LAB University of Applied Sciences

Lunawood C grade

What do we do with it?

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Abstract

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Title of the thesis

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Abstract

The aim of the thesis was to develop ideas how to utilize the C grade and sample studio offcut pieces of Thermowood for the company Lunawood. Furthermore, reasoning for the utilization instead of its disposal was researched and worked out.

First, the material Thermowood was explained and afterwards, the sustainability aspects were studied by the examples of the Zero waste movement and circular economy production.

To determine appropriate products made from the C grade and offcut pieces, brainstorming sessions and a survey were done. Two fitting solutions were found and further developed. In order to visualize the ideas, real prototypes were made at the wood laboratory.

Keywords

Thermowood, C grade, Side product, Sustainability

Contents

1 Introduction

This thesis was made in cooperation with the company Oy Lunawood Ltd. Lunawood is the market leader for thermally modified wood and has its headquarters in Lahti, Finland. The company produces sustainable, chemical free Thermowood from Nordic Spruce and Pine. The raw material comes from renewable and PEFC certified Finnish forests, and the average transportation distance is only 235km to the mills in Iisalmi and Kaskinen. Lunawood employs about 145 people and was founded by the brothers Olavi and Aulis Kärkkäinen in 2001.

By 2021 Lunawood had a production capacity of 172.000m³ per year. About 2% of the production volume are graded as C quality, which goes to energy waste. Since Lunawood Thermowood is a very sustainable material and the company itself has very sustainable values, new end uses for this waste material were researched.

In the beginning of this thesis, the sustainability aspects of the topic were researched. To make the Zero waste movement and the circular economy approach more tangible, company examples were described. Additionally, companies that already successfully utilize their waste products were given. This is done to show that it is possible to produce valuable products from production waste and side streams.

The main topic was to develop two different products made from the C grade pieces and the sample studio off cuts. To find ideas, brainstorming sessions were held, which then led to a survey that was sent to all staff members. Based on the results of the survey and further brainstorming, the two final products were chosen and subsequently prototyped.

The different sizes of the C grade pieces and the sample studio off cuts, as well as the form of them, limited the product options. In the end, two very different products were developed.

2 Thermowood

2.1 Thermal modification process

The thermal modification process happens in three phases. During the first phase, which is about 25 hours long, the wood gets dried until it has about 0% moisture content. To do this, the temperature inside the kiln is heated up rapidly to 100°C. After the moisture is out of the material, the temperature is slowly increased to 190-212°C. At this point, steam is added in the kiln to prevent the wood from cracking and burning. The second phase is the thermal modification. It is the shortest part of the process, but also the most important one. Depending on the outside temperature and wood species, the temperature stays this high for 3 to 5 hours. The chemical and physical changes happen due to the thermic degrading of the hemicelluloses. During phase 3, the kiln gets cooled down and the moisture content is adjusted with a water spraying system. In the end, the moisture content of the wood is between 4-7%. In figure 1, the whole process is visualized. On the y axis, the temperature is shown and on the x axis, the hours of the process. (Oy Lunawood Ltd 2022a & 2023.)

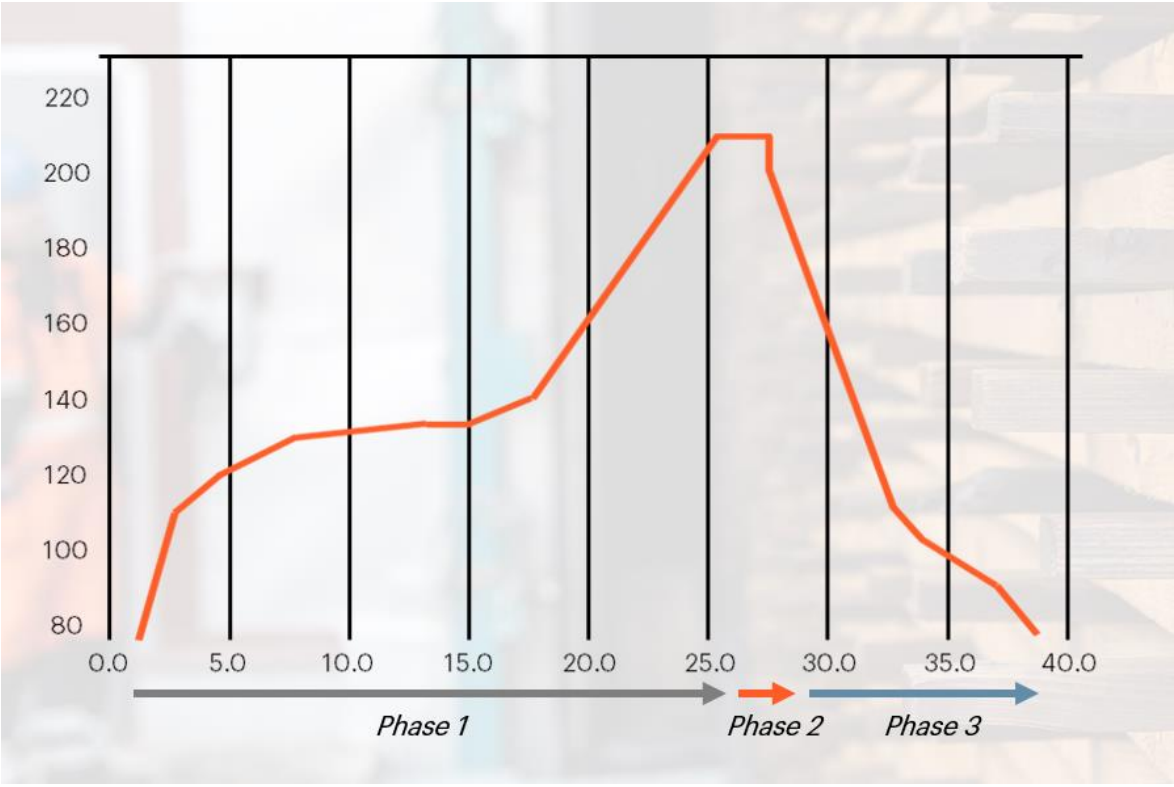

Figure 1: Thermal modification process (Lunawood 2023)

The process has been patented and the trademark Thermowood® was launched in the late 1990s. To ensure the quality, the process is audited three times a year and in the case of Lunawood Oy, additionally 10 samples of each kiln load get tested.

Throughout the whole process, no chemicals are used. In the end, the properties of the wood get improved, which makes more application options possible. Especially improved are the durability and dimensional stability. Since there are no chemicals involved, it is also a very sustainable product and ecological material choice. Thermowood is suitable for all climates and does not require any surface treatment. If it is left untreated, due to UV radiation and moisture, the wood will turn silver grey over time without losing any of the thermally enhanced properties. (Oy Lunawood Ltd 2022a & 2023.)

2.2 Difference Thermo S and Thermo D

Thermowood can be made with different temperatures and duration. Depending on that, it is either Thermo S or Thermo D. Thermo S stands for stability and it is produced at a maximum temperature of 190°C. Since the thermic degrading starts at 200°C, the Thermo S products are not as much modified as the Thermo D products. Therefore, they are lighter in colour and are supposed to be used only in indoor applications, as it cannot resist the weather conditions as good as Thermo D. The weather resistance, dimensional stability and darkness properties of Nordic softwood like spruce and pine, which is used by Lunawood, are enhanced but not significantly. Nordic softwood Thermo D, which stands for durability, is produced at a temperature of 212°C. At this temperature, the weather resistance, dimensional stability and darkness properties get enhanced significantly. In figure 2, the colour difference between Thermo S and Thermo D is visible. The company Lunawood does not produce Thermo S products anymore. (International ThermoWood Association 2021.)

Figure 2: Thermo S and Thermo D (International ThermoWood Association 2023)

Thermowood is especially fitting in Saunas, since there is no resin in the material. This means that no matter how humid and hot it gets, there is no leaking of resin on the Sauna benches and walls. Additionally, Thermowood is a very hygienic product that is even suitable for people who are prone to wood related allergies. Thermo S and Thermo D are

both possible to be used in Sauna applications. When mixed, the two colours can create a beautiful natural charm. A mix of Thermo S and Thermo D in a home Sauna can be seen in figure 3.

Figure 3: Sauna with Thermo S and Thermo D (Lunawood, Sami Tirkkonen 2023)

2.3 End uses of Thermowood

Thermowood does not necessarily need maintenance to offer a long service life. Only if the original colour should stay, a tinted surface treatment agent is required. Due to this fact, Thermowood is a popular choice for various end uses. The most common applications are on deckings and facades. There are many ways to design them, for example with battens or profiles with a pattern, as the Luna Triple profile of Lunawood, seen in figure 4. (Lunawood 2021.)

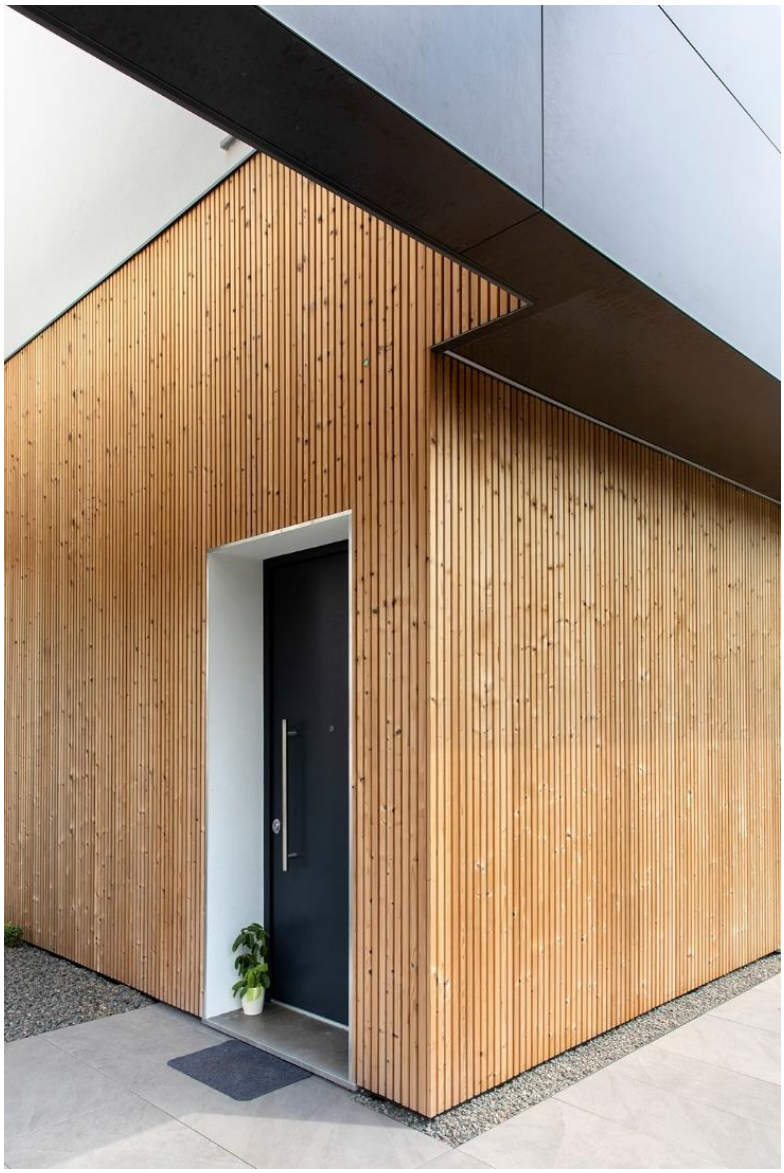

Figure 4: Luna Triple (Lunawood, Illaria Zennaro 2023)

Another very common use of Thermowood is for Saunas and interior. Especially the soft surface feeling of Thermowood is an important feature why it is used in Saunas or other interior applications. Since there are no chemicals involved in the manufacturing process, it is a safe choice in humid areas like bathrooms and saunas, as well as around children and pets. The 3D patterns are additionally convenient to create eyecatcher walls. The Lunawood Luna Aalto profile, shown in figure 5, makes a beautiful wave optic that changes depending on the angle of the light shining on it. (Lunawood 2021.)

Figure 5: Luna Aalto (Lunawood 2023)

A third end use of Thermowood is for industrial projects. This can include everything from pavilions, over fences up to furniture for indoor and outdoor use. These projects and products usually do not use any standard profiles, but specifically tailored sizes. Thermowood is a great material for these projects as it has a soft surface and can withstand the harsh weather conditions outside, without failing after a few years. One example for this is the Vaarni outdoor furniture collection made from Lunawood Thermowood, visible in figure 6. (Lunawood 2021.)

Figure 6: Vaarni outdoor furniture (Vaarni 2023)

Next to the Thermowood from Nordic spruce and pine, as Lunawood produces, there are also other wood species and wood-based panels that can be thermally modified. For example, thermally modified plywood or boards from thermally modified recycled timber, such as particle boards. These can be used in various applications. One good example is the new Artek 90th anniversary version of the iconic Stool 60. The Stool 60 Kontrasti, seen in figure 7, has thermo treated birch veneer sheets in contrast to the normal birch wood. This shows, that Thermowood even caught the eye of high-class furniture Designers. (Artek 2023.)

Figure 7: Stool 60 Kontrasti (Artek 2023)

2.4 Grading system

The different panels and battens are sorted into three qualities: A, B and AB. When a piece does not fit any of the three qualities, it is discharged as C quality, which is the material used in this thesis. A quality is separated additionally into indoor and outdoor use of the product. For B and AB quality, there is no difference between indoor and outdoor use. (Oy Lunawood Ltd 2022b.)

For planed products, only A and B quality are available. AB quality is just existing for Thermotimber, which is thermally modified wood which is not planed or further processed into the Lunawood profiles. Thermotimber is mostly sold by Lunawood in AB quality and is simply a mix of A and B quality pieces. For the planes products, mainly A quality is sold. If it is ordered specifically, also B quality pieces can be purchased. (Oy Lunawood Ltd 2022b.)

The internal grading criteria of Lunawood are stricter than the Thermowood Association demands.

3 Sustainability

The general definition for sustainability is that today´s economy should provide everything that is needed but without taking the ability of future generations to live at the same standard or better. The original thought behind this came from the German mining administrator Hans Carl von Carlowitz, who published a 300-page treatise in the year 1713. In his paper, he stated that the forest needed to be managed sustainable in order to keep up with the demand of timber in the future. Carlowitz noticed very early that the short-term thinking for profit would not work for long and therefore developed ideas for a long-lasting supply of wood. Today, sustainability is not only focusing on the forestry branch, but the worlds whole economy. In 1987, the Brundtland Commission of the United Nations wrote about the three E´s of sustainability in their report. The three E´s stand for environment, economy and equity. The Commission explains that for a sustainable living, it is essential that results at all three E´s need to be achieved without forgoing another. (Portney 2015, 1–7; Schmithüsen 2013, 5.)

In today's economy, a sustainable brand is not only important for the environment, but also for a company's brand image. As seen in figure 8, 72% of the Finnish people care about sustainability when shopping for goods. This therefore makes a green image vital for a successful business. Although, the image has to be genuinely sustainable since modern consumers are very aware of greenwashing and how to recognize it. There are different types of greenwashing a company's brand image. Overall, it is always about tricking consumers into believing that a company works sustainable with targeted marketing, while the operations are in reality not sustainable. (Courtnell 2023.)

Often, profit is put over sustainability in a company, but in the long-term, a positive brand image can generate more profit than a bad or neutral image. A sustainable work ethic can improve productivity and the overall employee well-being. Additionally, due to sustainable production styles like zero waste management or a circular economy production, the expenses decrease. It also motivates the staff to think of new solutions, which increases the creativity and leads to new innovations. The importance of sustainability in a business is high and more than 90% of CEOs state that it is crucial for their business's success. The market forces companies to rethink their sustainability approaches and demands a change in operation towards environmental friendlier methods. (Hoffman 2018; Inkbot Design 2022; Young Entrepreneur Council 2018.)

Figure 8: Influence of sustainability on buying behaviour (Statista 2023)

3.1 Zero Waste

The Zero waste movement started with the goal to produce and use as less single-use plastic in private households as possible. Over time it has developed into a movement which is not just meant for private consumers but also businesses of every branch. Companies trying to become zero waste certified need to proof that at least 90% of their produced waste gets diverted from landfills to other use or is not produced in the first place. This can be achieved with the principle of the 3 R´s: Reduce, Reuse and Recycle. With the implementation of the system into a company's production, waste can be minimized to a minimum, for example through proper material handling or using one products waste as the raw material for another. (Laico 2017b; iSustainable Recycling 2018; Unisan Ltd 2020.)

As recent studies show, 62% of all commercial waste is not waste at all and could be used in better ways, as for example selling it for a profit. But selling valuable waste material is not the only financial benefit for a company since less waste also means less landfill fees. Therefore, money can first of all be saved by minimizing the waste fee and secondly, profit can be made by selling valuable side or waste products. A Zero waste agenda and certification can additionally bring positive publicity to the company. This in the end leads to a

better, sustainable brand image which is getting more important in the buying process of the customers. Furthermore, the Zero waste management benefits the environment due to a large decrease of CO2 emissions. (Laico 2017a & 2021; Oster and Associates Inc. 2022.)

3.1.1 Example Subaru

The company Subaru shows that Zero waste management is possible and worth investing in it. In 2002 the company presented a 5-year plan to achieve Zero waste to landfill, which was ultimately achieved in May 2004, three years before it was initially planned. No waste has been sent to a landfill since then. The Japanese car manufacturer has one manufacturing facility in Lafayette, Indiana, and four in Japan. To make the Zero waste management possible, waste gets tracked using barcodes on reusable containers, that can be recycled or reused in other plants or departments. Damaged polymer bumpers get melted and sent back to the molding machines. Cafeteria waste is collected at their own composter and metals from welding slag is separated and resold. The Styrofoam packaging, used for engine parts, is sent back to reuse it several times. According to Subaru Indiana, the Zero waste programme costs around 7,5 million dollars, but also originates approximately 11,5 million dollars in financial benefits. To lead the way in a greener future, Subaru gives away the company's Zero waste strategy to everyone for free. (Guynup 2017; Markham 2021.)

3.1.2 TRUE Certification

The TRUE Certification is a project where businesses, schools, government agencies or non-profit organisations can be certified as Zero waste facilities. The goal of TRUE is to divert as much waste from landfills, incineration and the environment as possible. It is available for any physical facility that meets the seven minimum requirements and more than 31 points on their application form. The requirements to get certified are ranging from an already installed Zero waste policy at the company and on average 90 percent or more diversion from landfills to data documenting and a maximum percentage of contamination level for material which leaves the site. If a certification is granted, it lasts for a year and the business can then apply for a recertification. This also allows upgrades of the previous certification level if more points were gained. To help certification seeking businesses, trained stuff can help and advise on how to reach the Zero waste goals. (TRUE certification for zero waste 2023.)

3.2 Circular economy

The principles of circular economy appear similar to the Zero waste movement, but there are differences. One could say that Zero waste is the desired goal and circular economy is

the practice to get there. With Zero waste, companies try to keep the waste we produce out of the environment while circular economy wants to regenerate the environment. (Recycle Track Systems, Inc 2021.)

In general, the circular economy model reduces waste to a complete minimum and reuse the material instead of throwing it away. With this practice, the amount of new raw materials can be reduced, the loss of biodiversity gets limited, the usage of natural resources is slowed down and, landscape and habitat disruption are decreased. This model is an improvement of the linear economy which has been practiced up until now. The linear economy model was built on cheap and easily accessible materials, and energy, which were available in large quantities. Due to these factors, the practice of planned obsolescence was done by the majority of companies around the world. This means that products were designed with a limited lifespan, in order to force the consumer to buy another one of their products again. In figure 9 the differences between linear and circular economy can be seen. Achieving Zero waste or circular economy as a company also has different meanings. As described in chapter 3.1, Zero waste can be accomplished by reducing waste throughout the production and in the factory, but this oftentimes means that the waste is passed onto the consumer. One example for this is the packaging material. The packaging does not count as waste for the for the company since it leaves the factory. To achieve a more circular economy strategy, the company would need to take the packaging material back and reuse it for new products or as a wrapping. (European Parliament 2015, Recycle Track Systems, Inc 2021.)

Another benefit of circular economy is more independence from other countries resources. Since raw materials and resources are not infinitely available, the EU and every individual country now need to rely on imports from other regions and continents. Additionally, new jobs can be created due to the needed innovations to reuse the existing materials in a secondary life. (European Parliament 2015.)

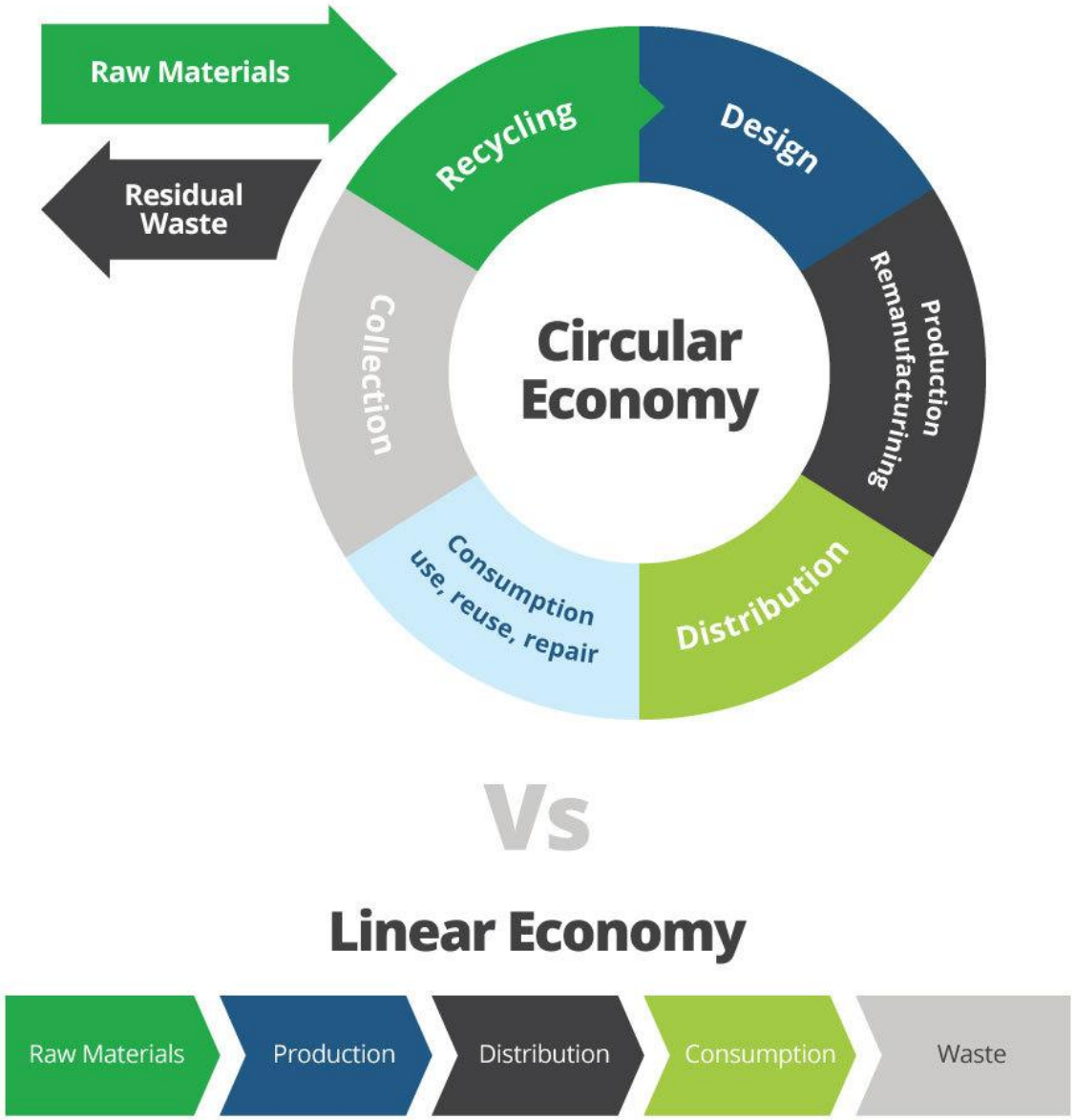

Figure 9: Circular Economy vs Linear Economy (Requis Inc. 2023)

3.2.1 Kamupak

A great example for a circular economy company is Kamupak. The Finnish company offers the service of reusable packaging. Next to the reusable takeaway containers seen in figure 10, this includes a digital deposit and borrow system and environmental impact data. With a 50% market domination of single use plastic, takeaway products are a big player in the plastic industry. This is why the company's founder Iida felt the need to reduce the single-use options with a reusable alternative. (Kamupak 2023.)

Figure 10: Kamupak containers (Food & Beyond Collective 2023)

The containers can be used 100 times on average until they reach the end of their lifecycle. After every use, the containers get returned at a station, where they get washed and made ready for the next pick up. Those stations can be found in offices, restaurants, kiosks, grocery stores, cafes and at events. Bis partner of Kamupak are for example Picnic, Wolt and Koti Pizza. During one lifecycle, each Kamupak product saves up to 6 bags of garbage and CO2 emissions can be reduces up to 72-95% compared to a disposable container. At the end of their lifecycle, the containers get sent back to the manufacturer, where they are recycled as raw material for new reusable containers. In this way, primary raw material can be saved, which saves natural resources, and the environmental impact of the production is decreased significantly. (Kamupak 2023.)

3.2.2 Circular Economy Institute Certification

As for now, most of the certifications regarding circular economy are for individuals and not for entire companies. The Circular Economy Institute started a certification programme for whole businesses, but at the moment it is still in pilot stage. Nonetheless, it is a certificate to ensure that businesses have established an approach for circular economy operation and is working on the implementation of it. Companies certified with this certificate commit to this approach in the long term and prove that they meet the highest standards in effort and commitment when it comes to the implementation of circular economy. The certificate

needs to be renewed every 3 years. The certification process includes in-house training of the employees, the establishment of an internal system with a coordinator and clear goals, and an internal circular assessment. The focus of this certificate is on the whole business, starting at the supply chain up until the end of life of the product. (Circular Economy institute 2023.)

3.3 Companies utilizing their waste

To reach the Zero waste or Circular Economy goals, the production waste needs to be utilized. This is not only a chance to improve a company's sustainability, but also a chance to generate new income. The following two companies show effective ways how to develop a whole new product sourced by a previous waste product.

3.3.1 Stora Enso

Together with the packaging company Pulpex, which is established by the company Diageo who owns brands as Johnnie Walker and Guinness, Stora Enso developed an eco-friendly paper bottle. The bottles are made from wood fiber pulp and are formed by being pressed in a mould. After the forming, the bottles are cured in a microwave oven and later specifically coated to be compatible with the product they get filled with. The wood fiber pulp bottles can be used for various markets, such as home- or personal care products, liquid foods or non-alcoholic and alcoholic drinks. As for now, they are not suitable for carbonated and hot drinks. After use, the sustainable containers can be recycled with paper and cardboard. (Stora Enso Oyj 2021; Roar B2B 2021.)

According to Pulpex, the used wood fiber pulp comes from 100% renewable feedstocks. The bottles carbon footprint is 90% less than virgin glass and 30% lower than plastic. This makes it an actual sustainable alternative to traditional plastic bottles and in cooperation with companies like PepsiCo, GSK Healthcare and Unilever, up to 750 million per year are aimed for. (Stora Enso Oyj 2021; Roar B2B 2021.)

The colour of the bottles is very neutral but can be adjusted to the company's brand image with coloured pigments. Additionally, embossing and labelling are possible on the paper bottles. This can be seen in image 11.

Figure 11: Pulpex bottles (Stora Enso Oyj 2023)

3.3.2 Tapio Anttila Collection

A smaller example for a circular economy approach from the Interior sector is the Renki series from Tapio Anttila Collection. The series has 5 different pieces, which are all made from leftover material of other products. With this approach, the production waste got minimized and a profitable new shelf series has been launched. The company is in general highly invested in sustainability, which is also done by the compensation of each products carbon footprint. The website also lists the carbon footprint percentage for each stage of the product. This means the manufacturing, materials, lifetime and the transport. In figure 12, one shelf of the Renki series is shown. (Tapio Anttila Collection Oy 2023.)

Figure 12: Renki S shelf (Tapio Anttila Collection Oy 2023)

4 Possible new uses

Using waste materials and off cuts is beneficial for Lunawood in different ways. First of all, it reduces the amount of material that goes to energy waste, secondly it brings an additional profit stream and also because it makes the whole production more sustainable.

Lunawood is a big Thermowood company and therefore has a significant amount of waste material and off cut pieces from the sample studio.

Currently, the sample studio off cuts and the sawdust, as well as most of the C grade quality pieces, go to energy waste where it gets burned. A little amount of the C grade quality pieces is taken from the factory staff for personal use.

In this chapter, two alternative end uses for Lunawood C grade pieces and sample studio off cuts, and the development progress are described.

4.1 Brainstorming results

To start the process of finding new end uses for the C grade products of Lunawood, several brainstorming sessions were held. Brainstorming is an idea generating method, where the participants have to say every idea as soon as it comes to mind. To do so, it is very important to set the goal for the outcome in the beginning and every idea gets treated equally. After all ideas are gathered, they get categorised and ranked for their importance. (TWI Ltd. 2023.) For additional help, different area managers were asked to join the brainstorming sessions. The goal was to not limit the idea flow, which is why every thought was written down, also the obviously impossible ideas. In the end, there were 130 ideas, which then got categorized into sizes and amount of needed further processing. The size categories were:

- 0 – 10 cm
- >10 – 30 cm
- >30 cm

After the size division was done, the next step about the needed further processing. For this, the categories were:

- No to little further processing
    - This includes little further processing such as repackaging.
- Medium processing

    - Everything that includes planing, chopping in size or any need of a CNC machine.

- Heavy processing
    - Everything that goes beyond the limits of medium processing.

The full list of all Brainstorming ideas can be found in the attachment.

4.2 Survey

After the Brainstorming, 17 ideas got chosen for an internal survey at Lunawood. It was sent to all staff members of Lunawood in Lahti, Iislami and Kaskinen. This survey consisted of 3 parts. The whole survey had to be answered with the participants personal opinion and preference. In the first part, the participants needed to rate every idea about the fit into Lunawood´s sustainability agenda and brand image. The rating system was:

- 1 star = not a fit
- 5 stars = medium fit
- 10 stars = perfect fit

For the second part, the ideas had to be ranked according to the best business potential. This was done by dragging the ideas in the right order, with the first idea having the highest business potential and the last one having the lowest.

The last part was an open text field for comments and recommendations about the ideas or the C grade pieces themselves.

The survey was open to answer for 2 weeks and in the end 30 staff members of Lunawood answered. After evaluating the results, 7 of the 17 ideas got into the final decision round. These ideas were:

- Kappla / Jenga
- Wooden Toys
- Small stick flooring
- Decking Tile
- Beehive
- Lampshade

- Boardgames
- Shingles

These 7 ideas were chosen by the number of votes that rated the fit into the brand over 5. Additionally, at least 17 votes had to be between 8 to 10. The exact numbers and the business potential ranking can be seen in figure 13. The business potential rating was then part of deciding the actual 2 ideas that got developed further. For this process, ideas that were in the meanwhile already started by someone else in the company, got sorted out. Finally, this lead to the decision of the lampshade and wooden toy cars.

Winners	Votes	BP
Kappla/Jenga	22x 8-10 5x 5-7	2
Wooden Toys	18x 8-10 9x 5-7	5
Small stick flooring	18x 8-10 9x 5-7	6
Decking Tile	18x 8-10 9x 5-7	1
Beehive	20x 8-10 7x 5-7	11
Lampshade	17x 8-10 9x 5-7	8
Boardgames	19x 8-10 7x 5-7	12
Shingles	20x 8-10 7x 5-7	3

Figure 13: Survey results

4.3 Lampshade

The lampshade was chosen as one option since the damages of the C grade pieces cannot be seen that obvious due to the brightness of the lightbulb and because the harsh cracks and knots can be cut away specifically. This is possible as only thin strips of Lunawood Thermowood are needed. For this idea, the sample studio off cuts cannot be used as they are too short.

4.3.1 Idea

The design of the lampshade needed to represent the values of Lunawood. This means that it should be simple, luxurious and Nordic design. To achieve this, a research of Nordic lamp brands and wooden lampshades in general was done, to get an overview of the market situation. Next to extravagant fluid forms made of bent plywood, there is a great variety of designs that show modern, Nordic simplicity. After the research process, the ideation started in form of first sketches. These can be seen in figure 14 below.

All the sketches are very simple but thought through to have a nice shadow pattern when the light from the bulb shines through the single slots of the wood. In this way, the lamp seems like a simple design piece when it is turned off, but when the lamp is turned on, a beautiful interplay of light and shadow can be seen.

Figure 14: First idea sketches lamp

In the end, the second design in the second row of figure 14 was chosen to be further developed. For this lampshade, two eight-sided bowls, the upper one bigger and the lower

one smaller, are overlapping while facing each other. The whole lampshade is 40,5cm high and at the widest point, the diameter is 25cm. The golden ratio was utilized in the proportions to make the product pleasant for the human eye. According to the Museum of Science, Boston (2023.), *the golden ratio, also known as the divine proportion, is a special number (equal to about 1.618) that appears many times in geometry, art, an architecture. The golden ratio is found when a line is divided into two parts such that the whole length of the line divided by the long part of the line is also equal to the long part of the line divided by the short part of the line.*

The proportions and measurements of the lamp can be seen in figure 15.

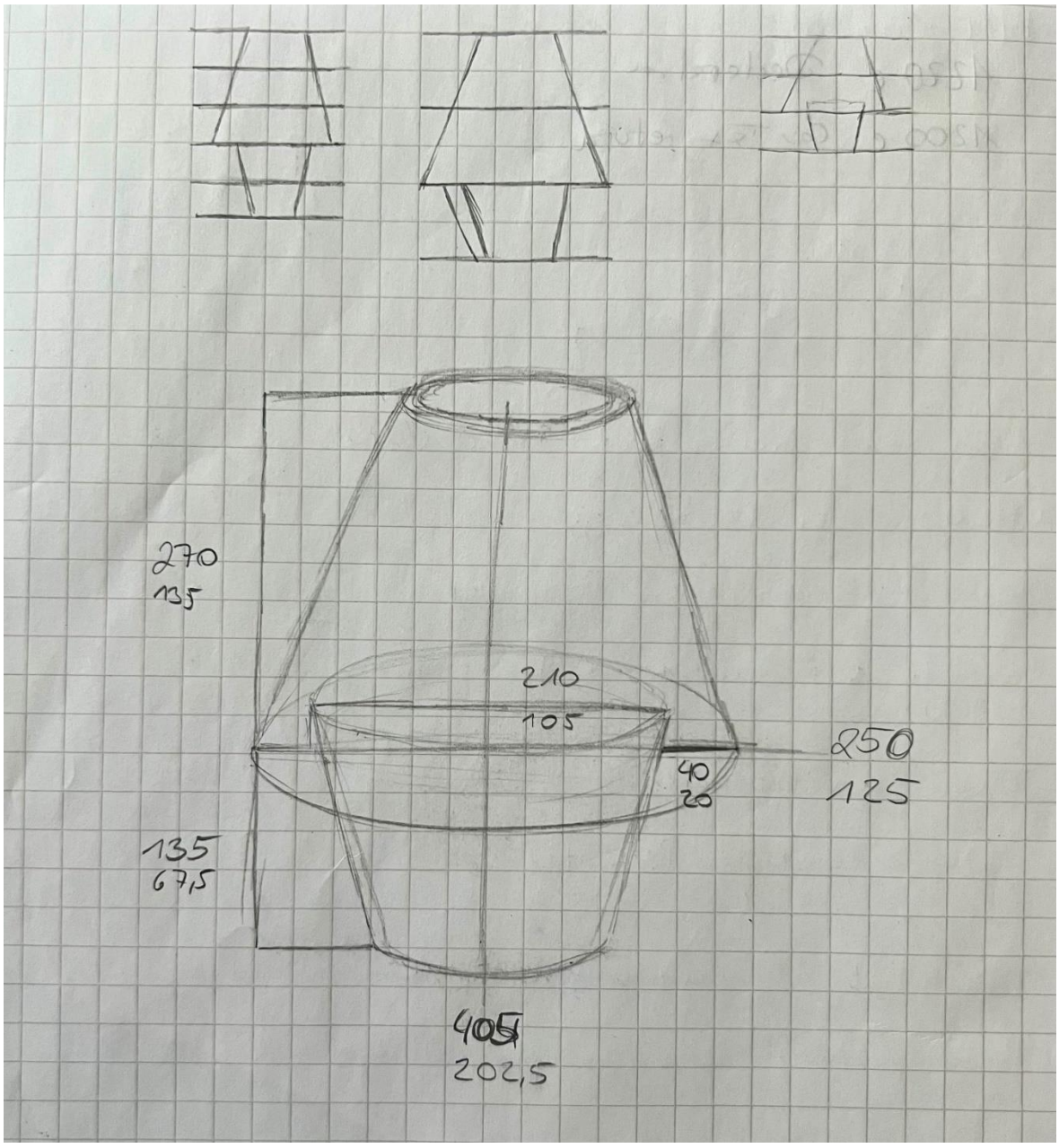

Figure 15: Further sketches lampshade

To showcase the design and how the light comes through the slots, a prototype was made. As seen in figure 16, the lamp creates a very atmospheric light. Due to the darkness of the Thermowood material, the light seems less bright, what makes the room cosier compared to white LED spots on the ceiling. The knots on the panels are not harshly visible and nearly disappear for the eye when the lightbulb is turned on.

Figure 16: Lampshade with light on

To give the lamp a subtle wow effect, the upper part will be made of brushed Lunawood Thermowood and the lower part of planed Thermowood. This little detail of the brushed surface cannot be seen immediately, but with a closer look, the defined wood grains can be visible. The difference between the brushed and the planed wood can be seen in figure 17 below.

Figure 17: Lampshade detail

4.3.2 Marketing concept and target group

The lampshade is a very luxurious and high-quality product, which also needs to be shown in the Marketing strategy. To accomplish that, the right Marketing channels need to be focused onto the right target group. As it is a higher priced product, the target group is in a higher income class and has an affinity for Interior. The age of the target customer is between 30 and 70 but can also go outside of these limits since the main focus is on the appreciation of high quality and timeless furniture. Sustainability and quality of the product are very important attributes for the target group, when buying furniture or other everyday items. Other important points for the target group are the production phase and the story behind the product. In this case the story is about the usage of C grade pieces, which otherwise would be thrown away. The target group includes all genders. A second target group are Architects, Interior Architects and Interior Designers.

To form a working marketing strategy, the four P´s of marketing mix were used. The four P´s stand for product, price, place and promotion, and come from E. Jerome McCarthy, who made this concept in the 1960s. In order to make a great marketing campaign, all four P´s

need to be treated with the same priority and it needs to be acknowledged that they effect each other equally. (Coursera 2023.)

Product

What makes this lamp unique is the fact that it is completely made from sustainably produced Lunawood Thermowood. Since Lunawood only sold and produced Thermowood panels, this is a new product for the company as well as it is for the ceiling lamp market. There might be custom made lamps made of Thermowood for specific projects, but so far there are no lamps made of Thermowood on the market which are made in an industrial scale. In general, the lamp should portrait the simplicity and elegance of Finnish design in combination with the natural feeling of the Nordic forests.

Place

Since Lunawood is not known in the Interior sector for making lamps or furniture, an own online shop is not an optimal way to sell the product. Instead, a distribution through bigger retailers needs to be worked out. Options for retailers are Vepsäläinen, Finnish Design Shop or the online shops of cooperation partners.

Promotion

The first point is a social media Account that belongs to Lunawood but is a separate channel from the Thermowood products. This account would be the main way of communication to the target group and a helpful tool to find new business partners or cooperations. Especially during the launching phase, social media influencers are a valuable tool to reach new audiences. These influencers need to be focused on Interior and fit the age and description of the defined target group.

A second way of marketing the Lunawood lamp would be via Architects, Interior Architects and Interior Designers. Since these professionals would have a high influence on their clients, who are potential customers, it is important to work together with them. This can happen in form of cooperations with their offices. This relationship to the professionals can start already due to an engagement with the universities and schools where future Architects and Interior Designers get trained. This can be achieved through free BIM objects or booths at school design fares.

Another marketing opportunity are the retailers themselves. A bigger retailer such as Vepsäläinen is more favourable than an own online shop, because they already have a big client group and a company image that stands for high quality brands. This would bring a lot of visibility to the product by being displayed in all the physical stores as well as their

online store. Additionally, the social media platform of these retailers can be useful in bringing the Lunawood lamp in the minds of potential customers.

Price

Since the Lunawood Thermowood lamp is still in the developing phase, an exact price per piece cannot be set yet. But in relation to similar wooden lamps that are on the market, the price range will be between 300 to 700 euros per lamp. This price range reflects the value of the Thermowood material and the elegant, Nordic design. As the price is oriented towards similar lamps from companies that have the same target group, it is already known that the customers are willing to pay this amount of money. With the right marketing of the story behind the Lunawood lamp, the price can even be higher. The story of sustainability and the connection of the lamp design to the Nordic roots can create a relation between the target customer and the product. This makes the customers want to buy the lamp based on the positive feeling they have towards it and not only because of the design.

4.3.3 Possible cooperations

Cooperations for this Lunawood Thermowood lamp can happen in two different ways. First in form of a cooperation with companies who completely take the lamp into their portfolio as a regular model. The second option would be a cooperation with individual designers who design a lamp together with Lunawood in form of a cobranding such as “Lunawood X Designer”. Both options are valuable business opportunities and can work together.

4.4 Toy car

Toy cars are a great way to use the C grade and sample studio offcut pieces from Lunawood Thermowood. As a result of the thermal treatment at 212°C, the Nordic spruce and pine get a soft surface and, are completely resin free and non-toxic. This makes the wood suitable for children. Additionally, normal wood easily stats rotting when left outside which Thermowood does not. This means that when a toy is left outside during a rainy day or even longer, there is still no health risk for the children when the toys get licked or touched otherwise.

4.4.1 Idea

As there are different profiles used by Lunawood, different car variations had to be developed. For the battens, the design is inspired by an old-school race car. It is expressed through a very slim body and a long front part. Since the sample pieces are 15cm long, the car is about 14,5cm long after the sanding process. This design is directed at older children

around the age of 3 and older. As Thermowood is very easy to sand, which made the production process fast and uncomplicated. In the figure below, the first sketch of the car can be seen.

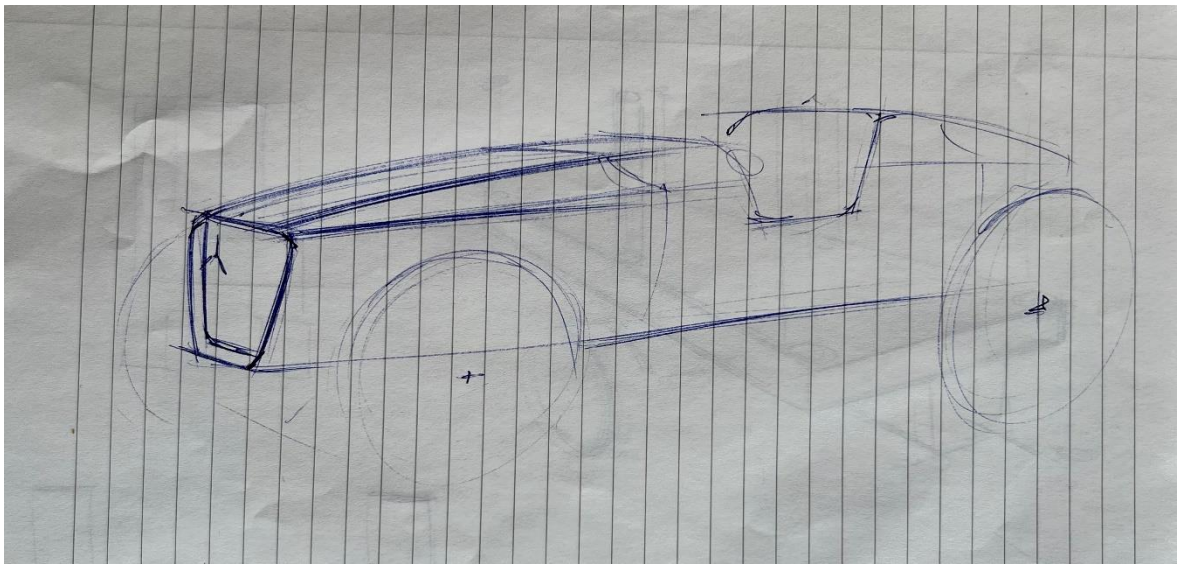

Figure 18: First sketch batten car

For the different panel profiles, another design was necessary, as the panel is not thick enough for a realistic toy car. To utilise the straight panels the most efficient, two cars were designed for the first prototype, an ambulance van and a normal small car. Both the ambulance and the car are between 13 and 15cm long and about 10cm high. These designs are very minimalistic and are meant for smaller children and toddlers. For now, just two designs are available but a whole range of cars, such a police cars, trucks, or construction vehicles can be added in the future for a complete “city set”. In addition to that, street signs and other accessory is possible to be made from the Lunawood Thermowood panels. In figure 19, the first ideation sketch for the small car can be seen. Since the design is very easy, there were no further changes made, this also applies to the design of the ambulance van, which can be seen in figure 20.

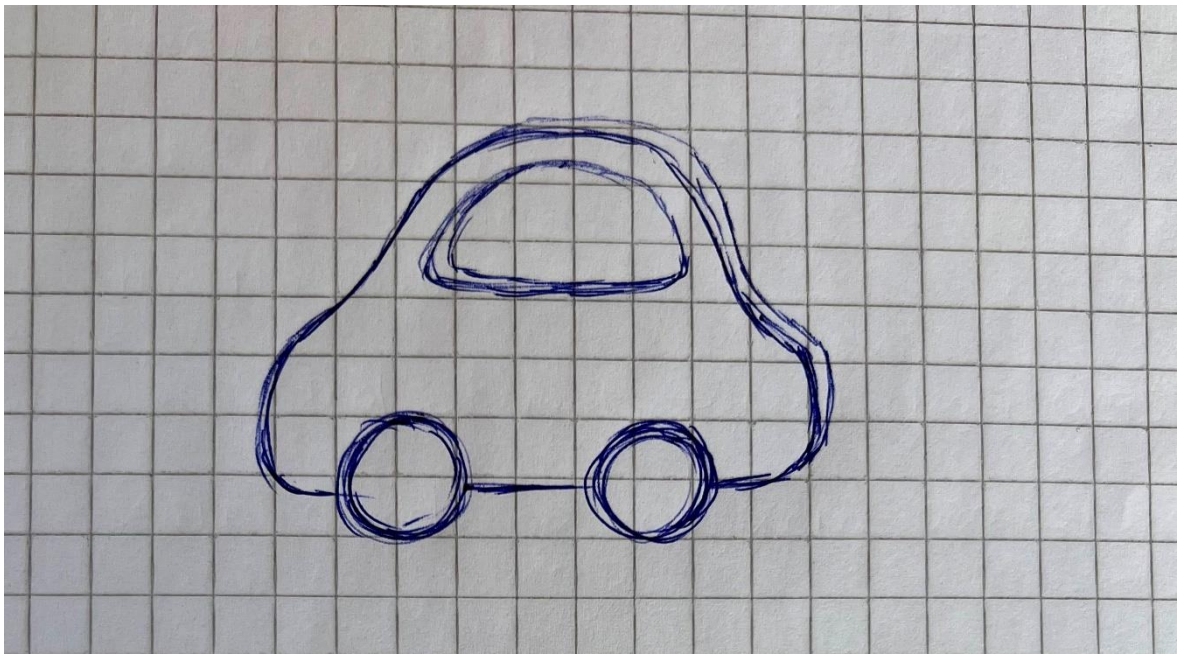

Figure 19: First sketch small car

Given the different 3D profiles from Lunawood, such as the Luna Triple, different car designs are possible. The 3D pattern can either be used as a special feature of the car or sanded away. They can for example be stripes on a fire truck or tour bus.

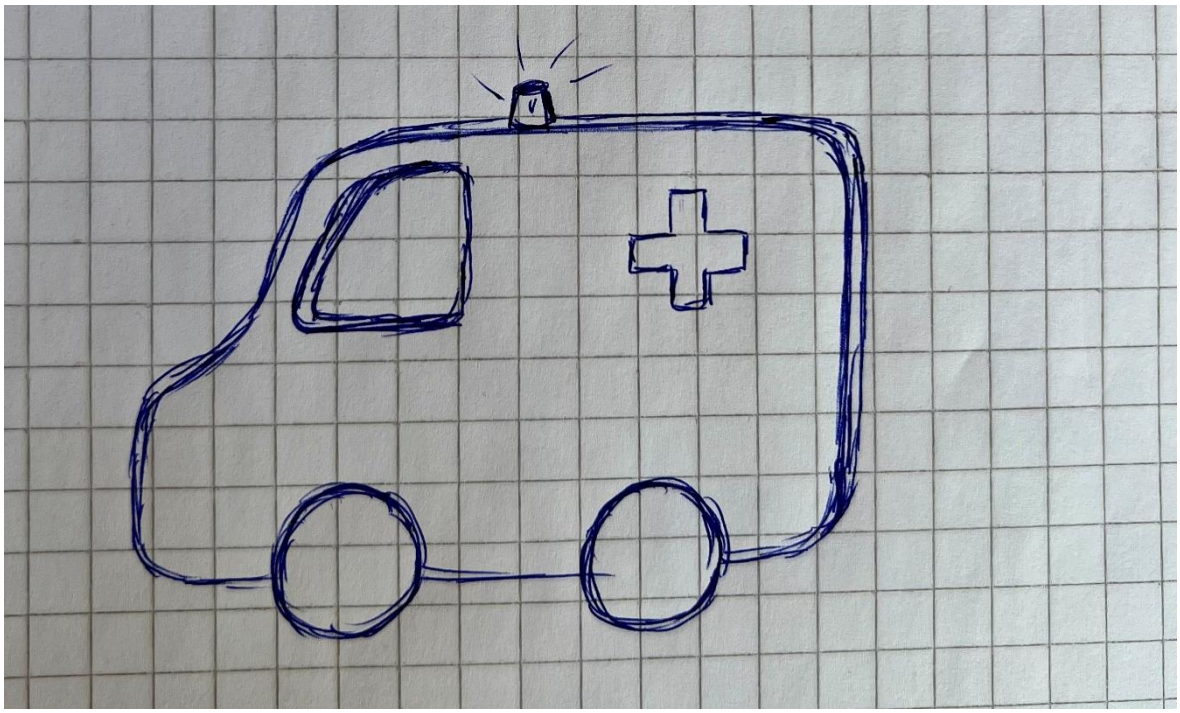

Figure 20: First sketch ambulance van

The first prototypes of the cars can be seen in figure 21. These prototypes have their tires either glued to their body frame as extra parts or as in the case of one ambulance car, they

are part of the body frame. The tires were planned to be movable but for these prototypes it did not work, since there was not enough space to drill the holes through at the bottom of the car. For next prototypes, additional space needs to be left to ensure that the wood would not break while drilling.

Figure 21: First car prototypes

4.4.2 Marketing concept

The marketing for the toy cars is completely different to the lampshade, since the target group is not the same. The target for the Lunawood toy cars is little children between the ages of 1 and 10 years old, and their parents. The parents are very cautious of the materials that their children are surrounded with in every aspect of their life. This starts with organic food and goes up to the quality of the clothes and the plastic free toys. The lifestyle of these people is marked by an upper middle class to higher income and a sense of responsibility towards their children's future world. This is why the sustainability aspect and the non-toxic production process of Lunawood Thermowood draws their attention. A second target group are schools, kindergartens and day care facilities. These facilities are responsible for the education and wellbeing of these children and have a responsibility to supply them with suitable and appropriate toys.

Product

These toy cars are unique due to their durability without any toxins and sustainability. In addition, it is also suitable for children with any wood related allergies. Therefore, the cars are suitable for all children, without any health risks.

The design of the different cars is tailored to the different Lunawood profiles and give two options for two age groups. This brings the parents an option to buy Lunawood toy cars for the various stages of their children and they do not have to look for other toys when they outgrow them. They can easily switch from the flat, minimalistic cars for smaller toddler to the more realistic car made of the Lunawood battens.

Place

As the assortment of toys is not big, which makes a separate online store unnecessary. The addition of the toy cars to the Lunawood website is not possible as the products are not comparable or in any way related to each other. The sale through a bigger toy retailer or even smaller local toy stores is more appropriate and makes more sense for the target group. Shops at Finnish airports or higher quality gift shops are also a possible retail place. Gift shops are specifically made for Finnish products and are a fitting spot for tourists who want to bring a travel present from Finland. The same applies to airport shops. The shops after the security check often lead to impulsive shopping and offer a chance to buy last minute presents for loved ones after a holiday. The Lunawood toy cars are a suitable gift option for travellers that are looking for a toy made in Finland.

Promotion

The advertisement of the Lunawood toy cars can work via different channels. The first option is through the toy retailers and the local toy shops. These sellers have their own marketing on television, radio or other mediums, which are powerful tools that should be used.

A second way is the self-promotion by Lunawood. This can be done with separate social media channels to promote the cars and get new cooperations. These cooperations can be with businesses as well as with influencers. The influencers that are suitable for cooperations are focused on family content and have a sustainable and thoughtful lifestyle.

Additionally, television ads and posters around the Christmas time can increase the sales of the cars. The television advertisements will be played on kids channels or in between family movies. The posters are placed around schools, kindergartens and day care facilities,

as well as shopping malls. For these advertisement options, the target group are the children themselves and not the parents. This also implies that the design needs to be very attention grabbing for children.

Price

The price range for comparable wooden toy cars varies from 12€ per piece to 50€ per piece. This huge gap comes from different manufacturing processes and countries of production. Since the manufacturing process of the cars can not be fully automated, the price per piece is at the higher end of this range. Furthermore, Thermowood is a luxurious material that stands for high Nordic quality with a chemical free manufacturing process and comes from sustainably managed Nordic forests. Due to this high-quality material, the lifespan of the toys is very long and can be used over generations. These characteristics justify a price per piece around 30€ to 45€. As the more realistic cars made from the Lunawood battens are most likely more complicated to manufacture, the price per piece will be higher than for the simpler cars made from Lunawood panels. Since no professional prototypes outside of the thesis have yet been made, an exact price cannot be determined.

4.4.3 Possible cooperations

As wooden toys get more modern and wanted every day, toy companies start to produce more varieties of them. Normal wood needs surface treatment to be used outside, which can be toxic and harmful for small children, as they often lick their toys. This makes wooden cars made from Lunawood Thermowood a great option for toy manufacturers.

An already well-known brand that focuses on wooden toys is Brio AB. Since the company's main products are made from painted wood, Thermowood toy cars would be a fitting addition to their portfolio.

Another option would be a cooperation with a company that normally does not have a focus on wooden toys, for example Lego Duplo or Steiff. Lego Duplo is commonly known for their plastic building blocks and Steiff is famous for high quality stuffed animals and other children's toys. These both companies do not seem like an obvious choice, but a cooperation would give a particular surprise factor to the customers and the competing brands. As Lunawood Thermowood is a high quality, luxury product, the company Steiff would fit well, since it is also known for high priced, luxury toys that last a lifetime.

Lunawood would benefit a lot from a cooperation, because the toy companies have already existing production lines and retailers. This means that Lunawood themselves just need to deliver the material and develop a cobranding and marketing strategy with the cooperation

partner. Altogether it would save a big amount of money compared to developing, manufacturing and selling the toys themselves.

5 Development ideas

Both the toy cars and the lampshade are currently in the development stage. This means that further development is needed to actually release the products to the market. To do so, the prototypes have to be tested by professional manufacturers or the possible cooperation partners. Without this, no actual price and needed production time per piece can be defined.

Lamp

In case of the lamp, it needs to be sorted out if it should be marketed as a Lunawood product, a separate brand or if it should be made in cooperation with another lamp manufacturer like Secto Design. To test these ideas, potential cooperation partners need to be contacted in the upcoming future. Also, external producers should be contacted for industrial prototypes.

Toy cars

Regarding the toy cars, the points mentioned for the lamp apply as well. In addition to this, the prototypes should be field tested with small children to see what the actual target group likes or dislikes at the toy cars.

6 Summary

The goal of this thesis was to find new end uses for the C grade pieces and sample studio off cuts of the company Lunawood. In the end it can be said that two products with high potential were developed. The lampshade and the toy cars deliver products to very different target groups. By shifting from just selling building materials, to adding other markets like Interior or child toys, a higher safety for Lunawood can be achieved. This would mean that if one market breaks away due to certain factors, the other market still provides a steady income source. At the beginning it could be hard to get a name and reputation in the different markets, which means that the toy cars and the lamp will not give a profit right from the start. Launching new products is an investment, but in the long term, the profit will make up for it.

The toy cars need a high amount of handwork, due to the design and the attention needed to cut around the harsh cracks and knots. In the long term, this might not work out. Solutions for this would be a higher price per piece or the use of a higher quality Thermowood. Additionally, the opinion of the target group, little children, has not been taken in account for this thesis. Therefore, the design might need to be changed if it is not appealing enough for the children. The attachment of the tires was also not tested in a way that they would move. Further research is also needed to check if the material can be thrown around without breaking. This is needed since children oftentimes drop their toys from a table or throw it somewhere.

The prototype of the lamp has connecting pieces made from plywood, that should be changed into Thermowood if it will be marketed as completely made from Thermowood. To do that, the right thickness and size need to be figured out, that the material can actually hold the weight of the lamp. Overall, the design of the lamp is appealing to the eye and fits the Nordic aesthetics for Interior.

Throughout the research to this thesis, a lot of valid sources have been collected, but for a quantitative approach more sources would be needed. For the company examples, a focus was set on Finnish companies, but other businesses were also considered, for example Subaru. To get a wider picture, more companies and examples could have been researched.

In conclusion, it can be stated that the lampshade and the toy cars are fitting options to utilize the C grade pieces and sample studio off cuts from Lunawood. In addition to that, the products offer promising new end uses for Thermowood, as well as promising new income streams for the company Lunawood.

Figures

Tables

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