A & D Postgraduate Department _ Master of Design

The AMICA Project

(AugMentative Interactive Cooking Station)

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Attestation of Authorship

'I hereby declare that this submission is my own work and that, to the best of my knowledge and belief, it contains no material previously published or written by another person (except where explicitly defined in the acknowledgements), nor material which to a substantial extent has been submitted for the award of any other degree or diploma of a university or other institution of higher learning.'

Auckland, 07.05.2019

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The AMICA Project

(AugMentative Interactive Cooking Station)

The AMICA (AugMentative Interactive Cooking Assistant) Project

Re-Thinking the Cooking Experience: Incorporation and Collaboration as Key Drivers for a Speculative, Feasible Design Scenario

Abstract

In our future globalized world, 'people's knowledge' will tend to be replaced by 'intelligent machines'. Cooking is considered to be one of the valuable skills involving "knowledge of everyday life" that is losing its reason for being. Positioning itself in a speculative (human+) scenario, this research explores how cooking can be imagined and incentivized in life as it will become in the next technological age.

Key Words

Cooking Experience, Speculative Design, Human+ scenario, augmenting technology, futures, evolution of technology

Introduction

Cooking has long held a central position in the hearts of human beings and marks their evolutionary development. Wrangham (2009) argues that apes began to morph into humans when they learned how to tame fire and heat food. Cooking makes us human.

Ever since human life shifted to a more sedentary mode, societies have become more prone to speculation (Diamond 1997), tending to focus more on food rather than the process of cooking (La Chapelle 1735; Brillat-Savarin 1825; Montanari 2006). Today, cooking seems to have lost its reason for being (UBS Mega-Trend Report 2018). Rather than being used for cooking, the kitchen has transformed into a sterile environment destined to vanish or survive only with the residual effect of it becoming 'an aid of orientation in the context of a broader society' (Burdek 2005, p330).

Thus, it is the wider cultural context that is seen to radically change. French philosopher Bernard Stiegler asserts that the cultural horizon of globalized societies today is tending towards insipience, a process whereby knowledge is replaced by delegating tasks to 'intelligent machines' (Toffoletto, 2019, p1). For Steigler, this loss of relevant knowledge and know-how is also and above all referred to as the 'knowledge of everyday life: the knowledge of parents, of education, as well as cooking', (Toffoletto, 2019, p1), which is also considered as part of the infrastructure of social cohesion.

Nevertheless, as a relevant form of practical understanding, cooking can embody new values. It is a civic act (Ducasse 2018), with ethical implications and thus responsibilities. It is a potential trigger to secure sustainable, inclusive economic growth on a domestic scale: an essential part of the food production ecosystem of the future, allowing people to make healthier choices, meet nutritional standards and move towards an environmentally friendly lifestyle (White 2018).

Located in a near future and intended as a speculative practice to address this new cultural scenario, this research aims to offer new, feasible solutions that can encourage the practice of cooking, reactivating and increasing cooking capabilities, rediscovering the autotelic pleasure of making (Chiksenmihai 2008).

Therefore, this speculative approach intends to define a cultural context of virtual, but perhaps universal, nature; more of a pattern than a vision. This research is not placed in a future tout-court, but instead into a mutant, liquid container of forces driving us in a direction we define as 'progress'. In this scenario, progress leads to a collaboration between users and machine and technology is constrained by our human values. In this context, our personal devices are machines that assist, resemble, know and live with us. The kitchen is still seen as a place of socialization, where behaviors and values are formed. Users become a fundamental constituent of the recipe and cooking is about generational involvement, the pleasure of making, caring, and sharing: a domestic container of such relationships and beliefs that shape and define us and is thus an essential part of the place of unmatched beauty called the home.

Critical Context

Today, in the age of information and networking, globalized yet urbanized societies are facing major changes that are set to have a radical impact on our lifestyles. Technological developments such as automation and artificial intelligence tend to marginalize activities and services structurally (Kinder 2018), also affecting the intellectual professions, such as law and medicine (Toffoletto 2019). The mechanization of manufacturing processes and more recently of services has drastically reduced the time dedicated to work (Fig. 1), which has contracted from 23% of a typical workers' lifetime in 1800 to 13% in 2018 (Casaleggio Associati 2019).

Image removed due copyright issues.

https://stream24.ilsole24ore.com/video/notizie/2054-lavoro-1percento-tempo-visione-casaleggio/AEyMA4GH?refresh_ce=1

Fig. 1. Contraction in the proportion of a typical worker's lifetime devoted to work, 1800–2018 (Casaleggio Associati 2019)

The French philosopher Bernard Stiegler asserts that the cultural horizon of today's globalized societies tends towards insipience, a process whereby knowledge is replaced by delegating tasks to 'intelligent machines'. As a result, humans are losing know how in relation to the items of technology utilized in their everyday lives and are consequently losing the ability to find alternative solutions to problems occurring outside the scope of standardized procedures (Toffoleto 2019). Stiegler's solution to this concerns the re-activation and augmentation of people's capacity (or, as defined by economist Amartya Sen, their capability), to face and solve problems, implying the recovery not only of an appropriate know how for interacting with new and complex artificial systems, but also of the 'knowledge of everyday life: the knowledge of parents, of education, as well as of cooking.' (Toffoletto 2019, p1) This knowledge is also indicated by Sen to be a driver of social resilience, namely, the capability of people to react to life's adversities, as it constitutes part of the infrastructure of social cohesion.

Modern and sedentary life is diminishing our knowledge of natural environments and phenomena and is also impacting on our senses . Over the last 50 years, the number of shortsighted people in the world has doubled, and by 2020, 20% of the world population will suffer from chronic rhino-sinusitis, affecting primarily the sense of taste (World Health Organization 2018). Cultural anthropologist Alessandro Gusman asserts that this process of sensory fading is not only about atrophization in aging populations but also due to the practice differentiator: a gap between those who grew up indoors, in artificial lighting and air, and those who are used to relating to their body through outdoor experience.

'Inhabitants of the Savannah still have a refined perception of smells: a poisonous plant can deceive their eyes, but not their smell.' (Muritti 2018, p1). Senses are drivers of cultural processing, which is continually subverting the labeling of odors and tastes: 'Fermented food, once rejected by western cultures, but common in many culinary traditions, has become delicious. Today, more than ever, smells have no barriers and large-scale migration has brought a variation of our sensory landscapes, mainly olfactory and auditory.' (Muritti 2018, p1).

Despite the shortening of peoples' working lives, life is perceived as increasingly stressful, especially among the millennial generation (American Psychological Association 2017). People are struggling to cope with the increasing need to multitask (Nordqvist 2017). The resulting lifestyle is also affecting our habits in terms of cooking behavior and nutrition. The amount of time dedicated to cooking has been dramatically reduced in developed economies (Greenwood 2018), resulting in an increase in dietary imbalances. The excessive consumption of fast food (Guyenet 2018), which tends to be heavily processed and hyper caloric, is often shown to be a cause of health problems such as obesity, diabetes, and hypertension (World Health Organization 2018).

Thus, the scope of this research project is to offer, from a design perspective, a possible solution that can facilitate the incorporation of cooking into future lifestyles. The main aim is to help improve users' cooking skills, taste experiences and ability to follow nutritional guidelines, while creating an environment that enables them to have a joyful and positive cooking experience.

As mentioned earlier, cooking has made us human and cooking has occupied a central place in life since the dawn of humanity, marking our evolutionary path. Wrangham (2009) argues that apes began to morph into humans because they learned to tame fire and heat food. Cooking made us human, and 'we are tied to our cooked food, and the result pervade our lives, from our bodies to our minds. We humans are the cooking apes, the creatures of the flame.'(Wrangham 2009, p14).

Cooking developed according to seasonal cycles that depended on the availability of food or its shortage due to famine or natural or technological constraints (Diamond 1997). The abundance of food allowed a faster transition from small hunter-gatherer tribes to evolved, sedentary societies based on agriculture (Diamond 1997). These were 'class-stratified societies incorporating many social orientations and occupations with internally specialized political systems that developed into large and densely populated urban environments.' (Yoffee 2005, p5).

Jared Diamond (1997) noted that once societies became sedentary, they tended towards speculation. Once class stratification took place, eating changed according to new lifestyles and food became a matter of speculation and discourse for the wealthiest.

In 1735, La-Chapelle defined the traits of the Nouvelle Cuisine as a lighter, simpler food, with almost no spices with a clear distinction between sweet and sour tastes and the rising importance of vegetables. During the Enlightenment, 'Pythagorean eating' (vegetarian diets) became popular, as food had to be more functional and comfortable for the elites of the emerging middle class, which was looking for a more dynamic and efficient business life-style.

In 1825, Brillat-Savarin, a gourmet and the first 'philosopher of the kitchen,' defined food as a form of fine art. His book The Physiology of Taste is not a cookbook per se, but is instead a meditation on life, seen through the pleasures of the palate (Brillat-Savarin 1825). Georges Auguste Escoffier was appointed as one of the codifiers of French haute cuisine, elevating cooking to the status of art and the chef to the position of being a respected professional.

In Food is Culture, food historian Montanari describes the process of how food came to be, how it came to be cooked, how it came to taste good and how it became metaphor and discourse (Montanari 2006).

Today, in the age of social media, sight is the dominant sense used to perceive food, as users are more focused on the 'Instagrammability' of photogenic food rather than the eating experience itself (Lee 2017).

However, the place where cooking occurs is a different cultural scenario. Cooking is not speculative: it is about a process that has to be learned, handed-down or acquired . It is knowledge of a practical nature that can be defined, in accordance with the Greek and Roman philosophers' distinction between liberal and mechanical activities, as a 'mechanical art.' The kitchen is the place where cooking transforms into knowledge and skills, which are of cultural relevance when they become the subject of argument and conversation, generational exchange or confrontation set in a convivial place of socialization, shared with family and friends. Ideally, the kitchen is a center of gravitation around which life occurs (Fig. 2).

Image removed due copyright issues.

Fig. 2. The kitchen as a center of gravitation around which life occurs (Repubblica, 2018).

Pino Cuttaia (2018) emphasizes the value of cooking. He recognized examples of cuisine created by an artist and by an artisan: 'Mine is of artisan nature, because it wants to repeat the recipe thus, to re-produce. The artisan is the one who knows the ingredients and their origins, repeating gestures, carrying traditions, preserving a cultural identity.' (Mancini 2018, p1). It is in the home that, through the process of domestic consumption of products and services, people constitute their gender identities. Through domestic activities, they define a specific form of cultural knowledge (Pink 2007). Anthropologist David Sutton has shown how cooking and food are key mediators of social relationships, a symbol of identity and a marker of difference, whether defined by gender, class, race, or ethnicity. 'They play Cooking and food plays a key role in social processes as rituals that focus on creating continuity with the past and thus on building and preserving memories.' (Sutton 2008, p160).

Today, cooking can incorporate and promote new values since eating is becoming an act of responsibility. For Alain Ducasse (2018) eating is a civic act. Accordingly, aside from playing an important role in the affirmation of multi-cultural societies, the way we eat and cook has civic implications that could help us to live better and healthier.

Thus, the responsibility we show towards ourselves and others can be a potential trigger for sustainable, inclusive economic growth on a domestic scale and an essential component of the food production ecosystem of the future, allowing people to make healthier choices, meet nutritional standards and move towards an environmentally-friendly lifestyle (White 2018).

It is in this cultural context that the project is intended to function.

Contextual Review

To address the research problem of how to incorporate cooking in future lifestyles, I opted for a speculative design approach. Speculative design, as defined by Anthony Dunne (2013) is a critical design practice. By speculating, designers re-think alternative products, systems, and worlds, and envisage and anticipate the future. At the same time, they help to understand and re-think the world of today (Auger, cited by Mitrović 2015).

According Dunne and Raby (2013), the speculative design approach is based on re-thinking a technological future that reflects the complexity of today's world while being engaged with a broader social context. Thus, a speculative practice opens space for discussing and considering alternative possibilities and options. It propels thinking, raises awareness, questions, and opens discussions. It can offer alternatives that are necessary in today's world, synthesized by the formula 'alternative presents and speculative futures' (Auger 2013; see Fig.3).

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http://speculative.hr/wp-content/uploads/2016/05/fig2_graf_en.png

Fig. 3. Here and now: everyday life and real products available on the market. The higher the line, the more emergent the technology and the longer and less predictable the transit to everyday life. Speculative futures exist as projections of the lineage in the future. The alternative reality presents a shift from the lineage at some point in the past to re-imagine our technological present (Auger 2013).

Speculative design has been defined as a discursive practice (a narrative) based on critical thinking and dialogue which questions the practice of design using imagination and visions of possible scenarios. Such a practice is characterized by a methodological flexibility and openness (Mitrović 2015). Dunne and Raby (2013) expanded the focus of their activities to include the cultural, social and ethical implications of new technologies, and, more recently, speculations about broader social, economic and political issues. Critical Design may seem like a top-down approach, placing the designer at the center of the process, offering a personal vision without involving the target audience (Mitrović 2015). However, one of the main goals of speculation is the inclusion of the public in the re-thinking and dialogue on new technological realities and social relations (Mitrović 2015).

However, one of the main goals of speculation is the inclusion of the public in the re-thinking and dialogue on new technological realities and social relations (Mitrović 2015).

While Dunne (2013) emphasizes that the success and impact of a speculative approach primarily depends on the believability of the designed artifacts and potential scenarios of the future, Auger (2013) states that a fundamental component in the success of a proposal of this nature is 'the careful management of the speculation, specifically what informs the use of technology, aesthetics, behavior, interaction and function of the designed artifact.' (Auger 2013, p1).

The fundamental component of this design approach is still based on criticism of the reality we experience, but it is not of an aprioristic nature. As highlighted by Naomi Klein, the ideological criticism of social phenomena and of the impact of new technologies often lead to a dystopian vision of the future.

A seminal point of reference of speculative (and critical) design is primarily the 'radical Italian architecture and design movements of the 1960s and 1970s.' (Mitrović 2015, Extension of 'Introduction to Speculative Design Practice') This was a period characterized by radical forms of criticism and social protest towards the materialistic culture of consumerist societies. From the design perspective, the critical approach is evident in Ettore Sottsass side table, 'The Structure Tremble' (Fig.4), Its 'trembling' legs are a sort of metaphor, representing a design that 'shakes' preconceptions in favor of a new, more ethical, social and political aesthetic (Sottsass 1976).

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https://nicholasandalistair.com/assets/Uploads/Sottsass-Alchimia-1.jpg

Fig.4.'The Structure Tremble', Side Table by Ettore Sottsass, 1979.

Today, most authors refer to speculative design practices as an opportunity to open a discussion, promoting questions rather than answers, with the goal of critically reflecting on the development and role of technology in society (Mitrović 2015). It results in an open process that can be enriched through discussion and interaction with other disciplines (Fig.5). Nevertheless, a vision of the future is often a projection operated through the personality of the designers. Their personal history and the cultural context in which they have been raised make designers a cultural product.

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http://speculative.hr/wp-content/uploads/2016/05/fig2_graf_en.png

Fig. 5. Traditional design vs. the open system of speculative design (Auger, 2013).

Modern and contemporary design objects are sometimes conceived by projecting elements from the past into the future, such as Achille Castiglioni's reminiscences of industrial artifacts or Philippe Stark's science fiction visions inspired by the lectures of his teenage years (Lloyd and Snelders 2003). With his 'Sella' stool, Achille Castiglioni transformed a tractor seat into one for domestic use (Fig.6). As shown by photomontages in a virtual set (or time machine), this process of cultural elaboration defines a provenance, and therefore the ability of these objects to engage in dialogue with those from the past (Fig.7,8).

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https://hivemodern.com/public_resources/mezzadro-stool-castiglioni-zanotta-1.jpg

Fig.6. Mezzadro stool, by Achille Castiglioni, 1957.

Fig.7. "Albero" vase holder, by Achille Castiglioni, 1983.

Fig.8. Juicy Salif lemon squeezer, by Philippe Stark, 1988 (left) vs. consumer product (right). Which is the alien?

Methodology

According to Auger (2018),speculative design enables one to think about the future and to critique current practice. However, a successful speculative proposal must 'elicit audience engagement and contemplation on a subject.' (Auger, 2013, p2). Thus, 'it is sometimes helpful for a speculation to provoke' (Auger 2013, p4), because if a design proposal is too familiar, it can be 'easily assimilated into the normative progression of products and pass unnoticed' (Auger, 2013, p4)). To connect the audience with a speculative concept, Auger (2013) suggested building perceptual bridges. Among Auger's several bridging techniques to elicit an audience reaction, I found 'design for the context ' to be the most suitable for my research scope. Within this approach, the designer should consider the environment and the context in which the speculative future products will be placed. This placement could be a specific space, such as the home or a cultural situation, based on current developments (Auger, 2018). As Auger (2018) stated, 'design for the context could be described as an ecological approach to speculative design and assists in grounding the concept in a familiar or logical reality.' (Auger 2013, p3).

In accordance with this principle, Dunne and Raby (2007) dismantled the stereotypical image of robots by designing them to be harmonious with the contemporary domestic landscape. Here, the furniture-robot is conceived to accommodate new technologies, and 'it appears familiar but has advanced function; technological interactions take place in intimate ways.' (Auger 2013, p4).

The research started with the critical observation of the cultural context to define the impact of new technologies on it and on the specific area of investigation where the researched product will be placed—the domestic landscape where cooking occurs (Fig.9).

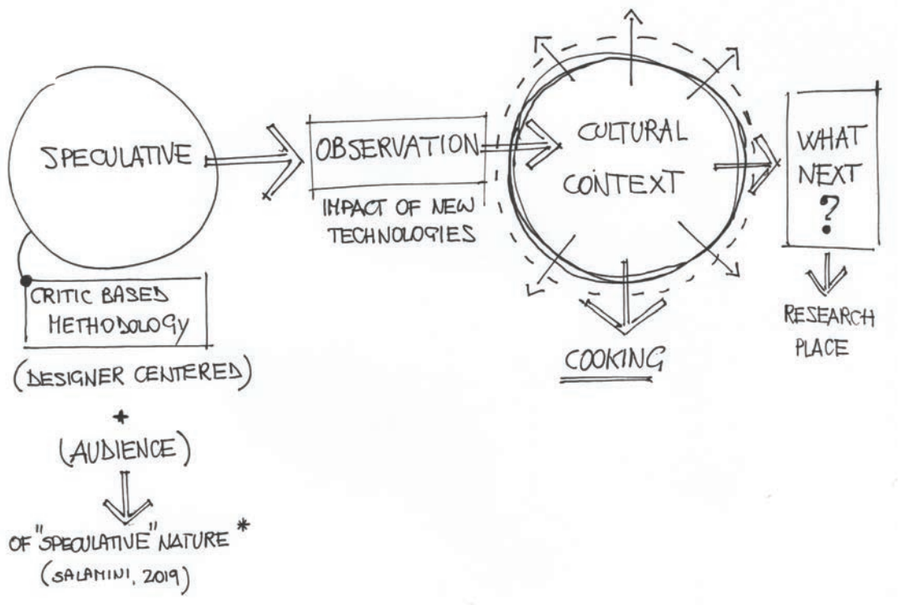


Fig. 9. Observation based speculation on the cultural context

Several methods will be used to assess this research.

The critical observation of the context will be conducted through historical research, which will provide an understanding of the evolution of the kitchen and will define the social, cultural, and historical context in which cooking activities occur. This information will be gathered through reading books, magazines, and newspaper interviews, taking detailed notes, and collecting images as references.

Case studies will be used to define the impact of technologies on cooking at domestic and hospitality levels and how a next-level technology can be utilized.

The reference audience is defined by the observation of the cultural context and then it is incorporated into the new scenario (Fig.10). The 'personas method' is often involved in user-centered design practices, and it aims to define a fictional character (persona), that represents a user type with a behavioral pattern who will be involved in the research (Nielsen, 2007). The profile can be defined from the data collection and analysis of qualitative and quantitative researches.

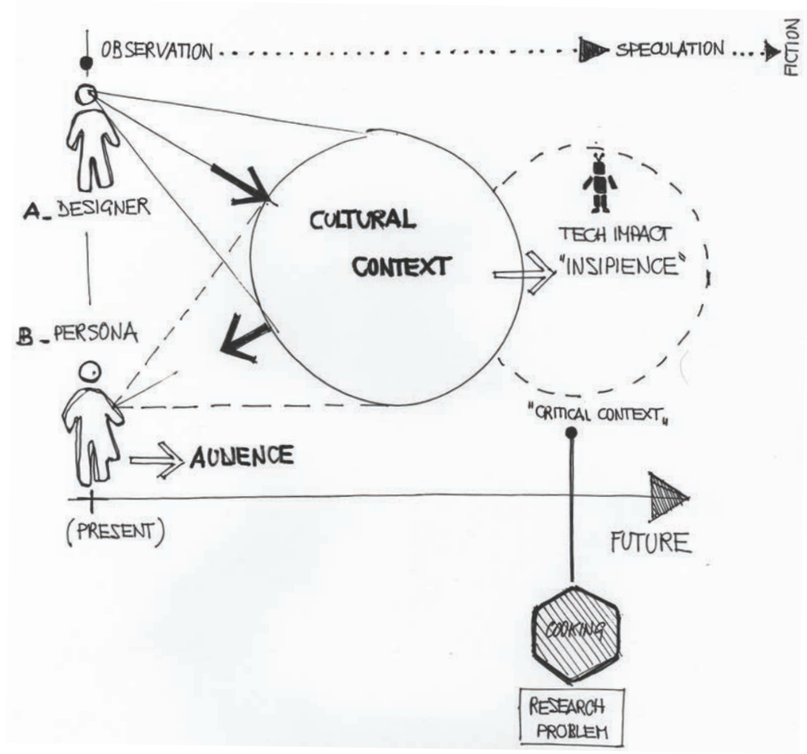


Fig. 10. Designer's perspective and audience incorporation.

According to Auger (2018), speculative design practices use models and prototypes at the heart of the enquiry. Considering the time limitation and the complexity of the cooking platform, including its dimensions, I opted for DMU (Digital Mock-Up) modeling, a virtual 3D space that allows for exploring and articulating different solutions. To control the dimensional accuracy and the users' ergonomics, virtual manikins representing the chosen persona will be placed at the center of the DMU process. A real-scale validation model will be made to validate the ergonomics settings and the proportions of the cooking platform's main body.
To instruct and guide the DMU modeling, conceptual sketching will be used at the exploratory stage of the design proposal to communicate and evaluate ideas in a 'tangible' format.

To simulate the user's interactions with the system, User Experience Journeys (map) will aid invisualizing those key processes that users must perform to accomplish a goal.

The methodological process is defined accordingly (Fig.11):

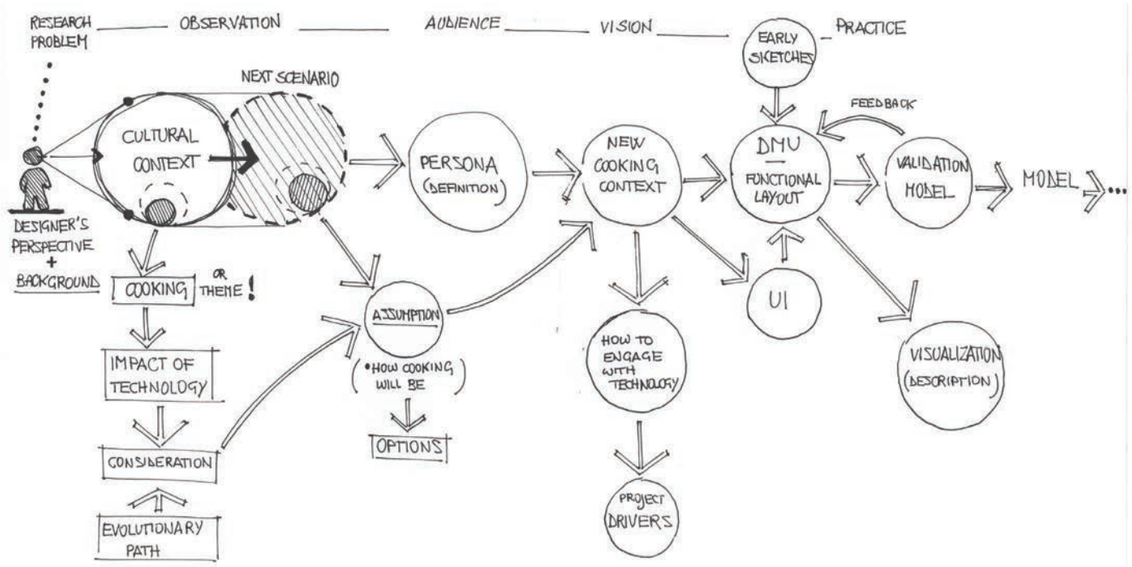


Fig. 11. Methodological Process

The designers' perspective on the context produces the next scenario based on the technological impact and defines the audience. Therefore, this new instance will instruct the new cooking context, which is defined at the "Vision" level, and it consists of how users will engage with technology while cooking

What is speculative? A place out of the "QWERTY zone"

Diamond (1997)argued that the success of an invention does not occur when it appears: inventions usually have to wait before being adopted. Societies are not always open to inventions. Maya and other pre-Columbian Mesoamerican cultures knew of the wheel since it was adopted by them for children's toys, but they didn't use it for technological advantage, for example to facilitate heavy duty transportation (Castellano 1996).
According to Diamond (1997), one critical factor limiting the success of an invention is its compatibility with consolidated interests acquired by a society in a specific moment. The QWERTY keyboard was designed in 1873 with the purpose of slowing down typing speeds, since typewriters could easily become blocked if two adjacent keys were pressed in quick succession. Thus, to reduce this risk, engineers placed the most commonly used keys distant from each other. In 1932, this technical issue had been solved and new keyboards were developed accordingly, doubling typing speeds and reducing strain by 95%. But the QWERTY keyboard had already become standard and was being used by millions of people around the world, making the acceptance and success of innovation difficult (Diamond 1997).
I believe that anything challenging the "QWERTY zone" is of speculative nature, as it confronts consolidated societal preconceptions (Fig.12). Challenging mindsets requires conventions to be broken and facilitators to be found.

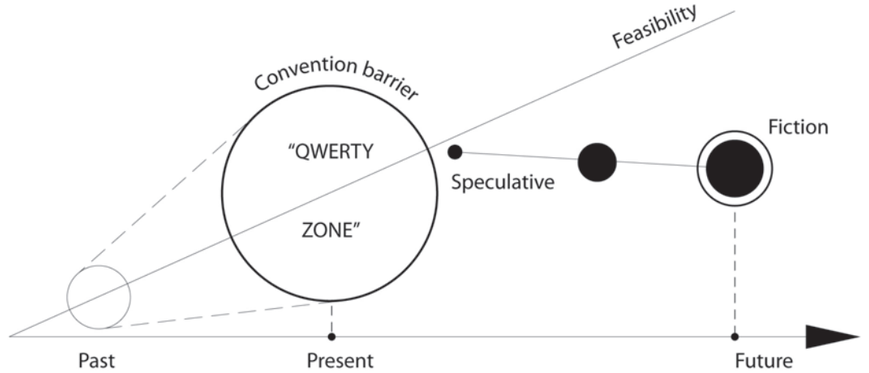


Fig. 12. The further a speculation is placed into the future the higher the risk of its turning fictional, increasing the distance from the feasibility line.

Which future? A possible scenario

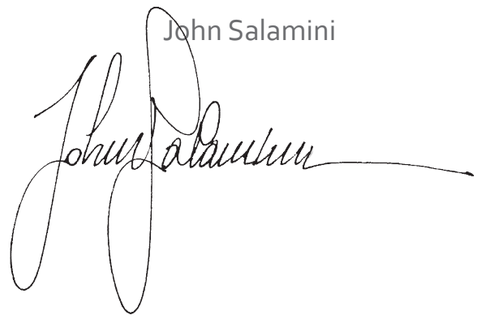
It is not the purpose of my research to create a virtual vision of the future: sci-fi movies are more suited to this. More than describing the destination, I think that speculating about the nature of what is leading us there (i.e., the nature of progress) is of interest in design.

Attestation of Authorship

'I hereby declare that this submission is my own work and that, to the best of my knowledge and belief, it contains no material previously published or written by another person (except where explicitly defined in the acknowledgements), nor material which to a substantial extent has been submitted for the award of any other degree or diploma of a university or other institution of higher learning.'

Auckland, 07.05.2019

John Salamini



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The relationship between human and machine has always been conflicted, and technology, in the form of industrialized processes, has been seen as alienating and degrading (Ruskin 1853). Thus, the human gaze often turns to the past, which is reassuring because it is immobile and known. No matter how horrible the present is, it is the future that scares us because it is unknown (Benjamin 1940). Benjamin depicted the impossibility of escaping from progress even though it is leading to catastrophe. Starting from Metropolis (1927), science-fiction movies have mainly depicted a future where humans are threatened by robots or Artificial Intelligence.

Nevertheless, defining the nature of progress can inform the way we imagine working with 'intelligent machines. It can define when and how to use them, orienting design towards solutions that support us in our human goals for a better everyday life (Tufecki 2017), leading to a technology constrained by our human values.

The creators of decentralized autonomous organizations (DAOs) seem to be persuaded that taking natural resources out of human control can benefit the whole society. DAOs are blockchain-based systems that can operate without human intervention, allowing people to create entities that produce and sell autonomously (Fig. 13).

Image removed due copyright issues.

https://www.repstatic.it/content/nazionale/img/2018/03/25/194937599-25a5cc4a-3cc5-4404-be0e-59bf10679bce.jpg

Fig. 13. Concept Image of decentralized autonomous organization (DAOs).

Designer Nathalie Post has created a DAO that produces and manages mint plants (Fig. 11). It controls their growth with cameras and soil sensors, recording their needs in terms of light and irrigation. The system also controls the price of the mint product, increasing it according to market demand, preserving the plants to be spoiled. Orders are received and managed online automatically, as is the delivery process. Sales and distribution are managed through 'smart contracts,' digital protocols that command the market negotiations. While DAOs offer a solution for natural resource management by replacing human control with machines, Lisa White refers to hi-tech with a warmer look: a sophisticated, discreet technology that can be gently integrated into daily life. In this way, technology can enter a sensorial, tactile and, definitely into a more humanized dimension. (Next Design Perspectives 2018). White sees a near future where the real luxury will be the quality of time that we can dedicate to ourselves.

Here design is asked to create environments for us to rest and to be sheltered.

Placed in this humanized and comfortable dimension, the study aims to develop a tool that can encourage the practice of cooking, making it more comfortable and efficient. It also aims to augment users capabilities with the support of a collaborative and constrained technology that can help, assist and guide them in the pursuit of a better cooking.

The analysis of the past and the understanding of the incorporation process of a knowledge into a culture are keys to explain and criticize the present in order to create a new feasible scenario (Fig.14).

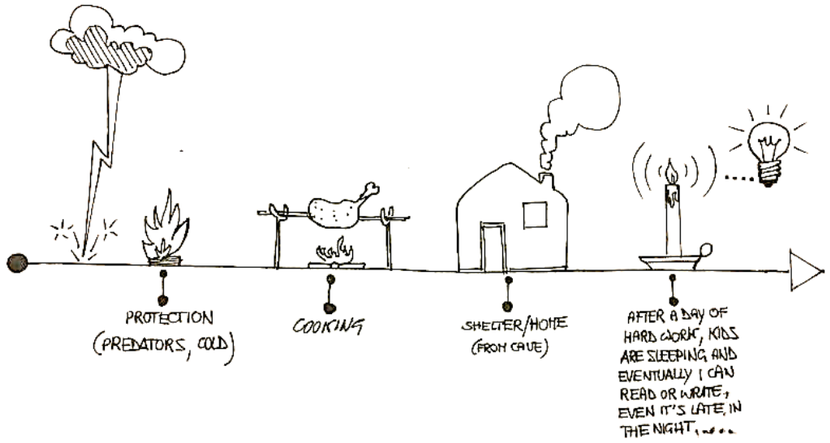

Fig. 14. Incorporation of a natural event, as knowledge becomes culture and nurtures ideas.

A brief story of the Kitchen

Wrangham (2009) stated that the preparation and consumption of food has occupied a central place in the lives and shelters of human beings since earliest times. (Wrangham 2009).

Although referring to cooking during the Paleolithic or Mesolithic Ages can be quite risky, clear evidence of cooking practices appeared in the Neolithic about 12,000 years ago when nomads as humans began leading a sedentary life, cultivate the land and domesticate animals (Diamond, 1997).

This coincided with the domestication of fire, which entered homes as part of a hearth, brick, or stone-lined fireplace without a chimney, usually placed at its center (Fig.15) , and was used for heating purposes and cooking food (Koontz and Dogwell 1994). In the late Middle Ages, with the adoption of bricks-stone masonries, the hearth was leaned against a wall (Fig.16) and completed by a chimney to reduce risks of fire (Neri 2016).

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http://www.orkneyjar.com/history/skarabrae/hearth.jpg

Gradually the fireplace, sometimes with vast dimensions, takes the place of the hearth. In 1742, Benjamin Franklin introduced the Franklin stove, a cast-iron efficient heating system designed to fit into a fireplace. This solution resulted later in the form of a cast-iron stove. (Fig.17).

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http://s3.amazonaws.com/opa-photos/photos/photos/000/187/108/large/lithograph_1874.jpg?1489271377

Fig.17_A lithograph showing a hybrid fireplace/stove in a wealthy home. Old Photo Archive, 2018

The change from an agrarian to an urban economy brought about a major transformation in cooking and eating habits (Myerson and Katz 1990). However, during most of the 18th century, there simply were not any kitchens in homes; rather, a fireplace or hearth was the center of all cooking (The evolution of kitchens, Old Photo Archive, 2018).

In 1834, Philo Stewart designed and patented a compact, wood-burning cast-iron stove known as the Oberlin stove (Fig. 18), one of the first to become a great commercial success. It stood by itself and was small enough for domestic use but more efficient than cooking in a fireplace, as it incorporated a water boiler, increased heating capacity, and helped one record their cooking times. It could also easily withstand temperature swings from hot to cold (The evolution of kitchens, Old Photo Archive, 2018).

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http://3.bp.blogspot.com/-kploFEPtm_E/VMey86zuPjI/AAAAAAAAa3k/gvVuTFHM4tQ/s1600/1869-Stewart-p74B.jpg

Fig.18_The Oberlin Stove

When cast-iron stoves became available around the 1850's, they introduced the idea of a 'living room' being separated from the cooking room. Progressively, self-standing stoves became the center of cooking, for which a dedicated space was set apart, turning it into what would eventually be known as the kitchen (Fig.19).

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http://s3.amazonaws.com/opa-photos/photos/photos/000/187/117/large/29416882122_61e1ed4173_0.jpg?1489272754

Fig.19_1896 self-standing stove into an independent kitchen (Biblio Archives, Canada). The sitting area has already been separated and some primitive storage for ingredients and kitchen tools began to have their own space. *Old Photo Archive, 2018*

In the early 1900's, as kitchens were becoming an independent space, various companies came together to promote ideas of more integrated and efficient kitchens (Fig.20/21), based on the concept of an integration of specialized areas.

Image removed due copyright issues.

http://s3.amazonaws.com/opa-photos/photos/photos/000/187/102/large/craftsman_magazin_1906.jpg?1489271365

Fig.20_Proposal of a model integrated kitchen.Craftsman Magazine, 1906

Image removed due copyright issues.

http://s3.amazonaws.com/opa-photos/photos/photos/000/187/094/large/1917_efficiency.jpg?1489271352

Fig.21_ Kitchen exhibition: moving toward 'Built-In' Solution vs. Standalone, 1917

Moving Toward Integrated Efficiency

In the late 1980's, kitchens were seen to be involved in specific design processes with the purpose to efficiently study the space around its user: the housewife.

In vFig. 22), where they considered the kitchen as a 'laboratory of rational planning' emphasizing how the spatial division of kitchens was arbitrary. Accordingly, they responded with thoughtful and 'efficient' designs for the sink, shelves, and storage boxes for various food items, underlining the importance of specialized and technologically-differentiated places for storage, preparation, and cooking.

Image removed due copyright issues.

https://media.treehugger.com/assets/images/2017/02/beecher.jpg.860x0_q70_crop-smart.jpg

Fig.22_Catharine and Harriet Beecher, the efficient kitchen, 1869

In the 20thcentury, 'time and motion' studies pushed forward research on efficiency regarding kitchen design. In 1912, home economist Christine Frederick developed the Applecroft Home Experiment Station (Fig.23), where she regarded the kitchen as a factory or a laboratory, grounding the scientific management of a home. The plans in Frederick's book 'The New Housekeeping' with dotted lines showing the work paths of a housewife are early attempts to graphically map women's domestic movements.

Image removed due copyright issues.

https://media.treehugger.com/assets/images/2017/02/frederick_plans.jpg

Fig.23_Christine Frederick Studies, 1912. The proper size of a kitchen for a small house was set at 10 feet x 12 feet and that near square is the perfect shape. Frederick divided equipment and processes into two types:
- preparing the meal
- cleaning after the meal.
A diagram for the proper kitchen layout illustrates her ideas for proper motion. Path A indicates food preparation while B applies to clean up.

The 'time-motion' studies were then used in 1926 by Austrian architect Margarete Schütte-Lihotzky to design her mass-produced Frankfurter kitchen (Fig.24). Adams (2016) noted that between the two world wars, Germany's hyperinflation and economic instability led many housewives to work long hours in factories to supplement their husbands' low income.

Schütte-Lihotzky designed the kitchen as a part of May's Neues Frankfurt planning, an ultra-efficient housing program for the city of Frankfurt, which was developed following the principles of minimal living standards (Existenzminimum). Accordingly, the kitchen was conceived to optimize the distribution of the living unit, minimizing the circulation of people (motion-path), and completed with the latest devices in order to save work and time (Fig.25).

The Frankfurter kitchen was a narrow, one-room workplace tailored for one person with an aisle 0.90 m wide. It was a space utilized by the woman of the house to cook efficiently and comfortably. Ingredients were accessible at arm's length from the cook's stool, and the distances between cupboards, the counter, and the sink were optimized. Its compact size and layout allowed for ease of cleaning.

As noted by Adams, 'The Frankfurter kitchen combined the scientific management theory of Frederick Winslow Taylor (Taylorism) and the regulation theory of Henry Ford (Fordism) with the time-motion studies of the 'German Reich Research Society for Economic Efficiency in Building and Housing' to create a physical environment that improved the housewife's efficiency.' (Adams 2016, p23).

Image removed due copyright issues.

https://media.treehugger.com/assets/images/2016/06/Frankfurter-.jpg.860x0_q70_crop-smart.jpg

Fig.24_Margarete Schütte-Lihotzky, Frankfurter Kitchen, 1926

Image removed due copyright issues.

Fig.25_Margarete Schütte-Lihotzky, "Time-Motion" Studies, 1926

The Frankfurter kitchen delineates the definitive features of the kitchen as we know it today. Further functional studies may not have such an impact in the way the kitchen's design was conceived.

Among these studies, the studies of Bülow-Hübe can be mentioned. She was influenced by Swedish research, paying attention to women's movements in domestic spaces: physiologists tracked all body movements and used sophisticated breathing apparatuses to calculate the amount of oxygen needed to perform tasks while simultaneously monitoring the caloric consumption of housewives (Fig.26).

In her 1968 study, (Fig.27), she abstracted the main areas of the kitchen, preferring to show them as nodes of activity laid out in a circular fashion, resembling a constellation of work stations. Bülow-Hübe was freed from the traditional, technical floor plan and dependency of walls (Adams 2016).

Image removed due copyright issues.

https://www.researchgate.net/profile/Annmarie_Adams/publication/311680894/figure/fig3/AS:440021997101058@1481920827944/HFI-researchers-monitoring-housewives-physical-response-to-work-in-Swedish-kitchens.png

Fig.26_ Monitoring Housewives, Sweden, 1968

Image removed due copyright issues.

https://www.researchgate.net/profile/Annmarie_Adams/publication/311680894/figure/fig6/AS:668590940360709@1536415910432/Buelow-Huebe-diagram-charting-a-womans-movements-through-an-unnamed-kitchen-on-October-23.ppm

Fig.27_1968's Bülow-Hübe's detailed studies.

This efficient reduction of labor and motion in kitchens found its epitome in 1969, when German industrial designer Luigi Colani developed a sphere-like, science fiction-inspired, highly compact kitchen (Fig.28). It featured the densest possible interface between the kitchen and the user, where all the functions were controlled from a seated position, literally making the appliance extensions of the body, eliminating the need to walk from one work station to another by placing them at arm's length.

Image removed due copyright issues.

https://thefoodmakers.startupitalia.eu/wp-content/uploads/sites/12/2016/01/IMG_5228-1024x768.jpg

Fig.28_Luigi Colani, Satellite Kitchen, 1969

However, the ergonomic set-up of the kitchen, as developed by Margarete Schütte-Lihotzky, did not change during the 1960's, but remained the paradigma of commercial kitchens (Fig. 29/30).

Image removed due copyright issues.

www.researchgate.net/publication/316905248_The_Evolution_of_Kitchen_Design_A_Yearning_for_a_Modern_Stone_Age_Cave_Aesthetic_Practice_of_Cookery/fulltext/594d4687aca27248ae342b2f/The-Evolution-of-Kitchen-Design-A-Yearning-for-a-Modern-Stone-Age-Cave-Aesthetic-Practice-of-Cookery.pdf

Fig.29_Model Majestic 500 by Nieburg Küchen, 1966

Image removed due copyright issues.

www.researchgate.net/publication/316905248_The_Evolution_of_Kitchen_Design_A_Yearning_for_a_Modern_Stone_Age_Cave_Aesthetic_Practice_of_Cookery/fulltext/594d4687aca27248ae342b2f/The-Evolution-of-Kitchen-Design-A-Yearning-for-a-Modern-Stone-Age-Cave-Aesthetic-Practice-of-Cookery.pdf

Fig.30_Kitchen units with colored pine decoration, 1974

In the mid-1970's, design criteria based on psychological considerations and attention to social interaction were incorporated into kitchen planning, making the closed kitchen units favor a more open space (kitchen-diner). This orientation toward greater 'livability', socialization, and coziness was achieved primarily through the incorporation of a functional 'island' at its center (which prioritizes the availability of a greater space to address people in the kitchen), or an eating area with a dining table.

Image removed due copyright issues.

www.researchgate.net/publication/316905248_The_Evolution_of_Kitchen_Design_A_Yearning_for_a_Modern_Stone_Age_Cave_Aesthetic_Practice_of_Cookery/fulltext/594d4687aca27248ae342b2f/The-Evolution-of-Kitchen-Design-A-Yearning-for-a-Modern-Stone-Age-Cave-Aesthetic-Practice-of-Cookery.pdf

Fig.31_John Heritage, English kitchen island "Masterplan", 1963

The solution of the central island was anticipated by pioneering design research, initiated between 1968 and 1973, when chemical companies and kitchen manufacturers launched a program known as 'kitchen ideas for the future'. These studies ended up with specific concepts such as the kitchen island designed by British designer John Heritage for the Swiss firm Novelectric (which was immediately adopted by manufacturers as a part of their kitchen ranges (Fig.31), and the trolley- mobile kitchen, "Cucina Minima", designed in 1964 by the Italian designer Joe Colombo and produced by Boffi, (Fig.32).

Image removed due copyright issues.

https://i.pinimg.com/originals/07/10/be/0710be701cf90556494cb61267753119.jpg

These new concepts seemed to minimize not only the use of kitchens but also cooking. The microwave oven was also introduced in 1967 after 10 years of facing trials. Thus, the main function of the kitchen mainly revolved around heating up ready-made meals and not on actual cooking. By this point, it could already be foreseen that frozen foods and ready-made processed dishes would become ever more important due to women's employment (Surmann 2017). In parallel to the dissolution of the status of homemaking and thus the work in the kitchen, at the beginning of the 1970's, designers simply got rid of the kitchen as a space, turning it into a mobile module (Surmann 2017).

Today, minimal and compact solutions such as the unfoldable block designed by Atelier Mendini are available on market (Fig.33).

Image removed due copyright issues.

https://img.edilportale.com/product-thumbs/b_AM-01-Sanwa-Company-335958-rel7958af9f.jpg

Fig.33_ Alessandro and Francesco Mendini, "AM 01" kitchen, Sanwa Company, 2018

When compared to the 1890's Hoosier Cabinet, a free–standing kitchen cabinet that also serves as a workstation (Fig.34), it seems no longer linked with its purpose, suggesting that cooking and eating at home is more of an emergency than a possible pleasure.

The Hoosier Kitchen Cabinet (a remarkable commercial success that was produced in more than two million pieces) was instead developed based on the idea of putting the basic tools needed to cook in one standalone cabinet: an efficient workstation featured with a foldable counter and pre-installed containers and recipes filed in the doors. Reflecting a cultural shift in attitude, towards cooking as leisure activity rather than a job as evident in the advertisement below (Fig.34).

Image removed due copyright issues.

http://s3.amazonaws.com/opa-photos/photos/photos/000/187/123/large/hoosier_ad.jpg?1489274175

Image removed due copyright issues.

http://s3.amazonaws.com/opa-photos/photos/photos/000/187/106/large/Hoosier_Cabinet_Ad.jpg?1489271374

Fig.33_The Hoosier Cabinet and ads. Pre-installed cooking tools, containers and recipes in the door included (1899)

Stuck in the "QWERTY ZONE"

As mentioned previously, kitchen has evolved as a response of radical social transformation (Myerson and Katz 1990). Cooking has changed accordingly, affected by a compression of time available to prepare food. Greenwood (2018) explained that the time spent on core household chores, including cleaning and cooking, has declined with economic development, as shown in the Caplow, Hicks and Wattenberg study on variation of daily housework in Indiana (Fig.35).

Daily housework in Middletown, IN.

	Percentage of married housewives in each category		
Year	≥ 4 hours	2 to 3 hours	≤ 1 hour
1924	87	13	0
1977	43	45	12
1999	14	53	33

Source: Caplow, Hicks, and Wattenberg 2001, 37.

Fig.35_ Declining of cleaning and cooking chores, 2001

Processed food, and pre-packed and take-away consumption have increased accordingly (Guyenet 2018) and can be seen as an indicator of the demise of in home cooking practices.

Accordingly, in terms of conception, the contemporary kitchen looks like a sterile place in that it appears as a place with pure ambience and not a place used for cooking, often fitted out with sleek furniture of astonishing quality and delicate surfaces (Fig.36).

Rather than a place where to process raw ingredients, it stands as an object to exhibit, qualified to celebrate a social status.

Image removed due copyright issues.

https://www.whirlpoolcorp.com/wp-content/uploads/Whirlpool_W-Collection-Suite-W11-1.jpg

Fig.36_ No food-No people _A contemporary kitchen, (Eurocucina 2018)

I place the Frankfurter kitchen at the center of the Qwerty Zone as it represents the archetype of the modern kitchen. In the last 94 years, kitchen development has been driven by feasibility, which revolves around the linear technological evolution of dropped-in appliances. However, its concept as a set of organized modular compositions of wall mounted 'cabinet-units' has not changed (Fig.37).

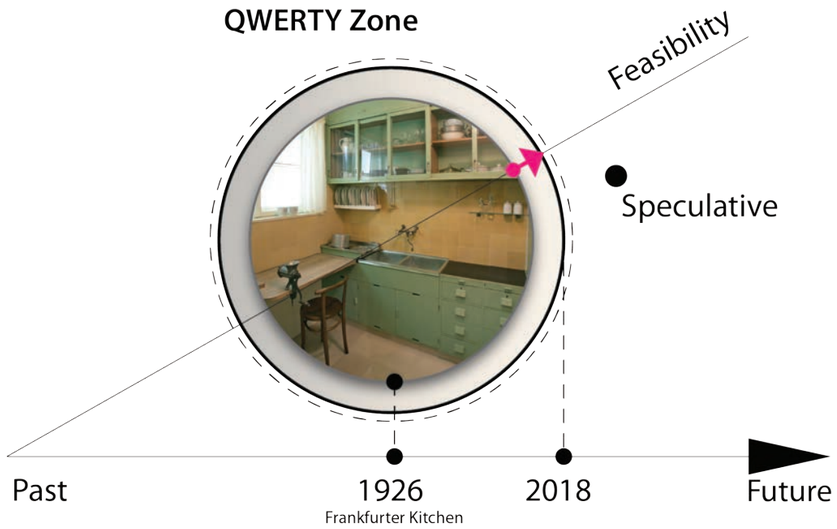

Fig.37_ Kitchen driver of modern kitchen

Apparently, with the disappearance of servants and the housewife as the reference audience, changes occurred in the conception of kitchens with regard to gender orientation (Giedion 1948). This change also corresponds with the disappearance of cooking practices (Fig.38), and the essence of the kitchen as a place for making and sociability.

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http://s3.amazonaws.com/opa-photos/photos/photos/000/187/093/large/1915.jpg?1489271350

Fig.38_ Cooking as a family affair, 1915. Old Photo Archive, 2018

Accordingly, further spatial, functional, and ergonomics studies (from motion/time path to 'memomotion' slow speed filming that were used to measure relative housewife's effort), were basically abandoned, leaving the kitchen with a gap in the integration of its components (Fig. 39).

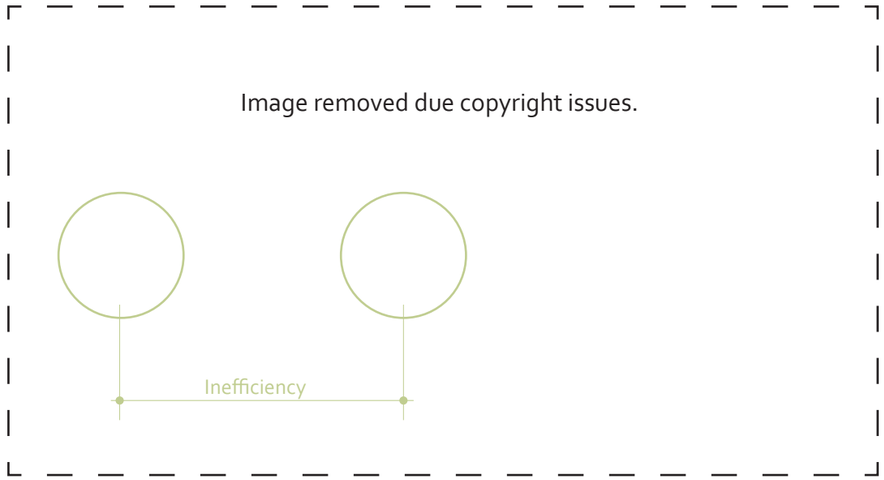

Fig.39_ Lack of Integration: Heating and water are not managed into a single spot

A kitchen, as stigmatized in the last decade's advertisements, is portrayed with no life, people or food (Fig.40). The appearance and tactile properties of material surfaces became critical, emphasizing those natural sensations and personal affections possibly were evoked by the contact with the matter.

Image removed due copyright issues.

Fig.40_ Artematica series ads. Tactile properties emphasis on corrugated walnut wood.Valcucine, 2018

Moreover, focusing on emotional and sensorial values, the kitchen has lost its basic component: the pleasurable experience of making and sharing. Today, the kitchen seems to be at the end of its evolutionary path.

IIn fact, according to a strategic survey by a Swiss investment bank, UBS, by 2030, the food provided by centralized kitchens will kill the kitchen. Thanks to robots and delivery drones, 'the cost of an online dish could be the same of one prepared at home, even less, if accounting the value of time used for its preparation.' If this conclusion is drawn, then in 12 years, cooking will not be a necessity and the space for the kitchen will be reduced until it almost vanishes completely, revolutionizing our lives and domestic landscapes in the process (UBS Mega-Trend Report 2018).

Meanwhile, robotic systems have already appeared in restaurants. One of the first robot restaurants, Creator, can prepare hamburgers automatically (Fig.41).

Image removed due copyright issues.

https://xraydelta.files.wordpress.com/2018/07/creator-burger.png?w=590&h=393

SPYCE (Fig.42), is also robotic joint but offers a higher culinary experience when compared to Creator. This restaurant has replaced human chefs with seven automated cooking pots that simultaneously whip up meals in three minutes or less. Humans have still employed for food finishing and garnishment.

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https://www.washingtonpost.com/resizer/alvZvDbyyNdRiUvv7D6okKVdJig=/1484x0/arc-anglerfish-washpost-prod-washpost.s3.amazonaws.com/public/SCRGCKOTWYZBNKE2EASYQL3ZMU.jpg

Fig.42_ SPYCE Robotic Restaurant - Automated pots, 2018

In the domestic area, Moley's kitchen is developing a workstation that includes two robotic arms; both the hands are equipped with tactile sensors that allow the system to pick up and interact with most kitchen equipment.

The actions of a cooking chef are translated into digital movements using gesture recognition algorithms. Movements are captured using an integrated 3D camera and wired gloves, allowing the robotic kitchen to reproduce the whole process of cooking an identical meal from scratch, with cooking ingredients prepared in advance and positioned in preset locations (Fig.43).

Image removed due copyright issues.

https://techcrunch.com/wp-content/uploads/2016/10/moley_propotype.jpg

Fig.43_ Moley Robotic Workstation, Moley Robotics. 2018

In this scenario, IBM Watson's cognitive cooking system is exploring the ways in which a machine can be creative. It captures and analyzes tens of thousands of existing recipes in order to understand ingredient pairings and dish compositions that it can rearrange and redesign into new recipes. It then cross references with the data on the flavor compounds found in ingredients and the psychology of people's likes and dislikes (according the hedonic perception theory) to model how the human palate may respond to different combinations of flavors.

Collaboration: Augmenting, not replacing Human Capabilities

Driven by a positive vision of progress, which suggests that people will be interested in cooking as long as it is assisted, efficient, and thus convenient, the system I have in mind is not working at the robotic intersection because it is conceivet and constrained to augment human capabilities.
It is however valuable because it gives pleasure, is easy to access, can be shared with family and friends, and driven by the autotelic pleasure of making.

Cooking is seen accordingly as an act of socialization where we can produce food along with culture, knowledge, awareness and embed new values.

To address this scenario, I first defined the key feature of a system which is interactive and assistive but not robotic. Unlike DAOs, it does not involve autonomous cooking. The users' experience is still considered to be at the center of the cooking process. A machine that resembles, knows and lives with us, learning our habits and assists us accordingly.

To validate this model, I defined a target audience based on cooking behavioral studies.

Defining a Persona (Target Audience)

While defining a speculative scenario for the system as a conceptual projection into the possible future of needs, in order to define the ideal user of the station (persona or personas), I relied on the large amount of available data acquired from quantitative surveys and qualitative research on cooking behavior, most of which are based on focus groups and questionnaires where the collected qualitative data were analyzed by using a grounded theory approach, an inductive comparative methodology that provides systematic guidelines for gathering, synthesizing, and conceptualizing data of that nature (Charmaz 2006).

Different surveys in Europe show a difference in gender regarding cooking approach. Cooking enjoyment was found to be the most important predictor for cooking skills, especially for men, while women exhibited higher cooking skills. Cooking skills have also been demonstrated as a facilitator that can help people meet their nutrition goals, facilitating them with healthier food choices. Consequently, the importance of teaching children and teenagers how to cook and encourage them to develop their cooking skills was emphasized (Hartmann et al. 2013).

Conversely, based on recent statistics (Fig.44), 43% of American men are cooking at home today compared to at any point of time in the last 30 years. Consequently, they are seen to spend more time, 49 minutes a day, in doing so. These statistics are greater than 38% and 40 minutes, respectively, that were recorded two decades ago. In contrast, 70% of women are seen to cook these days, which is slightly more than the 67%observed two decades ago. However, it is a definite decline from the 88% of women who cooked 40 years ago. Also, they are seen to spend 71 minutes a day cooking, which is a small increase from 20 years ago but lesser than the 101 minutes spent 40 years ago (Smith et al. 2016).

For Americans, key barriers to cooking include affordability, lack of time, and lack of enjoyment. Key facilitators of frequent cooking include extensive organization and time management to help participants incorporate cooking into their daily lives .(Lavelle et al, 2016).

The frequency of cooking at home appears to increase slightly with age. Millennials were seen to prepare dinner at home on average of 4.5 times per week in 2014,Gen Xers 5 times, Boomers 5.1,and those aged 65-plus 5.2. (FMI's Survey, 2014).

Recent research (Euromonitor, 2016) suggested that young men cook more, as Millennials tend to be less bound within gender norms and their roles are less fixed (Fig.45). Less data available for Digital Native.

Thus, in terms of cooking behaviors, latest generations are seen to be less bound to gender norms. Accordingly, I simplified my persona as western, gender-neutral, Millennials to Digital Native (Fig.46).

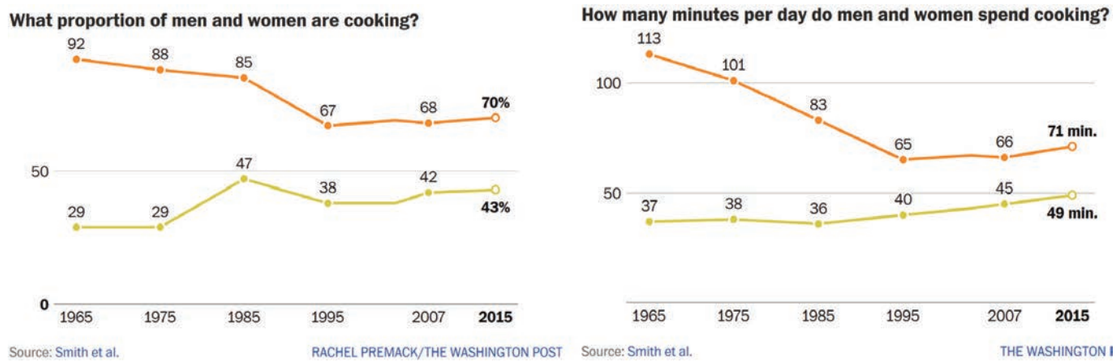


Fig. 44_ Male/Female proportion and timing comparison

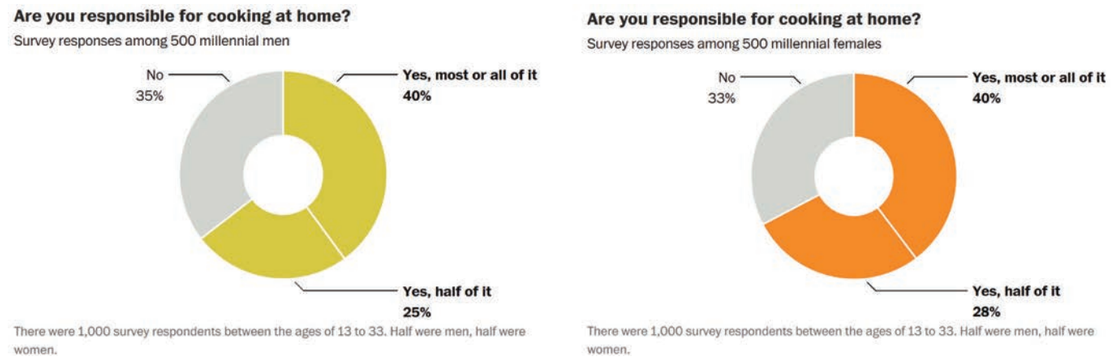


Fig. 45_ Millennials gender trend in cooking at home tend to be less bounded

However, we can assume that this Persona can establish a family. A generic definition holds that in most societies, family is considered to be a group of people related to each other, as the principal institution for the socialization of children, and the basic unit for raising them (Wikipedia).

In order to simplify, I will not consider a specific type of family classified by anthropologists (matrifocal, conjugal, avuncular, or extended), but instead a generic, gender-neutral unit that has the potential to raise children.

To set this model, I have assumed that shifting to a unit-family changes persona's "orientation" from open-type to inclusive (see picture above). In this mode, the "unit-family" is seen to share experiences among themselves (care for each other) rather than opening up in social groups. This assumption requires a further investigation, since significant data is not available

In terms of cooking, research shows that relatively a few Americans learn to cook from formal instruction in school. Rather, they primarily learn from their parents and/or by teaching themselves using cookbooks, recipe websites, or by watching cooking shows on television. Almost all Americans hold parents and other family members responsible for teaching their children how to cook (Wolfson et al.2017).

Millennials tend to ask for assistance and search for guidance. Questions like "In which temperature should the chicken be baked?"are frequently asked through cellulardevices;68% of Millennial moms also confirmed that they watch videos while cooking while 59% of 25-to 34-year-olds state that they head to the kitchen with either their Smartphone or tablets (Cooper 2015).

Millennials do not cook at home alone; 27% are most likely to share their cooking experience with a spouse, friend, or child (Cooper 2015).

Recent findings on the impact of video technology on cooking learning display the potential to promote motivation and confidence as well as enhancing cooking skills. Focus group findings revealed that video technology was perceived to assist learning how to cook in the following ways (Surgenor et al. 2017)

- improved comprehension of the cooking process.
- enhancing the enjoyment of the cooking process.
- real-time reassurance in the cooking process.
- assisting the acquisition of new cooking skills.

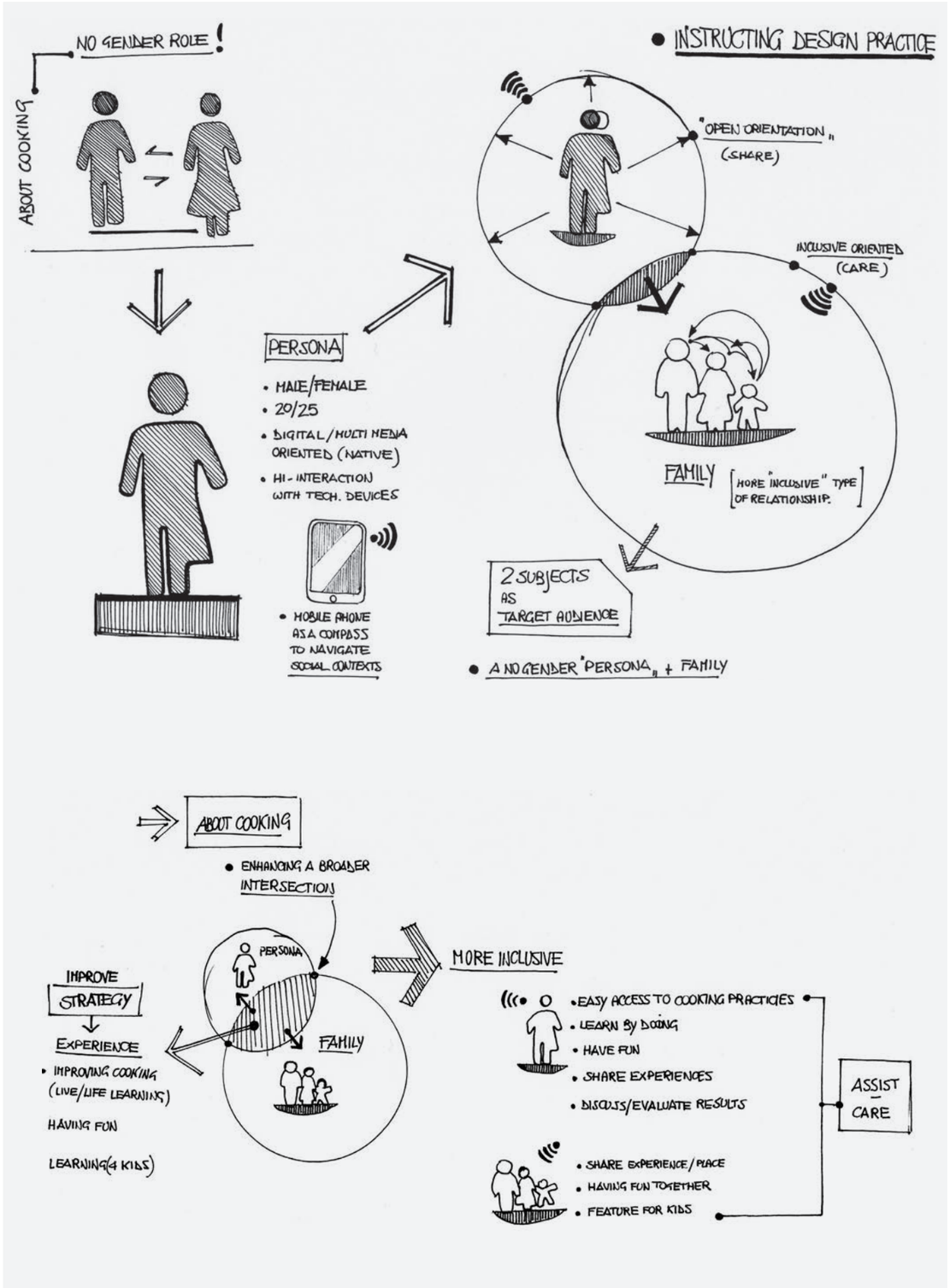


Fig. 46_ Definition of the Gender-Neutral Persona

Thus, interactivity, functionality, and guidance (make cooking more efficient, easier, and joyful) are key drivers to instruct the design of the station. Since my persona needs assistance, wants to share experiences and seeks an improvement in dietary quality and health: definitely, a better 'incorporation' of cooking into their daily lives.

Facilitators
- Incorporating cooking, efficiently, into the daily life. (integration)
- Make cooking accessible and a pleasurable experience
- Augmenting Cooking Capabilities
- Meet nutrition guidelines in the daily nutrition supply, help to make healthier choices

Incorporation

As seen earlier, cooking is one of those valuable 'knowledge of the everyday life' that globalized societies tend to lose.

In the process of defining the target audience, behavioral researches and trends have shown that there is a specific demand of cooking in daily life. Thus, the purpose of the research is to design a system able to stimulate cooking by incorporating it into the daily life: a tool that assists users with cooking by augmenting and not replacing their capabilities.

I began by elaborating a possible solution from a definition of cooking. According the Oxford Dictionary, it is the practice or skill of preparing food by combining, mixing, and heating ingredients.

So far, cooking can be perceived as a recipe execution.

We can assume that a recipe is a proceduralized set of instructions based on ingredients, and personal (technique and tools) knowledge.

Accordingly, with a breakdown of the recipe, it was possible to define three key main terms:

I used a very simple tomato/basil pasta as case study. (Fig .47).

By deconstructing the recipe, I was able to evaluate which part can be completely automated (fully controlled and executed by the machine) and which can instead be supervised in its execution.

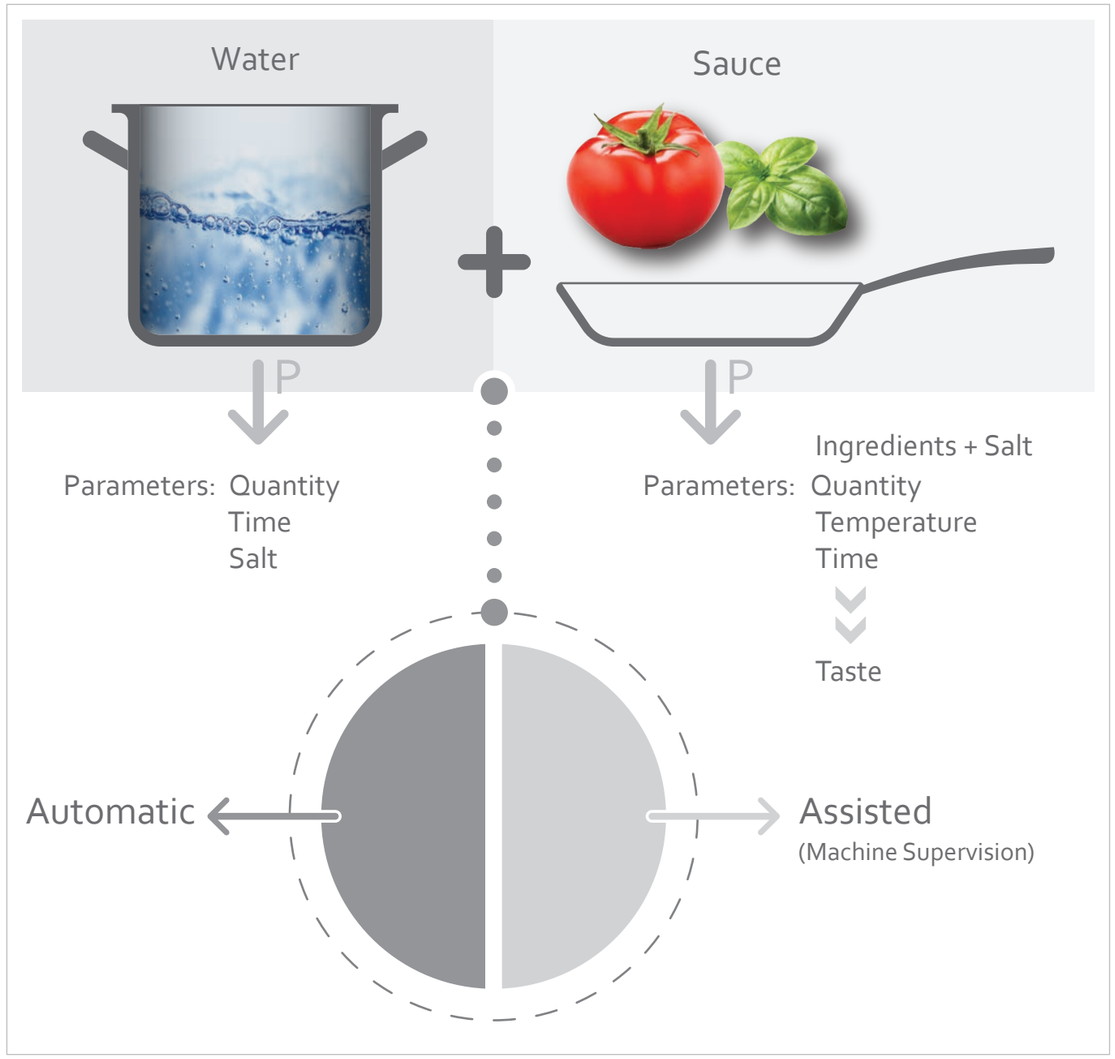


Fig. 47 - Recipe Breakdown _ Tomato/Basil Pasta_ Machine action

Therefore, the system is conceived to assist users by dividing labor intense operations, which are wholly automated, from operations involving taste, which are supervised. In this way, users can focus on the sensory aspects of cooking, possibly setting customized cooking parameters. (fig.48).

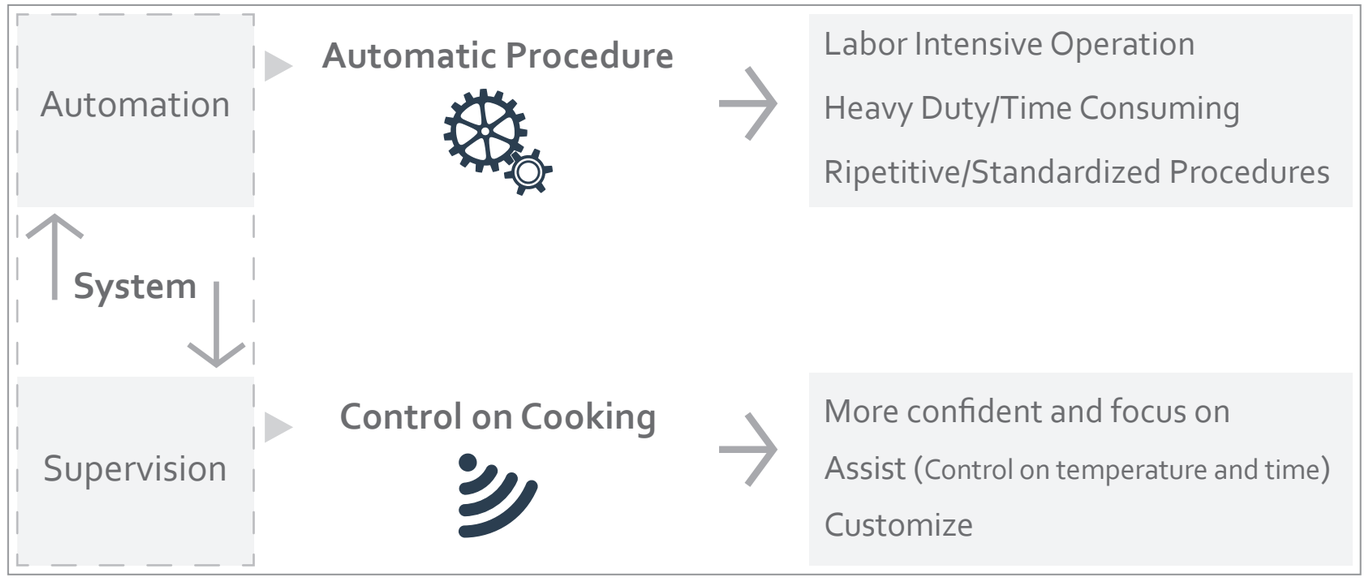
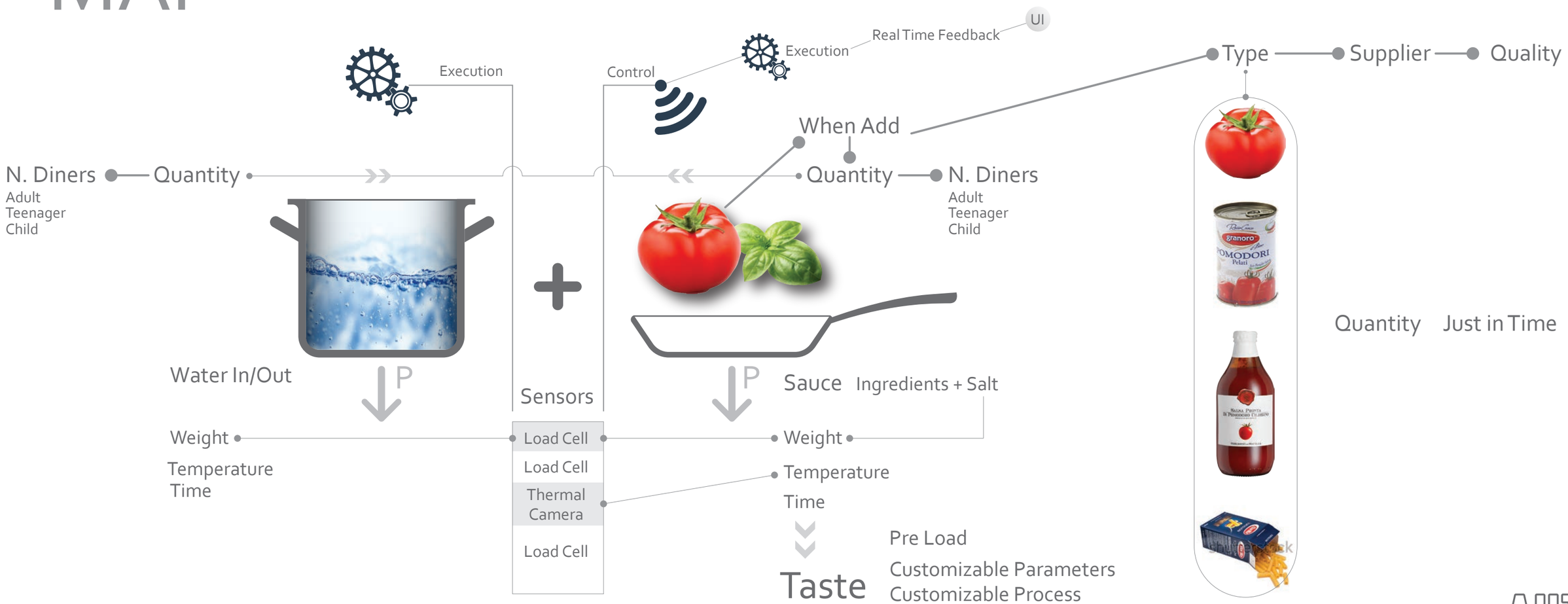
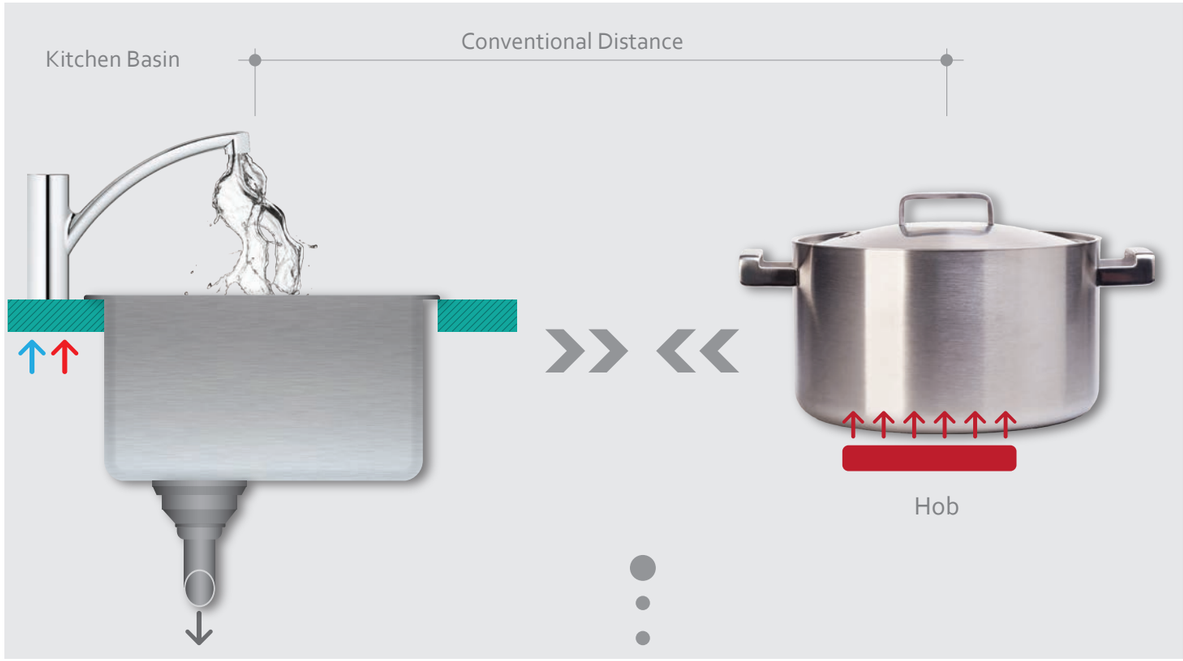


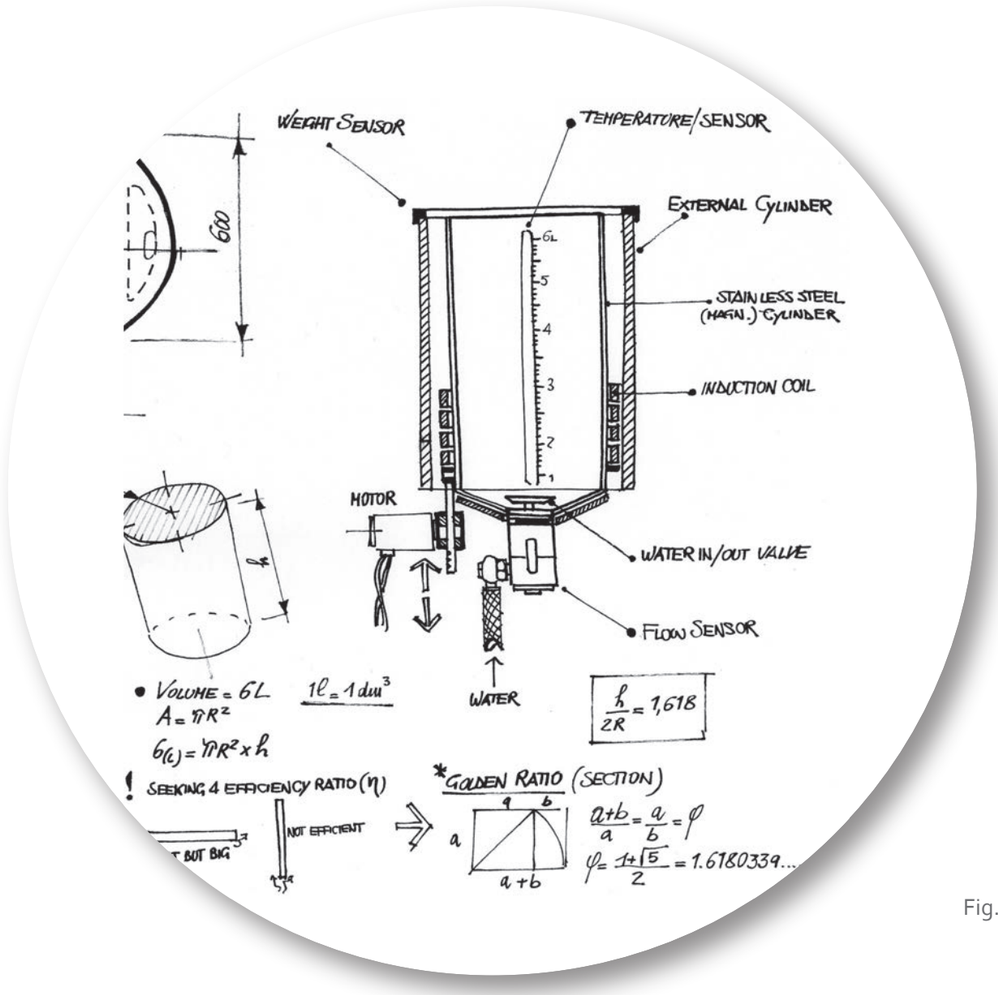
Fig. 48 _ Systems' modality of intervention

MAP



This integration not only reduces labor but also makes cooking more efficient, minimizing the use of pans and increasing safety (Fig.48-a).





BOILER

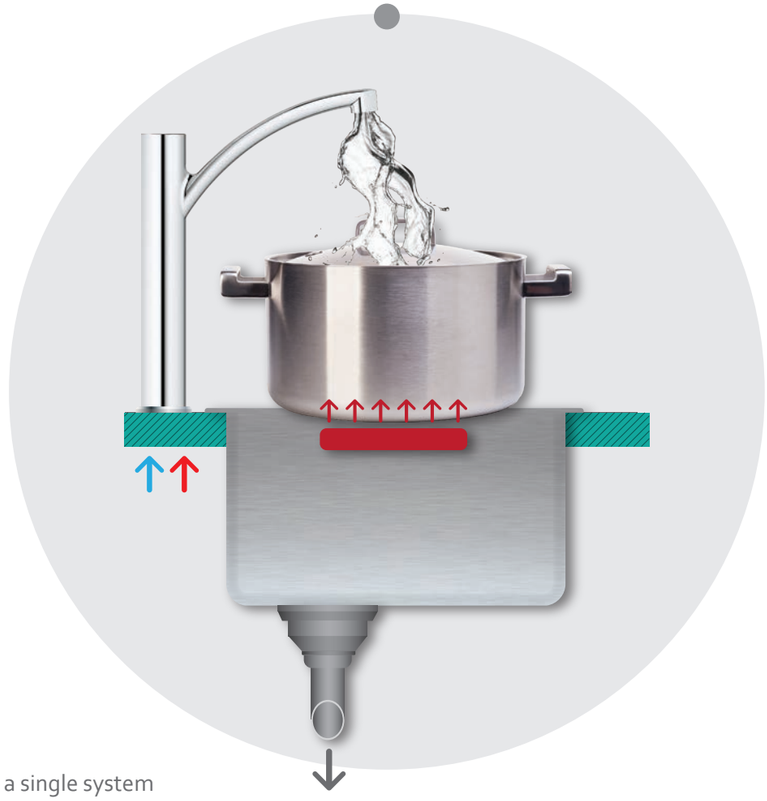
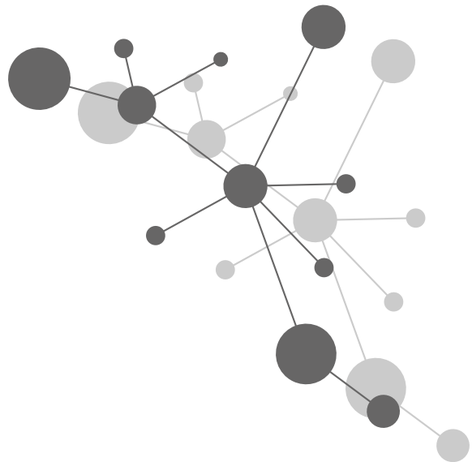


Fig. 48-a _ Process of Incorporation into a single system



Concept Generation

Collaborative Cooking
Shaping a Cooking System around a Persona - Morphing and Ergonomics

The recipe deconstruction leaded to the subdivision of the system in key functional areas as well as the procedures between users and machine (automatic or supervised).

Thus, I arranged an 'organized system' as a simple, linear sequence of functional units (Fig. 49). I placed the water unit at the center, since it is critical for food preparation and sanitation procedures. Irrespective of whether it is convenient to have a continuity between the cooking area and food preparation, I preferred to separate both in order to reduce the risks of food cross-contamination.

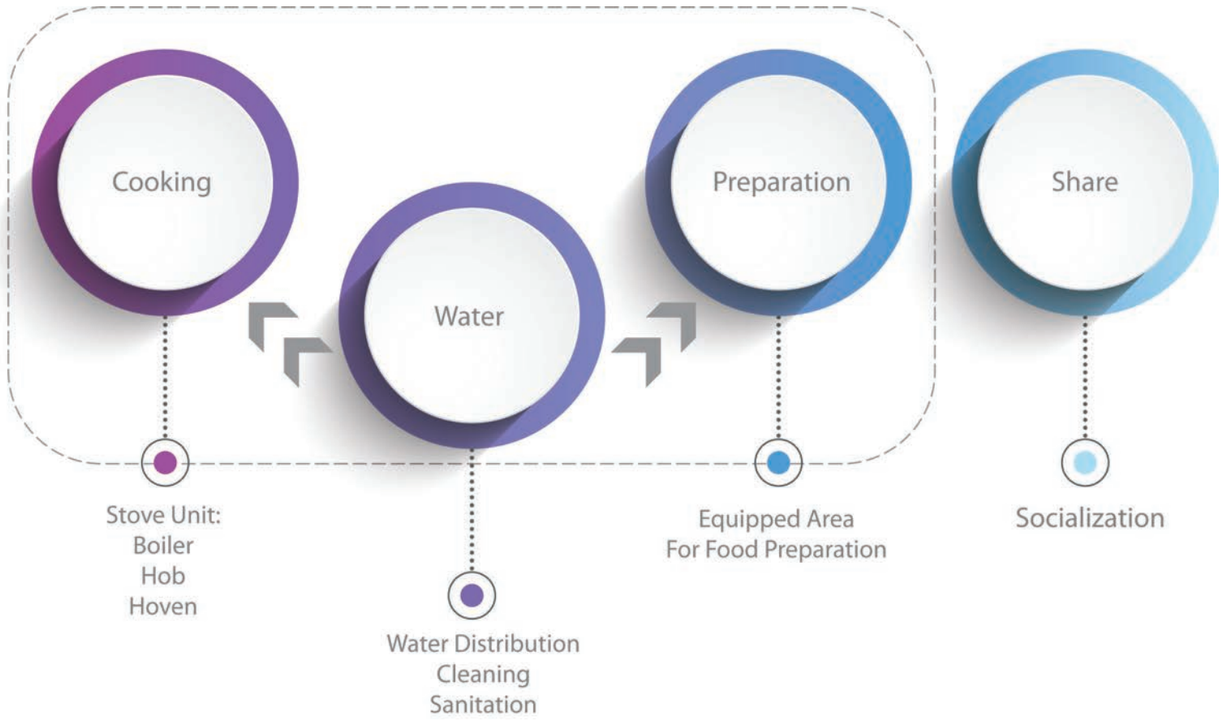


Fig.49 _ Preliminary "Water Centric" System Organization

Considering the nature of my persona, I defined a 'symmetric' system with the purpose to be used by both sides simultaneously (fig. 50).

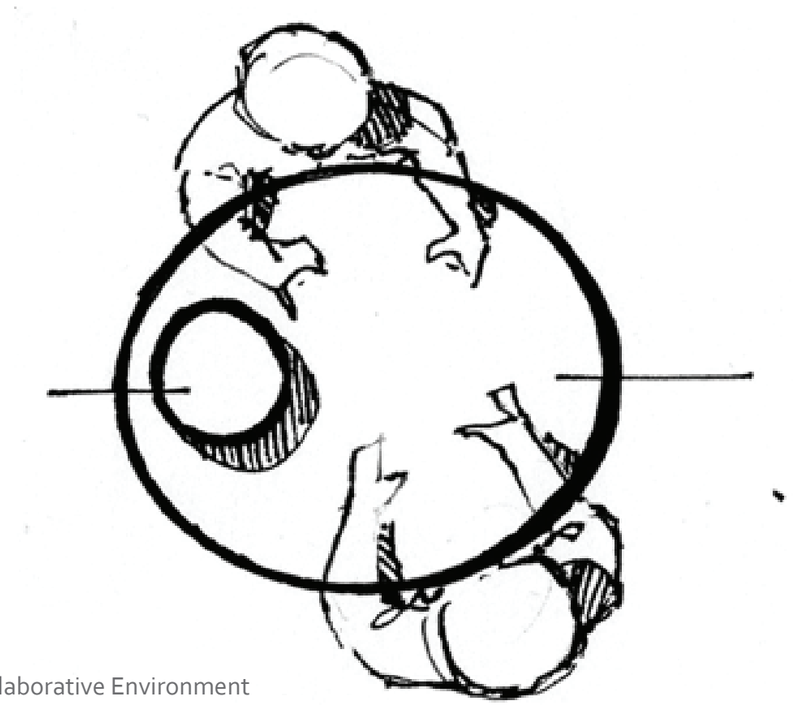


Fig.50 _ A Collaborative Environment

Then, I defined a collaborative model between my persona and the system, placing key units around it that could be accessible from all key functional areas (Fig.50/51).

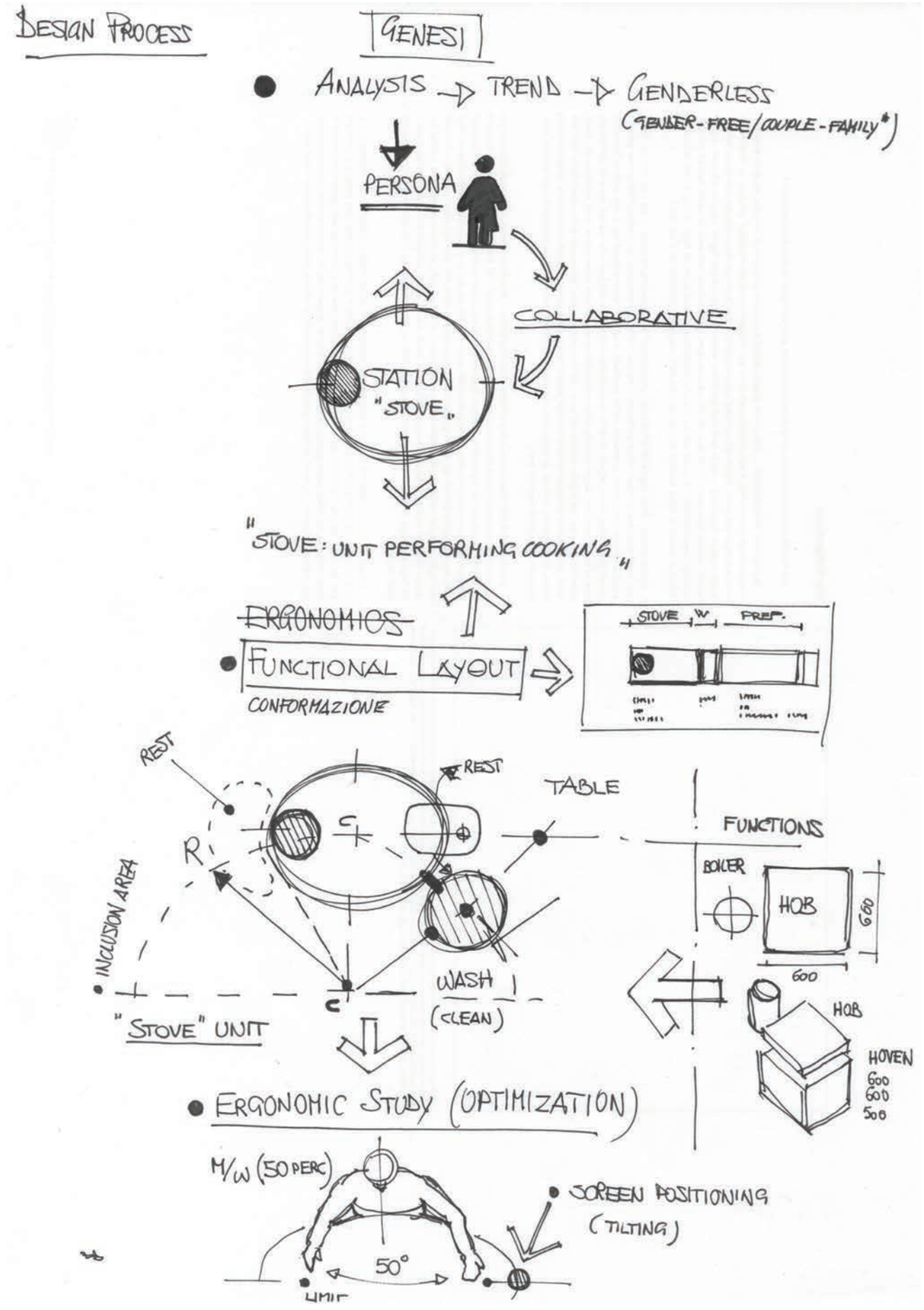


Fig.50 _ Collaborative and functional model

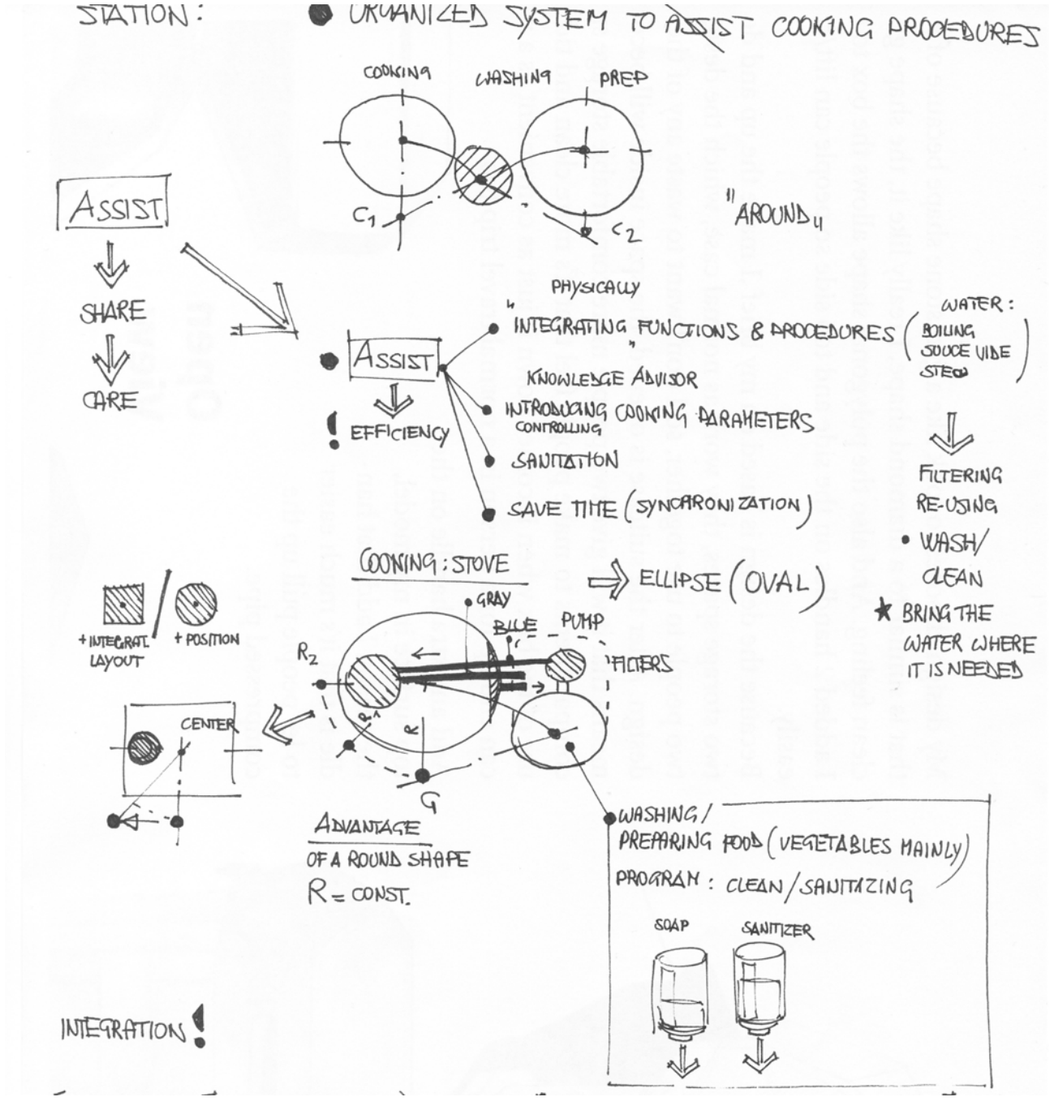


Fig.51_ Collaborative and functional model

Since this very early proposition, it emerged a clear orientation: to be effective, the system tend to be a self standing station. A workbench for cooking.

The functional layout was developed accordingly, completed by a detailed set of components with the purpose to get a significant aid in cooking (Fig.52).

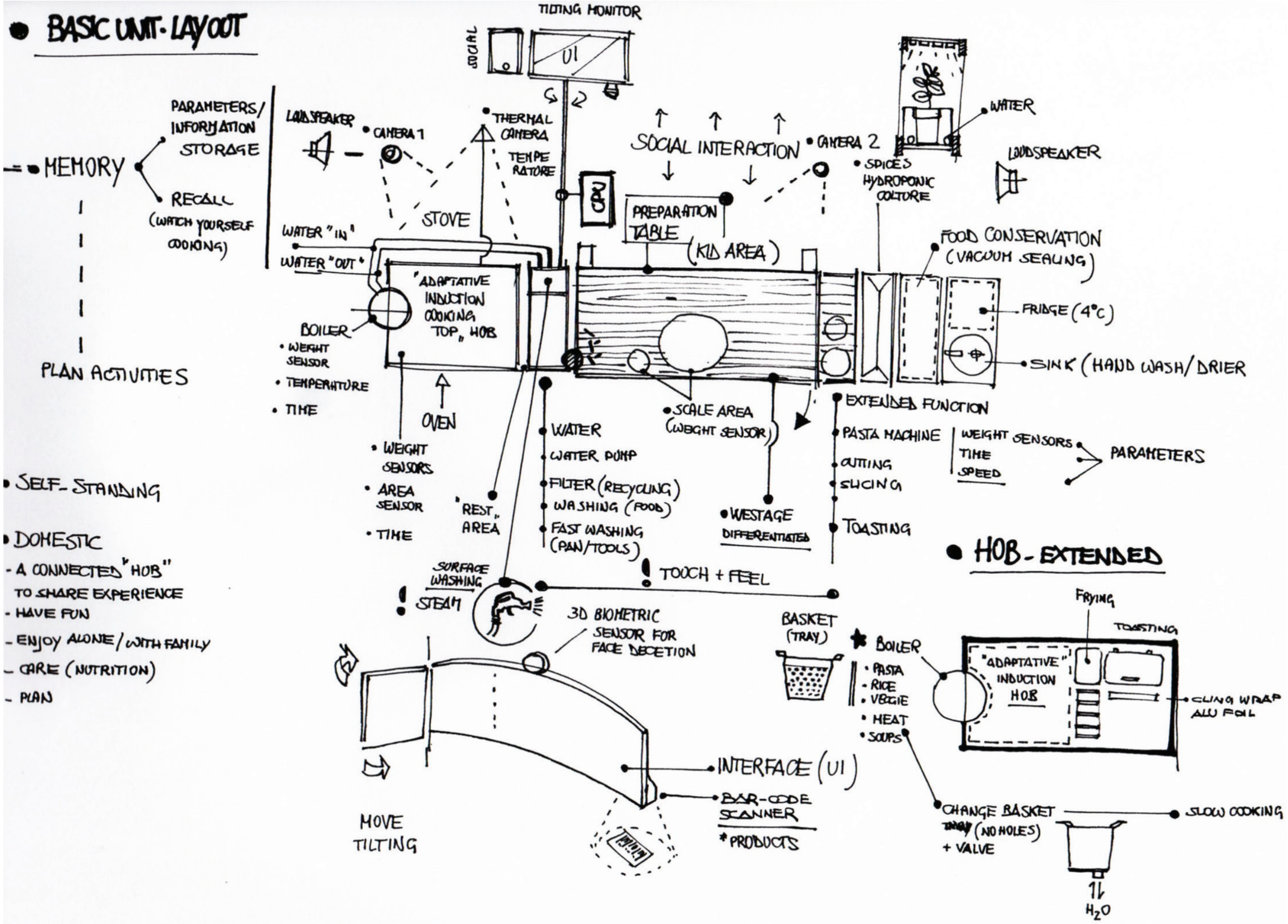
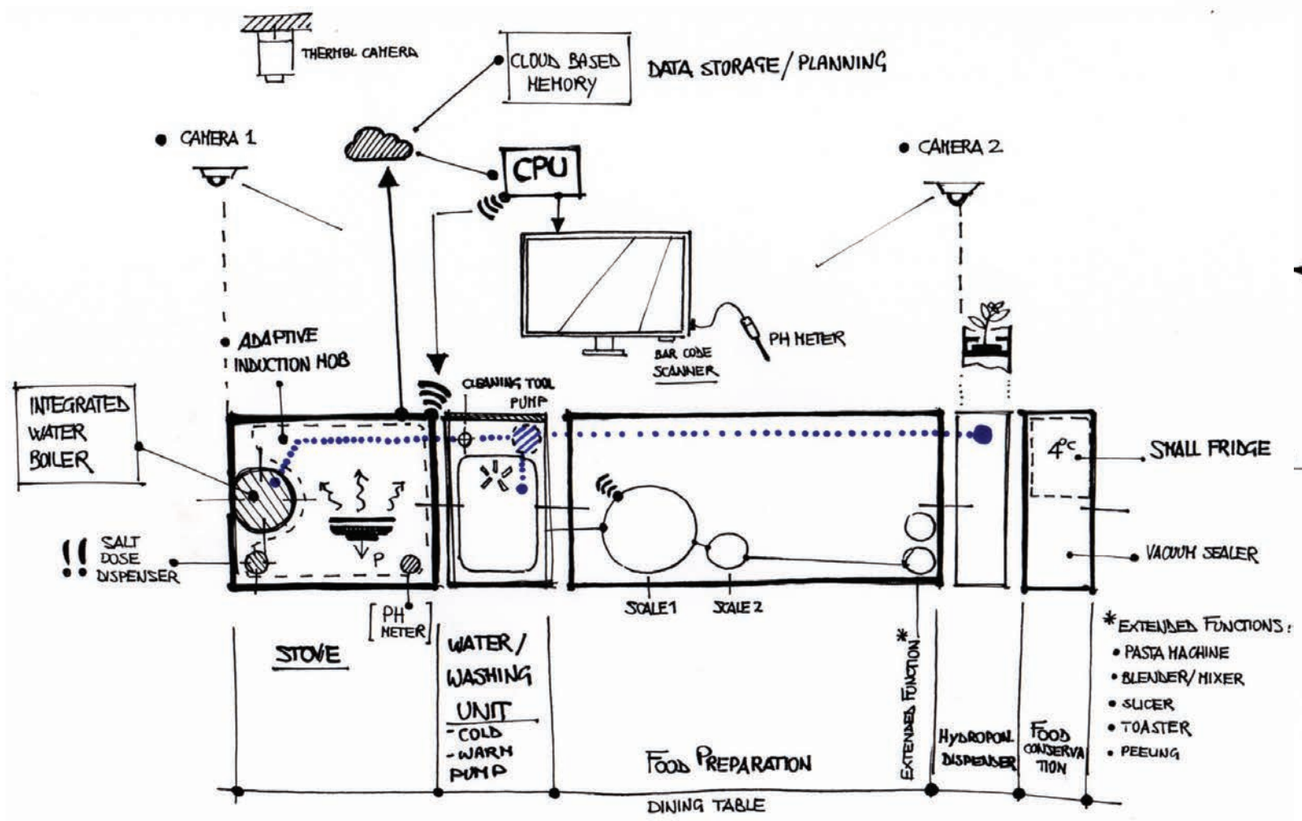


Fig.52 _ Detailed functional lay-out

The functional layout was simplified, in order to create detailed sub-families of functionalities such as water distribution and sensors placement (Fig.52).



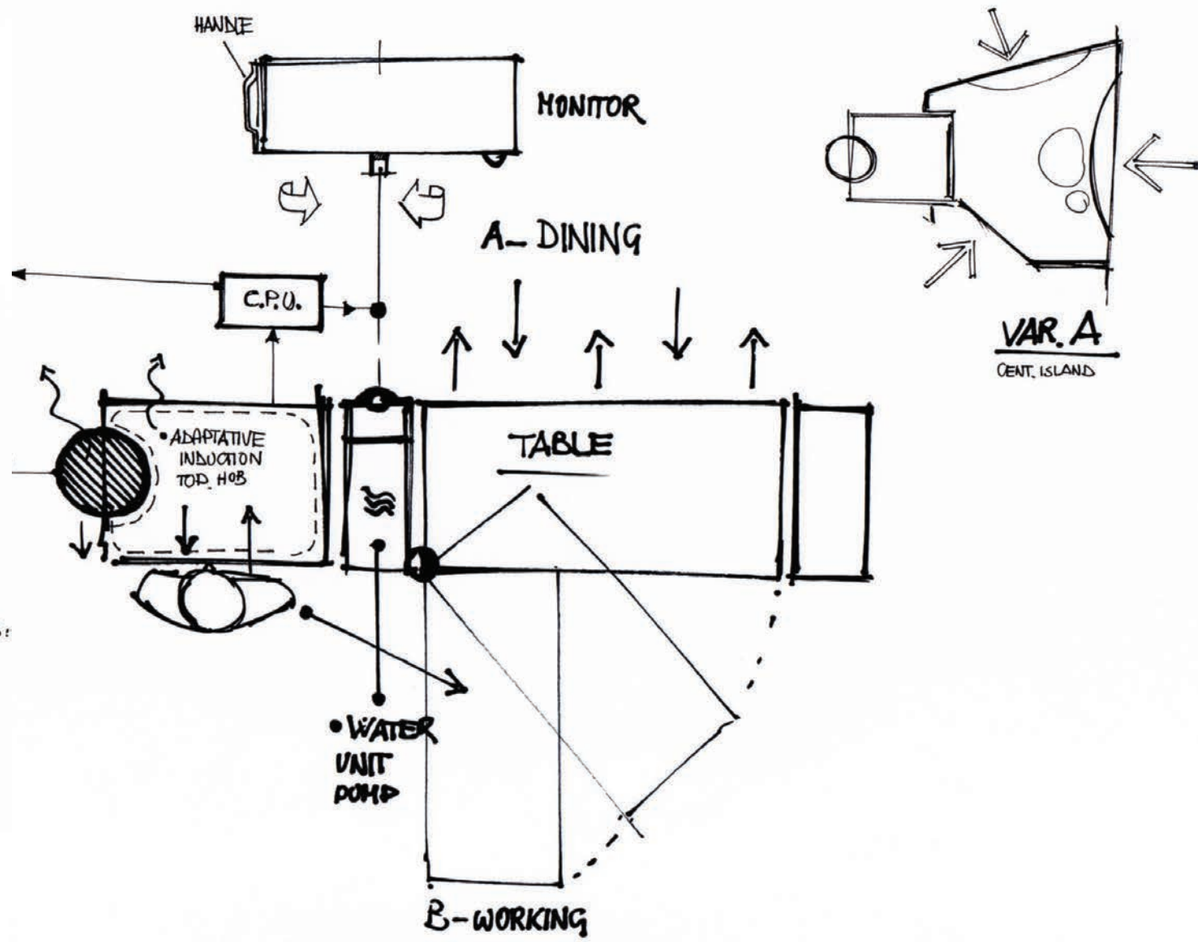
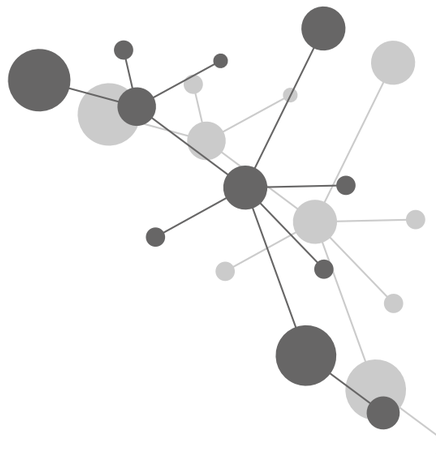


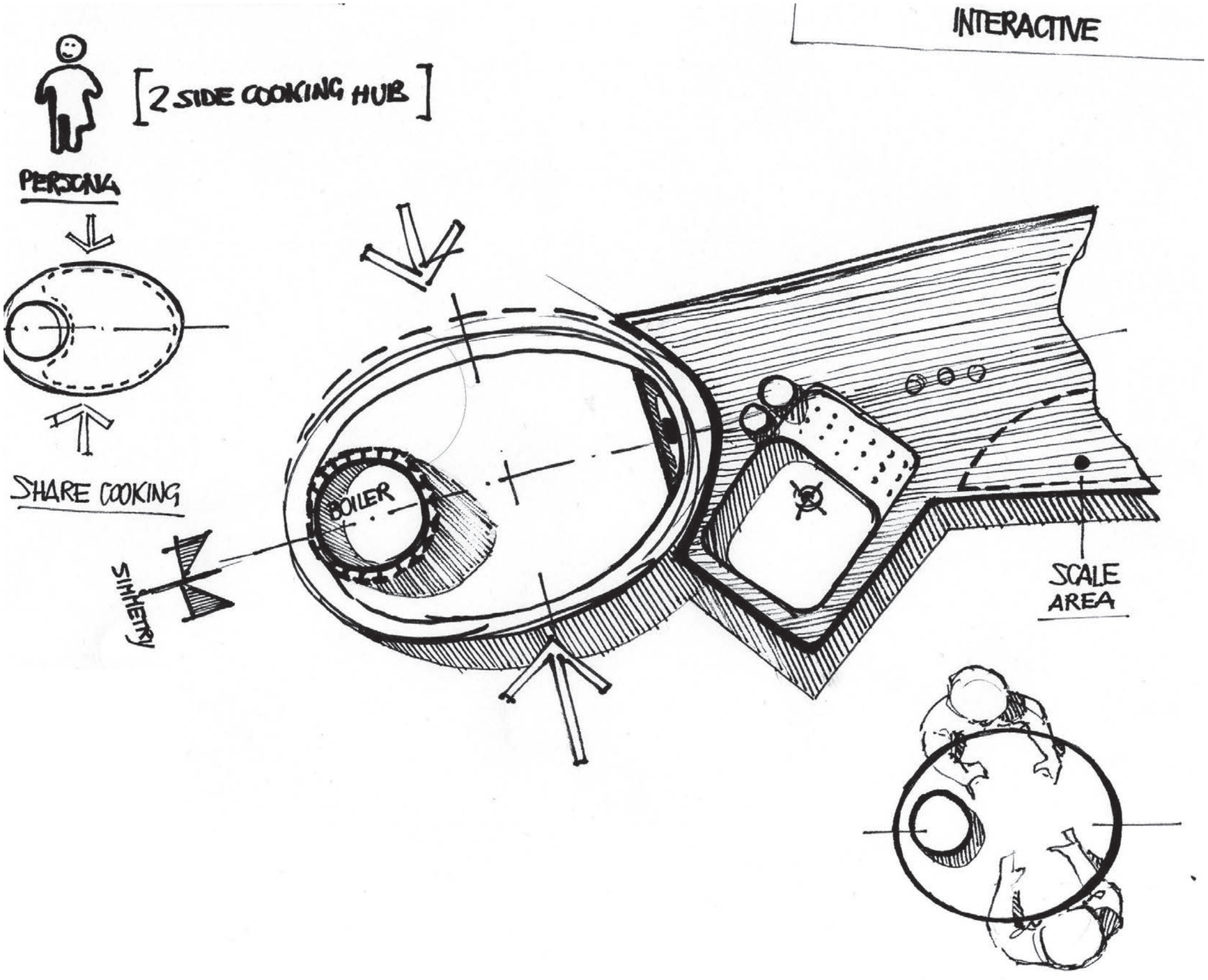
Fig.52 _ Functional studies.



Conceptual Sketches

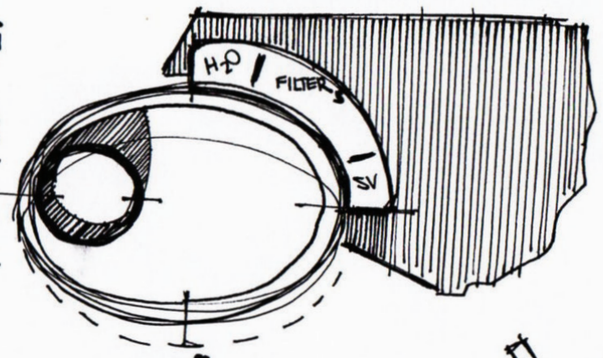
Conceptual Sketches

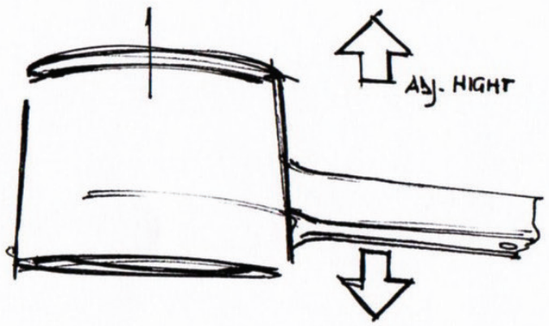
Conceptual sketches were used during a preliminary phase to clarify some key components and functions of the cooking station. They have been helpful to approach the Digital Mock-Up modeling. They also helped to define some traits of the station, which was intended to appear solid, reassuring and inviting. An object that is not intimidating, highly technological but with an empathetic appearance.

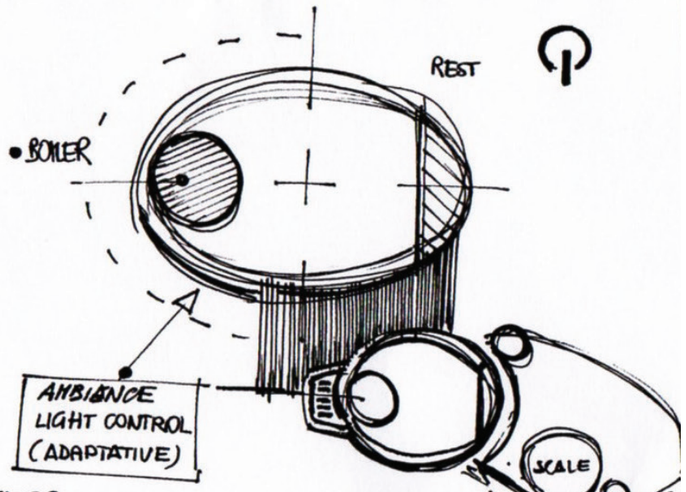


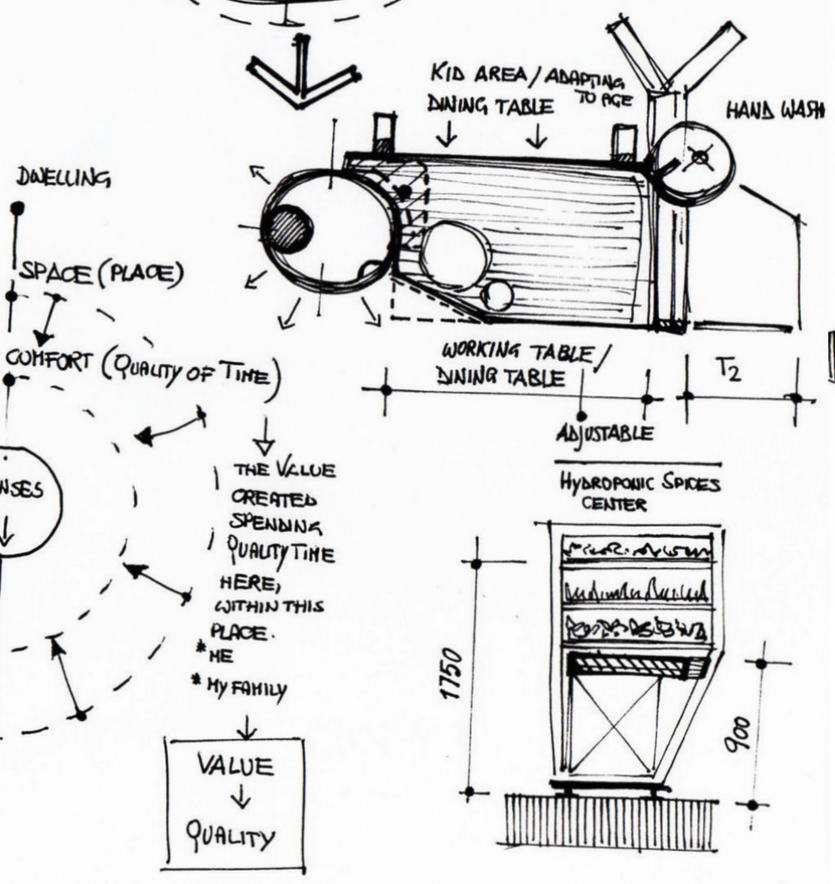
- SELF STANDING INTERACTIVE COOKING STATION
- [SYSTEM]

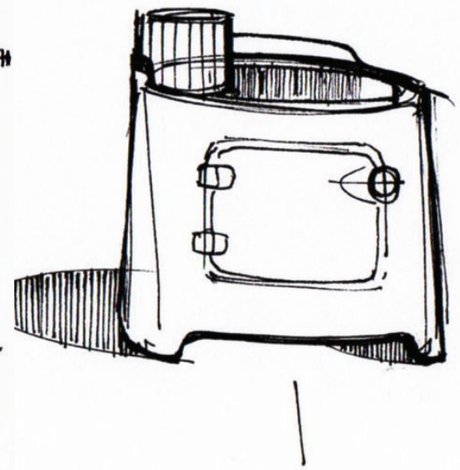
ASSEMBLY OF UNITS

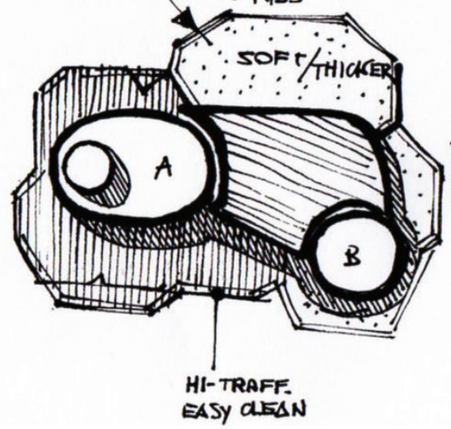


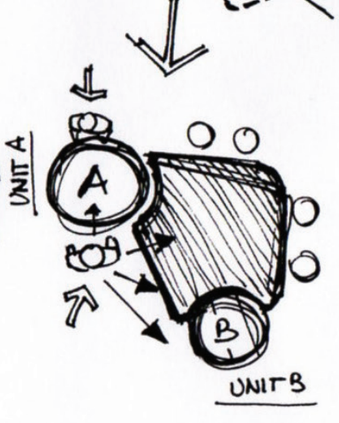


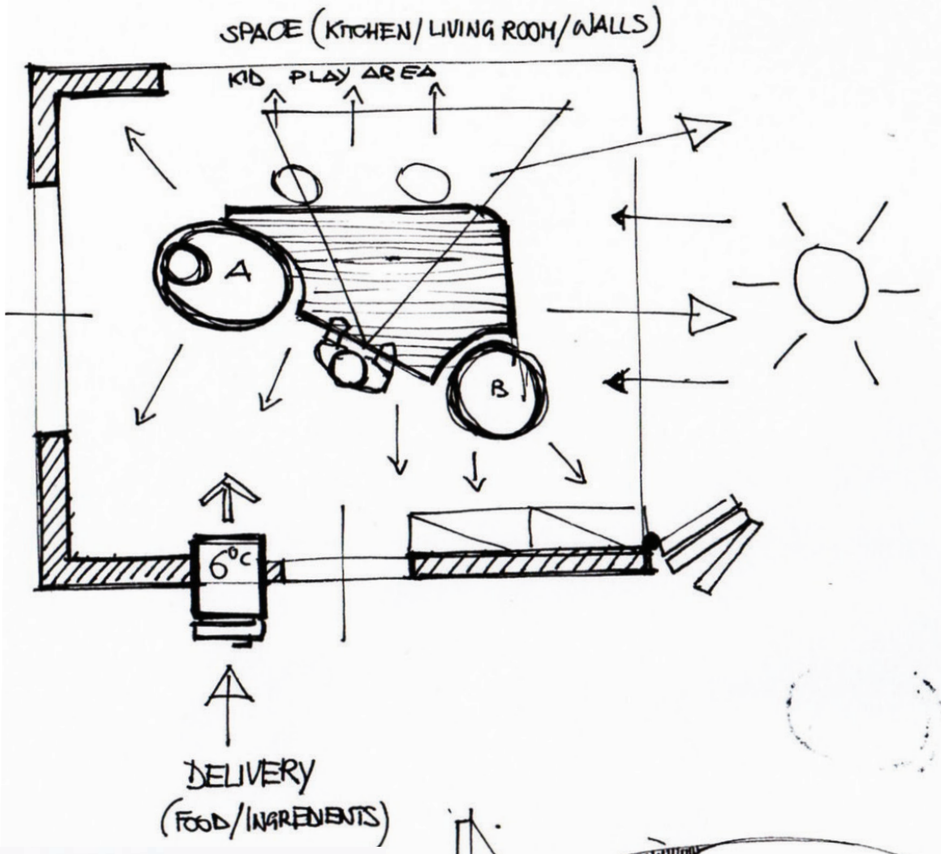


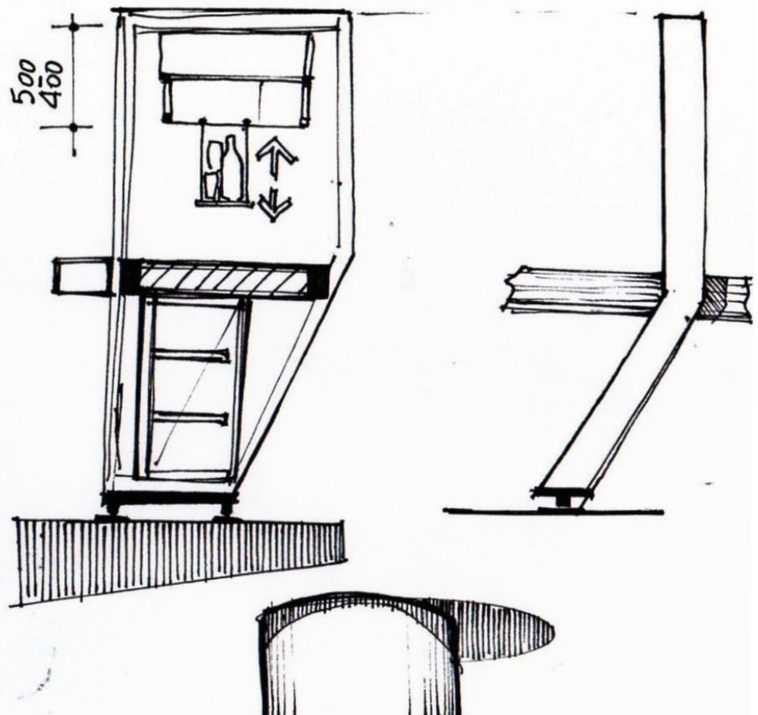


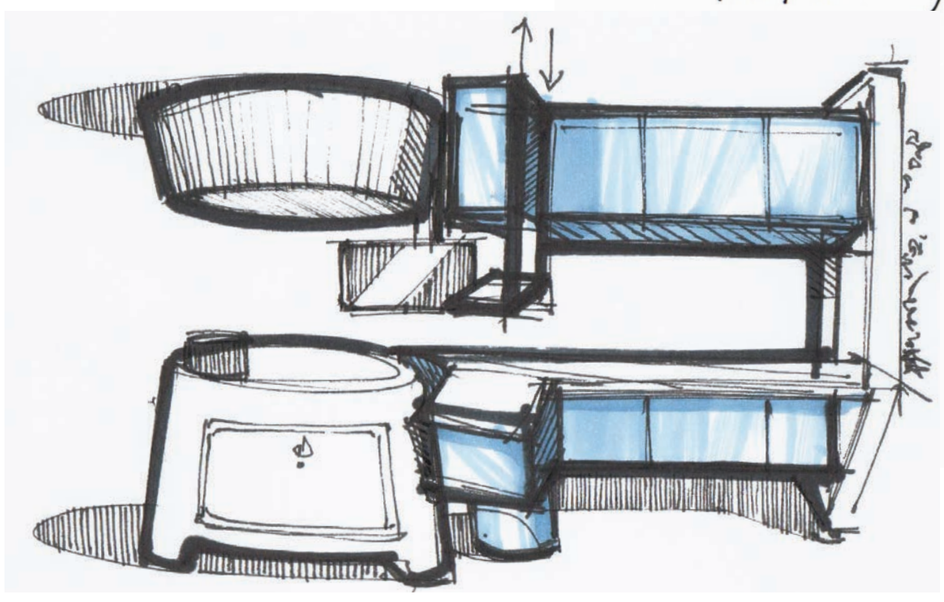


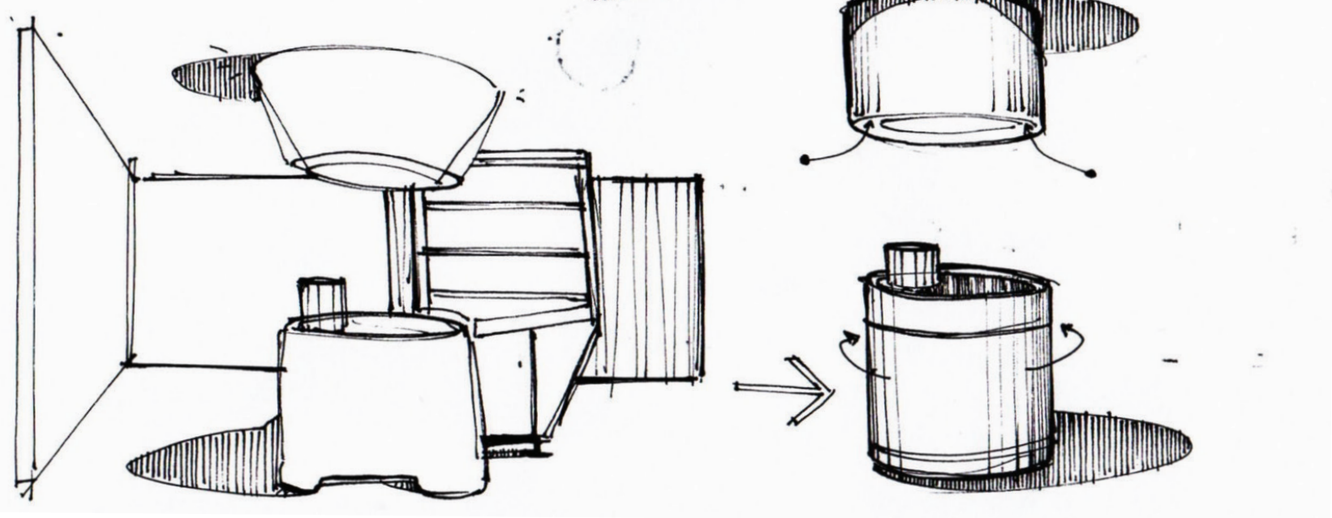


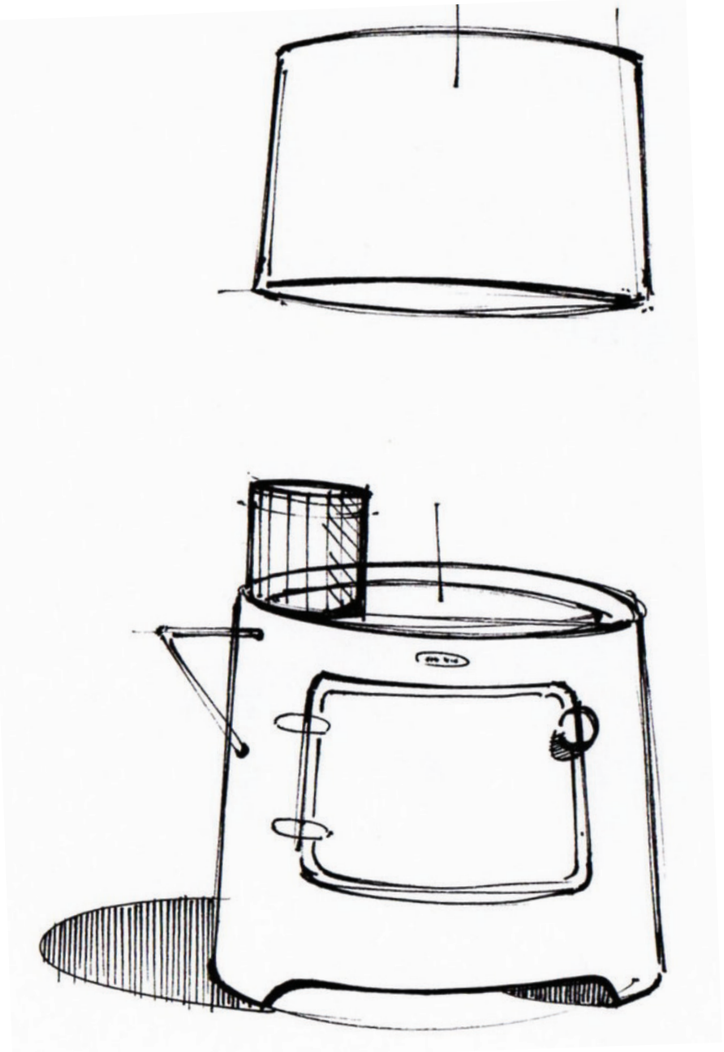


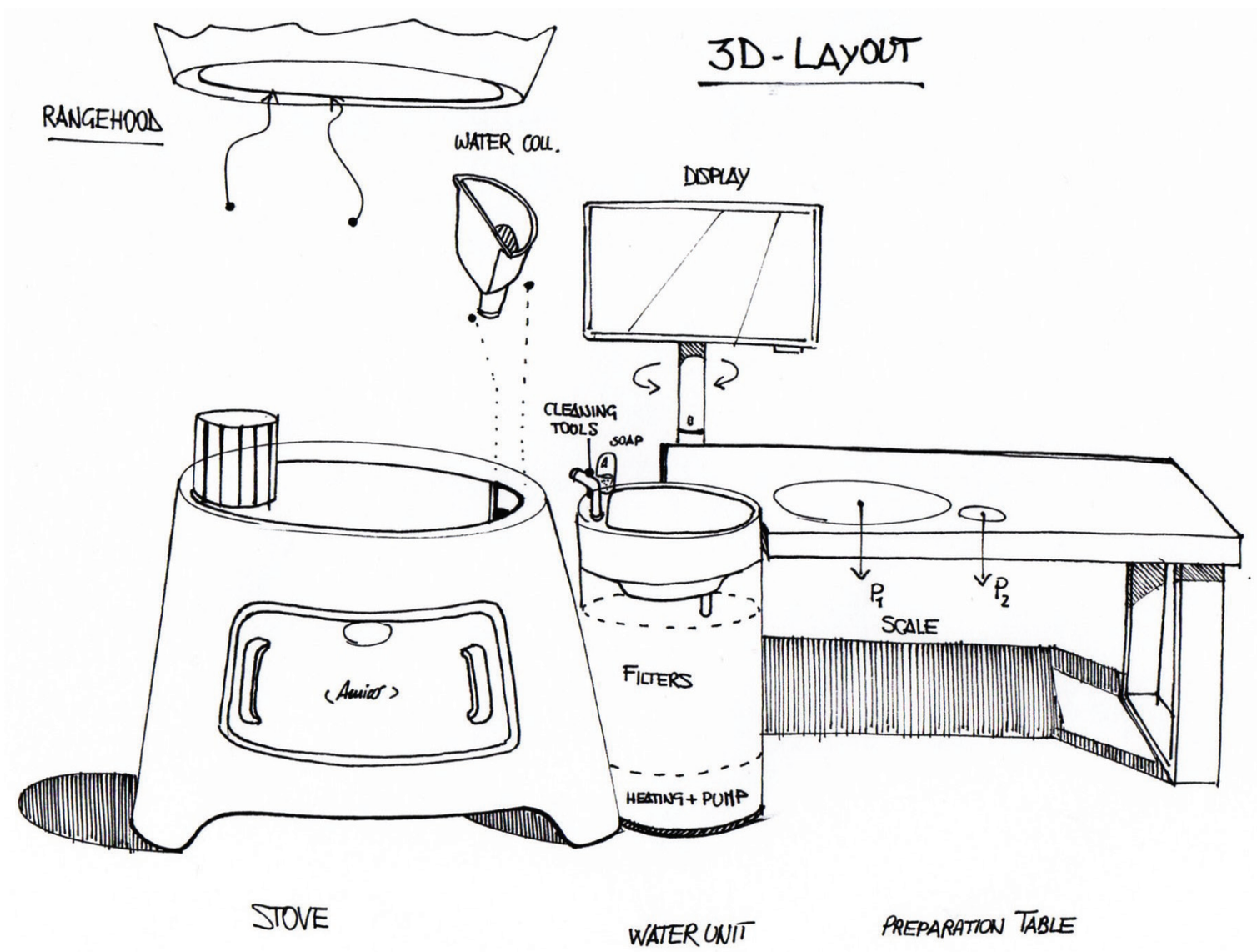

SPACE (KITCHEN/LIVING ROOM/WALLS)
KID PLAY AREA
A
B
6°C
DELIVERY
(FOOD/INGREDIENTS)

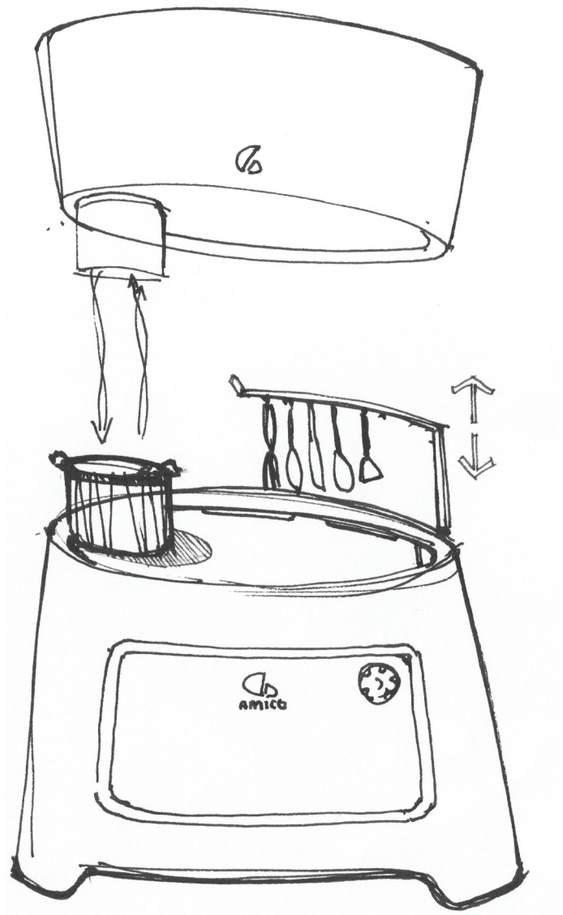

500
400

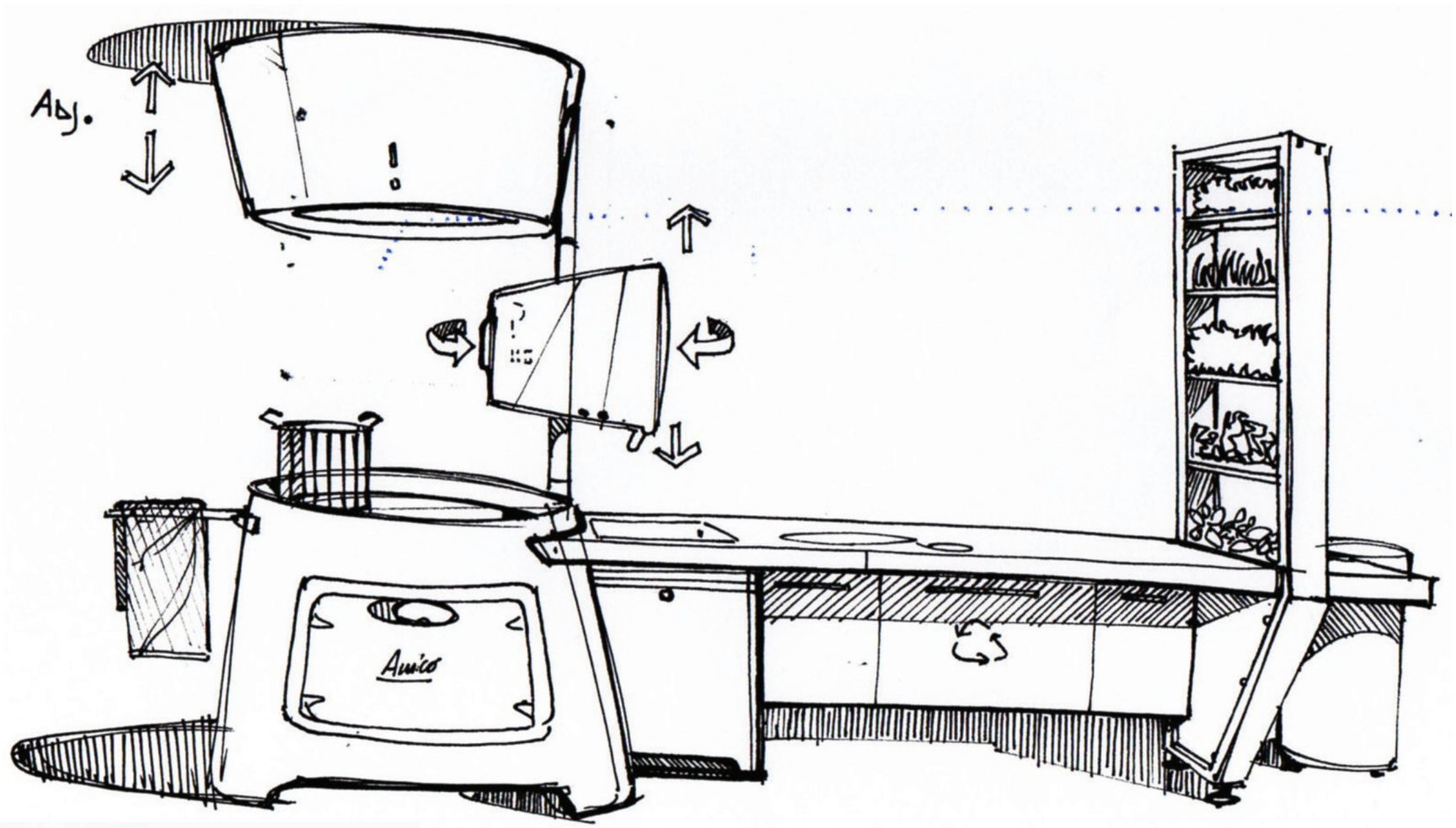


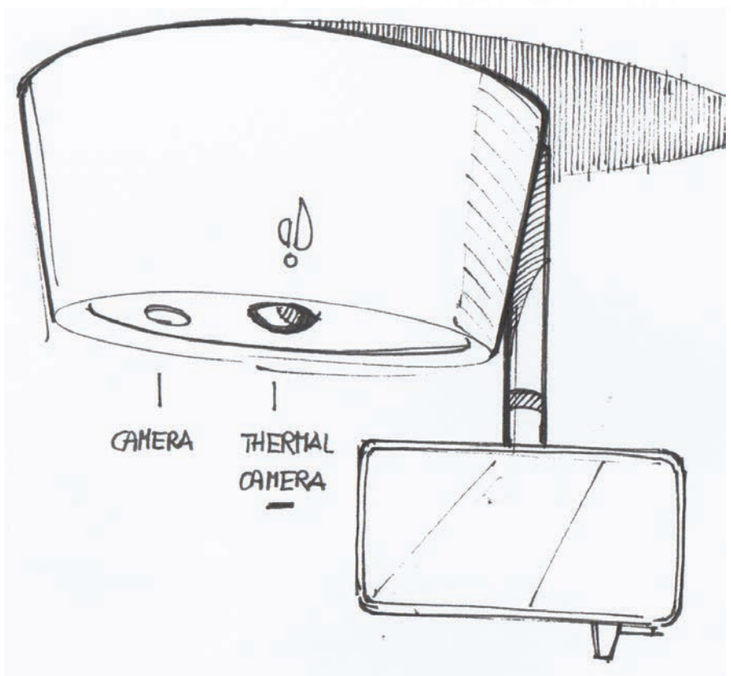


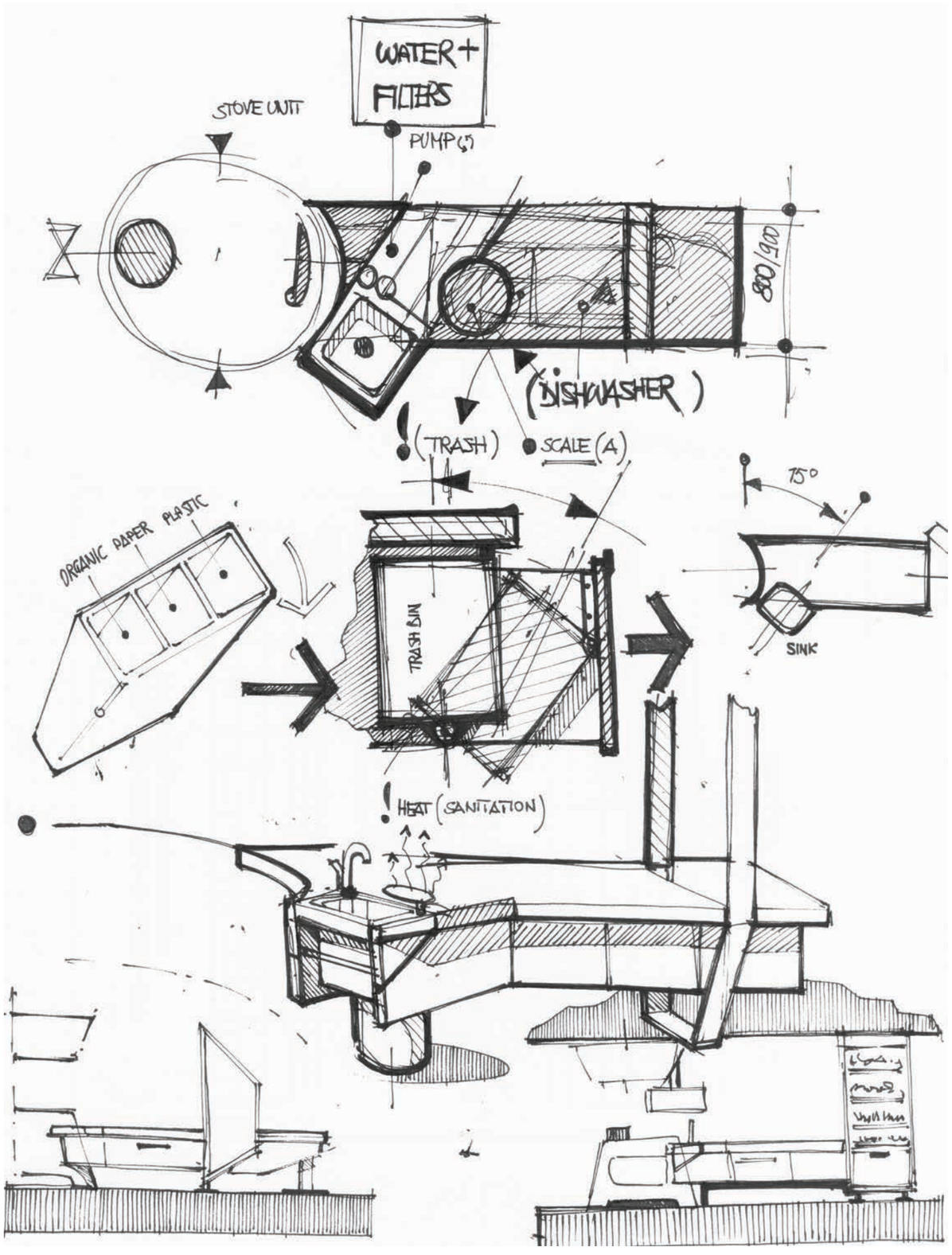


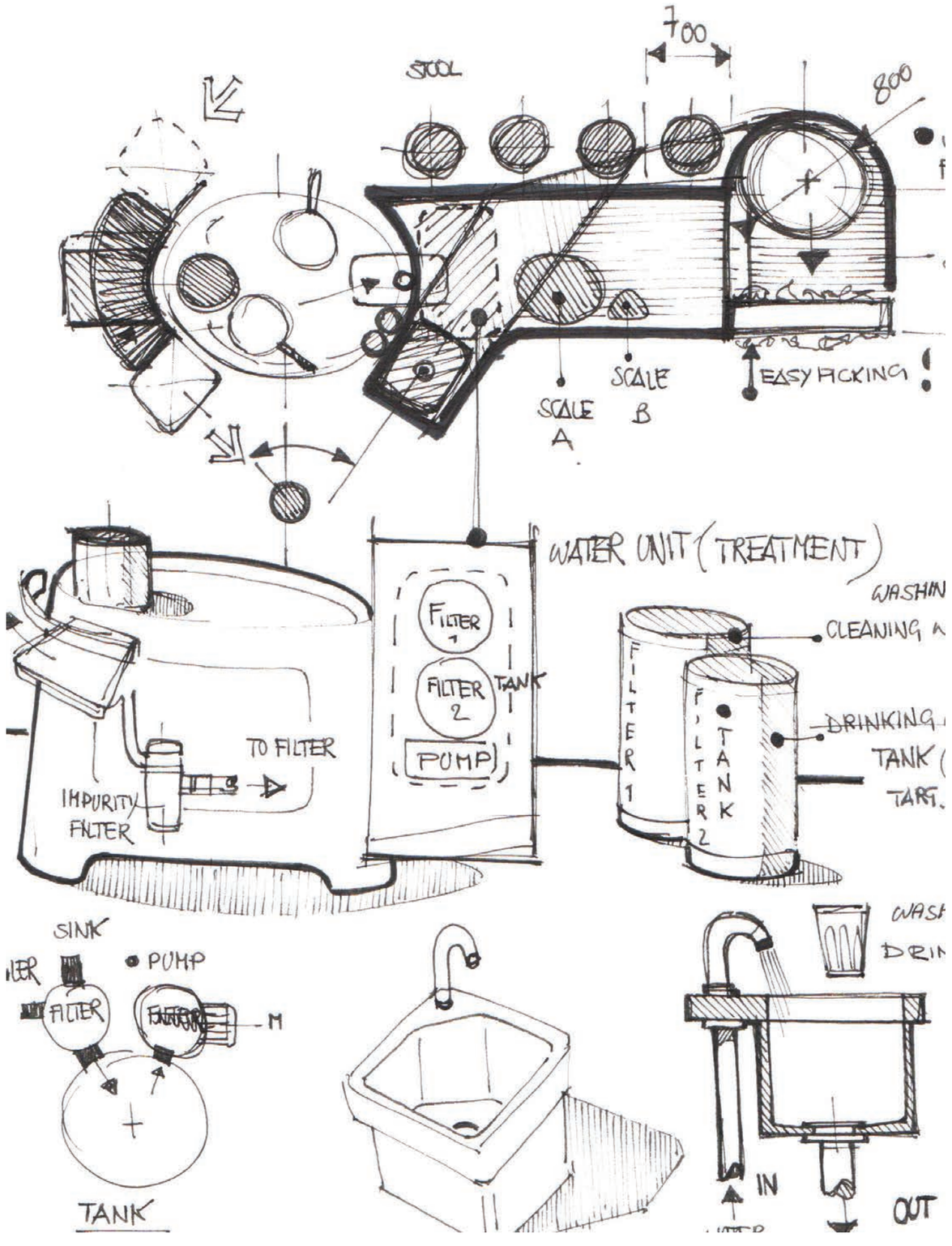

3D - LAYOUT
RANGEHOOD
WATER COLL.
DISPLAY
CLEANING TOOLS
SOAP
P1
P2
SCALE
FILTERS
HEATING + PUMP
STOVE
WATER UNIT
PREPARATION TABLE

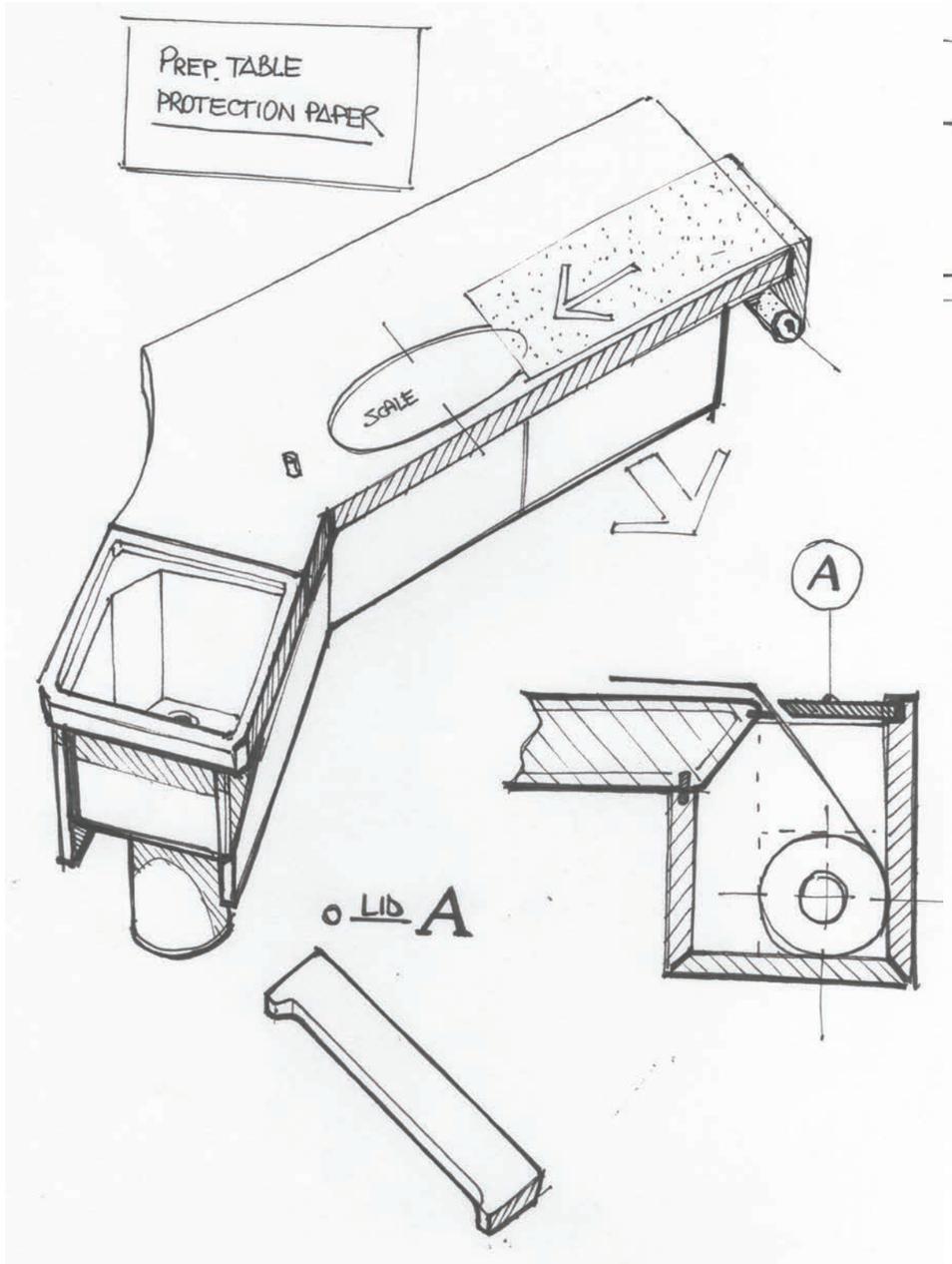

amica

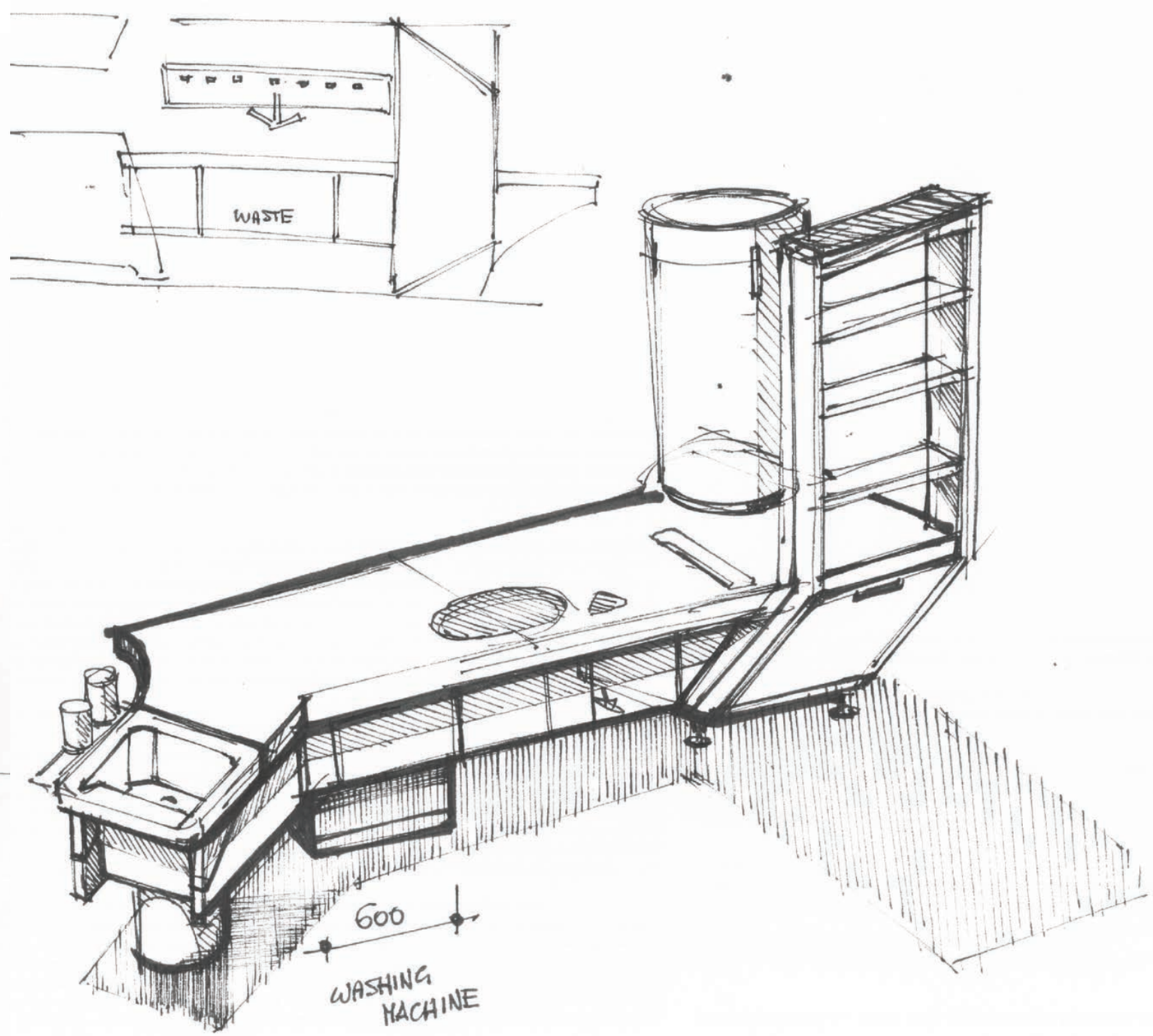

Adj.
Amica

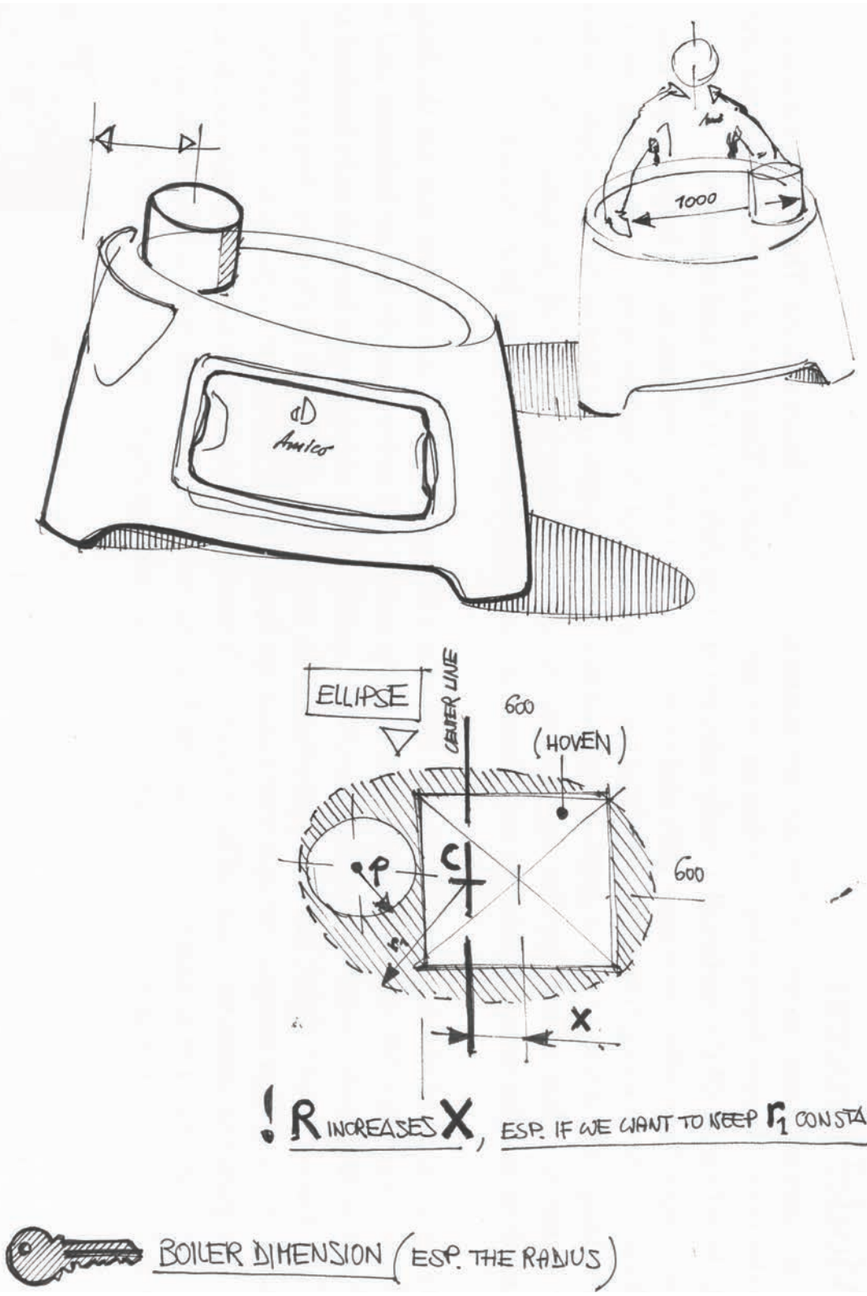

CAMERA
THERMAL CAMERA

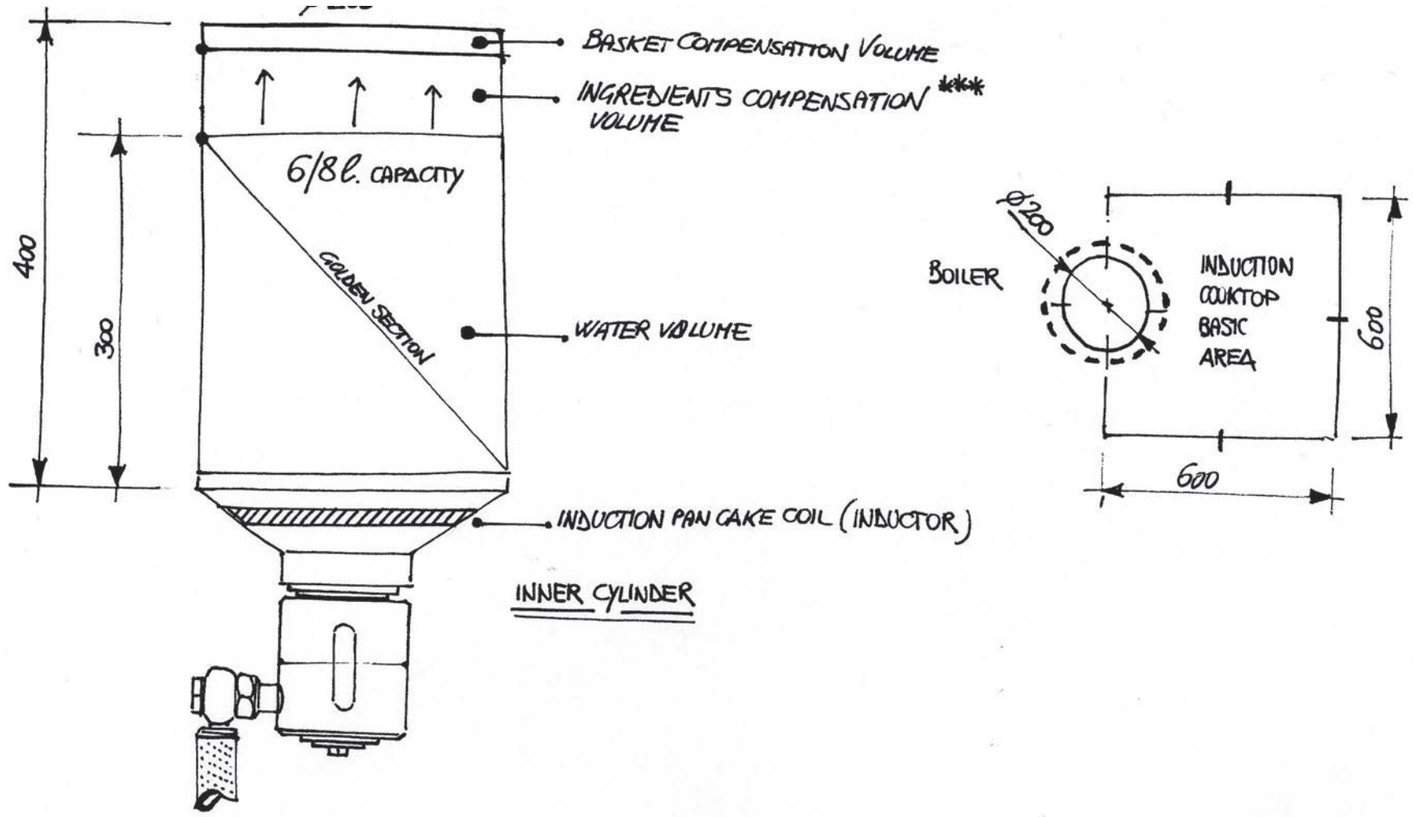

WATER+
FILTERS
STOVE UNIT
PUMP(S)
80/100
(DISHWASHER)
(TRASH)
SCALE (A)
75°
SINK
ORGANIC PAPER PLASTIC
TRASH BIN
HEAT (SANITATION)

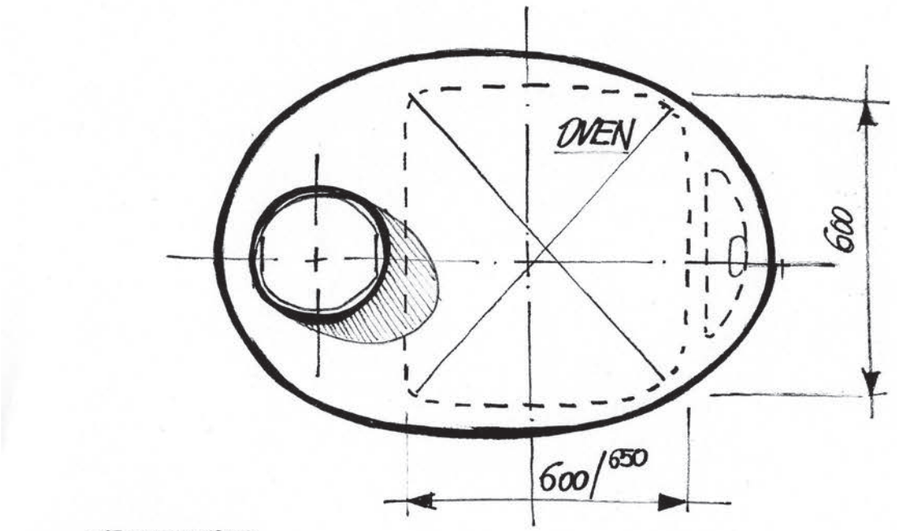

700
800
STOOL
SCALE A
SCALE B
EASY FICKING
WATER UNIT (TREATMENT)
FILTER 1
FILTER 2
PUMP
TANK
TO FILTER
IMPURITY FILTER
SINK
PUMP
FILTER
TANK
IN
OUT

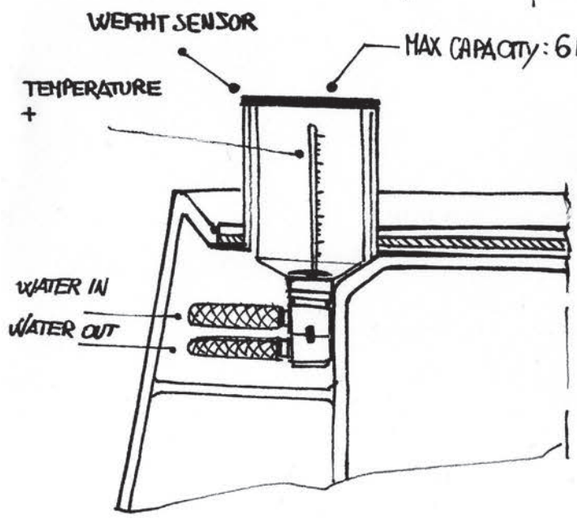

PREP. TABLE
PROTECTION PAPER
SCALE
A
LID A

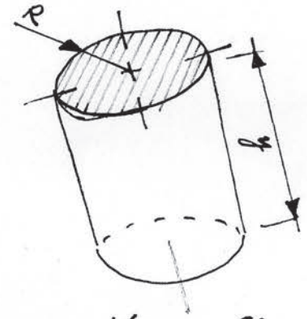

WASTE
600
WASHING
MACHINE

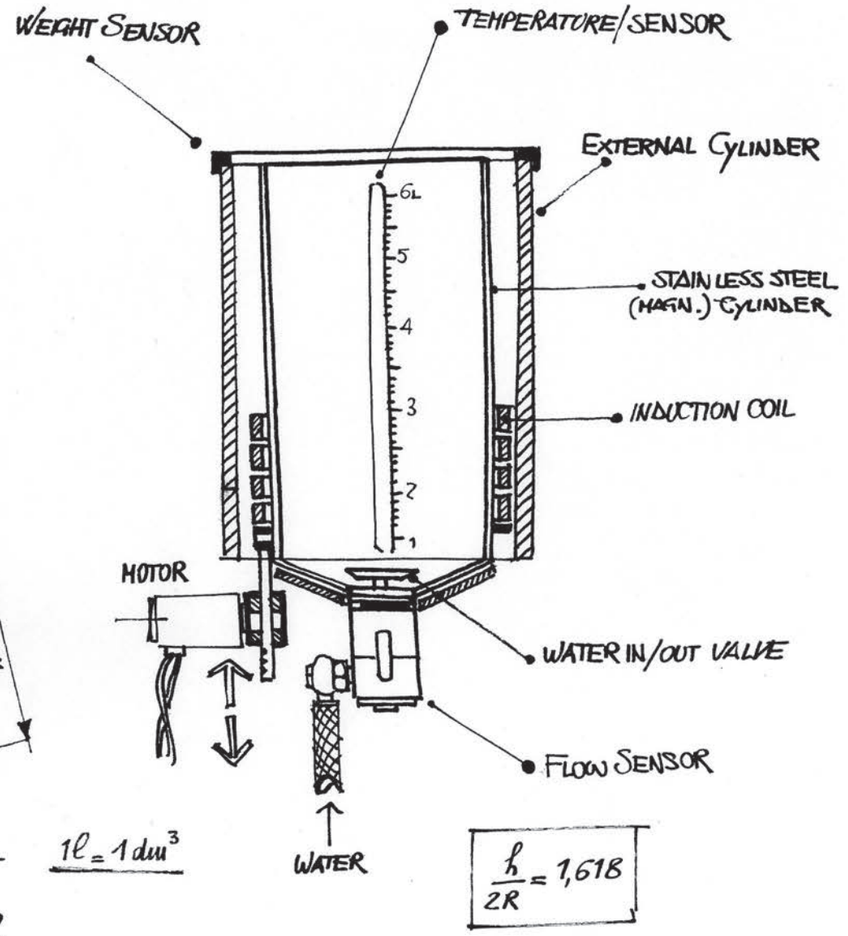

1000
Amica
ELLIPSE
CENTER LINE
600
(HOVEN)
P
C
600
X
! R INCREASES X, ESP. IF WE WANT TO KEEP r1 CONSTANT
BOILER DIMENSION (ESP. THE RADIUS)


BASKET COMPENSATION VOLUME
INGREDIENTS COMPENSATION VOLUME
6/8 l. CAPACITY
GOLDEN SECTION
WATER VOLUME
400
300
INDUCTION PAN CAKE COIL (INDUCTOR)
INNER CYLINDER
BOILER
Ø200
INDUCTION COOKTOP BASIC AREA
600
600





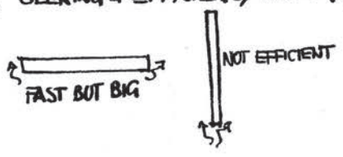




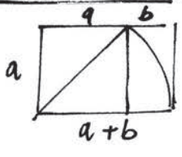
- VOLUME = 6L $1\ell = 1\,dm^3$
- $A = \pi R^2$
- $6(\ell) = \pi R^2 \times h$

$\frac{h}{2R} = 1{,}618$

! SEEKING 4 EFFICIENCY RATIO (η)



*GOLDEN RATIO (SECTION)



$\frac{a+b}{a} = \frac{a}{b} = \varphi$

$\varphi = \frac{1+\sqrt{5}}{2} = 1.6180339.....$

SOL. A ADAPTATIVE

HONEY COMB COILS

(ϕ260)

LED

DRAIN

SOL. B PRE-DEF AREAS

P

ACCESSORIES

TOOLS

HOVEN TRAY

GRILL

GLASS

INDUCTION RADIATION COILS

GRILL

90 CM

40

INDUCTION TRAY

GUIDE

ROD A

ROD B

SLIDER

WEIGHT

SLIDER

INDUCTION

ROD

ROD

★ RECIPE

INGREDIENT

EXECUTION

TEMPERATURE

TIME

COOKING PROCESS + SAFETY

i.e. LASAGNA!

MONITOR

PROCESS

INDUCTION COIL UNIT

30

(20)

t°c

PREHEAT

180

GRILL

0

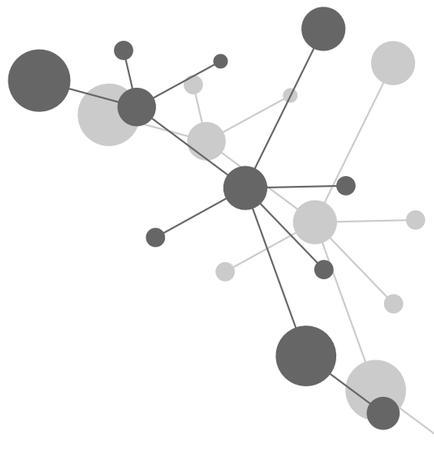
LASAGNA PROCESS

t TIME

LAW

PROCESS SCHEMA

TRAY LIFT

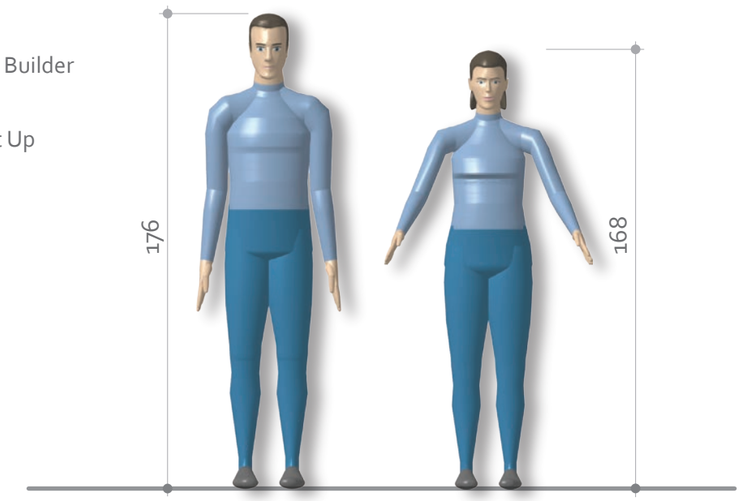


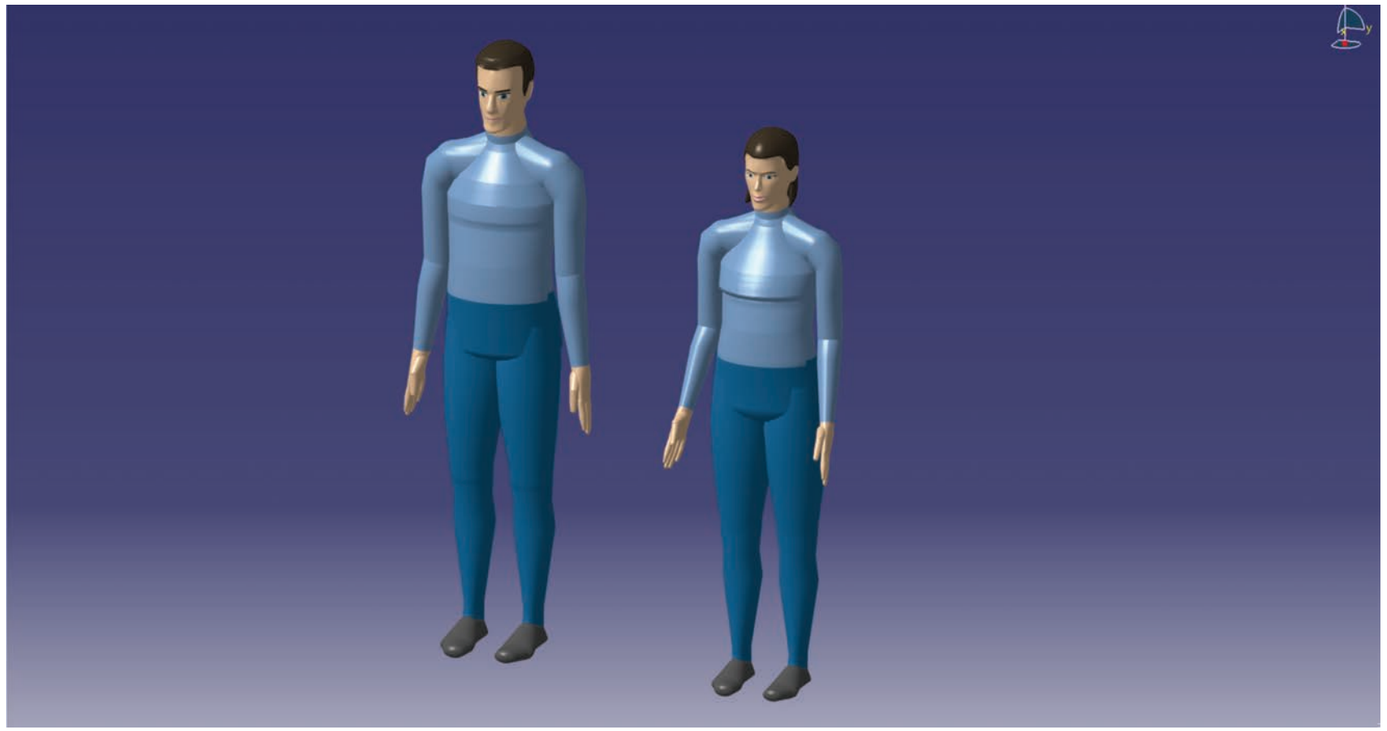
Designing around a Persona

Even if I assumed that my Persona tend to be less bound within gender norms, there are still anthropometric differences between the two sexes. To define a correct ergonomic set up of the station I used two manikins representing male and female North American adults, with standard proportions (50 Percentile).

Tools:
Catia Human Builder

Manikins' Set Up





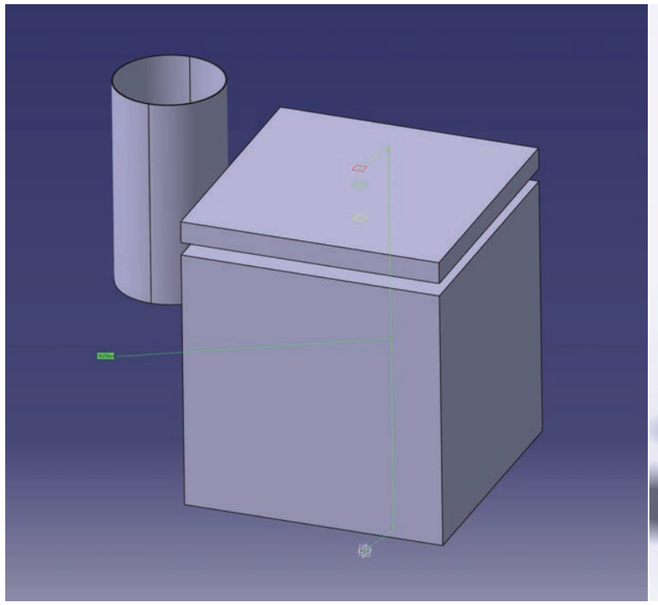
Male and female North American adults, with standard proportions (50 Percentile).

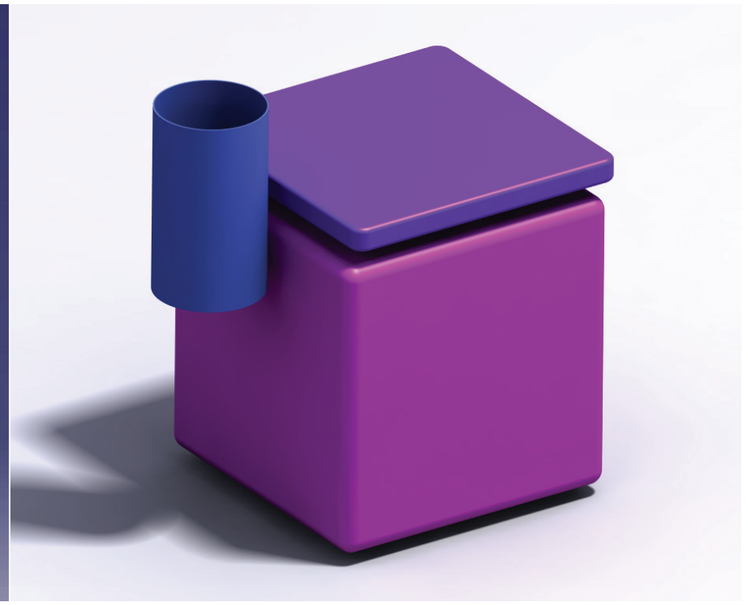
I started the design process of the stove unit with an assembly of standard cooking appliances housed into it (Boiler/Hob/Oven).

Oven (600x600)

Hob (600x600)

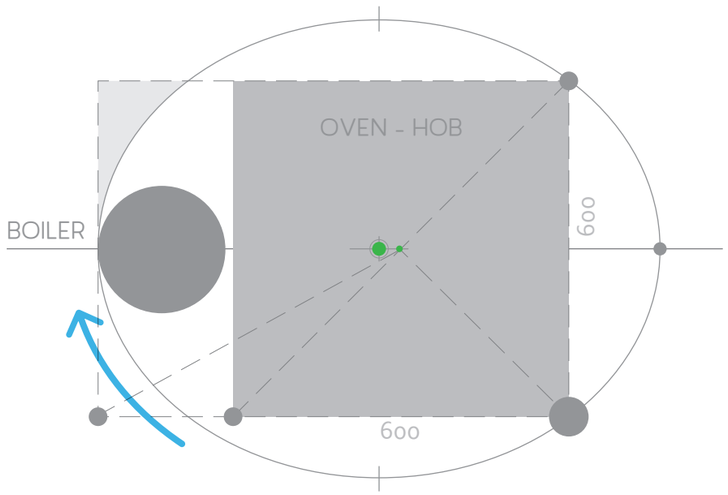
Boiler (to be defined)

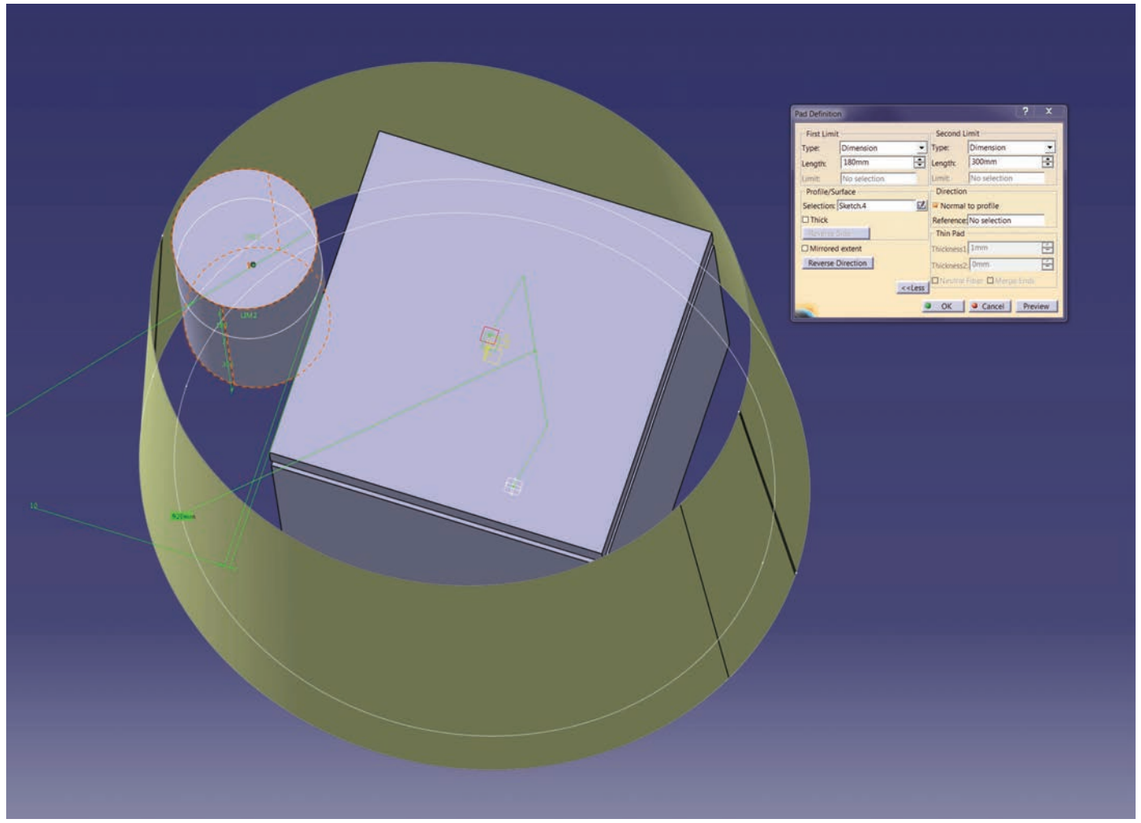




Early Schematic Appliances 3D Layout

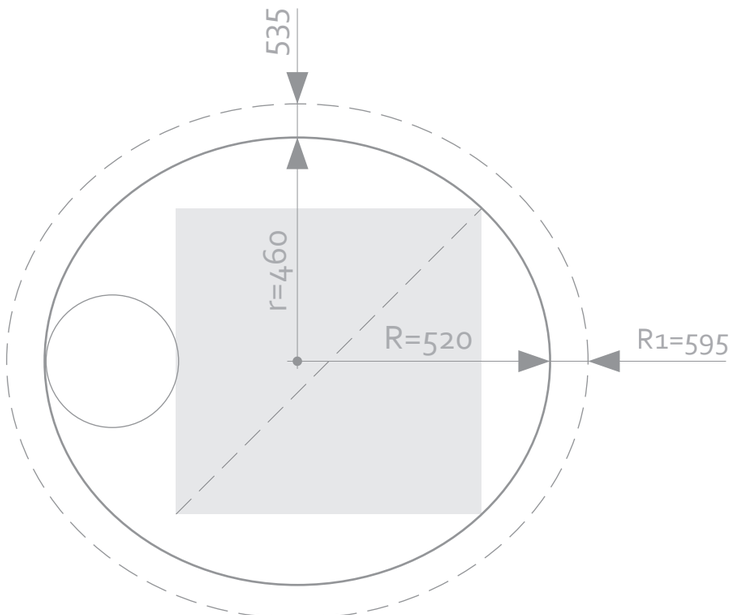
The resulting schematic 3D layout, has been contained in a truncated-cone shape with elliptical section that can remain functional with the manikins' correct ergonomics and posture.

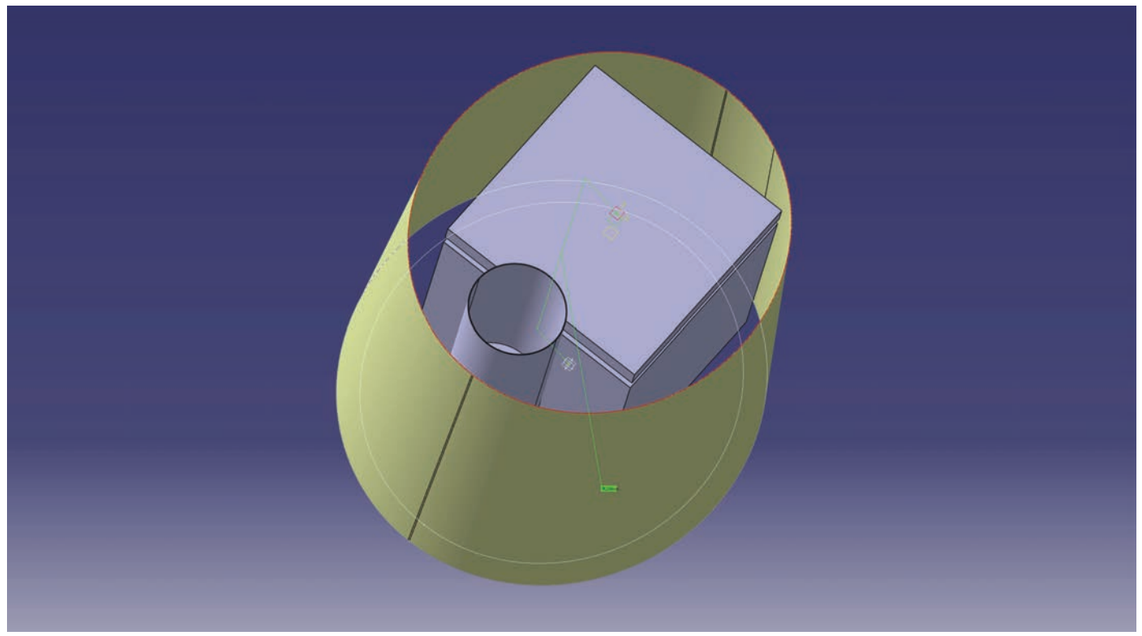




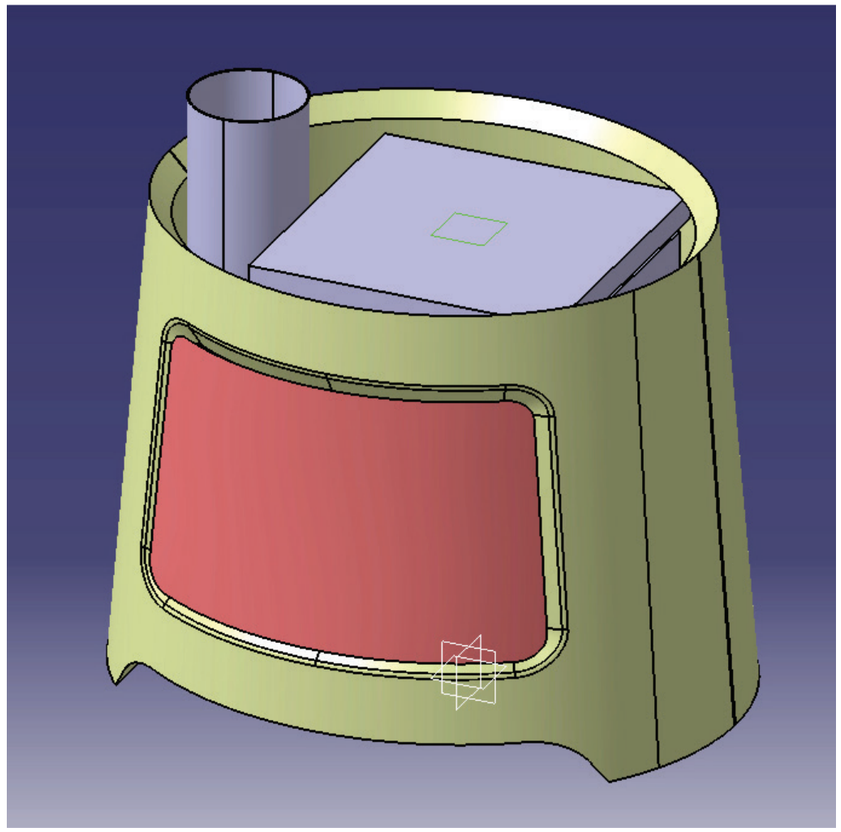
The elliptical shape facilitates an easier workflow around the stove unit (which is conceived for collaborative tasks), and the access to the boiler. It helps also to characterize the esthetic of the unit.

The ellipse at the top was eventually set with a major radius of 520 mm and a minor of 460 mm.

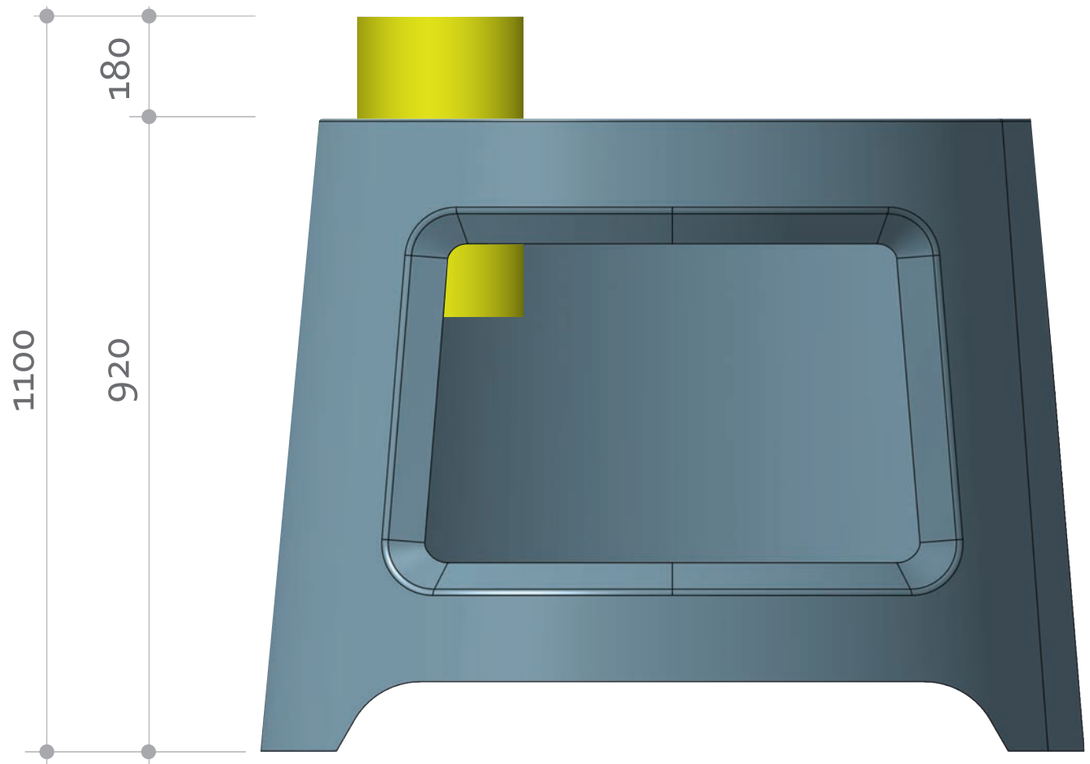




The model was completed with the access area of the oven, to evaluate issues about its asymmetrical placement into the main body.



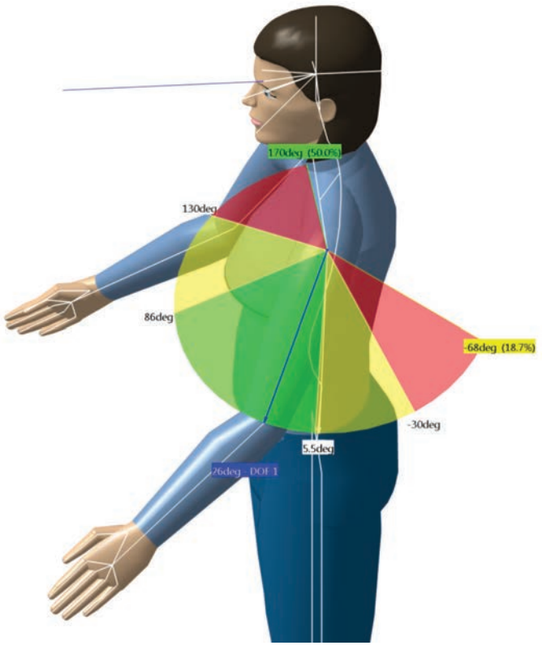
The working height of the stove unit was set at a standard 920 mm, while the boiler at 1100 mm.



The dimensions the model have been validated through the use of manikins, in order to assess the correct ergonomics.

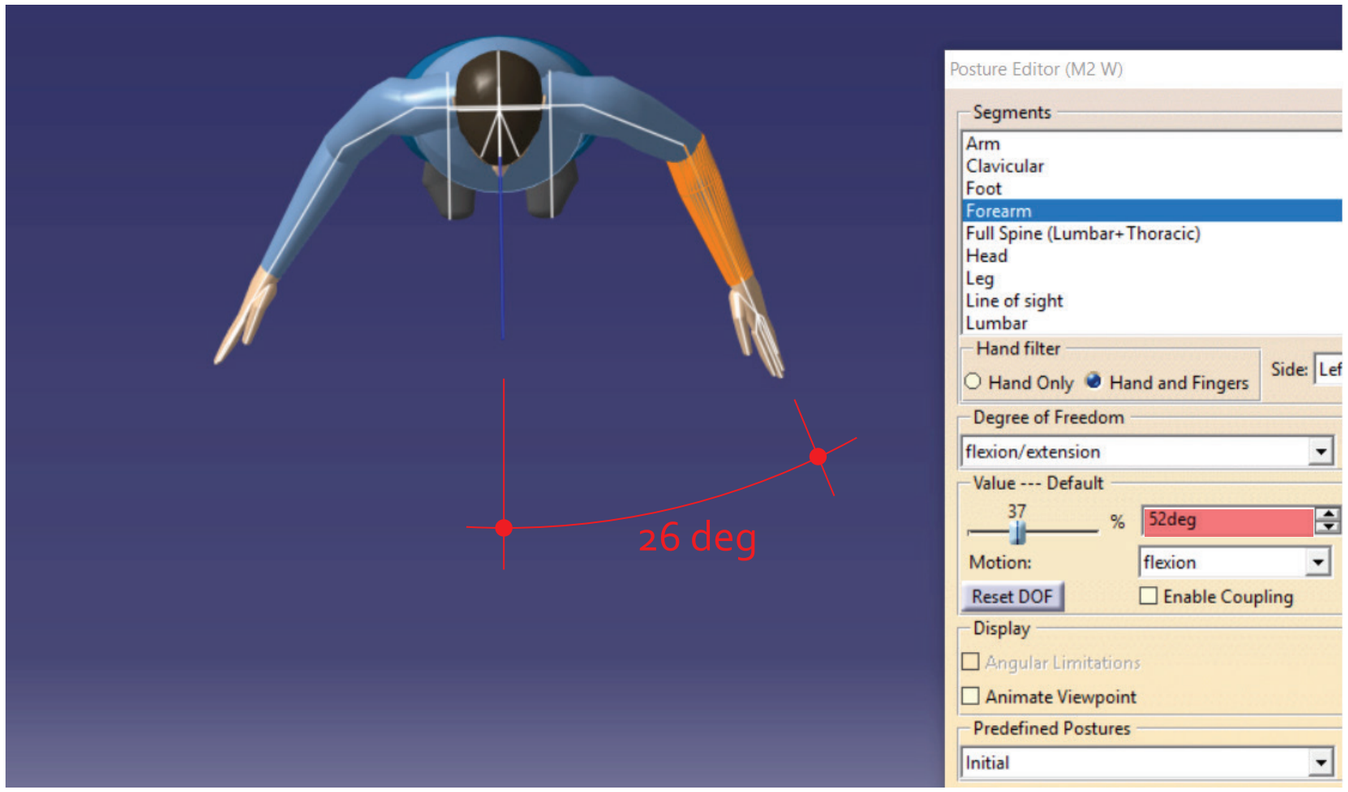
I set an angle for the posture of the forearm of 52 degrees, both for men and women, so as to maximize operational comfort.

This pre-evaluation involves parameters that should be further investigated. The defined arm comfort angles are not supported by any research on proper postures in relation to cooking activities. They also have to be validated in relationship to the carried loads, such as pans or baskets.

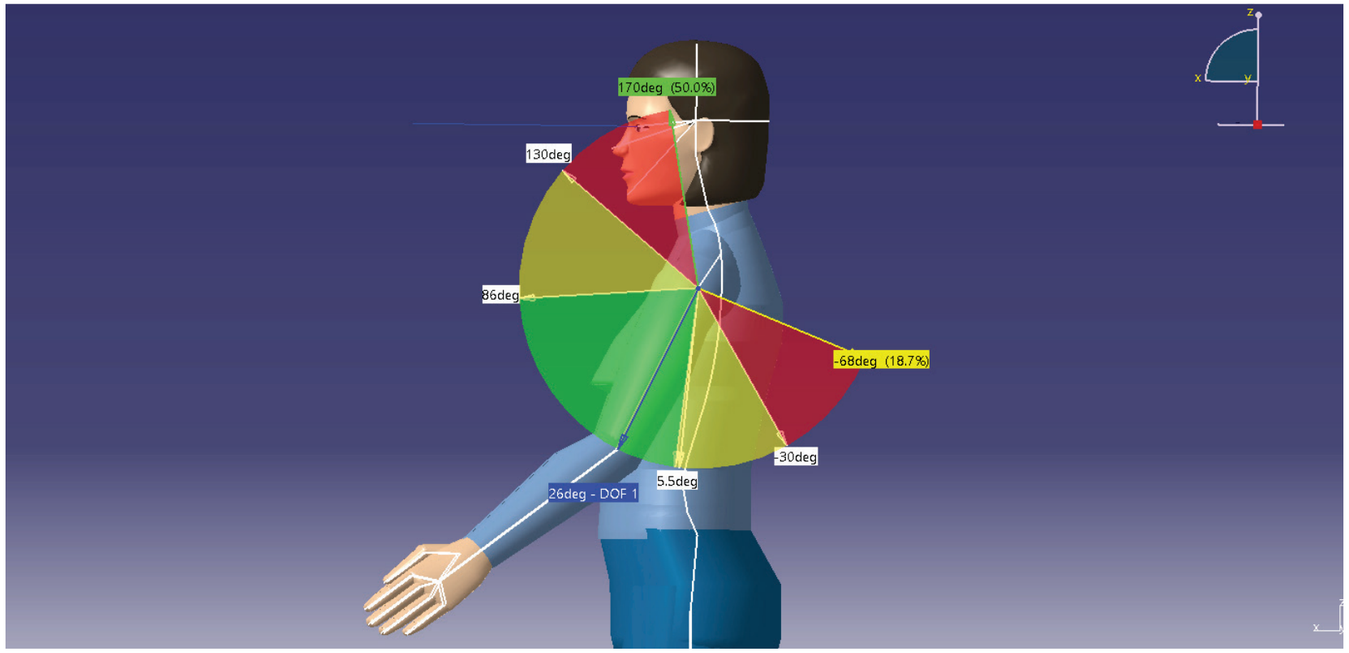


Arm Comfort Angles

- Not Acceptable (-68/-30 _ 130/170)
- Acceptable (-30/5.5 _ 36/130)
- Preferred (5.5/36)

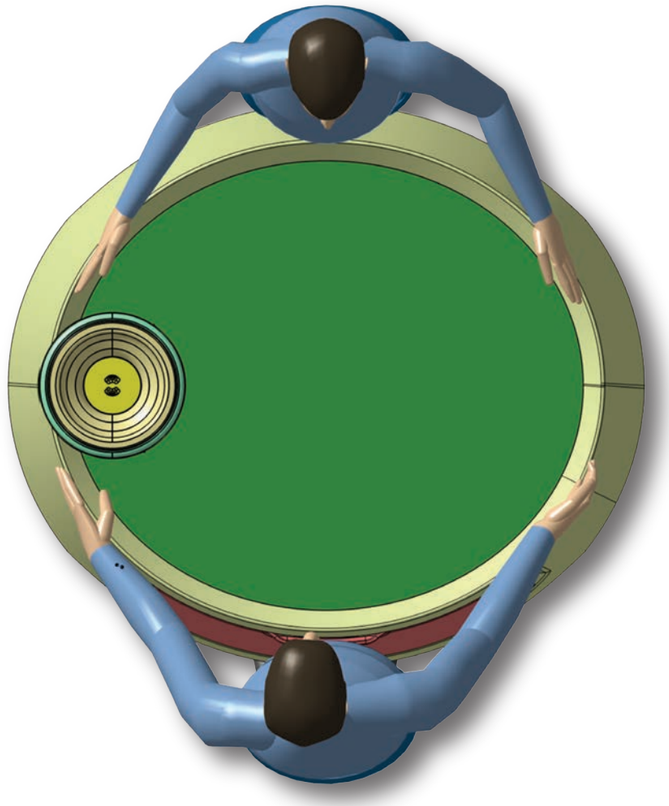


Female Manikin (Operator) - 50 Percentile Arm Angle Set-Up

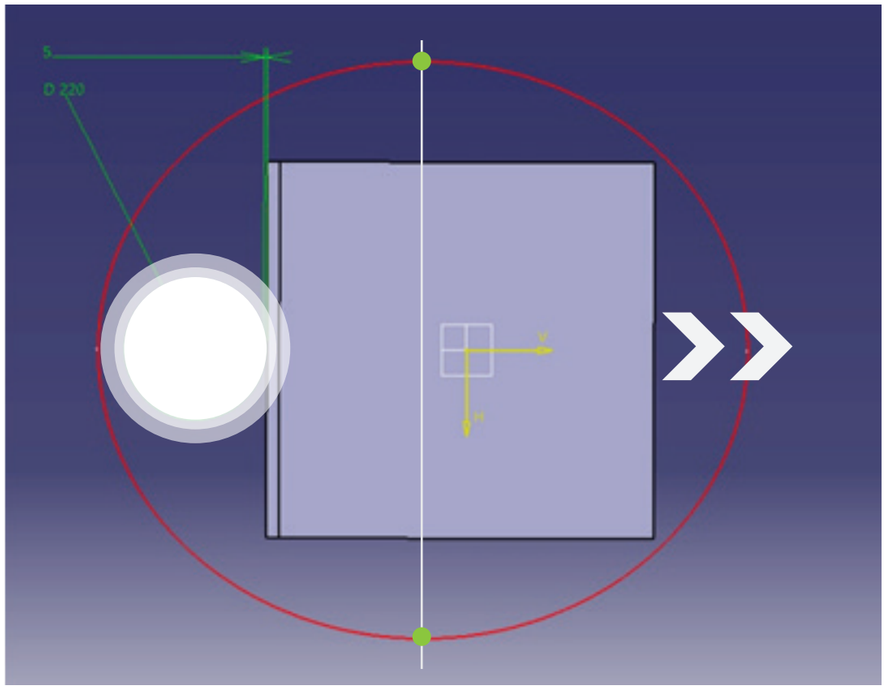


Female Manikin (Operator) - 50 Percentile Arm Angle Evaluation

The combination of all the instances led to the following layout:



The diameter of the boiler significantly affects the ergonomics of the basic unit, forcing the oven and the hob to move in an asymmetric range (of about 150 mm), compared to the axis of the ellipse. Moreover, it forces an increase in the main radius of the ellipse beyond the comfort zone of 52 degrees set for the forearms of the manikin.

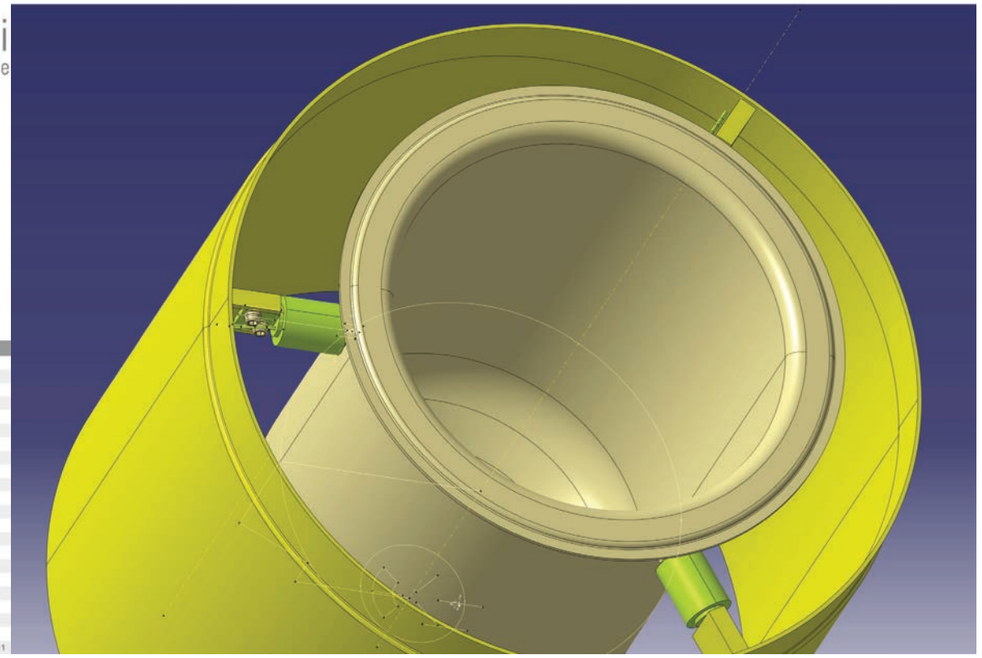


In order to prevent an excessive misalignment, the diameter of the boiler should be precautionarily constrained to less than 270 mm, but still be capable of holding 6 to 7 liters of water (serving 6 people).

For this reason, it has to be developed more accurately, verifying its feasibility and components' integration.
Its diameter, as mentioned, affects the ergonomics of the stove area. It is influenced by the dimensions of the weight sensor, arranged in a radial direction. In an early stage, I used the following load cells, which resulted in a boiler diameter of over 350 mm.

Pavone Sistemi
pesatura elettronica industriale

CARATTERISTICHE TECNICHE ALPHA	
Portata nominale (PN):	25, 50, 100, 150, 250, 500 N
Errore combinato:	< ±0.02% SN
Ripetibilità:	< ±0.01% SN
Creep (20 minuti):	±0.05% SN
Sovraccarico di sicurezza:	175% PN
Sovraccarico massimo:	300% PN
Alimentazione consigliata:	5÷12 Vcc/ca
Alimentazione massima:	20 Vcc/ca
Resistenza di ingresso:	350 ± 3.5 Ohm
Resistenza di uscita:	350 ± 3.5 Ohm
Resistenza di isolamento:	2000 M Ohm
Sensibilità nominale (SN):	3.0 mV/V
Bilanciamento di zero:	< ±2% SN
Temperatura di funzionamento:	-25 ÷ +80 °C
Temperatura compensata:	-15 ÷ +65 °C
Effetto della temperatura sullo zero:	< ±0.0014% SN/°C
Effetto della temperatura sull'uscita:	< ±0.0014% carico/°C
Flessione al massimo carico:	0.254 mm portata 25÷250 N; 0.432 mm portata 500 N
Grado di protezione:	IP67
Materiale:	Rame al berillio - Soffietto in ottone stagnato
Connessione elettrica:	Cavo schermato a 4 conduttori; lunghezza 1.5 m
Certificazioni:	OIML EN 45501: 1992 (25÷250 N), CSA C22.2, FM3611



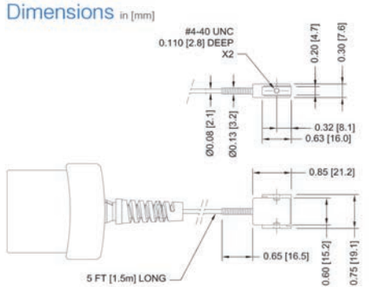
I solved this issue adopting different load cells with a squared and much compact section (20x20x7 mm), still arranged radially, with a placement of one each 120 degrees.

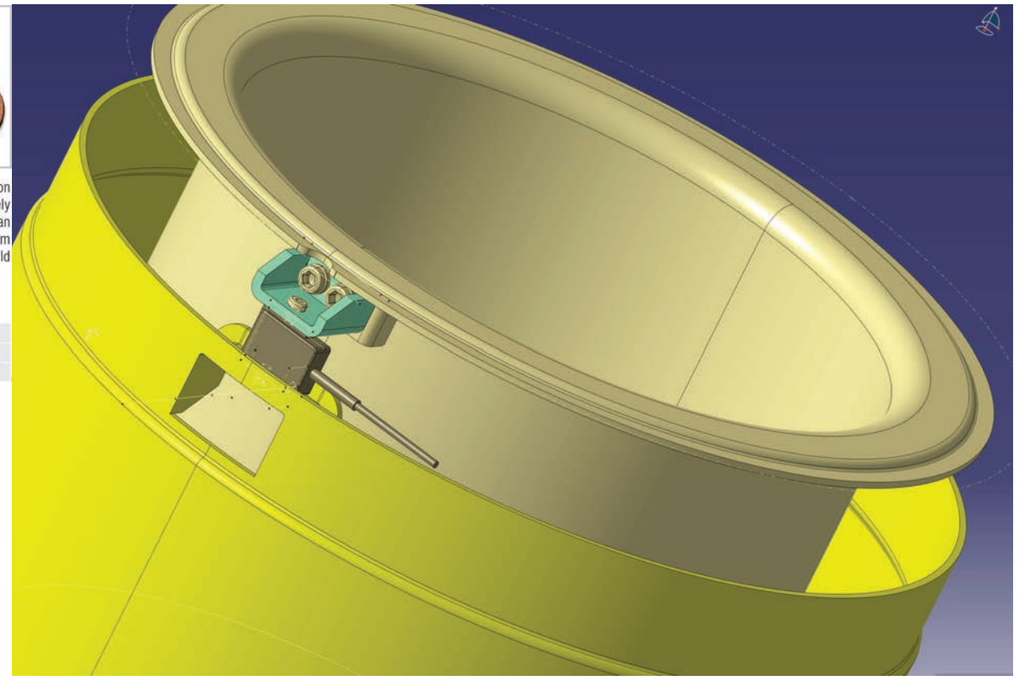
Series R04 smart sensors are designed for tension and compression measurement applications with tight space constraints. These extremely compact force sensors feature threaded holes on two sides, which can accept a variety of hooks and implements. Capacities available from 0.25 to 100 lbF [1 to 500 N]. Compatible with Mark-10 indicators (sold separately) through unique Plug & Test™ technology.

Specifications

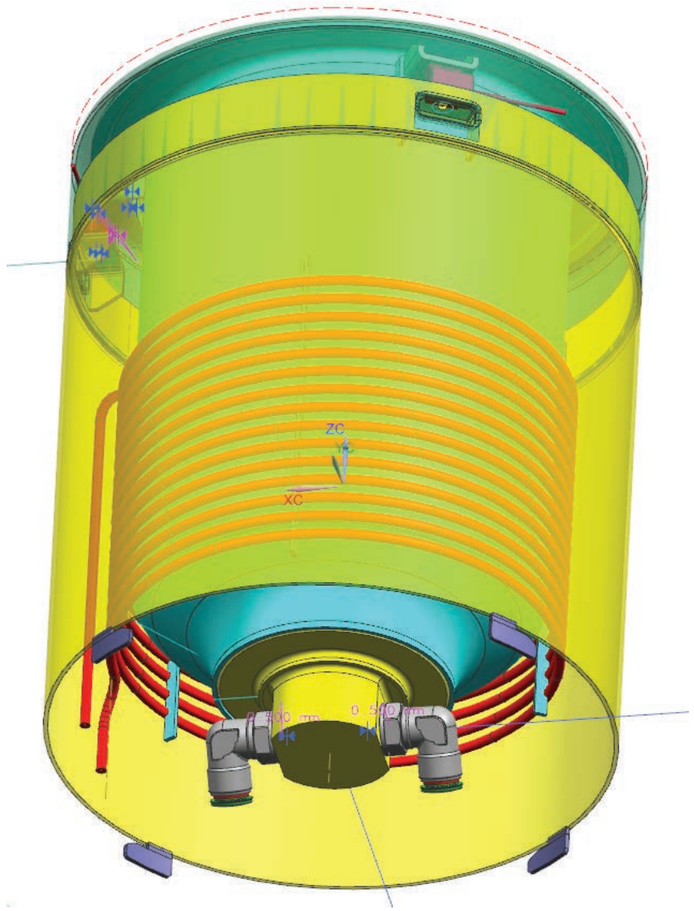
Accuracy:	±0.2% of full scale + indicator
Safe Overload:	200% of full scale
Weight:	0.015 lb [0.007 kg]

Dimensions in [mm]





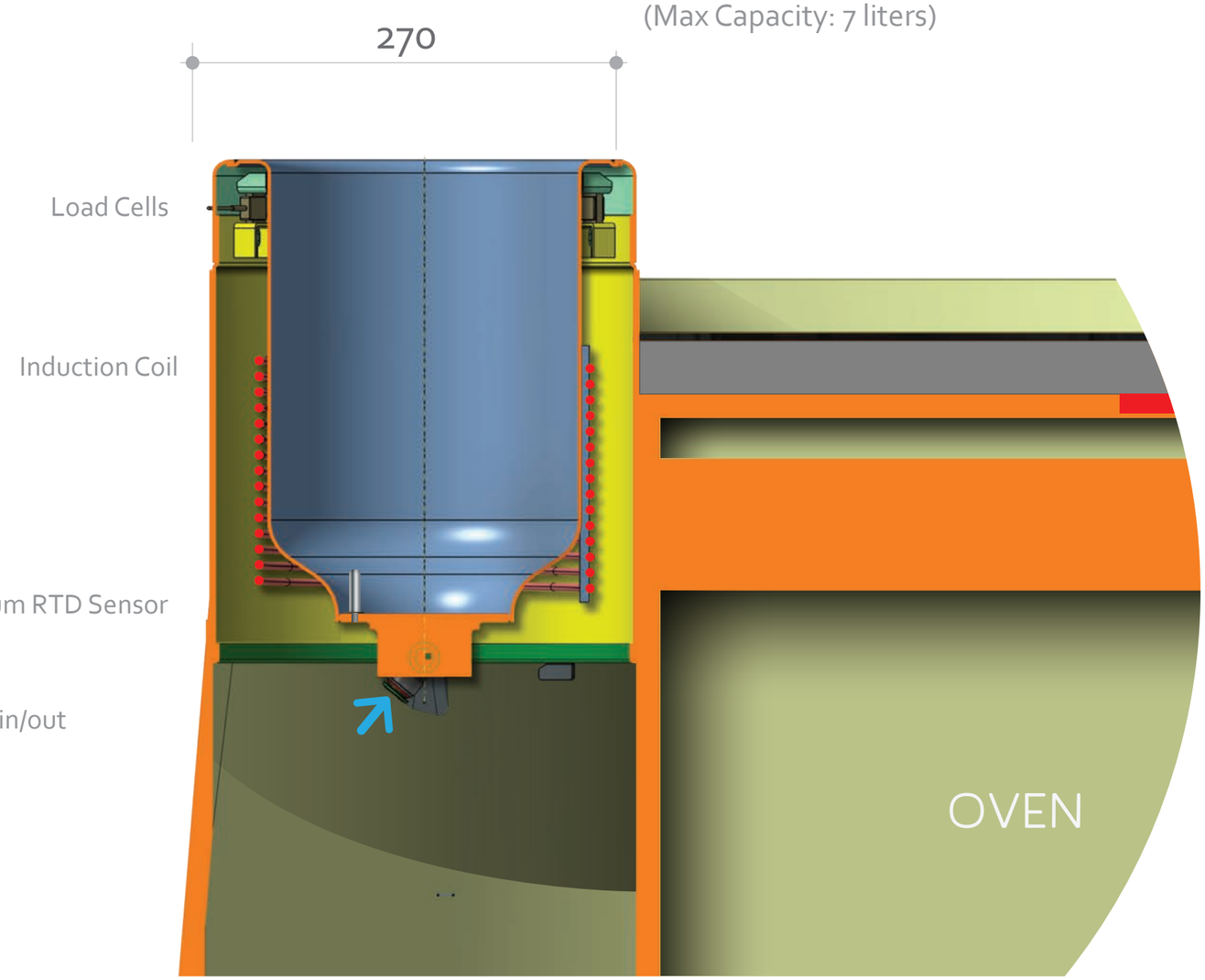
With this solution it was possible to keep the boiler external diameter around 270 mm, however leaving enough space to host the induction coil unit. Even though, it is necessary to modify the external shape of the stove, in order to get enough space to fix it to the main frame, keep room for the piping and a suitable distance to the oven unit.



INDUCTION COIL

BOILER

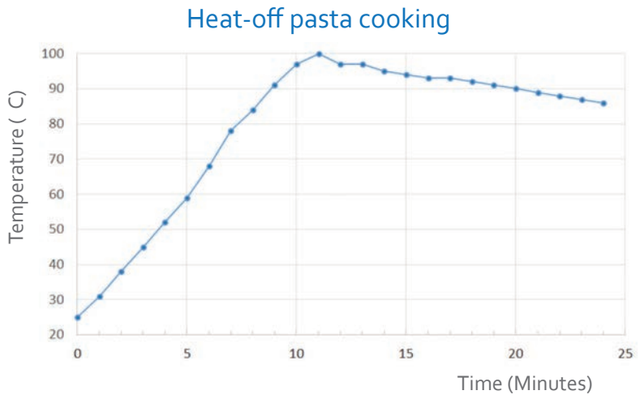
(Max Capacity: 7 liters)



The integrated boiler can perform different cooking functions, such as boiling, steaming, and slow- cooking techniques, including sous-vide (vacuum-sealing), braising, and stewing. Two baskets are provided. The water is automatically pumped into the boiler, per the selected recipe, which determines the quantity of ingredients via the number of dining companions. At the end of the cooking process, excess water is pumped out.
The possibility of using different cooking laws and criteria within the same appliance can optimize both time and energy.

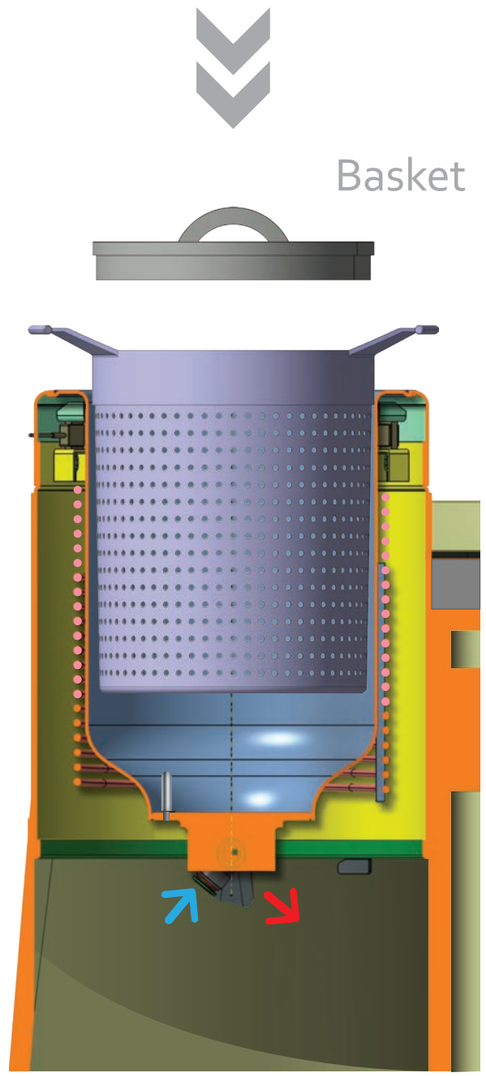
Maintaining water at a boil wastes energy: 'All the fuel used to let the water boil vigorously is wasted. It is from the heat—through intensity and duration—that the food is cooked and not from the boiling of the water' (Thompson 1799).

The cooking of pasta has been used as case study. To cook pasta, the chemical processes depend on three factors: the speed of penetration of the water inside the dough, the gelatinization of the starch, and the denaturation of gluten, with the consequent coagulation (Sicignano et al. 2015). All these phenomena are related to the temperature: as the temperature increases, the water enters the dough faster. Starch gelatinization is the process in which the starch granules absorb water and form a gel. Normally, wheat starch gelatinizes between 60°C and 70°C. The gluten denatures and coagulates between 70°C and 80°C. Accordingly (Fig.1), the pasta can cook by keeping the water at 80°C, it just takes a bit longer since the water will moisturize the dough a little slower (Bressanini 2018).



Heat-off pasta cooking process (Bressanini. 2018)

This opens to the possibility of appliances with an incorporated know-how. Cooking laws parameters (such as time and temperature), can be customized upon expert users needs and taste.



BOILER

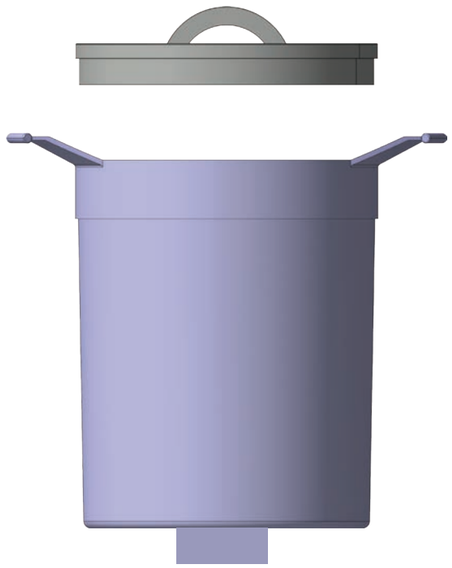
Water - In (Cold)

Water - Out (Hot)

Type A

Boiling
Steaming

Pasta
Rice
Vegetables
.....



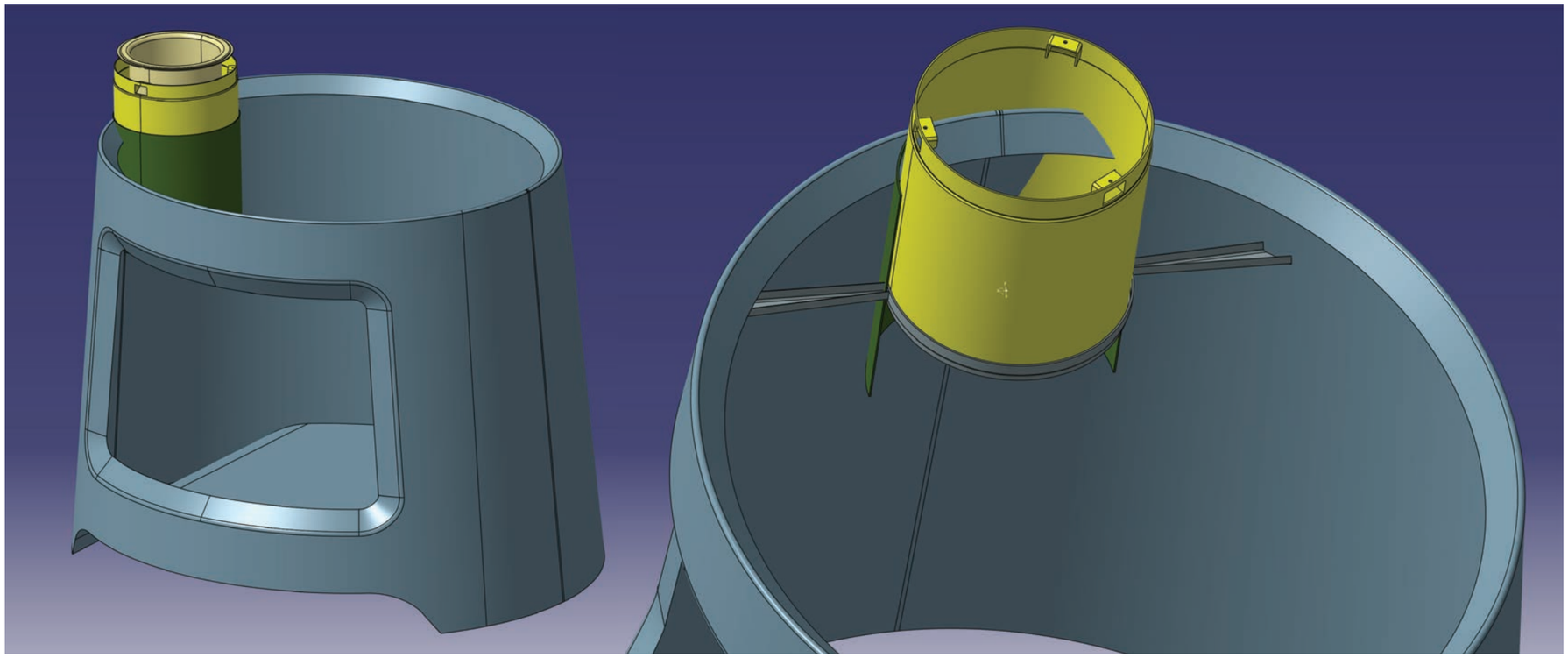
Type B

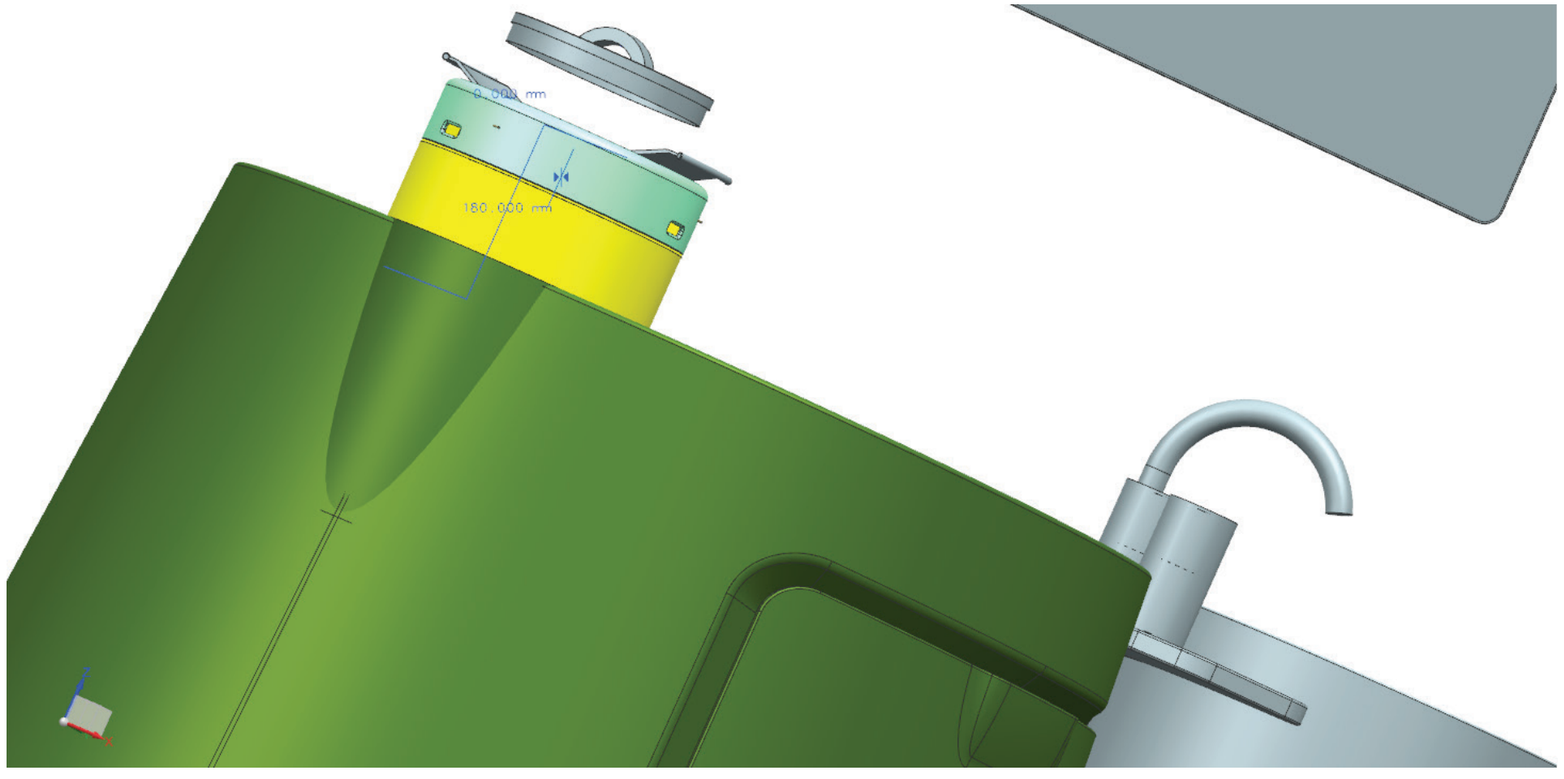
Slow
Long Cooking

Soups
SousoVide
Braising
Stewing

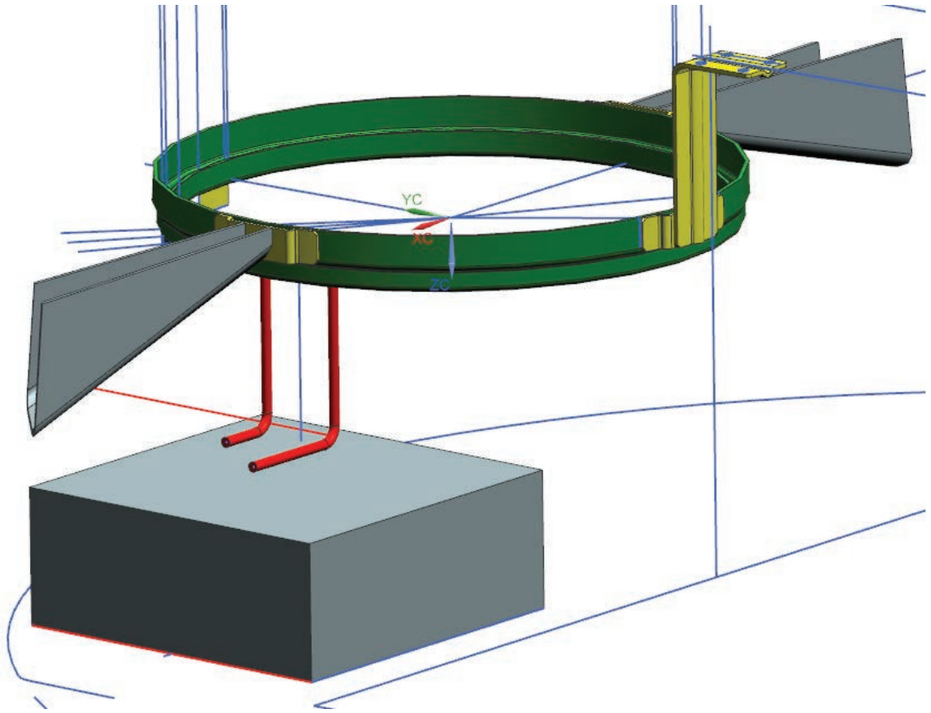
Boiler Position in the stove unit

The elliptical body of the stove unit has been affected by the boiler position. In order to reduce the resulting misalignment of the oven, the cylindrical boiler unit has been shifted to the left. This resulted in a slight but acceptable protrusion in the body of the stove unit.

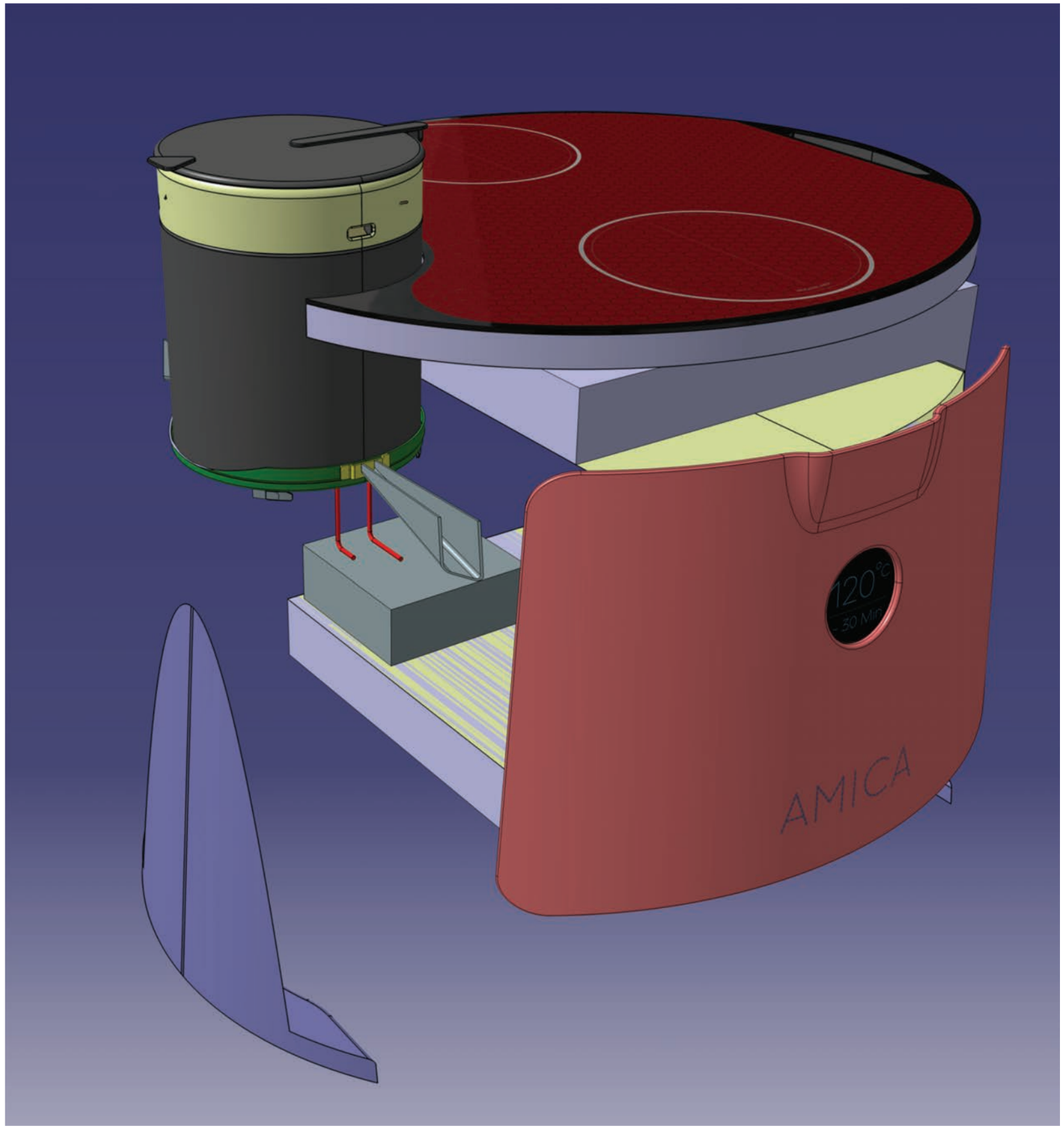


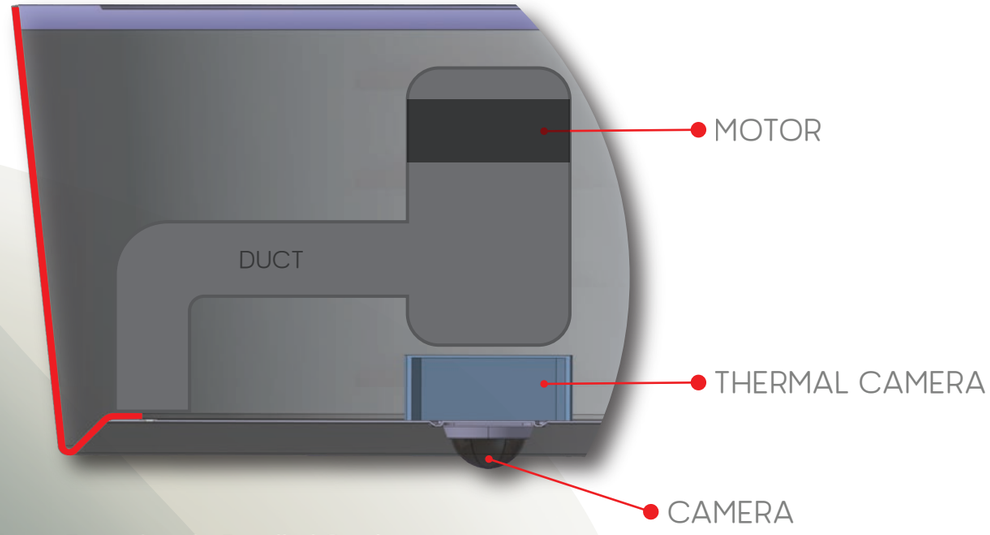


Final Appliance Layout

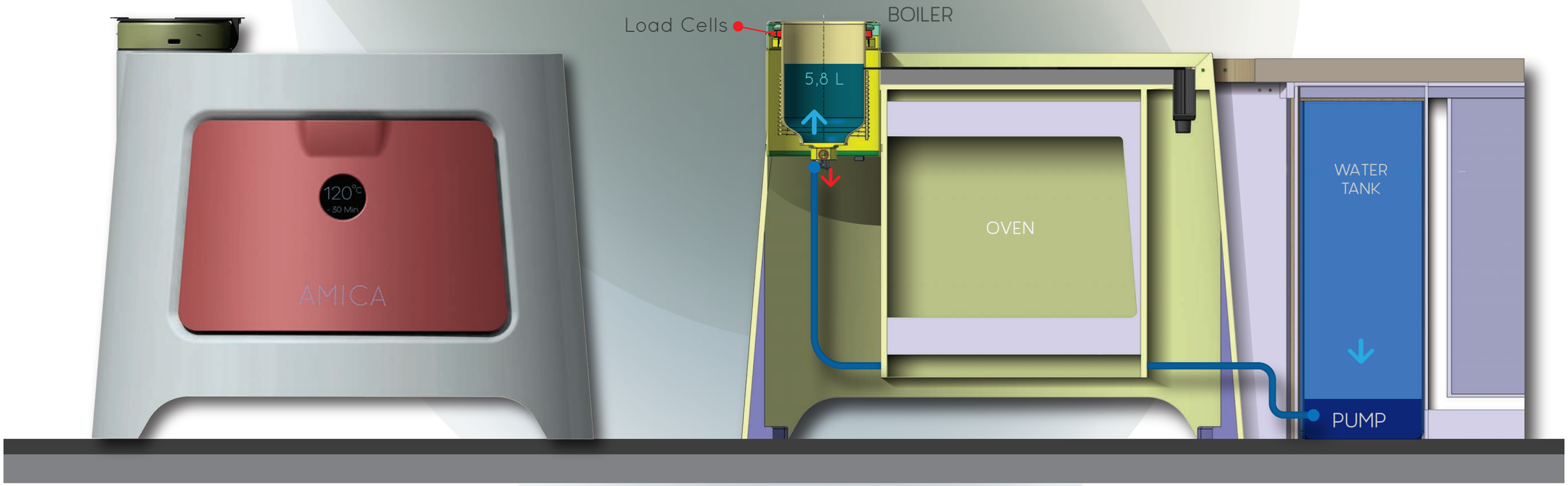


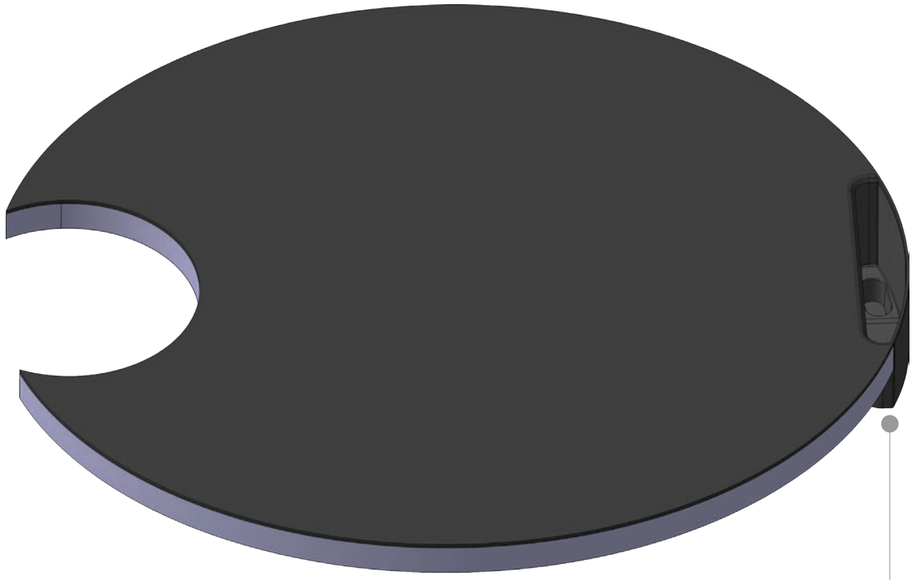
Boiler Support Crown and Fixings





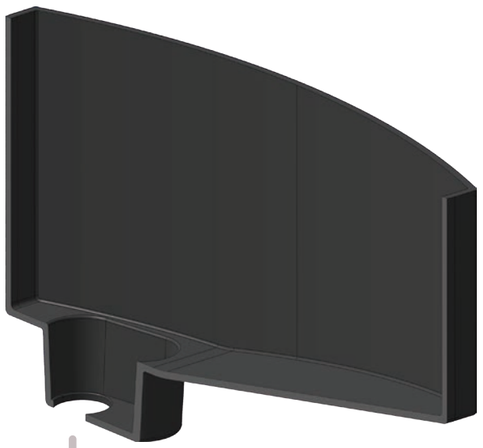
Rangehood - Detailed Section





Built-In Hob Element

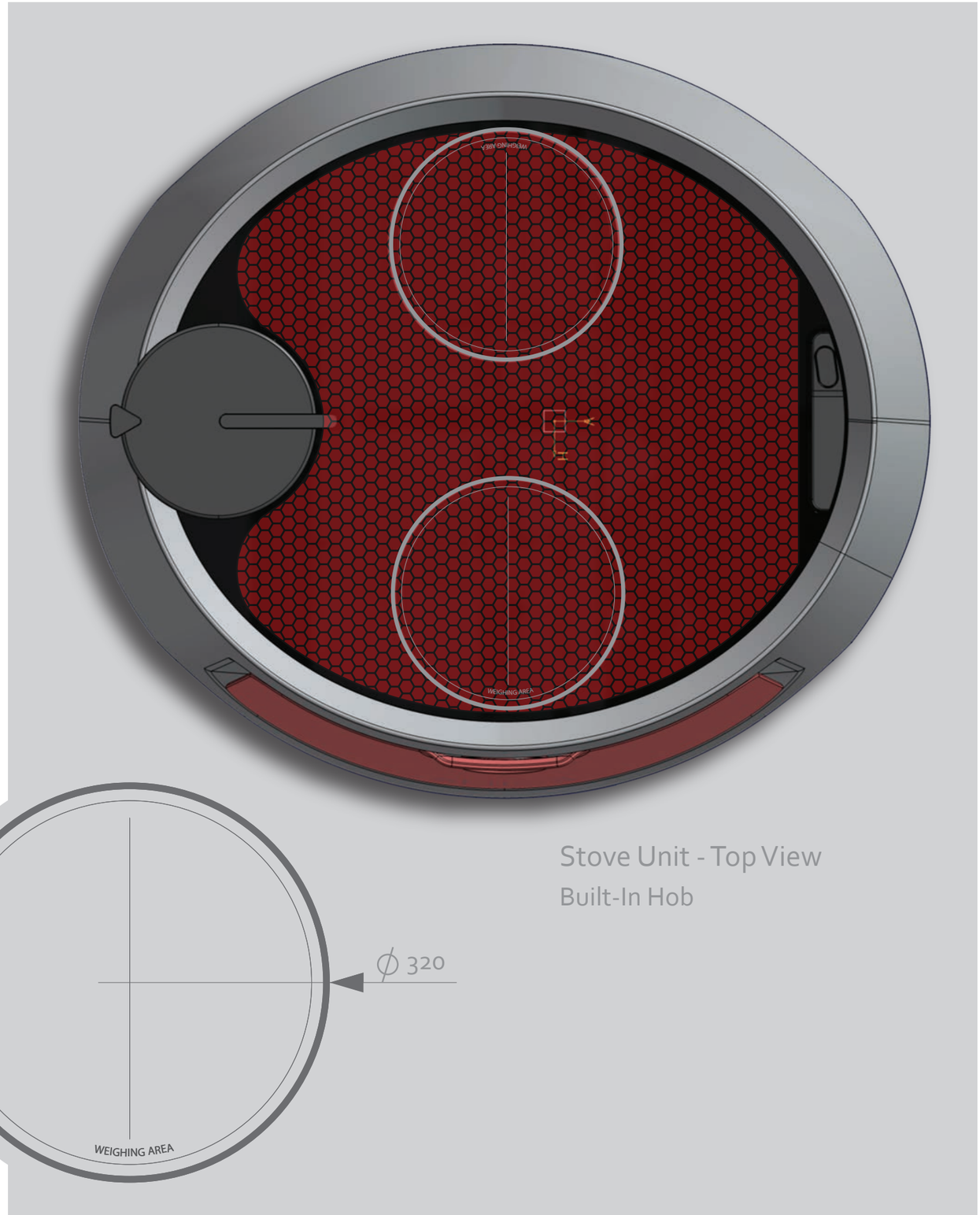
A ceramic glass surface



Drain

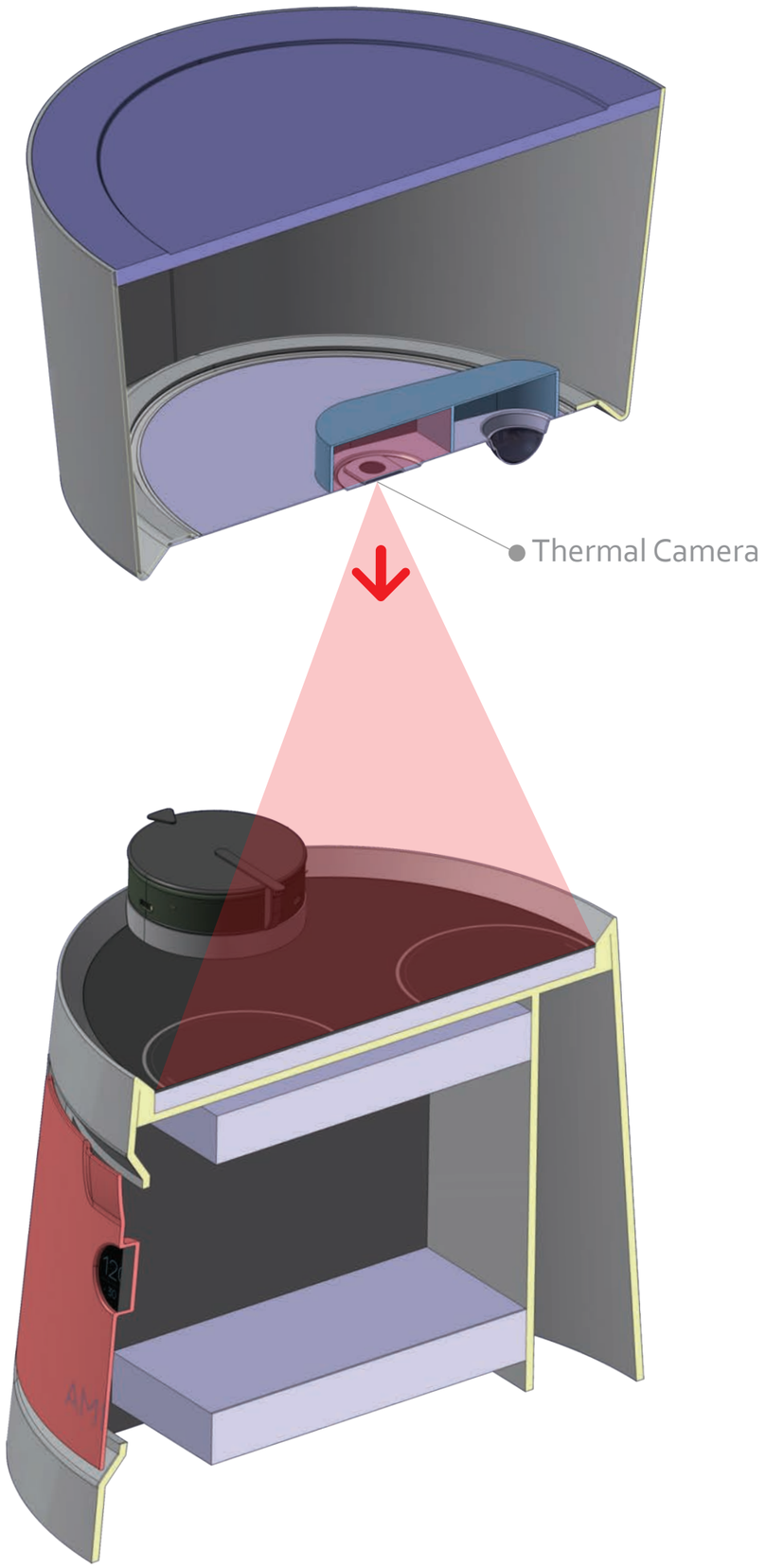
Water Collector Tank

Water collection during cleaning.



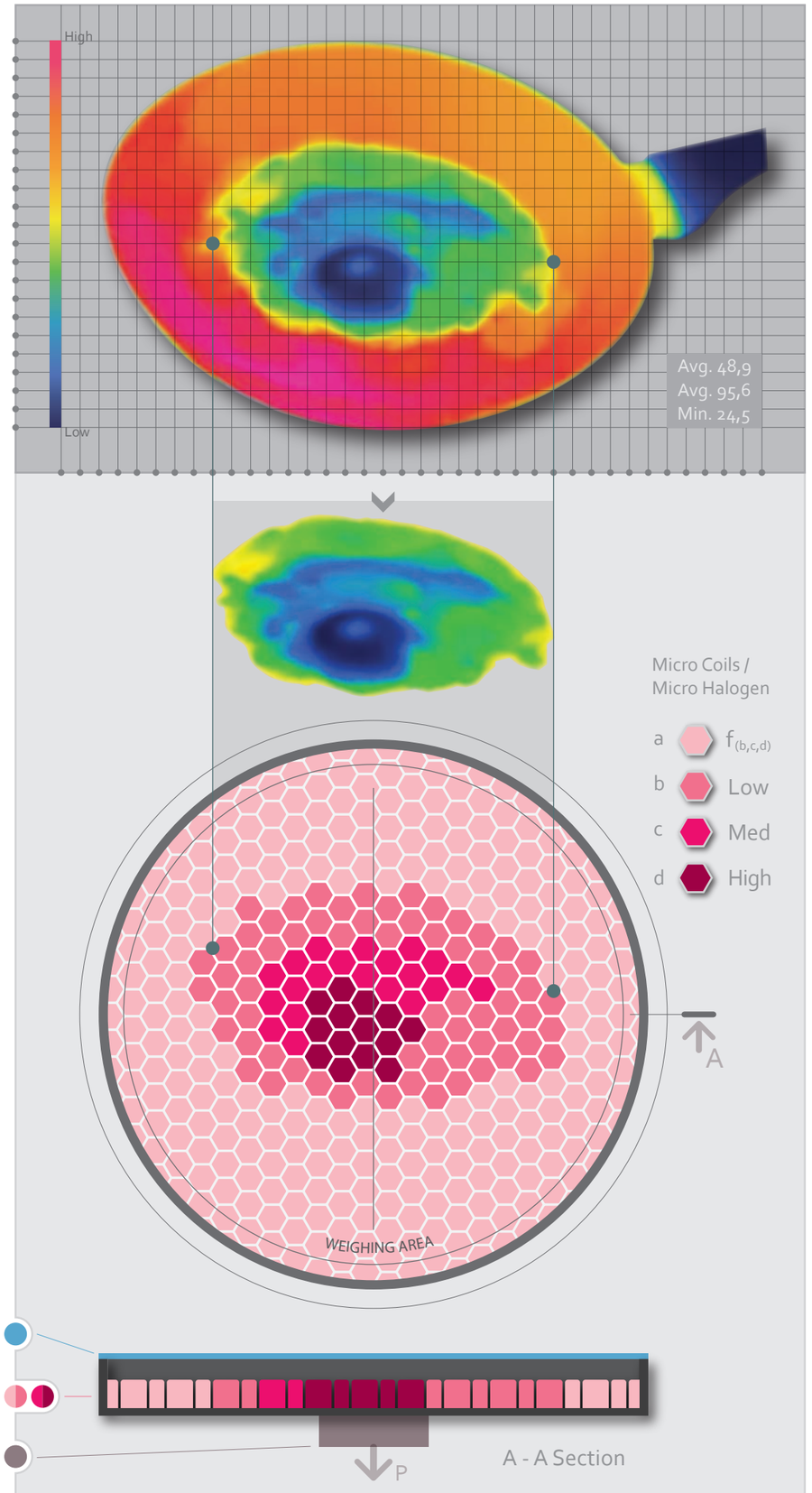
Stove Unit - Top View

Built-In Hob



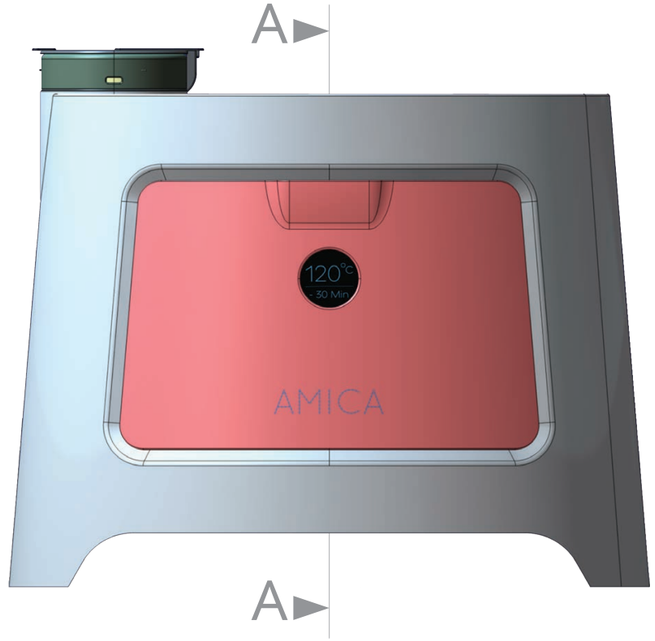
Precision Heating

Egg Thermography (Source: FLIR)

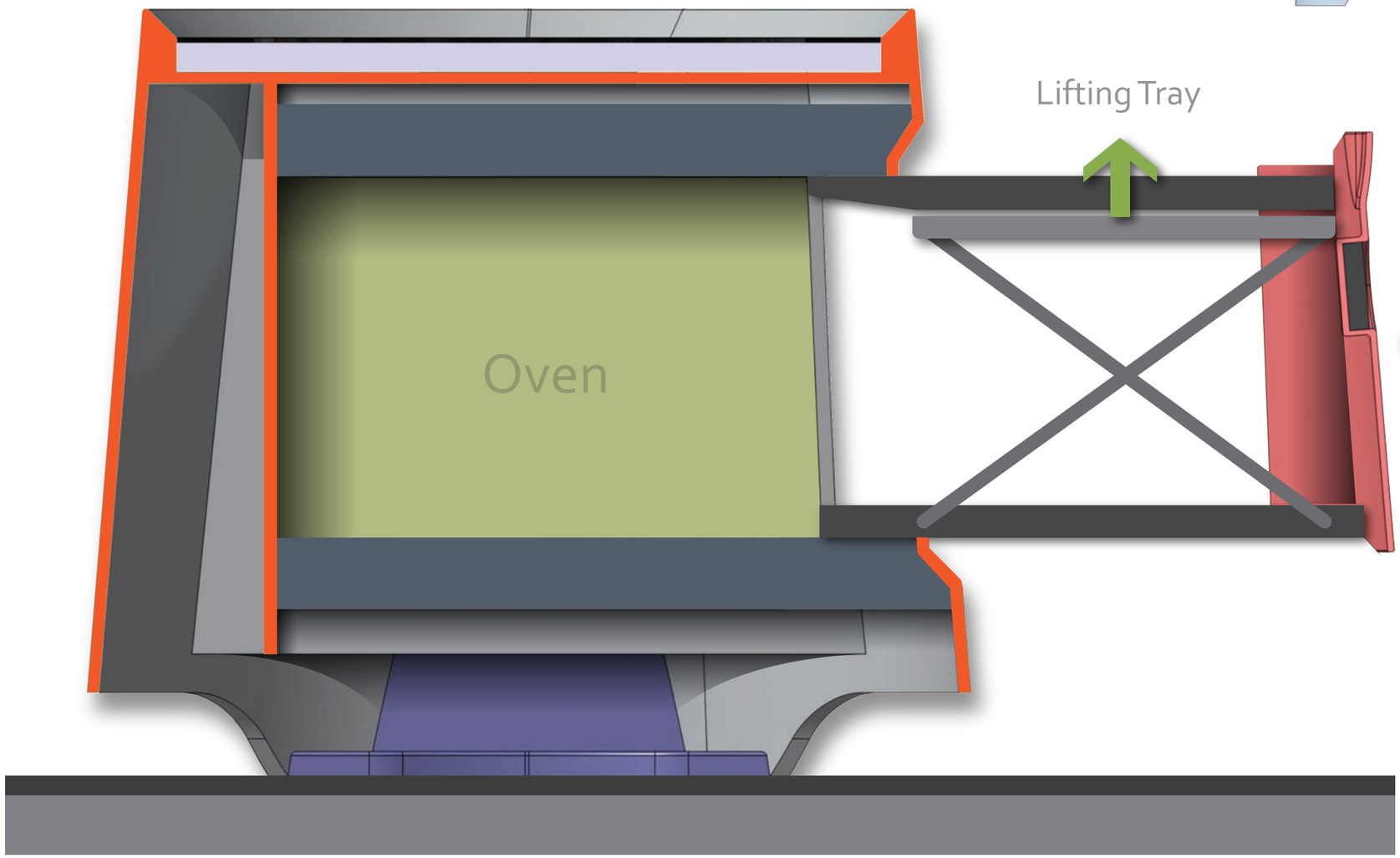


Stove Unit - Oven

Sliding Carriage Drawer



A-A Section

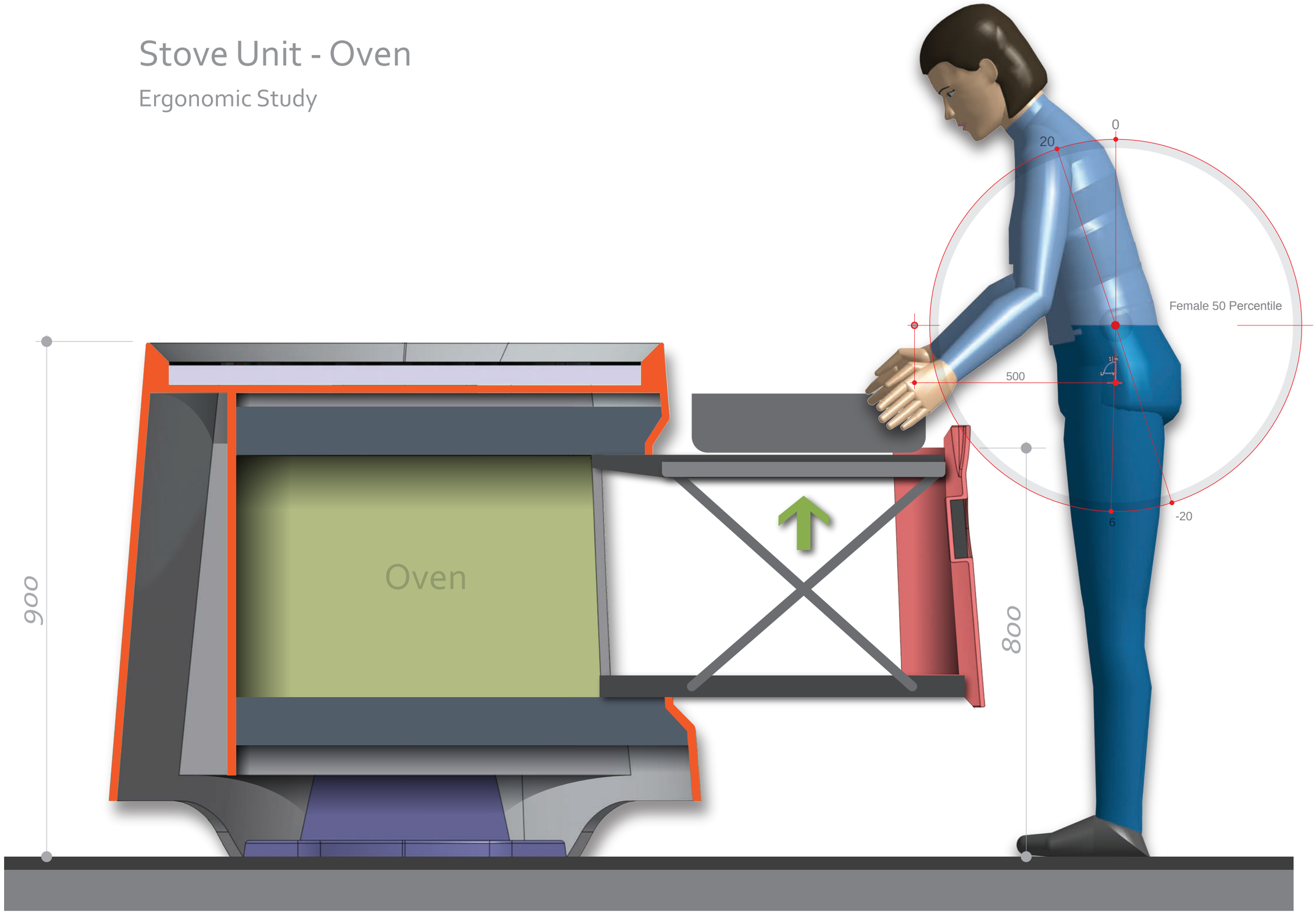


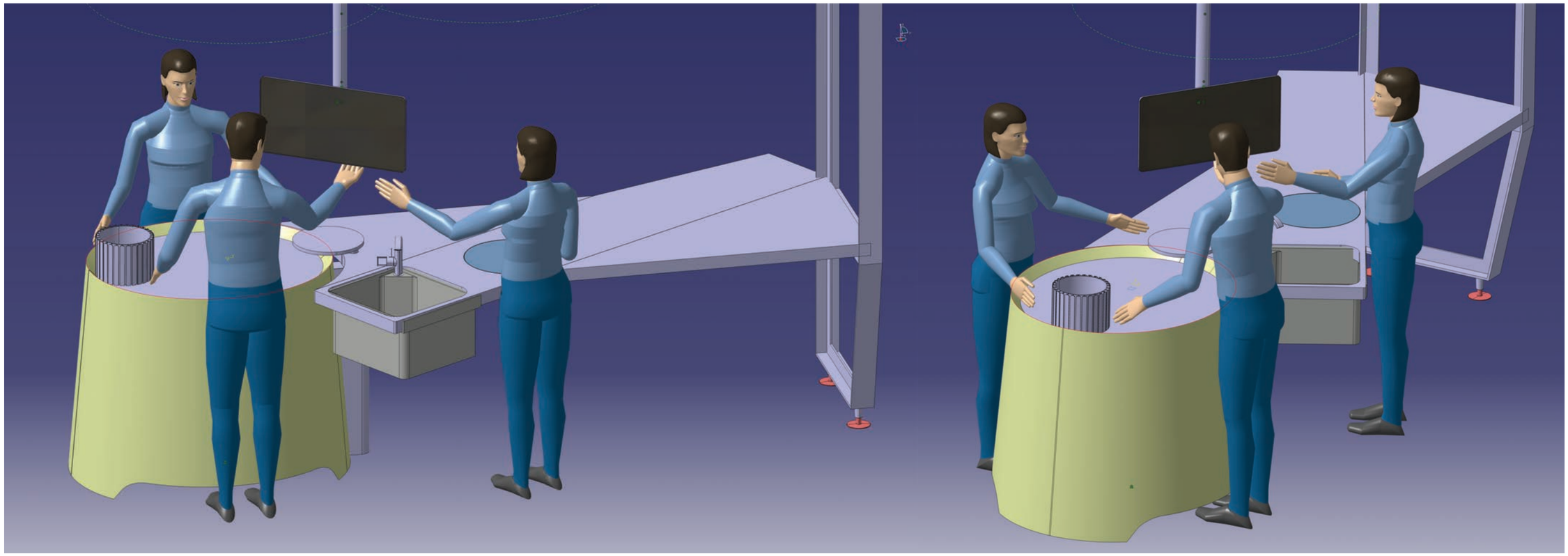
Runner-Mounted Drawer

Double (full) extension runners allow the drawer to be pulled fully out of the oven.

Stove Unit - Oven

Ergonomic Study

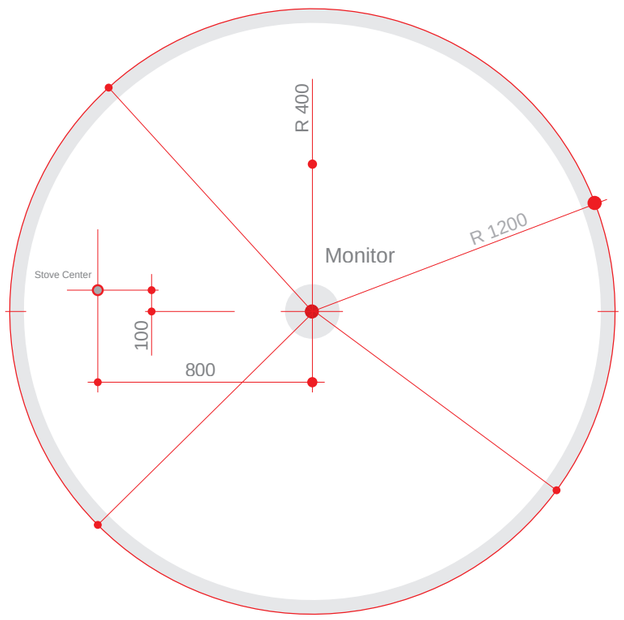


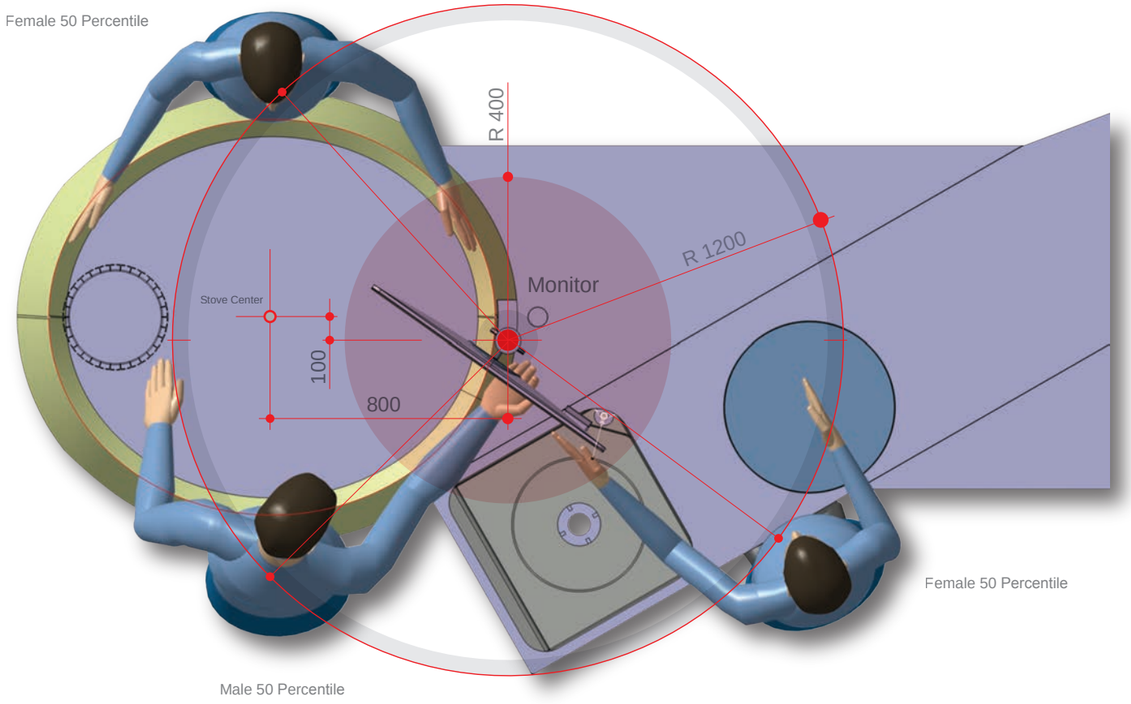


Monitor and Sink

The same ergonomic process was used to define the position of the monitor, which needs be reachable from the main working areas of the station. To verify its correct position, I set the manikins with a chest/arm angle of 48 degrees. The sink was placed within the same area.

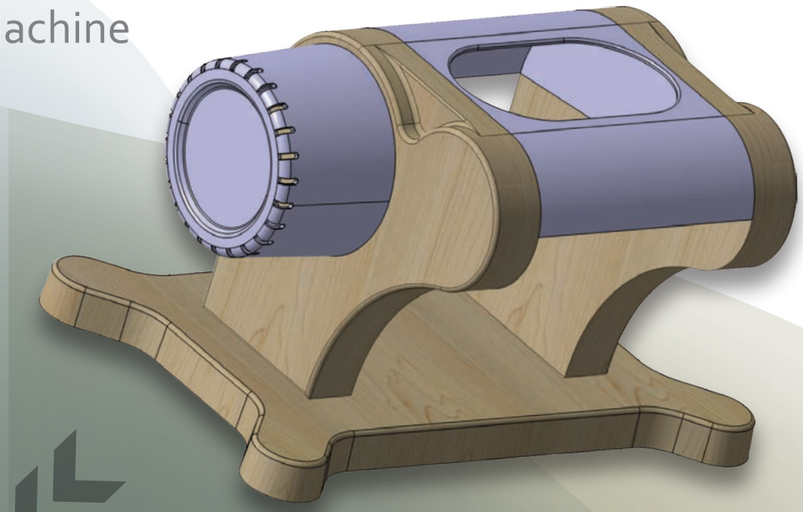
Dimensional Model





Appliances

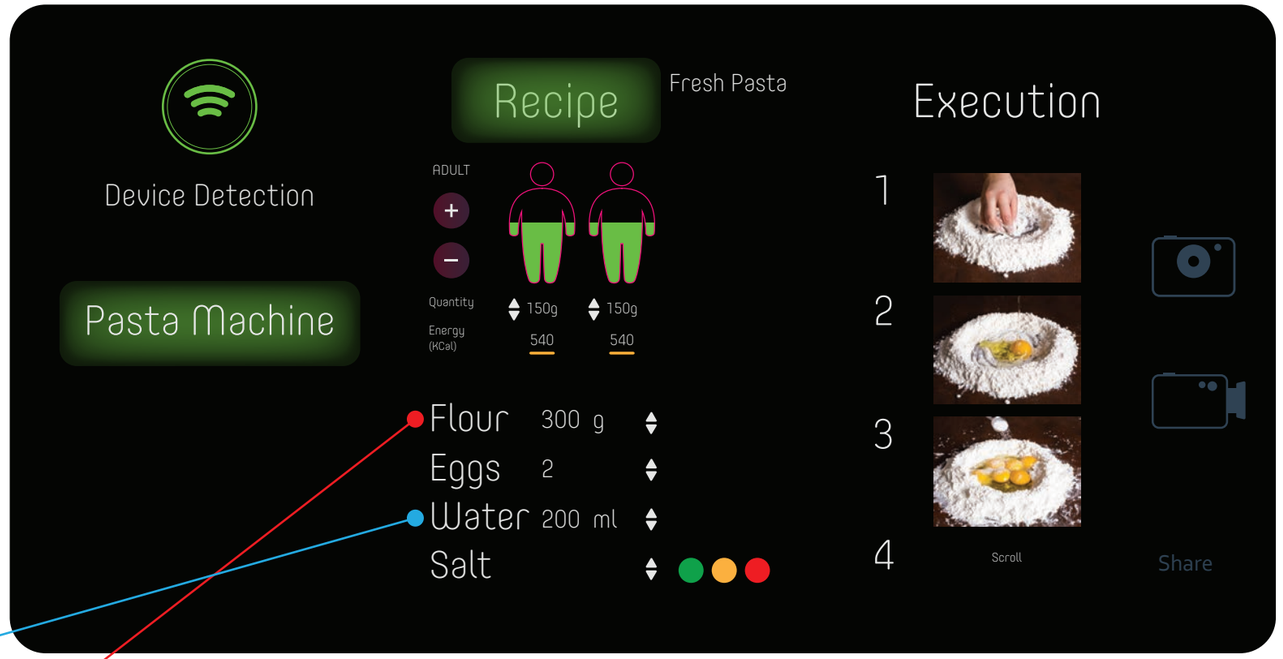
Pasta Machine

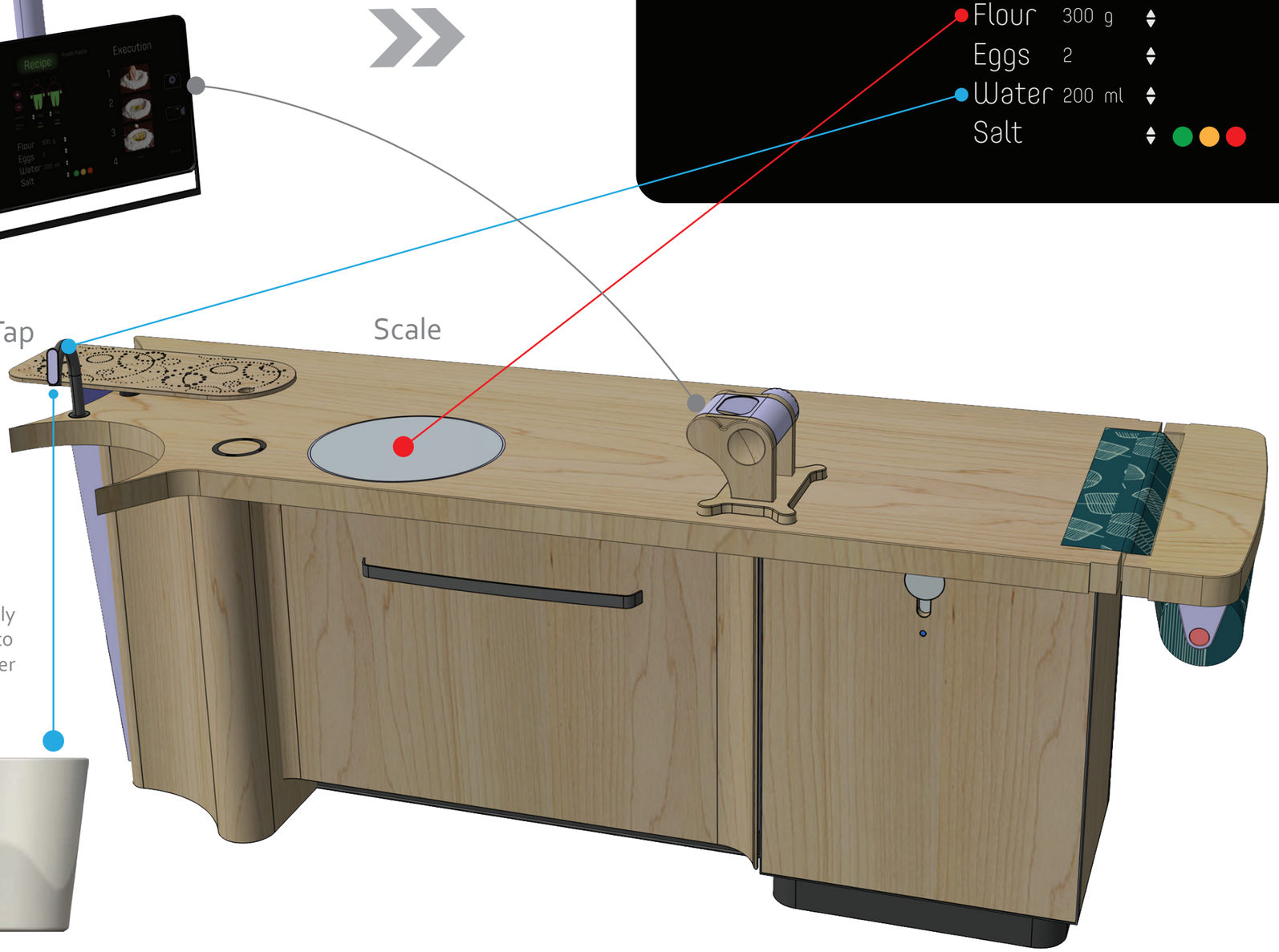


Preparation Table

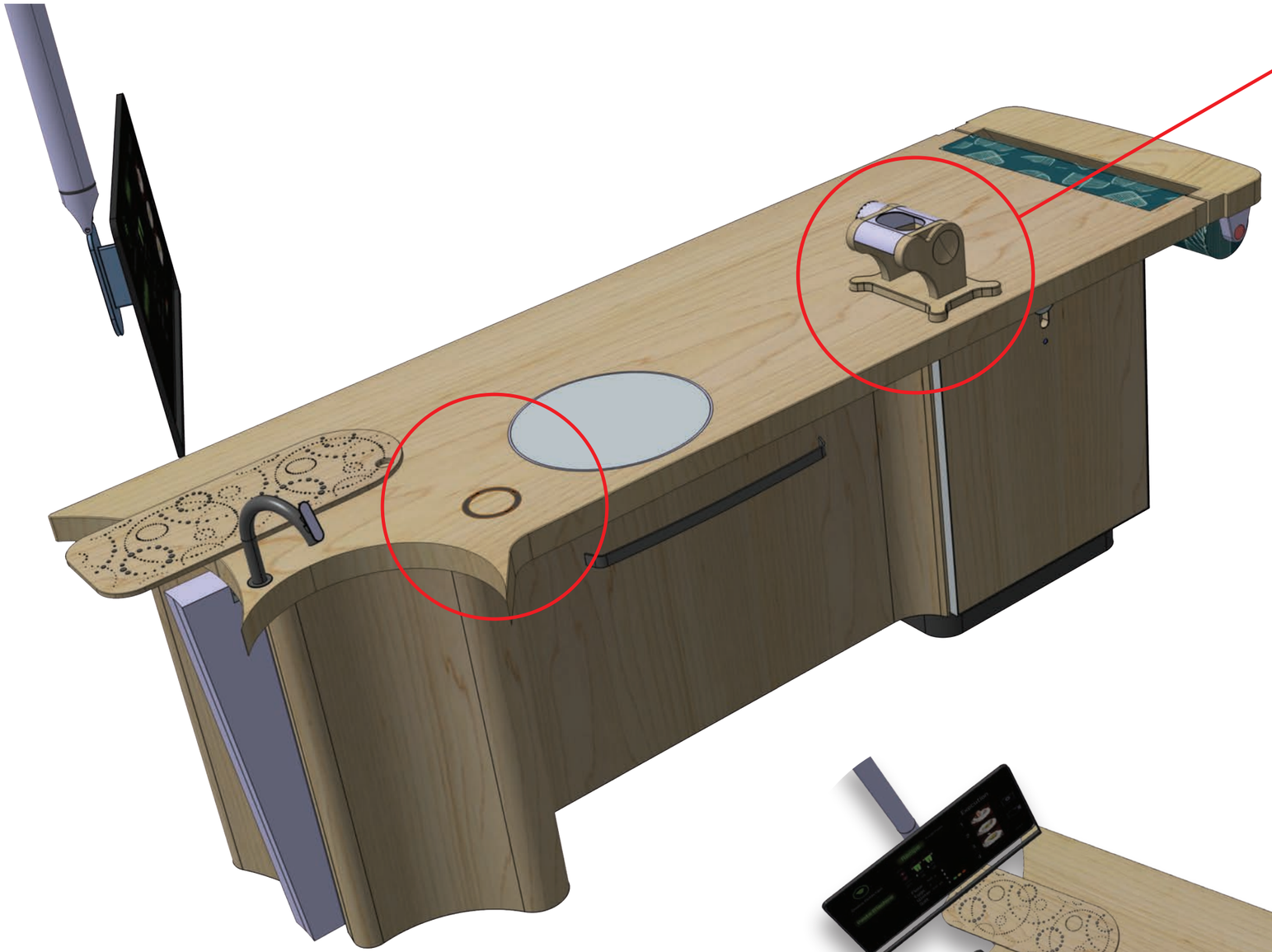
Recessed Slot

Plugging the appliances into the counter's slots will automatically activate the monitor. For instance, inserting the pasta maker means that the user wants to make fresh pasta. Optional settings, recipes and the execution will be displayed on the touch screen, allowing users to interact with the system that will guide them to successful completion of the task.





Water is automatically dispensed according to the recipe or user setting.



- Pasta Machine
- Vegetable Slicer/Dicer
- Toaster
- Mixer
- Blender
- Whisk
- Coffee Machine
- Cheese Grater/Shaver

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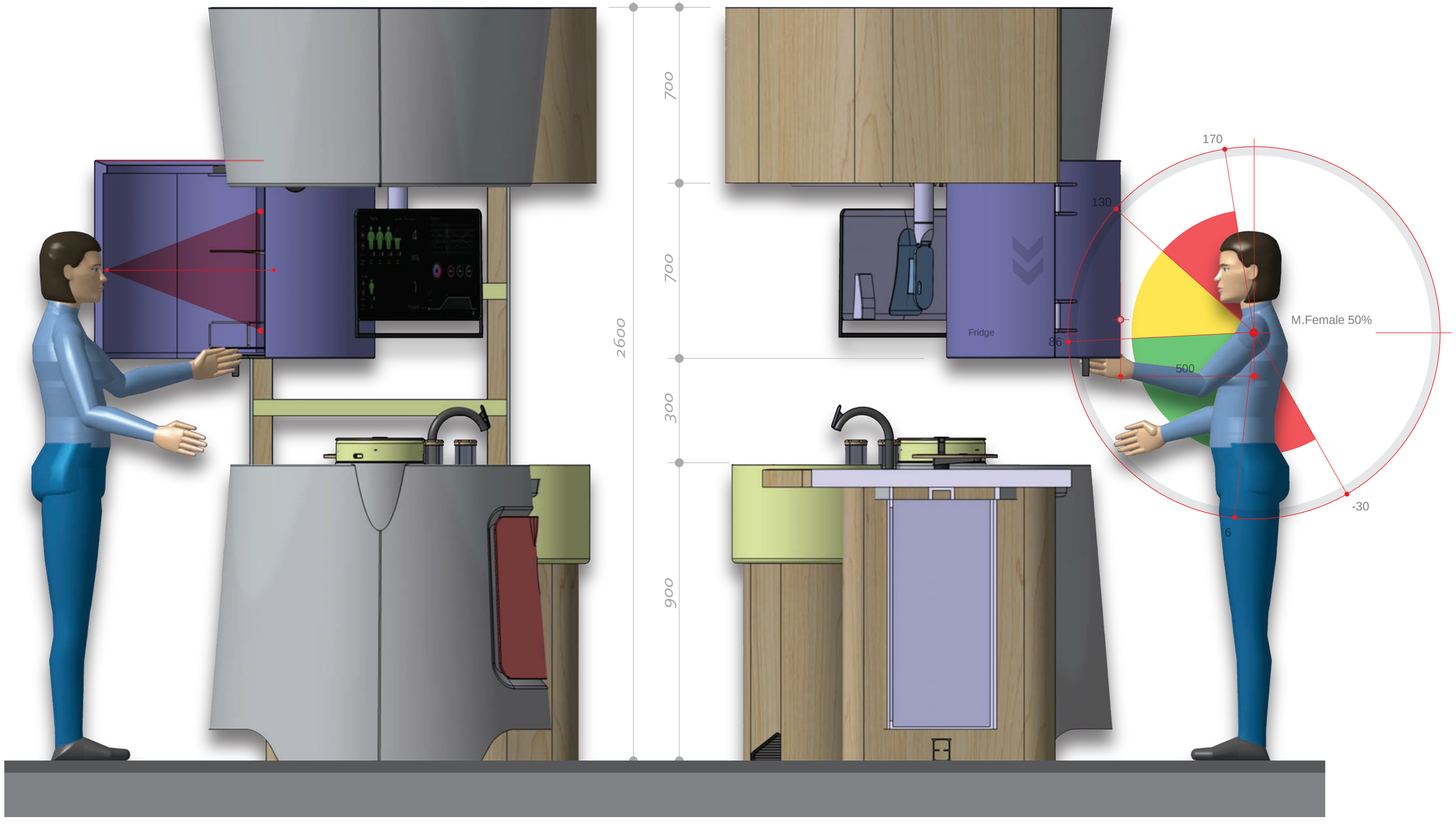
Appliance Ecosystem

Plug & Play

Suspended Fridge

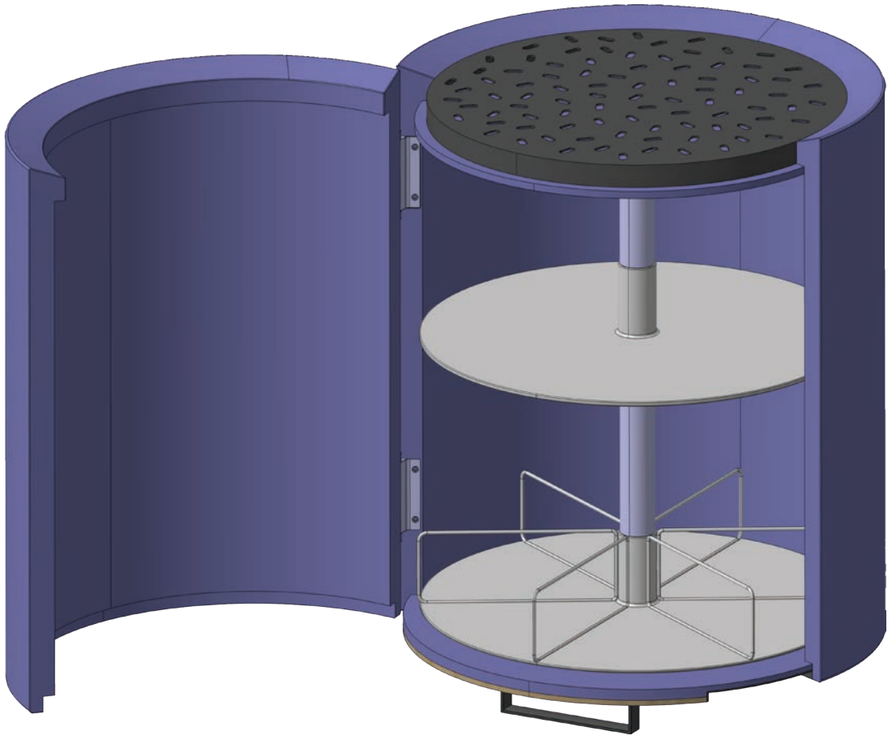
The fridge has adjustable height for individual users.

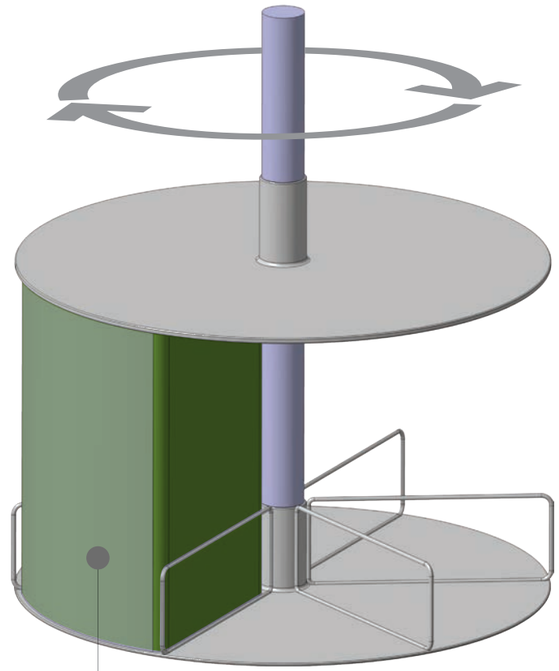
Type A Station - Rear View



Ergonomic Study

Type A Station - Side View

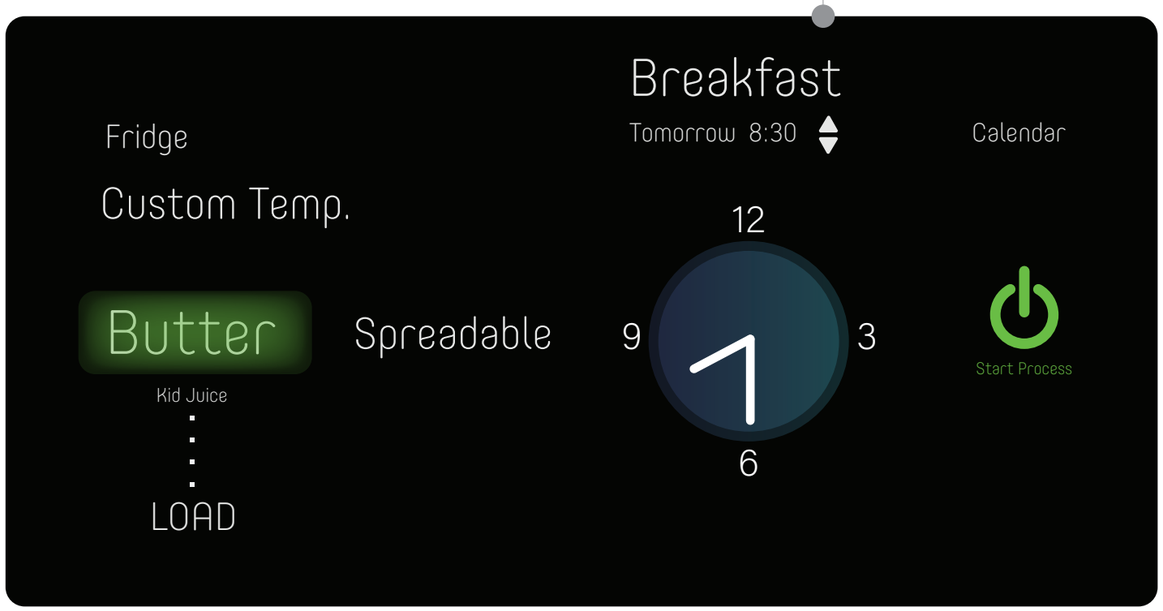




Custom Temp. Chamber

Suspended Extendable Fridge

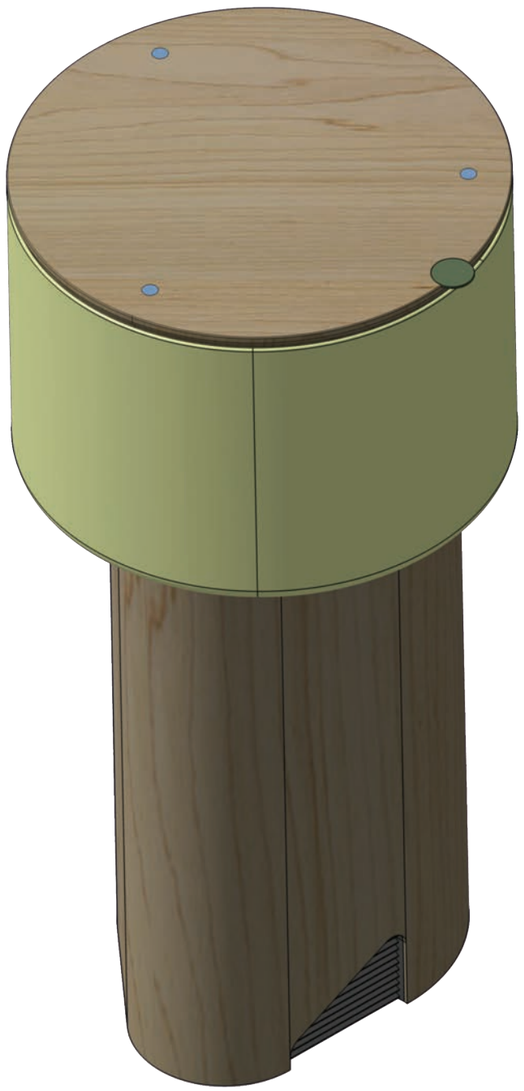
The unit has a remote compressor and revolving trays.

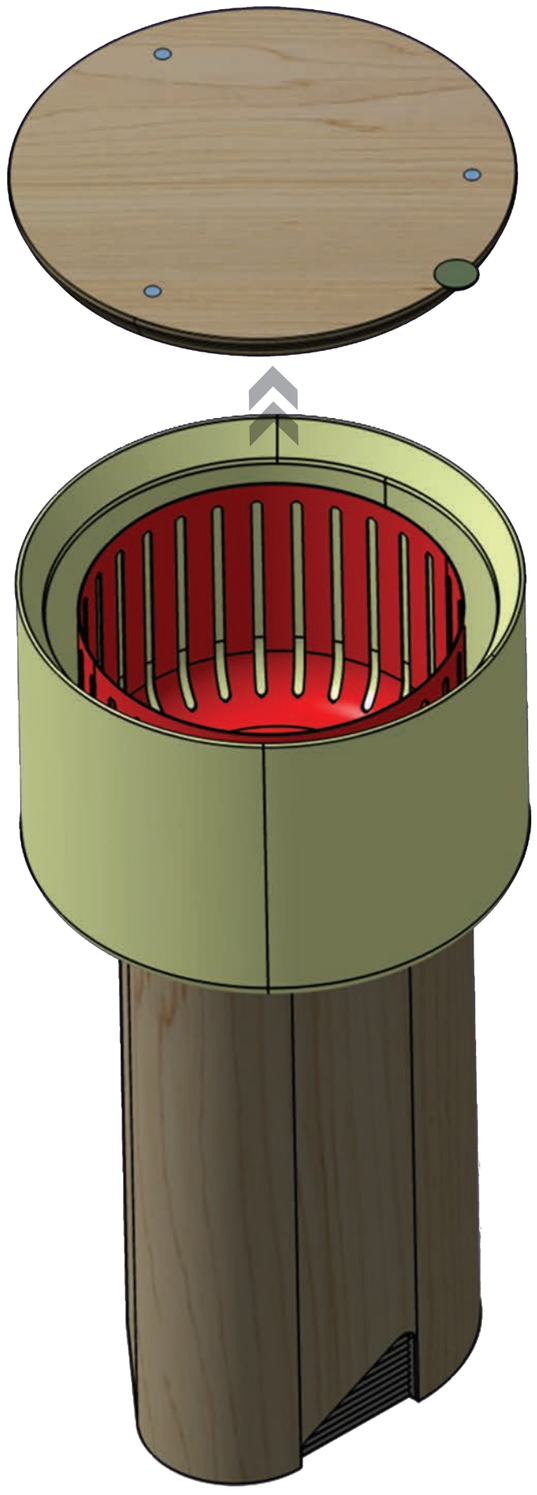


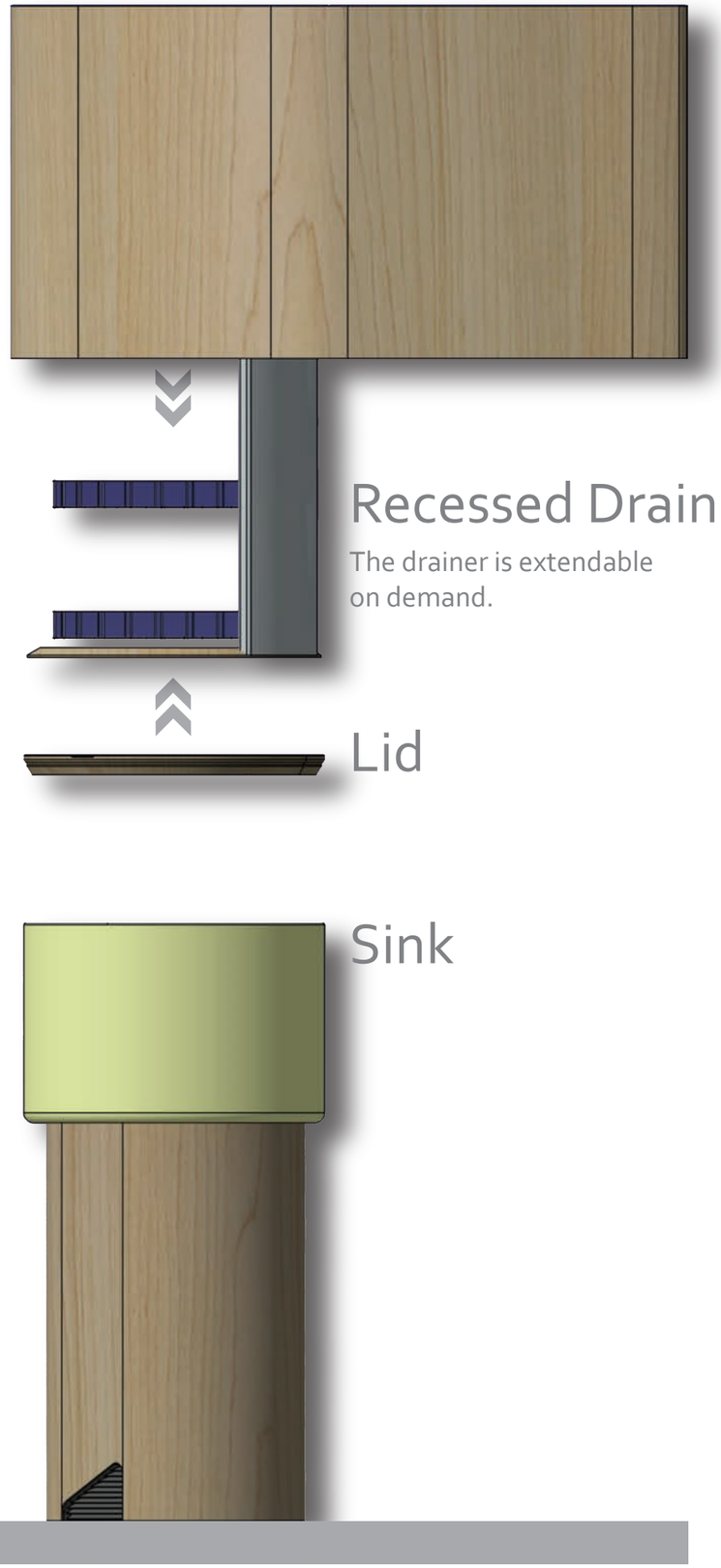
Multi-Function Sink

Includes a water basin and vegetable/fruit washer and spinner.

Lid/Chopping Board





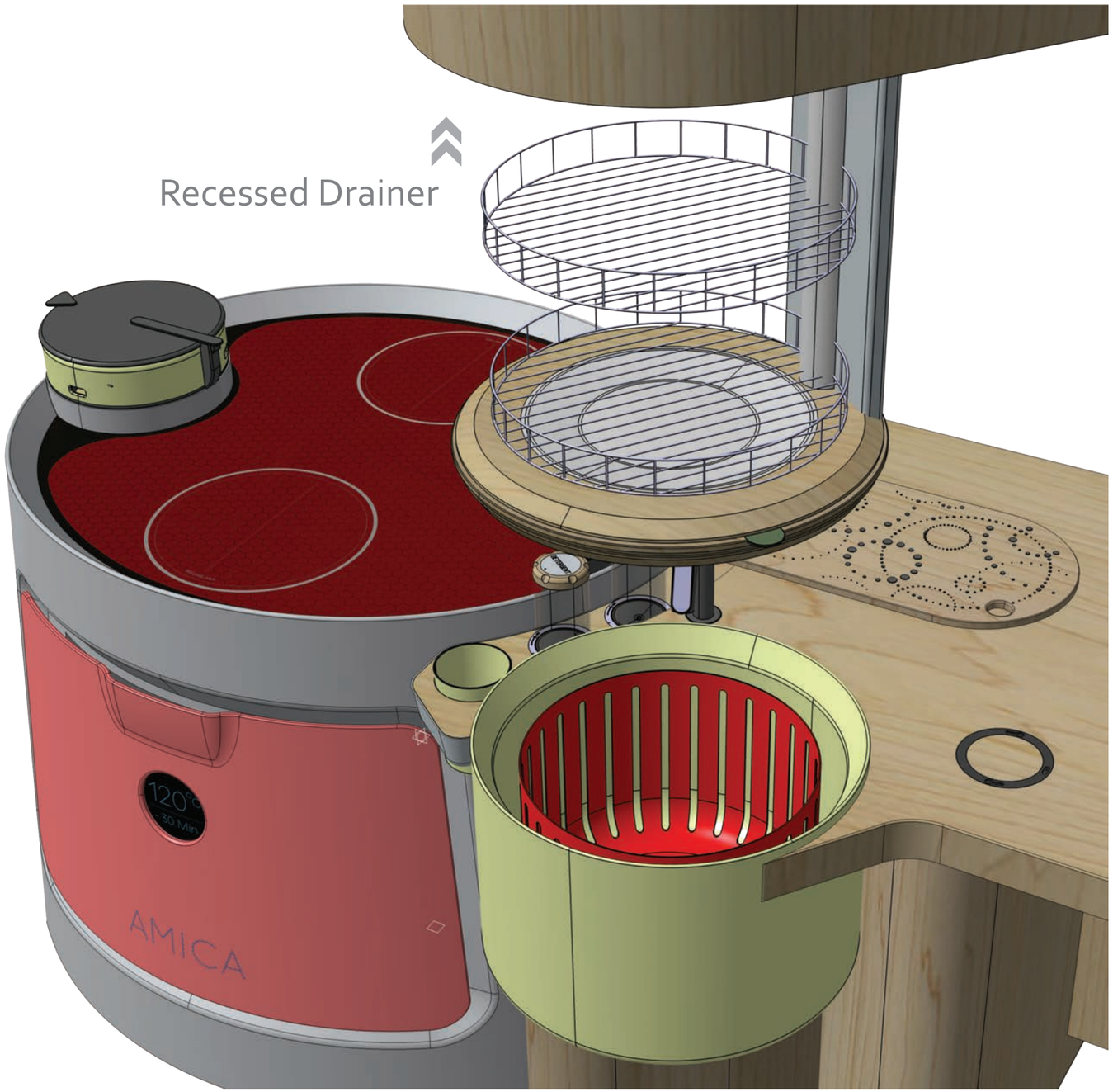


Recessed Drainer

The drainer is extendable
on demand.

Lid

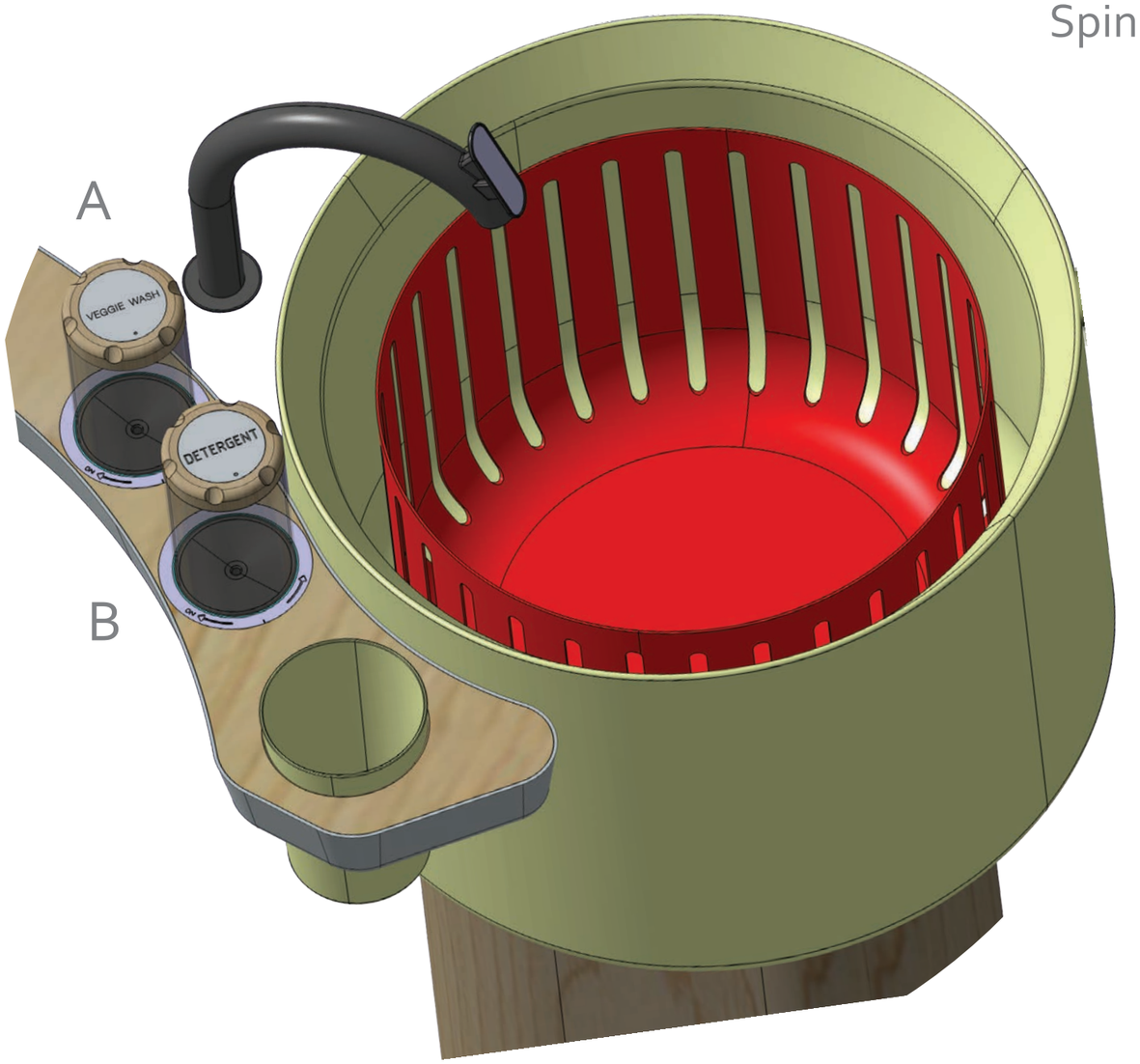
Sink



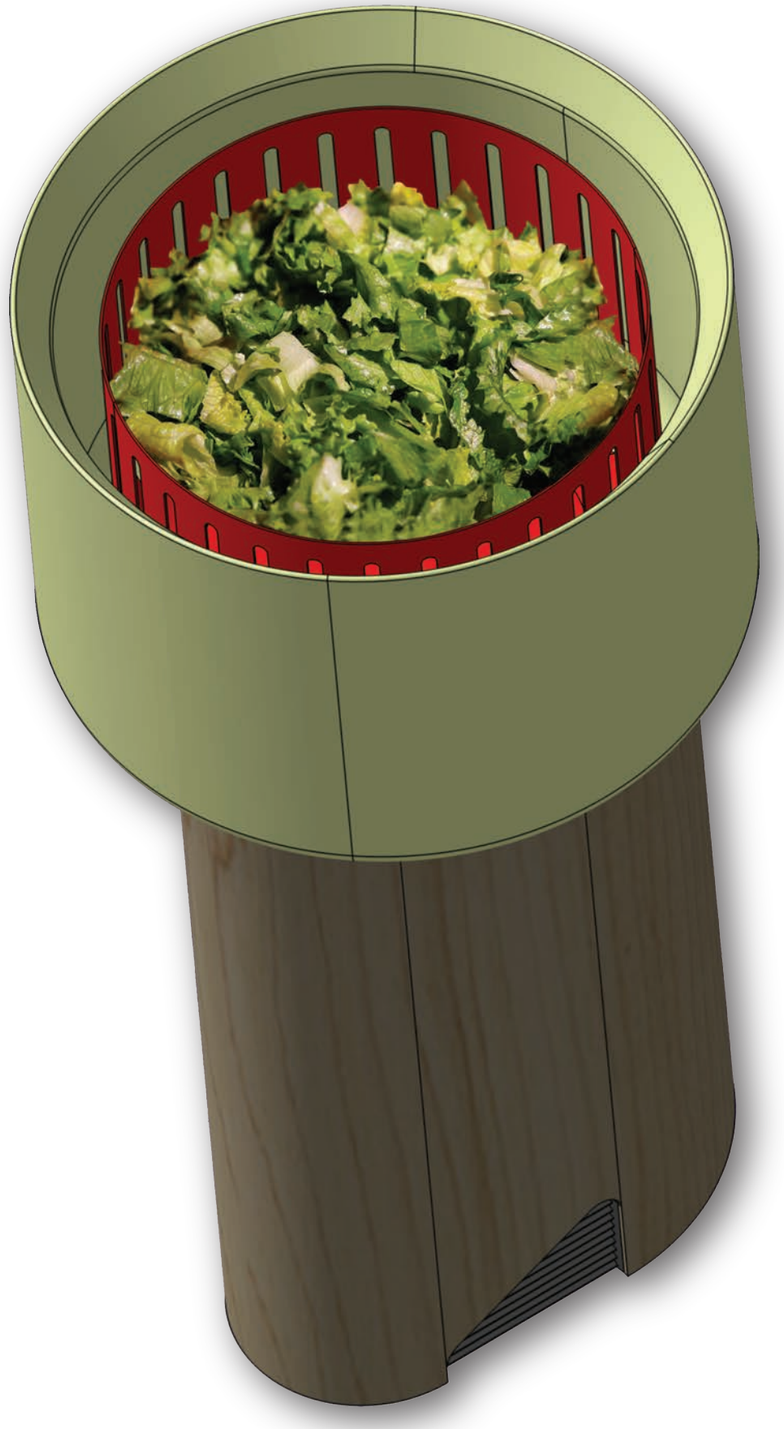
Vegetable/Fruit Washer and Spinner

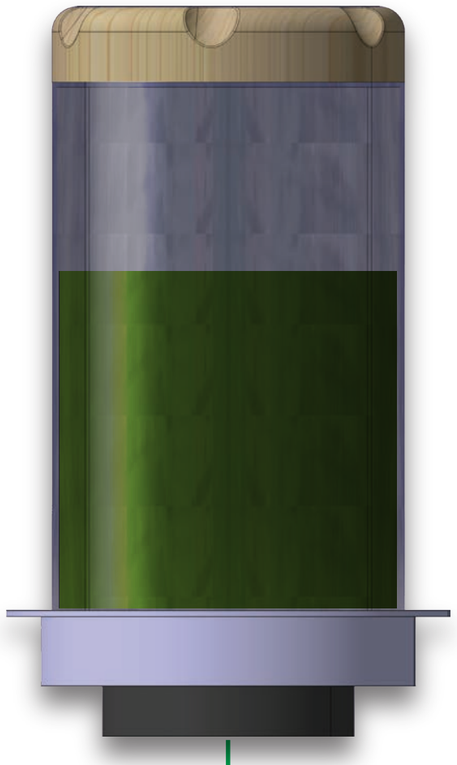
A - Veggie Wash Dispenser

B - Detergent Dispenser

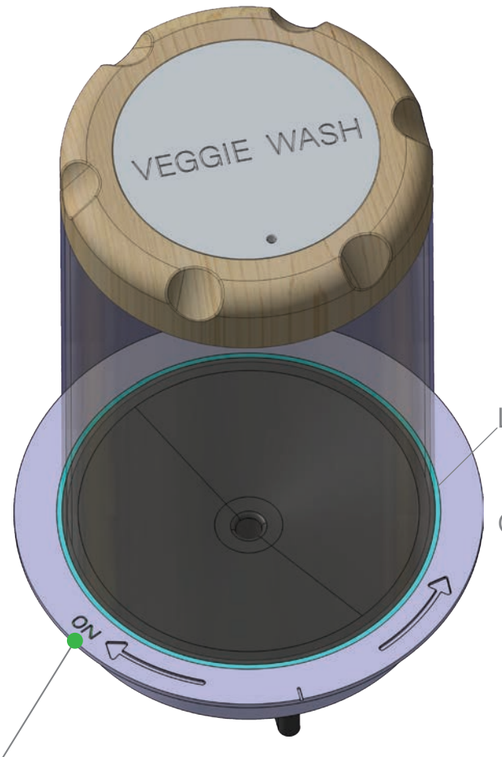


Spinner

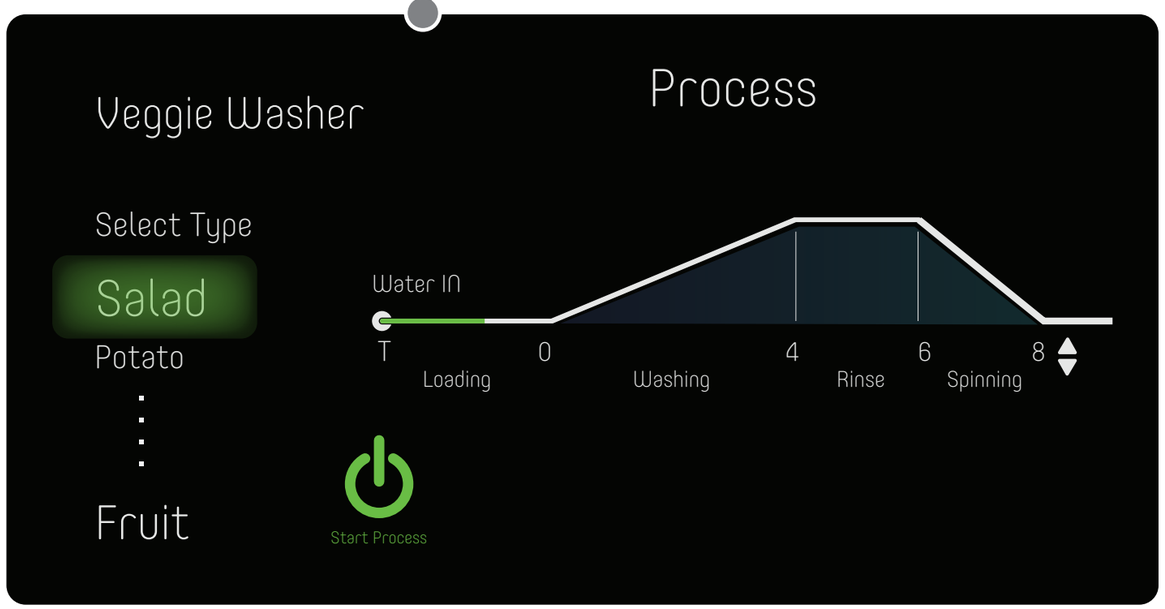


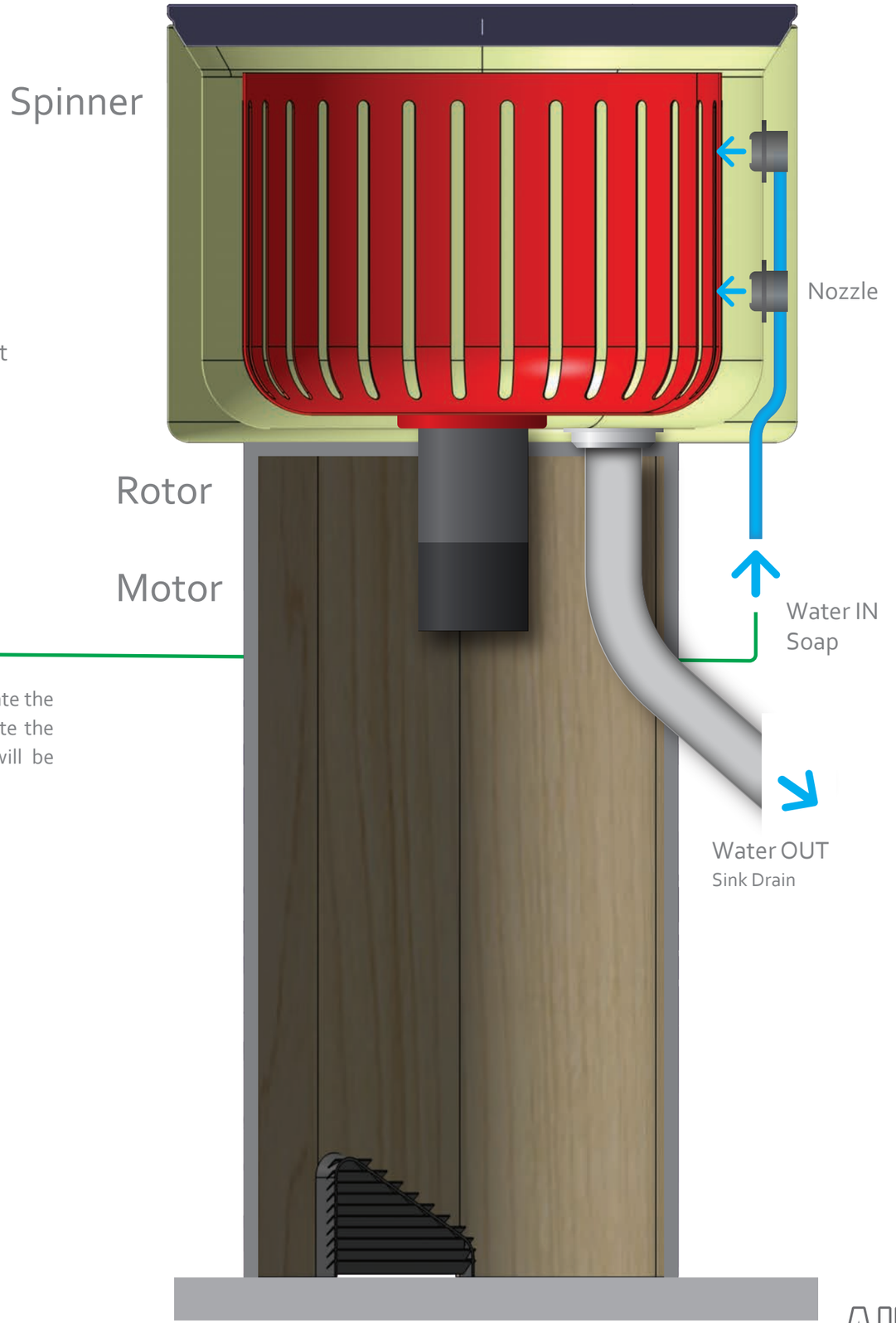


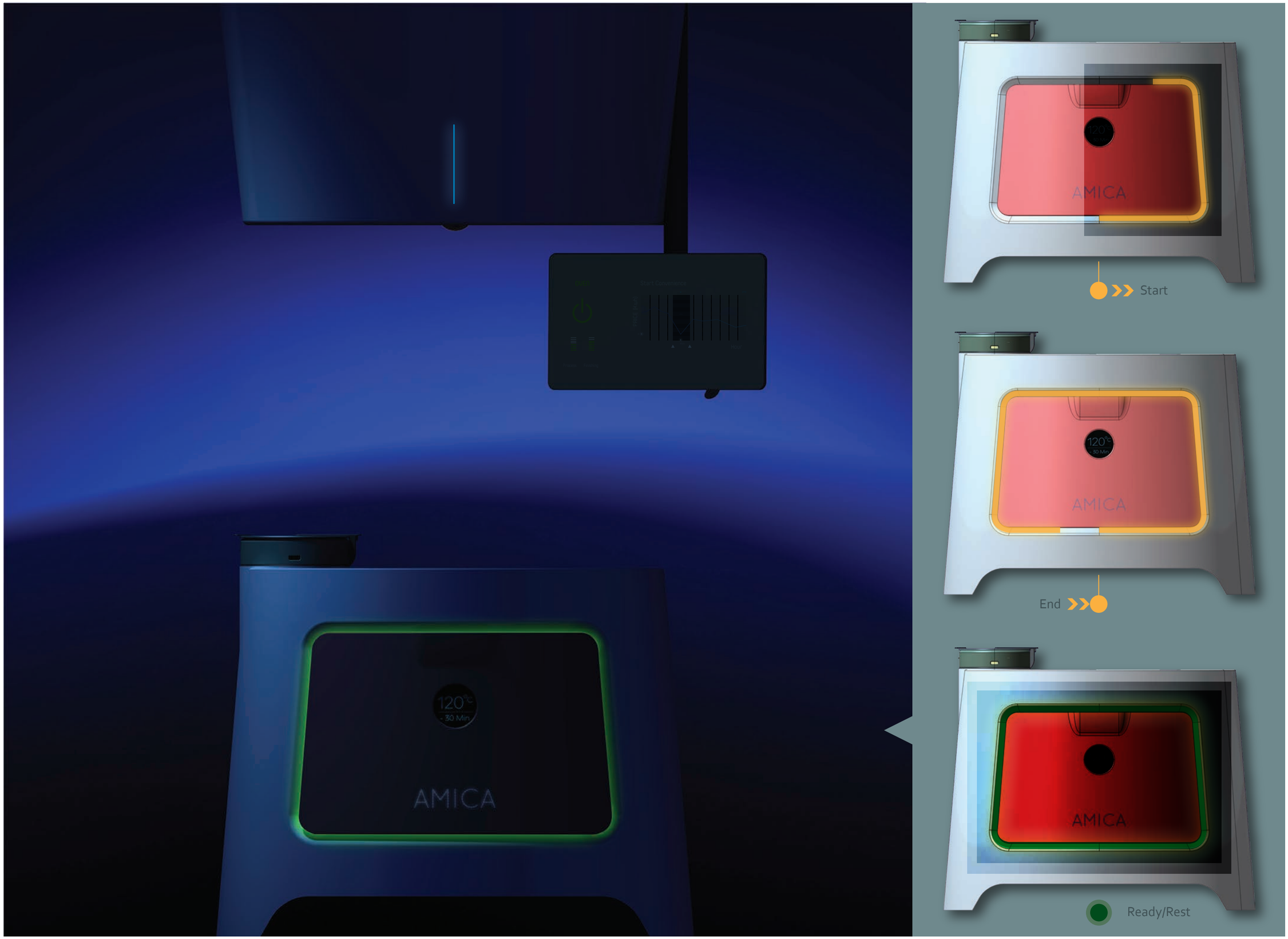
A - Veggie Wash Dispenser



Plugging in the spinner or turning the dispenser will activate the display. Selecting the type of vegetable or fruit will activate the related process (Standard or Custom). Veggie wash will be dispensed accordingly.

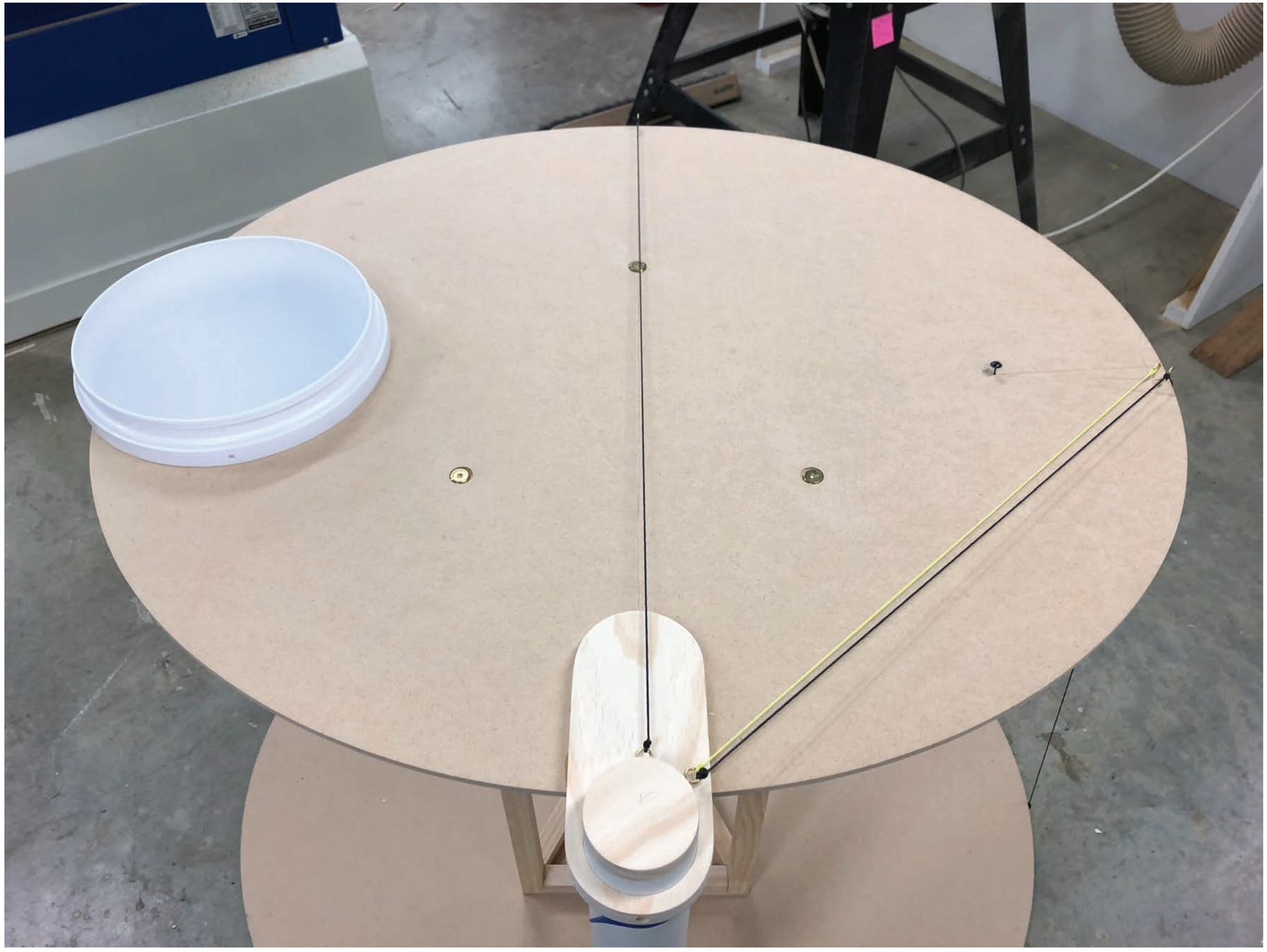


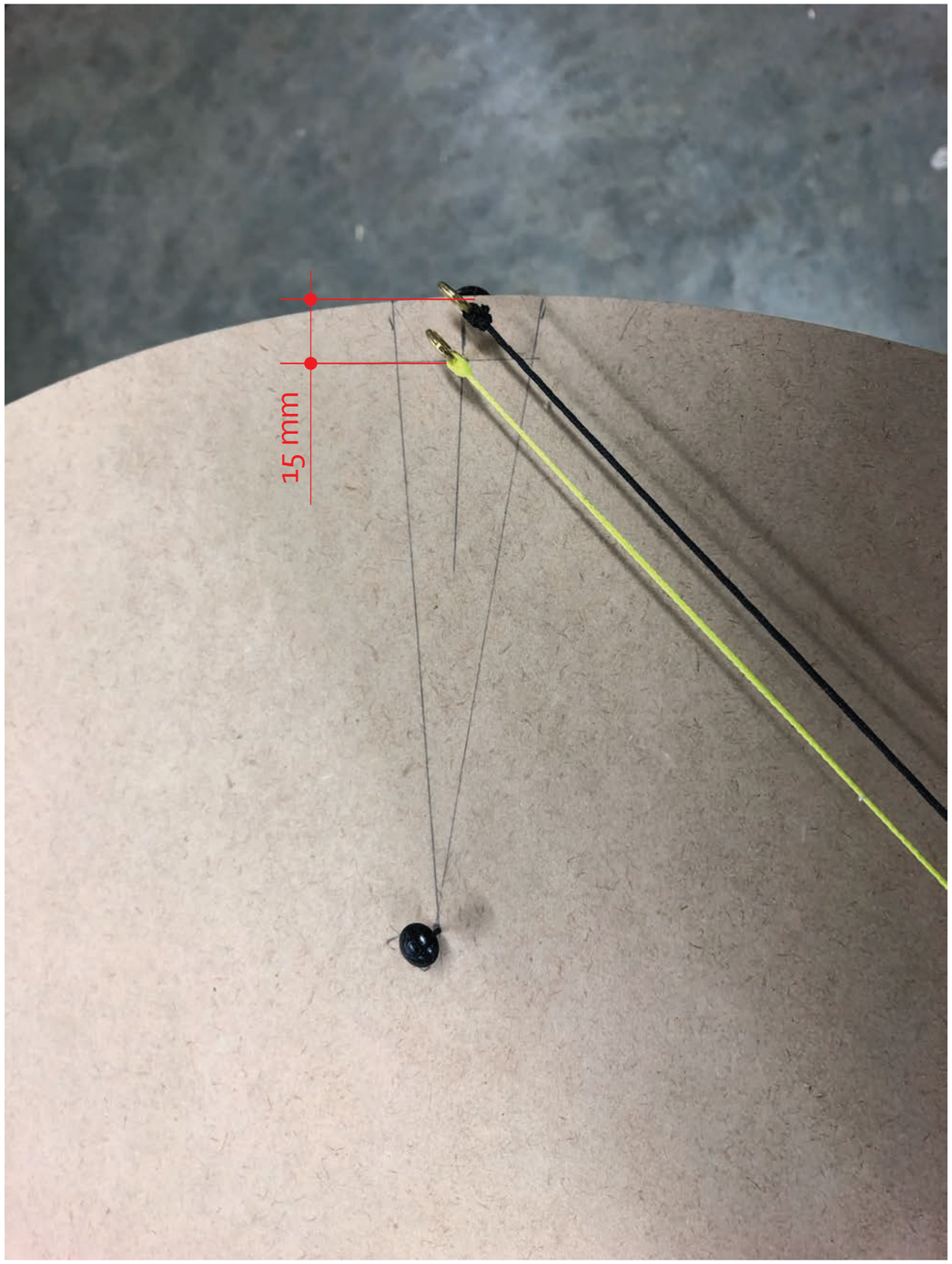



AMICA
Start
End
Ready/Rest

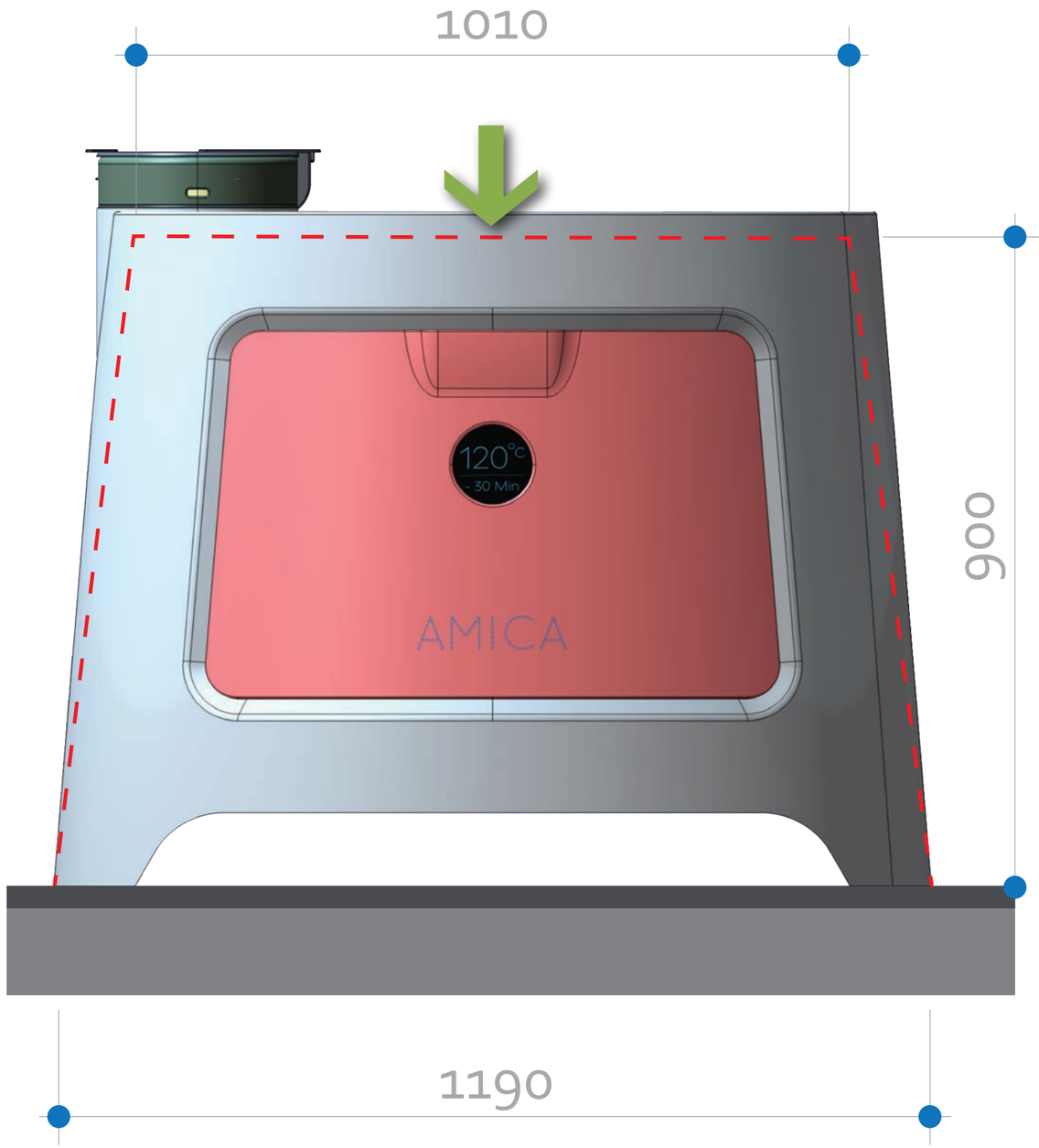
DMU Validation Model

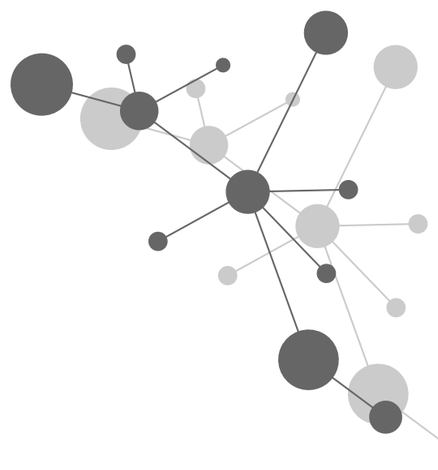
A simplified, full scale model of the stove unit has been produced in order to control and validate the ergonomic parameters previously set in the digital mock-up with the mannequins. The model confirmed that the ergonomic parameters are realistic, requiring only minor changes. The height was reduced from 920 to 900 mm and the upper ellipse radii reduced by 15 mm each. It should be noted that these adjustments are based on a discretionary and subjective assessment of the designer and not on the basis of specific anthropometric data collection.





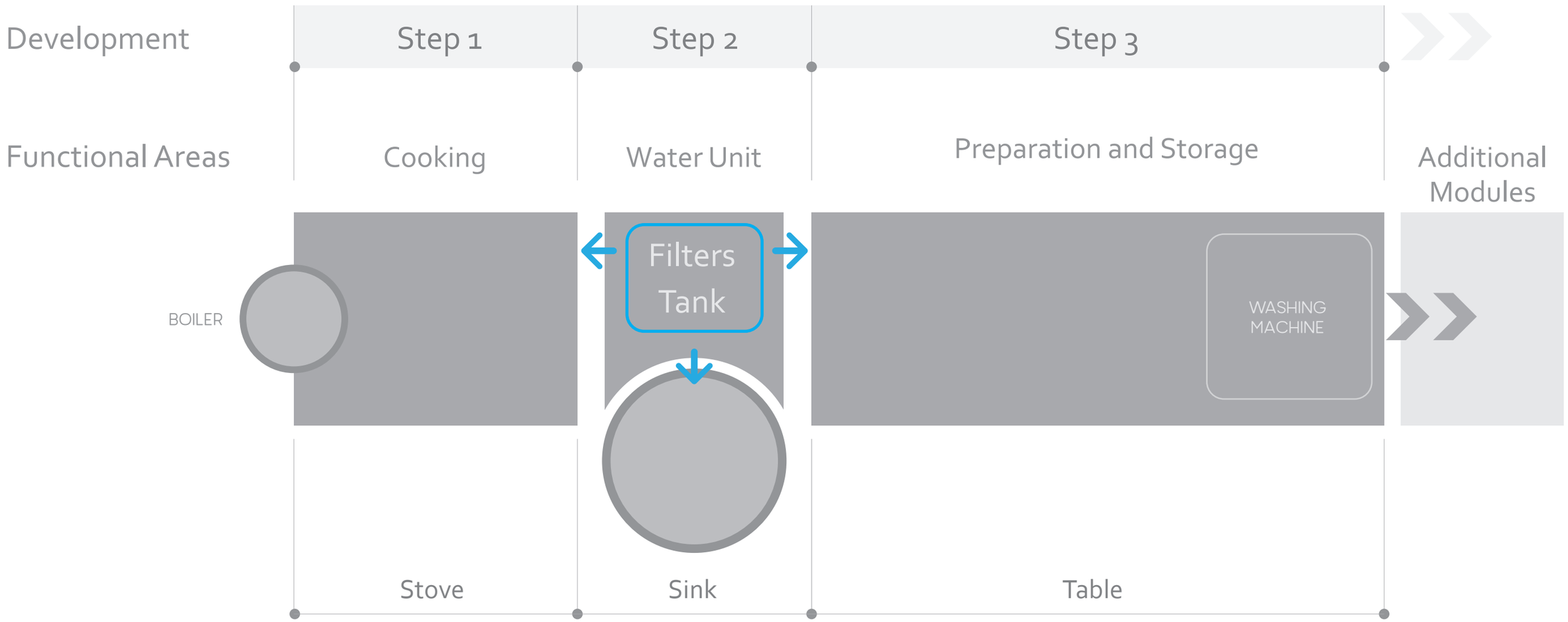
Dimensional Optimization





Cooking Station Typologies

Type A Layout - Key Areas and Development



Functional Layout

Subdivided into 3 key functional areas.

Type A Layout - Basic Configuration

Linear and Ceiling Suspended

Front View - Elevation

Interactive CS
Not ito Scale

A3 Printable Size

Top View

AUT UNIVERSITY

Type A Layout - Basic Configuration

Linear and Ceiling Suspended

Hard Maple

Painted Metal

Solid Surface (Acrylic)

Rangehood

Drainer/Fridge

Adjustable Shelf

Hydroponic Shelf

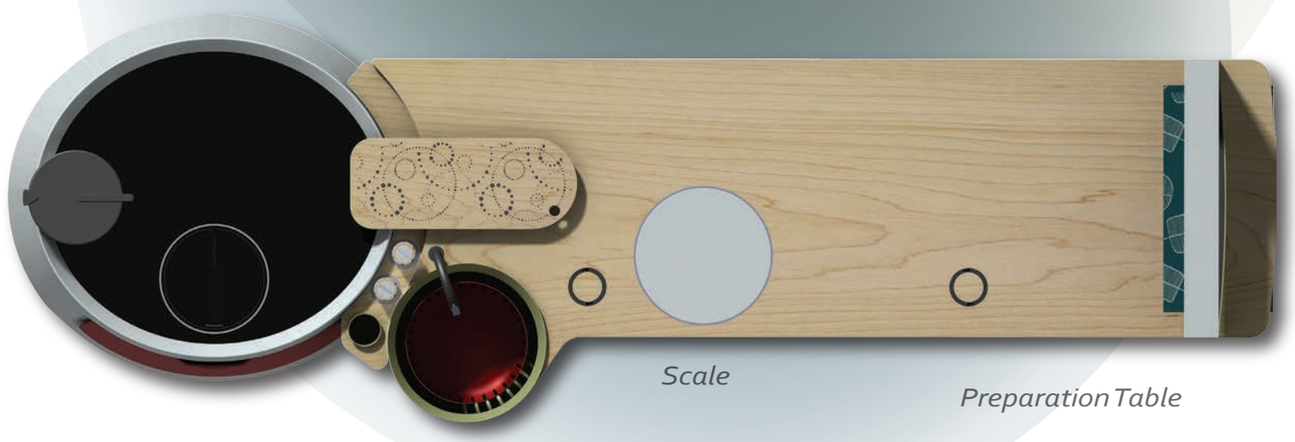
Stove Unit

Front View - Elevation

Sink

Storage Unit/Drawers

Dish Washer



Top View

Scale

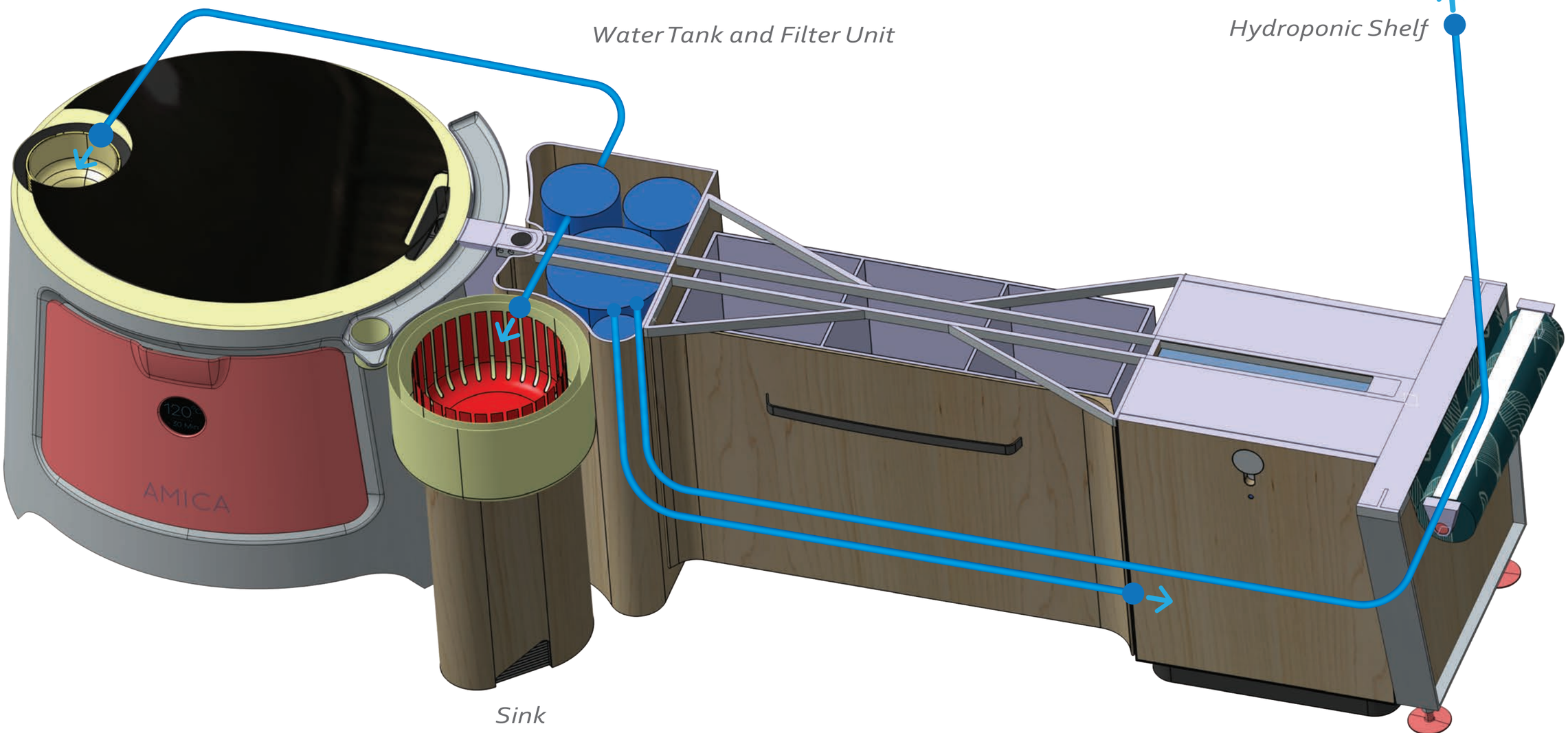
Preparation Table

Integrated Water Supply

Multi-Purpose Boiler

Water Tank and Filter Unit

Hydroponic Shelf



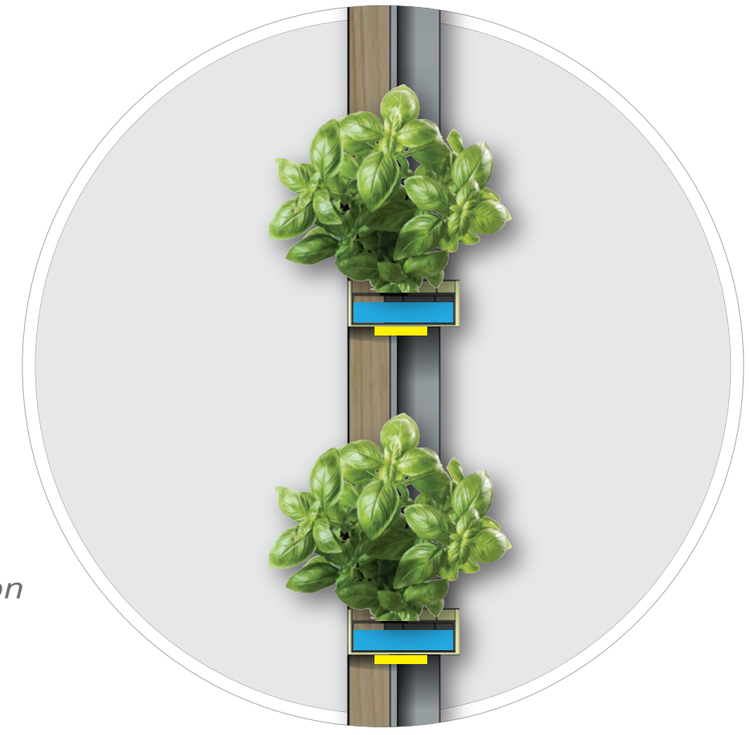
Sink
Fruit and Veggie Washer

Dishwasher

Hydroponic Shelf
(Domestic Herb Cultivation)

Water/Gel

LED Light



Detail Section
on Shelves

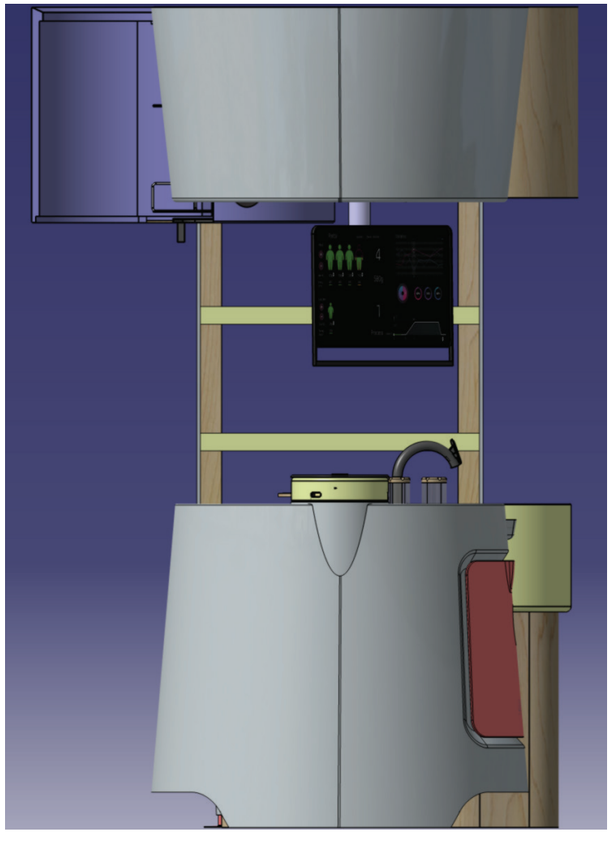
Water In

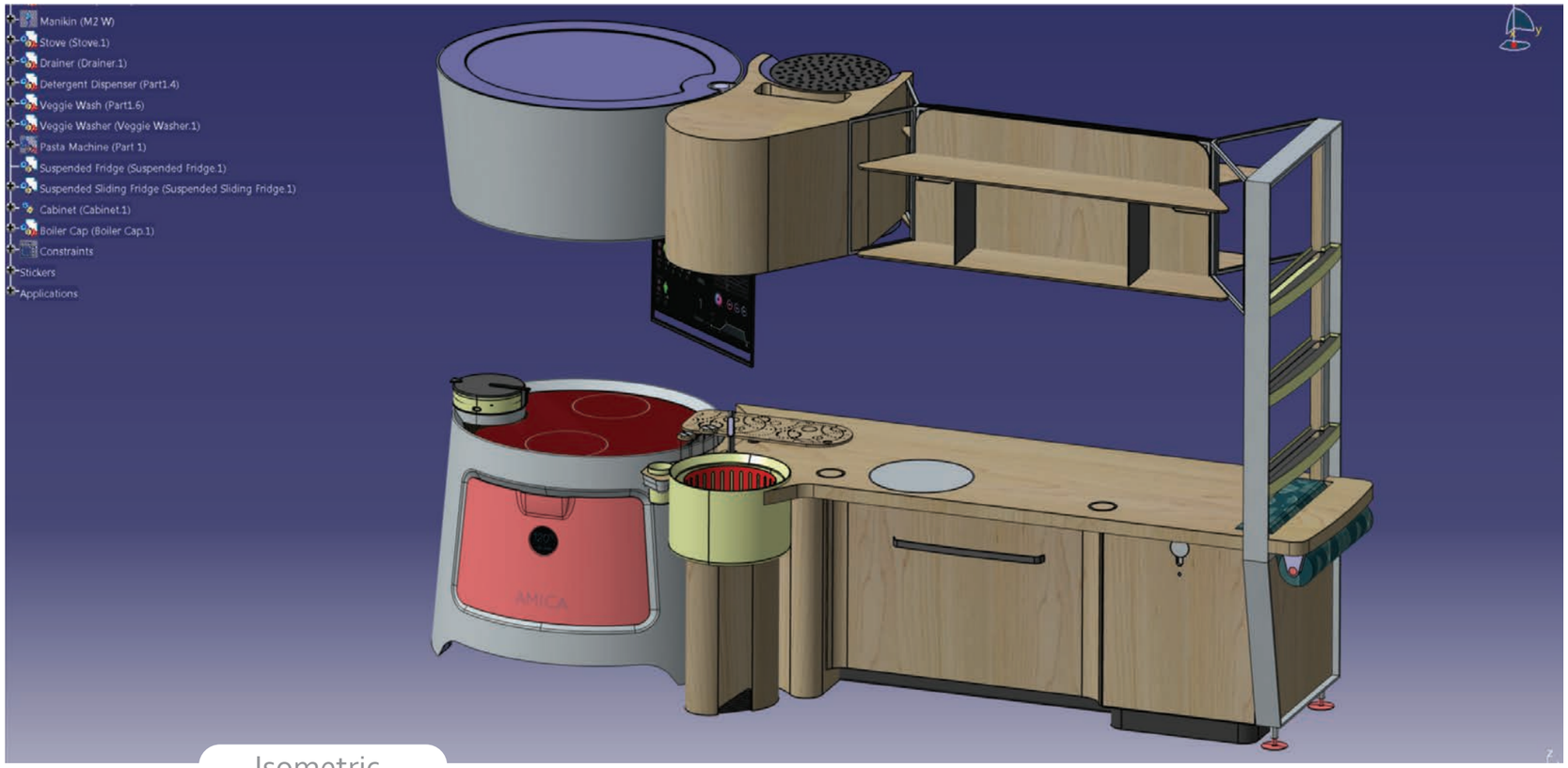
DMU

Digital Mock Up

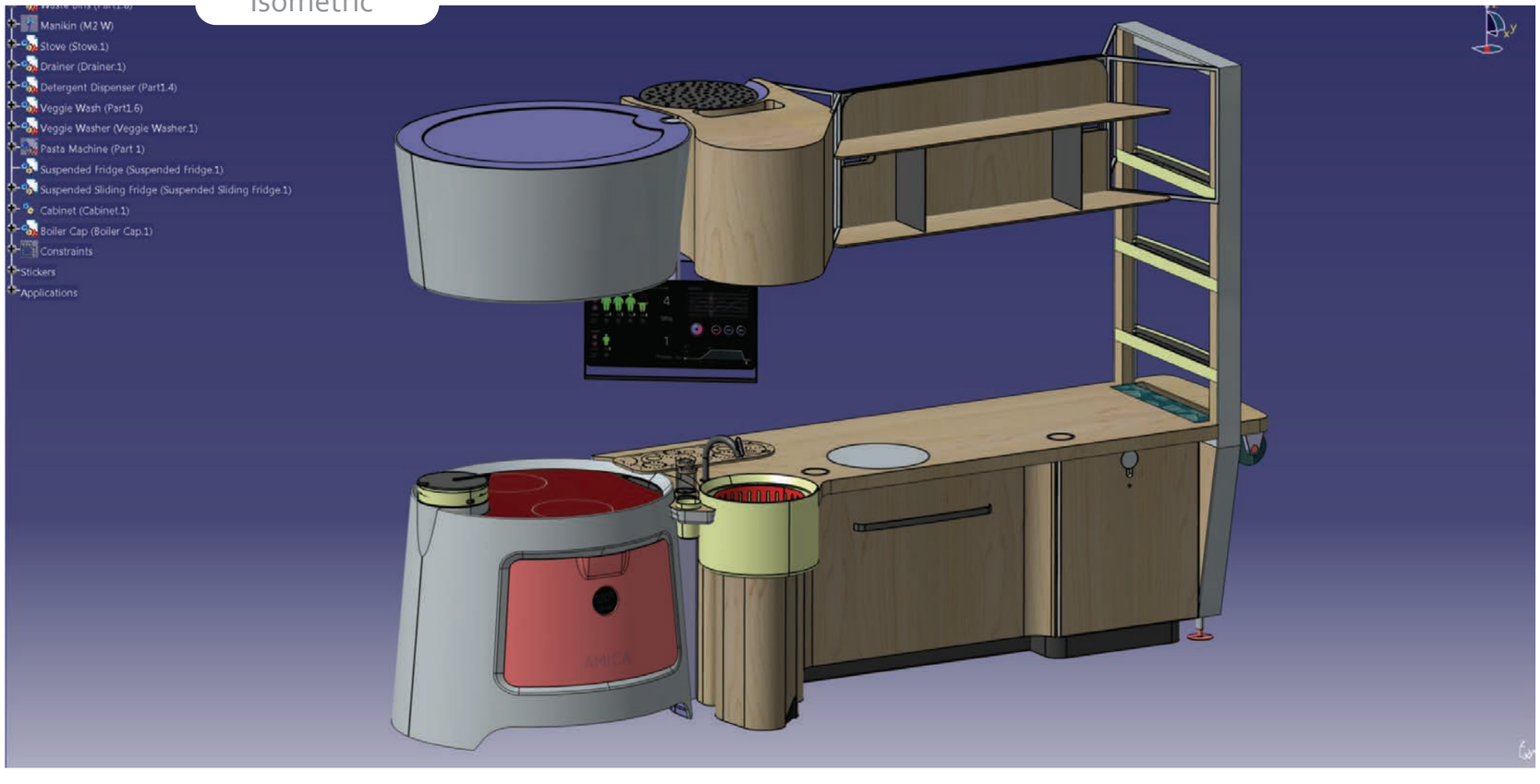
Isometric and perspective views on the 3D parametric model

Side View



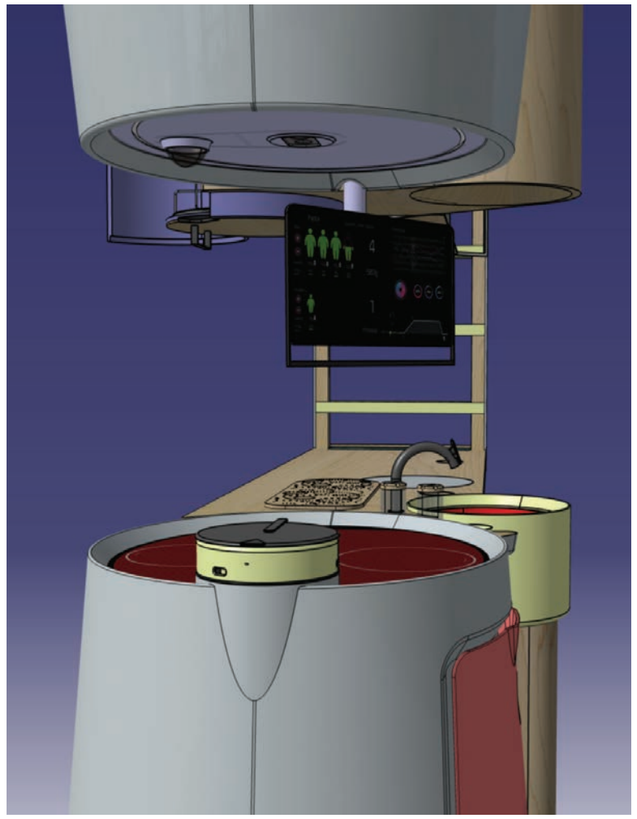


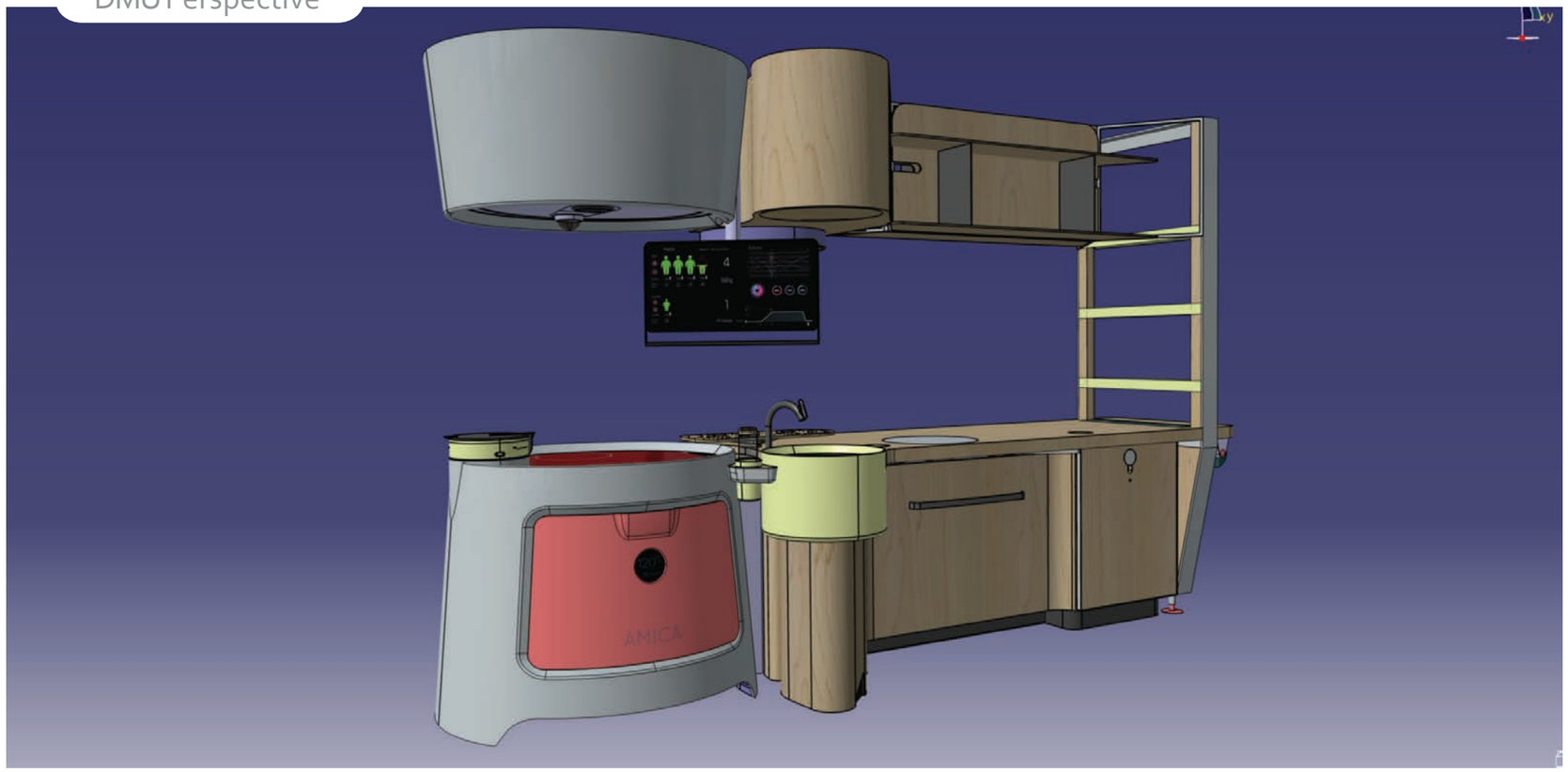
Isometric



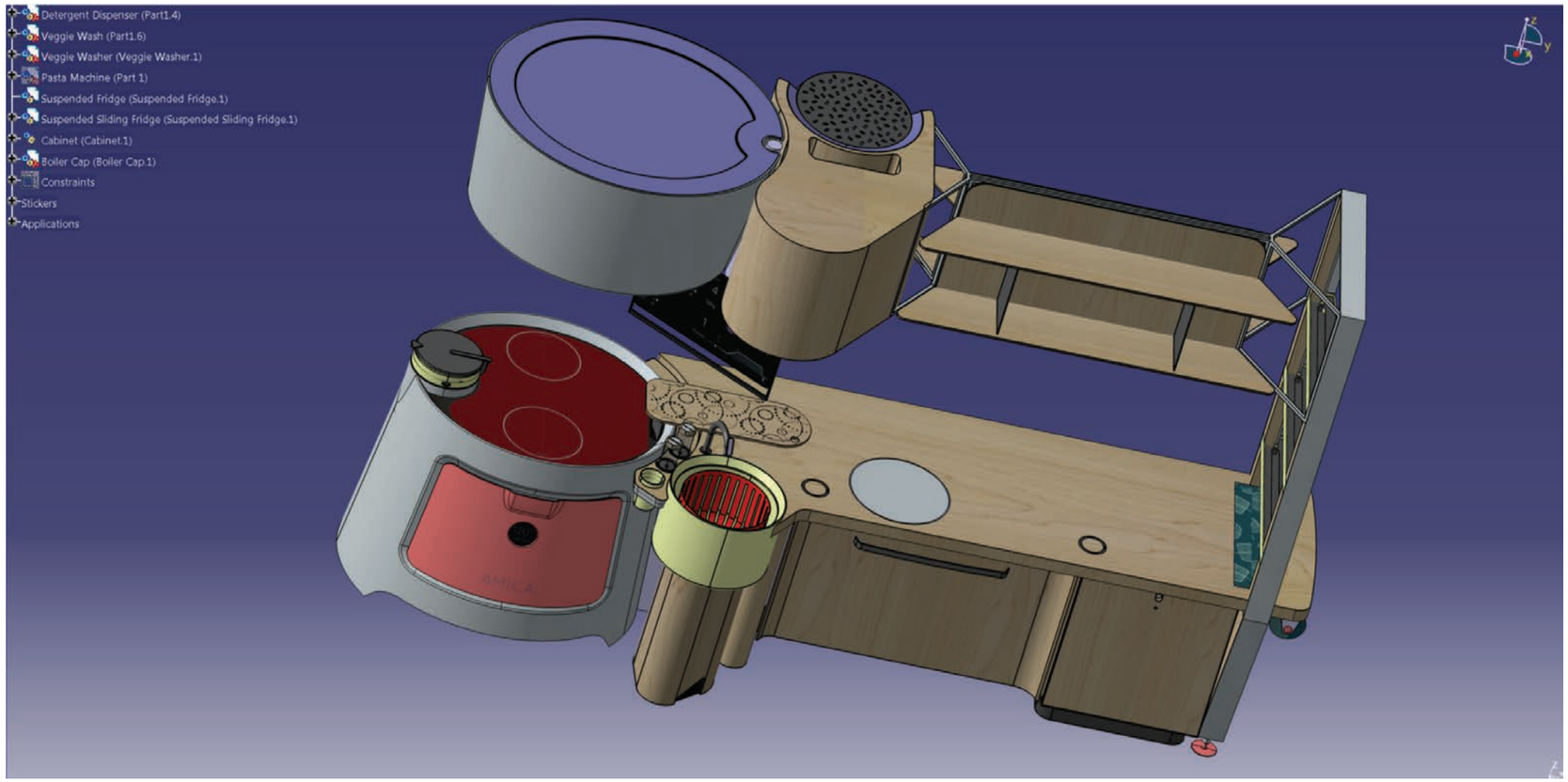
DMU Perspective

Rangehood Unit with Camera and Thermal Camera

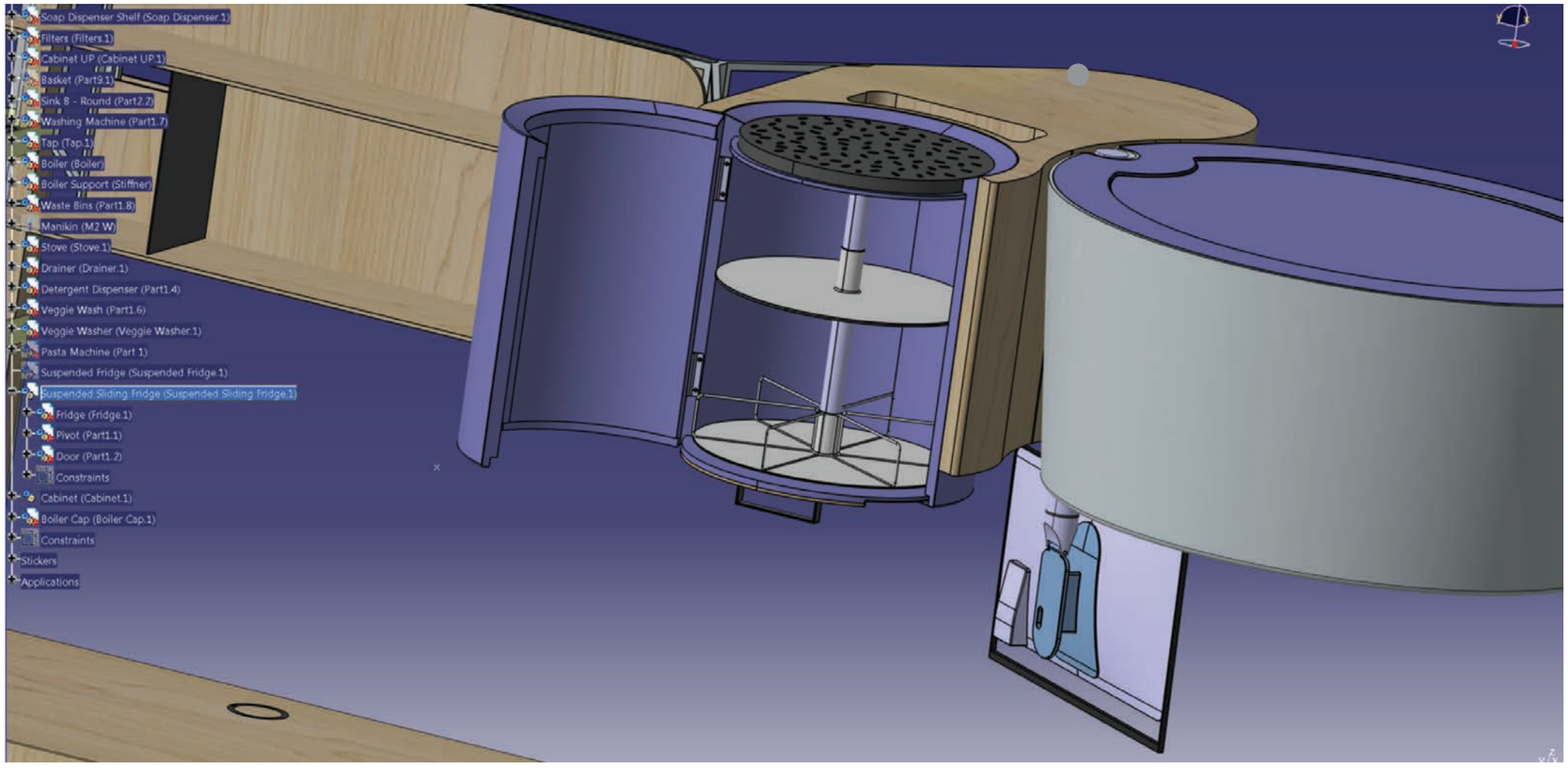


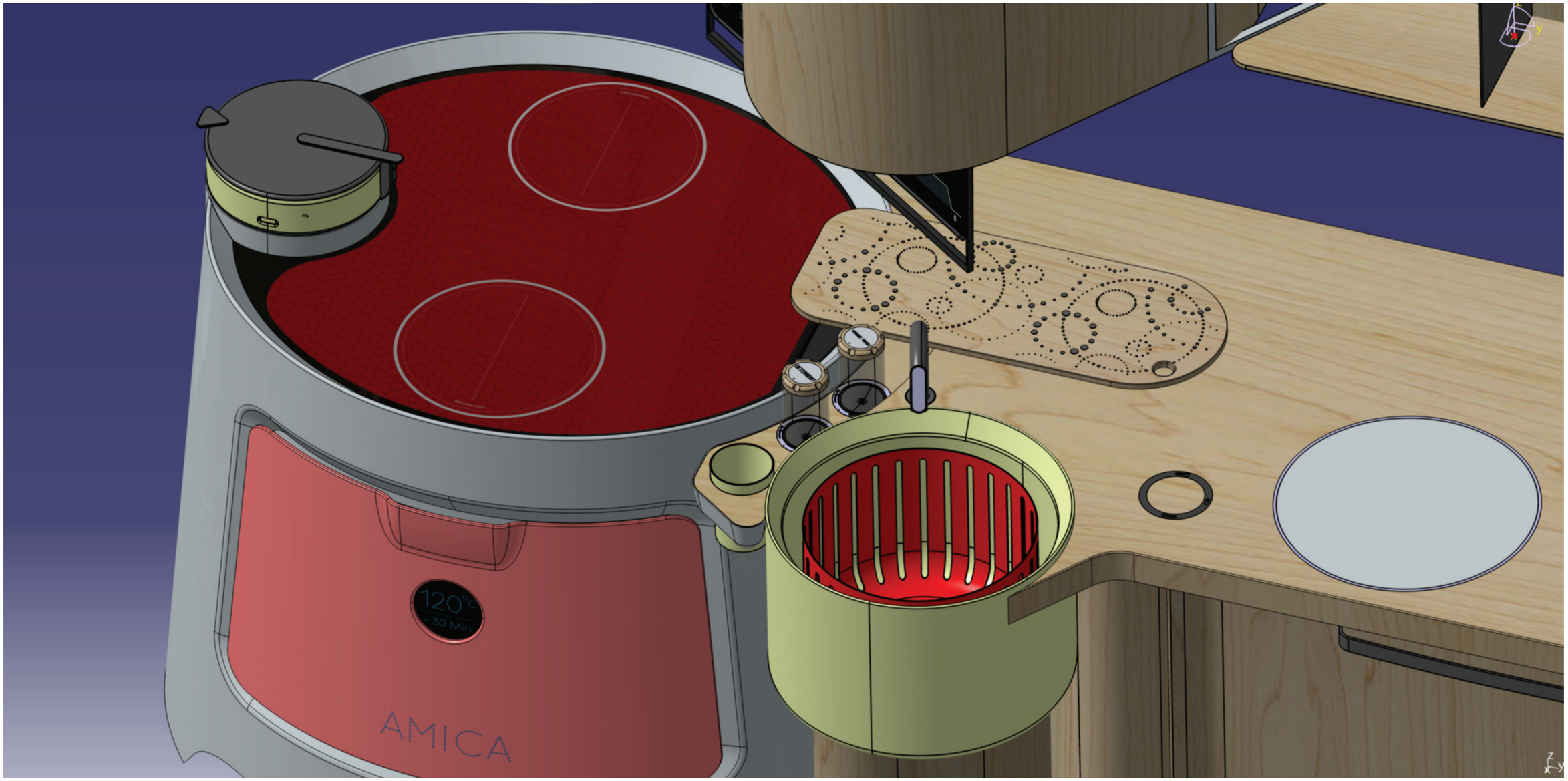


DMU Perspective

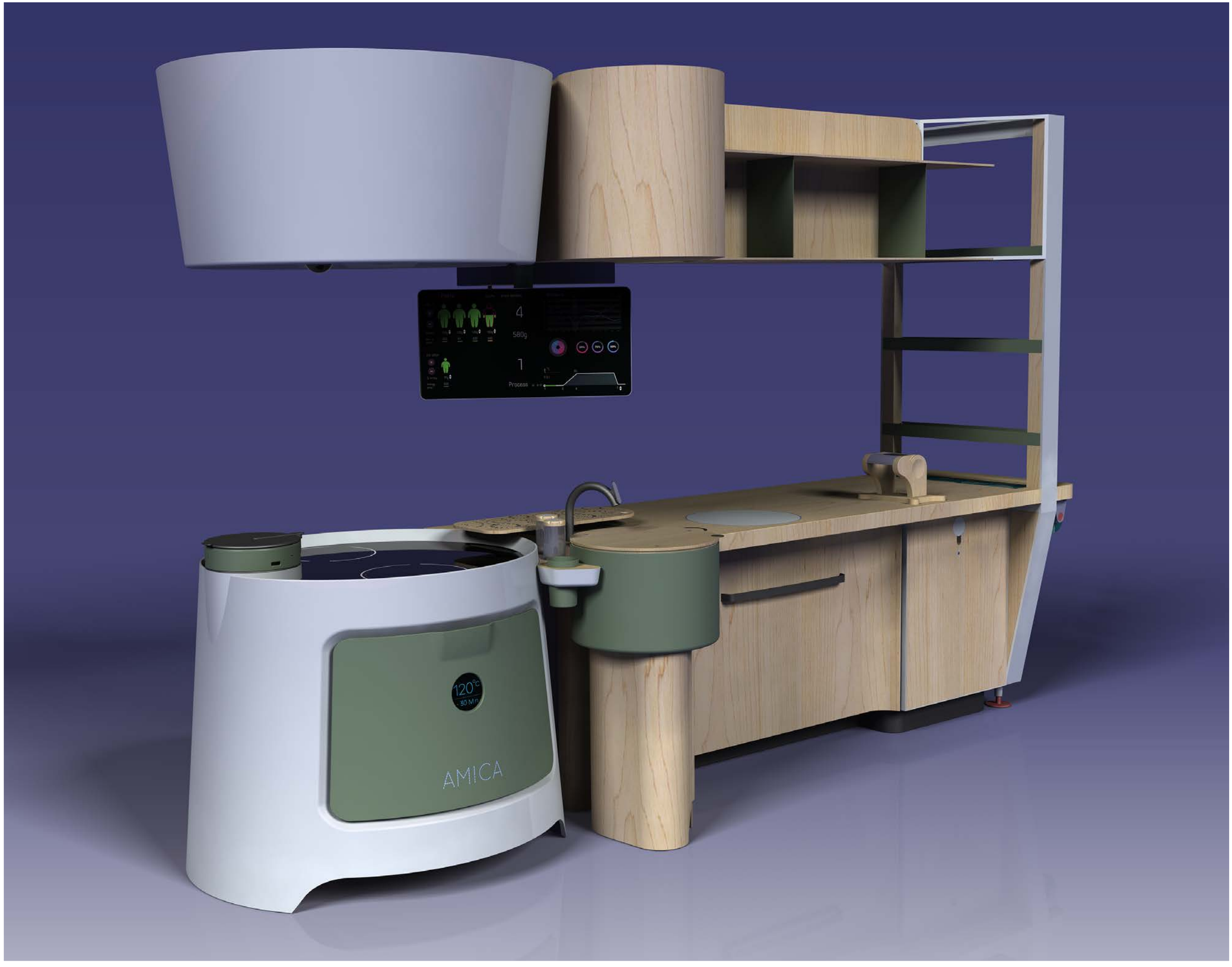


Detailed View of the Retractable Fridge



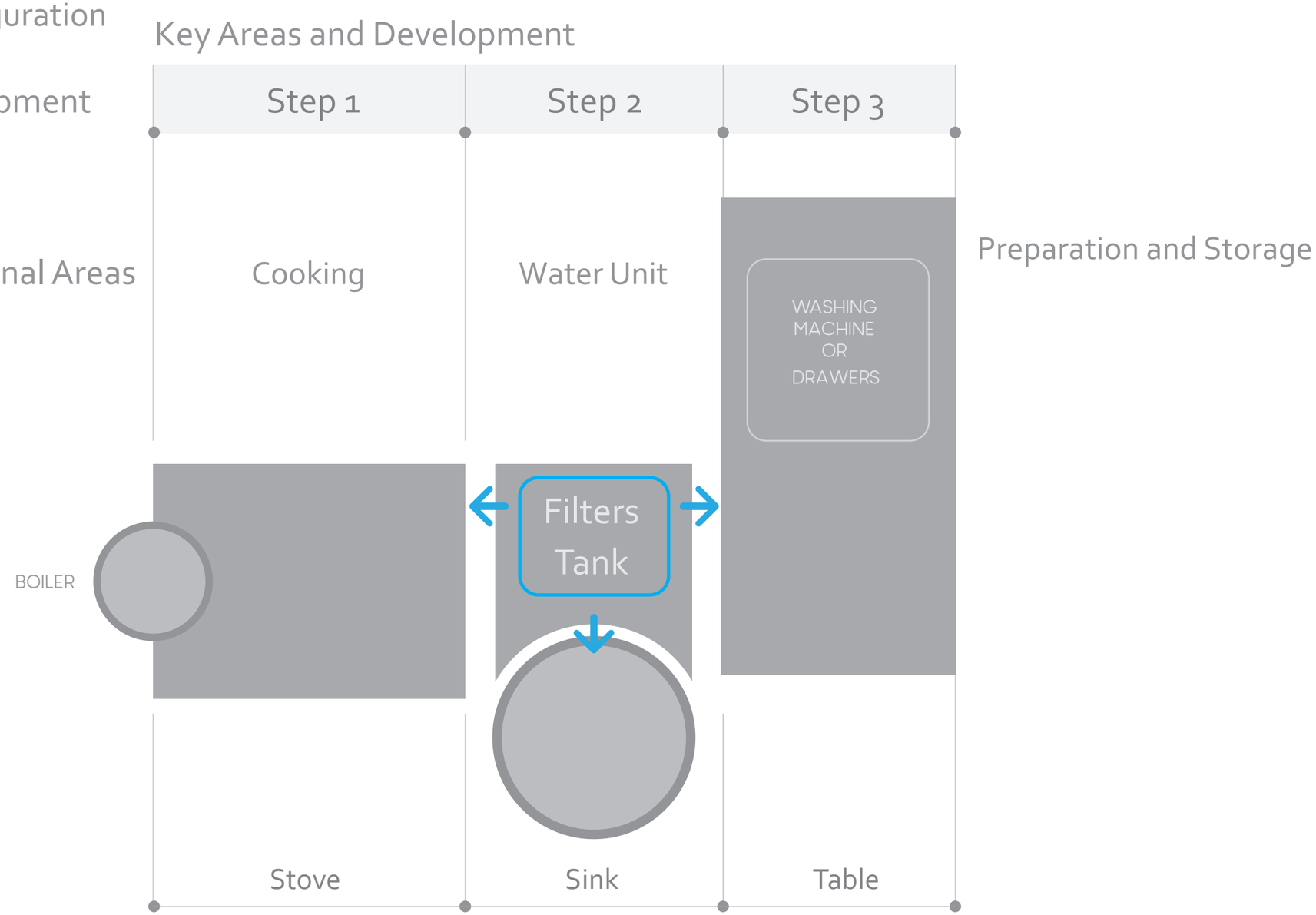


Detailed View of the Stove Unit and Sink


4
580g
1
Process
120°C
30 Min
AMICA

MINIMA Unit

Type B - Minimal Configuration



Functional Layout

Subdivided into 3 key functional areas.

Front View - Elevation

MINIMA Unit

Minimal Configuration

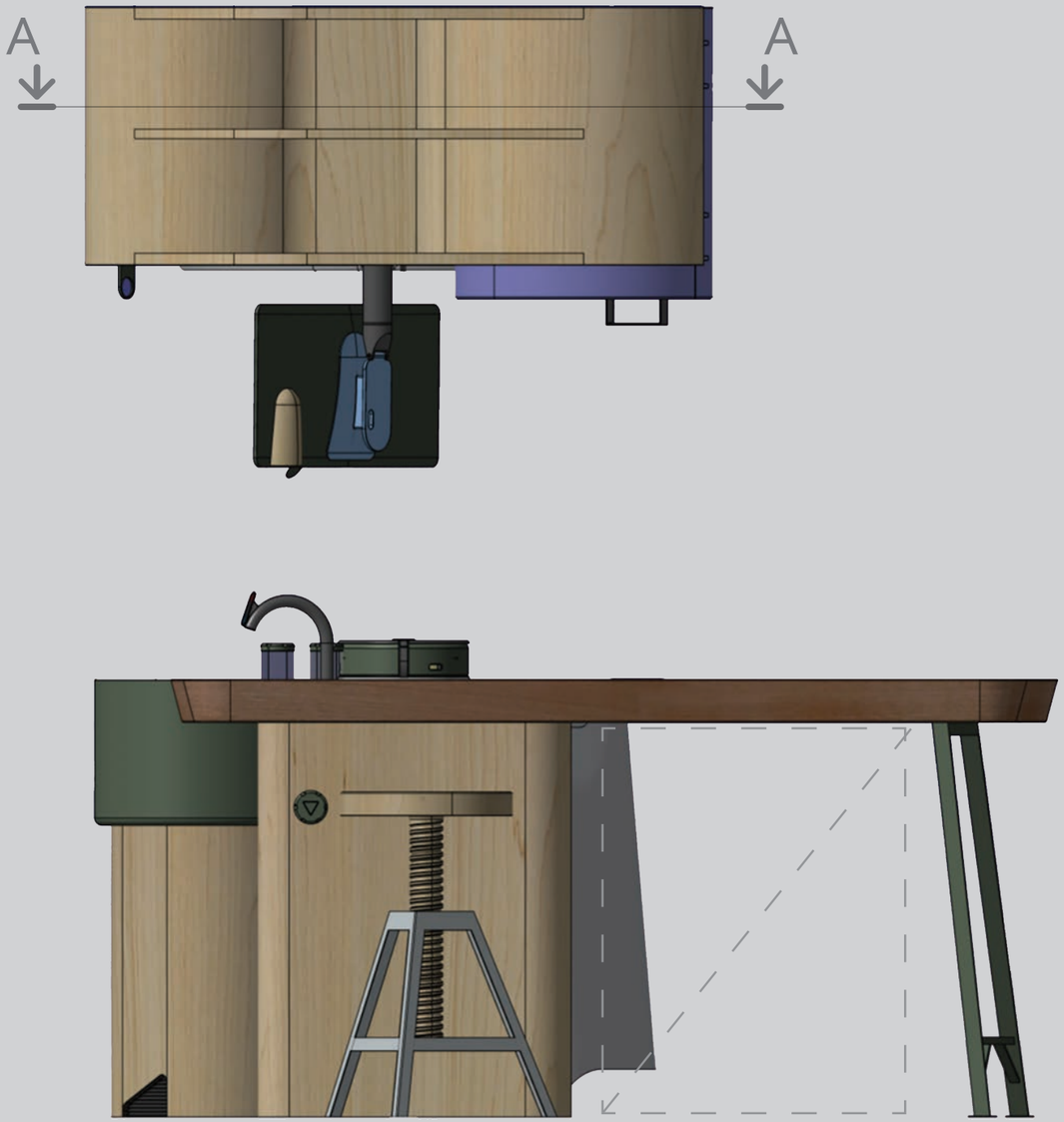
Hard Maple

Weathered Solid Wood

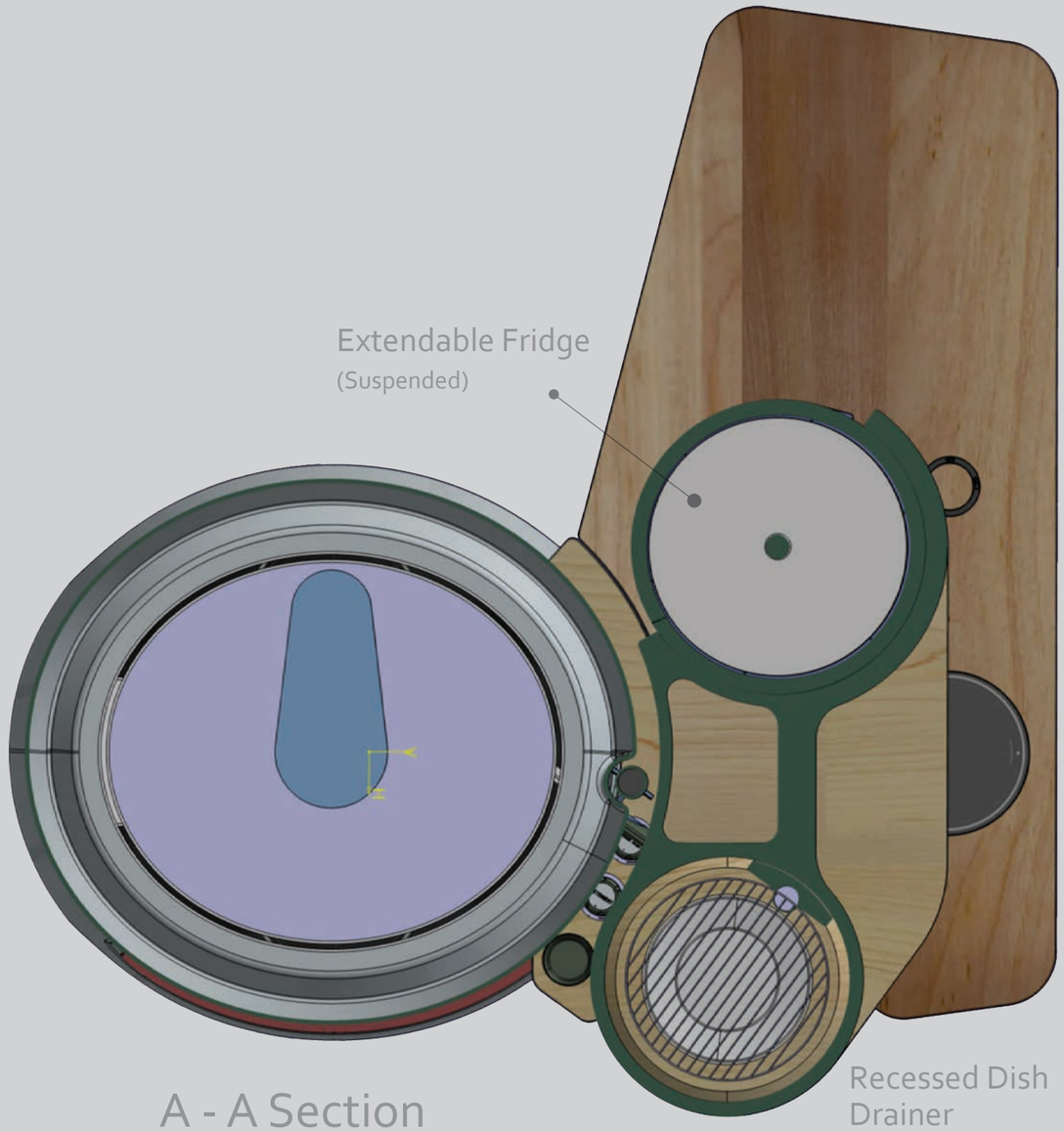
Painted Metal

Solid Surface (Acrylic)

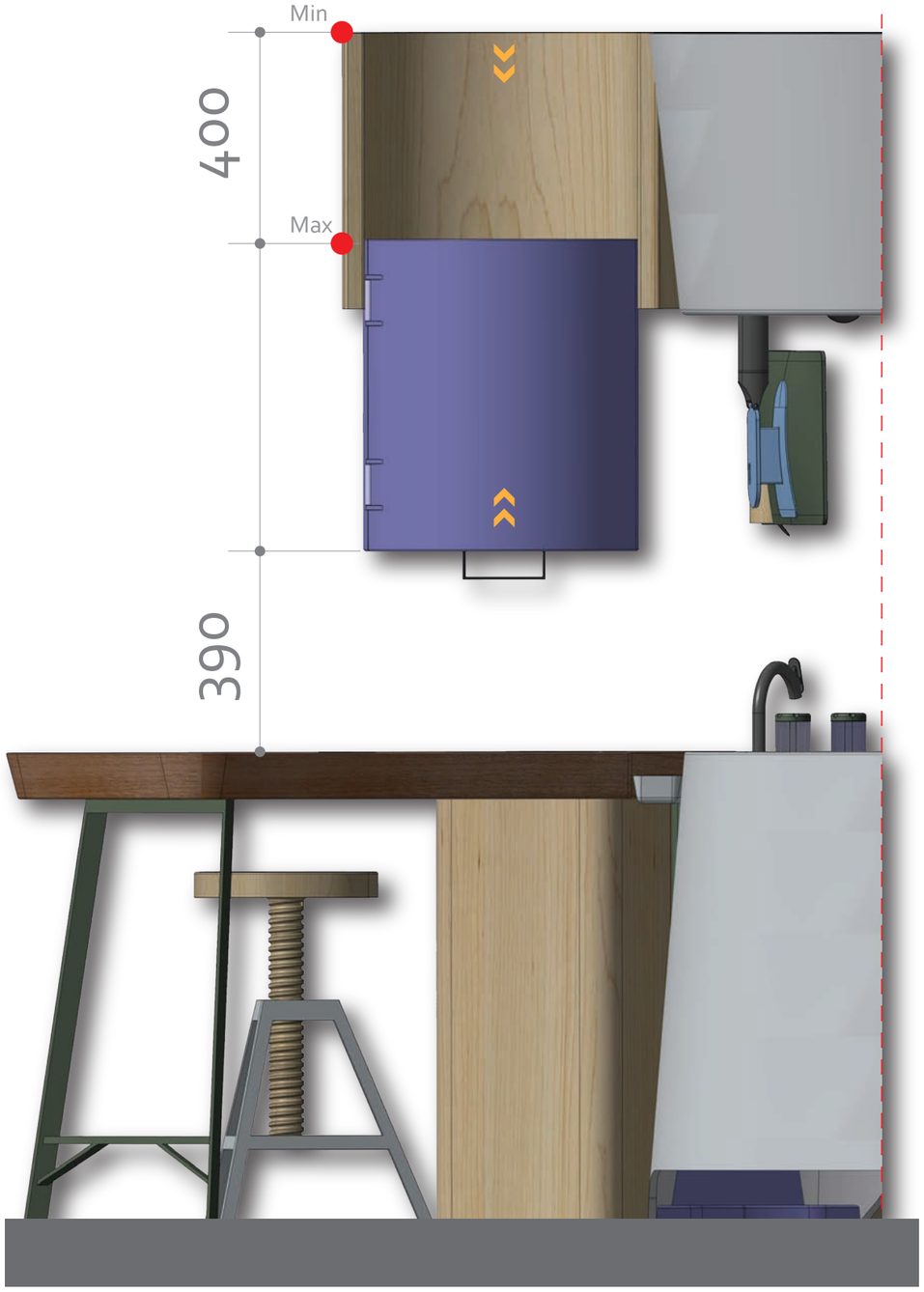
Top View



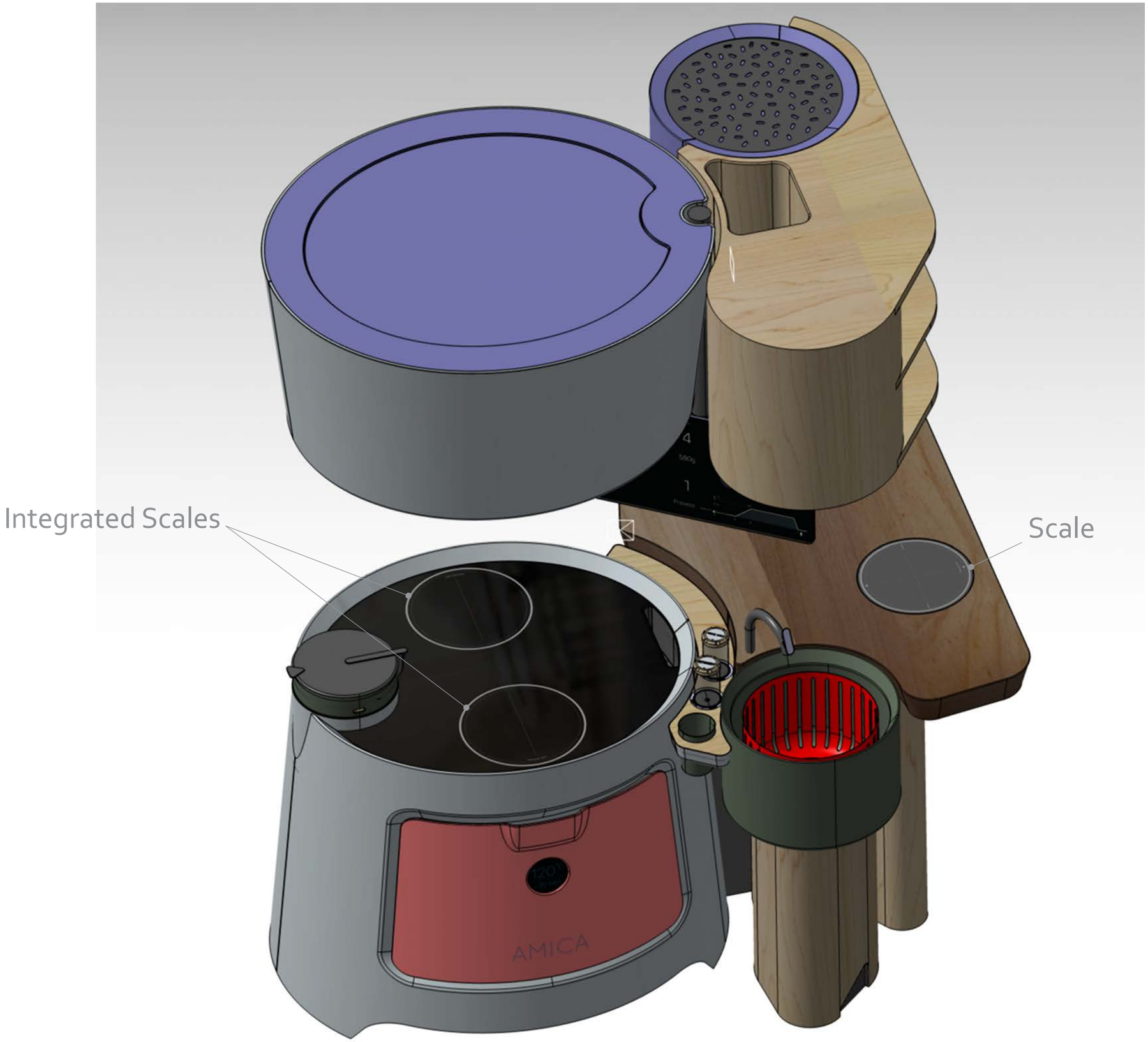
Side View

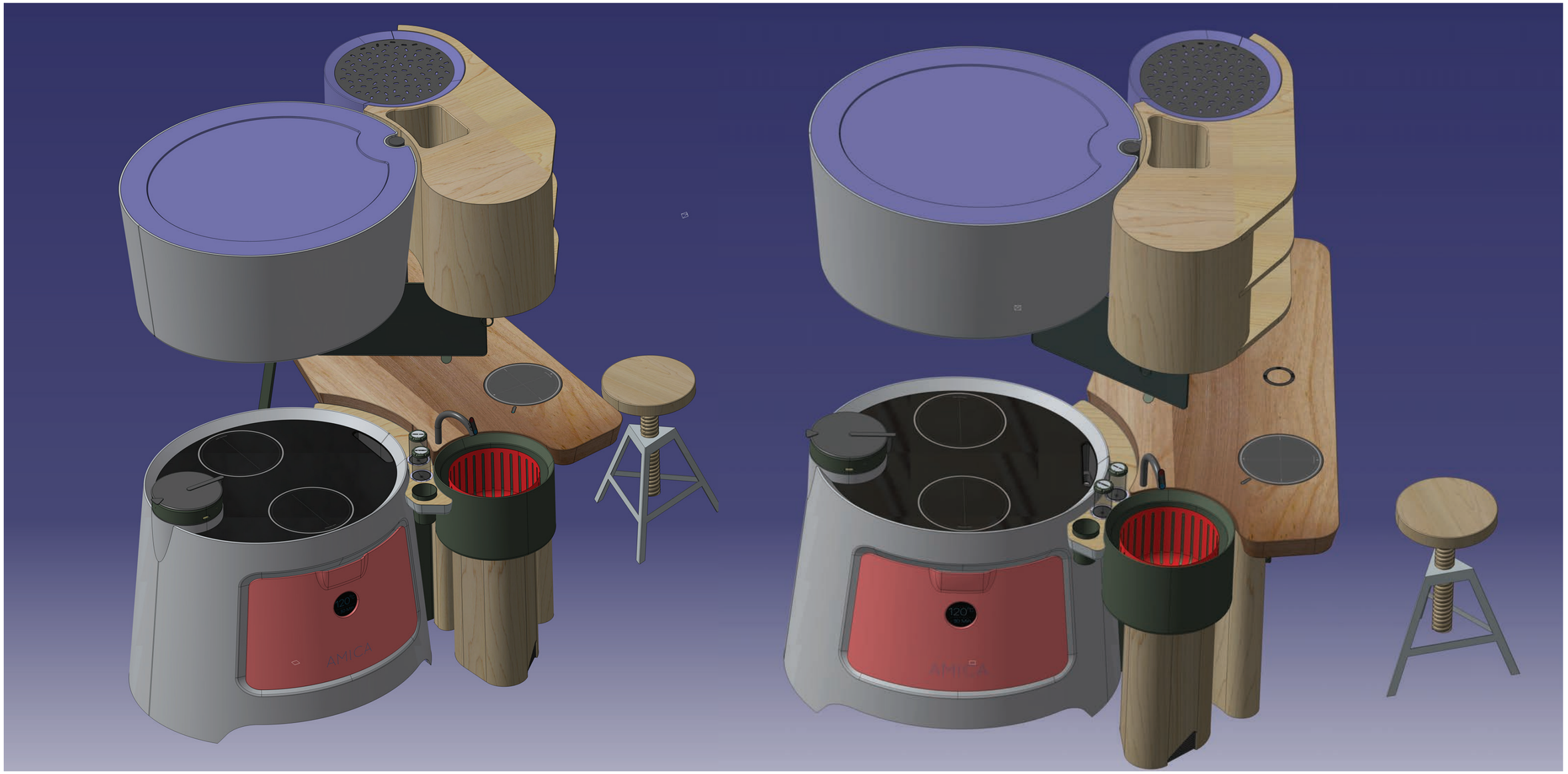


A - A Section



Extendable Fridge


Integrated Scales
Scale
AMICA


AMICA
AMICA

DMU Capture

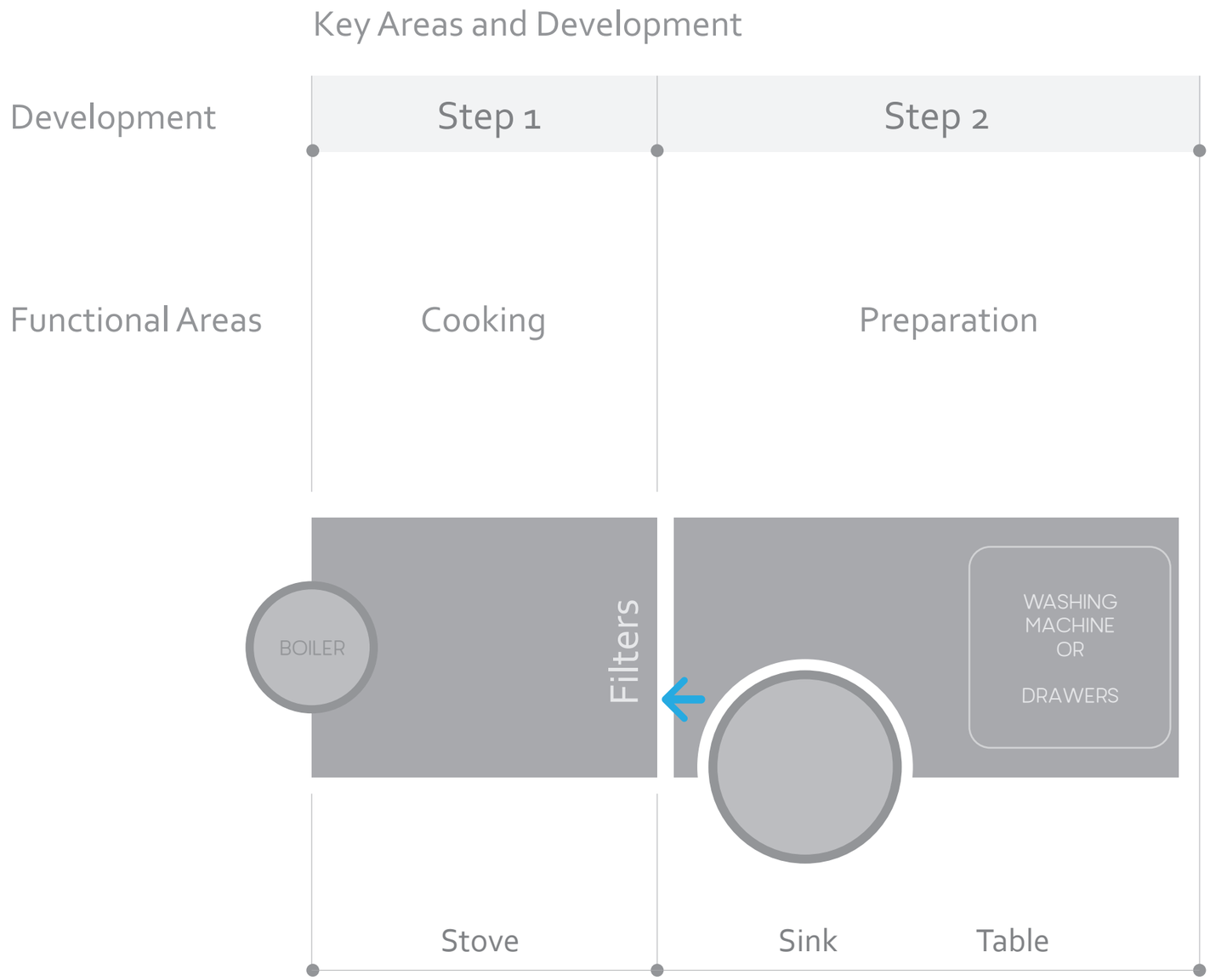
Isometric View

Perspective View


Hi There!
Cooking
Washing
Sharing
120°C
30 Min
AMICA

SUPERMINIMA Unit - Self Standing

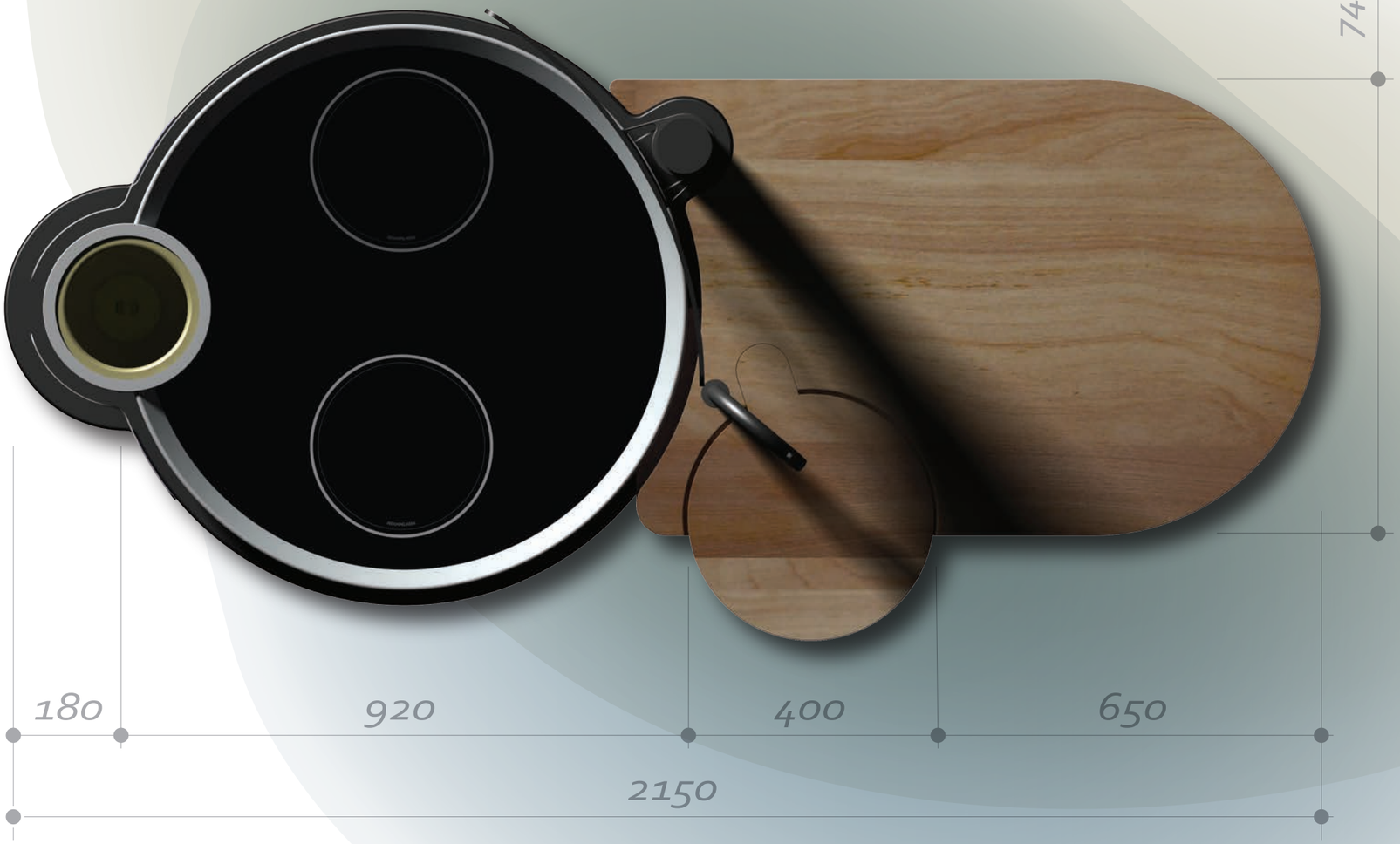
Type C - Minimal Configuration



Functional Layout

Front View - Elevation

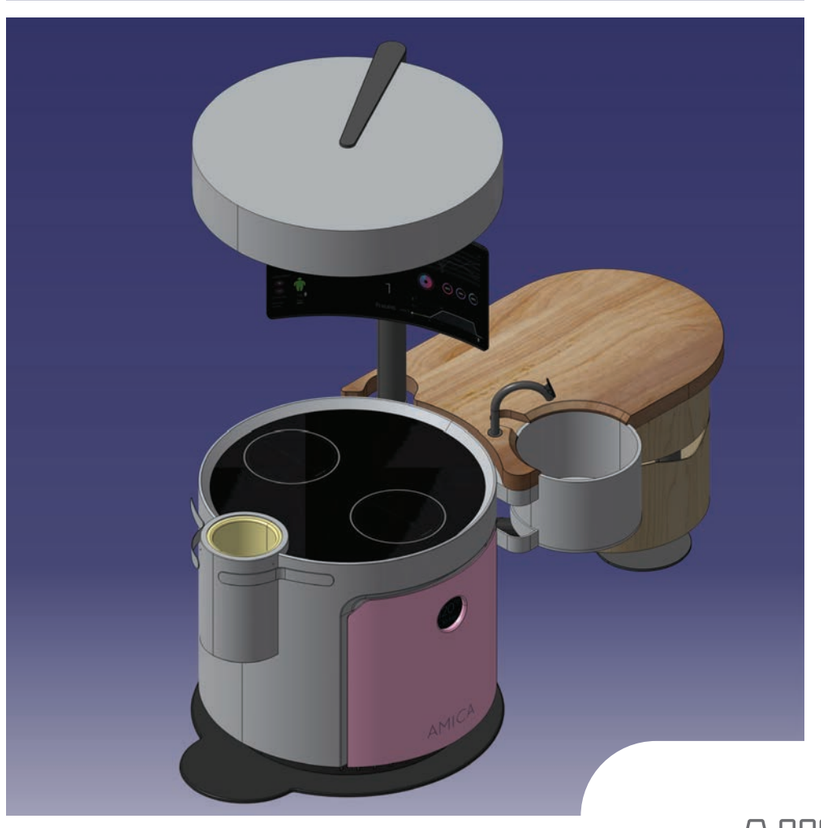
Top View



Side View

DMU Captures

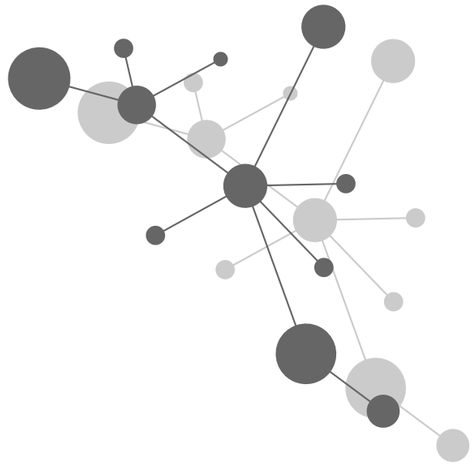
Isometric Views



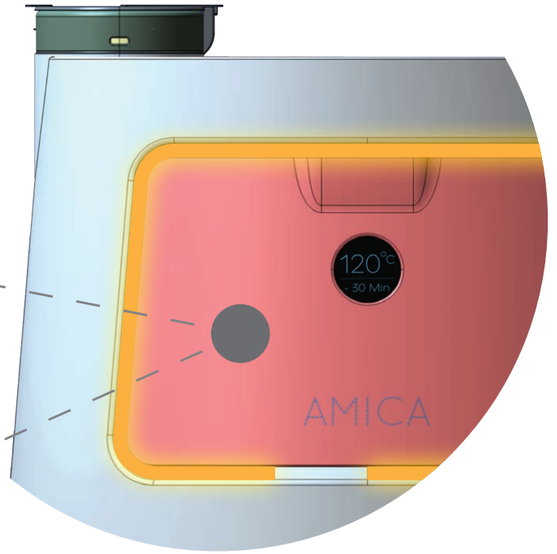
Isometric View

Perspective View


i20°c
30 Mn
AMICA

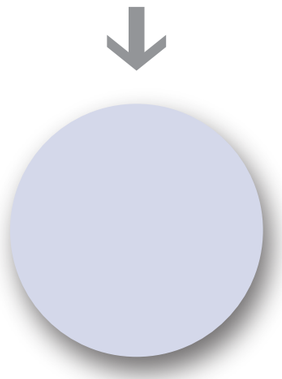


Colour Scheme



The main body of the stove is painted in a neutral, reflective color coating. The purpose is to make the LED light visible even in daylight.

FUN+CLEAN+GREEN



Material Matching - Solid and Traditional

Oak Wood

Solid Weathered Oak Wood

Maple Wood

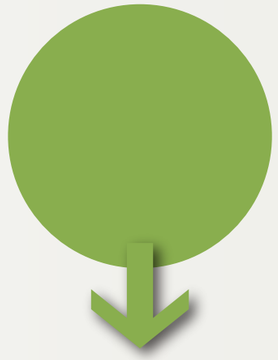
PANTONE Neutral Gray 4 U

Contrast Color

Soft Color Range

Green

Greenery	To add a complementary tone for a soft vibe.
Values	Natural Fresh Healthy Joyful Relaxing



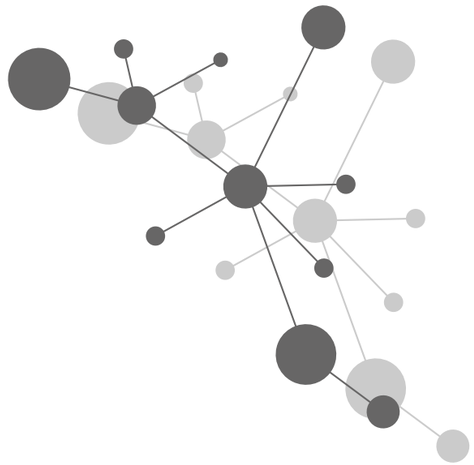
TRUST

Secondary Set (Soft Tone)

PANTONE 12-0105	PANTONE 14-0627	PANTONE 16-0439
Bone White	Shadow Green	Spinach Green
PANTONE 17-6009	**PANTONE 18-0430**	**PANTONE 14-3911**
Laurel Wreath	Avocado	Purple Heather

Stove Unit - Soft Color Range

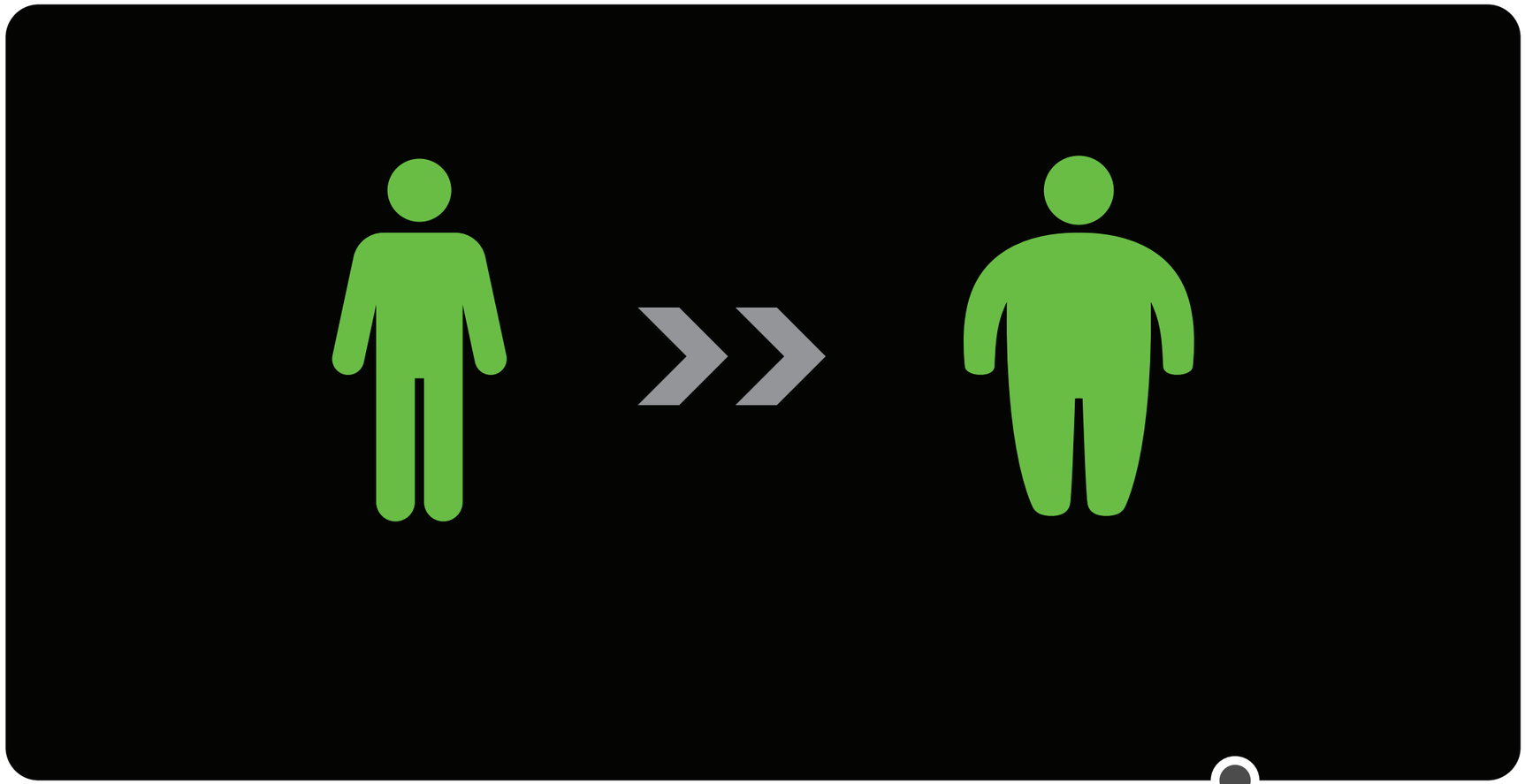

4
1
AMICA
120°c
30 Min



User Interface

UI Concept

Interaction

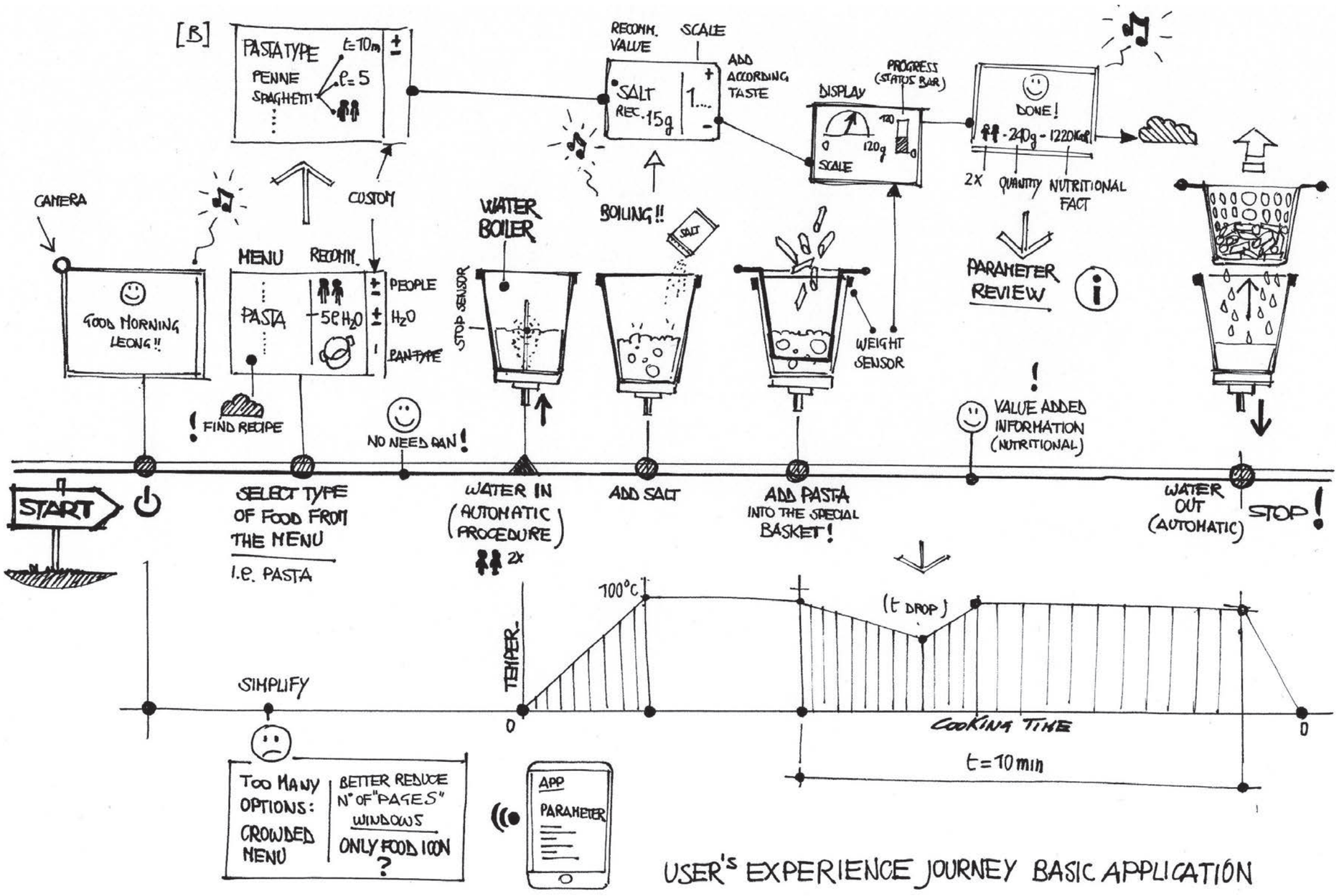


Interaction Driver: Cause-Effect

Excessive consumption leads to weight issues.

Background - Black OLED

There is no back-light to reduce energy consumption.

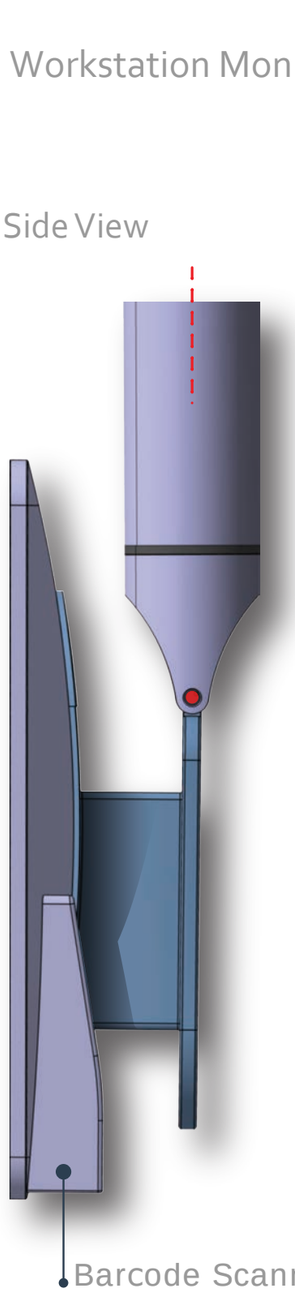


Early Proposal of an Experiential Journey

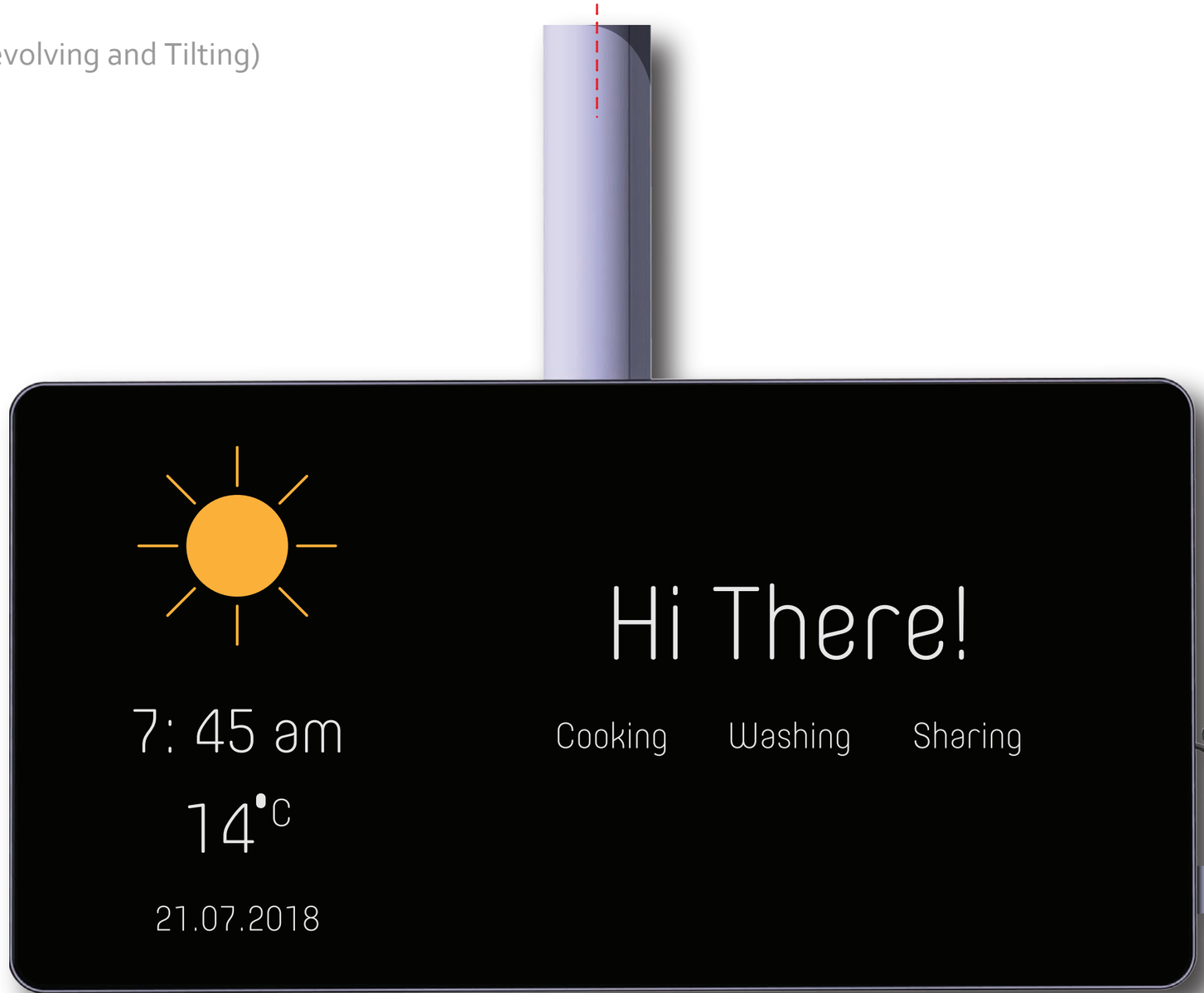
The user's interaction with the boiler and basket

Workstation Monitor (Revolving and Tilting)

Side View



Barcode Scanner



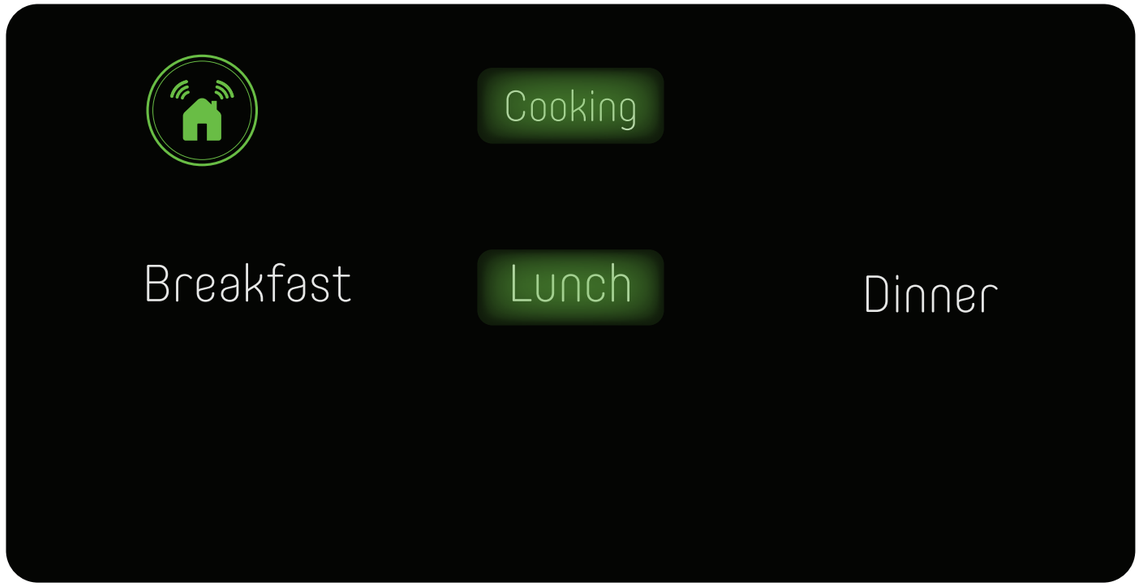
Front View

pH Meter

Navigation

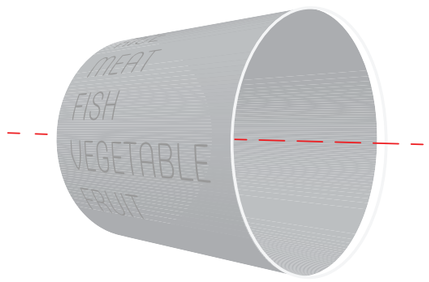

Back
Skip
HOME
Connected


14°C
21.07.2018
Auckland
Hi There!
Cooking
Washing
Sharing

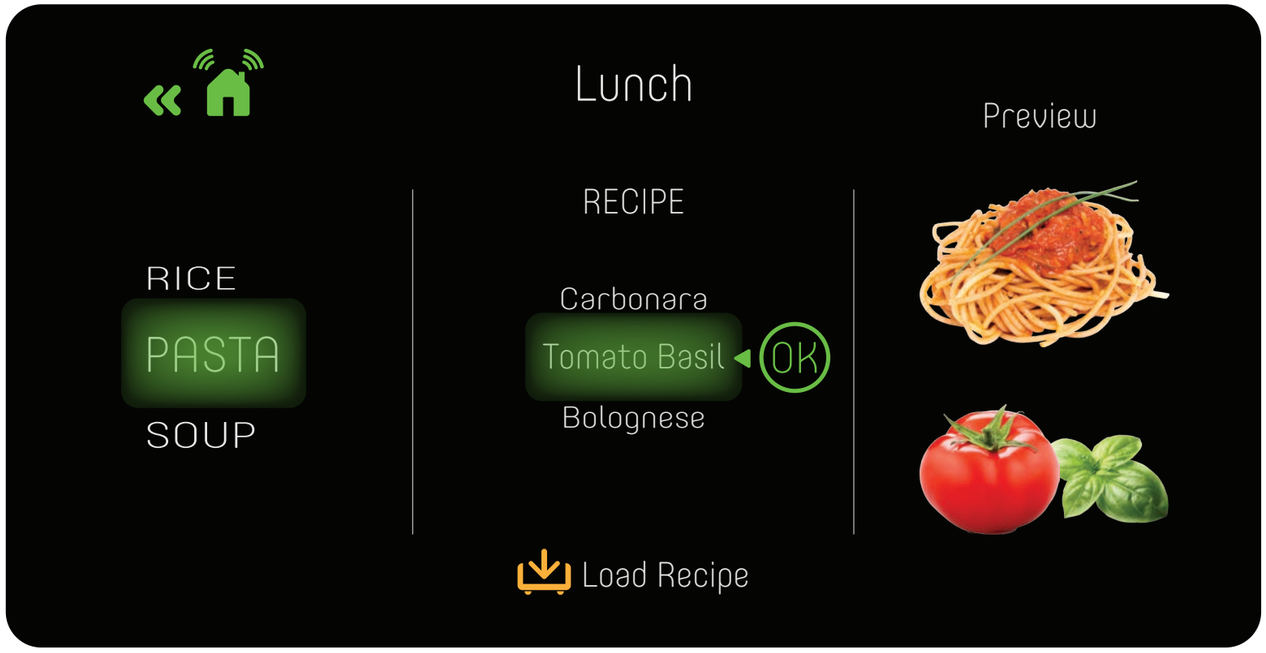

Cooking
Breakfast
Lunch
Dinner

Dish and Recipe Selection

PASTA
RICE
MEAT
FISH
VEGETABLE
FRUIT

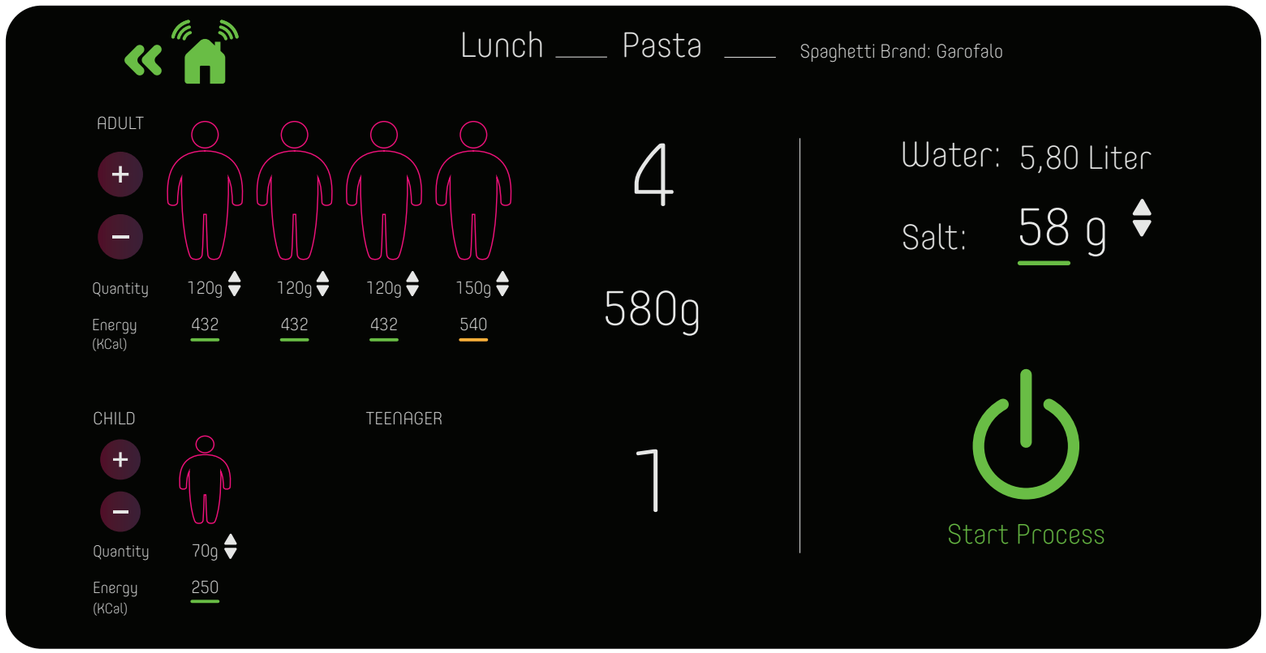


or ADD your Favourite



Define Quantity

Start Processes

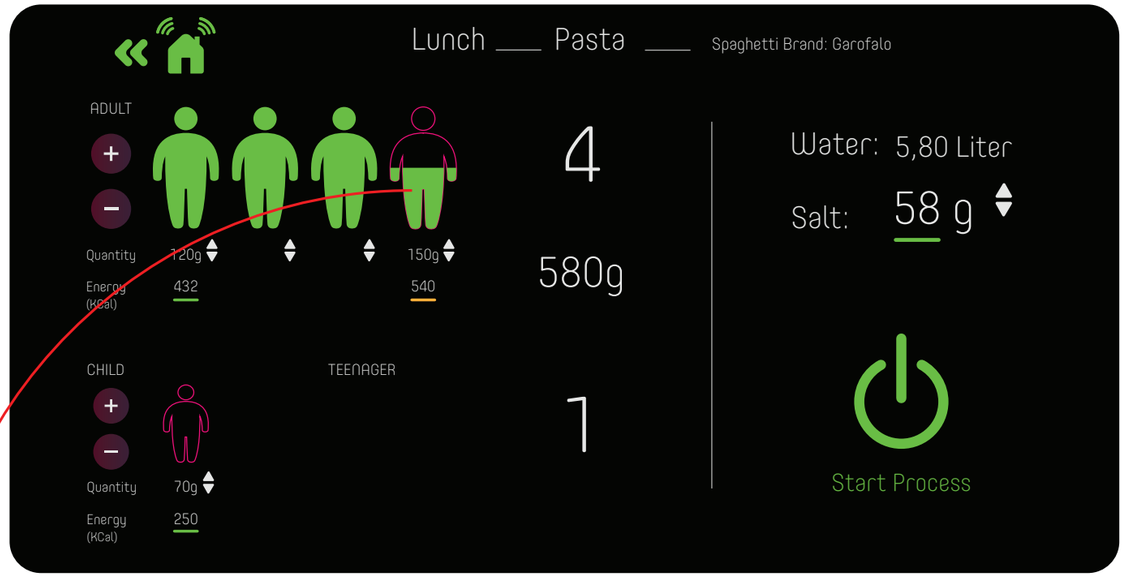


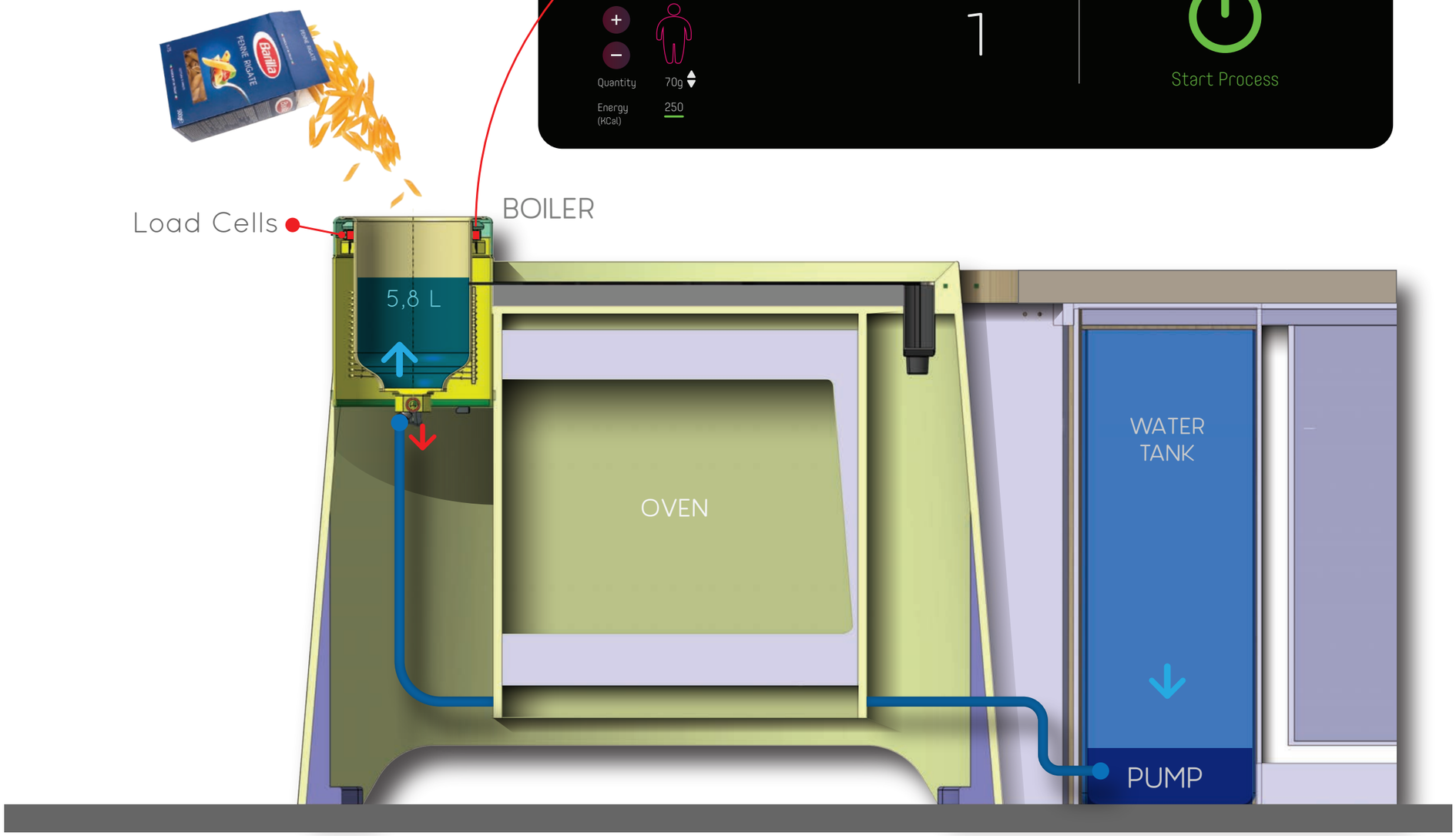
Automatic Procedure

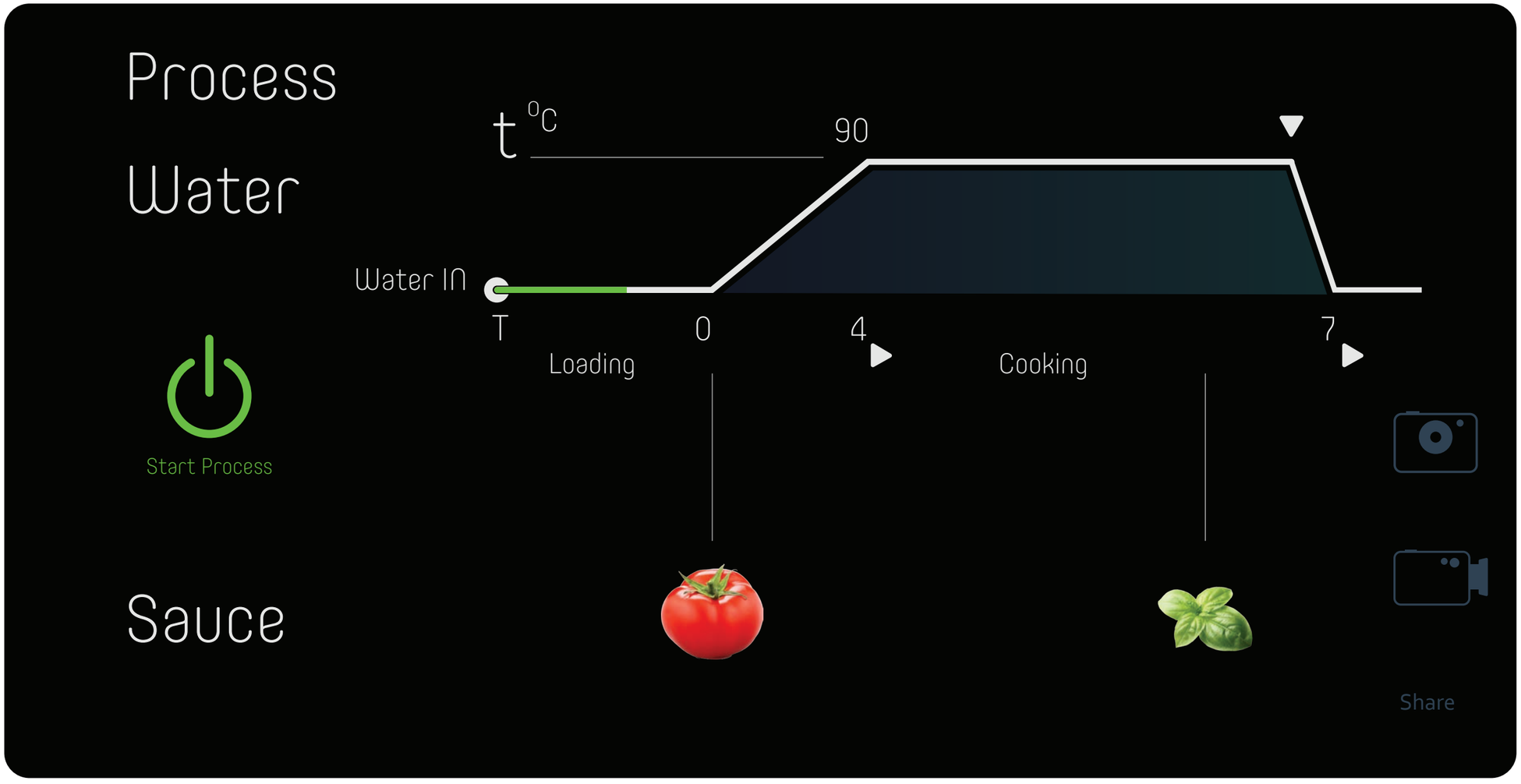
Start Process

Starting the process, water will be automatically pumped into the boiler.

Real-Time Feedback



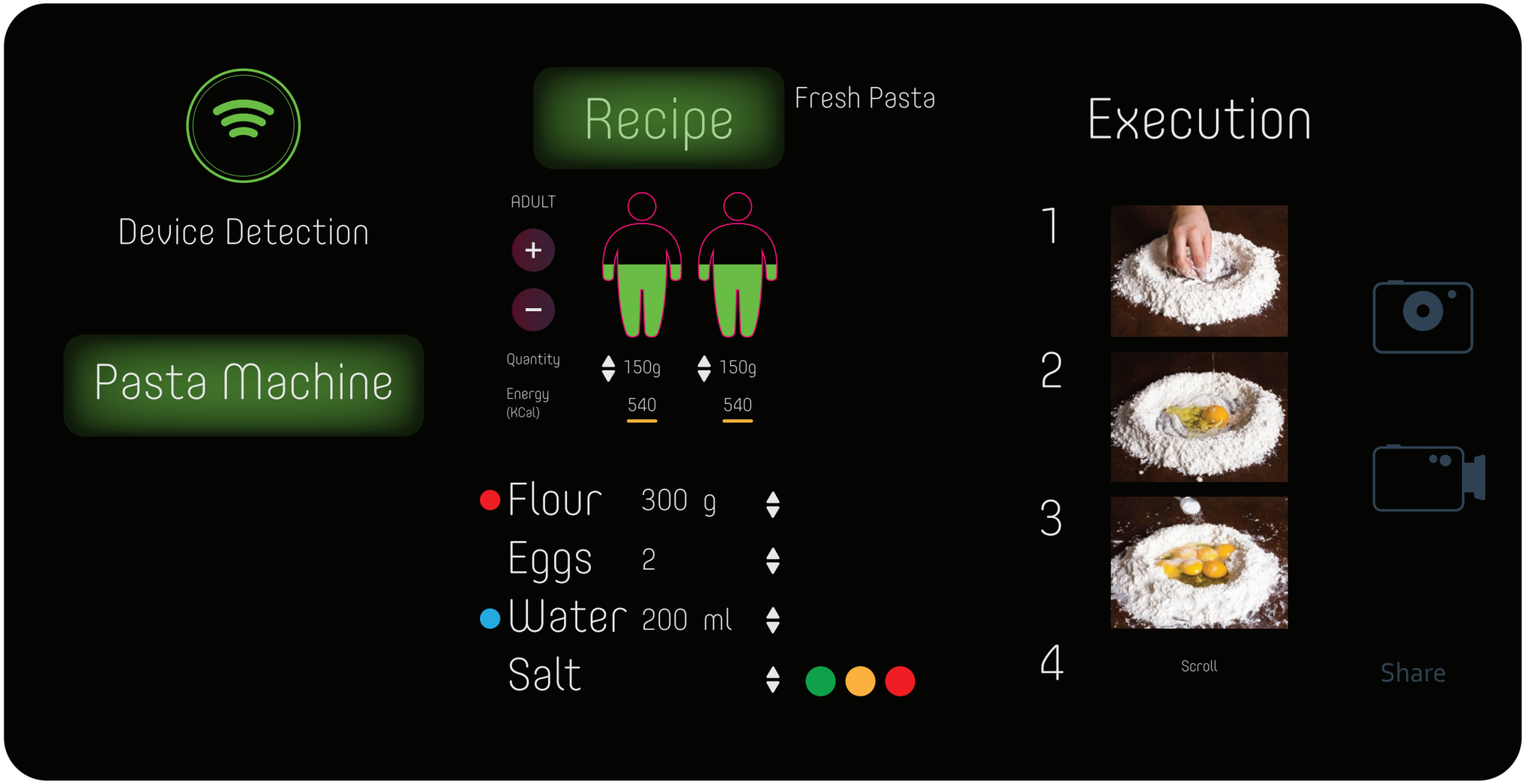




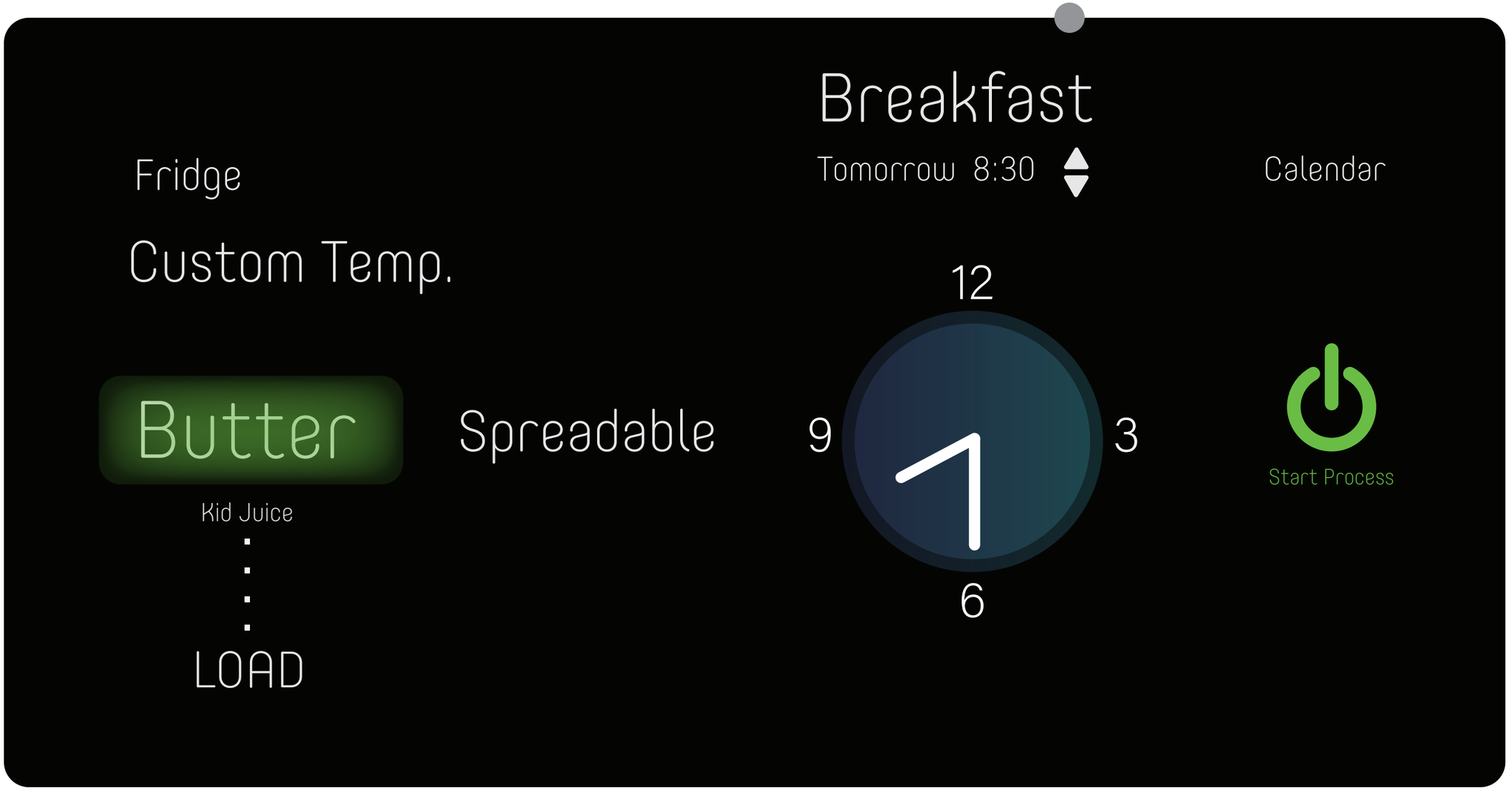
Cooking Process

Recap

Summary of Information and Statistics



Device Detection and Automatic Procedures



Preparation Timing and Settings

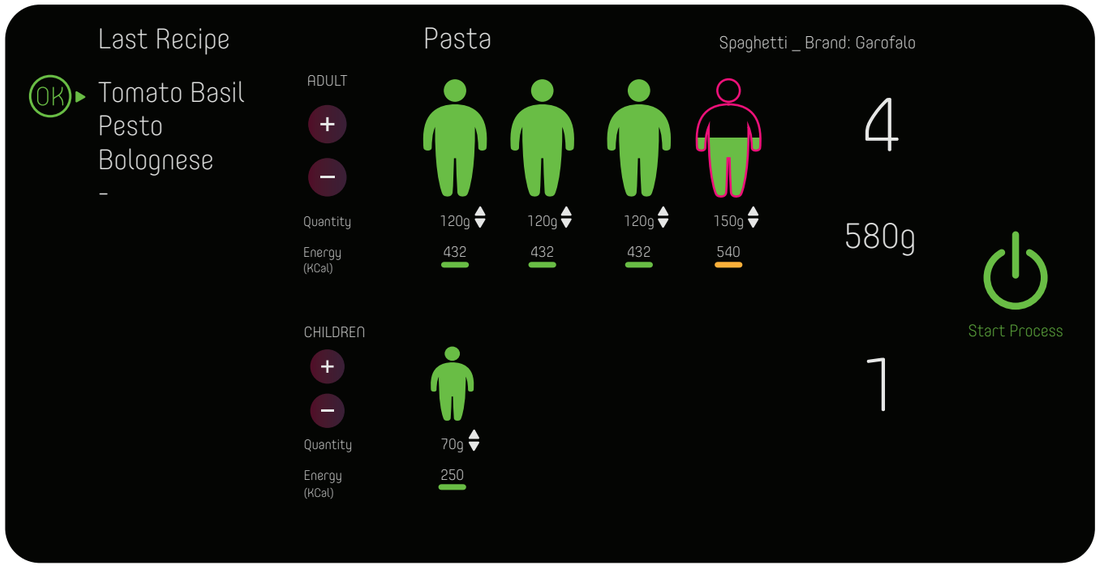
Automatic Recipe Recall

Previous settings associated with specific products can be recalled automatically via barcodes.

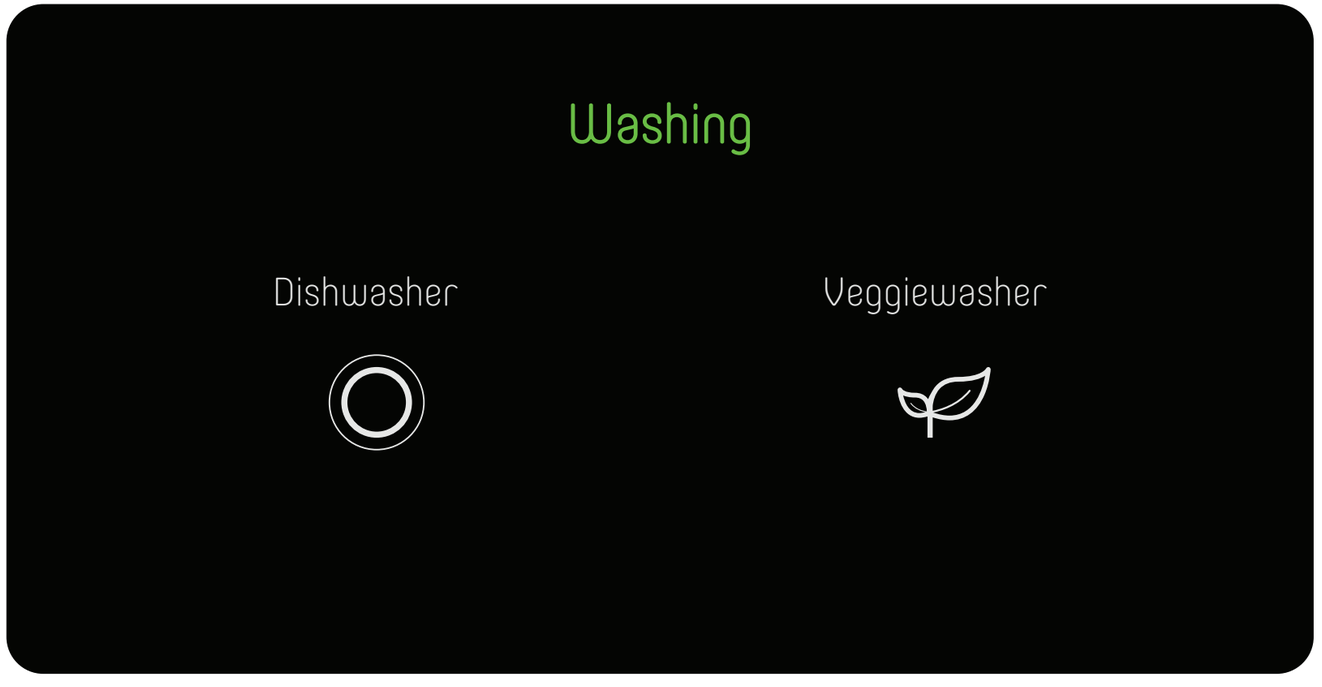
Recollection of Last Recipe Using Spaghetti (associated with the brand)

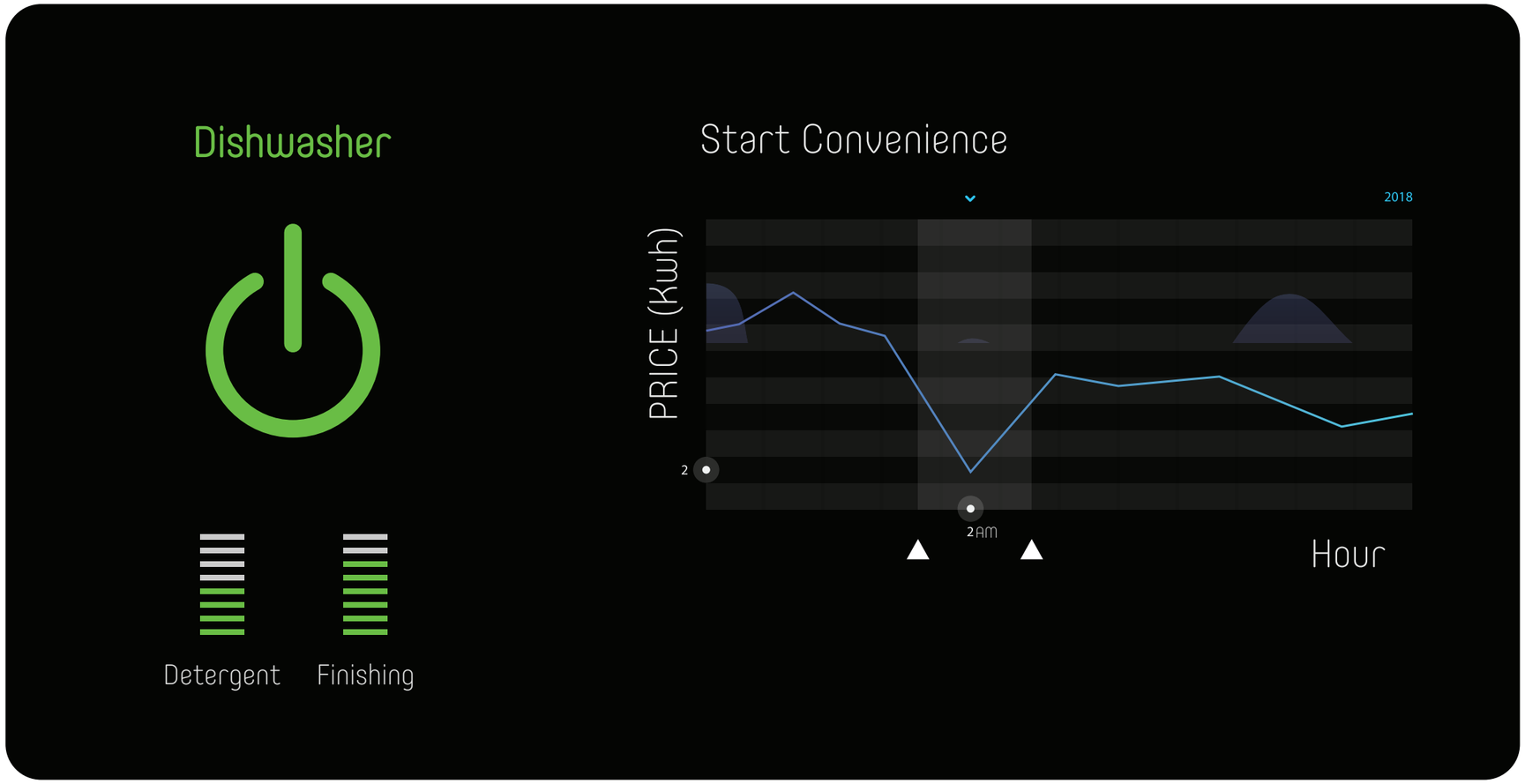
Adjust Quantity

Start Process

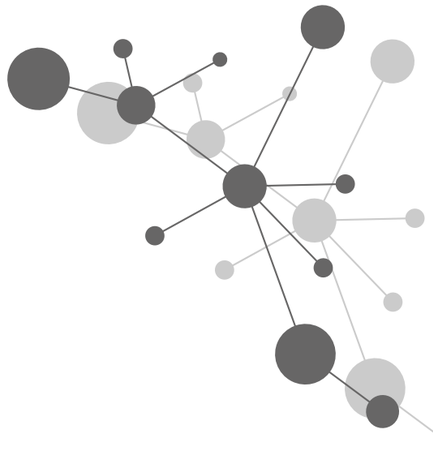


Other Processes





The washing process is automatically started when it is more convenient or cost effective such as off-peak times.



Findings & Conclusion

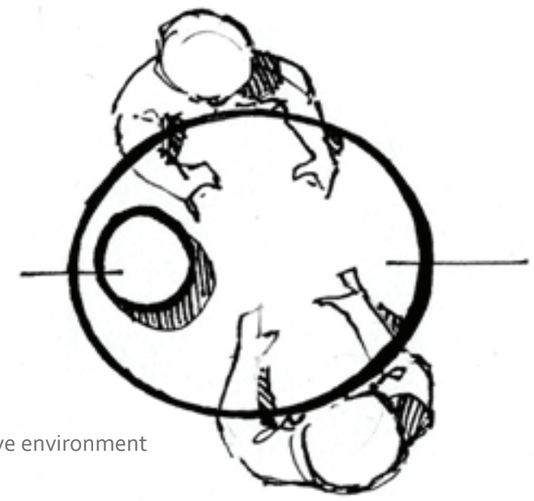
Findings

The research was conducted as an attempt to provide a solution to the problem of the loss of knowledge of everyday life (in this case cooking) within globalized societies prone to insipience (Stiegler 2013). The solution that has been proposed through this research is a tool capable of re-activating and augmenting people's capacity, by incentivizing cooking practices that are assisted and supervised.

Thus, the research was intended as a contribution to re-thinking the cooking experience, to defining the current functional limits of conventional kitchens, and to instructing the design process for a better collaboration between users and their technological device. In the development of the research, it became clear that cooking is a relevant form of practical knowledge,as well as an act of socialization. Consequently, in this research the kitchen has been intended as a 'domestic place' wherein people produce food along with culture. Thus, the scope of the research was not only to offer a feasible solution for the cooking devices of tomorrow, but also to elicit critical reflection on what cooking means, how it has 'shaped' humans throughout their evolutionary journey, and consequently the impact that it has had on our domestic habitats and behaviors.

According Auger, the speculative design practice can be instructed by 'placing the new technical object into a domestic landscape' (Auger 2013 p4). However, the incorporation of this speculative proposition was not fully realized in my research, as the domestic landscape that situates this research (the kitchen) has been historically criticized and considered to be at the end of its evolutionary path.

Thus, the design concept was not placed in a familiar or logical reality (Auger 2013), but in a new 'cooking context' where personas were used as a means to ask for new forms of incorporation and collaboration. The new cooking context was placed in the next 'post-digital' age, a 'human +' scenario (Russo 2019) in which technologies are adapted to offer an increasingly personalized experience ('get to know me') and are deployed to support individuals in achieving human goals and values (Tufekci 2017).



The collaborative environment

Here, new forms of 'collaborative intelligence' characterize the modalities of human-machine interaction (Accenture Tech Vision 2019) with the purpose of augmenting human capabilities and incorporating cooking into future daily life.

The design concept that was identified thought this research is grounded in this 'space,' and it is conceived to be harmonious with anew domestic, cultural context. Like Dunne and Raby's furniture-robot, the design solutions developed here were conceived to accommodate assistive technologies into the cooking station, and while it features advanced functions, it aims to still appear familiar. This sense of familiarity was a key design driver throughout the research, with the intent to establish an empathetic response with users. Consequently, a comforting appearance evoking a sort of 'grandma' feeling was explored, which aims to engage users' emotionally,and to make the system more approachable and intuitive. When undertaking the initial development of the concept, I soon realized I required new forms of collaboration to be embedded into the cooking experience. Therefore, the users' experience remains at the center of the cooking process, with the users' senses forming a fundamental component of recipe execution.

What emerged is a relevant form of 'assistive' cooking ('make it together'), around which the design process started.

The outcome is a cooking platform, a scalable, open system conceived to augment, not replace, human capabilities. Thus, the platform is interactive and assistive, but not robotic.

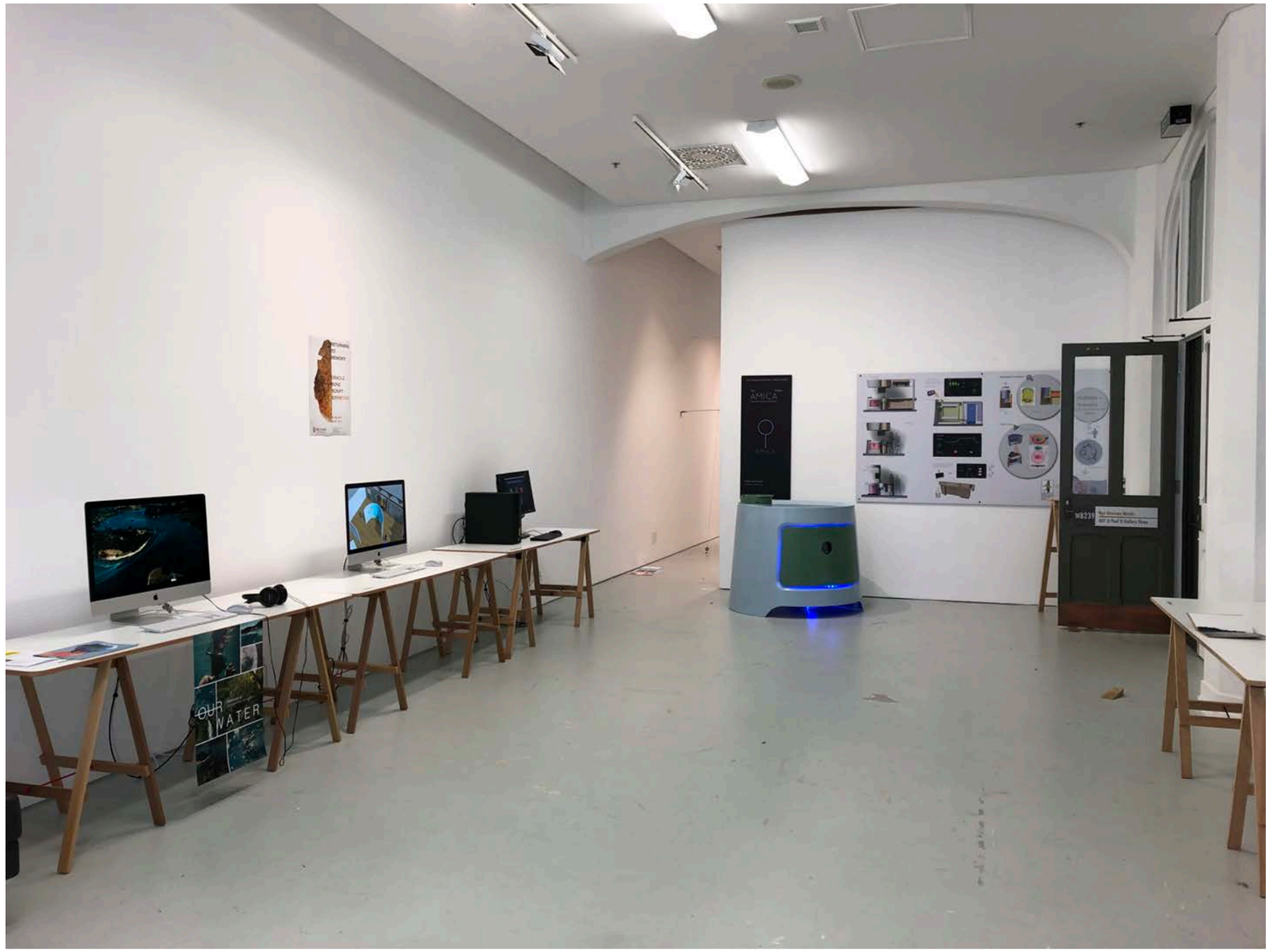
The platform is a stand-alone workstation that assists users with guided cooking procedures and basic on-board recipes. Users will ultimately customize and the system will memorize cooking parameters according to their preferences. The station's sensors, which inform users with real-time feedback displayed on the main monitor, control the cooking parameters (weight, temperature, and time) and support the recipe execution. This interaction defines how the machine and users collaborate while cooking. I started from a simple recipe breakdown, and found that it was possible to separate labor-intensive operations from those involving the users' senses. In this concept, labor-intensive operations are considered as being wholly automated, while those involving the senses are design to besupervised by the system, for the purpose of reducing the users' mistakes and stress. This creates a system where different cooking functionalities are merged into a single device. For example,the boiler can perform several cooking techniques, from a simple steaming to a sous-vide, vacuum-sealed slow cooking. This integration not only reduces labor, but also makes cooking more efficient, minimizes the use of pans and increases safety. In addition, the recipes are easily scalable, with the system adapting the cooking process to the weight of the ingredients. The system's sensors are also open to the possibility of appliances using different cooking rules or criteria, resulting in the optimization of time and energy. Centralizing water distribution into the station is essential to perform labor-intensive operations automatically, as well as for sanitation procedures. In a 'human+' scenario, it is easy to forecast the intensive use of autonomous vehicles delivering food 'on demand' directly to the home. Therefore, the space dedicated to food storage is minimized in accordance with the principle of 'just in time', using only the quantity of ingredients required for a meal.

A small, cylindrical, suspended fridge is included to store leftover food and those products requiring low-temperature storage (e.g., dairy products). A station of this nature can evolve with its users' experience. The system can be implemented according to the users' desire for customization and then completed with a wide ecosystem of dedicated 'plug & play' appliances, as well as dedicated cooking content(e.g., recipes, tutorials, and companions).
Furthermore, the system interface informs users about the caloric content of recipe ingredients, allowing them to make healthier choices and to meet nutritional standards. This interaction with the system can contribute to reducing food waste. Information about ingredients, such as their quality, availability, and price in marketplaces, can be tracked via barcodes. The station can be acknowledged as a comfort solution because it is able to memorize users' habits, such as their desired serving temperature for dishes and raw ingredients, whether they prefer a spreadable butter for breakfast, or if a certain wine should be paired with a planned meal.

Conclusion

Auger (2013) stated that one of the purposes of speculative design is to shift the discussion on technology beyond the fields of experts to a broad popular audience. To elicit the popular audience's reaction, the human mind must be carefully manipulated via 'perceptual bridges.' (Auger 2013, p3). In this research, I did not use fictional materials, such as observational comedy or horror films, as a source of inspiration. To instruct the 'design for the context' perceptual bridge, I relied on the historical evolution and criticism towards the kitchen and the cultural significance that cooking can have if placed into a new context. Therefore, the design proposal presented here could suffer from a lack of audience reaction since its outcome can appear too familiar to them, failing to engage their involvement. Thus, the research is more user-centered than audience-centered.
When I started to develop this research, a significant tension emerged between two competing interests: the person, or ideal user, at the center of the design process and speculation about the future of cooking. As a designer/researcher caught between these, my inclination was to focus on the physical artifact at a human scale. This impulse occurred as a result of considering users as a key component of recipe execution. This simple assumption implied that in order to enhance users' experience, cooking practices have to be supervised and assisted, thus giving users more opportunities to focus on the sensory aspects of cooking. Therefore, the research outcome resulted in a "pragmatic" solution that is more experimental than provocative. It is an indicator of a solution for the near future to aid cooking, but not the speculative critique that I set out to produce. Instead, I offered a feasible solution, based on emerging generational behaviors and needs.
In adopting this approach, I have simplified the speculative method, assuming that anything can be of a speculative nature if placed outside of a convention by which, for historical reasons, an object, rather than an idea or a theory, has been confined until it is no longer capable of evolving. I defined this area as a "Qwerty Zone". This simplification occurred mainly because I did not find a more appropriate 'Perceptual Bridge' that would be able to drive the audience engagement with the argument.
In part, this was due to the emergence of psychological implications in the methodology that I was not able to assess at the time. In fact, I found avast corpus of literature available on psychological studies about emotional transference mechanisms in single individuals. Under certain circumstances, they consistently experience a state of complete absorption and focus towards arguments or activities (Csikszentmihalyi and Nakamura 2002). Moreover, these studies emphasize that a positive experience is acting as a beacon of incentive to decide in favor of similar actions in future decision-making processes. The engagement of individual people is triggered by the pleasure that they are experiencing while they are making something. Conversely, I was not able to find consistent studies on mechanisms to induce a collective reaction from an audience without taking the risk of fictionalizing the research. Auger solution, based on Freud studies, is about to engage the audience by provoking a state of 'desirable discomfort' (Auger 2013 p4). This discomfort is a paradoxical reaction (defined by social psychologists as "cognitive dissonance") that humans may experience when facing something which is familiar but at the same time foreign as 'uncanny'. Thus, I was unable to articulate a research that was able to both trigger pleasurable experience on individual basis while being able to provoke a desirable discomfort at the scale of a larger collective audience.
As a consequence, the "AMICA" system was therefore conceived to be collaborative, designed around a persona made up of two or more people cooking together, constantly interacting with the machine. This conception, if related to the user's dynamics in the contemporary kitchen, serves as a strong subject for further "speculative" research.

Exhibition



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