (Worksheet 18) confirmed the statements about quality and durability.



Research on future trends and lifestyles.



The product must comply with new laws.



Miele's brand values should be considered in the concept (social responsibility, trustworthiness, quality, continuity and sustainability).



Customer loyalty
Quality (High warranty and quality-tested)
Trustworthiness
Solid company (No debts and own bank)
Production control
Continuity strategy



Changes in production
Self-financing (Materials, technologies, production, moulds)
Many resources on logistics
High price level

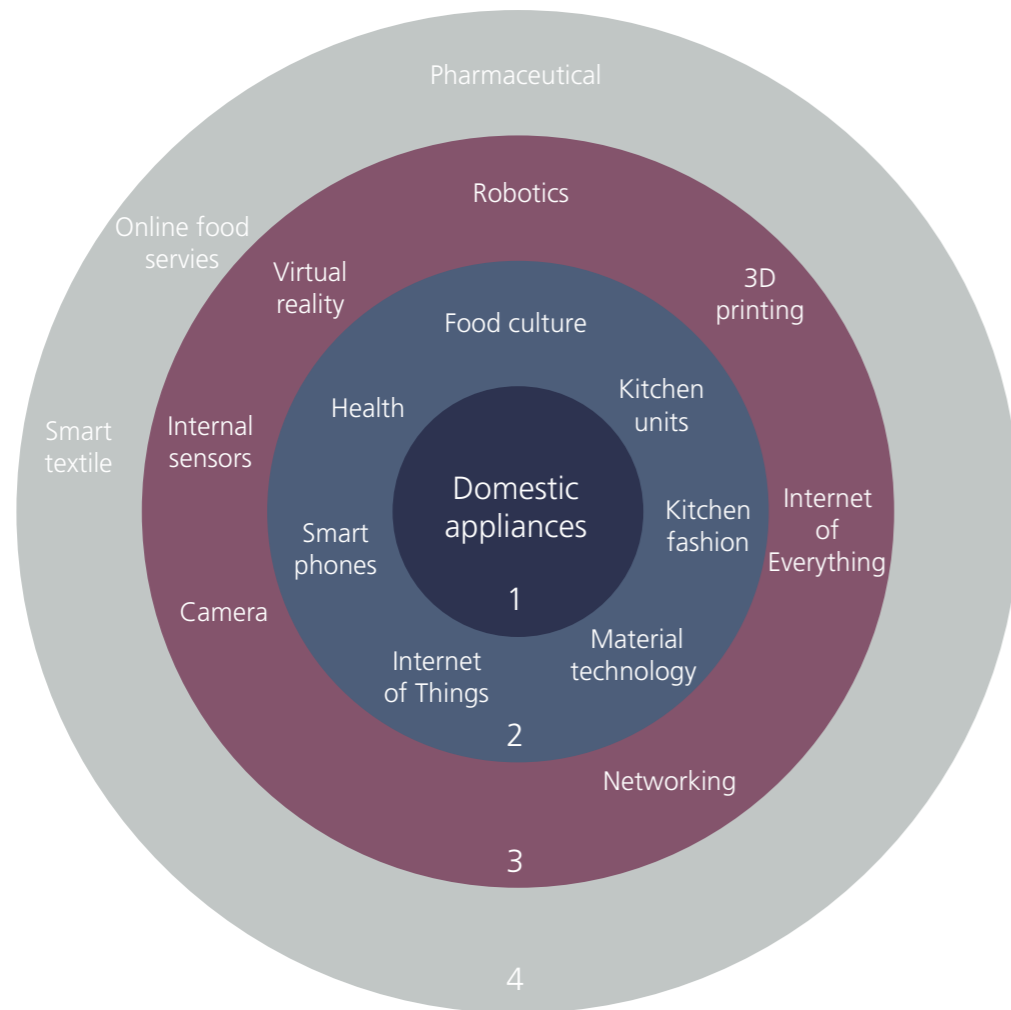


Outsource consumer products, software solutions and hardware systems
World wide trend: less space per person
Danish trend: bigger and bigger kitchens
Danish health promotion wave
Scandinavia as kitchen trendsetter
Doing non-kitchen related activities in kitchen
EU future lifestyles 2020



Market conditions (financial crisis)
Legislation
Competitors are faster to use new technologies
Consumers cannot feel the quality difference in a buying situation

ILL. 3: SWOT ANALYSIS OF MIELE DENMARK HIGHLIGHTING THE MOST IMPORTANT FACTORS



1. IN WHICH INDUSTRY IS YOUR ORGANIZATION?
2. WHICH INDUSTRIES AFFECT YOUR ORGANIZATION?
3. WHICH INDUSTRIES MAY AFFECT YOUR INDUSTRY OVER THE NEXT 3-10 YEARS?
4. WHICH NEW INDUSTRIES COULD POTENTIALLY ARISE THAT MAY AFFECT YOUR ORGANIZATION?

ILL. 4: MODEL OF CROSS-INDUSTRY POLLINATION METHOD (KATES, 2012)

1.2 INFLUENCING INDUSTRIES

As all industries are affected by others, we have looked into which industries might influence the industry of domestic appliances. The method called cross-industry pollination (Kates, 2012 cited in Kongsholm and Frederiksen, 2015 p. 302) is used to map potential influencing industries (ill. 4), both existing industries and potential new and upcoming industries, based on desk research on global trends.

The inner circle illustrates the industry Miele belongs to, which is domestic appliances.

The second circle contains the industries that already influence the inner circle, e.g. the kitchen fashion influences the aesthetics and sizes of domestic

appliances, and the food culture has an impact on the functions of the appliances.

Industries that might affect the current industry over the next 3-10 years, both as threats and opportunities, are listed in the third circle. An example could be the robotics industry, which is emerging in new fields such as the hotel industry (Chang, 2015) and kitchen concepts e.g. Moley Robotics have made a robotic kitchen concept, which is set for launch in 2017 (ill. 5). The kitchen concept is a fully functional cooking robot integrated in the kitchen, which makes the human unnecessary in cooking (Moley Robotics, 2015). Another example of robots, which have entered private homes are the robotic vacuum cleaners.



ILL. 5: ROBOTIC KITCHEN CONCEPT FROM MOLEY

The emergence of all these robots in private homes indicates that the robotic industry already has started influencing the industry of domestic appliances, so it is likely that this development will continue in the future.

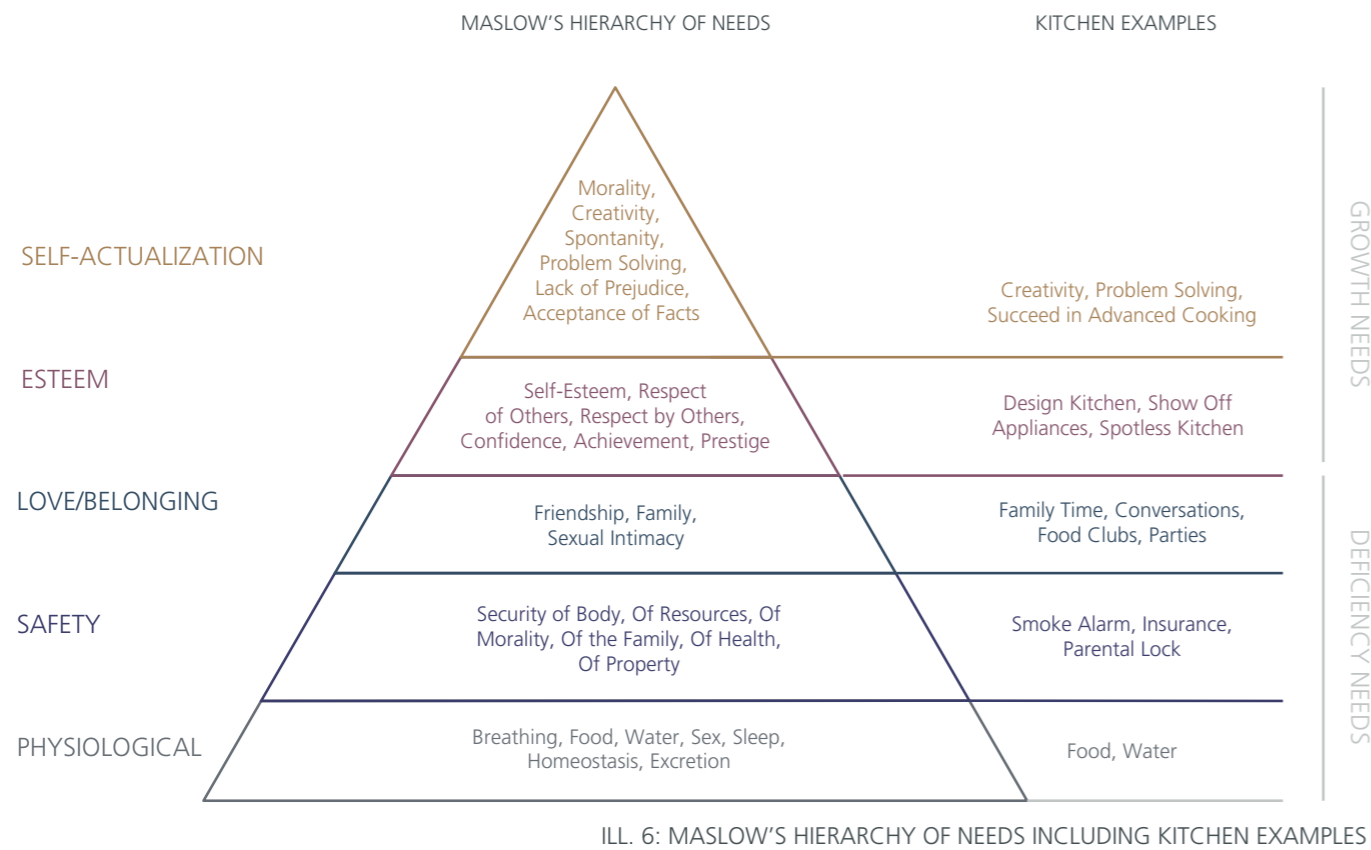
Finally, the fourth circle requires a more imaginative mindset as it deals with new industries, which potentially could emerge and affect the organisation in the future. Some examples could be an online food service delivering all meals every day, making domestic appliances completely unnecessary in private homes, or that the pharmaceutical industry develops a pill containing all needed nutrients, which replaces the necessity to eat regular food.

CONCLUSION

The model does not cover all potential industries as it is impossible to include everything. However, it gives us an idea of what could be relevant to consider when designing a future concept for Miele. During the design process, we should consider at least some of the aspects and reflect on how to benefit from influencing industries instead of seeing them as threats.



Research on trends in following industries; Food, kitchen and domestic appliances.



1.3 WHAT IS A KITCHEN?

To get a common ground to start from and a deeper understanding of what the kitchen term basically covers, the subject was investigated through literature and by using Maslow's hierarchy of needs (Maslow, 1943) to systematically define what needs the kitchen potentially is able to fulfill in which situations (ill. 6) Thus, important factors to consider in the concept development are found.

The kitchen is a place everyone associates with special memories and experiences, expectations and dreams. Kitchen processes are mostly characterized by being practical and functional, but does also contain emotional and social aspects (Engholm, 2008).

THE PHYSICAL ASPECTS

Basically, the kitchen is a place where you eat and drink to satisfy the most basic needs in the first level of the hierarchy of needs. The room contains physical objects; walls, ceiling, floor, supply and export of running water, heat, electricity, ventilation, refrigerating storage room for raw materials, dining room etc.

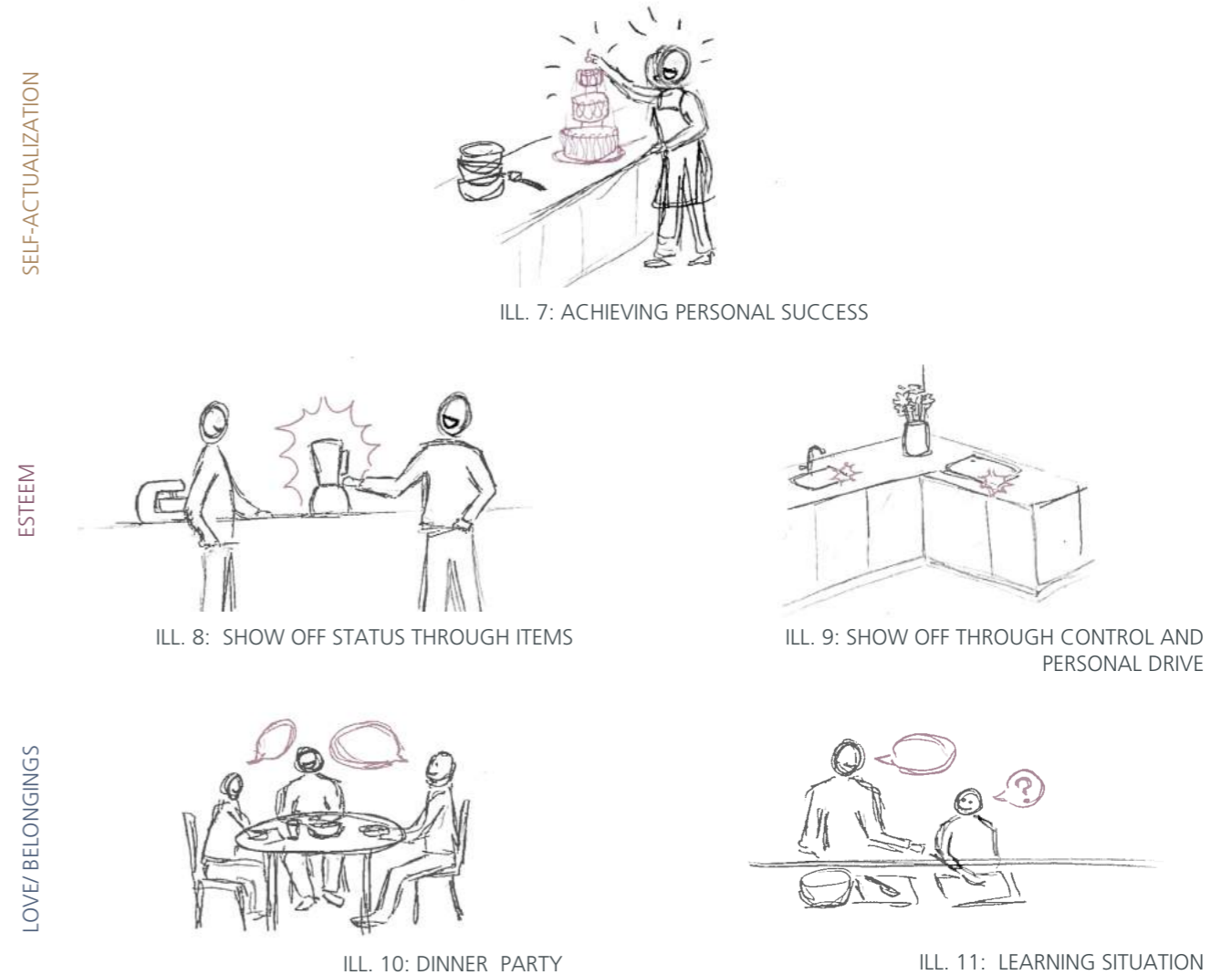
The kitchen has become a multifunctional common room where the whole family does activities like homework and watching tv. The kitchen is no longer just for routines and habits directly related to cooking, but also a gathering place for social activities (Salamon, 2008).

Safety is an important part of the kitchen and in relation to Maslow's second level 'safety', the physical objects in the kitchen that help to fulfill this need could be smoke alarms, as they give the owner a feeling of security.

The third level in the hierarchy of needs can be fulfilled through both physical and psychological aspects, as physical contact happens through the activities done in the kitchen and these activities provoke feelings, which cover the psychological aspects.

THE PSYCHOLOGICAL ASPECTS

As mentioned before, emotional and social aspects is a central part of the everyday life in the kitchen, but also culture is a main factor. The symbolic meanings and rules about handling of food vary from culture to culture, creating different mindsets about the



kitchen depending of the culture you belong to. For example, there is a high hygiene level and focus on health in Denmark, which results in certain guidelines about handling of e.g. raw meat and vegetables. Additionally, some Danes often throw out food at the expiration date even though it is still edible. This is due to the symbolic meaning caused by rules and culture, but the behaviour can also be affected by social norms as unwritten rules, such as "you are not allowed to sit on the tabletop", which of course differ from family to family. Besides reflecting habits and cultural traditions, the kitchen also reflects the self-perception and dreams of the user. People, whose basic deficiency needs are fulfilled, will have a natural motivation to fulfill the growth needs, the esteem and self-actualization levels in Maslow's model. This can be done through meals and food, as these act as a stage for presentation of identity, prestige and storytelling, either consciously or unconsciously (ill. 7-11). An example could be the ecology enthusiast, whose kitchen and meals will reflect this identity as someone who cares about the environment and animal welfare (Salamon, 2008).

Another psychological aspect is the kitchen as a place for social gatherings and the memories created in those situations. Common meals where the whole family is involved in the process is becoming more and more popular, which also affects the design of the modern kitchen where e.g. adjustable table heights and double sinks are ways to emphasize the kitchen as a social gathering place (Salamon, 2008).

CONCLUSION

The way kitchens have developed means that they are able to support all levels in the hierarchy of needs. A lot of activities take place in the kitchen, not only cooking and eating, but also social gatherings and activities usually performed in other rooms. Kitchens tell a lot about the owner, as personality and values often are reflected in this room. The kitchen's role as a social gathering place is a central part of how the kitchen is perceived today.



The ability to act as a social gathering place should be emphasized.

1.4 TYPES OF KITCHENS

In order to specify which type of kitchen to focus on, the main kitchen types and their characteristics have to be identified.

We have defined 5 main types of kitchens, organised them on a scale regarding size of the rooms, number of objects and activities performed in the room. Pros and cons are noted for each type (ill. 12). First on the scale is the kitchenette, which is either a tiny kitchen or part of a room equipped as a kitchen. Next is the outdoor kitchen, which typically is mobile and acts as an extension of the main kitchen. Both kitchen types are not fully equipped, typically they lack hotplates and/or an oven.

Kitchens without a dining area is the smallest of the fully equipped kitchens, which are found in most houses from the 1920's-50's in Denmark. The fourth type is a combined dining room and kitchen, where there is space enough to bring other activities into the kitchen. The last and largest type of kitchen is the open-plan kitchen, which combines multiple rooms in the house into one; kitchen, dining room and living room. Hence, the amount of objects and activities increase with the size of the rooms. The spacious kitchen-dining area with space for cooking, homework and playing is a permanent part of the dream and is still the heart of the family housing dream (Levinsen, 2015).

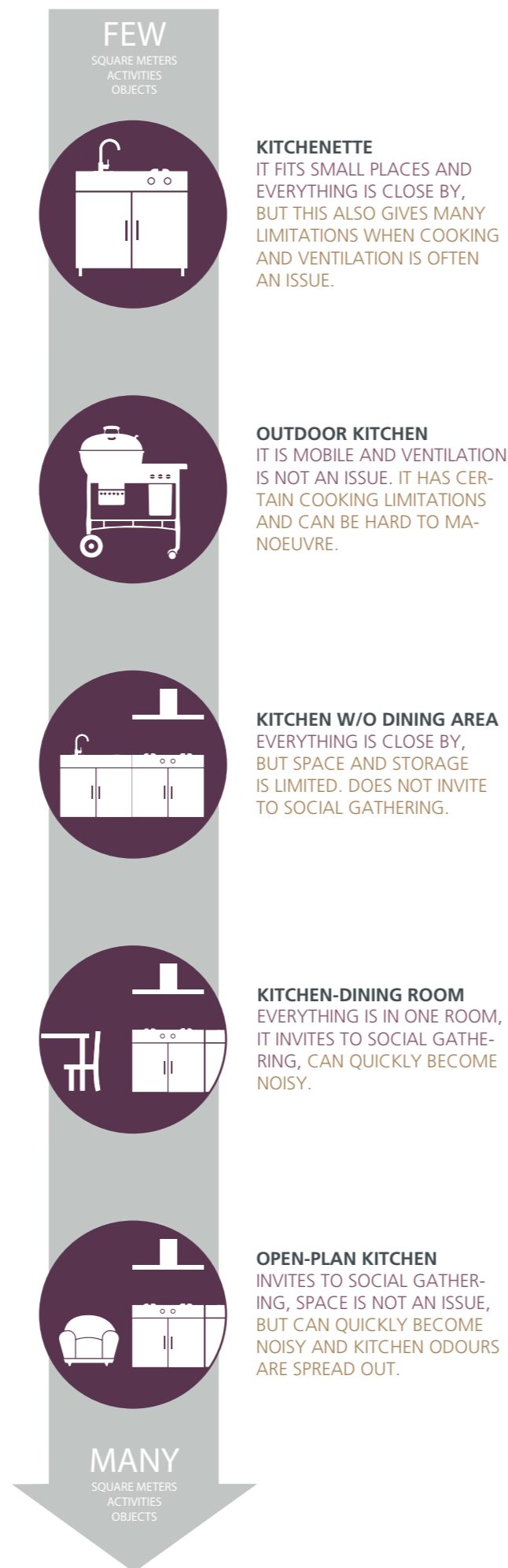
Through mail correspondence with 3 standard house companies (Worksheet 10), it was found that large kitchen-dining rooms, typically 25-38 sq. meters, are the most common in new standard houses today and that kitchens tend to become larger in size. As the kitchens become larger, the amount of objects and activities increase, which causes a rising noise level. In order to reduce noise, the kitchen-dining room is separated from the living room, so the kitchen noises are isolated from the rest of the house.

CONCLUSION

We have decided to focus on the kitchen-dining room, as we want to emphasize the social aspect of the kitchen. The problem about noise might be an issue to work with.



Assumption about noise level issues in the kitchen-dining room needs confirmation.



“Our hearing **cannot distinguish** many individual sound sources and long echoes **put a strain on us**”

- Henrik Møller, Professor in Acoustics, Aalborg University

“A **normal conversation** is around **55-60 dB**, other **noise** should normally be approx **10 dB lower** in order **not to be disturbing**” (Arbejdstilsynet, 2015)

1.5 SOUND LEVEL

Following up on the noise issues mentioned in the previous section, the sound level is investigated. The intention is to compare the noise levels in the private kitchen with the work rules of the Danish Working Environment Authority (DWEA) to confirm if it is an alarming problem.

As mentioned earlier in this report kitchens are getting bigger and ceilings are higher, which needs to be considered in relation to sound level. Noises and bad sounds have an annoying and tiring impact on humans (Pasternak, 2014). Professor in acoustics at AAU, Henrik Møller explains; “When you only have hard surfaces, there is nothing to absorb sounds. They are thrown back and forth and linger longer. This makes it difficult to communicate. Two persons may be able to have a conversation, but if more than two persons talk, or a radio is on, the sound level will be too confusing. Our hearing is unable to distinguish the individual sound sources, and long echoes puts a strain on us” (Ottenssten, 2013, translated by the team). Architect Tine Nielsen from Bolius adds that the acoustics is a part of a good indoor climate (Ottenssten, 2013).

Central to the acoustics of a room is the reverberation time. Technically, the reverberation time is defined as the time it takes for the sound level to fall 60 decibels (Arbejdstilsynet B, 2008). A long reverberation time provides an echoing effect in a room because the sound reflected from surfaces and takes longer time to die out, causing a rising noise level. In an ordinary living room, the reverberation time must be around 0.5-0.7 seconds before it is considered an enjoyable room to be in. In addition to this, another important

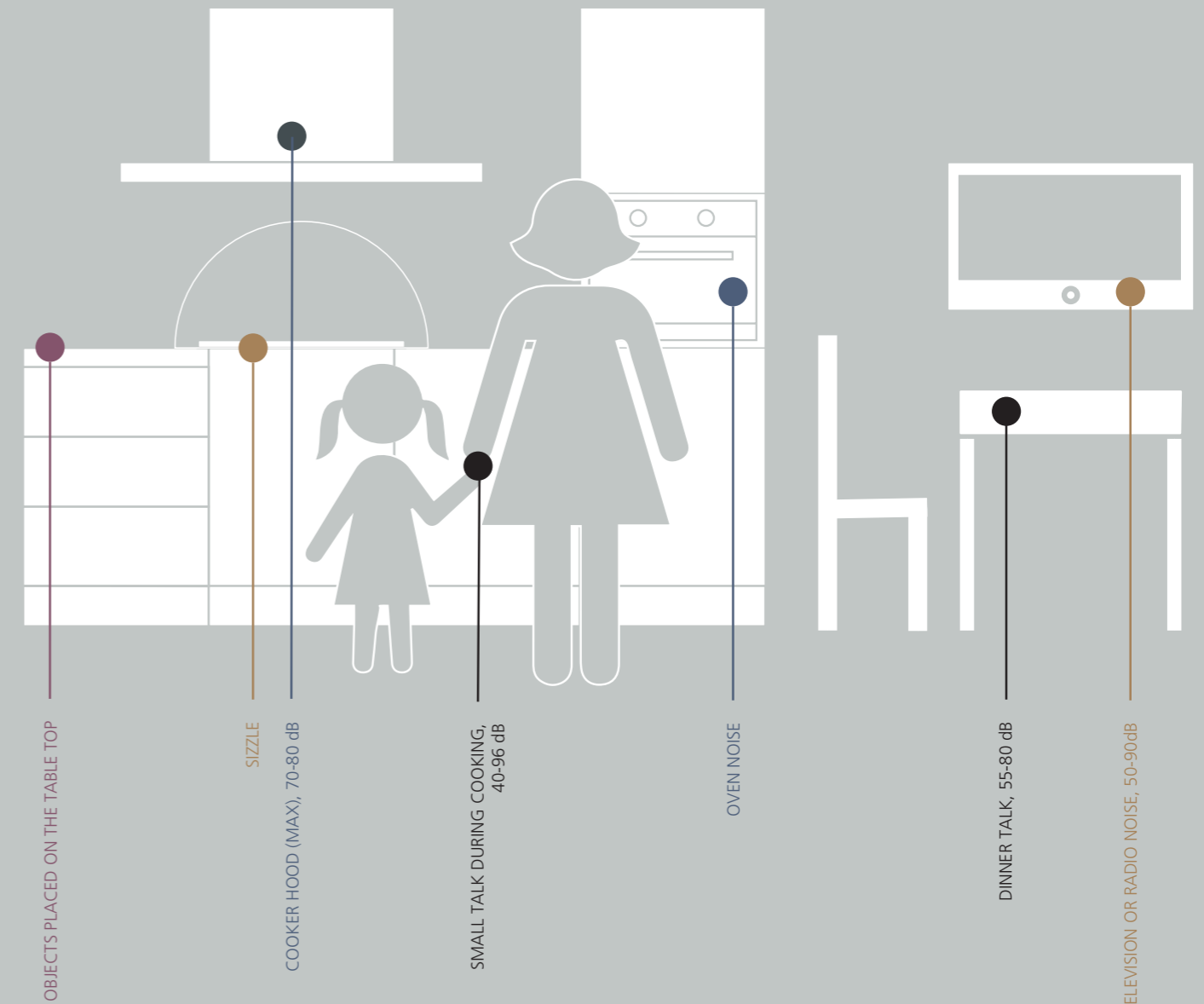
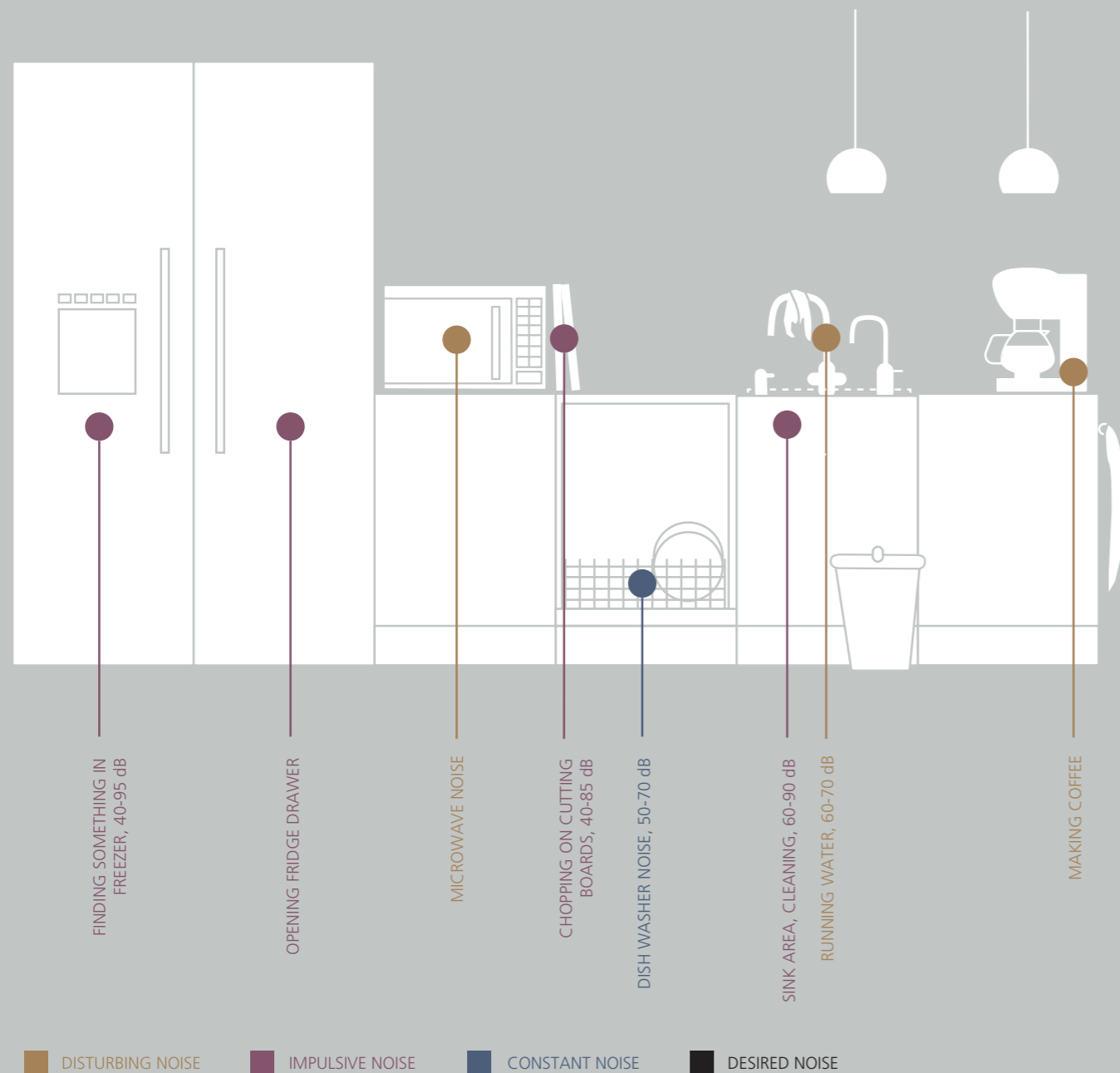
term is absorption of sound. Soft objects such as upholstered furniture, carpets, beds with blankets and pillows, and objects with porous surfaces absorb sound, while furniture, walls, windows, ceilings and floors with hard and smooth surfaces reflect sounds (Pasternak, 2014). Another factor is the proliferation of sound, also called diffusion. When sound hits a very uneven surface, it is divided and spread in different directions. The sound is not muted, but distributed in the room instead of giving a single echo (Pasternak, 2014).

The National Research Centre for the Working Environment divides noise into three categories; disturbing, impulsive and constant noise. Disturbing noise is not harmful in itself, but is instead part of an unhelpful and potentially stressful work environment. Impulsive noise is a sudden and very loud sound.

Constant noise is a more or less constant noise level, e.g. machines in a factory (Videnscenter for arbejdsmiljø, 2016).

We have observed and brainstormed on sounds occurring in the kitchen and categorised them using the mentioned categories and added the category “wanted noise” to be able to distinguish the noises during ideation (Worksheet 21). The conclusion of this research was that wanted noise, such as television and radio, can be categorised as both disturbing and wanted noise depending on whose perspective it is seen from, which makes it impossible for us to highlight one from another. The impulsive and constant noises depend a lot on materials, hence reducing the noise level through materials is a great opportunity to ideate on.

ILL. 12: KITCHEN TYPES' PRO AND CONS



ILL. 13: MEASURED NOISE LEVELS

DWEA has defined four categories for working environments in which we have placed the private kitchen-dining room in the category "Attention and Effortless Conversation" as this category covers environments where it is essential to be able to have an effortless conversation or precision, speed and attention is required. A normal conversation reaches 55-60 dB and other noises in the room should be about 10 dB lower in order not to be disturbing (Arbejdstilsynet A, 2013).

To get data on noise levels in the kitchen, which could be compared with the working environment rules,

we measured the noise level during three different cooking scenarios (Worksheet 20, 26-27). The measured noises were identified and categorised into disturbing noises (50-90 dB), impulsive noises (40-96 dB) and constant noises (50-80 dB) (ill. 13). The measured noises are unable to cause serious hearing damage because of the short amount of time the user is exposed to the noise (Worksheet 28). However, some of the measured noise exceeds the limit for an effortless conversation, especially work around the sink and the cooker hood area (unless the cooker hood motor is installed above the ceiling, which lowers the noise level to 40-45 dB).

CONCLUSION

The measured noise levels from the kitchen tests are not alarming regarding hearing damage, but it might be hard having an effortless conversation and cook simultaneously, as the noise level should be 10 dB lower than the conversation level, which usually is 55-60 dB, in order not to disturb the conversation.

REFLECTION

The rules by DWEA are addressed at businesses and therefore not directly applicable in private homes, as it is the consumer's own responsibility. However, it can still be used as a guideline.

OTHER KITCHEN PROBLEMS

A survey about kitchen problems in general was also conducted at the beginning of the project to uncover potential problems to work with (Worksheet 7). The main issues were related to cleaning of domestic appliances, as well as organising and poor storage solutions. Furthermore, too few power sockets, too low/high work height, inefficient cooker hoods and not enough space was mentioned many times.



The concept should be easy to clean.

1.6 TRENDS

As mentioned in the section about influencing industries, it was concluded that we needed to research on trends within the kitchen, food and domestic appliances industries to get a better understanding of where these industries are heading.

In the book 'Trendsociologi', Louise Byg Kongsholm and Cathrine Gro Frederiksen divide trends into 6 phases; type of society, paradigms, global trends, megatrends, microtrends and fads (Kongsholm and Frederiksen, 2015). This project deals with three of these categories to find directions for the future, 2025, type of society, global trends and megatrends. Type of society is very broad and covers all aspects of society. This type will only be described briefly, while global trends and megatrends are more specific and will be described more comprehensively on the following pages.

TODAY'S SOCIETY

Type of society reflects waves and mainstreams, which leave marks on the values in the society, and characterizes the society in longer periods of time. The change of society happens faster than ever. Only 5 years ago, the dream society with feelings and dreams in focus started, and 20 years before it was the information and science society with the individual in focus. The world has just turned into the so-called creative society where ideas and innovation are in focus (Kongsholm and Frederiksen, 2015). According to financier, entrepreneur and author, Lars Tvede, it is necessary to mobilize creativity in order to avoid a static society that leads to pessimism and collapse (Tvede, 2014, cited in Kongsholm and Frederiksen, 2015, p. 87).

GLOBAL TRENDS

Global trends have a lifespan of 10-30 years and have a radical impact on the society. Examples of global trends are globalization, immaterialization, privatization and digitalization. Also the wide "green" global trends about e.g. climate change, sustainability and new forms of energy are more popular than ever before. The green wave has now changed to the blue wave because water has become the "new global concern" (Shah, 2015, cited in Kongsholm and Frederiksen, 2015, p. 213). According to sociologist and futurologist Birthe Linddal Jeppesen there will be even more focus on a "save the planet" theme where local sustainability, no plastic, stop food waste and save water are essential aspects (Jeppesen, 2015) or this is at least one direction towards a future that fits well with the new "blue" theory.

MEGATRENDS

Megatrends are characterized by being longer trends, which defines the spirit of time in periods of 3-7 years. Megatrends are connected to lifestyle, not specific product categories, and are often used in product development of products with a longer development time. The majority of megatrends are in a field of tension between contrasts, e.g. materialism vs. immaterialism, fast vs. slow down and urban vs. rural. The consumers want to have the best of both worlds, resulting in a change from having to choose either or to being able to have both, e.g. urban gardening (Kongsholm and Frederiksen, 2015).

CONCLUSION

Global trends and megatrends will be used to explain and spot directions of the future domestic appliances.



Research on the future consumer to gain insight about consumer needs.



Research on kitchens and domestic appliances from a historic perspective to be able to understand and spot trends.



Sustainability should be integrated in the concept.

1.6.1 HISTORIC PERSPECTIVE

We have divided the most influential industries in this project into the following categories; kitchens, food culture, and domestic appliances. Each of the industries will be explored in a historic perspective as trends tend to run in a cycle, where old trends come back again and again and new things emanate from old things. Therefore, it is relevant to research on the development of these aspects through history to get an overview of the changes and be able to identify a pattern that might give some clues to how domestic appliances will develop in the future.

1.7 KITCHENS' FOCUS

The history of the kitchen has of course been influenced by changes in society through time, both gender history, design and social aspects have influenced the way kitchens are designed today. Particularly the evolution during the last 150 years affects how kitchens are designed today. Many factors, such as the global trends; industrialisation, economic growth, women entering the labour market and the welfare state, have all left their marks on how the kitchen is used and organized today (Engholm, 2008). The most important changes regarding placement and layout of the kitchen are explained in this section (ill. 14).

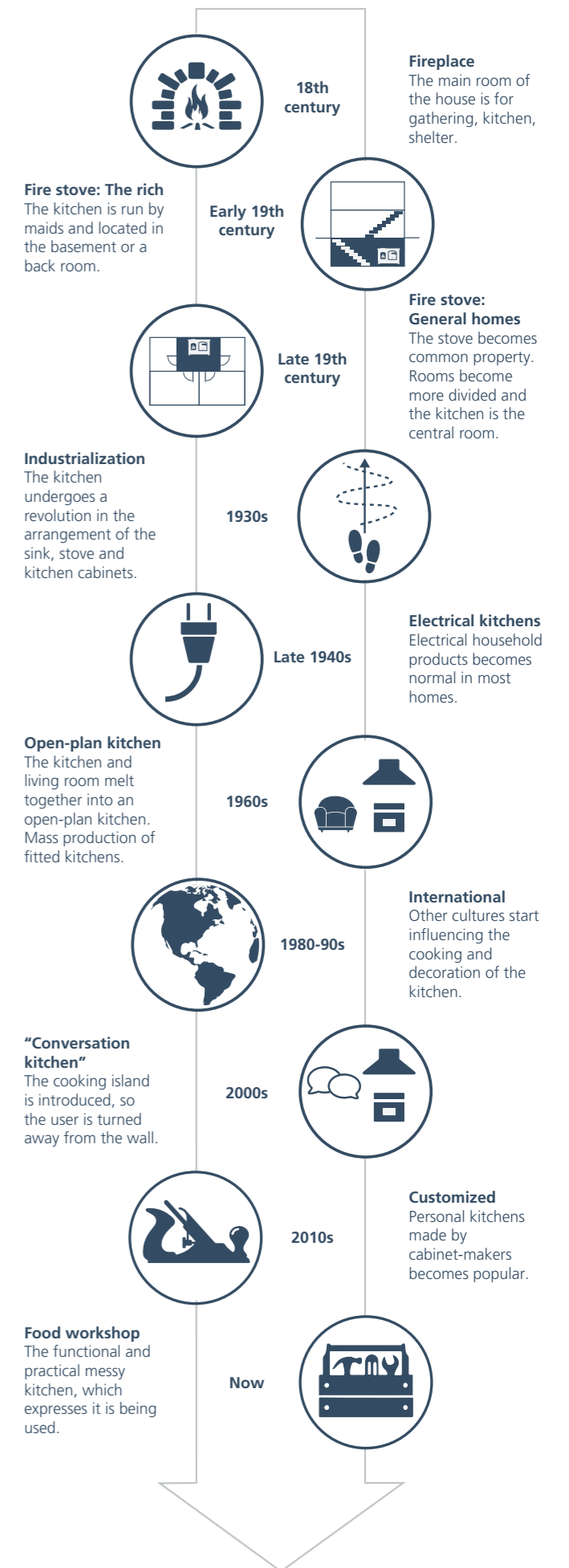
It was not until the middle of the 19th century that the modern kitchen made its entrance in Denmark, where the fireplace was replaced with a stove. Initially, it was only in richer homes, where they had enough space and maids to cook. Therefore, the kitchen was located in the basement or a back room far from the living rooms. In contrast to the rich homes, the kitchen in working class homes was a central room as space was limited and the family cooked for themselves. Around the turn of the 20th century, kitchens become smaller and its former functions are divided into several rooms.

During the 1930s, the kitchen undergoes a revolution regarding the layout inspired by lean thinking in the industry, resulting in a new and more convenient placement of the sink, stove and kitchen cabinets. After World War II, electrical appliances begin their entry in the kitchen and the dream of an electrical kitchen became fulfilled in most homes through the spreading of electrical household products.

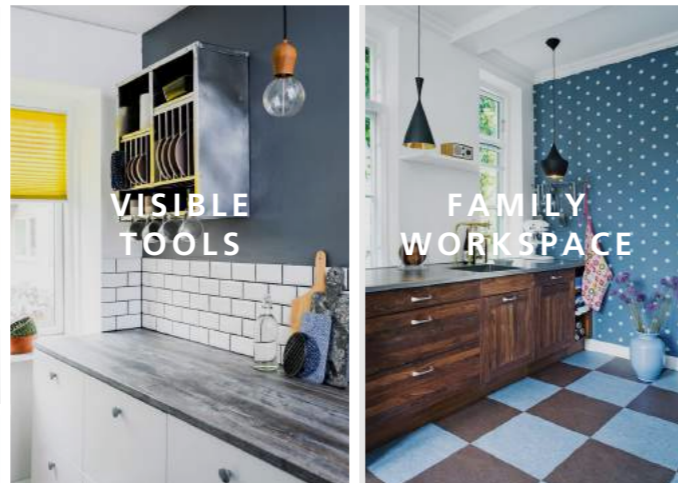
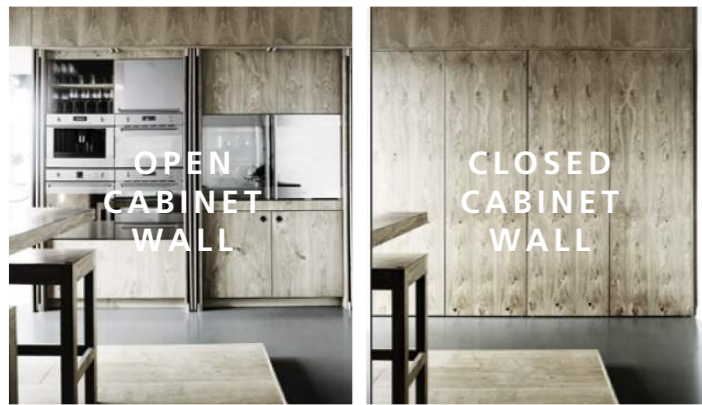
The housewife kitchen from the 1950s became more social in the 1960s, as the dining area became bigger and the open-plan kitchen was introduced (Hansen, 2014b).

The "conversation kitchen" was introduced by the kitchen company Kvik in the beginning of the 21st century as part of their campaign for a kitchen that brings families together at a time where divorces and alternative family constellations are becoming more and more common.

Around 2010 everything had to be customized, clean lines and surfaces became popular. According to the trend institute PEJ Gruppen, the trend can be described using the keywords "calm fusion" and "complex simplicity" (Møller, 2016, WS3). Calm fusion is about silence being the new luxury. In line with this, people become more conscious about the



ILL. 14: TIMELINE OF THE KITCHEN HISTORY
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ILL. 15: CALM FUSION EXAMPLES

ILL. 16: FOOD WORKSHOP EXAMPLES

extensive use of digital media, which will result in an increased use of "digital detox", where you stay away from digital media for a certain amount of time to get a balance between analogue and digital life. Complex simplicity refers to products that appear simple on the outside, but are complex on the inside. The principles of calm fusion help the busy consumer to hide mess and filter the impressions of everyday life, making it easier to balance between the digital lifestyle and the digital detox (ill. 15).

The newest trend is that the kitchen should work like a food workshop, where practicality and functionality is in focus, and the kitchen elements are drawn towards the walls to utilize the space best (ill. 16). This trend goes in the opposite direction of calm fusion, as the food workshop should express that it is a work space, which is used and not just completely clean white surfaces (Hansen, 2014a). Furthermore, self-supporting and urban farming has become a trend as the consumer is willing to take the time to make a homemade meal and use more time in the kitchen, at least in the weekends (Madkulturen, 2016). This tendency, the so-called 5/2 principle, where the kitchen is used less for cooking on weekdays, but instead serve as a social gathering place where various

activities happen, and on the other hand has to be ready for advanced cooking in the weekends, calls for a certain amount of adaptability in order to fulfill shifting needs during the week.

CONCLUSION

The role of the kitchen has changed several times through history, influenced by changes in society. The kitchen has changed back and forth between smaller separated kitchens and bigger, more open kitchens where the kitchen also serves other purposes. The big kitchens are back and they are still working as a gathering place for the family.

While researching on the changes through history within the three chosen industries (kitchens, food culture and domestic appliances), we used an Eras map (Kumar, 2012, cited in Kongsholm and Frederiksen, 2015, p. 326) to structure the information about the different eras in order to get an overview of potential emerging patterns that can be used to predict future directions for what may happen in 2025.

An eras map containing a sum-up of all chosen industries can be found at the end of this phase (ill. 25).

	KITCHEN UNITS	KITCHEN FOCUS	SOCIETY
1960	Housewife kitchen with dining area, cooking island, open-plan kitchen, standardization of kitchen units. Rustic materials, use of wood, brown, beige and olive green, tiles in kitchen.	Housewife kitchen and standardization of kitchen units	Industrial society
1980	Kitchens become larger and more social, multifunctionality is necessary.	International inspiration and multifunctional	Information society
2000	User is turned away from the wall, towards the cooking island with bar stools. Focus on minimalistic and clean styling, white and polished surfaces.	The conversation kitchen and lifestyle	Dream society
2010	Tailor-made kitchen with calm fusion, high quality and clean solutions: handle-free drawers, hidden power sockets, cooking area behind cabinet walls. Cooking island becomes sink island.	Customized and calm fusion kitchen	Dream society
2015	Kitchen must be practical and functional. User is turned toward the wall and the island disappears. Fresh herbs on the table top and open shelves. Social aspects is still important.	Kitchen as a food workshop	Creative society
2025	Influenced by urban farming and eco-lifestyle trends: Sustainable materials and plants.	Adaptable kitchen	Intelligent society

ILL. 17: TIMELINE OF KITCHEN UNITS, TRENDS

1.8 KITCHEN UNITS

The aim is to get an overview of the history of Danish kitchen trends from the 60's to today to identify potential overlaps or patterns that may be reused in the future. A trend lecture, interviews with kitchen salesmen and desk research, gave us a lot of insight into new overall trends within the kitchen industry, as well as an understanding of new aesthetic directions in the kitchen area.

The Eras map (ill. 17) shows the most significant characteristics in relation to kitchen units and kitchen layout, and points out the main focus in each era.

One of the main patterns that can be extracted from the Eras map is the role of the cooking island, which changes the user orientation in the kitchen. During the eras where the island is a big part of the kitchen, the user is oriented outwards in the room, instead of being turned towards the wall. These eras are also the periods where the social aspects of the kitchen are valued.

However, the social aspect is still important in 2015 even though the kitchen layout tend to be oriented towards the wall again and the island is gone because of the impracticalities linked with it (Hansen, 2014a). The tendency to choose hideaway solutions and

calm fusion is consistent with some of the tendencies observed at kitchen stores (Worksheet 6, 29-30). Furthermore, according to these observations, wall cupboards are also becoming less common.

1.8.1 SIGNAL SCANNING CARDS

Another method used in trend spotting is signal scanning (Ansoff, 1975, cited in Kongsholm and Frederiksen, 2015), which is about searching widely for weak signals that can indicate a new trend with the purpose of being able to spot the trends early. We have used an adjusted version of the signal scanning cards in an attempt to map global trends and megatrends found through research on social media, trends sites and futurologists. The signal scanning cards describe the found example, its potential and what trend the example could be an example of.

The signal scanning cards 1-6 (ill. 18) show a clear tendency towards urban farming and the desire to bring plants into the kitchen. Eco-friendliness and sustainable living are also trending themes, which might influence the materials and technologies used in kitchens in the future.



1

ANIMAL SELF WATERING PLANTS

Description: Flowerpot that measures when the herb needs water.
 Potential: **Self-living plants** while consumer travels.
 Influenced trends: Sustainable living and **urbanfarming**.



2

FLOWERPOT

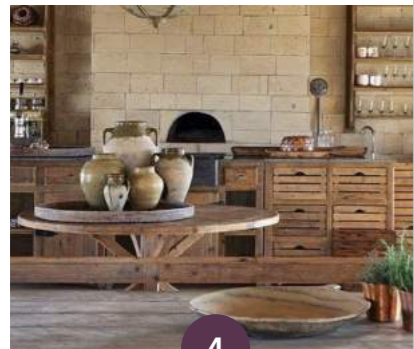
Description: Lots of **flowerpots** in the kitchen.
 Potential: Make your home **alive**.
 Influenced trends: Sustainable living and **urbanfarming**.



3

HEMP AND BIO-DEGRADABILITY

Description: Everything should be bio-degradable.
 Potential: **More reusable plastic types**.
 Influenced trends: Sustainability.



4

ECO-RETREAT

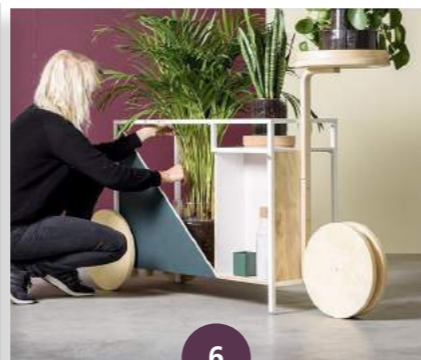
Description: Communal kitchen in Kenya that is a part of **eco-retreat** Segera.
 Potential: **Simple living** and room for eco-retreat.
 Influenced trends: Sustainability and **eco-friendliness**.



5

DIGITAL DETOX

Description: Stay away from digital media for an amount of time to get balance between analogue and digital life.
 Potential: The ability to relax and rest in a complex world.
 Influenced trends: **Anti-technology**.



6

NATURE

Description: The combination of these 3 common plants **filter toxins** and create measurably **cleaner air**.
 Potential: Solutions by nature rather than technology such as air cleaning.
 Influenced trends: Health focus and **eco-friendliness**.

ILL. 18: SIGNAL SCANNING CARDS FROM INSTAGRAM PROFILES

CONCLUSION

The layout of the kitchen has switched between being oriented towards the wall and away from the wall with the emergence of the kitchen island in various versions (cooking island, sink island etc.). If the pattern continues, the island might come back in some form in the future. Furthermore, it seems like sustainability, urban farming and eco-lifestyle will be characterizing for the kitchen in the future as several emerging trends point in this direction.

	FOOD TRENDS	KITCHEN FOCUS	SOCIETY
1960	Traditional Danish heavy food (e.g. meat balls with gravy sauce and boiled potatoes). Appetizers such as porridge, gruel or sweet soups.	Housewife kitchen and standardization of kitchen units	Industrial society
1980	Italian and American inspired food (pasta and pizza), fast food and convenience food. Counter reaction: fish and vegetables.	International inspiration and multifunctional	Information society
2000	Welcome cocktails, sipping wine, gourmet coffee, sushi, low fat food, ecological goods.	The conversation kitchen and lifestyle	Dream society
2010	Danish goods, 5/2 principles (weekdays = convenience food, weekend = home-made food). Nordic food like oatmeal porridge and raw food.	Customized and calm fusion kitchen	Dream society
2015	Local goods, gluten free, free-from products, luxury convenience, greener lunch, sustainable meat, self-supporting with urban farming.	Kitchen as a food workshop	Creative society
2025	Local sustainability, support local produce. More vegetables, less meat, honest food.	Adaptable kitchen	Intelligent society

ILL. 19: ERAS MAP, FOOD CULTURE AND TRENDS

1.9 FOOD CULTURE

Food habits influence how and what kitchens and domestic appliances are used, so it is relevant to get an overview of Danish food habits through the years in order to see if they can give any directions for future food habits. Two lectures about food trends and consumer needs (Worksheet 15) and desk research have been the main source in this section.

The eras map shows the different food trends since the 60's until now and suggests the food trends for 2025 (Worksheet 41). The food history has been used to spot potential trends because the timeline shows a clear tendency that the consumer gets inspired by other cultures and cares more and more for ecology and sustainability.

The signal scanning cards 7-12 (ill. 20) show tendencies towards focus on sustainability, ecology and urban farming, as well as focus on stopping food waste and supporting food production in developing countries, the plant's power - from animal to vegetable, saving water, recyclable packaging. The megatrend is about saving the planet because of CO2 emissions, lack of

water, the excessive food waste in the world, the plastic islands in the oceans and lack of animal welfare. Overall the life around food must be less harmful to the planet (Jeppesen, 2015).

CONCLUSION

The patterns found in the eras map on food culture (ill. 19) is that the interests in climate-friendly, sustainable and local food are becoming more and more important to the consumers in the future.



7

HONEST FOOD

Description: Food is completely visible, packed in a very **honest and direct packaging**.

Potential: The consumers see what they get.

Influenced trends: Ecology, health focus.



8

INDOOR GARDENING

Description: An avocado tree as **indoor gardening**.

Potential: Farming own vegetables and fruit.

Influenced trends: Ecology and **urbanfarming**.



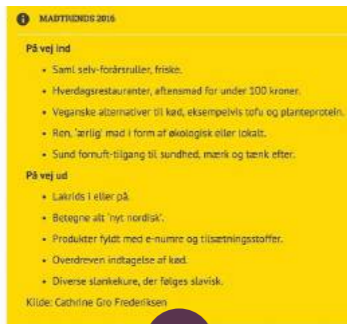
10

ANTI-FOOD WASTE

Description: An anti-food waste concept in Oslo that sells **ugly vegetables**.

Potential: Better use of all types of food.

Influenced trends: **Stop food waste**.



11

FOOD TRENDS 2016

Description: More vegetables, honest food and common sense.

Potential: More simple living.

Influenced trends: **Globalization**, ecology and health focus.



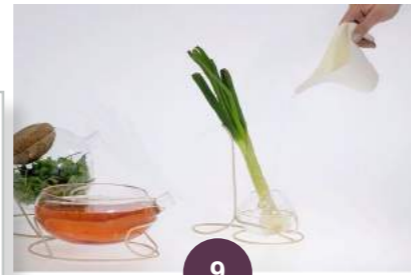
13

GINGER SHOT

Description: Today's busy consumer takes gingershots and dreams about a life in balance.

Potential: A quest for purpose.

Influenced trends: **Health**.



9

"GRÖNT"

Description: Grönt is a **storage system** by Agnes Sjöberg.

Potential: The vegetables are **kept fresh** for longer by storing them similarly to how we store freshly cut flower in vases and their location in the kitchen reminds us to **eat our veggies**.

Influenced trends: Sustainable living and **urbanfarming**.



12

VEGGIES

Description: Vegetarian, part-time vegetarian or flexitarian.

Potential: Danes will eat more vegetables than meat.

Influenced trends: Ecology, sustainability.

"Earlier people had **1½-2 hours** for themselves each day, this is changed to only **20 minutes**" (PEJ-gruppen, 2016)

"Time and presence is the new luxury" (PEJ-gruppen, 2016)

1.10 TODAY'S CONSUMER

It is necessary to acquire some knowledge about today's consumers and identify tendencies that influence the way Danes use their kitchen in order to define a target consumer. This knowledge was mainly obtained through lectures by PEJ-gruppen and Madkulturen at FoodExpo 2016 (Worksheet 15).

As time is scarce and people are becoming more and more busy, time and presence is a luxury. Earlier people had 1½-2 hours for themselves each day, this has now changed to only 20 minutes. The answer to the lack of time seems to be to make life more efficient, so the consumer looks for solutions to optimize their lives in every aspect. Everything that can be measured is measured, there are apps for everything to control your life, but on the downside all these apps take time and might cause even more stress (Kongsholm, 2016, WS 15). Furthermore, it is confirmed by the Danish Health and Medicines Authority that the tendency to be online and almost always available to reach no matter where you are and what you do, also contribute to the rising stress levels (Kristensen and Nielsen, 2007, WS 19).

The consequence of lack of time is stress and fast solutions, which results in the basic needs, such as food and sleep, are not fulfilled. This results in a food culture where ready-to-eat, fast food, semi-convenience food becomes the quick solution.

A counter reaction to this is slow food and high involvement in cooking. Many consumers fit into the 5/2 principle, which means that they use quick solutions and spend less time in the kitchen in the weekdays, but spend more time on cooking in the weekend to compensate for the lack of cooking on weekdays. There is a tendency to take shortcuts and pay for the "boring part", so the consumers only have to do the fun part by themselves and save time on the

boring tasks, e.g. buying the pizza dough and only have to put filling on at home (Kongsholm, 2016, WS 15).

Regarding target consumer, the group who will become the main target group in 2025, are the ones who are families with children now. According to Madkulturen, families with children cook from scratch 50% of the time and every third meal is made with semi-convenience food. Even though they choose the easy way every now and then, they cook on a higher level and tend to try new recipes more often than other groups. This behaviour should be considered when developing concepts.

CONCLUSION

The lectures gave a lot of insight into the behaviour of today's consumer and have contributed to the selection of the current target consumer: the busy consumer with shifting needs regarding the kitchen, who does not necessarily have a lot of time on hand to spend in the kitchen every day, but wants the possibility. Hence, the kitchen should be able to adapt to the consumer's shifting needs.

REFLECTION

The target consumer is based on today's consumers. As the project is centered around designing for the future, more research on future lifestyles is necessary.



More research on future lifestyles 2025 to gain more insight about consumer needs.



The "boring" parts should be easy to do or self-regulating.

ILL. 20: SIGNAL SCANNING CARDS FROM INSTAGRAM PROFILES

“Everyone are **connected** with everything” (Wevolve, 2013)

“**Mindfulness, immaterial experiences** as well as **holistic wellbeing** are important factors” (Wevolve, 2013)

1.11 FUTURE LIFESTYLES 2020

To support the choice of target consumer, research on possible future lifestyles in a broader perspective is necessary. A report made for European Forum on Forward Looking Activities (EFFLA) by the research and strategy agency Wevolve describes four future lifestyles, which are likely to become dominating in Europe and the US in 2020 (Wevolve, 2013).

“AUGMENTED AND PROGRAMMED LIVES”

This lifestyle evolves from the increasingly digital lives, where everyone is connected with everything through the internet and cloud services. Self-monitoring using tracking devices to become better and better, both physically and mentally, is increasing.

This lifestyle is reflected in the future kitchen concepts by IKEA and IDEO with e.g. an induction smart tabletop (Worksheet 5) and Whirlpool’s concept “Interactive Kitchen of the Future” with a smart sink combined with a dishwasher and a tracking display (Whirlpool, 2016) fit into this lifestyle.

“CULTURE OF PRODUCING AND SHARING”

There will be a change from the consumer society to a producer society, where materialism and consumption recede into the background, while creating and sharing will become more prominent. The growing DIY culture and focus on sharing resources are central for this lifestyle.

“RESILIENT AND PROACTIVE CITIZENS”

A growing number of people are turning to a lifestyle based on the principle of resilience, adjusting to

live in an unforeseeable and imbalanced world. As resources are not abundant, new ways of sharing and crowdfunding are emerging, and communities become more self-reliant with locally produced goods.

“THE QUEST FOR PURPOSE”

This lifestyle is re-evaluating what is important in life. The “enlightened consumption” is the base for a lifestyle where mindfulness, immaterial experiences as well as holistic wellbeing are important factors. A sign of the emergence of this lifestyle is the shift in how the rich spend their money. Earlier it was about creating value for themselves, today it is becoming more about making the world a better place (Lyngsø, 2015).

CONCLUSION

The future lifestyles are supporting the research on trends and future kitchens, especially the lifestyles “augmented and programmed lives” and “the quest of purpose”. The target consumer somehow shifts between these two almost opposite lifestyles; the consumer lives the digital lifestyle and then shifts to the more or less opposite, where focus is on mindfulness and presence, when the consumer needs a break from the digital lifestyle.



14

TRANSFORM USED PLASTIC

Description: Transform your used plastic bottles into vases with 3D-printed structure by Libero Rutilo
Potential: **Reuse plastic products.**
Influenced trends: Minimalism and **sustainability.**



15

FAMILY FIRST

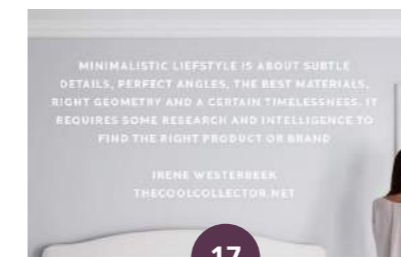
Description: The family will overrule the career.
Potential: Use time on family or social events.
Influenced trends: Family values and **social gatherings.**



16

ECLECTIC AND MINIMALISTIC

Description: Living room of Jeremy Anderson and Gabriel Hendifar.
Potential: **Lighting as art** in a minimalistic way.
Influenced trends: **Minimalism** and eclecticism.



17

LIVING-WITH-LESS

Description: Living-with-less with best materials and **timeless expression.**
Potential: From quantity to **quality** and **long lasting** products.
Influenced trends: Sustainability and **minimalism.**



18

TOUCH

Description: The more technological the world gets, the more **we crave touch.**
Potential: High tech may lead to **senses**, feelings and desires for textures as a new luxury.
Influenced trends: **Technology.**



19

HUMAN SOCIAL RESPONSIBILITY

Description: Consumers find a case that they are **passionate** about and use it as branding.
Potential: HSR becomes an import part of your career.
Influenced trends: **Human social responsibility** and sustainability.

ILL. 21: SIGNAL SCANNING CARDS 13-19 FROM INSTAGRAM PROFILES

1.12 THE FUTURE CONSUMER

The two future lifestyles about augmented and programmed lives and the quest for purpose are reflected in the signal scanning cards 13-19 (ill. 21). They show a tendency to focus on softer values, hence the quest for purpose, such as family, sustainability and human social responsibility. The sustainability focus also influences a minimalism wave, where living-with-less and timeless, long lasting products with simple geometry are central. The augmented

and programmed lifestyle also increase the desire for social contact and touch, but might also be able to help this through development of holograms that allow virtual hugs to be sensed as real (Lyngsø, 2016).



Sustainable products with minimalistic style and simple geometry seem to be the future.



20

ROBOTS ARE COMING

Description: Pepper is a **humanoid robot** that can communicate with humans through his voice, touch, and the expression of his emotions.
Potential: The new nanny and personal assistant.
Influenced trends: **Robotics** and technology.

Be enthusiastic experts
Offer solutions not more choice
Craft it specially
Get your customers involved

21

OFFER SOLUTIONS

Description: Companies should offer solutions and **not a lot of choices** in the products.
Potential: More simple living and less concerns.
Influenced trends: **Digital detox.**



22

EVERYTHING IS ORGANIZED

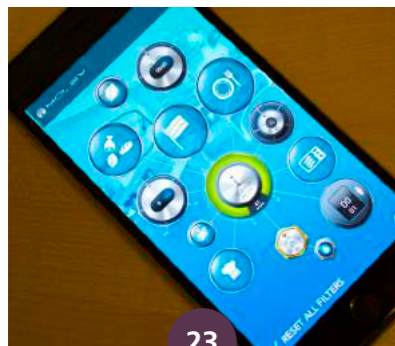
Description: In Tokyo the cleaning tools in stores are neatly **organized**.
Potential: Creating an overview of everyday life.
Influenced trends: Digital detox and minimalistic lifestyle.



24

PHYSICAL INTERACTION

Description: The more technological the worlds gets, the more **we crave touch, physical interaction, nature**.
Potential: High tech may lead to **senses**, feelings and desires for textures as a new luxury.
Influenced trends: **Technology.**



23

CONNECTIVITY IS EVERYWHERE

Description: Even simple devices will communicate with the user, but also with each other.
Potential: Creating **self-regulating systems**.
Influenced trends: **Connectivity** and technology.



25

INTELLIGENT LIGHTING

Description: **Intelligent lighting** effects the learning and working environment positively.
Potential: Better learning and working environment.
Influenced trends: **Smart technology.**

ILL. 24: SIGNAL SCANNING CARDS 19-25 FOR DOMESTIC APPLIANCES

smart tabletop, which helps the user to prepare a meal providing guidance and recipes (IKEA, 2015). Panasonic's kitchen of tomorrow is also based on smart devices used to control the home. By placing cameras in ovens and refrigerators it is possible for the smart device to help determine what to cook and if the food is ready (McGrath, 2015). Whirlpool's future kitchen concept is somewhat similar to Panasonic's, as they have a vision of an interactive kitchen where

a main unit controls everything, from the calendar to what to pack in the kids' lunch packs (Whirlpool, 2016). The intention is to help the busy consumer, but as seen on the signal scanning cards (ill. 24), the consumers become overwhelmed by the many choices and start to prefer solutions instead of choices, which also corresponds with the term living-with-less. This creates a potential in self-adjustable products that

	FOOD TRENDS	DOMESTIC APPLIANCES	KITCHEN UNITS	KITCHEN FOCUS	SOCIETY
1960	Traditional Danish food with starters like sweet soups or porridge	Electrical stove, freezer and fridge becomes common	Open-plan kitchen with dining area and cooking island	Housewife kitchen and standardization of kitchen units	Industrial society
1980	International food, convenience food and fast food	All kinds of electrical appliances improve the cooking skills	Larger kitchens and multifunctional	International inspiration and multifunctional	Information society
2000	Welcome cocktails, sushi, low fat food, ecological goods	Energy label and power savings	User turned away from the wall and cooking island with bar stools	The conversation kitchen and lifestyle	Dream society
2010	5/2 principles, Danish goods, Nordic food and raw food	Smart domestic appliances	Tailor-made, hidden solutions, cooking area behind cabinet walls, free/sink island	Calm fusion and customized kitchen	Dream society
2015	Luxury convenience, greener lunch, local goods, sustainability	More programmed cooking, flexibility and customization	Practical and alive. User turned towards the wall and island disappears	Kitchen as a food workshop	Creative society
2025	Local sustainability, support local produce and more vegetables, less meat	Self-adjusting and connectivity	Farming shelves and more space for domestic appliances	Adaptable kitchen	Intelligent society

ILL. 25: COMPLETE ERAS MAP SUMMING UP THE CHARACTERISTICS OF THE CHOSEN INDUSTRIES

can adjust to the user's needs without using robots to take over completely and make the user unnecessary as is the case with Moley's kitchen chef (p. 14-15). As the target user values time for cooking, but is willing to pay for the uninteresting parts, this seems to be the direction to go.

CONCLUSION

The future of domestic appliances is characterized by focus on sustainability and climate friendliness, but also with a huge focus on technology and the possibilities the technology development creates, such as self-adjusting appliances and connectivity. The technology and increasing use of robots also influences the our social behaviour, making social gatherings an important aspect in the future as well.

REFLECTION

The mentioned keywords are what we identified and categorised as the most important and most obvious tendencies in domestic appliances, but there are most likely also other tendencies, which could be highlighted as well.



Connectivity is a must for future products



Self-adjusting to user's needs at a given time.



Provide solutions instead of many choices.

1.14 PHASE CONCLUSION

The information gathered throughout the discover phase is narrowed down and specified in the design brief 1.0 as a guidance for the concept development with areas of priority and requirements.

1.15 DESIGN BRIEF

1.15.1 PROJECT OVERVIEW

The project is based on the design competition marking Miele's 50th anniversary in Denmark, which means that the team is cooperating with Miele Denmark. Through research containing observations, interviews and analysis, the focus is specified to the areas of priority (listed in the next column) regarding the kitchen-dining room for the living-with-less consumer in Miele's high-end segment.

The finished concept is intended to represent an entire kitchen concept with focus on domestic appliances to show Miele the opportunities of the future kitchen. One product will be detailed, while the rest will be on concept level.

1.15.2 PROJECT CATEGORY

As kitchens are such a big market and belong in a red ocean, it is essential to gain insight about the competitors and how the concept for Miele differs from the rest. From the initial research Miele positively differentiate themselves with products that contain electronic solutions for water related machines, while they are more average regarding other appliances.

Currently, competitors focus on smart devices and advanced technology with more and more options and choices, while research shows an emerging tendency in the opposite direction where living-with-less and solutions rather than options are desired.

1.15.3 TARGET CONSUMER

We want to design a kitchen concept for the consumer, who is living-with-less and stressed out from daily activities and therefore needs a digital detox from time to time. Today, time is in short supply, so this consumer is therefore willing to spend extra money on fulfilling physiological needs to gain more time and presence, increasing the possibilities of reducing stress. However, the consumer values to use his time in the kitchen area and is defined by the term 'foodie', or 'gastronome' and 'epicure', i.e. a person who enjoys food for pleasure. This type of person also focuses on experience, feeling and senses during cooking.

"How can we design a future Miele kitchen concept for 2025, which radically changes the experience of domestic appliances in private homes?"

OUR VISION IS TO ENHANCE THE JOY OF COOKING TOGETHER IN THE KITCHEN

1.15.4 AREA OF PRIORITY

The concept kitchen will be adjusted to Miele's product portfolio and inspired by 7 assumptions about how Denmark will be in 2025, based on research and analysis.

Following Miele brand values Social responsibility, sustainability, trustworthiness, quality and continuity are factors that Miele assign a high priority to.

'Blue' welfare society
The Danish Government wants Denmark to become more blue by saving water and use recyclable packaging as an extension to the energy-efficient society with focus on energy saving, ecology, green energy etc.

Living-with-less
From quantity to quality and long lasting products, minimalistic lifestyle is about subtle details, perfect angles, the best materials, right geometry and a certain timelessness.

The ability to choose
The complex lifestyle increases the need for being able to adjust to a given situation at a certain time, e.g. the 5/2 cooking principle.

Offer solution not more choices
The new consumer will prefer solutions rather than too many choices and possibilities because of their busy and complex lifestyle (Matthew Brown, 2014).

Living in a social kitchen
The kitchen is the central meeting place for the family, where social interaction takes places e.g. sharing food, doing other activities, work, homework etc.

Time and presence
Due to their busy and complex everyday life people want more time and presence, which increases the desire for mindfulness and immaterial experiences.

Connectivity will be everywhere
More and more devices will be able to communicate with users and each other, creating the possibility for self-regulating systems.

1.15.5 REQUIREMENTS

The found requirements are listed below: (The team knows that the criteria are unmeasurable and needs further refinement)

- » Sustainable and recyclable
- » Social responsibility
- » Trustworthiness
- » Quality
- » Comply with the new laws
- » Scandinavian design values with simple geometry and minimalism
- » Emphasize cooking area as a social gathering place
- » Easy cleaning
- » Self-adjusting for the boring parts
- » Connectivity
- » Solutions instead of options



IDEATION

This section describes the most significant concepts developed during the project, leading to the choice of final direction and definition of a clearer focus, which leads to the choice of concept to developed further in the concept development section.

External cooling Box

- Camera to tell where the products are
- Cooling Box placed in the bath
- slotted case
- no noise inside the drawer
- self close
- perfect light control colours in the drawer
- scale to increase productivity to add volume to production line

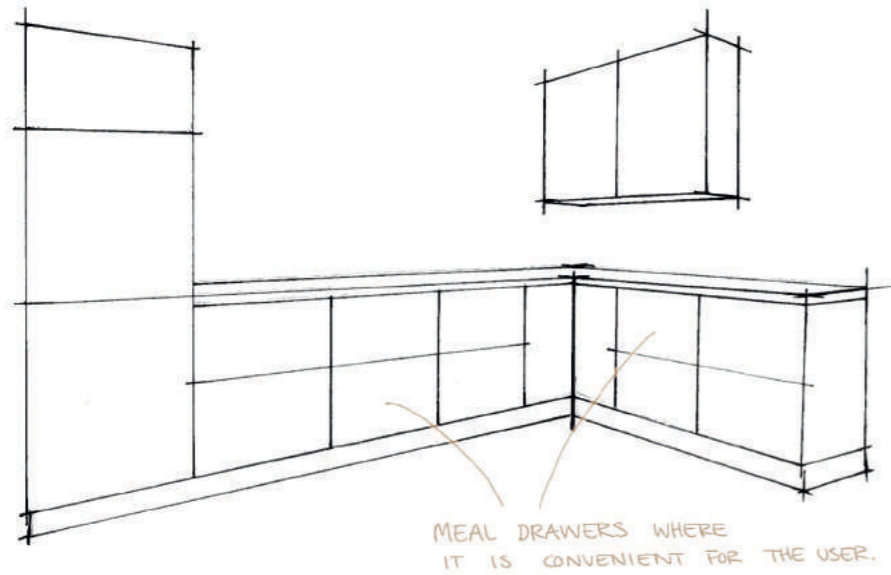
Key elements

- Modular
- Flexible temperature
- division of drawers
- system moves with
- Customizable
- Hide away solution

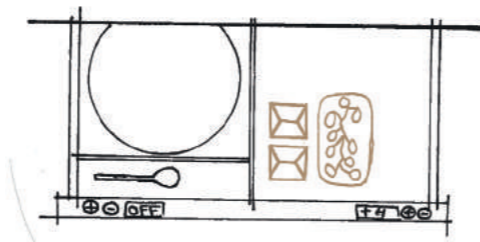
Key elements

- Modular units
- Customizable

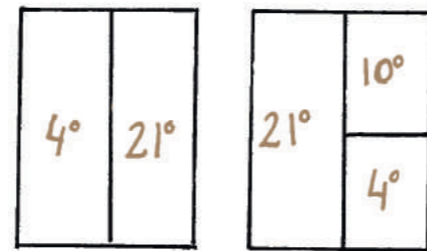




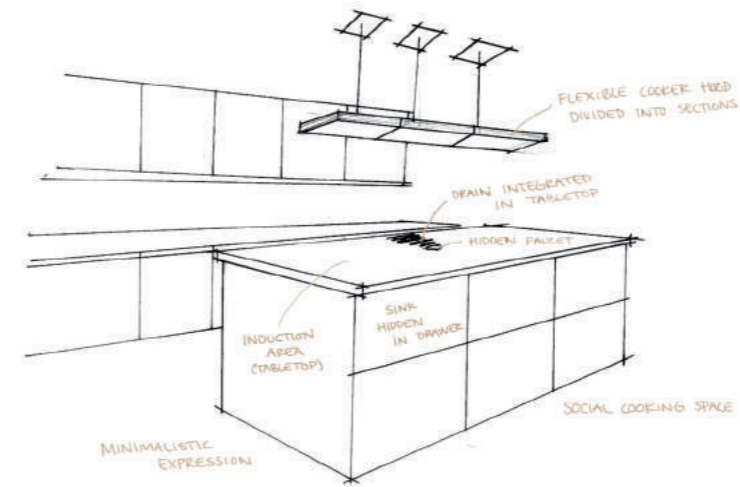
ILL. 26: MEAL DRAWERS REPLACE THE TRADITIONAL FRIDGE



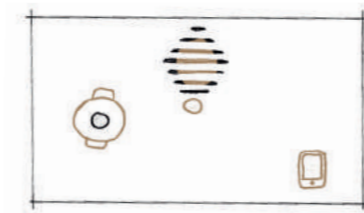
ILL. 27: MEAL DRAWER DIVIDED INTO SECTIONS (TOP VIEW)



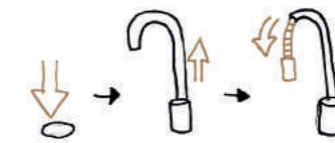
ILL. 28: ADJUSTABLE TEMPERATURES (TOP VIEW)



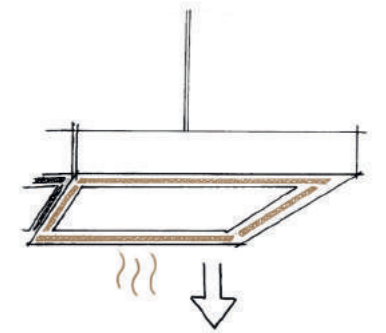
ILL. 30: MULTI ISLAND CONCEPT



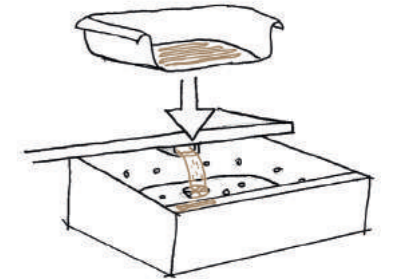
ILL. 32: INDUCTION STOVE TOP WITH HEATING AND CHARGING



ILL. 33: HIDDEN AND FLEXIBLE FAUCET



ILL. 31: FLEXIBLE COOKER HOOD



ILL. 34: DRAWER SINK WITH MOVEABLE GRILL

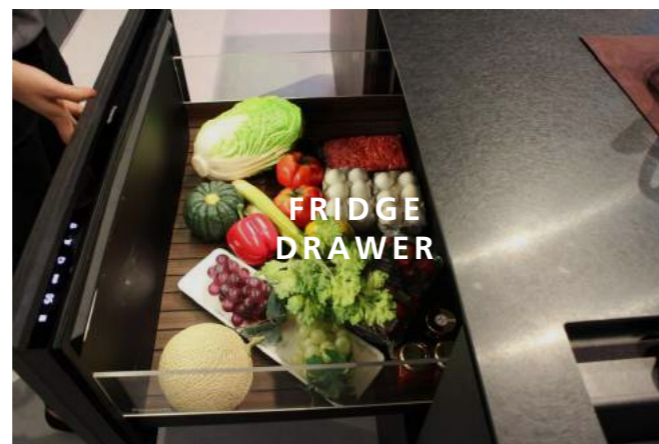
2.1 MEAL DRAWER

This concept was made early in the process, when we were still focused on using a completely problem-based approach, before the trend research started. The concept emanates from the observation of workflow and activity patterns in the kitchen. It was observed that people tend to walk long distances when preparing a meal in order to collect ingredients and tools (Worksheet 12). Focus was to optimize the workflow and improve the activity patterns in the kitchen.

The main idea of the concept is to make it possible to rearrange goods, tableware and tools in the kitchen, so the user can create the ideal workflow and activity pattern, customized for their specific needs (ill. 26). The concept is based on drawers, which the user can divide into smaller sections, depending on their needs (ill. 27). In each section, the temperature can be regulated and adjusted to the type of content the user wants to put in the section (ill. 28). Thus, the user can have everything needed for e.g. breakfast in one drawer, as one section can be fridge-cold, while another section has a higher temperature suitable for fruit or vegetables, and the third section can hold the tableware. By arranging the content of the drawers according to the user's habits, the activity pattern and workflow can be improved significantly.

REFLECTION

The concept is mainly about the layout of the kitchen and organization of the things in the kitchen. We must be careful not to begin designing kitchen elements instead of domestic appliances. However, the idea of changing the concept of a traditional fridge and divide the fridge into more than one unit is interesting. Later, we discovered that Panasonic's future kitchen concept has a similar idea (ill. 29) with pulling out the fridge like a drawer (McGrath, 2015).



ILL. 29: PANASONICS' FRIDGE DRAWER

2.2 MULTI ISLAND

This concept was made simultaneously with the meal drawer concept. It took its starting point in the fact that almost 50% of the respondents in the kitchen problem survey (Worksheet 7) needed more storage space on the kitchen table. The main focus was to create flexible solutions, so the tabletop could become as clean a surface as possible when needed. This also corresponds with the essence of calm fusion.

The concept is essentially a cooking island, where all cooking functions are integrated (ill. 30). The entire tabletop should be an induction area creating maximum flexibility, so the tabletop can be used by several people simultaneously, both for cooking and other activities, emphasizing the possibility for social gatherings. The induction could also provide charging of electrical devices (ill. 32).

Because of the large induction surface, the cooking spot can change from time to time. Instead of having a large cooker hood covering the entire island, the cooker hood is flexible and divided into sections, so the section closest to the chosen cooking area can be moved towards the pots, making it possible only to use one or two sections of the cooker hood, depending on how much suction is needed (ill. 31).

To maximize the space at the tabletop, the sink is in a drawer underneath the tabletop. The sink has

different programs for several common tasks, e.g. to rinse various types of vegetables or a regular dishwasher program (ill. 34).

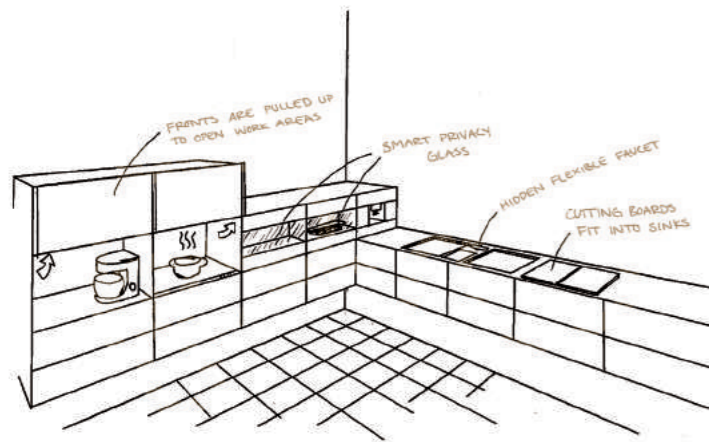
In the middle of the tabletop is a flexible faucet. When not in use, the faucet can be placed in a cavity in the tabletop, so the faucet does not take up any space. A flexible hose makes it possible to reach all parts of the tabletop with the faucet, so a pot can be filled without having to move to the sink (ill. 33). Next to the faucet, a drain is integrated into the tabletop, so the user does not have to use the drawer sink when only a small amount of water is needed.

REFLECTION

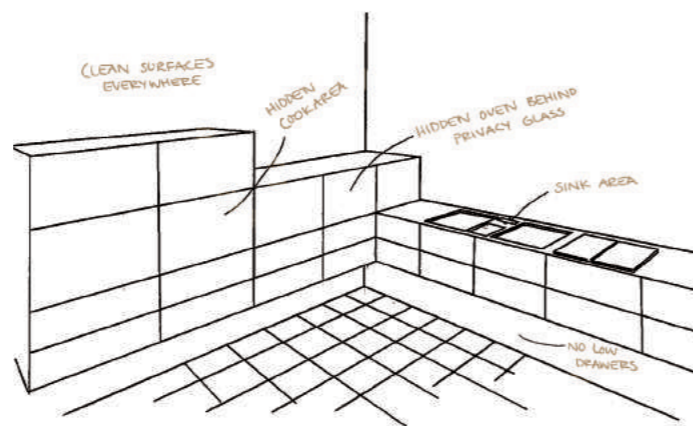
After some discussion the idea about a sink drawer was discarded as it seemed too inconvenient to hide the sink like this. Furthermore, the prevalence of the cooking island seems to decrease, according to our research, because of its unpractical function. Overall this concept focus more on calm fusion and minimalism than being functional, which is the reason the concept was discarded. However, we still think that a flexible and maybe self-adjusting cooker hood is an interesting idea to brainstorm on, as cooker hoods are one of the appliances that is uninteresting to spend time on and interact with.



Brainstorm on cooker hoods.



ILL. 35: THE CONCEPT WHEN NOT IN USE



ILL. 36: WHEN IN USE

2.3 MIELE MEETING CONCEPT

This concept consists of a collection of concepts for several domestic appliances, made for presentation at an introductory meeting with Miele to hear their thoughts about the initial ideas. The intention at this point was to come up with an entire kitchen concept, which had an unusual approach to the layout of kitchens, as the team had a hard time coming out of a thinking mode that was too rational.

The overall idea of the concept is that everything should be placed in the right height to enhance the ergonomics in the kitchen, so the user is always able to reach what is needed without having to bend down or lift things with a bad posture. Consequently, there are no low drawers, instead all cabinets are lifted up and mounted on the wall (ill. 35). Additionally, the idea is that it should be possible to have clean surfaces everywhere without any distractions when the kitchen is not in use to reflect the focus on calm fusion (ill. 36).

The cooking area, as well as smaller kitchen appliances, is located inside cabinets where the fronts can be pulled up when the user wants to use it. Having the working spaces inside cabinets makes it easy to hide the contents when finished using them.

The ovens and other similar appliances have fronts made of smart privacy glass, which can be turned on and off, making it either see-through or frosted glass, so the expression will be more calm when the appliances are not in use, as you cannot see the inside of the oven.

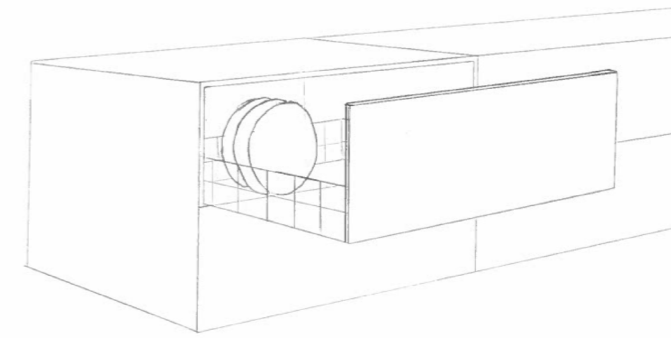
Another feature to keep the clean surfaces is the sinks with integrated cutting boards. When not in use, the cutting boards close the sinks, so the tabletop surface appear to be one flat surface. The flexible faucet and hose can also be hidden into the tabletop. The sinks are made of a flexible material, which yield when something is put into it in order to reduce the noise when an item hits the bottom of the sink (ill. 38).

Between the sinks, a small dishcloth disinfection machine is placed to avoid the problem with bacteria-filled dishcloths. Exactly what technology could be used for this still has to be investigated, if we choose to work more on this concept.

Finally, instead of having a traditional dishwasher, the dishwasher is split into two drawers, making it possible to wash smaller amounts or empty one of them, while the other is washing (ill. 37).

REFLECTION

This concept also has a strong focus on the layout of the kitchen, which should be toned down. Yet, there are elements in the different subconcepts that could be inspirational for other concepts or interesting to work with, which also could fit into Miele's product portfolio, such as the dishcloth cleaner or the idea about an isolated cooking area. However, we found that different types of dishwasher drawers already exist, e.g. Fisher & Paykel, so this idea does not contribute with anything new.

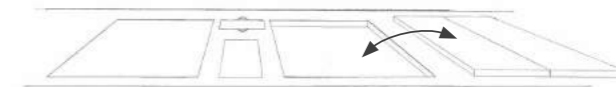


ILL. 37: DISHWASHER DRAWER SPLIT INTO TWO

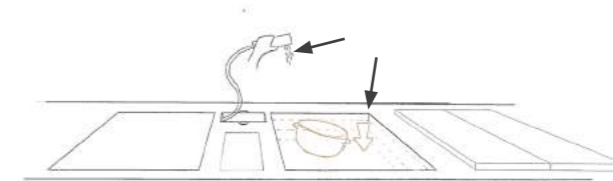
SINK AREA



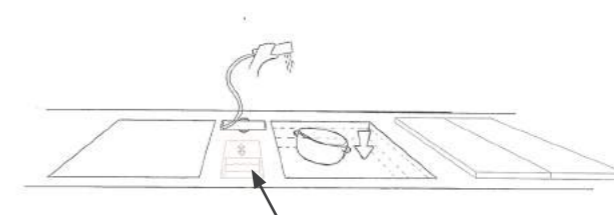
FIRST STEP: PLAN SURFACES



SECOND STEP: FITTING CUTTING BOARDS INTO THE SINK



THIRD STEP: FLEXIBLE SINK AND FAUCET



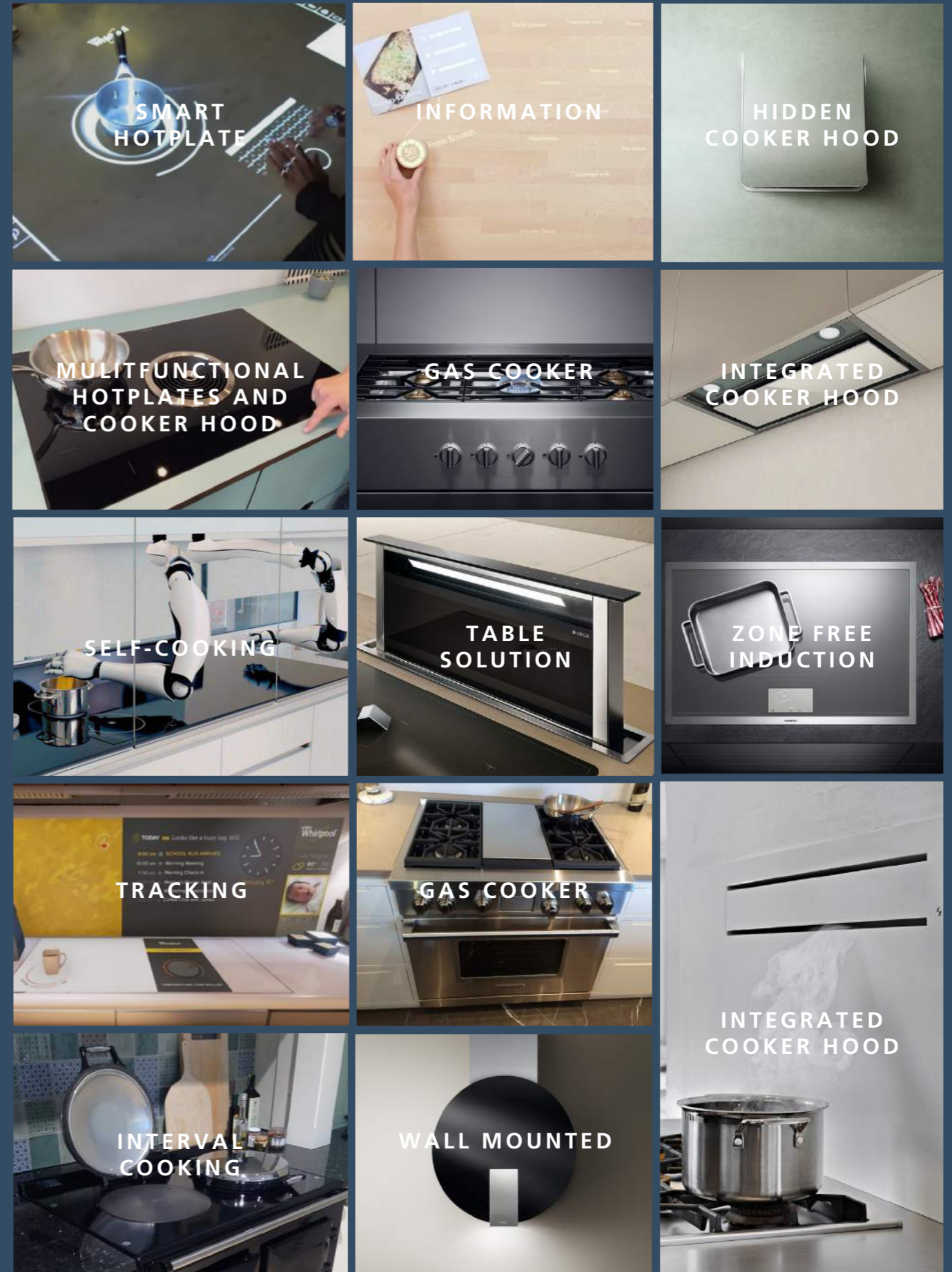
FOURTH STEP: CLOTH WASHING MACHINE

ILL. 38: SCENARIO: USING THE SINK AREA

2.4 PHASE CONCLUSION

The focus has been very broad, trying to cover domestic appliances for an entire kitchen. This resulted in too much focus on kitchen elements, and we found it necessary to narrow the focus down to one specific area.

As we found the cooking area interesting and since this is a central element in the kitchen, the cooking area was chosen as the new focus. Furthermore, we saw some potential in the idea of an isolated cooking area as a way to differentiate the project from existing solutions (ill. 39) and re-think the connection between cooker hood and hotplates.



ILL. 39: DIFFERENT TYPES OF HOTPLATES FROM GAS COOKER, ZONE FREE HOTPLATES TO ROBOTS AND INTERACTIVE TABLETOPS

COOKER HOOD

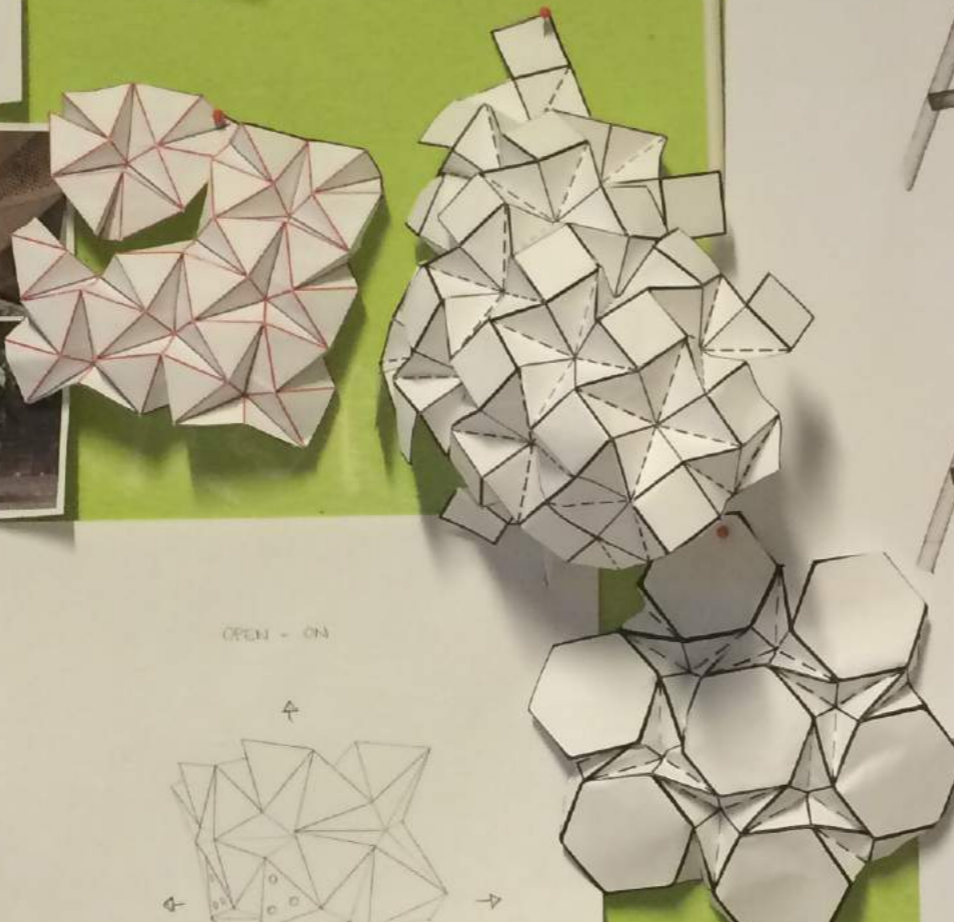
COOKING

ORIGAMI

ADAPT-

ABILITY

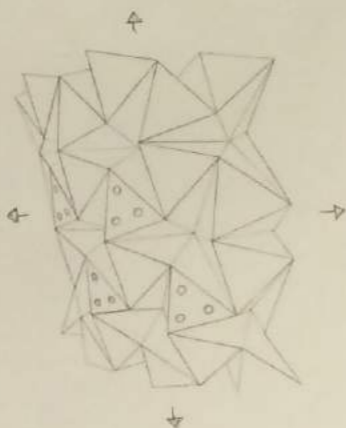
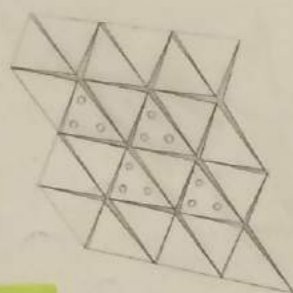
INSPIRATION



CONCEPT

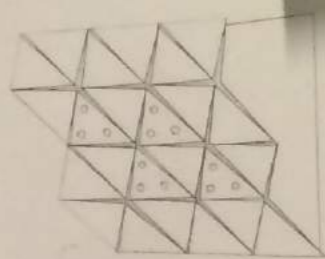
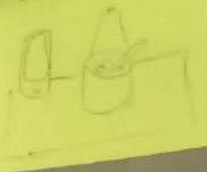
CLOSED - OFF

OPEN - ON

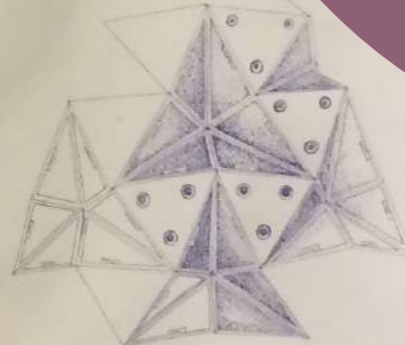


Cooking plate falls
when hood when
to turn on

Camera



Built-in cookerhood



CONCEPT DEVELOPMENT

This section covers the development of the concept chosen from the ideation phase. This includes further research, test of working principles and interaction, which all lead to the detailing of the final concept. An updated version of the requirements can also be found in this section.



FUME CUPBOARD

ILL. 40: INSPIRATION SOURCE



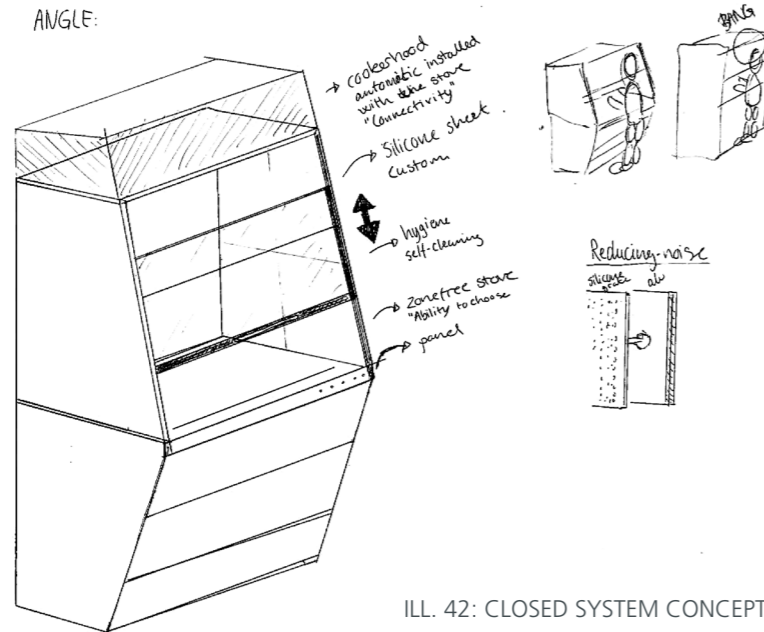
SMART PRIVACY GLASS



SMART PRIVACY GLASS

ILL. 41: SMART PRIVACY GLASS

ANGLE:



ILL. 42: CLOSED SYSTEM CONCEPT

3.1 CLOSED SYSTEM CONCEPT

The concept emanates from the idea about creating an isolated cooking area, so the cooker hood has a smaller volume to suck air out from. Glass walls around the hotplates from tabletop to cooker hood creates a closed system in a separate "room" for the cooking area.

This principle resembles a fume cupboard known from laboratories, which also has been an inspiration source (ill. 40).

The front is angled so the user easier can look into the chamber without hitting the head on the glass (ill. 42). The hotplates are zone free and communicate with the cooker hood inside the chamber, so the cooker hood is used most effectively.

The inside of the chamber could be insulated with silicone to reduce noise inside the cabinet. The chamber could be self-cleaning, using e.g. pyrolysis or something similar to ease cleaning.

To make the expression more in line with calm fusion, the glass is smart privacy glass, which can be turned on and off to switch between see-through or frosted glass (ill. 41).

The fume cupboard principle may be problematic as the freedom of movement is limited. We tested how much the freedom of movement is affected by building a mock-up of the system around our own cooking area to see how annoying it is to have movements restricted like this (Worksheet 38). The test pinpointed some issues with interaction, e.g. that it was hard to see and use the innermost hotplates because of the front glass. The limited work space does not invite to social cooking, which is one of our requirements.

CONCLUSION

The main problem is the user interaction, as the system is not closed, when the user is working in the cooking area. It requires more development of the concept to find a solution, so the system can be closed during the entire cooking session without being annoying to the consumer if the idea of a closed system should have any effect. Regarding fulfilment of the requirements, the connectivity is emphasized as everything is integrated into one system, but the social aspect is lacking.



MULTIFUNCTIONAL



DIFFERENT SECTIONS



LARGER PORTIONS

ILL. 43: VARIO COOKING CENTER MULTIFICIENCY



ILL. 44: MULTI COOKING CONCEPT



ILL. 45: DIFFERENT SIZES OF CONTAINERS AND INSERTS

3.2 INTEGRATED MULTI-EFFICIENCY COOKING

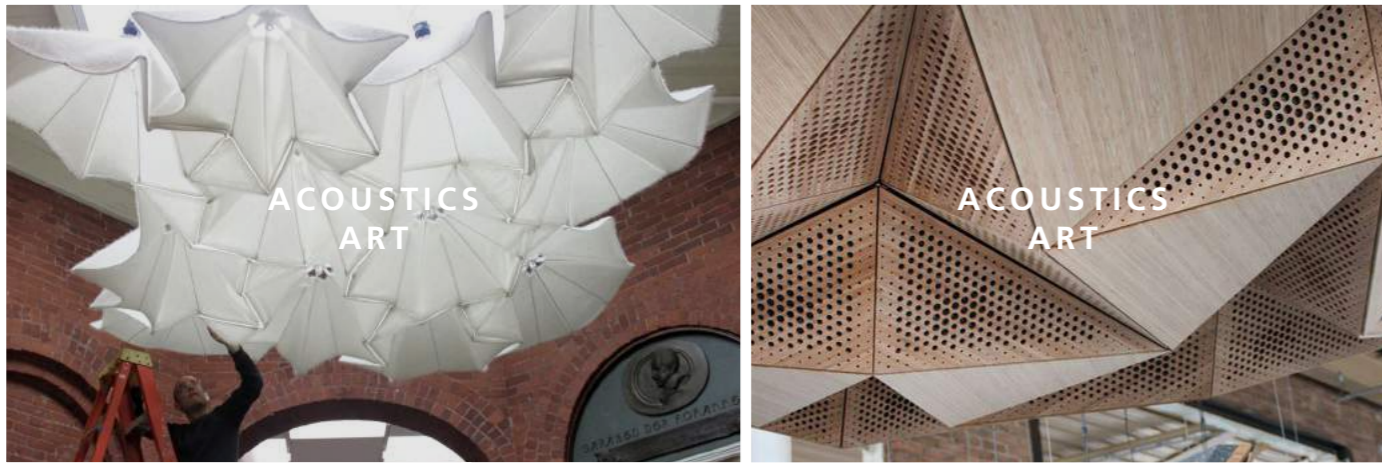
This concept is inspired by VarioCooking Center MULTIFICIENCY® from FRIMA, which is a multi-unit made for boiling, deep frying and roasting larger quantities for industrial kitchens (ill. 43). VarioCooking Center MULTIFICIENCY® consists of two deep sections in which various types of inserts can be placed or the bottom surface of the sections can be used directly as a pan. Display and control panel is placed between the two sections.

The main inspiration for the multi cooking area (ill. 44) comes from the bottom roasting area and the small inserts, as it allows the users to adjust the cooking area to their needs in the specific situation. The concept rethinks the way of cooking by replacing the cookware and instead there is an integrated deep roasting pan in the tabletop with inserts and containers (ill. 45), which can be placed in the deep section when a boiling function is needed. Another new aspect is the integrated cooker hood placed along the edge of the roasting pan near the tabletop surface.

Some of the cons in this concept are that it requires Miele to be willing to produce cookware and that the consumer has to replace all cookware. Another issue is how to make the cooker hood efficient enough without being uncomfortable for the user during interaction with roasting area and inserts.

CONCLUSION

The cons in this concept outnumber the positive sides, so it was decided to ideate further to find a new concept for the cooking area.



ILL. 46: INSPIRATION SOURCES FOR THE ORIGAMI CONCEPT

3.3 ORIGAMI CONCEPT

This concept is inspired by origami and acoustics art (ill. 46). The basic idea of using the origami tessellation is that the surfaces that disappear into the structure, when it is pressed together, will be the suction areas, so the functional parts of the cooker hood is hidden when it is not in use, which corresponds to the principles of calm fusion (ill. 47).

The initial thought of using origami principles was that the structure could have some good characteristics to help creating better acoustics as some of the kitchen noise would be absorbed into the openings in the pattern (ill. 48), where the filters also are placed.

Spotlights could be placed in the triangles, which are visible all the time, to give the right amount of working light. The light should be able to regulate itself to ensure the optimal working light and adjust to the movement and different positions of the cooker hood.

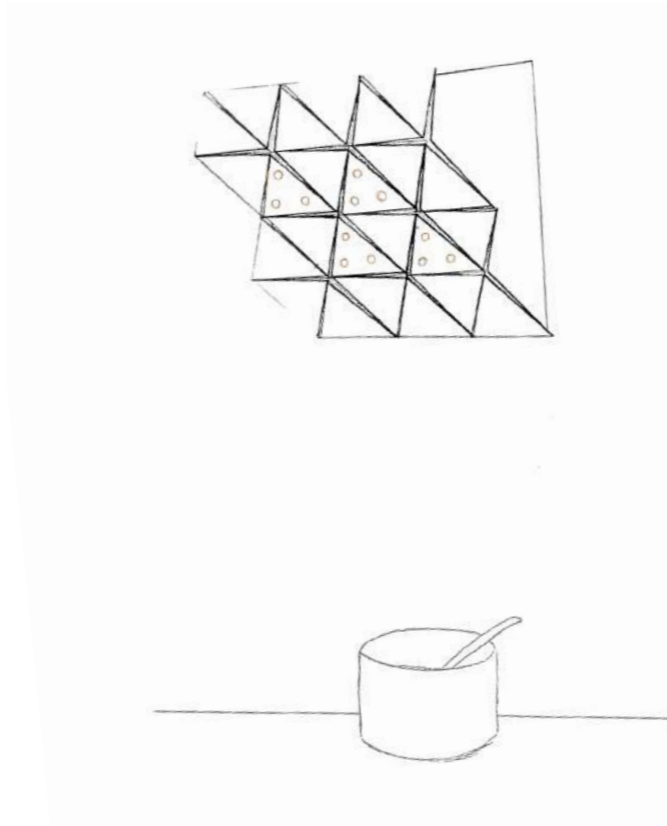
The installation of the cooker hood will give some challenges regarding how the origami structure should be mounted in the ceiling (ill. 49) or on the

wall, as the material for the origami structure has to be flexible in order to open and close the structure.

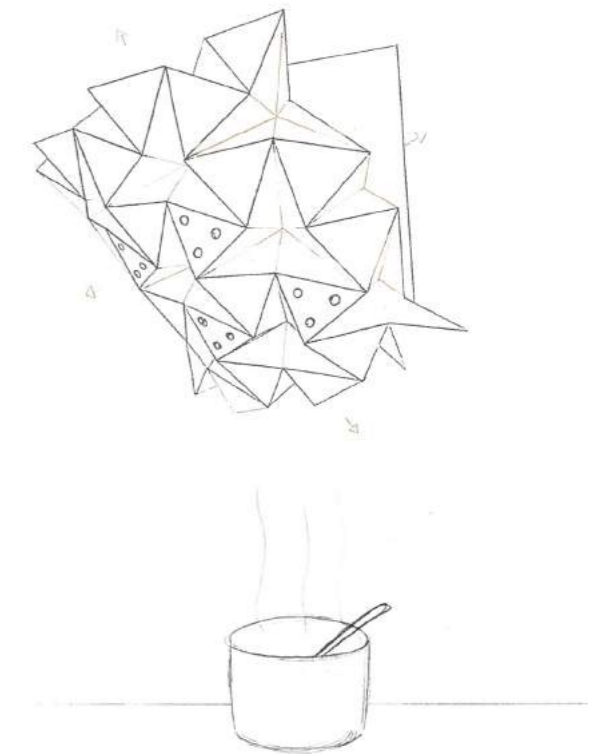
To avoid too much interaction directly with the cooker hood, the cooker hood should be regulated through signals sent from the hotplates, so the cooker hood can adjust itself to the number of pots, their position and how much heat/moisture is generated. So when the hotplates are turned on, the cooker hood will react on that information and start to open.

CONCLUSION

The concept of a self-adjusting cooker hood is interesting as the user does not have to interact directly with the cooker hood. Both because the cooker hood will be more efficient as it will turn on early in the cooking process and because the user does not have to think about it. The adaptability and the expression of a living organism are other aspects of this concept, which add something new compared to other cooker hoods and are worth to continue to work with.



ILL. 47: TURNED OFF (WALL MOUNTED)



ILL. 48: TURNED ON (WALL MOUNTED)



Explore different origami patterns to find the most efficient.



Find a working principle, how to make the origami structure move.



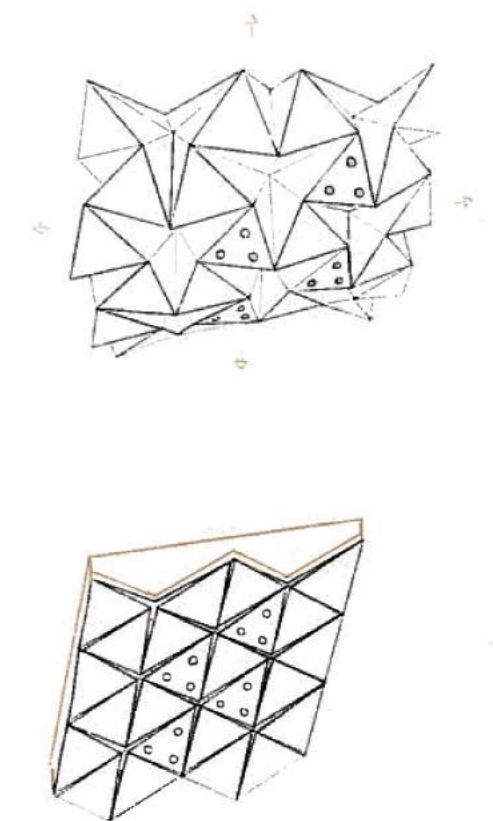
Consider how to clean the filters in the origami structure.



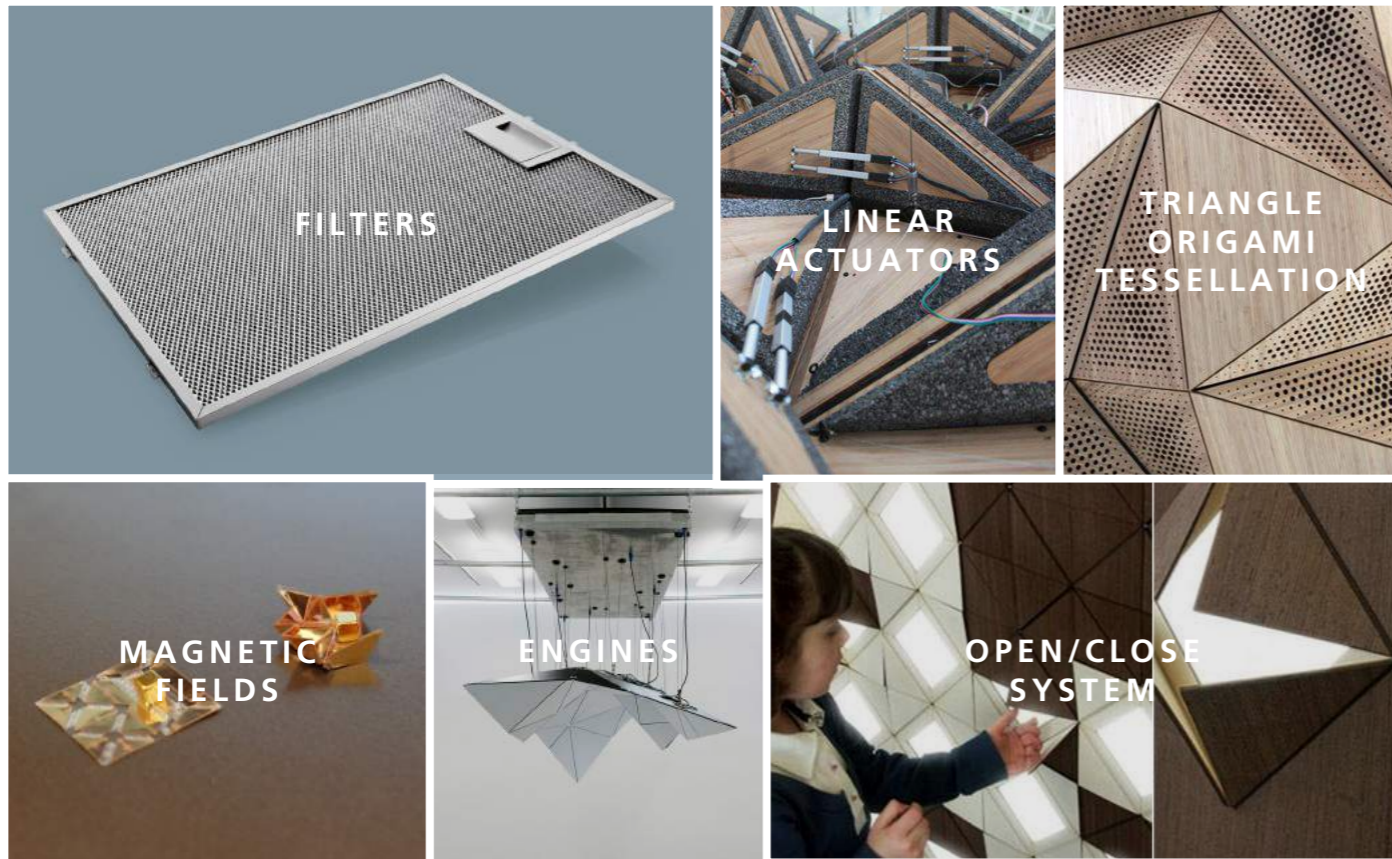
The cooker hood should be connected to the hotplates.



The cooker hood should be adaptable and have an expression of a living organism.



ILL. 49: BUILD-IN VERSION, OPEN AND CLOSED



ILL. 50: FILTER AND POSSIBLE WORKING PRINCIPLES

3.4 INITIAL THOUGHTS

Two different origami patterns were chosen for calculations on the potential suction area (Worksheet 33). The original triangle pattern was the one with the biggest potential suction area, and was chosen for further development.




To make cleaning of the filters easier, the filters should be easy to take out, so a click system (ill. 50) would be a possible solution. It would be beneficial if all filters in each opening could be one unit and thus be taken out at the same time, so the user does not have to take out too many filters. Furthermore, it is assumed that filters placed in the top of the cooker hood will be too inefficient, so it might be a better idea just to have filters in the openings in the lower part of the structure to limit the number of filters that have to be cleaned.

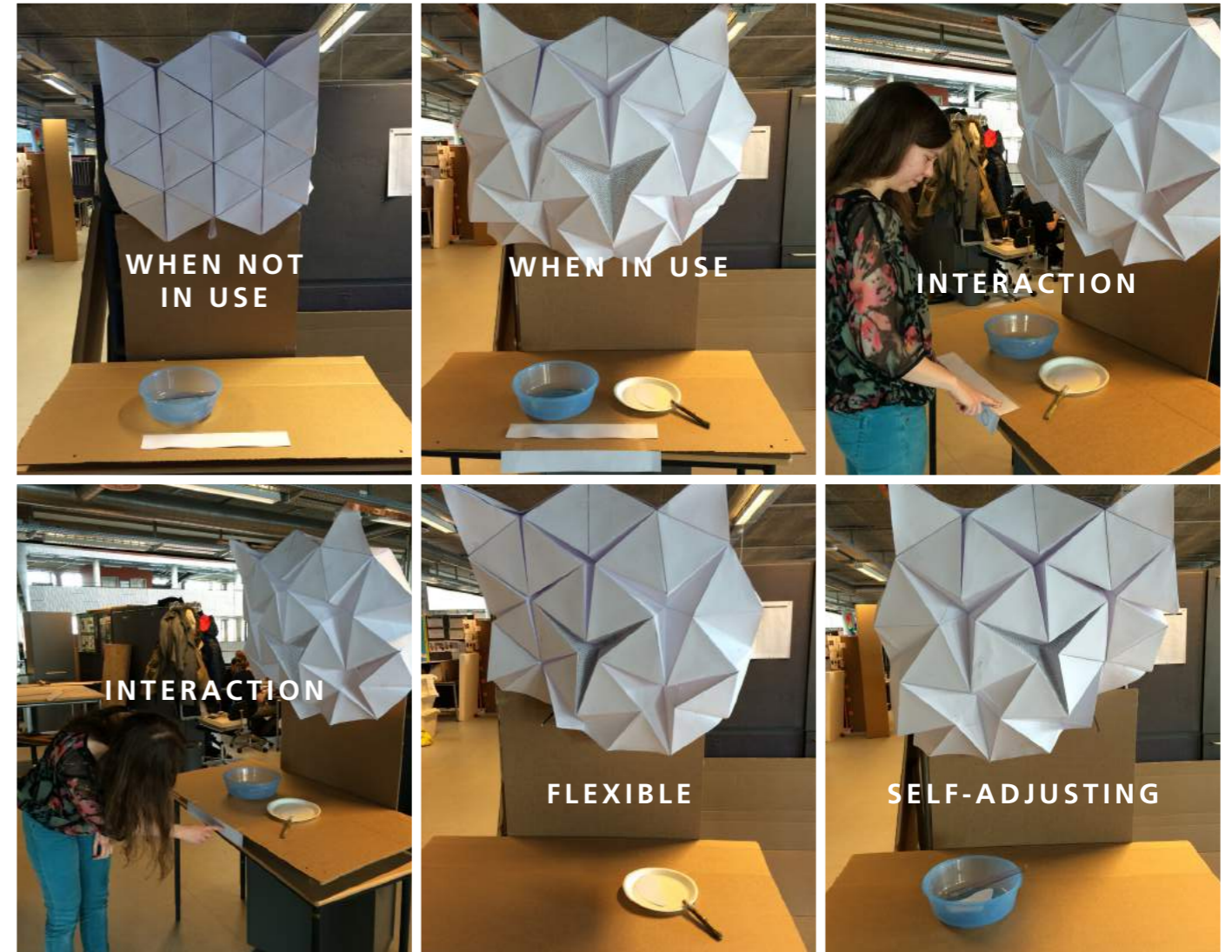
How the cooker hood should be able to move should be investigated more, but some possible solutions, inspired by existing installations, is linear actuators or small engines placed on the back of the structure (ill. 50). Another method that might be a possibility is magnetic fields, which is used in a tiny origami robot (Hardesty, 2015). How this exactly works has to be investigated more before it is possible to say if it could be a realistic solution. Another possibility is that the

material itself responds to heat or moisture, but there is a risk that the material will react too slow, especially considering the fact that a cooker hood ideally should be turned on in advance before cooking (Kjær, 2016, WS 6).

CONCLUSION

There is still a lot of things that have to be researched on regarding working principles and materials. It is hard to get a sense of what the expression of the origami pattern will be like when it becomes bigger than the small models made. Next step is to make a 1:1 mock-up to figure out if the pattern is useful in large format or if it is too busy and complex.

-  Make a 1:1 mock up to get an understanding of the visual expression.
-  Research on working principles and materials.
-  Filters with click system for easy removal when cleaning is needed.



ILL. 51: BODY STORMING, DEVELOPMENT OF COOKING AREA

3.5 BODY STORMING WITH 1:1 MOCK-UP

To get a better sense of size and expression of the cooker hood and to ideate on the cooking area, we made a mock-up in real size and used bodystorming to develop the hotplate area (ill. 51).

The bodystorming resulted in a cooking area, where the induction area is a rectangular area, which is drawn back towards the wall, creating a working space in front of the induction area.

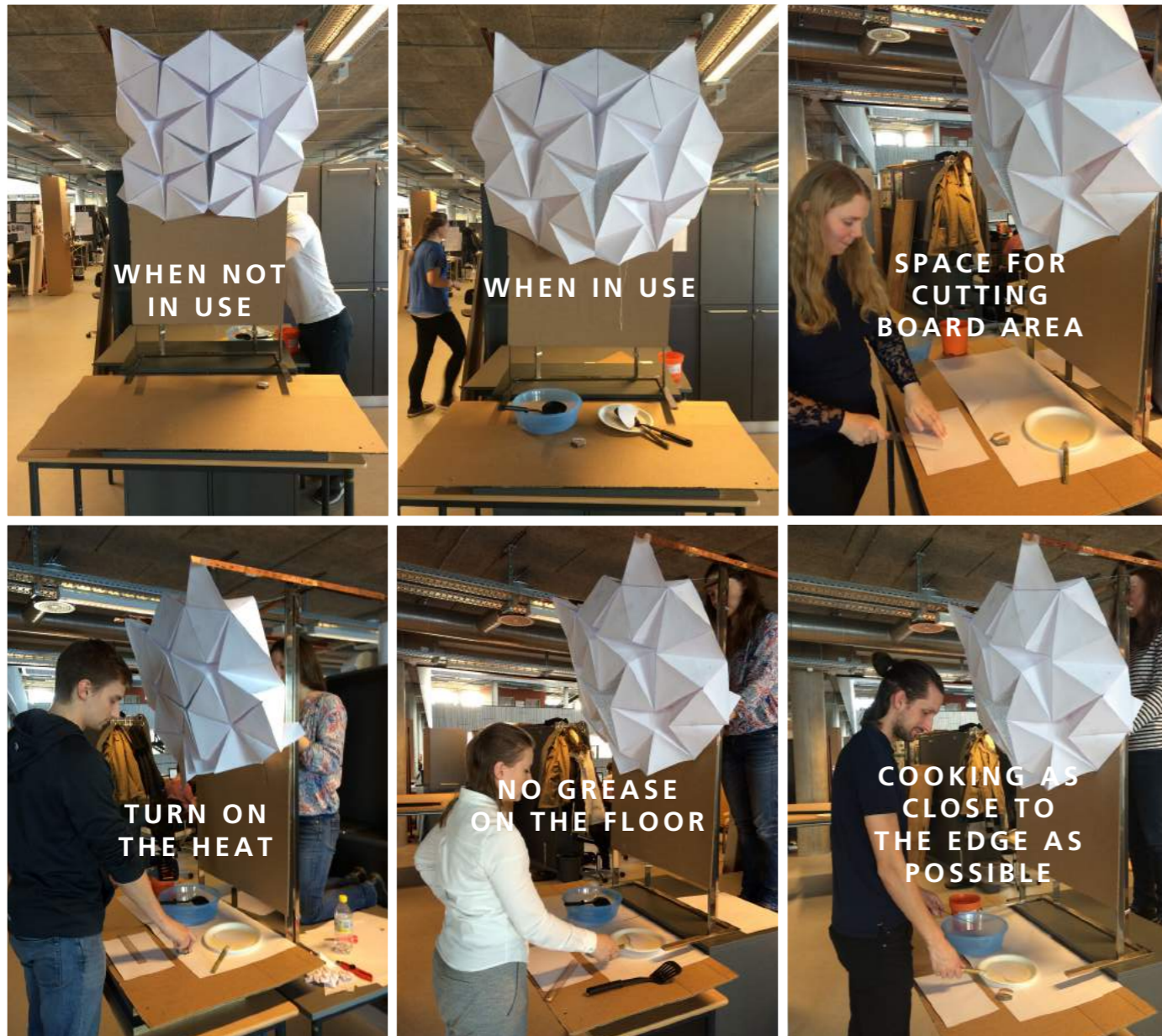
In order not to take up table space with a hotplate area, the induction could be placed underneath the tabletop, so the tabletop could look like and serve as a regular tabletop, when the user does not need the induction function. In this way, the hotplate area could be completely invisible when not in use.

However, a completely invisible hotplate area would lead to some issues regarding the interaction, as the user should have some sort of guidance to know where to place the cookware. This could be solved by milling a small groove in the tabletop, which marks the outline of the hotplate area.

During the bodystorming, the interaction with the induction area was developed from being a display on or near the edge of the tabletop at first to become a moveable control unit. The control unit should connect to the induction area and register the pots and their position, so the user can regulate the temperature for each pan by moving the control unit towards the pan, so they connect, and then turn the control unit left or right. A removable control unit would also emphasize the minimalistic expression of an almost invisible hotplate area, as the control unit can be put aside when not in use.

The mock-up was tested by users (ill. 52) to hear their reactions to the movement of the origami cooker hood as well as the interaction with hotplate area and control unit.

Regarding the cooker hood, the general opinion was that the movement should be slow-paced to be comfortable to stand in front of, but the movement was a nice feature. However, the expression turned



ILL. 52: BODY STORMING WITH TEST PERSONS

out to be more aggressive and intimidating than expected. The test persons were mostly positive about size and placement of the induction area and the working space in front of it, though some of the test persons preferred to have the cookware closer to them while cooking.

CONCLUSION

By retracting the induction area towards the wall, a working space is created in front of the hotplate area where the user can prepare food without leaving the cooking area. If the induction is placed underneath the tabletop and the outline is marked discreetly in the tabletop surface, the tabletop will have a very minimalistic look and invite to be used as a regular tabletop when not using the induction. It should be

tested whether or not induction can work through a tabletop and what kind of materials that can be used for that.

REFLECTION

The 1:1 mock-up was a good indicator of the visual expression of the cooker hood, so the team realised how intimidating it could be in real size.



A simpler, less intimidating pattern for the cooker hood has to be found.



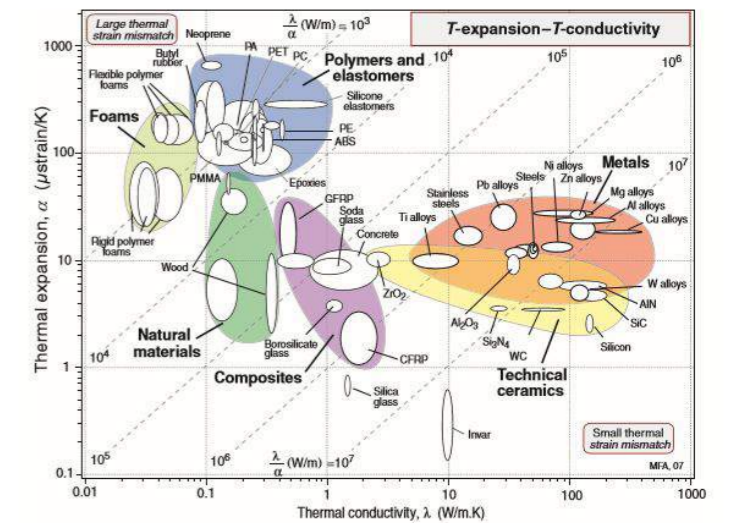
Develop further on hotplate layout and test induction materials.



"Invisible" induction area, only the outline is marked permanently.



ILL. 53: TESTING INDUCTION WITH A SLATE PLATE



ILL. 54: MAPPING OF THERMAL EXPANSION AND THERMAL CONDUCTIVITY

3.6 TABLETOP TEST

Because the hotplates are placed underneath the existing tabletop, it is essential to test which types of tabletops allows the hotplates to be in that position. We have tested different types of materials on an induction hotplate and looked at the thermal properties. To avoid thermal shock, we have to look into materials' coefficient of thermal expansion and thermal conductivity.

Materials with a low coefficient of thermal expansion and a high thermal conductivity are the best to resist and avoid thermal shock (Ashby, Shercliff and Cebon, 2010). We tested eight different types of materials (Worksheet 32), where the most interesting materials were glass, ceramic tile, silicone rubber and a slate plate (ill. 53). The aim was to confirm or disprove the possible use of other materials than glass for an induction hotplate by measuring the boiling time when the induction had to go through the test materials. The glass type silica glass had the shortest boiling time, 4:54 minutes. Compared to the soda glass, which broke during the test, silica glass has better characteristics for heating, as its coefficient of thermal expansion is lower than the thermal expansion of soda glass (ill. 54), which helps to avoid thermal shock. The slate plate had the second best boiling time (7:06 minutes), which might be caused by the thickness of the slate plate (5mm thicker than the silica glass). With the ceramic tile, it took 10 minutes to reach the boiling point, but the test was made with the standard silica glass plate underneath the ceramic tile, creating a potential source of error as distance and thickness of the materials influence the induction. In the test with silicone rubber it took 10:51 minutes to reach the boiling point. During the test the

silicone rubber became very soft, which indicates that this material is less qualified as tabletop, at least in the specific variant, we tested.

We also tested the after-heat effect on the slate plate (Worksheet 50) to measure how long time it takes for the material to cool down to 50 degrees, which is the temperature where the heat indicator on an induction hotplate is deactivated. The standard silica glass plate was 107 degrees after boiling water and after 15 minutes it had cooled down to 50 degrees, while the slate plate was 58 degrees after boiling water and 50 degrees after 10 minutes. This means that the slate plate has a lower thermal conductivity than glass. Moreover, the after-heat test showed that the hotplate was cold enough to use as a working space when cooled down to 50 degrees, so until it is sufficiently cooled down, a heat indicator should warn the user.

CONCLUSION

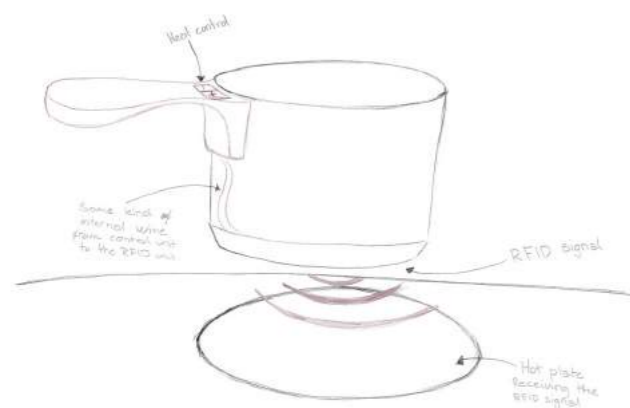
The sources of errors, such as the different thicknesses of the test materials, make the test less precise, but it can be concluded that silica glass is the best material for an induction hotplate, but other types of materials could also work as tabletop on top of an induction hotplate.



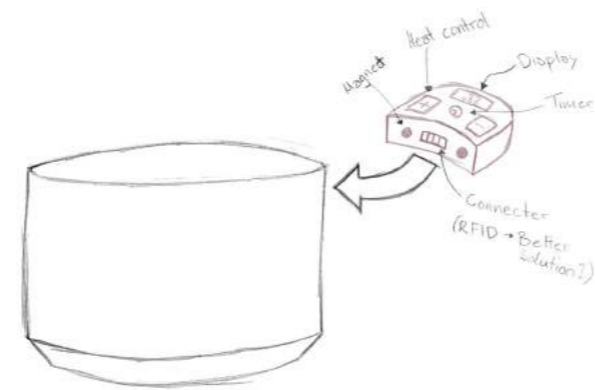
Heat indicator for surface temperature over 50 degrees.



Tabletop materials should have a low coefficient of thermal expansion and a high thermal conductivity to avoid thermal shock.



ILL. 55: WIRE CONNECTION FROM RFID TO CONTROL UNIT



ILL. 56: DETACHABLE HANDLE WORKING AS CONTROL UNIT

3.7 INTELLIGENT COOKWARE

At the second status seminar we got feedback on the origami concept above, which led to a brainstorm on other interaction methods as the supervisors saw the control unit as a step back instead of being innovative. Instead we should rethink how to interact with the cooking area. A result of this brainstorm is intelligent cookware with an integrated control unit.

The working principle of the intelligent cookware is divided into three steps.

First the hotplate registers the cookware and its position on the hotplate. Then the hotplates activate a RFID chip, placed in the bottom of in the cookware, which lights up a button on the handle. The cookware then sends a signal to the hotplate to turn it on/off and to regulate the heat.

How the chip should be powered can be one of three suggested solutions:

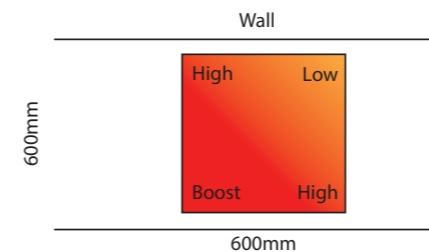
- » A wire connects the bottom of the cookware and the handle (ill. 55). This requires a high isolating factor because pots and pans typically reach up to 230 degrees (Worksheet 44), which the wire should be protected from. A standard silicone wire has the maximum temperature to 200 degrees (Calmont, 2016), which is not enough.
- » A battery, which can last 10-20 years depending on how much software the control unit should contain. This needs a charger, which is not a solution, as we do not want to give the user more tasks to remember.
- » A coin cell battery, which can be changed every fifth year or so, could work via bluetooth or something similar.

Another issue with the intelligent cookware is that it should be able to go into the dishwasher or at least be able to be washed by hand, which requires the cookware to be waterproof. A solution could be to make the handle with control unit detachable (ill. 56). However, a loose handle can easily get lost when not placed on the pot.

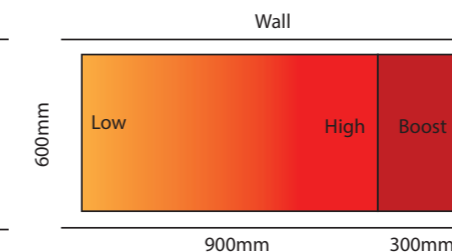
This concept changes the interaction in the cooking area radically and requires Miele to broaden their product portfolio to include cookware. As mentioned in the discover phase, Miele have their own bank with a sound financial base, which makes them able to enter new big markets better. The cookware market requires a lot because of the different types of cookware (e.g. pots, pans, woks) in different sizes. Furthermore, Miele may have to make several collections in different styles to satisfy the customers. With that said, it is logical to bring cookware, hotplate and cooker hood into one package solution to enhance the communication between the units in the cooking area.

CONCLUSION

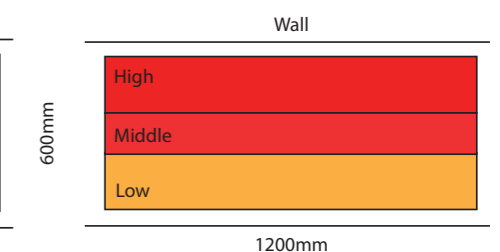
Despite all the good things in this concept, the challenges require a lot of research and effort to reach a satisfying level of detailing of the cookware, which we are unable to do, while also detailing cooker hood and hotplates only four weeks prior hand-in deadline. A simpler solution to regulate the heat is required.



ILL. 57: GRADIENT SHIFT WITH BOOST CORNER



ILL. 58: LOW-HIGH WITH BOOST AREA



ILL. 59: THREE HEAT ZONES WITH GRADIENT SHIFT

3.8 HOTPLATE LAYOUT

As the intelligent cookware had to be discarded, the hotplate concept developed through bodystorming with the 1:1 mock-up of the origami cooker hood needs to be developed further, both regarding size and position as well as the layout of the heating zones.

The new approach to the hotplate area is to have fixed heating zones instead of having a completely zone-free induction area. This changes the interaction as the user regulates the heat on the cookware by moving the cookware between the different heating zones instead of regulating the temperature on a display.

Possible layouts were systematically defined and tested through a new bodystorming session (Worksheet 48+49). The result of the bodystorming was that it is most convenient to regulate the heat by moving pots back and forth in the depth of the table, rather than moving it sideways, as this caused trouble moving the cookware around when using several pots. Furthermore, the layouts where the heating zones were clearly defined (ill. 59) worked better than the ones with gradually shifting heat zones (ill. 57), as the gradient shift made it hard to determine which area the pot was placed in.

A boost area with extra high temperature was also considered (ill. 58), but the test showed that the boost area quickly became crowded and required a lot of coordination to utilize most efficiently. As the boost function is not a necessity, but only "nice to have",

and future tendencies is going towards living-with-less, where the consumers want solutions without too many choices, the boost area was discarded. Instead, the induction zone is divided into three heating zones for low, medium and high temperatures (ill. 59), which should be adequate to cover most needs.

Regarding size of the induction area, the tested sizes were 600x600 mm (length x depth), which is equivalent with a small traditional hotplate, and 1200x600 mm. As we want to emphasize the possibility for social cooking, the length should be at least 1200 mm if two persons should be able to be comfortable working at the cooking area simultaneously.

CONCLUSION

The best layout for the hotplates turned out to be a long induction zone divided into three heating zones lengthwise with the low temperature zone closest to the user and the high temperature zone closest to the wall (ill. 59).



Three fixed heat zones: Low, middle and high.



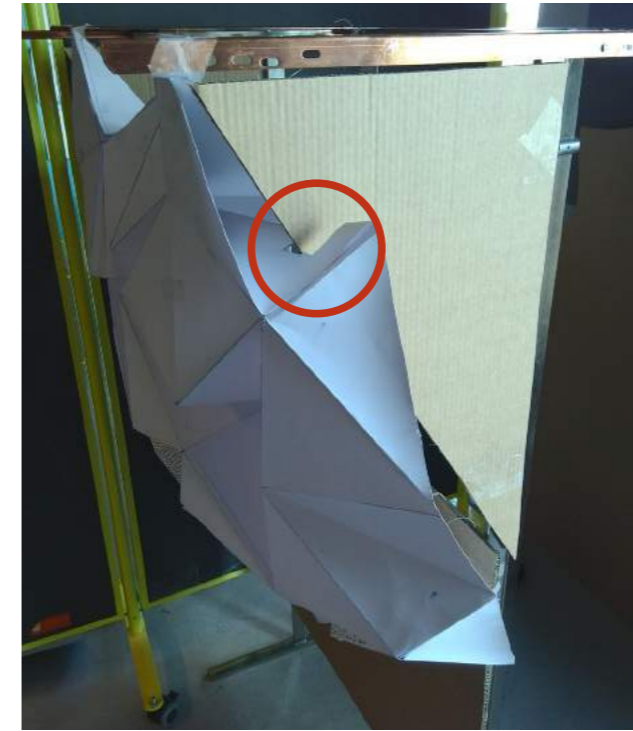
The induction area should be at least 1200 mm long.

3.9 UPDATED REQUIREMENTS

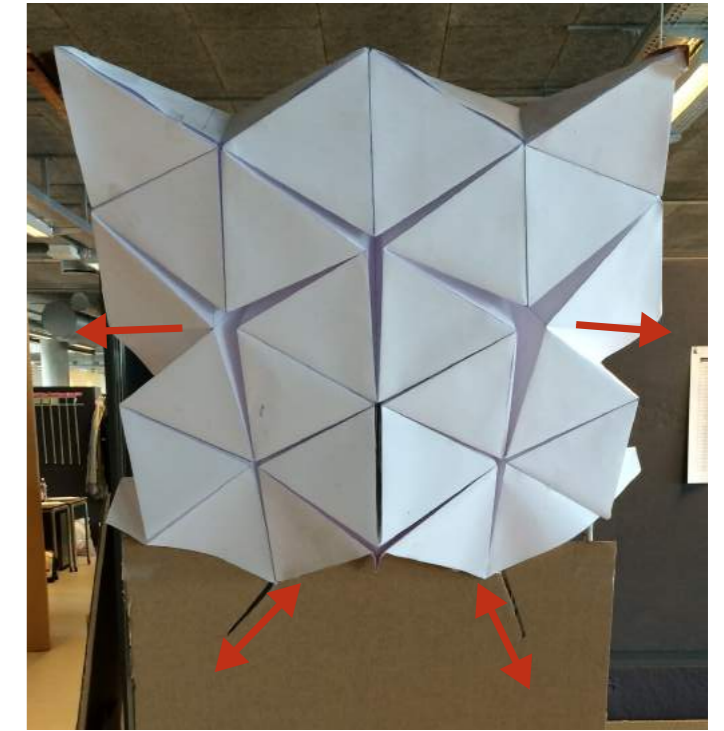
As several requirements have been found since the design brief, a sum-up of all requirements are listed below. The added requirements are marked with yellow.

The requirements will be specified further in the following sections. A final list of requirements is presented in the epilogue.

Unspecified requirements	Specified requirements	What the requirement is based on
COMMON		
Miele brand values: » Sustainable and recyclable » Social responsibility » Quality » Trustworthiness	Sustainable materials	1.1 Miele Denmark + 1.6 Trends + app. 2
Scandinavian design values	Minimalistic and simple geometry	1.12 The future consumer
Emphasize cooking area as a social gathering place		1.3 What is a kitchen
COOKER HOOD		
Comply with new laws	Ventilation section	1.1 Miele Denmark
The "boring" parts should be easy to do or self-regulating	Self-adjusting	1.10 Today's consumer + 1.13 Domestic appliances
Connectivity with hotplates		1.13 Domestic appliances + 3.3 Origami Concept
Alive expression		3.3 Origami Concept
Easy cleaning	Filters with click system	1.5 Sound level + 3.4 Initial thoughts
TABLETOP		
Materials: low expansion coefficient and a high thermal conductivity		3.6 Tabletop test
	"Invisible" induction area, only the outline is marked permanently.	3.5 Body storming with 1:1 mock-up
HOTPLATE		
	The induction area must be at least 1200 mm long	3.8 Hotplate layout
Solutions instead of options	Three fixed heat zones: Low, middle and high	3.8 Hotplate layout
	Heat indicator for surface temperature over 50 degrees	3.6 Tabletop test



ILL. 60: ISSUES BETWEEN MOVEABLE ORIGAMI AND FIXED WALL MOUNT



ILL. 61: THE ORIGAMI PATTERN REQUIRES MANY DEGREES OF FREEDOM

3.10 WORKING PRINCIPLE FOR ORIGAMI COOKER HOOD

As mentioned earlier, there are some issues with the origami concept that need to be considered to find out if the concept can be realised. The mock-up helped regarding the visual aspect, whereas the more technical issues became more clear when looking at the mock-up (ill. 60).

One of the biggest issues is the mounting of the origami parts on the wall mount, as the origami structure requires a certain amount of flexibility and degrees of freedom to be able to perform the movements (ill. 61). The connection between the origami structure and the wall mount should both be flexible and close tightly in order to secure the right air flow, which requires a very flexible and durable material.

Another possible issue is turbulence inside the cooker hood, as the many angled walls in the origami structure probably will cause turbulence and noise. This requires more detailing on how the air flow should be, where and how the vent should connect to the origami structure and filters. Another big issue is cleaning, as the amount of small surfaces and corners makes it inconvenient to clean, especially on the inside.

CONCLUSION

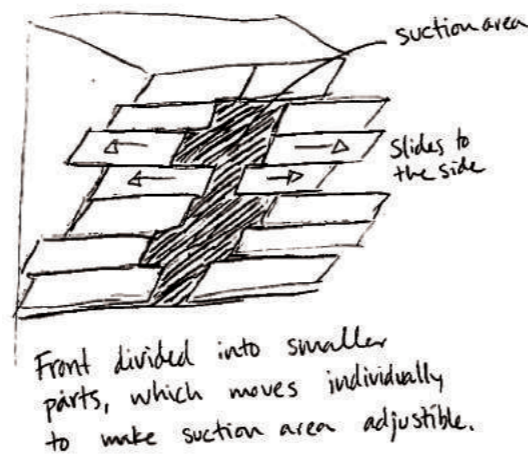
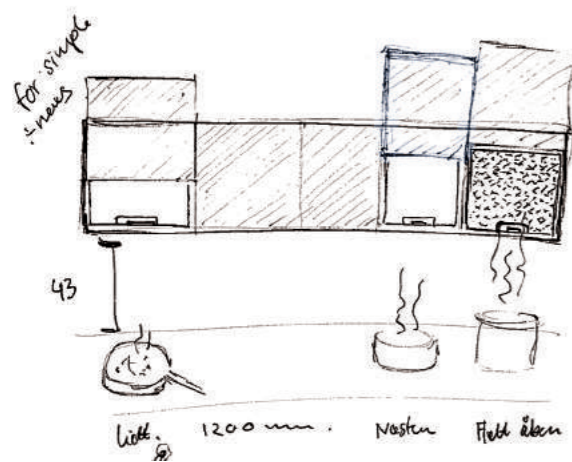
These issues might be possible to solve with further development, but as mentioned earlier, the pattern should be changed anyway, as it is too intimidating and complex as it is, so we decided to stop developing the origami concept and instead find a less complex and more minimalistic solution. A more minimalistic direction will also fit better into Miele's product portfolio and brand values. However, the overall concept about self-adjustment and an adaptable, "living" structure is still the aim.



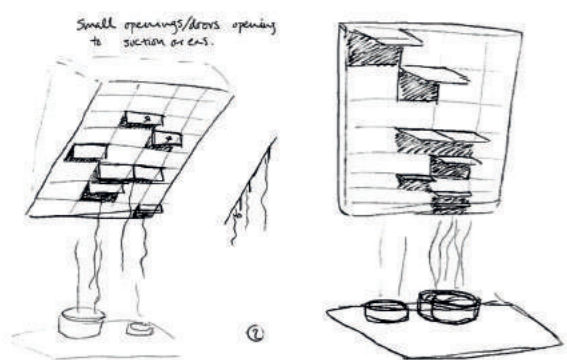
Find a simpler and more minimalistic structure.



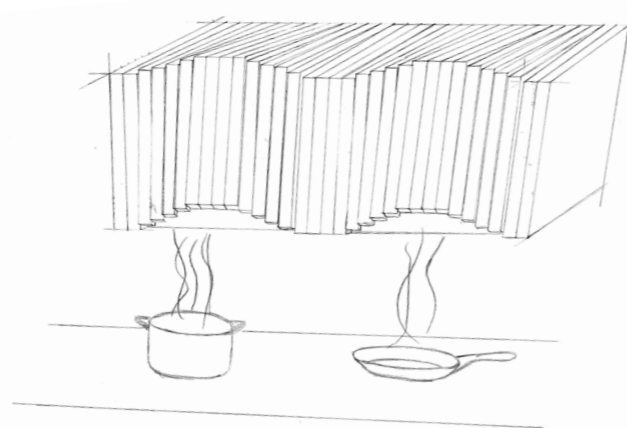
The cooker hood should have an expression of a "living organism".



ILL. 62: TWO SLIDING CONCEPTS



ILL. 63: FLAPS CONCEPTS



ILL. 64: THE ACTUATOR WAVE CONCEPT

3.11 NEW ADJUSTABLE COOKER HOOD

In order to find a new cooker hood principle that still adjusts the suction area while expressing a living organism like the origami concept, we made a moodboard with different types of opening and closing mechanisms, which was used as base for ideation while having the future consumer in mind regarding living-with-less and the keywords minimalism, timelessness, quality and sustainability (Worksheet 51).

The sketching session lead to three types of opening mechanisms: sliding (ill. 62), flaps opening up (ill. 63) and an actuator wave (ill. 64). The sliding principle is easy to clean, but the expression is flat and boring and does not emphasize a living organism. The concept with open/closed flaps is complex in terms of cleaning and it requires many motors in order to have a living expression. The actuator wave concept has the desired expression of a living organism without looking too complex, while still being minimalistic in its shape.

CONCLUSION

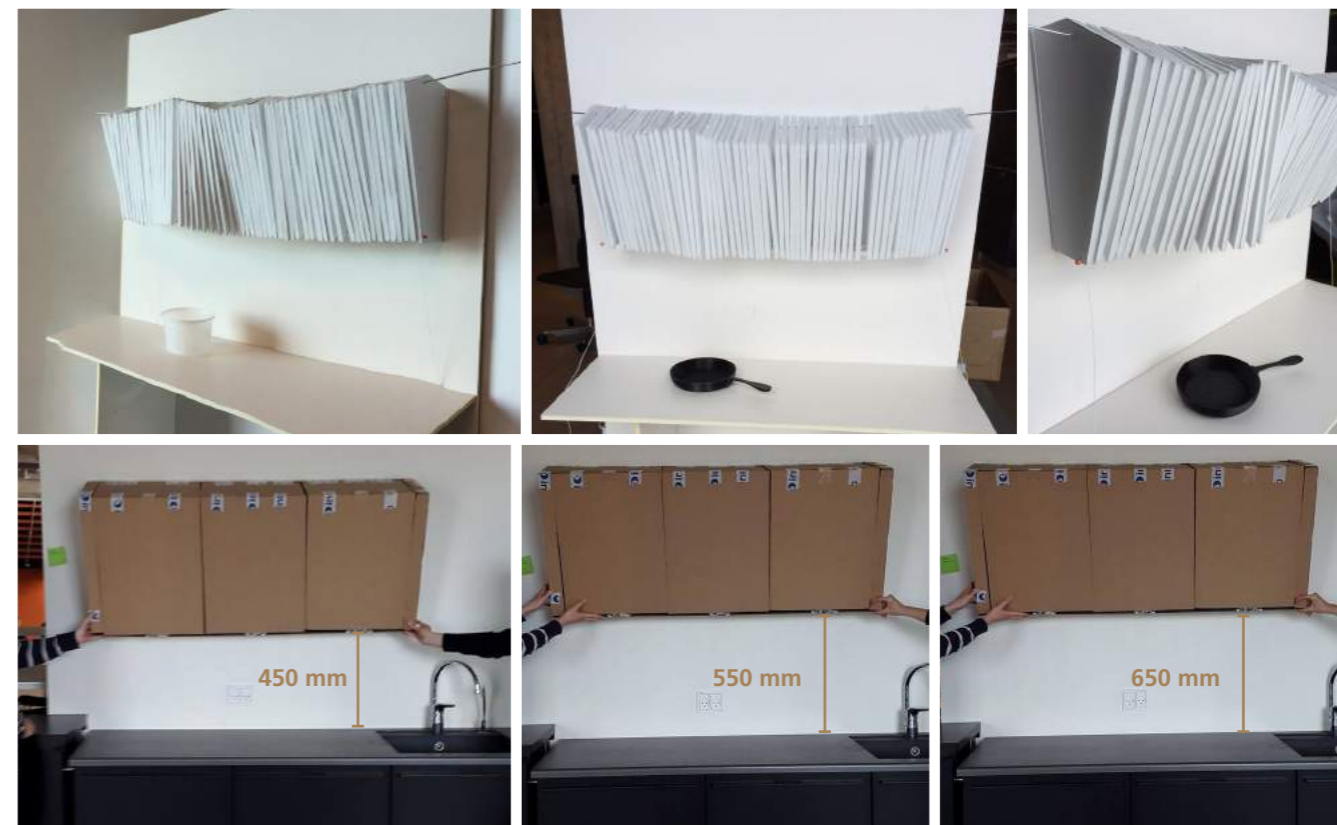
The actuator wave is chosen for further development because of its minimalism and expression. It will be helpful to make a mock-up to get a better understanding of how the adjustable parts should work.



Make a 1:1 mock-up to investigate sizes and angles.



Explore working principles and construction.



ILL. 65: 1:30 MOCK-UP (TOP ROW) AND 1:1 MOCK-UP

3.12 MOCK-UPS OF WAVE CONCEPT

Due to the finding of a new cooker hood concept 3 weeks before hand-in, a smaller mock-up 1:30 was made to explore and develop the concept and later a 1:1 rough mock-up to control sizes. They have mostly been used as communication tools during discussions about functionalities, construction, sustainability and cleaning issues.

The first initial thoughts about control panel was explored via the 1:30 mock-up as to where the power function should be placed, which will be further explained in section 3.15.

How each lamella followed each other and reacted when pulling one lamella was explored, and we considered using small sticks or a flexible material as an elastic band as connector between the lamellae. A small stick could be placed as the link between each lamella, however this will be time-consuming due to production, but also give twists which are not desired. By using an elastic band, the lamellae will follow each other without twisting the lamellae. This also requires a rotation joint in the top of the construction to hold the lamellae in order. The elastic band could be attached to the sides of the construction with springs.

Considering construction, sustainability must be in mind, which is why we will be focusing on how to

disassemble the construction so the materials can be reused. As the concept is based on many lamellae that will be greasy, cleaning is in focus as well, which will be explored in the section 4.2 and 4.3. An initial thought is to use nano coating to ease cleaning. Furthermore, a 1:1 mock-up is made to control the size of the cooker hood as it should be minimum as long as the hotplate, which is minimum 1200 mm. The cooker hood mock-up is 1350 mm x 610 mm x 300 mm, which is relatively big compared to cooker hoods today, so we used the mock-up to test what mounting height above the tabletop will be suitable. The minimum height for mounting the cooker hood is 450 mm, according to Miele's cooker hood guide for mounting (Miele, 2016b) and the maximum height is 650 mm otherwise the suction will be reduced. A mounting height in this interval seems suitable for our cooker hood.



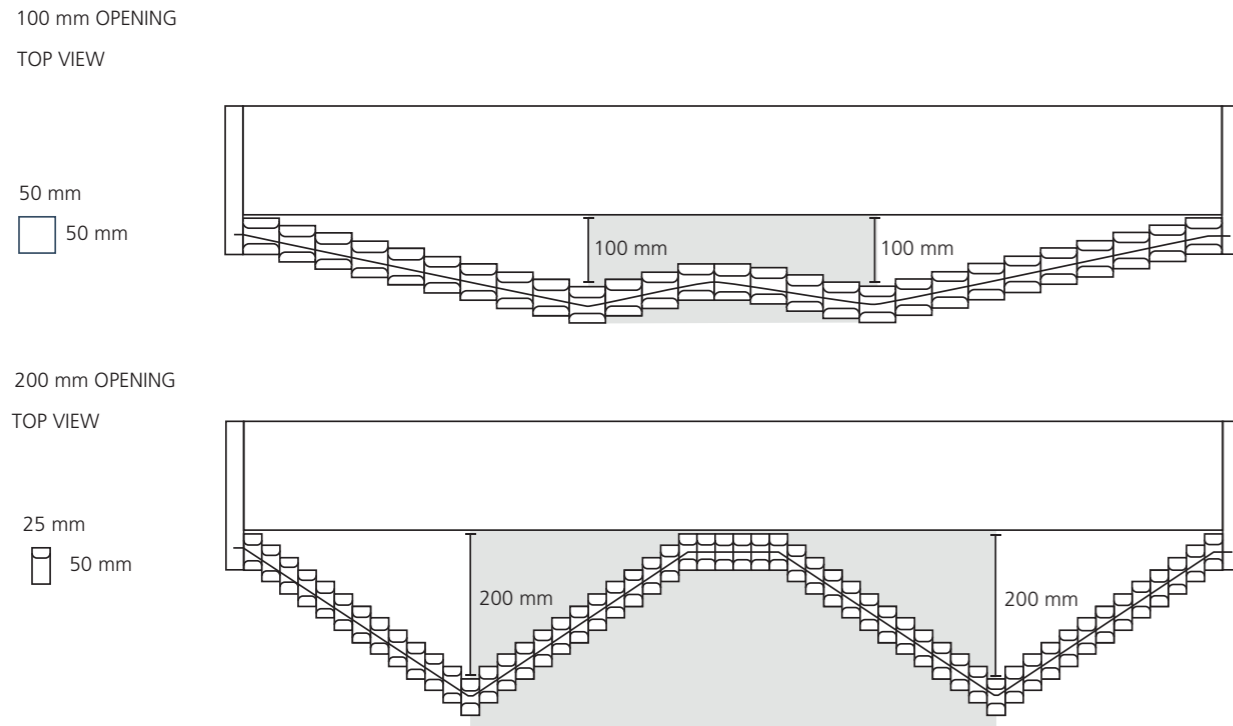
Research on nano coating.



How to disassemble the construction.



Disassembly should be possible due to cleaning and reuse.



ILL. 66: MAXIMUM OPENING OF THE COOKER HOOD

3.13 ADJUSTABLE LAMELLAE

The dimensions of the moving lamellae in the wave concept will have a big impact on the opening of the cooker hood and how much the lamellae are able to move. In order to determine the size of the moving lamellae and see how it affects the size of the opening, a few initial illustrations were made (ill. 66).

The thinner the lamellae are, the more the wave will be able to open. The bigger the opening is, the easier moisture and steam will be led into the cooker hood. However, the thinner the lamellae are, the more is needed and the amount of corners and surfaces to clean will rise. The lamellae should therefore be as broad as possible without decreasing the opening too much. As seen on the illustration (ill. 66), the opening can be up to 200 mm, when the lamellae are 25 mm wide, which is preferred rather than an opening of just 100 mm. Whether or not the size of the opening is suitable has to be tested on a mock-up as it is hard to imagine exactly how it will fit, based on illustrations. Scenarios

If the lamellae are 25 mm wide, the cooker hood will take the shapes illustrated (ill. 67), depending on the scenario and number of pots.

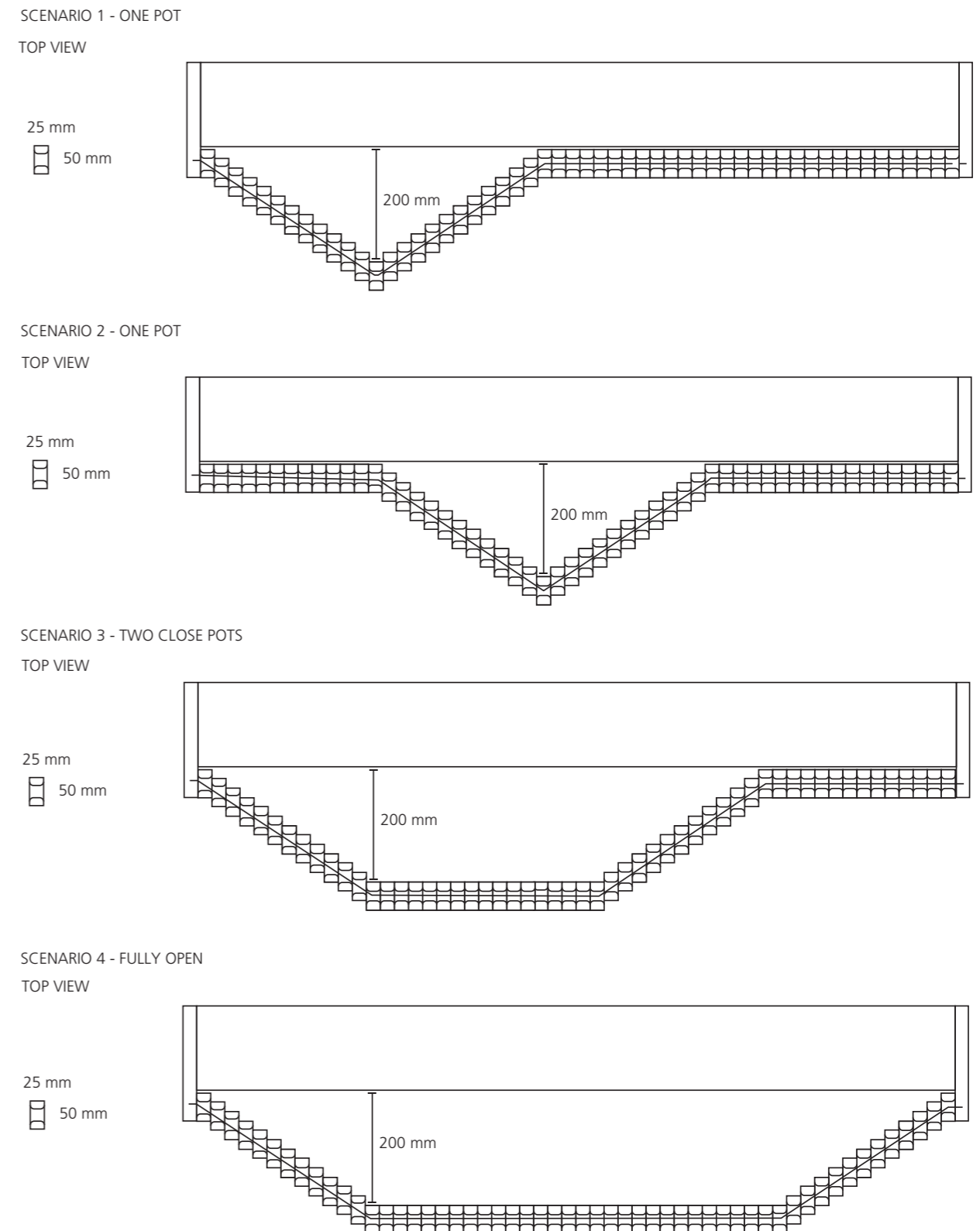
The grey areas mark the maximum opening of the cooker hood, which also speak in favour of choosing the thin lamellae, as the maximum opening is much bigger when the lamellae are 25 mm wide instead of 50 mm.

CONCLUSION

The chosen lamella thickness is 25 mm as this gives the largest opening without making the lamellae so thin that cleaning is impossible.



Look into how the lamellae should work.



ILL. 67: OPENING VARIATIONS DEPENDING ON NUMBER OF POTS.

3.14 INTERACTION

A flowchart is made to show the connectivity between the induction hotplate and cooker hood and how it could work. The flowchart is based on observations from the 1:3 mock-up, working principle for zone-free induction hotplate (Worksheet 46), hotplate layout test (Worksheet 47) and measurements of surface temperature on hotplate (Worksheet 50).

The chosen hotplate layout, where only the outline of the induction zone is visible, gave some issues regarding user feedback; how does the user know that the hotplate is turned on and how hot is the tabletop surface after use. This led to a discussion (Worksheet 47), where we decided to give the user feedback with light indicators; a bright light to illustrate that the hotplate is turned on after placing the cookware on it, and a red light to indicate the hot area after use, also called after-heat indicator. For the after-heat indicator we imagined that the temperature should be shown by a projector in different colours, letting the user know how hot it is, so the user can use the tabletop before the after-heat indicator disappears, if they can see that the temperature is low enough. However, using a projector is an expensive solution and compared to the little value this feature would give, it seemed too costly to integrate this feature. Thus, we decided to go with a less complicated and cheaper solution: Red LED light that gradually fades according to the temperature level, until it has cooled down to 50 degrees, which is where normal heat indicators disappear (Worksheet 50) and fades out.

When placing a pot on the induction area, the hotplate registers the position of the pot via its system of coordinates, weight measure and many small electromagnetic coils, like in existing zone free induction hotplates (Worksheet 46).

The connectivity system can be divided into four steps in the flowchart (ill. 68):

Step 1: If the hotplate registers a unit (cookware) on the induction area, it registers the position of the unit on the hotplate and sends a wireless signal to the cooker hood to activate suction function and working light, which indicates that the unit is turned on.

Step 2: If the hotplate registers a change in the unit's position, it sends the new position to the cooker hood, so the cooker hood can adjust to the situation, depending on which of the following scenarios happen:

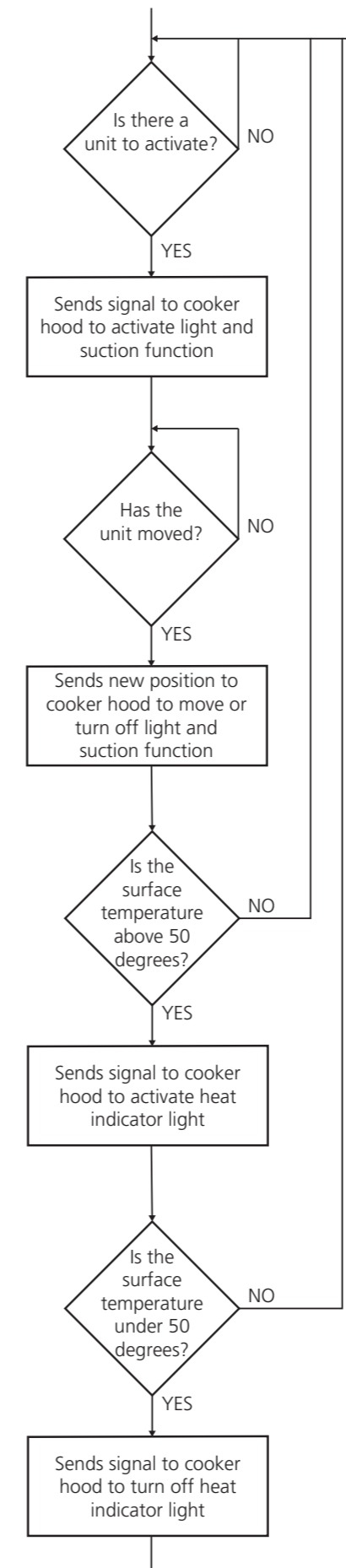
Step 2.1: If the unit is moved to a new position on the hotplate, the hotplate sends a signal to the cooker hood to move the suction area and activate the light to the new position.

Step 2.2: If the unit is moved away from the hotplate, the hotplate sends a signal to the cooker hood to turn off the light and suction function. The suction function is not turned off immediately, but when a sensor has registered that the air is back to normal.

Step 3: When the unit is moved, an infrared thermometer in the cooker hood measures the temperature of the tabletop surface. If the surface is warmer than 50 degrees, the cooker hood activates a red light lighting up the hot spot.

Step 4: When the infrared thermometer registers that the surface temperature is below 50 degrees, a signal is sent to turn off the heat indicator light. The light fades gradually along with the temperature. The heat indicator will be deactivated if a new unit is placed in the same position before the red light is turned off automatically.

POSITION IN HOTPLATE






ILL. 68: FLOWCHART

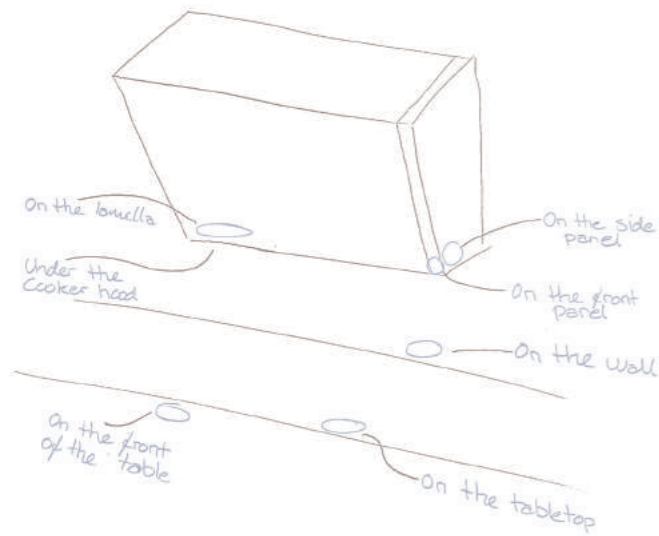
CONCLUSION

The system is a one-way communication from the hotplate to the cooker hood that allows the cooker hood to start right after the cookware unit is placed on the hotplate. This means that the user does not have to think about the cooker hood unless the filters and cooker hood needs to be cleaned. The user gets a start feedback through a bright light source to indicate that the cookware unit is on. The hotplate knows the position of the cookware and controls the lights and suction area accordingly.

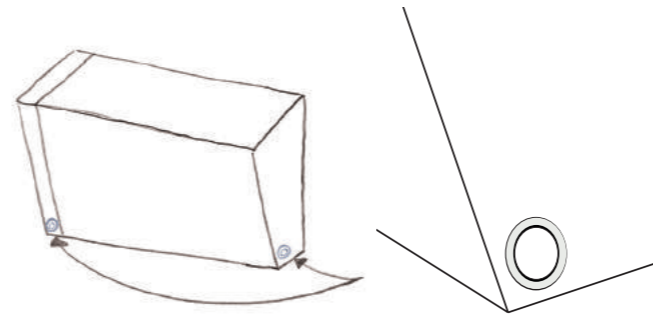
REFLECTION

We need to have an on/off function so the system can be deactivated, if wanted. Regarding cleaning, there should be an indicator showing when cleaning of filters is necessary and a function to open the entire cooker hood when it has to be cleaned to make it possible to remove the filters.

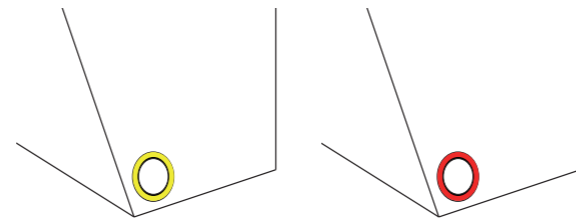
-  Develop control panel.
-  On/off function to deactivate the system.
-  Opening function to open entire cooker hood for cleaning.



ILL. 69: POSSIBLE PLACEMENTS OF THE CONTROLS



ILL. 70: BUTTON WITH LIGHT RING AND POSSIBLE PLACEMENT



ILL. 71: YELLOW LIGHT INDICATES CLEANING, BLINKING RED LIGHT INDICATES AN ERROR

3.15 CONTROLS

The objective of this task is to define which controls are needed to control the cooker hood and hotplate, and where they should be placed (Worksheet 55).

As the cooker hood automatically adjusts to the signals from the hotplate and the hotplate has fixed heating zones, there is no need for an adjustment control for any of them.

As mentioned in the previous passage, two features are needed: an on/off function in case the user want to deactivate the system and an opening function to open the entire cooker hood when it needs to be cleaned.

Furthermore, the controls should indicate when the cooking area is active, when the filters has to be cleaned and if an error has occurred.

Ten possible solutions were identified through a brainstorm. Two of the possible solutions, buttons and touch interfaces was chosen as the most suitable as the others either could be triggered by accident when working in the kitchen (gestures, voice and force/weight) or could get lost easily and be in the way (remote and smartphone). In addition, a slider or a knob was discarded as they are more suitable to control adjustments, which is unnecessary in this case.

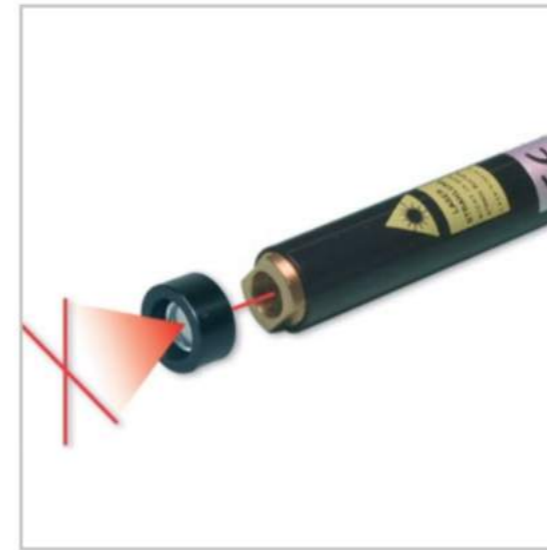
Regarding placement of the controls, the possible solutions were systematically identified (ill. 69). Out of the seven possible positions, the ones on the table were discarded as we want the table to be as clean

as possible, while the placement on a lamella was discarded, as it is not optimal to have the controls placed on a moving part. This leaves us with four different placement options: On the side panel, on the front panel, under the cooker hood and on the wall.

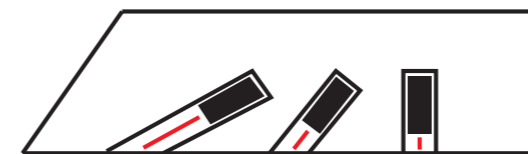
Three different concepts were made (Worksheet 55): a display with light indicators and on/off button, a display with light indicators and touch field and an on/off button with a ring around it as light indicator.

CONCLUSION

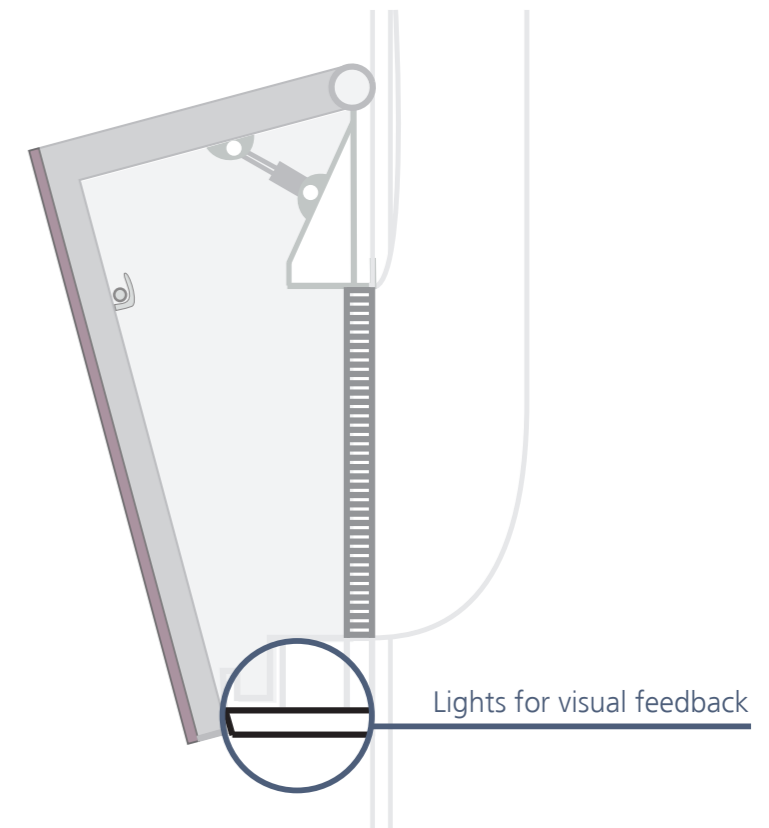
The button with a ring of light (ill. 70) was chosen as it was the simplest and most discreet one with only one button. When pressing the on/off button quickly, the system is activated/deactivated. Pressing the button for 5 seconds opens the entire cooker hood, so it can be cleaned. The light around the button changes colour depending on the situation (ill. 71). White light indicates that the system is activated, yellow light indicates that the filters needs cleaning and a blinking red light indicated an error, e.g. that the filters are not placed correctly. The rhythm of the red light indicates what kind of error has occurred.



ILL. 72: A LENS SPREADS OUT THE LASER BEAM



ILL. 73: ANGLED LASERS



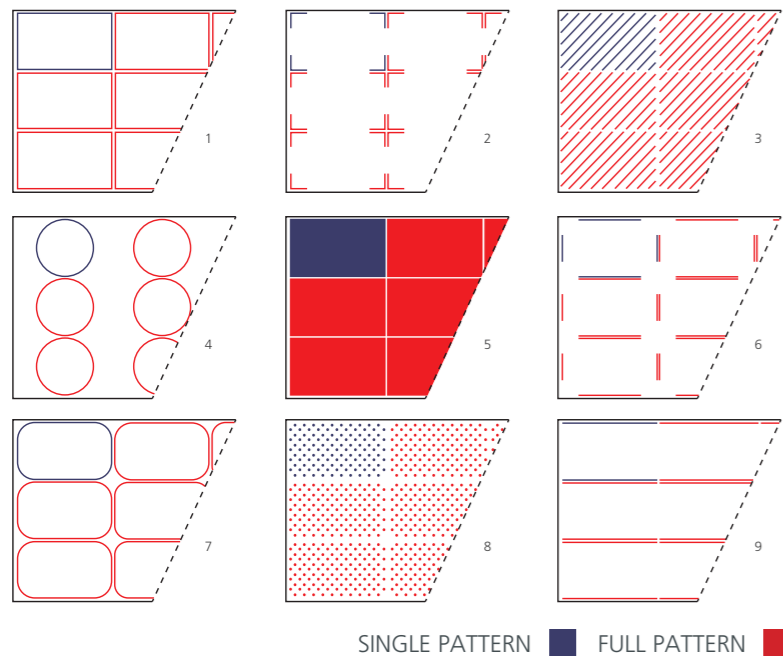
ILL. 74: A LENS SPREADS OUT THE LASER BEAM

3.16 VISUAL FEEDBACK

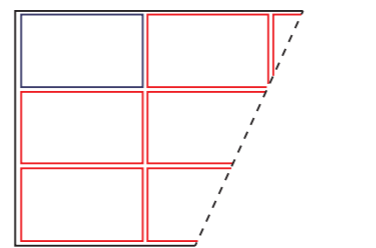
Because the induction area only is marked with an outline milled into the tabletop, it is crucial to get feedback when using the cooking area in order to determine if the hotplate is turned on.

As mentioned in section 3.14, the feedback will be provided by lights placed in the bottom of the cooker hood. A laser emitter will be able to light up the hotplate, but it requires a lens to spread out the light (ill. 72), as the laser should light up a bigger area than just a dot in the size of the laser beam (Worksheet 52). By adding a pattern generator to the lens, it is possible to make a precise border around the cookware, showing that the area is in use (blue light) or still hot after use (red light).

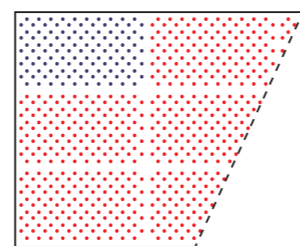
A laser is needed for each heating zone as the lights have to be angled differently in order to reach the right spot (ill. 73). Because of the length of the induction zone, each heating zone will need at least four lasers to cover the whole area. The laser emitters will be placed in the bottom plate of the cooker hood in three different angles (ill. 74).



ILL. 75: DIFFERENT KINDS OF FEEDBACK PATTERNS

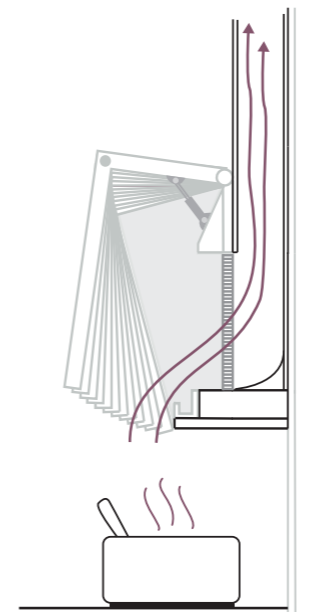


ILL. 76: THE CHOSEN LIGHT PATTERN FOR THE BLUE INDICATOR

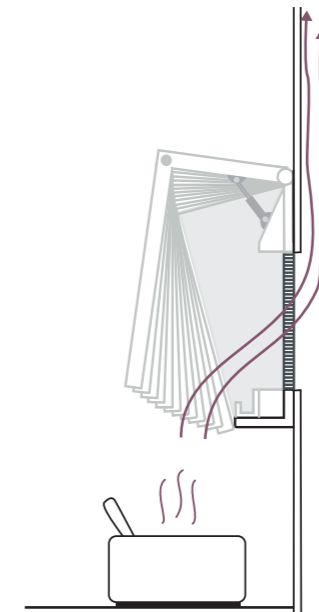


ILL. 77: THE CHOSEN LIGHT PATTERN FOR RED HEAT-INDICATOR

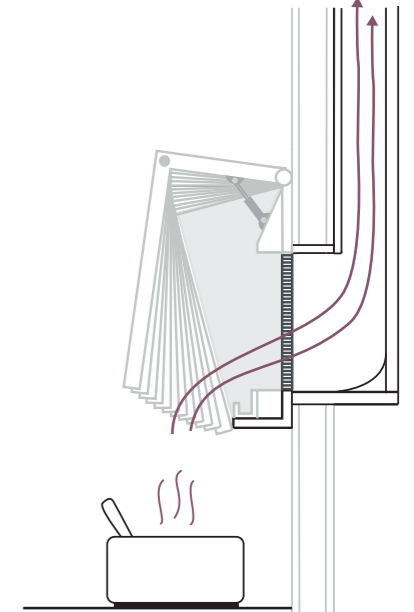
SCENARIO 1 ON THE WALL



SCENARIO 2 INSIDE THE WALL



SCENARIO 3 ON THE OTHER SIDE OF THE WALL



ILL. 78: PLACEMENT OF THE VENTILATION

3.17 FEEDBACK PATTERN

To find the best light pattern for each light indicator, several patterns were listed and evaluated using a PV chart (Worksheet 53).

The criteria, which the patterns are evaluated on, depends on which light it is. The blue light should only indicate where the induction is active, but not light up the food in the pot, so that pattern should only mark the border of the zone, while the red heat-indicator light should cover the whole hot surface, not only the border, to warn about the heat. None of the lights should be too disturbing, so another criteria is that they have to be discreet.

For the blue light, the patterns were evaluated using the following criteria (listed in order of priority):

1. Pattern only covers the outer border of the zone.
2. No light in the pot.
3. Discreet.

For the red light, the patterns were evaluated using the following criteria (listed in order of priority):

1. Pattern covers the zone completely.
2. Discreet.

Each pattern (ill. 75) is given a score from 1-5, where 5 points mean that the pattern fulfill the criteria very well, in order to determine which pattern is the best for each light indicator. The PV charts can be found in worksheet 53.

CONCLUSION

The pattern, which got the highest score for the blue light, was no. 1 and 2 with 13 points. Pattern 1 got a top score regarding border coverage, whereas no. 2 only scored 4 on that criteria. As to light in the pots, no. 2 was better than no. 1, but as the border criteria is higher prioritised than the light in the pots, pattern no. 1 is chosen for the blue light (ill. 76).

For the red heat-indicator, pattern no. 8 got the highest score as it covers the zone with dots and is much more discreet than pattern no. 5, which scored highest on the zone coverage, but only got 1 point for being discreet. Thus, pattern no. 8 is chosen for the heat-indicator (ill. 77).

3.18 BUILDING REGULATIONS

Because of an upcoming law requiring cooker hoods to have a vent, we have explored the possibilities regarding placement of the ventilation.

Three possible solutions were found: visible on the wall, hidden inside the wall or hidden on the other side of the wall (ill. 78).

The first solution with a visible vent on the wall has the advantage that the suction area is further away from the wall, which probably makes the suction more efficient when using the hotplates far from the wall. The cons are that the cooker hood will get closer to the user's head, take up more space and have a visible vent, which might reduce the minimalistic expression. The solution where the ventilation is hidden inside the wall is probably the most ideal solution as the vent will be invisible in the kitchen without taking up space in another room, which is the case with the third solution where the vent is hidden on the other side of the wall.

Apart from taking up space in another room, the third solution might also cause more turbulence as the vent pipe will have a sharper bending (Worksheet 43).

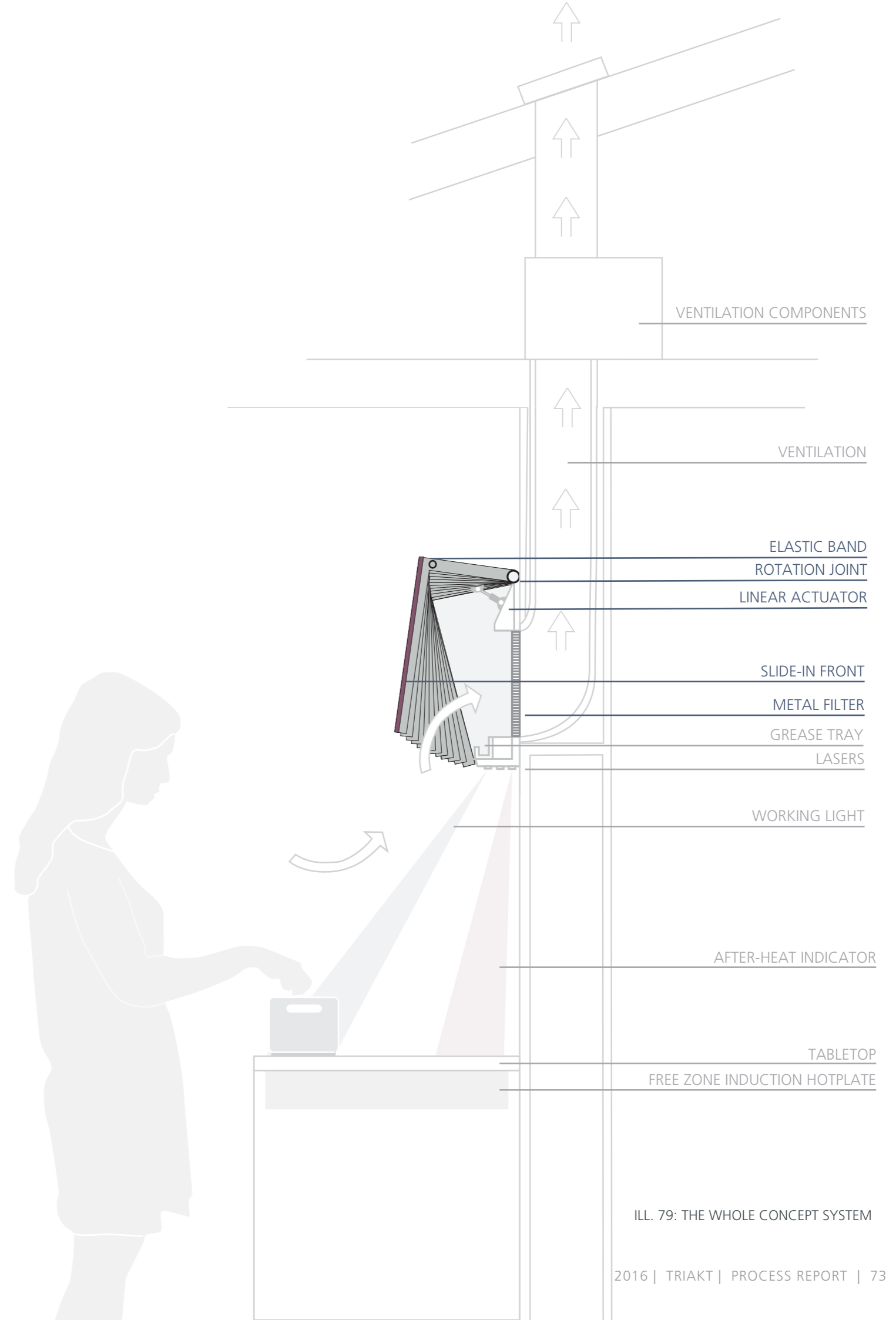
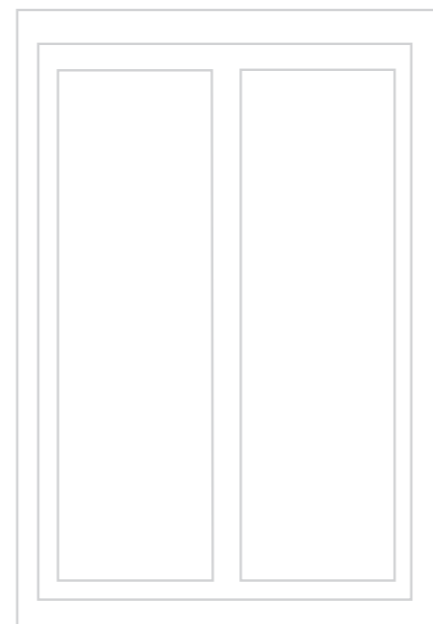
CONCLUSION

Putting the ventilation inside the wall will probably be the most ideal solution as it enhances the minimalistic expression and does not take up extra space in the rooms. The concept will focus on a solution for scenario 2 and 3 as both scenarios are the most suitable considering the importance of minimalism and living-with-less, according to our research.

3.19 PHASE CONCLUSION

For clarity, this conclusion will sum up our whole concept system (ill. 79). The whole concept contains of an adjusting cooker hood, which is connected to a zone free induction hotplate. The hotplate will be placed underneath the tabletop and will only be visible in terms of a milled outline marked in the tabletop. The system is turned on by pressing the round button in the corner of the cooker hood after which a blue light will light up your cookware and start the heating zone where the cookware is placed. For turning up and down the heat you pull or push the cookware into a new heat zone. If the empty spot on the tabletop is warm, a red light will light the spot until it is under 50 degrees. Meanwhile, the cooker hood adapts to your interaction with the cookware, so you do not have to think about it. The only interaction you have to do with the cooker hood is when the cooker hood and the filters need to be cleaned. When the filters need to be cleaned, a yellow light will be shown in the power button on the cooker hood. To open the cooker hood, you press the button in for 5 seconds. When you are finished cooking, the concept system will turn off automatically after a while.

The lamellae on the cooker hood are highlighted as they will be detailed in the next phase.



ILL. 79: THE WHOLE CONCEPT SYSTEM



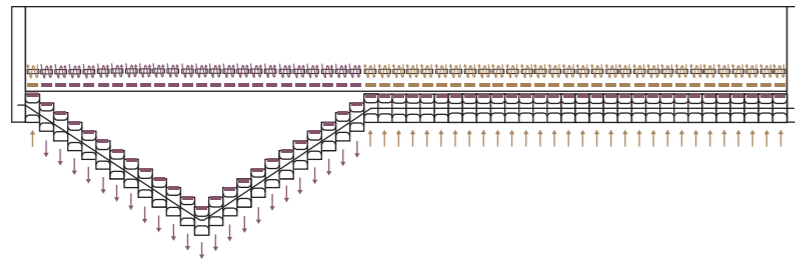
DETAILING

This section describes the detailing of a chosen part of final concept, the lamellas. The lamellae are a central part of the concept and is main focus in the detailing process.

ELECTROMAGNETISM - SCENARIO 1 A COIL FOR EACH LAMELLA

TOP VIEW

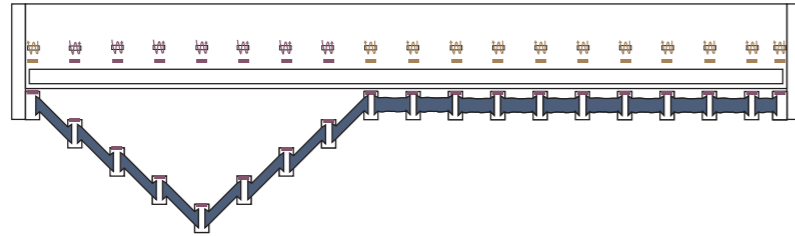
- ☳ COIL WITH DIRECTION
- NEGATIVE POLE
- POSITIVE POLE



ELECTROMAGNETISM - SCENARIO 2 DIVIDED WITH MEMBRANE

TOP VIEW

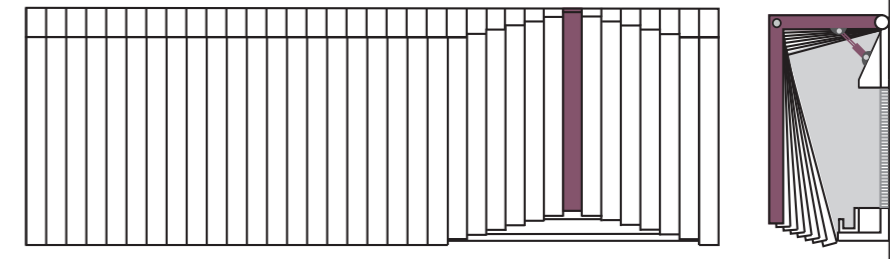
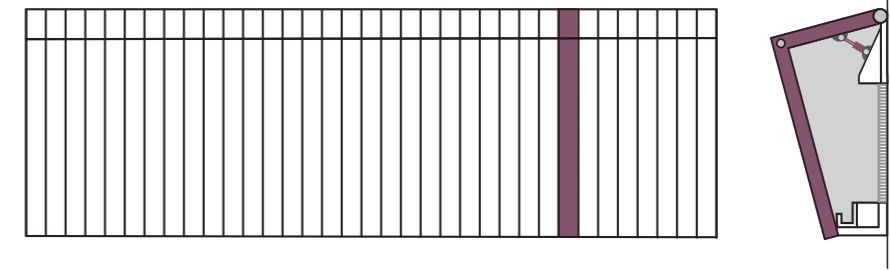
- NEGATIVE POLE
- POSITIVE POLE
- MEMBRANE



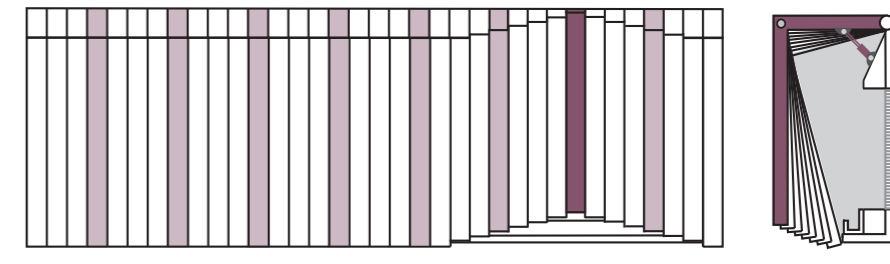
ILL. 80: SCENARIOS WITH ELECTROMAGNETISM

LINEAR ACTUATORS - SCENARIO 1 AN ACTUATOR ON EACH LAMELLA

FRONT VIEW



LINEAR ACTUATORS - SCENARIO 2 AN ACTUATOR ON EVERY FOURTH LAMELLA



ILL. 81: SCENARIOS WITH LINEAR ACTUATORS

4.1 WORKING PRINCIPLE FOR ADJUSTABLE LAMELLAE

The aim is to find a working principle for the wave concept to make it look like a living organism. The main challenge is to make the lamellae follow each other as it opens and closes.

Electromagnetism is considered to control the opening and closing as shown in two scenarios (ill. 80). In the first scenario, a magnet is placed on each lamella and on the bottom plate of the cooker hood, coils are placed parallel with the magnets. When the power is running in one direction, the magnets will be drawn to the coils, making the cooker hood closed. When the power run in the other direction, the magnets will be repelled and the cooker hood will be open.

In the second scenario, the working principle is the same, however, there are silicone rubber membranes between the lamellae, which reduce the amount of lamellae, magnets and coils. One of the main challenges is to control the opening, so the lamellae are not dangling because of gravity. This requires more research and knowledge on electromagnetism as the system might disturb or be disturbed by other magnetic fields e.g. the induction hotplate.

Another possible solution is to use linear actuators (ill. 81). In scenario one, an actuator on each lamella push the lamella upwards to open it. Linear actuators are fairly expensive, so we need to reduce the number of linear actuators, while still maintaining living expression of the cooker hood. In scenario two, the linear actuators are placed on every fourth

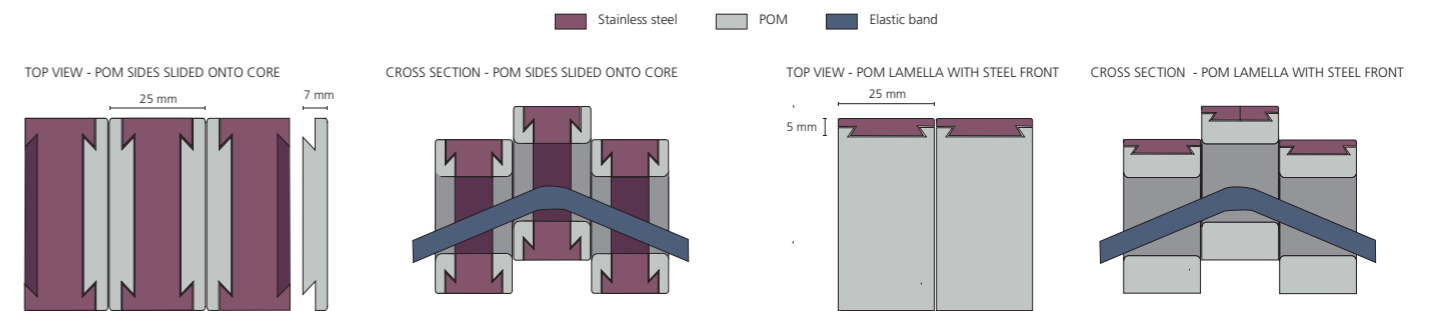
lamella. This requires a flexible connection between the lamellae, so the lamellae next to the ones with actuators follow the one pushed by the actuator. The connection could be an elastic band running inside the lamellae, making the connection invisible.

As the lamellae are placed very close to each other, it might cause a lot of friction between the lamellae. This issue can be solved by making the sides of the lamellae from the material POM as POM is self-lubricating, hard and resilient (VinkPlast, 2012), so it would cause less friction.

The sides of POM could be slid onto the core of the lamellae (ill. 83) or the core could be made by POM and then the front of stainless steel could be slid onto the POM instead (ill. 84). The latter seems to be the better choice, as the amount of parts will be lower and thus less complicated to assemble.

CONCLUSION

The solution with linear actuators on every fourth lamella and an elastic band is chosen, because it is easier to control than electromagnetism and the number of actuators is reduced, making it less expensive. To avoid sliding friction between the lamellae, we use POM. Size, position and shape of the lamellae, as well as how to attach the linear actuators and the elastic band still have to be explored. Cleaning also seems to be a challenge, we have to consider during development of the construction, especially as it is one of our requirements.



ILL. 82: SOLUTION 1 - LAMELLAE SIDES OF POM

ILL. 83: SOLUTION 3 - LAMELLAE SIDES OF POM



Size, position and shape of the lamellae.



How to attach the linear actuators and elastic band.



How to ease cleaning of the cooker hood.



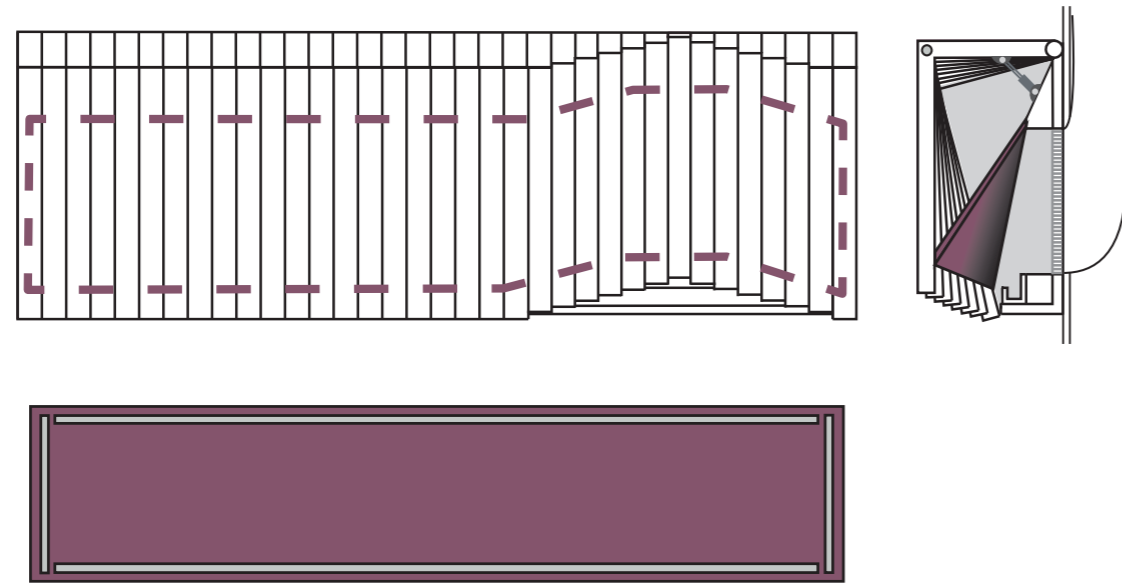
Linear actuators.



Elastic band to hold the lamellae together.

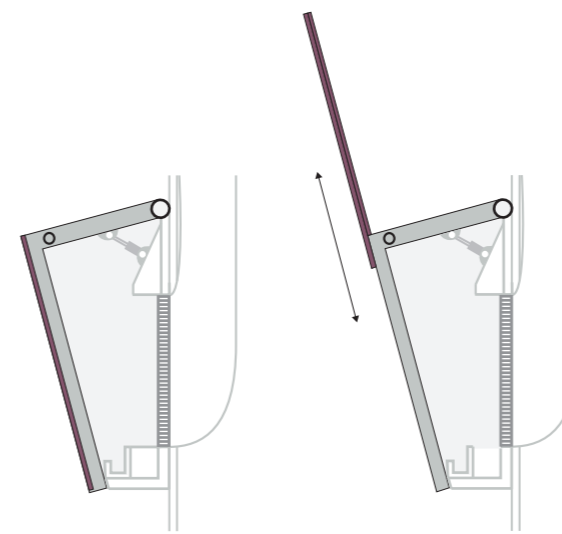


Lamellae should be made of POM.



ILL. 84: PLACEMENT OF MAGNETIC MEMBRANE

SIDE VIEW



ILL. 85: SLIDE-IN FRONT

TOP VIEW (CROSS SECTION)



ILL. 86: INSIDE THE LAMELLAE WITH ELASTIC BAND

4.2 INNER CLEANING

Easy cleaning is one of the requirements, so we have to optimize the concept in this regard as the current version of the cooker hood is hard to clean on the inside when the lamellae are fixed.

The first solution is nano-coating on the inner parts and each lamella. Nano treatment creates a smooth surface, which will make it more difficult for dirt and grease to stick onto the surface. The nano-coating only lasts for 6-12 months before it has to be applied again (NanoCover, 2016), so the user should give the cooker hood nano treatment at least once a year if this solution should work. However, a better durability of nano coating may be a possibility in the future. With a nano cover solution, there should be a tray in the bottom of the cooker hood, which the grease could be collected in.

Another solution is to prevent the grease from reaching the inside of the lamellae, which could be done by attaching a membrane between the wall and the lamellae with magnets. The solution requires a strong magnet and a flexible membrane as it must be able to stretch when the lamellae move. The membrane could be made from silicone rubber with magnetic tape along the edge (ill. 83).

A third solution is to disassemble the cooker hood and make the lamellae detachable, so the lamellae can go into the dishwasher. This requires that the elastic band inside the lamellae is easy to take off and put on. It also requires fewer lamellae, because

the current number (64) will take about 4 cycles in a standard dishwasher (8 hours in total, depending on the washing program) if the lamellae are placed most efficiently. In addition to this, the more the cooker hood can be disassembled, the better when considering sustainability.

CONCLUSION

To be able to clean the cooker hood thoroughly and to take sustainability into account, the construction should be able to be disassembled.

REFLECTION

We need to reduce the dishwasher cycles and the number of lamellae in order to ease thorough cleaning. We also need to consider the cleaning part on the outside of the cooker hood.



How to lower the amount of lamellae.



Cleaning the outside of the cooker hood.



The lamellas should be detachable.

4.3 OUTSIDE CLEANING

As the inner cleaning has been explored the outside cleaning must as well.

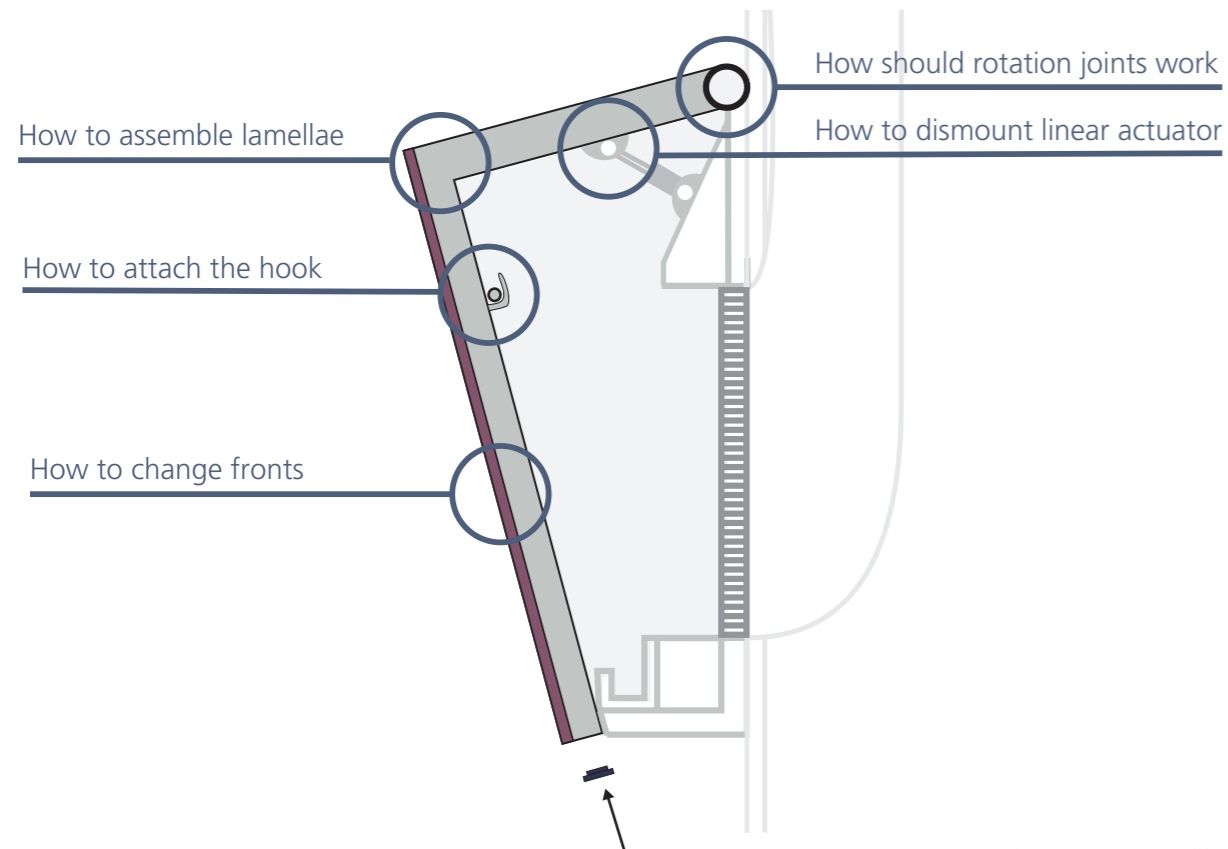
The first consideration was to make a sheet in some way that covers the whole construction so the front still has a minimalistic expression because of requirements. This could be done by an elastic coat of silicone rubber, which can be pulled off the lamellae when it needs to be cleaned. However, the coat may be too hard to handle and it will require more than one person to put it on and off. Furthermore, the silicone rubber surface expresses a more futuristic and plastic look, instead of a more natural minimalistic expression, which we are looking for.

We suggested nano coating as a possibility as well, but as mentioned in the inner cleaning section the sealing only last 6-12 months. On the other hand, it will probably be easier to add new coating on the outside than on the inside.

A third possible option is to construct the lamellae in a way that allows the outside part of it to be removed for superficial cleaning. This could be done with removable fronts that can be slid on/off the lamellae (ill. 85) and go into the dishwasher. It also allows the cooker hood to be customizable in terms of different expressions in colours and materials without being too costly.

CONCLUSION

The thorough cleaning will still be done by detaching the lamellae, but for superficial cleaning of the outside we have chosen to stick to the original expression of lamellae instead of a coat, by using the new lamellae construction with removable fronts, that also allows the expression to be more customizable.



ILL. 87: OVERVIEW OF MISSING POINTS

4.4 DISASSEMBLY

The missing points regarding construction and disassembly of the cooker hood, which need further detailing (ill. 87) will be explored in the following pages.

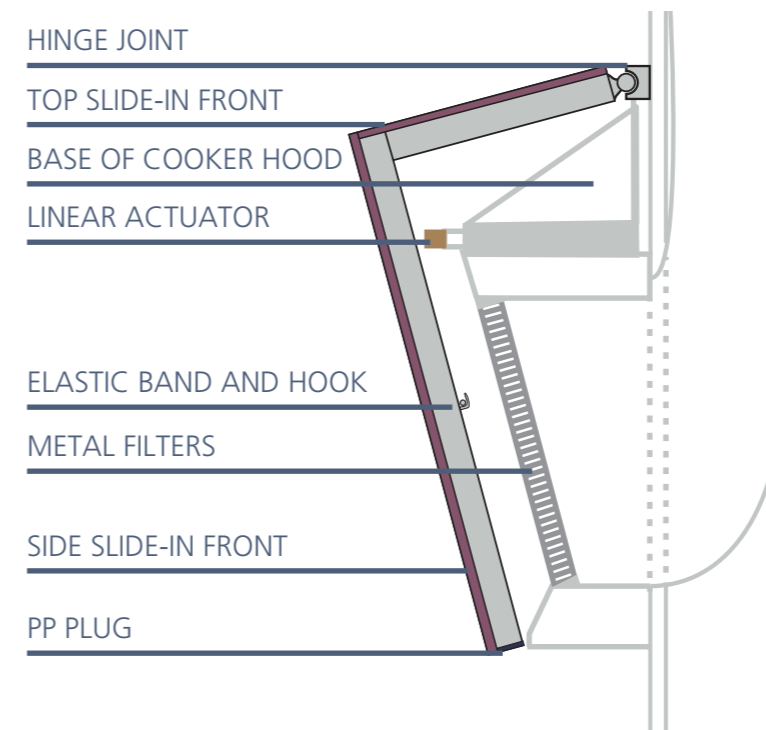
The first missing point is how to get access to the elastic band inside the lamellae, as it is necessary to be able to detach the lamellae. Because the lamellae are placed so tightly together it is only possible to get access to the elastic band in the ends of the cooker hood, so in order to detach the lamellae, the elastic band should be detached in one of the ends. This results in all lamellae will be detached at the same time, which might be hard to handle for the user because of the size and number of lamellae. Therefore, an alternative solution was considered, where the lamellae could be detached one at a time. Instead of having the elastic band running inside the lamellae, it could be placed on the backside of the lamellae, held in place with a hook on each lamella. This allows the user to pull up a single lamella and detach it by unhitching the elastic band from the hook on the specific lamella.

In order to make the lamellae move like a wave, a rotatory joint is required at the top of the lamellae. The lamellae should be fixed to the base of the cooker hood through this joint. The joint only needs to be movable around the x-axis to perform the desired

movement, so it could be a hinge joint with a convex part that fits into a concave part, only allowing movement in one plane. POM, which the lamellae are made of are normally used for joints.

In the updated version of the cooker hood (ill. 88), each lamella consists of four parts: a side part, a top part and two slide-in fronts to slide onto the side and top parts. The side part and the top part could be extruded in POM and be welded together using ultrasonic welding. Extrusion will leave a hole in the top and bottom of the side part. The top hole will be hidden by the two slide-in fronts, which also can be used to customize the cooker hood, depending on the choice of material, e.g. a stainless steel slide-in front could be extruded or bend, while a slide-in front made by wood could be done by milling. The bottom hole will be closed by a polypropylene plug, which also works as a stopper to hold the slide-in front in place.

The convex part of the joint and the hook could also be made of POM via injection moulding in a mould with multiple cavities, as a big amount of parts is needed. Both the hook and the convex part could be welded onto the lamella using ultrasonic welding, as it is fairly cheap.

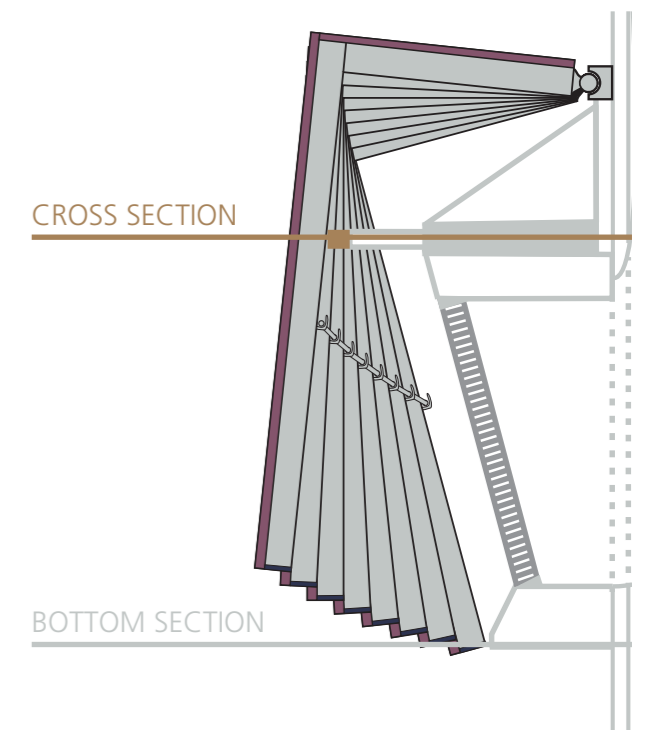


ILL. 88: UPDATED VERSION OF THE LAMELLAE

There is still the issue about detaching the linear actuator from the lamellae. Through desk research on linear actuators it was found that they turned out to be too powerful and would be overdimensioned for this purpose. Instead, stepper motors seem more suitable. Another advantage of using stepper motors is that they do not need to be attached to the lamellae, but can push them instead. The part of the stepper motor, which pushes the lamellae, has a rubber tip at the end to avoid wear on the lamellae.

To disassemble the cooker hood, the elastic band should be unhitched from the hook and the lamella should be pushed up until it can be lifted out of the hinge joint. Then the slide-in fronts can be slid off and the lamella and fronts can be cleaned. Due to ease the removal of the filters inside, the inner parts have been changed (ill. 88), so the filters are closer to the opening and easier for the user to reach and click off.

The current shape of the lamellae will cause wear on the elastic band because of the sharp corners (ill. 90). Therefore, we angled the backside of the lamellae (ill. 91), so the lamellae can be moved without tearing the elastic band. To lower the number of lamellae to ease the cleaning process, the lamellae have been resized since section 3.13, where the number of lamellae was



ILL. 89: SIDE VIEW SHOWING SECTION CUTS

54, so the current number of lamellae is 25. The depth of the lamellae has also been extended, as this allows each stepper motor only to push 9 lamellae (ill. 92) instead of 13 (ill. 91), making the movement livelier and allows the opening of the cooker hood to reach the desired 200 mm and cover a bigger part of the induction zone as the openings get closer to the sides.

Another aspect to take into consideration is the strength of the beam on which the lamellae are attached. We have calculated the deflection of different beams to be able to determine which size is possible without getting a deflection larger than 2 mm (Worksheet 56). The result of these calculations is that the beam will only deflect 1,69 mm if the beam is 10x20mm (width x height) when all 25 lamellae are attached and both ends of the beam are fixed.

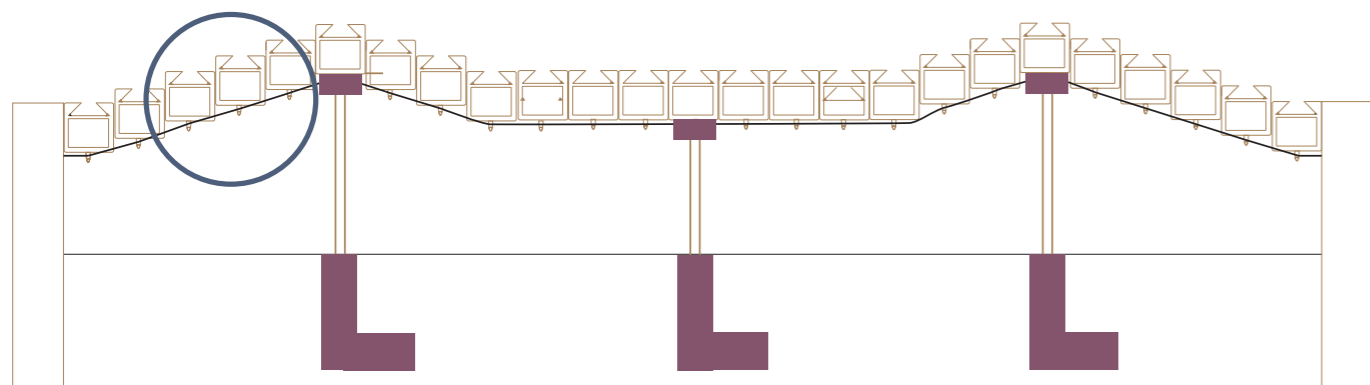
CONCLUSION

The lamellae are attached to the base construction with a hinge joint in the top, making it possible to detach the lamellae by unhitching the elastic band from the hook on the backside of the lamellae and lifting up the lamellae until it can be taken out of the joint hinge.

The working principle for the lamellae are stepper motors that push the lamellae out with help from

CROSS SECTION CUTS (PLACEMENT OF CUT MARKED AT ILL. 89).

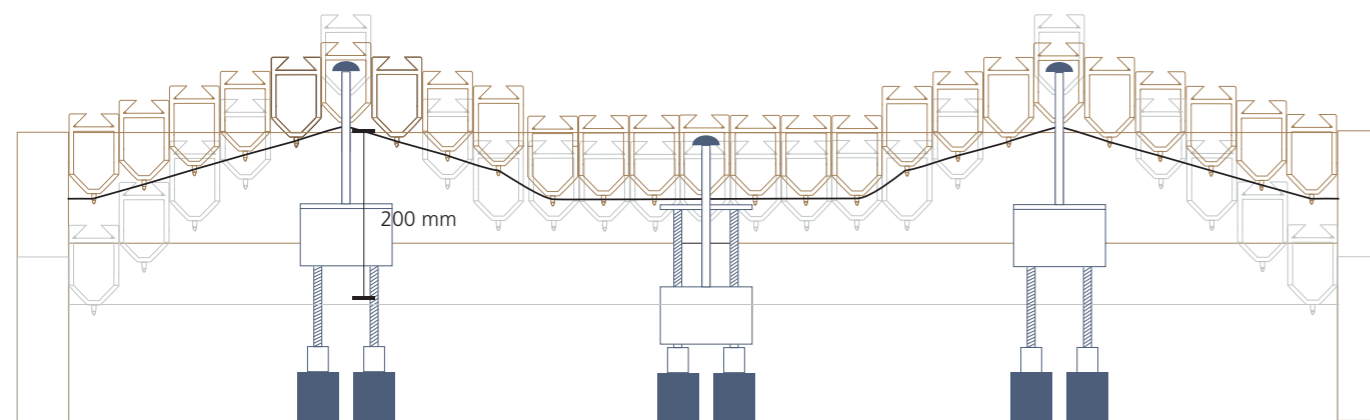
CROSS SECTION
 BOTTOM SECTION
 LINEAR ACTUATORS
 STEPPER MOTORS
 ELASTIC BAND



ILL. 90: THE SHAPE OF LAMELLAE WEAR AND TEAR THE ELASTIC BAND



ILL. 91: 13 LAMELLAE FOR 200 MM OPENING IN BOTTOM



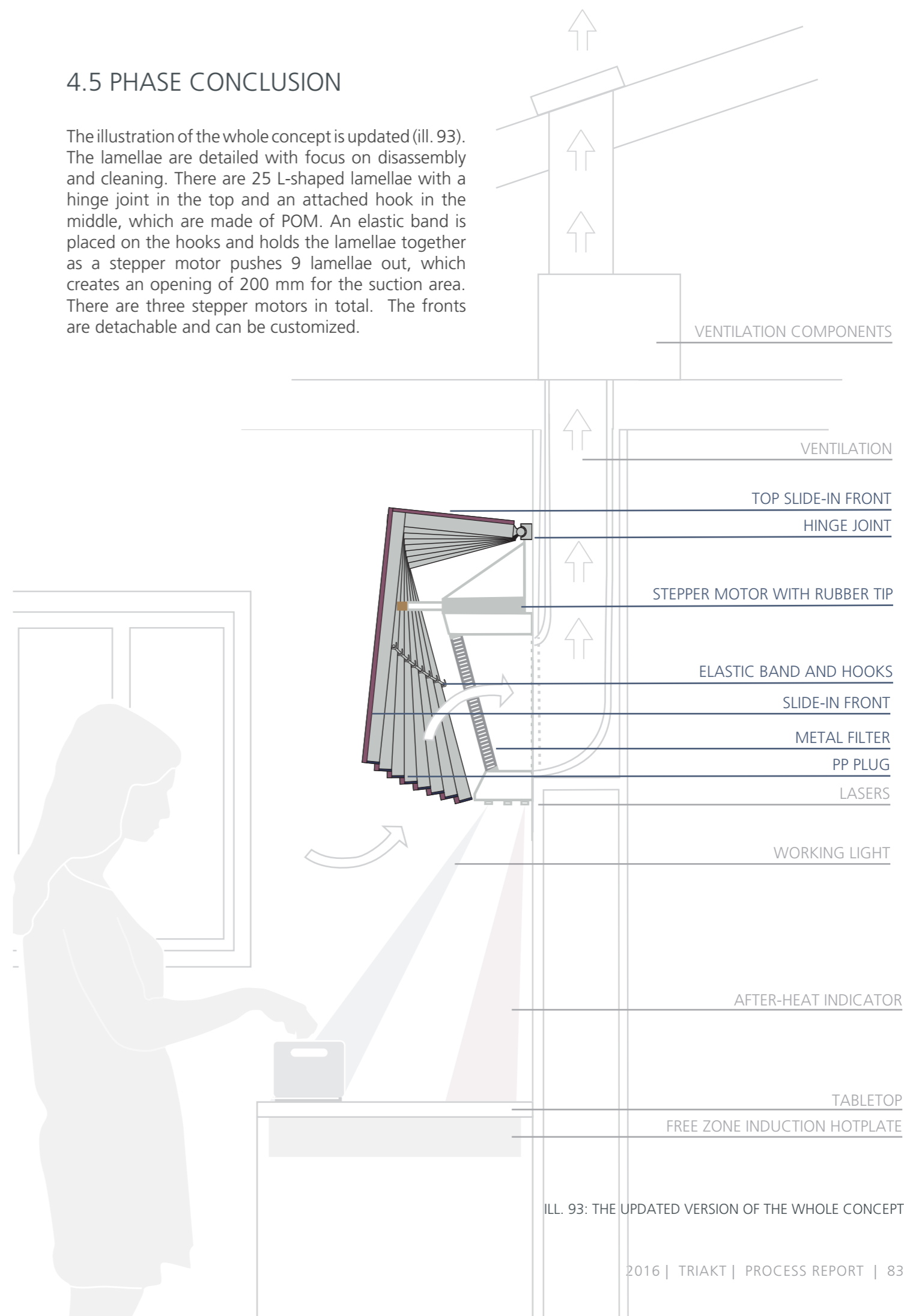
ILL. 92: ANGLED LAMELLAE AND STEPPER MOTORS

the elastic band and create a wave shape with the lamellae. The backside of lamella is angled around the hook to avoid wear and tear of the elastic band. The depth of the lamellae is extended with 30 mm, which allow the shear between each lamella to be 40 mm at the bottom, so the stepper motors only have to push 9 lamellae each to get a total opening of the cooker hood of 200 mm.

The beam, where the lamellae are attached, will only deflect 1,69 mm, if it has the dimensions 10x20mm and is fixed in both ends.

4.5 PHASE CONCLUSION

The illustration of the whole concept is updated (ill. 93). The lamellae are detailed with focus on disassembly and cleaning. There are 25 L-shaped lamellae with a hinge joint in the top and an attached hook in the middle, which are made of POM. An elastic band is placed on the hooks and holds the lamellae together as a stepper motor pushes 9 lamellae out, which creates an opening of 200 mm for the suction area. There are three stepper motors in total. The fronts are detachable and can be customized.



ILL. 93: THE UPDATED VERSION OF THE WHOLE CONCEPT

PREMIERE. WORLD PREMIERE. WELTPREMIERE

WELTPREMIERE. WORLD PREMIERE. WELTPREMIERE. WORLD

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WELTPREMIERE



BUSINESS & MARKETING

This section deals with business and marketing strategies with a short summary to recap Miele's current business strategy and our strategy proposal, shown in a 4P innovation model, promotion considerations and an implementation plan.



ILL. 94: SWOT ANALYSIS OF MIELE DENMARK HIGHLIGHTING THE MOST IMPORTANT FACTORS

5.1 BUSINESS CONSIDERATIONS

Regarding the business perspective, we have discussed several options. Firstly, Miele will be our main key partner, as the deal of the competition is that Miele have prior claim to decide if they will use the concept. Therefore, this section will mainly focus on business aspect aiming at Miele. Prices in terms of production and sales price will not be prioritized, as this project is future based, cost prices will change over time.

KEY PARTNERS

When it comes to key partners, we have looked at three different scenarios; a business plan for Miele, a competitor or a fictional startup company. The last proposal will not be the first preference as the concept is pointing 9 years forward and will be the costliest. As Miele have been part of the project as target company, they are first priority. As a backup plan, the concept could be sold to Miele's main competitors like Gaggenau or Siemens with some adjustments. Siemens are fast developers with less quality tests compared to Miele, but they have a cooker hood that can self-adjust after the consumer turned the cooker hood on, but it does not communicate with the hotplate (Siemens, 2016) like Miele's connectivity function does with wireless communication. However, the living-with-less theme is the opposite of Siemens' current products, as they are very technology and feature based. Gaggenau, on the other hand, fits well to the living-with-less theme as they focus more on quality than features. No matter what, the concept needs to have some small changes to fit their portfolio, therefore we chose to only describe the proposal for Miele's future business plan.

MIELE TODAY

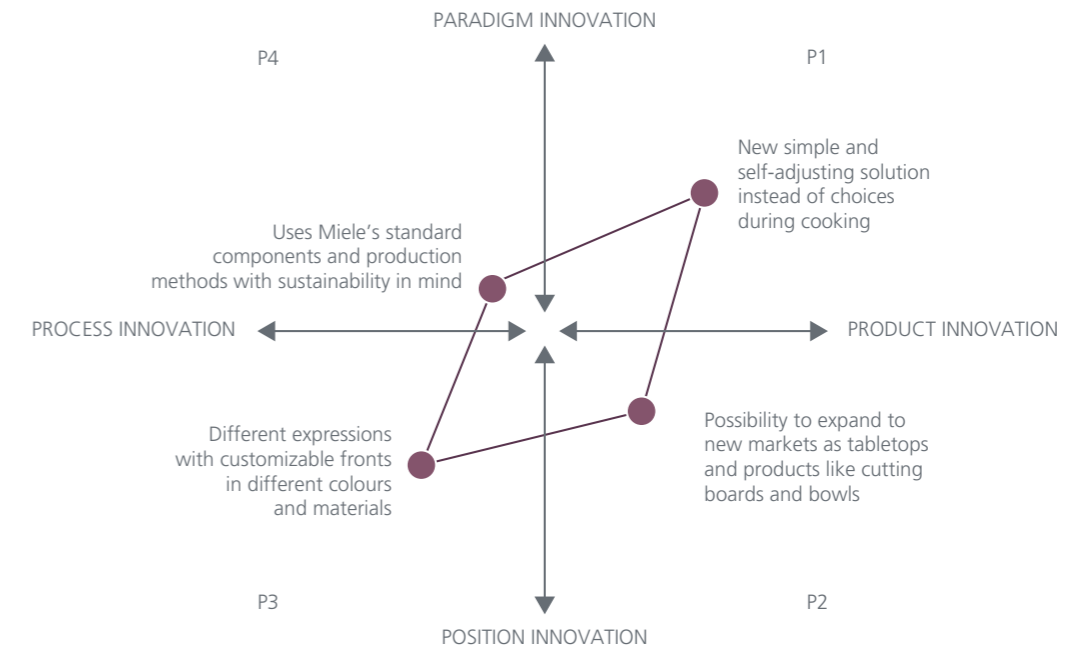
In the beginning of the report Miele's current business aspects and brand values are described, this will briefly be summed up for better understanding of our business considerations and decision-making. As the SWOT-analysis highlights (ill. 94), Miele has a

huge focus on sustainability and their brand values about social responsibility, trustworthiness, quality and continuity. Their products are tested thoroughly before entering the market, resulting in long-lasting products and loyal customers, which is also caused by their continuity strategy, as the customers know what Miele stands for, that it is a solid company and that these things do not change overnight. Miele have their own production plants and are generally producing everything themselves, which means that Miele are able to control the processes from start to end in order to maintain a high level of quality. This is a very expensive strategy regarding innovation, as the production facilities might have to be changed in order to implement an innovation, which is more demanding than just replacing a supplier or outsource some of the production. Outsourcing smaller parts of the production in areas where Miele is not competitive is an opportunity for Miele to explore. However, Miele have their own bank, meaning that the company does not have any debt, which also strengthens the stability of the company (Bache Jensen, 2016).

The consequence of Miele's extensive quality control and own production is a slower product development process compared to competitors, who are able to release new products with new technologies faster. Thus Miele is a step behind their competitors regarding innovation. In relation to this, another threat is that the quality difference between Miele and competitive products might not be obvious for the customers to begin with, causing the customers to buy a cheaper alternative as they seem just as good as Miele at first.

BUSINESS FOCUS

As Miele is a worldwide company with a very strict business model, we will present a business plan to Miele Denmark that focuses on how Miele can promote themselves as being just as fast developers and innovators as the competitors.



ILL. 95: THE 4P INNOVATION MODEL

5.2 INNOVATION

When this project started, the idea was to make a whole kitchen concept, which later was narrowed down to a system between the hotplates and cooker hood, here called the cooking area to show future potential that still follows the main parts of Miele's business plan and brand values. We have used the 4P innovation model with paradigm, product, position and process (Francis and Bessant, 2005) to put our concept into perspective. In this case paradigm is about Miele's current mindset about their business model and assumptions about the product category. Product includes product values and technologies etc. and process is e.g. the production and logistic setup. Position is about new markets, consumers or supplementary products. These parameters should be seen as guidance, while the fields between them show the innovation capacity.

P1. Paradigm and product innovation

In the field between product innovation and paradigm innovation our concept is radical innovative in its self-adjusting function via the opening mechanism instead of suction function (ill. 95). Currently, Miele's connectivity function only focuses on regulation of the engine power. Furthermore, the concept is minimalistic in its expression when it is not in use, while it in use has a joyful and alive expression that fits the busy consumer. As a contrast to other Miele products, this concept focuses on the core of needed functions which minimizes the user choices to simplify the cooking process.

P2. Product and position innovation

Due to the after-heat indicators, the concept makes

it possible to use the tabletop for something else than heating area. This could lead to complementary products such as cutting boards or bowls that can withstand the heat areas. Therefore, the concept is positioned close to the incremental area as it is existing markets in which the product categories are improved.

P3. Position and process innovation

The concept can be scaled to other countries, especially in terms of aesthetics because of the Scandinavian expression with minimalism and simplicity, often visible through simple and discreet colourful forms. Moreover, the changeable fronts and the base of the cooker hood will work as a platform, which is radical innovation compared to cooker hoods.

P4. Process and paradigm innovation

In this field, the concept uses existing Miele production methods and standard components that already have sustainability and recycling in mind. We have tried to improve this field by making it possible to disassemble the cooker hood in order to ease the separation of materials after disposal.

CONCLUSION

The potential of the concept is mostly radical innovative in P1 as it differs from Miele's current products compared to mindset, where we want to show Miele that they can be more innovative faster or least at the same level as the competitors as mentioned in previous section. However, the concept is incremental in P4 to make the concept more implementable in the current business plan.



ILL. 96: SAMSUNG PRESENTATION PICTURES (TOP) AND BMW PRESENTATION PICTURES (BELOW)



ILL. 97: MIELE'S CURRENT MAGAZINES



ILL. 98: OUR PROPOSAL OF MAGAZINE

5.3 PROMOTION

As mentioned in the Innovation section, we want to make a proposal on how Miele can show consumers that they are just as fast to innovate as the competitors without compromising Miele's core requirements about quality and thorough testing.

Miele has an innovation center with development and research, which tests and explores new innovations and technologies with a team full of professionals. Today all the useful and exciting data is a secret to the consumer and only used inside the company. Only very few concepts are selected to be shown on the website for Miele Innovation Centre, written only in Dutch (www.mieleinnovationcentre.nl). We believe that Miele should let the consumers inside the Miele innovation world by doing one or more of the following suggestions.

WORLD PREMIERE

We suggest Miele Denmark to make a world premiere presentation with Miele innovation concepts, inspired by e.g. BMW (ill. 96). BMW has more or less a yearly world premiere of innovation concept cars that works as showoff concepts, that never get fully realized. This kind of principle will make Miele more visible for the consumer and competitors according to being innovative. We have considered the pros and cons for this type for branding strategy.

The biggest advantage is the promotion, but Miele can also get an idea of how many people follow Miele by

making an application form for the event on websites or in magazines and sending invitations out. Today Miele never misses an opportunity to attend fairs during the year, but here it can be difficult to measure the amount of people visiting the Miele exhibition stand by interest or coincidence. It can also be beneficial in terms of promotion online, as it could be streamed live and shared via social channels e.g. youtube and facebook to get faster publicity. Furthermore, it offers an extra opportunity for Miele consumers, followers and distributors to get a glimpse inside the company. However, the show in itself will be very costly as it should be a big event that impresses the audience. The process around the concept presentation and the presentation in itself must be detailed professionally to have a wow effect. Since Miele is in a good financial position, this should be possible as the world premiere principle will work as an investment in improving their brand.

Instead of a yearly world presentation like BMW, Miele could do it every second or third year, as it is a costly event and Miele wants to hold a high standard, therefore they should make a presentation when there are breakthroughs.

INNOVATION MAGAZINE

Another strategy to show their innovation process is to make an innovation magazine. Today they have two magazines, one that focuses on life around food with recipes and food trends and one that focuses on

Miele's success and advertisement for their products (ill. 97), even though the consumers have other platforms for this kind of information. We believe it would be more efficient to focus on new innovations such as technologies and production as it is more important in branding strategy to invite the consumer backstage in the company. The magazine could include user letters with feedback from consumers about their thoughts on the new innovations and concepts, thereby getting a closer consumer relationship. Miele innovation centre in Holland could be responsible for the magazine. A disadvantage is that the competitors can get inspired by the innovations and implement it in their own products faster than Miele. However, the consumer will be able to find the inspiration source, depending on how big the magazine will be.

The magazine (ill. 98) should be published once a year, which requires more or less permanent employment of one or two persons if it could be in relation to Miele's Innovation Centre, which will be less costly compared to the world wide presentation.

CONCLUSION

By making a magazine about innovations once a year or a world premiere presentation of a new innovation concept, Miele will be able to show customers that they are innovative without losing their high standard of quality. We discussed if Miele should make a presentation or the magazine, but decided to propose both as those two easily can complement each other.

The magazine could reveal the presentation date and be a part of advertising it or a new issue of the magazine could be handed out to the participants at the presentation. The magazine could be subscription-based and the presentation could maybe also have an entrance fee, depending on how big it would be.

According to innovations and secrets, we assume that Miele takes patents on their innovations, which still will give Miele a head start compared to the competitors, when revealing innovation through the magazine and presentations.

Miele Denmark's 50th anniversary party and evaluation of student concepts. If our concept wins, it will be handed over to Miele Innovation Centre in Holland.

Miele Innovation Centre develops our concept and creates a whole kitchen concept with new innovation technologies and functionalities.

Miele Denmark plans and designs World premiere presentation of the kitchen concept anno 2025, which will work as a teaser, and later presented on fairs too.

Development period of each product in the kitchen concept and making it ready for production, quality tests and testing by Miele's professional chefs, hereby finalizing the products.

Miele Denmark's preparation of launch and advertisement.

Miele Denmark launches the new kitchen.

ILL. 99: NINE YEARS IMPLEMENTATION PLAN

5.4 IMPLEMENTATION PLAN

To have a clear understanding of our business plan for this project concept, we made a nine-year implementation plan (ill. 99). As our concept is based on research about the future, the launch should not be before 2025. However, the realization of the product must be suited for the spirit of time, and since nothing is guaranteed as trends and futurological research have many pitfalls, Miele need to update the concept during the implementation process if we win the competition. Moreover, a nine-year long plan is a long time for a simple product, so we suggest that our concept should be extended to a whole kitchen concept as a solution package for launching. This leads to our implementation plan where the current year is fixed with Miele's 50th anniversary party. The best participants will be selected and invited to the event where the winner will be found. If Miele decides to go further with the concept, we suggest that Miele hand it over to Miele Innovation Centre in Holland. Miele Innovation Centre have two main purposes; increasing product benefits for customers and protection of the environment, where we would like them to extend our concept to a kitchen concept with their newest innovations.

After one and half year of developing and extending the concept, Miele Denmark will start planning a world premiere presentation of the new innovation kitchen concept that will work as a teaser and show the outside world that Miele is innovative as well, if not even more than the competitors. We believe that this event needs to present a whole kitchen concept to give the presentation more substance and thus make it have a bigger impact on Miele followers, consumers and competitors.

The next step is to finalize and make the kitchen concept ready for production, which we estimated to take four years as new technologies and changes will be implemented and produced. After this, Miele Denmark starts advertising for the launch, which will be in the beginning of 2025.

REFLECTION
Our inspiration source for the implementation plan is based on the kitchen concept 2025 from IKEA and IDEO. IKEA asked IDEO and students from Lund University to develop a future kitchen concept, where the students were interns at IDEO. IDEO gathered the students' ideas and developed the ideas further to

create a whole kitchen concept. Miele is also offering the winning team an internship, which might be in the department of Miele Innovation Centre. We do not know how much the individual Miele departments share or work together, so we assume that the concept handover is possible as it would be beneficial to use the innovation department as a strategy for more visible promotion, instead of almost hiding them as it is the case today.

As mentioned previously the future is hard to predict, so our concept in the current form might change a lot during the development phase leading up to the launch in nine years. Therefore, we see this project as a kick starter for Miele to promote themselves as an innovative company through teaser presentations, which could lead to more innovation presentations. However, it is not the idea that Miele should work on this project for nine years but rather see it as a project running in parallel with other projects, otherwise the project will become very cost-intensive.

6.1 CONCLUSION

The starting point for the project was to create a whole kitchen concept for 2025 that would change the experience of domestic appliances in private homes. This was narrowed down to how to create a cooking area system that could radically change the experience of using the kitchen-dining room for Miele's high-end segment.

Through research, seven areas of priority, which are assumptions about the future, were identified as guidelines to have in mind during concept development. The seven assumptions were "blue" welfare society, the ability to choose, time and presence, offer solutions, living-with-less, living in a social kitchen and connectivity will be everywhere. We chose to really focus on the last four assumptions, which are shown in the final requirements (ill. 100) with solution and evaluation method to show how it has been solved. In line with this, our vision is to enhance the joy of cooking together in the kitchen.

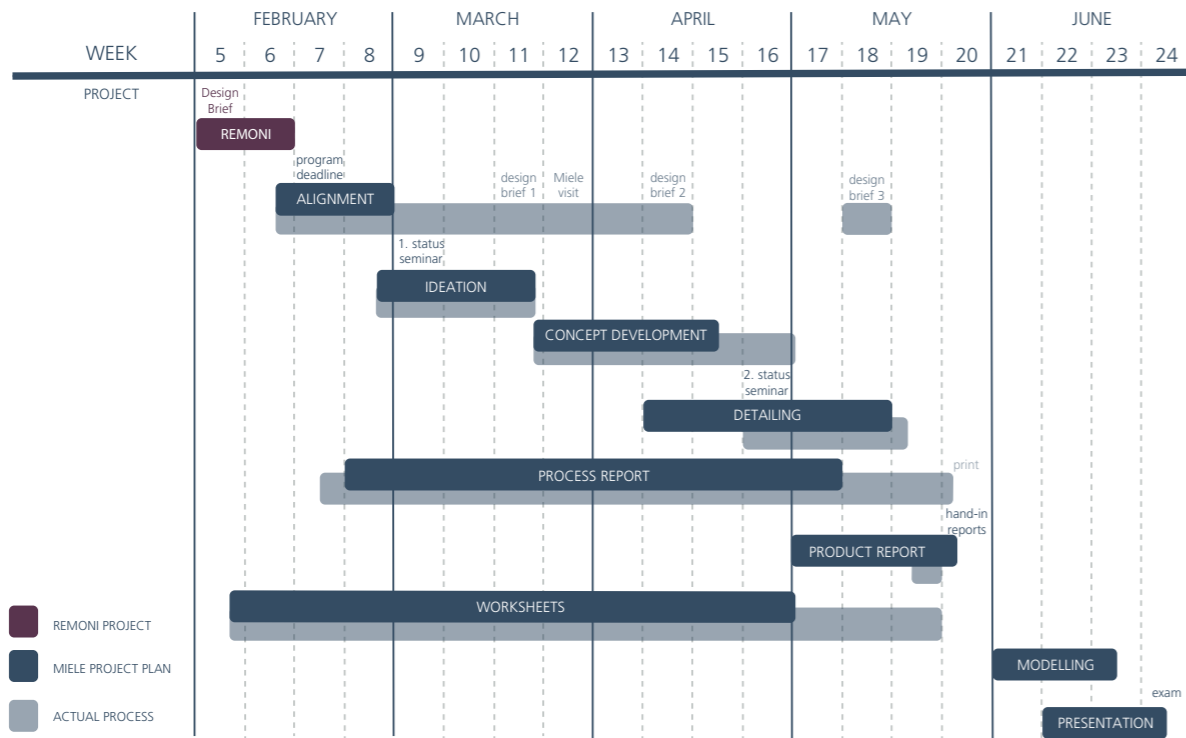
The outcome of the project is Symphony, which consists of an adjustable cooker hood connected to a zone free induction hotplate with three fixed heating zones that allows the users to enjoy cooking together with its wide working area. The hotplate is placed underneath the tabletop to make it as discreet as possible with only the outline of the induction area marked on the tabletop. The interaction focuses on the living-with-less theme as the system consists of three heating zones placed in extension of each other, instead many programs to choose from. This means the user has to interact with the cookware to regulate the heat. During cooking, the consumer will get visual feedback through light on the active induction zone and on after-heat areas. The control panel is as simple as possible as it only is a single button with two functions. One for turning the system on and off and one for opening and closing the cooker hood for

cleaning filters and cooker hood. The consumer can concentrate on the fun parts in cooking instead of the cooker hood, as it is self-adjusting and regulates the suction area to fit the cookware, which creates a beautiful wave in the cooker hood construction.

Symphony is still only a concept, thus there are multiple details that need to be refined and optimized in order to go further with the concept and making it ready for production.

REQUIREMENTS	SOLUTIONS	METHOD
COMMON		
Miele brand values (1.1 Miele Denmark, 1.6 Trends, app. 2)	Disassemble cooker hood after disposed (4.4 Disassembly), sustainable production process (4.4 Disassembly)	Deskwork and team discussion with pros and cons
Scandinavian design values (1.12 The future consumer)	Minimalistic expression with simple geometry (3.11 New adjustable cooker hood)	Team analysis of aesthetics and what scandinavian values means
COOKER HOOD		
Comply with new laws; ventilation section required (1.1 Miele Denmark)	Implemented ventilation section in the wall (3.18 Building regulations)	Three scenarios are discussed with pros and cons for on wall, inside wall and behind wall, where inside the wall was chosen
The "boring" parts should be easy (1.10 Today's consumer, 1.13 Domestic appliances)	Self-adjusting (4.1 Working principle for adjustable lamellas)	Asked target group, fellow students, supervisors for boring parts in the cooking area, all agreed on the cooker hood
Connectivity with hotplates (1.13 Domestic appliances, 3.3 Origami Concept)	Via Wireless signal (3.14 Interaction)	Miele's connectivity 2.0
Alive expression (3.3 Origami Concept)	Three stepper motors push the total 25 lamellae for full opening of the cooker hood, each stepper motors is placed to push 9 lamellae (4.4 Disassembly)	Calculations are made to find needed force and drawings are made to find the maximum size of the lamellae that still looks like a wave
Cleaning (1.5 Sound level, 3.4 Initial thoughts)	Detachable filters with click system (4.2 Inner cleaning) Disassembly of the cooker hood (4.4 Disassembly)	Desk research of standard use of filters Mock-up building and team discussion with pros and cons
Interaction	One button with ON and OFF, opening and closing of lamellae (3.15 Controls)	Sketching and team discussion with pros and cons based on status seminar
TABLETOP		
Induction though tabletop (3.6 Tabletop test)	Materials with low expansion coefficient and a high thermal conductivity (3.6 Tabletop test)	Litterature about Materials Engineering Science Processing and Design
Invisible induction area (3.5 Body storming with 1:1 mock-up)	Outline is marked permanently by milling (3.5 Body storming with 1:1 mock-up)	Sketching and team discussing with pros and cons
HOTPLATE		
Cooking area as a social gathering place (1.3 what is a kitchen)	The induction area must be at least 1200 mm long before more than one person can cook undisturbed (3.8 Hotplate layout)	Tested via 1:1 body storming pros and cons
Solutions instead of options (1.13 Domestic appliances)	Three fixed heating zones: Low, middle and high that are zone free horizontally (3.8 Hotplate layout)	Sketching and tested via 1:1 body storming pros and cons
Heat indicator (3.6 Tabletop test)	Red laser to light the spot if the surface temperature is over 50 degrees (3.16 Visual feedback)	Surface temperature test on induction hotplate and team discussion about lighting source with pros and cons

ILL. 100: FINAL REQUIREMENTS WITH SOLUTION AND USED METHOD



ILL. 101: PROJECT TIMELINE

6.2 REFLECTION

After the development and documentation of the project, it is possible to look at the process and the product as a whole and reflect on the elements. The reflection is divided into a product part and a process part with several subsections.

PRODUCT

As the product has to aim at the spirit of 2025, there are many uncertainties as variables in market, business, technology and consumer behavior will change during the process. You never know when the next financial crisis will happen, if the consumer trend will be to eat pills instead of food or the government adopt new laws that prevent the concept. Therefore our concept needs to be further developed and updated to fit the spirit of time.

We are aware that we have not looked into the suction area in the cooker hood, even though it is a main part of the cooker hood. We believe that our contribution to Miele will be better in other aspects, as Miele are constantly developing in the suction area, which we cannot compete with. However, we could have used Miele's competencies to get a better understanding of this field by doing expert interviews with Miele's innovation engineers. In line with this, we could have given new inputs or further developed Miele's newest innovations if we had had a better understanding of Miele's new innovations. During documentation of the final phase we noticed

the fact that we have mostly evaluated the solutions of the requirements (ill. 100) ourselves instead of using external opinions e.g. bodystorming with consumers and consumer evaluations of scenarios.

Our concept consciously questions the use of smart technology as Miele and all competitors rush in that direction. We want to remind Miele of another direction, which focuses on the core needs of a target group with the lifestyle "a quest of purpose" instead of only smart technology and delivering many programs and functions. This is a change of Miele's portfolio that we would like to add to show that Miele can be both, and fit other target groups as well, even though it might worsen our chances of winning. Miele might be expecting more technology advanced concepts as nothing is stopping our concept to be produced today, but it will not fit the consumer's need as current consumers want possibilities and choices. But the future research point in the direction that the consumer in the future wants solutions and only the necessary because of the living-with-less theme to save the planet.

PROCESS

The project is an iterative process with several processes running simultaneously, as shown in the project timeline with both the planned time and actual time used on the project (ill. 101).

Project management

The project management has been controlled by use of a Scrum board that makes delegation of tasks tangible and visible through use of post-its. Each post-it contains one task with explanation and time deadline to secure progress and give all team members an overview of the project and tasks to solve. This tool was very beneficial the further the project proceeded and the tasks became more and more tangible.

In the beginning we tried to make the project problem based but could not find the right approach, therefore we looked into trends and futurologist research, which resulted in using more time on framing and research than first planned (ill. 101). It is the first time for all team members to work with futurologist research and use trend spotting methods, like signal scanning cards, eras map and cross-industry pollination, which contributed to a more controllable and systematic research phase.

Furthermore, the project is placed in a red ocean as kitchens are well explored, which also contributed to a longer development phase, as we often came up with concepts, which we later in the process realised already existed. All this lead to a decreased detailing phase compared to the original plan. In retrospect, we should have stopped researching earlier and done more detailing instead.

Target group

Even though the research phase was long, we did not manage to gather more target group interviews than one from Miele's high-end segment. We tried to get in contact with the target group by handing out flyers via door-to-door method in Aalborg high-end areas, but no one responded. Now we see that we could have contacted estate agents or kitchen companies and asked if the consumers would take part in the project to get more user inputs, rather than just consumer behavior research. We could also have used Miele, as they told us at the Miele interview that they have a team of professional chefs that test Miele products and concepts. These chefs could have been interviewed as well or asked for feedback on our concepts for external evaluation.

Miele competition

The design competition has been a big motivation factor and guideline with Miele as a main target group, which set some basic rules and made the project more tangible in terms of Miele's portfolio and aesthetics.

Miele collaboration

We have had mail-correspondence with Miele, got a guided tour at Miele's showroom in the headquarter and an one and a half hour interview with Asger Bache

Jensen, Marketing Director at Miele Denmark, which were very useful. In general we have been too passive regarding getting Miele to share their knowledge. If it would have been beneficial to use Miele's expertise in the different departments if possible. If the departments work well together, we could have interviewed on different levels and made a workshop with Miele Innovation Center, Miele's team of professional chefs and production departments. This could contribute to further development and mock-ups or prototyping and testing, as we as students are limited in resources. However our 1:1 and 1:30 mock-ups worked very well as discussion tool to find construction problems and exploring expression and emotions about the concept. This could have been done faster with help from Miele.

Even though it is a competition we believe that it Miele would benefit more, if Miele Denmark worked as supervisor to let the students get a deeper understanding of the Miele culture and its future possibilities. It succeeded in getting useful feedback on our concept at the Miele meeting although the marketing director does not play favourites.

Another advantage for the project could have been to get a sneak peek at the invisible kitchen concept from Miele to see in which direction the future kitchen is heading according to Miele themselves.

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