CIRCULAR RUBBER SPORTS FLOORING

A strategic roadmap towards a circular business for Stockz

Abel Kappenburg

Master Thesis

MSc Strategic Product Design

Faculty of Industrial Design Engineering

Supervisory team

Chair	Dr. Ir. Ellis van den Hende Assistant professor of Innovation Acceptance and Consumer Research at the Faculty of Industrial Design Engineering
Mentor	Theresa Wallner PhD candidate Consumer Behaviour in a Circular Economy at the Faculty of Industrial Design Engineering
Company mentor	Raimo Treffers Commercial Director at Stockz

Delft, The Netherlands

July 2022

Executive Summary

Rubber is by the European Union stated a critical material (*Critical Raw Materials*, 2020). For our society the material is essential but can be depleted. The search for circular solutions for rubber is urgent.

In 2020 27.4 million metric tons of rubber has been produced globally (Tiseo, 2021). Around 70% of all produced rubber is used to create tyres (*About rubber*, z.d.). creating one of the biggest single product waste streams in the world.

Rubber granulate is a material made by recycling tyres. Stockz is a company which creates rubber sports flooring solutions for fitness gyms and sport clubs from these rubber granules. Delivering a safe space for athletes, reducing sound and protecting the base floor from the impact of falling weights. The life of the rubber material is extended but still after this 2nd life cycle the product ends like waste.

In this project circular strategies are examined to prolong product and material life as long as possible. The 3 most promising circular strategies, Reusing, Remanufacturing and Recycling were chosen to evaluate on feasibility, viability and desirability. Based on tests to create 2nd cycle granules and rubber sports flooring solutions the feasibility is proven for the recycling strategy. Reusing flooring is also possible. Remanufacturing is based on interesting ideas and therefor is plausible but not proven feasible.

Interviews with clients, end-users and production partners gave valuable information on their view on the strategies. An idea generation session to redesign for remanufacturing gave new ideas how to create a more circular product. Life Cycle Analysis were made for the current situation and the 3 strategies. Resulting in a decrease of CO2 with the use of the strategy reusing by 11%, remanufacturing by 15.5% and with recycling by 17%.

Next to this circular business models were examined which led to 2 different retrieval services for indirect sales clients and a rent/hire business with direct sales clients. Cost calculations were made and discussed with clients and end-users. The viability of the reuse strategy is proven. The viability of the remanufacture strategy is because of the new idea not certain but plausible after some investments. The viability of the recycle strategy was not proven because of a higher price than the current product which was not desirable. A 2nd cycle recycled flooring solution could be viable for other clients or end-users than interviewed who are willing to pay more for a more sustainable product.

From these results a strategic roadmap was made towards the vision of Stockz having a circular business. A MVP to start the retrieval service in 2023 is the first horizon going towards the second horizon in 2024 were pre-loved (used) products and 2nd cycle products are being sold.

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1 Introduction

1.1 The problem

The world's environment is changing because of human activities. The consumption and use of materials and energy pollutes the earth at a rate that is not seen before. Treating products as waste after use is one of the issues we need to solve to decrease pollution. Rubber is unfortunately a good example of this current linear way of consumption.

In 2020 27.4 million metric tons of rubber has been produced globally (Tiseo, 2021). Around 70% of all produced rubber is used to create tyres (*About rubber*, z.d.)Because of the increasing number of humans living on the planet (Roser, 2013) and an increasing middle income class there is a general increase of produced cars and therefore rubber tyres(ACEA editor, 2022). Next to this the production of electric cars is increasing and will increase even more in the future. Electric cars are generally heavier and have a faster acceleration increasing tyre wear. Therefore an increase in the production and use of tyres in the upcoming years is very likely creating one of the biggest single product waste streams in the world.

Rubber tyres contaminate ground and water at landfills (source). Because of this in Europe as many End of Life Tyres (ELTs) are collected as possible. In 2019 95% of all ELTs were collected from which around 62% was treated through material recovery and 32% was used in energy recovery (*Circular Economy*, 2021).
Rubber tyres are a cheap and an easy source of energy but the amount of pollution that is created by burning tyres is (arguably) not worth the consideration. Western European countries therefore try to collect as many ELTs as possible for material recovery.

Fortunately governments are already trying to decrease the energy recovery, burning, of tyres. Subsidies are created to collect ELTs for material recovery. Currently tyres are collected and recycled in a couple of ways. With chemical recycling like pyrolysis and devulcanization base materials of tyres such as carbon black (*About Us*, z.d.) and even gas & oil are recovered. With mechanical recycling steel and textiles are removed from the tyre and the rubber is turned into small pieces called granulate. A wide range of products are created from these small chips of a tyre which can be glued and moulded together in many different shapes. The rubber material of a tyre gets a second chance, extending its use life.

Stockz is a company which creates rubber sports flooring solutions for fitness gyms and sport clubs from these rubber granules. Delivering a safe space for athletes, reducing sound and protecting the floor from the impact of falling weights. The product is made from recycled tyres granulate, extending the life of a valuable material. Still after this 2nd life cycle the product ends like waste. The rubber product is becoming part of general waste processing and is therefore still becoming land filled or burnt.

1.2 Problem Definition

The current business of recycled rubber granulate products probably will be competitive for another decade without any major problems. The Dutch government want to decrease the use of raw materials with 50% in 2030 (Dutch Government, n.d.) But the recycled product of Stockz is minimal 95% made of used materials. Recycled products are seen as good, which they are, but an even more sustainable product therefor is not necessarily wanted. At this moment there is not a sustainable or circular problem that needs to be solved for Stockz. But there will be in the future.
To reach sustainable goals, governments and/or the EU will create more & more regulations to take care of waste streams. When regulations exactly will be created and how these will work is not clear yet. Still Stockz wants to invest in solutions beforehand for multiple reasons.

Preparation

The rules and regulations of waste are going to change so Stockz has the mindset to better prepare for it. New sustainable regulations could have a big impact on the business of Stockz. Changes in production to separate materials or changes in business to be responsible for the end of life stage of your product are not far-fetched. The Dutch government wants to have a 100% circular country in 2050 (Dutch Government, n.d.)To be as prepared as possible for these changes Stockz invested now to find solutions for the future.

Competitive advantage

If Stockz is faster in changing their business to meet new sustainable standards compared to competitors this can lead to a competitive advantage.

Social Responsibility

Stockz is selling sports flooring products made from recycled tyres to extend the rubber material life. Still at the end of the life cycle of their own product the rubber is burned for energy production or is landed filled. This does not feel right for a company who is trying to reduce pollution with a recycled product.

1.3 Assignment

In this graduation project a strategic plan to create a circular business will be made for the company Stockz. Shown in a strategic roadmap the most promising circular strategies will be put into incremental steps towards a future circular business.

Will it be technical feasible to retrieve used flooring and to use them in a valuable way? What will the costs be to create a viable business case? And what is the desirability of a circular product for customers?

With an analysis of the company and the topic circularity the most promising strategies for the market and business will be chosen to investigate further. With the use of interviews and a creative idea generation session more information about the viability and desirability of the circular strategies will be gathered. This leads to my final conclusions and the roadmap (see figure 0).

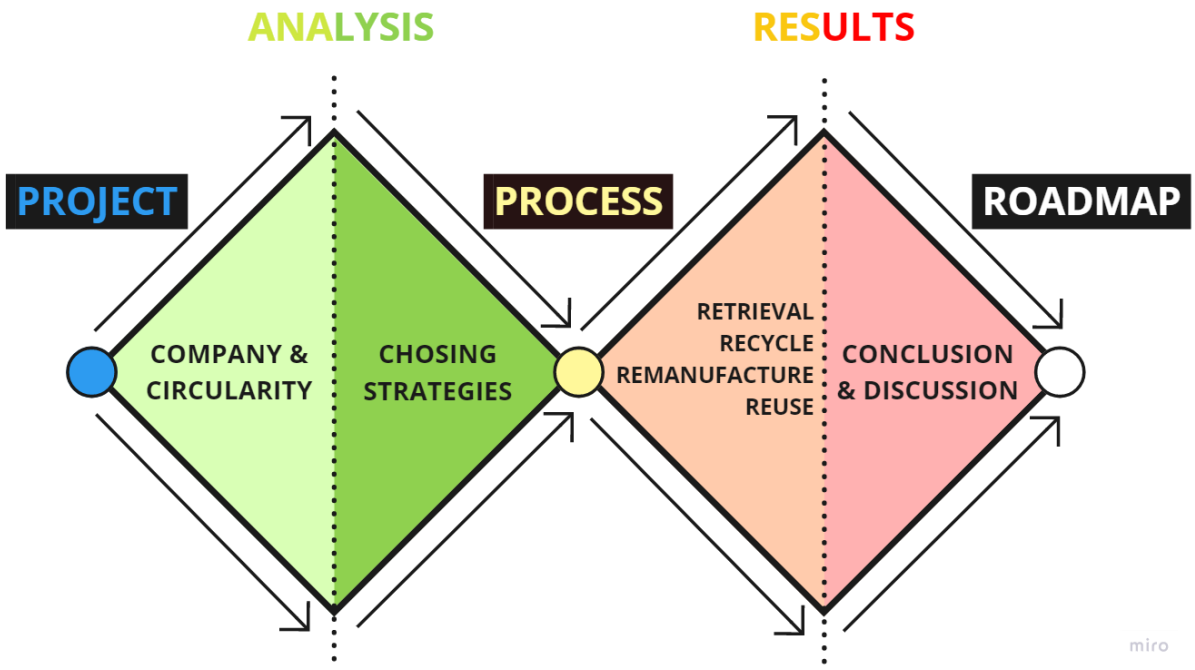


Figure 0: Design process of report based on double diamond design process model

- ANALYSIS -

2 The Company Stockz

2.1 Introduction

Stockz is the North-western European market leading wholesaler in supplying rubber sports flooring for both domestic and commercial fitness spaces. The company delivers more than 300.000 m2 per year to fitness facilities, CrossFit boxes, hotel gyms, home gyms, healthcare, etc. The products are (almost) exclusively manufactured from recycled rubber tyres. Customers are based in the key geographical areas of the United Kingdom, Ireland, Scandinavia, Benelux, the DACH region and France (see figure 17).

Started in 2017 Stockz wanted to create a solution for the problem that flooring specialists, fitness material distributors and sports clubs have with rubber sports flooring manufacturers. The manufacturers have large scale factories only supplying against high minimum order quantities. Delivery times are slow and the product portfolio is limited per individual manufacturer. Stockz solved these problems by becoming the first wholesaler for this niche market of rubber sports flooring in Europe.

Stockz's products are produced by 3 production partners respectively in Switzerland, Poland and China. Stockz is the primary client of these factories and therefore has influence on the design and quality of the products. The main operations of Stockz are buying, stocking, selling and shipping of rubber sports flooring products. Also advice is given about the use and installation of the flooring but Stockz never does the installation themselves. They give their clients premium service by offering a wide range of products, fast delivery and a fitting sports flooring solution for all circumstances.

Now, 5 years later, the company sold a lot of rubber sports flooring products which are now nearing their end of life. These rubber floors are becoming part of general waste processing and are mostly land filled or burnt. Because of the increasing importance of sustainable behaviour to slow global warming a big opportunity lies in this end of life phase. A circular product and business would decrease the environmental impact. This could be the next step for Stockz to become more sustainable and future proof as a company.

Employees

Stockz has low overhead costs, with only 5 full time staff members. The founder with the knowledge about the material and the rubber production factories. The commercial director with the knowledge of the fitness industry and market. The co-founder and owner of Techniparts. is an share holder and friend who has no daily activities at Stockz. There is a sales and social media employee and 2 man are responsible for the logistic operations in the warehouse of Stockz. A lot of knowledge is inside the company but the production partners have the detailed expertise about tyres and rubber granulate and the clients of Stockz have the connection to the end users (see figure 3, on the next page).

Trackz

Next to rubber sports flooring solutions also artificial grass turf flooring is sold under the name of another company called Trackz. Stockz together with a german client (of rubber sports flooring), are the owners of Trackz. See figure 1 for an example of a track fitted in a rubber tile floor.

Figure 1: Example of a custom turf

Techniparts

Techniparts (see figure 2) is the company of the co-founder of Stockz. Techniparts is selling seals, bearings and other technical applications. These are also rubber products. Knowledge about rubber is shared between the companies. The building of Techniparts is shared with Stockz as the main office, but Stockz has their own warehouse. Stockz is building their own office and new bigger warehouse which will be finished Q2 2023.

TECHNIPARTS
INDUSTRIAL SUPPLY

Figure 2: Techniparts company logo

2.2 Supply Chain & Fitness Market

Supply chain

To better understand the business of Stockz the supply chain is shown in the figure 3. From rubber granulate to the end user. The production partners create the rubber sport flooring products in their factories. The manufacturer in Poland creates the granulate from car tyres themselves before creating the flooring, in Switzerland the granules are bought in from German granulate producers and in China this is unknown. More information about the production of rubber sports flooring is illustrated in paragraph 2.4 Production.

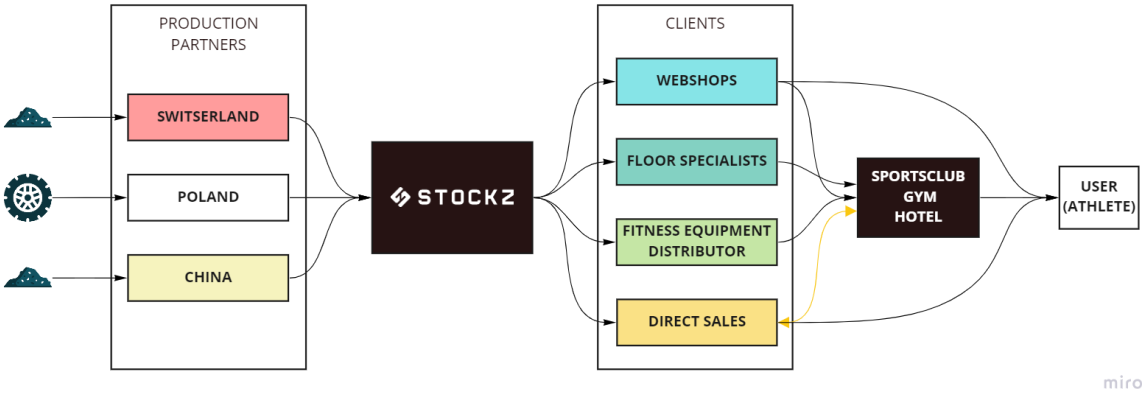


Figure 3: Supply chain of Stockz

When produced a full truck of products will be transported to the warehouse of Stockz in Wezep the Netherlands. All products Stockz sells are thereby available for quick delivery when ordered. An overview of the products Stockz sells are shown in paragraph 2.3 Products.

The companies that buy the flooring solutions of Stockz can be divided into 4 client groups. Webshops, Floor specialists, Fitness equipment (manufacturers &) distributors & Direct sales. Direct sales are clients who have sportsclubs/gyms themselves. More information about these clients is illustrated in paragraph 2.5 Clients. The clients of Stockz sell sports flooring to the gyms, sport clubs, hotels ect. These companies are the last step in the supply chain but the end users will be the athletes using the facilities of these companies.

Fitness Market

The fitness industry increased fast in the last decade. Fitness now is the largest sports activity in Europe. Because of trends like governmental health campaigns, individualism, social media and healthy lifestyle (food, supplements, tracking ect.) the fitness industry became bigger and bigger (Scheerder et al., 2021)).

But looking at the fitness industry at the largest fitness trade show of the world, FIBO at Cologne Germany 8 April 2022, sustainability is lacking . The main industry is about investing in yourself not the world around you. Therefor there is a low interest in environmental responsibility.

The amount of companies marketing about sustainability were close to none. Clients mainly want value for money. Even Stockz who creates rubber sports flooring from recycled car tyres don't really use this as a unique selling point (USP) because all produced rubber flooring is made out of rubber granules from car tyres. Figure 4 shows the stand of Stockz at FIBO 2022.

Figure 4: Stand of Stockz and Trackz at FIBO

One company did have a sustainable appearance. SportArt is a producer of green fitness solutions creating machines that generate electricity when athletes use them. These machines are about 20% more expensive compared to 'normal' fitness equipment but according to SportsArt this can be earned back with the produced energy. To comprehend there green image they also sell eco mats which are 86% sugar cane.

Still this was the only company at FIBO using sustainability as a USP. The only clients willing to buy the SportsArt products are high class gyms with a green image part of a higher price segment, mostly located in Scandinavia.

Ecore sells rubber sports flooring with itsTRU technology. This indicates that the top and bottom layer are glued together in an by Ecore stated 'outstanding way'. Next to this they have a 2nd cycle product used for isolation in construction of buildings. More and more constructors need to use recycled materials in the buildings that they build. Ecore is providing them with a 2nd loop recycled product. This could be seen as the circular strategy re-purpose (see paragraph 3.5 Circular Strategies). This business is at the moment still a very small part of Ecore but increasingly gets bigger. (see Appendix A 2 for more pictures)

2.3 Products

Figure 5: Three main product groups Stockz

The products of Stockz can be divided into 3 main groups (see figure 5). Tiles, rolls and support products. Within tiles you have 4 sub-groups (see figure 6). Connect, standard outdoor and puzzle tiles. Puzzle tiles are stamped out of tiles or rolls. Within the different product groups the thickness of the tile, the size, the colour and the amount of layers the product consist of can be different. (see appendix A 1 for additional information).

Figure 6: Four sub-groups of tiles

The size of tiles are 600x600, 1000x1000 or 500x1000 mm for the thicker tiles. The roll flooring is 1250 mm wide and can have varying lengths. The common length of roll flooring is 10m. Also some corners and ramps are sold for specific product category. There are 14 different thicknesses for Stockz flooring. Some flooring have 2 layers, a bottom and a top layer. A thick bottom layer with bigger granules for optimal damping and cost reduction (because of shorter time of shredding is needed), and a thin top layer made out of smaller granules or with a mix of virgin EPDM for a smooth surface. This top layer optimizes comfort and cleanability. Coloured granules can be mixed trough the product or only the top layer to for aesthetic value. See figure 7 for some colours of roll flooring. Looking at all product Stockz sells with all the different thicknesses, colours and sizes over 200 different products are available. Not all 200+ possible products are sold. In total an amount of 4891 tons of rubber product were sold in 2021.

Figure 7: Different colours of roll flooring

Connect tiles

Figures 8: Blue Connectors

This product is the highest quality rubber sport flooring Stockz sells. These tiles create a floating floor which means it isn't glued or fixed on the base floor. Instead connect tiles use connectors to fixate the flooring (see figure 8). It is the easiest way for installation and with a mixed EPDM top layer the appearance and cleaning ability is on top of the game. The bottom layer is made of is a mix of car tyres and other rubbers. This is also visually noticeable by a mixed colour of granules in the bottom.

Standard tiles & Outdoor tiles

These products are all made from 100% car & truck tyre granules. All are fully black and from a thickness of 15 mm the product is made with 2 layers of bigger granules in the bottom flowing into smaller granules on top. The standard tiles are not connected to each other but need to be installed under tension (see figure 9, picture 1 & 2).

Puzzle tiles

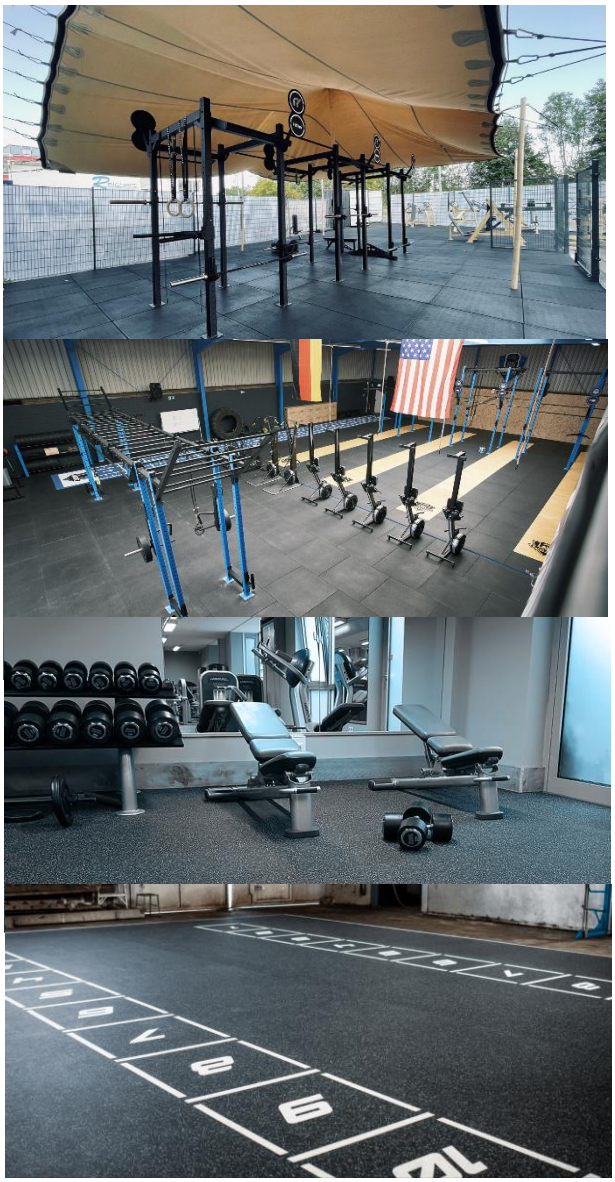
Puzzle flooring can be made from roll flooring or tiles. Puzzle tiles are always cut out of another product. This gives the opportunity for many different thicknesses and colours. Puzzle tiles have an easy installation because like it says, the flooring needs to be puzzled together. (see figure 9, 3rd picture)

Rolls

Roll flooring always has to be glued to the main/base floor. This creates a seamless appearance. Rolls are almost all thinner compared to tiles and never are made out of 2 layers. This product category has after puzzle tiles the highest amount of colours available. It is also possible to create sprint ladders with special tape (see figure 9, 4th picture).

Supporting products

Fixating products like connectors for the connect tiles, pins for the outdoor tiles, glue for rolls and adhesive tape are part of the product category supporting products.



Figures 9: Outdoor, Standard, Puzzle & Roll flooring

But also knives to cut flooring to the right size are part of it. Also some other products are sold like acoustic strips or rubber for cargo bikes or even subflooring / protection mats to get Trackz turf at the same hight as the rubber flooring (see appendix A 1 'Other' for additional info).

2.4 Production

2.4.1 Introduction

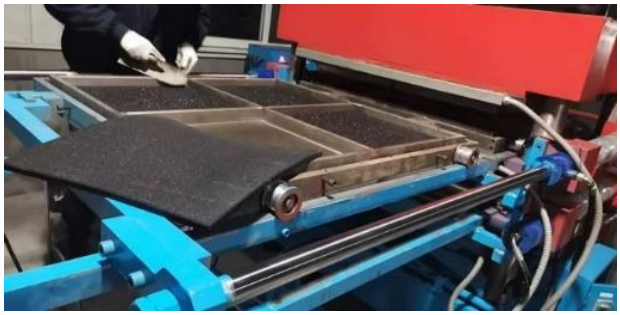
Stockz products are made of rubber granulate. This is a recycled material created from car and/or truck tyres. Other materials used in tyres such as metal and textile are removed and the rubber is shredded into small pieces, so called granules (see figure 10). Many different product can be made from this recycled rubber granules. Stockz's production partners and many other companies create sports flooring from it.

Figure 10: Rubber granulate (Shabbir And Sons Eco Exim Private, n.d.)

Rubber is one of the critical material stated by the European union (*Critical Raw Materials*, 2020). This means the material is essential for our society but can be depleted. This shows the search for circular solutions for this material is urgent.

Production method

There are 2 ways of producing recycled rubber sports flooring products from granules. Tiles are produced with a mould and rolls are made with cylinders. Stockz partners use a warm process for the tile moulds and a cold process for the rolls cylinders.



Warm process mould
Granules are put into a mould and glue is added. This glue is liquid at a high temperature and solid at room temperature. The mould closes and presses the granules against each other and divides the glue between them. The granules that are pushed against the mould create a smooth surface (see figure 11).

Figure 11: Warm moulds

Cold process cylinder mould
In the cold process a big cylinder mould is filled with granules and glue. This glue starts to become solid when reacting to air. With a lot of pressure the granules are pressed into a cylinder. This process takes more time compared to the warm mould process. The skin is peeled of the cylinder to create a very long rubber sheet. These sheets are normally cut by every 10m (see figure 12).

Figure 12: Peeling process of a cold moulded rubber cylinder

Production partners

Figure 13: Production partners of Stockz, from left to right: Switzerland, China, Poland

China

The producer of connect tiles with warm moulds. Recycled rubber granulate is used for the bottom layer and virgin EPDM for the top layer. Recycled rubber granules and the EPDM granules are bought in for the production of the products. This partner is responsible of 23.23% of all rubber sold in 2021 by Stockz (see figure 14).

Poland

Here the standard and outdoor tiles are made with the warm mould process. Also some puzzle tiles are produced. The Polish company is 50/50 a tyre recycling granulate producer & a rubber granulate flooring production company. Tyres are bought from all around Europe to create granules. Granules are sold in bags and flooring made from the granules are sold per pallet. All the pre-consumer waste from creating granules and creating the flooring products are sold to another company which produces wheels for containers. A product which does not need high quality granules. This production partner produces the largest amount of rubber for Stockz (see figure 14).

Switzerland

In Switzerland all rolls and some puzzle tiles are produced. They buy in granules from German recycling companies. A cold cylinder mould is used which gives some sustainable benefits. All the pre-consumer waste, because of cutting in production, is used to create the lowest quality product. This is a bumper block for car parks and truck transport stations. The Swiss production partner is only responsible for a little less than 14% of the total rubber sold.

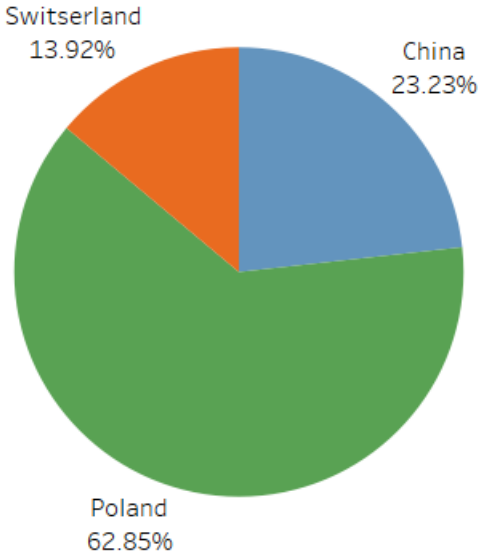
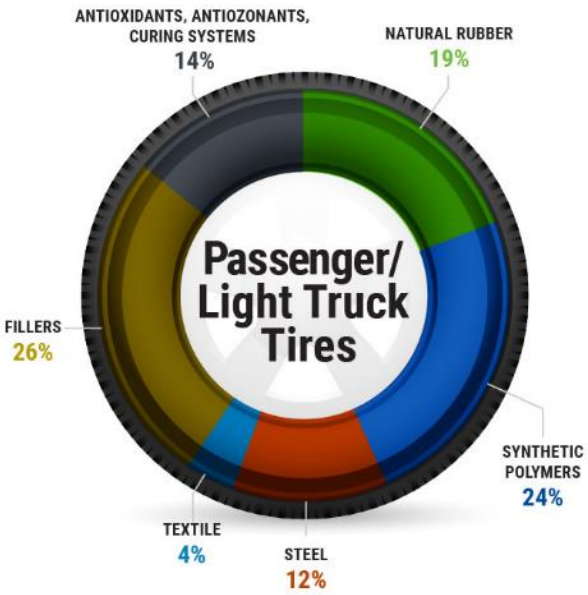


Figure 14: Distribution of total weight of rubber flooring produced in 2021 by manufacturers

2.4.2 The current recycling process

The current business of Stockz is based on 2 loops but at the end it is still linear. In the first loop a tyre is produced, used and collected. In the second loop the tyre is shredded into granules, which is the base material for the sports flooring solutions of Stockz. This flooring is then again produced, used and wasted. Unfortunately at the moment this is the end station of the material. Floors are thrown away in waste facilitations and landfilled or burned to create some energy. Of course this second loop is extending the life of the rubber material and is decreasing the amount of wasted rubber. Still at the end of the life cycle the rubber is wasted which creates a lot of pollution.

Tyres



To know what kind of rubber material the products of Stockz are made of, a look into the production of tyres is needed. A tyre is made of a combination of natural rubber and synthetic rubber (see figure 15). The synthetic rubber that is used is called SBR (styrene butadiene rubber). Fillers like carbon black and silica are used to reinforce the rubber by improving tear, tensile strength, abrasion and rolling resistance properties. Sulfur is used to vulcanize the natural rubber creating crosslinks between polymer chains by heating. Vulcanizing of natural rubber changes it from a thermoplastic to a thermoset which has the known characteristics of coming back to original shapes after deformations due to mechanical stress. This is what makes rubber rubber.

Figure 15: The composition of a tyre (*Tire Composition*, n.d.)

Antioxidants, antiozonants and other curring systems are used to decrease the effects of oxygen, ozone and UV on the rubber. The steel and textile are used, reinforce specific parts of the tyre improving functionality. To create granules of tyres the steel and textiles are removed from the tyre and the rubber is shredded.

Granules

The quality of the granules have a big impact on the quality of rubber granulate products. The quality of granules is based on size, shape, the origin and the cleanliness of the rubber. The granules should always be as clean as possible to get a high quality product, but the quality is not necessarily high or low when you use different sizes, cuts and origins of the rubber granules. The most important factor is consistency.

The kind of glue that is used, the adjustments of the production method and the quality of granules that are used together form a product recipe. The more precise this recipe can be the higher quality product can be made. Compared to the glue and production method the granulate is not really consistent. Every tyre can be a little bit different changing the size and cut of the granulate created from it. This recipe is based on consistency of the base materials. The tolerance of the granulate is the weakest link in this recipe.

2.4.3 Production recipe

For every product different recipes are made. Every specific product has a recipe which is based on 3 things. The quality of granules, the glue and the adjustments of the production method (see figure 16). The quality of the granules is based on the origin of the rubber, the cleanliness, the shape and the size. The adjustments of the production method are the temperature, pressure in the mould and the duration of pressing. These are all adjustable to optimize the quality of the floor.

Figure 16: Production recipe overview

Origin

If the origin of the rubber is the same throughout the whole granulate batch the quality will be very constant and therefore higher compared to mixed origins of rubber. It is possible to buy granules which are made only from truck tyres or from a specific brand like Michelin or Continental or even from a specific country like the Netherlands. The price will be higher with specific demands about the origin but if you want a higher quality product a similar origin of the rubber is the way to get a constant quality of granules. The shape and size of the cut will be more similar between all the granules that are formed. This gives a more constant result in the material that is used.
The origin of the rubber therefore has a big influence on the quality of the product. The quality of the end product can be seen by the consistency of the size of the granules, the colour, and the smell. A high quality rubber granulate product has constant granule size, one colour (if tyres are used black), and a specific smell. If different origins of rubber are mixed the granules are different from size, have different colours and the smell of the product can be more intense because of for example used chemicals to mollify harder rubbers.

Cleanliness

In recycling the cleanliness of the retrieved material is very important. Every contamination of the material with other materials will create potential production errors and will decrease the consistency of the granules and therefore the product. Recycled materials are always dirty. A lot can be cleaned but still the cleaner the better. For example small rocks in between the 'loopvlak' of the tyre is a very big and real problem in rubber granulate product production.

Shape

The cut of the granule which creates the shape is very important because of how the different granules glue together. If a perfect round granule is cut the contact area between the granules is very little. A more cube like shape will have more contact area and therefore will stick better to each other. At the end the most important factor of a rubber granulate product is that single granules are not coming loose from the product.

Size

The size of the granules have an effect on the product functionality and therefore the quality. Bigger size granules create a more porous product which can for example let through water. Also the deformation can be a little bit bigger, which could be good for noise and impact reduction. A negative factor of bigger granules is the fact that the sharp edges more prominent. This creates a harder to clean product and a decrease in comfort for the athlete. Smaller granules create a more smooth surface which is easier to clean and creates more comfort for the athlete. Also the fire resistance is created with smaller granules.
Size also has an effect on the costs of the production. The smaller the granules need to be the longer the machines need to cut and the more expensive the material will be. Also more glue is needed in a recipe with smaller granules because there is more contact area.

Glue

The glue that is used together with the adjustments of the production is the way for production companies to create a specific kind of recipe which is creating their specific kind of product. All companies who create rubber granulate flooring use the same basis of glue. This is a one-component, pigmented PUR binder on the basis of MDI, but the specific components of the glue is actually the trick of the trade. This will never be shared.

Consistency

The origin and cleanliness have influence on the consistency of the shape and size of the granules. This is very important when looking at granules in a circular business

2.4.4 End of life

A rubber sports flooring solution is disposed when it is worn out, the club is renovating or the entire gym is moving. A worn out floor will, in the many years of use, loose individual granules. One by one the top part of the product will lose granules and thereby its smoothness. This smoothness is created by the pressure of the granules that are bonding together with the glue against the mould. Especially at specific locations in gyms, for example at a squatting station, flooring is used more which can result in scrubbed flooring or when a lot of granules fall of hollow places in the flooring. When a gym is renovating or moving and because of this is buying a new floor, the used floor could be still in a quite good shape. This used flooring could be useful for the closest loops of circular strategies in the techno cycle which are prolonging the product. The worn out flooring could become circular with the larger cycles prolonging the use of the material.

2.5 Clients

The clients of Stockz can be divided into 4 groups (see figure 3: Supply Chain). Webshops, Floor specialists, Fitness equipment distributors and Direct sales. Direct sales are to the larger gyms and sports clubs. These clients sell the products of Stockz to gyms, private customers for home appliances or to another business in between.

Webshops

This client category can be seen as a BtoBtoB/C business. Webshops buy sports flooring solutions from Stockz and sell these products without brand label at their own website. They buy large amounts of flooring at Stockz and sell these in smaller batches to mainly domestic customers and smaller businesses. Webshops never do flooring installation.
It will be very hard to retrieve Stockz's products which are sold through webshop clients. Webshops have many different customers and because they sell the products without brand label the end users have no idea that the product is from 'the brand' Stockz.
Webshops became explicitly more important when lockdowns began in early 2020 because of covid. At the beginning of 2022 around 45% of all Stockz's products are sold through webshops clients.

Indirect Sales

This client category can be seen as BtoBtoB and consist of the sub client groups Floor specialist, Fitness equipment distributors and manufacturers.

Floor specialists
Next to the rubber sports flooring solutions of Stockz, floor specialists sell many different kinds of flooring. Clients of floor specialists buy for example a pvc + ceramic, wet area, flooring ect. next to the rubber sportsflooring of Stockz. Floor specialists sell their products most often to middle size gyms and fitness sport clubs and do the installation aswell.

Fitness equipment distributors
Fitness equipment distributors sell fitness equipment like cardio machines, weights and rack constructions but also flooring solutions. If their clients want to buy the whole package, the fitness equipment distributors are buying the rubber sports flooring solutions from Stockz and the equipment from manufacturers. Fitness equipment distributors deliver their products to small and large gyms and sports clubs and other larger businesses

Fitness equipment manufacturers
Manufacturers of equipment also distribute their own equipment. Just like distributors they often sell whole project which includes everything you need for a gym. The main difference is the fact that manufacturers make their own equipment. Of course a lot of clients of Stockz are a little bit in between manufacturing and distributing. For example rack constructions are manufactured but no machines are distributed, but for a whole project everything is delivered. You can compare these companies with construction contractors.

Direct sales

Big brands with a lot of gym locations want to optimize their purchase. Therefore these clients are willing to buy large amounts of rubber sports flooring at once to decrease costs. A rule of thumb for Stockz is that direct sales are only possible for clients with 100+ locations. If Stockz would sell a lot of their products directly to gyms they would compete against their own clients (webshops, floor specialists, fitness equipment distributors). Still if Stockz has not a large amount of other clients in a specific country direct sales are possible on a smaller scale. Basic Fit & Fitforfree are 2 examples of companies that can buy flooring solutions at Stockz directly. Stockz does not do the installation of the flooring themselves. Basic Fit has their own ways of installation and for Fitforfree Stockz is working together with a company who does all the installations.

Client location overview

At some point a country or region is full in terms of clients of Stockz. If too many clients are pitching on the same project they all are trying to sell the same Stockz product to a gym. This creates friction between the clients and Stockz about costs and discounts. In figure 17 all red numbered countries are thereby declared 'full' in the business of Stockz. The fewer clients Stockz has in a country or region, the more possible it is to deliver directly to gyms without competing against their own clients.

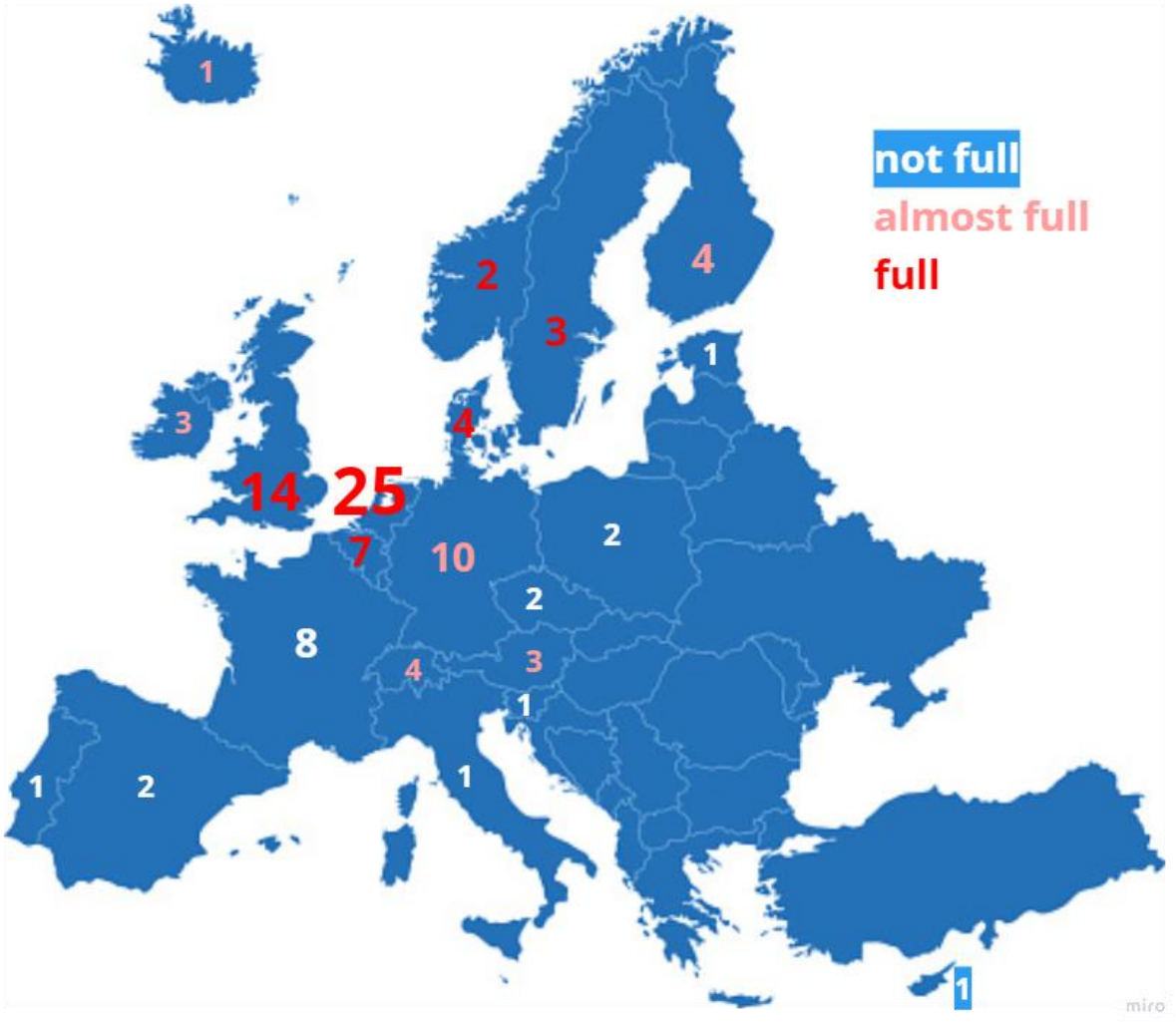


Figure 17: Clients overview in Europe

3 Circularity

3.1 Butterfly diagram

In the living world there is no waste. One species waste is another's food. The energy is provided by the sun. Things grow then die and nutrients return to the earth. Yet humans have a linear approach. We take, make and dispose. When a product is old or a newer version is available we throw away the old one. We have a big impact on the finite supply of resources and often produce toxic waste when disposed. We need to rethink and redesign to become circular. The old can be the resource for the new. Biological materials should be compostable in a safe way within the earth's cycle. The technical materials, metals and oil based materials like polymers, need to keep their value for as long as possible in a technical cycle. Maintaining the quality to be useful after the life of an individual product. Instead a throw away and replace culture we need to return and renew. Products and components need to be designed to be disassembled and regenerated. Where materials of the bio cycle need to be separated from the materials from the techno cycle. The butterfly diagram is good representation of this circular economy (see figure 18).

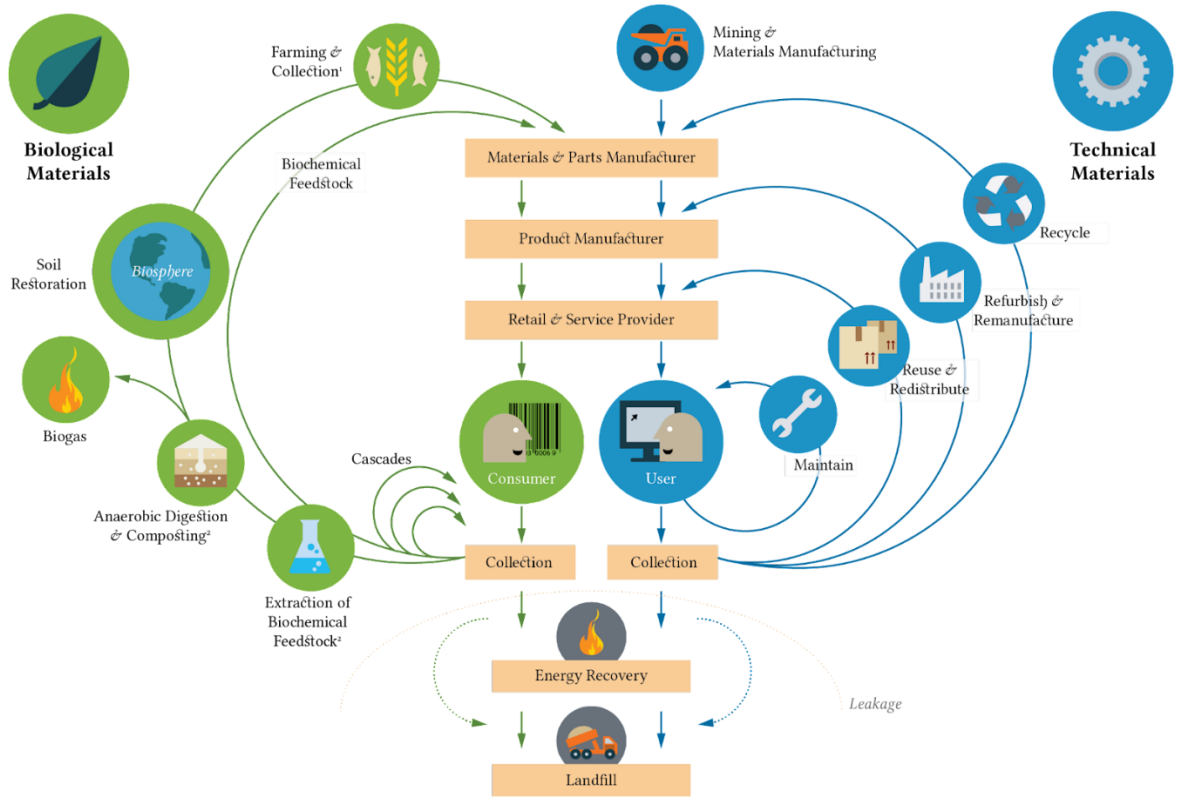


Figure 18: The butterfly diagram (Bakker, 2019)

Rubber can be considered as a technical material. A part of the rubber in tyres is natural rubber (see figure 15) but this is vulcanized and therefore not compostable by nature anymore. The glue that is needed to create flooring from rubber granules can also be considered a technical material.

In the techno cycle prolonging product and material life is the way to become more sustainable and decline pollution and environmental impact. Keeping the loop as small as possible will keep the highest value of the product or material.

3.2 Value hill

Figure 20: The value hill (Achterberg et al., 2016)

Another way to look at circularity is the value hill (see figure 20). In the linear economy (left hill) the value of a material extracted from the earth manufactured and assembled into a product increases. But after use the value decreases. Business models are made to sell as many products as possible. Products are designed to have a short lifecycle. Old products will be land filled or burnt for energy after use. The value is destroyed which is shown by a rapid downhill. In the circular value hill (right hill) the value is kept as high as possible. After use the product, component or material is no waste but valuable for a new product. Note that the use phase is longer and the repair/maintain strategy is often done by the end user itself. Companies can design products for easier repairability and maintenance.

3.3 Ladder of Circularity

Figure 19: Circular Ladder of Jacqueline Cramer (Cramer, 2020)

Many different circular strategies could help to keep the loop as small as possible. Looking at the circular ladder (see figure 19), different circular strategies are ranked from high to low priority. The highest priority strategies create the smallest loops in the circular economy. These smallest loops are at first preventing or decreasing the amount of material or energy used. Next the usage of the product is extended, than the usage of components and last the usage of materials is extended.

3.4 Cradle to Cradle

At the moment the way to proof that your product is circular is to get a Cradle to Cradle (C2C) certificate. Looking at C2C standards, circularity is about maximizing health and wellbeing for people and the planet by creating an economic system of closed loops. C2C is thereby focussing on 5 main topics (see figure 22).

Figure 22: The 5 main topics of C2C (Cradle to Cradle Products Innovation Institute, n.d.)

In this project the main focus will be on the first 2, Material health and Product Circularity or Reutilization to create a feasible product. To create a truly circular product the other 3 topics also need to be addressed.

This C2C certificate is based on C2C certified achievement levels. A basic, bronze, silver, gold and platinum level are applied. Looking at Material health and Product Circularity the criteria seen in the table below are made. To have a silver level, the criteria of the level before, so basic and bronze, has to be made as well. The overall achievement level is based on the lowest scoring topic.

The materials used to produce sport flooring are rubber granulate and glue. Both are not on the list of banned C2C materials.

Looking at the criteria for Material Health the rubber granulate sport flooring of Stockz can already have a Silver level. For Product Circularity / Reutilization a Silver or Gold rating is possible. This project will probably not increase this rating because with Cradle to Cradle the assessment is done at product level. A circular product can have a C2C assessment for every loop. So creating a 2nd cycle product will give you another product with the same rating. Therefore it could be more interesting to look at business level certificates. These could take a more broad look to your business valuing the fact that a product is recycled for a second time.

3.5 Circular Strategies

In this paragraph the circular strategies are all evaluated on how well they fit and if they could contribute to the business of Stockz, rubber sports flooring. The strategies of the butterfly diagram are put together with the 10 strategies of the circular ladder. In the next paragraph 3 strategies are chosen.

Refuse & Reduce

Refusing or reducing the use of the product or the material is not a strategy which can benefit Stockz. Therefore these strategies are not applicable but with a redesign of the product a reduction of material could be established.

Redesign

Redesigning the current product to let it fit better to other circular strategies is a very interesting opportunity. Therefor for every circular strategy a redesign could be the deciding factor to contribute significantly to create a circular business.

Maintain

Maintaining a rubber sports flooring is all about taking care of the product. The most important factor is the way the floor is installed. If this is done properly the flooring can last much longer or better said maintained longer. Stockz is helping their clients with manuals and animated video explainers for installation. It is also advised to use the floor installation services if clients of Stockz have it.
Next to this regularly cleaning the floor by vacuum or mopping is also prolonging the products life. Stockz now even sells cleaning products for optimal cleaning.
Rearranging flooring pieces can maintain the floor as well. Some clubs and gyms are rearranging tiles from corners which are not used at all with tiles that are heavily used at specific training spots. Rearranging is not likely to happen with rolls (glued and pretty big) but it is very possible with tiles.

With a redesign for maintain it could be possible to extend the life of flooring even more. Designing products that are easier to maintain or create custom tools for installation.

Reuse

Reusing flooring is a very plausible circular strategy. Flooring can be used for a long time depending on the use. If a gym is relocating, moving or quitting the business, which is happening a lot of times earlier than when the end of life of the rubber product is reached, a 2nd hand product could be retrieved and sold. These products now are thrown away or are sold on a 2nd hand market.

Repair & Replace
Repairing flooring is not really doable. It is not possible to glue granules or broken parts on to an old flooring piece at the location of the user. A repair at the production site will is part of the refurbish or remanufacture circular strategy.

Replacing a small number of tiles instead of replacing the whole floor could be seen as a way of maintaining the rubber sports flooring solution. This is currently already happening on a small scale. Gyms, clubs and hotels sometimes buy a small amount of new flooring for replacement if a small part of the current flooring is broken or worn out. Still there are some challenges. The shape shift tiles undergo after a use period makes it a custom job to fit new pieces into the current flooring. Next to this the products can change colour so there could be a difference between the older and the newer flooring. These problems are not easily solved because it are material properties of rubber.

Refurbish
Refurbishing a product has to be done by a company. Repairing the product to a state where it works but usage is noticeable. For a rubber sports flooring it is not possible to replace or repair one part of the product. Therefor refurbish as a circular strategy will not work.

Remanufacture
But remanufacturing of rubber flooring could be very interesting. Looking at the use of rubber flooring actually only the top is worn out. If the top of the product could be taken of and a new top or top layer could be produced and added, a lot of material in the bottom can be used for a longer period. The remanufacture strategy could make it happen to maintain the bottom longer. How this top or top layer will be separated from the bottom is a big question. A redesign of the product could make this problem a lot easier.

Re-purpose
Re purposing rubber sport flooring will change the functionality of the product to create a new application. Because this is an even bigger downcycling step this is not the focus for this project.

Recycle
The circular strategy of recycling is prolonging the life of material and not the product. Recycling can be done mechanically and chemically. In the current process of creating Stockz's products, the base material is created by recycling tyres mechanically into granulate. Also other products can be made from this recycled material.

Chemically recycling rubber is also possible. With pyrolysis, which is the decomposition of carbonaceous material by heating (University of Twente, 2020), rubber can be turned into carbon black, oil and gas (see figure 23). Pyrolysis needs lots of energy and therefor all the created gas is used for the process itself. The other materials can be used to create rubber again. This is quite a new process which is mainly done with car tyres. There have been done some research about pyrolysis of rubber granulate products and other rubber products which shows it is possible to chemically recycle rubber granulate flooring (Januszewicz et al., 2020)

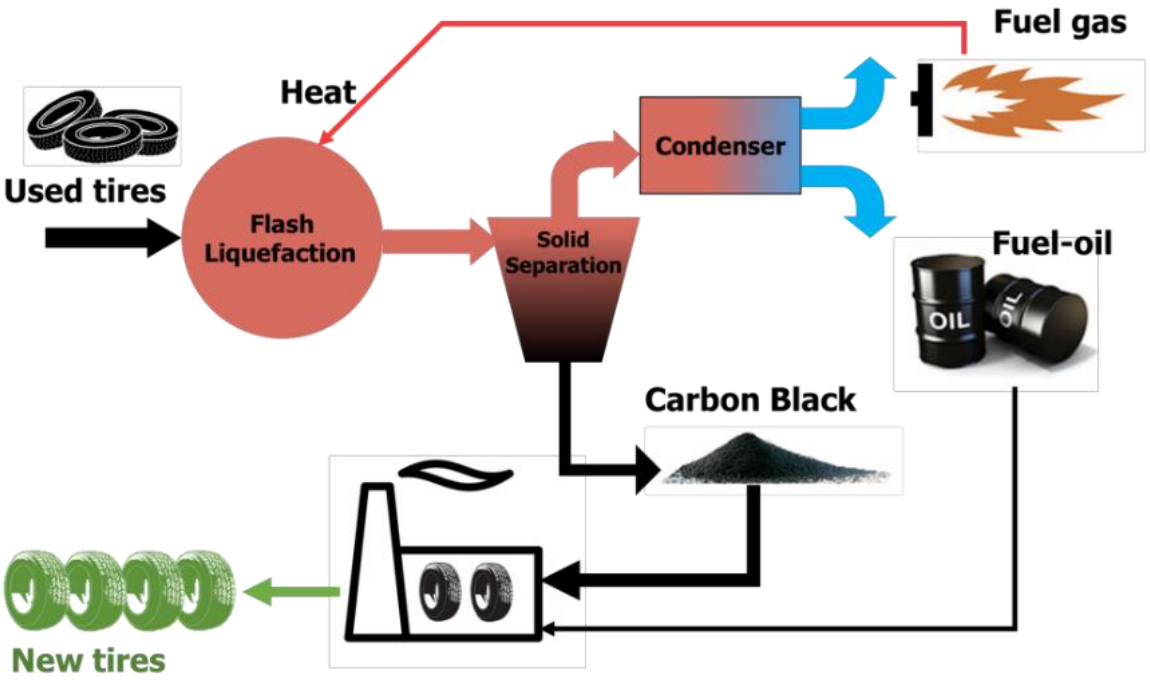


Figure 23: A schematic view of pyrolysis (University of Twente, 2020)

Recycling is the largest and last loop in the techno cycle of the butterfly diagram. Compared to using new material it is more sustainable but a lot of energy is needed to create recycled material. A advantage of recycling is the use of these base materials can be used for much more purposes compared to the smaller loops retrieved product/material.

The current product is recycled from car tyres, so it would be very logical that creating a floor from a floor is also possible. The main difference is that there is glue between the rubber which can't be separated. Because of this, the only way to mechanically recycle this product is by downcycling. Every time a floor is recycled again the quality goes down. But where is the quality of a floor based on, to understand this first a look into the current recycling process is made. From this knowledge, conclusions about the next cycles of recycling can be made.

Recover

Thermic recycling is often used as a synonym to recovering. Burning or incinerating the product to create energy. For rubber this is interesting because there is a lot of rubber waste and 1 kg of rubber creates more energy than 1 kg of coal (Thomas et al., 2018). Still even with the cleanest incineration the value of the material is decreased as far as chemically possible. This is a solution for waste which arguably is not a circular strategy.

3.6 Choosing Circular Strategies

Reuse, Remanufacture and Recycle are the circular strategies with the highest potential for rubber sport flooring. These strategies will be the main focus for this project.

Reuse of rubber sports flooring is promising because rubber can be used for a long time. Sports clubs throw flooring away when renovating or moving. These flooring is still good for use. Selling used rubber flooring is already done on a small scale but can be a real business for Stockz when a retrieval service is created.

Remanufacturing of rubber sports flooring could be very interesting especially in combination with a redesign. This redesign could also create possibilities in other circular strategies like reduce, maintain and maybe even repair or replace.

Recycling is already the business of Stockz, therefor it has high potential to recycle flooring to create flooring again.

3.6 LCA current product

To compare the current impact of rubber sport flooring on the environment to new product designs from the chosen circular strategies a Life Cycle Analysis (LCA) has been conducted. The IDEMAT2021 database has been used to calculate the carbon footprint. The Eco-intensity is therefor based on the IDEMAT2021 CO2 impact.

The most sold product based on weight, the standard tile 20mm produced in Poland is used for the LCA. A second LCA of the second most sold product from another product category, the connect tile 20mm with a 2 mm EPDM toplayer, is also made.

A functional unit (fu) of 8 years is chosen. For a car tyre and a rubber sports flooring this is the average time that the product is used. Because of this all material impacts, except for the glue, are divided by 2 fu.

Assumptions

For the material part of the LCA the items per functional unit is based on the % of the materials that are used in a tyre. The % are based on the numbers in figure 15 the ingredients of a tyre. The metal and textile is removed from a tyre to create granules, so the other 4 ingredients (natural, synthetic, fillers & curing systems) have another (metal 12% + textile 4% = 16% divided by 4=) 4% of the total ingredients. Yet glue is added with an approximation of 3.5% of the total weight. This gives the % for the items per functional unit shown in the LCA excel (see Appendix B).

Next to this the synthetic rubber is assumed to consist of half SBR and half butadiene rubber (*Tire Composition*, n.d.). The ratio black carbon / silica is assumed at 1/5 (Zafarmehrabian et al., 2012). It is assumed silicagel is the same as silica (Wikipedia, 2022). For the curing systems the ingredients are simplified to only sulphur and zinc oxide in an even distribution.

For the connect tiles an EPDM toplayer of 2 mm of a 20 mm tile is used. EPDM has a bigger density compared to other rubbers so it is assumed that it contributes 16% to the weight. This means the other 8 materials contribute 2% less to the weight in a connect tile.

The impact of the materials of the granules are divided by 2 in the LCA. This is because of the functional unit (fu) of rubber. The assumption is that a flooring product has the same product life, of 8 years, as a tyre (source). 1 fu is 8 years. Therefor the rubber material extends their life with a factor 2. The only material which is new and will not be divided by 2 is the glue.

For the new LCA's for the circular strategies it is assumed there always has to be but the same amount of glue again in the mould. This is not true because the old glue also has effect. But how much this has effect and how much new glue needs to be added is not known. Therefor the assumption is to use the same amount. Using less will only improve the reduction of the impact.

Manufacturing - For the manufacturing part of the LCA the production process of pressing the granules with the glue into a tile in the mould is assumed to be thermos forming for plastics. The Shredding and Filtering is assumed to be comparable to cutting of non-ferro and the removing of steel and textile is to be assumed to be comparable to Drilling/Milling/Turning of steel.

Transport - For the transport a truck+trailer is used for 1400 km (1100km from Poland to Stockz and 300 km from Stockz to the Belgium client) for the standard tile. For the connect tile a container ship from Guangzhou to Rotterdam (18000 km) was used and a truck+trailer from Rotterdam to Stockz to the Belgium client (450 km).

Use - The use phase has no effect on the impact because no energy is used.

End of Life - For the end of life (EOL) phase the fillers, curing systems and glue were not taken into account because no comparable waste treatment was found for these materials. The weight of the product was evenly distributed on the natural and synthetic rubbers.

Next to this some assumptions about the LCA's of the new products of circular strategies are made. In the LCA's of the different circular sports flooring it is assumed the amount of rubber in weight after use is the same as when sold/installed.

Results

The standard tile 20 mm has an impact of 40.48 kg CO2.
The connect tile 20 mm has an impact of 42.19 kg CO2.

So an average flooring of 100m2 has an impact of respectively 4048 or 4219 kg CO2. An average Dutch household (2.2 persons) has an impact of 19000 kg of CO2 per year (Milieu Centraal, 2021).

For comparison the production of one tile of 1 m2 has the same CO2 emission as around 150 eggs (foodfootprint.nl, 2021). On average a Dutch citizen eats 210 eggs a year (Eieiei.nl, 2018). So you could say you can eat your eggs for 8 years or use rubber flooring of 10m2 for 8 years.

- PROCESS -

4 Method

Looking at the chosen circular strategies questions arise. How to retrieve products? Is it possible to use the current production process to recycle flooring? How is remanufacturing of a rubber sports flooring possible? How can a redesign of the product contribute the remanufacture (maintain, repair) strategy? Can rubber sports flooring be sold as a used product?

To answer all these questions interviews with clients, end users, experts and the production partners are conducted. Also a creative idea generation session with fellow industrial design students was done. For the interview an interview guide was created (see Appendix A 5)

4.1 Interviews

Clients of Stockz give advice on the retrieval service and the circular product strategy. Also the hire/lease business case will be discussed. End users can give advice on the circular product strategy and the retrieval service as well but from another perspective. The production partner of Poland will give advice of production of the circular product.

Interviewees

4 clients of Stockz within the indirect sales category (see table 1), 4 home gym owners (see table 0) and 1 gym owner were interviewed. Next to this multiple interviews were held with the production partner in Poland.

Interviewee	*Location*	*Floor Size*	*Kind of flooring*	*Student*	*Man/Woman*
Home gym owner 1	Ypenburg	13 m2	Foam	No	Man
Home gym owner 2	Delft	4 m2	Foam	Yes	Man
Home gym owner 3	Den Hague	9 m2	Rubber Tiles	No	Man
Home gym owner 4	Delft	0 m2	None (carpet)	Yes	Man

Table 0: Overview of the home gym owner interviewees

Interviewee	*Location*	*Client Category*	*Storage*	*Installation*
Client 1	Belgium	Equipment manufacturer	Yes	Yes
Client 2	Sweden/Norway	Equipment manufacturer	Yes	Yes
Client 3	Austria	Equipment distributor	No	Yes/No
Client 4	Denmark	Floor specialist	Yes	No

Table 1: Overview of the indirect sales clients interviewees

The gym owner had one location in Delft of about 600m2 with 325m2 roll flooring, 200m2 2nd hand tiles and 75m2 of very old tiles. This gym could be classified as a classic or old school gym. (see figure 28)

The floor size of home gym owner 4 is 0 because there was no flooring on the base flooring.

The Austrian client is setting up a installation service but this is not existing yet. The full interview guide and the written interviews are shown in the Appendix A 5. Photos of the home gyms are shown in figures 24, 25, 26 & 27.

The results of the interviews can be found in the evaluation parts of the retrieval 5.4 and circular strategies paragraphs 6.1.3 Recycle, 6.2.3 Remanufacture & 6.3.3 Reuse.

Figure 24: Home Gym of owner 1

Figure 25: Home Gym of owner 2

Figure 26: Home Gym of owner 3

Figure 27: Home Gym of owner 4

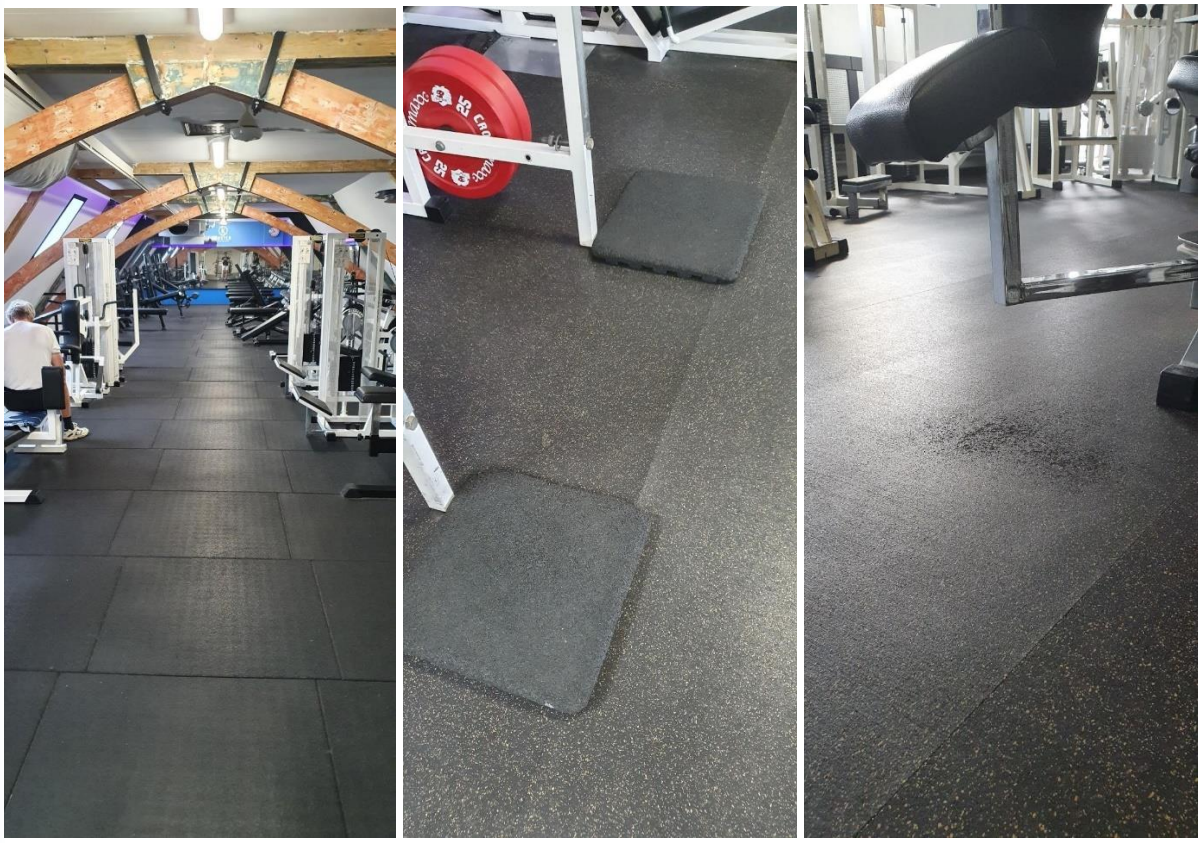


Figure 28: Gym of gym owner 1 (2nd hand tiles, extra tiles for heavy impact zone, scrubbed flooring)

4.2 Creative idea generation session

To redesign for circular strategies a creative idea generation session will be conducted. Using the skills and inspiration of other designers creates interesting ideas and directions.

The main focus will be to redesign for remanufacture but a redesign to maintain, repair, replace or some other circular strategy will not be discouraged. In between reuse and recycle a lot of interesting strategies are possibly usable when the design is changed. Reusing is one of the best things to do circularity wise but what to do with the product if it cannot be reused anymore? There are still a lot of strategies in between reuse and recycle so redesigning the product is an direction in my project that should be explored to help create a more circular rubber sprot flooring solution.

The How Can You (HCY) method will be used to start with a broad view on the topic. How can you replace, separate or fixate something. The ideas from this method can be put into the light of the problem, creating a more circular product. Which ideas can redesign the product to use circular strategies?

- RESULTS -

5 Retrieval

In this chapter the retrieval part that is necessary for a circular business is analysed. First an introduction to the problem and an overview of the possibilities will be given. The transport, storage, sorting, cleaning will be looked into. A cost calculation is made and

5.1 Introduction

To make a circular business possible a used product has to be retrieved. This crucial, and not existing, part of a circular business needs to be established. Taking out flooring, transport, storage, sorting and cleaning are all part of this retrieval business.

In theory governmental recycling centres could let users separate 'useful' rubbers. Collection companies then could sell the rubber back to Stockz. For this to work Stockz will be dependent on this not yet existing recycling step. To become more circular now Stockz need to take back flooring themselves. Stockz needs totake responsibility into their own hands.

To retrieve flooring there has to be contact with the end user. Stockz only sells to the end users in the direct sales client category. So with for example FitForFree and BasicFit a direct contract could be set up for retrieving flooring. This also gives the possibility to create custom business models for these direct sales clients. The indirect sales client category are selling Stockz's flooring to end users. So here a collaboration with the clients of Stockz is necessary. The webshops sell to end users but have very little contact with them. Therefor it will be the hardest to retrieve flooring from users who bought at these clients of Stockz. For this project webshops will be excluded. Also a group of clients not fitting in these categories, named other, will be excluded.

Looking at figure 29, the biggest turnover is made through webshop clients. Excluding webshops and other clients will leave only 37.8% of the 2021 turnover available to retrieve. This is not really representative because of the corona pandemic. In 2019 around 30% of the turnover came from webshops and this year's trend show the shift back to the old ratio.

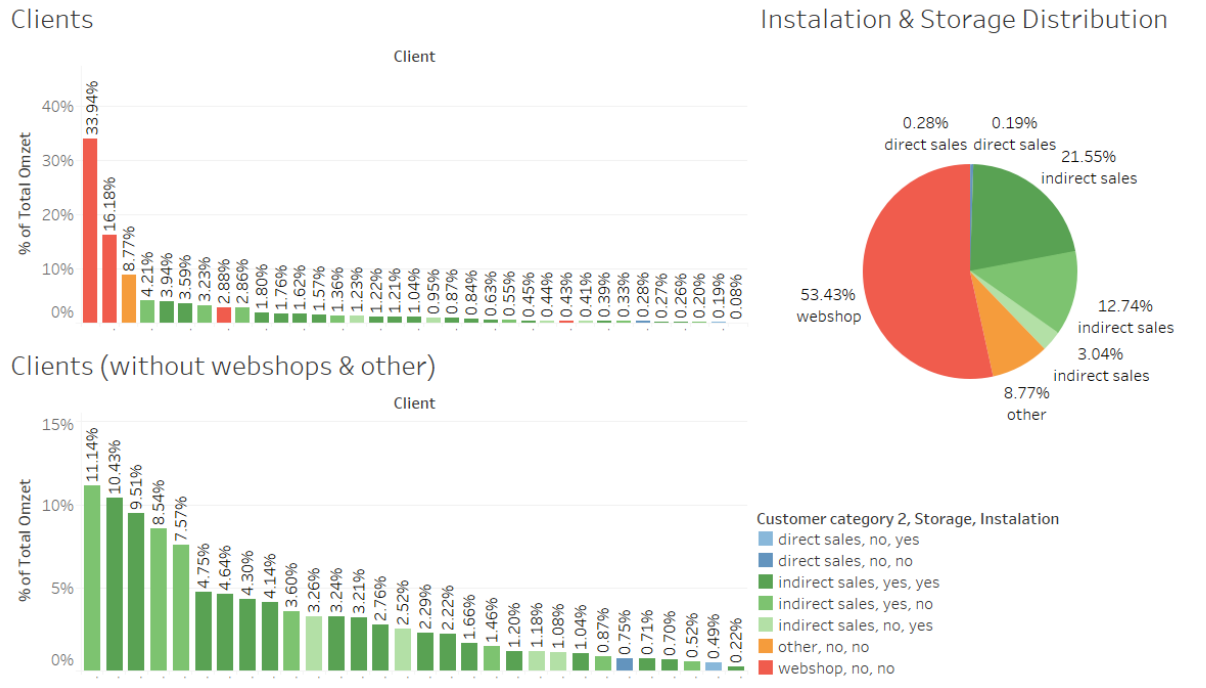


Figure 29: Clients of Stockz ranked on turnover made in 2021 (clients with a turnover lower than 10000 euros are not included).

The clients with the biggest turnover, who have storage and do the installation of flooring themselves are most promising to start the retrieval business. A big turnover is needed to collect enough old flooring in a respectable timeframe. Storage is needed to give the retrieved flooring a place until enough is collected to ship to Stockz and experience of installation of flooring is very useful because this will help at taking flooring out. The first green coloured client is a client from Denmark, second from Belgium, 8th from Sweden and 9th from Austria which are the 4 clients who gave feedback on this project. The 3rd client is Holdstrong, the german co-owner of Trackz. With one of these 5 mentioned clients the retrieval service can be set up.

5.2 The retrieval service

Taking flooring out

Taking the flooring out can be done in 2 ways. The end user can take out flooring or the client of Stockz can do it as a service. Both need pallets to put the flooring on top. If users do it themselves pallets should be sent to them. If the client of Stockz will do it the only way it could be done without too much costs is if they also install new flooring afterwards.

Transport

Because tiles are very heavy you need a truck with loading door and a pallet truck. The transport to the end user and back to the client warehouse are the main costs of retrieval (next to labour). Therefor the whole retrieval service is only possible if new flooring is ordered as well. Letting a truck with 2 persons drive for only retrieval will not be financially interesting. The delivery of the new flooring is than paid. The weight of the retrieved flooring on the way back is not creating a lot of costs.

Storage

A full truck of flooring has room for 26 pallets of flooring. With a product of 20mm this is 1300 m2. No end user will have a such a big space so at retrieval the truck will never be full. Therefor if clients of Stockz retrieve flooring they should store it at their own warehouse first. Only in the NL when the distance is not that great, the used flooring could be directly send to Stockz. When a large amount of flooring is in clients storage a full truck can be loaded and delivered to Stockz. This will lower transport costs dramatically. To lower costs even more flooring from some clients, for example the Scandinavian countries, should be sent directly to the polish production partner.

Sorting

Not all retrieved tiles will have a high enough quality for reuse purposes. There has to be a sorting step in the retrieval phase. The easiest will be to do this during taking the flooring out. But can end users or clients of Stockz make the choice which tile is good and which is not. The choices will not be consistent so at the warehouse of Stockz the products need to be sorted. It could be needed that flooring also needs to be sorted for recycling but that is something that should be tested. Sorting products by category will probably keep the 2nd cycle granules more consistent.

Like stated before used flooring could travel directly to the Polish production partner. The sorting step then has to be done by the client or by the production partner.

5.3 Cost calculation

All costs of retrieval are a sum of the costs of the retrieval service, the transport from client to Stockz, the sorting in Stockz's warehouse and the transport to Poland.

Retrieval service

The retrieval service will be done by the client of Stockz. They will have contact with their own clients, the end users of the flooring. After talking to the Belgium client it became clear that this retrieval service can be done in 2 ways. The first is getting end users taking the flooring out themselves and putting them on pallets. The second way the clients of Stockz take out the flooring for the end user. Both ways are done when the end user is buying new flooring and this will be delivered and optionally installed.

1. The clients takes the tiles out and put them on pallets.
    a. Collection: The client will put the tiles on pallets. Delivering 1 pallet = 40 euros
    b. Retrieval: putting the pallets from the gym into a truck. Labour = 5 euros (about 15 min labour)
    c. Transport: weight of retrieved products on the way back = 2 euros
    d. Storing: There will be some costs in storing the flooring in your warehouse until enough is collected to transport to Stockz. = 3 euros

Estimated costs of 50 euros per 50m2 = 1 euro per m2

2. The clients ask you to take the used flooring out. (This is only possible if the sold flooring is also installed.)
    a. You take additional a pallet = 5 euro
    b. 2 man will need 2 hours of labour to take out the flooring but no extra personal is needed because the new flooring also has to be installed. = 90 euros
    c. Transport: the same as retrieval service 1 = 2 euros
    d. Storing: the same as retrieval service 1 = 3 euros

Stated by client Sweden 200m2 takes 16 hours of labour for installation so 50m2 takes 4 hours for installation. Stated by the Belgium client taking flooring out will be twice as fast. So taking out 50m2 will take 2 hours.

Estimated costs of 100 euros per 50m2 but for this service the client also has to pay. Something like 50 euros or 1 euro per m2 will be reasonable. So the estimated costs for service 2 is therefor also 1 euros per m2. This is exactly the same as what the Swedish client of Sweden estimated.

There should be a minimal amount of m2 that could be retrieved to make it profitable. Probably this will be around 50m2 of 20 mm tiles which is 1 full pallet. If more flooring could be retrieved the costs will be lower.

Transport

For this project I take for the transport between Stockz and a client 300 km. This is based on the distance of the Belgium client. This will cost about 600 euros. The transport between Stockz and Poland is based on the costs of buying a truck full of new products from the production partner. This is a distance of 1100 km and costs 1300 euros. It could be that the costs will be lower if the same truck can be used to deliver used flooring back.

To lower transport costs flooring has to be stored until a full truck can be loaded. 26 pallets fit into a truck. So 1900 euros divided by 26 = 73 euros per pallet

Sorting
Sorting tiles to different circular strategies or to comparable product categories has to be done at the warehouse of Stockz. This will take some time and labour. For every pallet it is assumed 1 hour with 2 persons are needed. This will be around 50 euros.

Total costs
Total costs per pallet (1 ton) = 50 + 73 + 50 = 173 euros
Total costs per m2, 20 mm = 173 / 50 = 3.46 euro per m2 or 20mm tile

5.4 Evaluation Retrieval Service

Installation cutting loss
Some clients of Stockz stated that the cutting loss of installing flooring could also be recovered. The Belgium client already collects these bits and pieces in a residential waste container at their warehouse. Separating the cutting loss from the other waste could create up to 1 full containers or 6m3 of cutting loss rubber material per year. If this is true 300 tiles of 1000x1000x20mm can be made from this unused material.

From the interviews
Gym owner 1: It could be done by an external organisation which collects used equipment and flooring to sell 2nd hand. If the quality is to low it can be sold or collected by Stockz.

Home gym owner 1: Give back your old flooring for a small discount (0.25 cents per tile)
A retrieval service would be nice, or can I send the old product back with the new packaging
Home gym owner 2: A retrieval system will only work if I know it exists
Maybe the product can be a bit more expensive if you know it will be picked up when you want to dispose it. And then you get a discount for the product.
"people will not really think about the end of life if a product lasts very long"
"If I would know that the flooring has value and that the company want to retrieve it I would like to help. Communication of this is very important. It should not be costly"
Home gym owner 3: With a deposit or removal fee in the buying price. Just like bottles. But does this still work in 10 years?
2nd option is to bring the tiles to a disposal hub. 3rd retrieval service - the tiles will be collected at my home.
It has to be communicated that you can bring back flooring and that this is better compared to the recycling centre. This could have some costs for me as a user but not much. Driving a bit further to deliver it is not a problem.
"If I would drive 10 minutes further to dispose my flooring at a gym (where the flooring will be used in a circular business) instead of the dump or recycling centre I will feel much better."
Home gym owner 4: "I don't want to have a hassle. The recycling centre is close by so I don't want to bring the used flooring any further than that. Or we should lay it outside and someone will pick it up."
"After 20 years I don't know if I would remember the retrieval service."

Client Austria: "It is all about communication … we could do this as a service for free. Clients probably don't want to pay for it, we need to make it attractive for clients."
Our installation partner could help to retrieve flooring but not for free
The best way will be letting users take out their flooring and put it on a pallet
Retrieving flooring should be fast and easy without hassle and financially interesting.
We should give information about retrieval at the sales pitch. Introduction the service from the start. Stockz should do some test with a couple of clients (MVP's).
There should be no hassle for clients.

Client Belgium: We should let clients know that flooring can be collected after use, like a kind of service. Promote if you buy a new floor we take the old one out.
It would not be good if Stockz have contact with our clients.
It would be good that retrieving overall will be organized by Stockz. Also selling 2nd hand products should be done by Stockz. If we have a client who is interested in 2nd hand flooring that we can look and see if there is flooring available at Stockz for this.
If you sell the flooring with the info of retrieval clients will get back to us!
Client Sweden: We take out flooring in 50% of all cases. But transporting this to NL will be very costly. My clients will be very interested in a retrieval service. Retrieving flooring without selling new flooring is to expensive.

Price

Home gym 3: I would pay 25-30 euros for picking up my 9 m2 tiles.

Belgium client: We could do the retrieval service for like 3-5 euros per tile. For clients it should be free if they buy new flooring. If they do not order new flooring we could ask some money.
Client Sweden: End users maybe will be willing to pay a very little for a retrieval service.

Disposing

Gym owner 1: “It is a bit of a thing, moving everything”
She talks about moving equipment, taking the flooring out and transporting to dispose, “it will be a hell of a job.”
She even thinks the gym has to close to get new flooring because they are open every day. That is why she is delaying the job. If the flooring can’t be sold again 2nd hand she has to lend or hire a truck to move all the flooring to a recycling centre.
A retrieval service that takes the flooring out of her gym could take a lot of the hassle away. But a consideration has to be made about the costs. If they do it themselves some core members will probably help.

Home gym owner 1: “it’s quite a struggle to replace flooring because all machines have to be moved”

5.5 Circular business models

Business cases for circular strategies are all about retrieving the product.

5.5.1 Hiring or Leasing

To support circular strategies a hire or lease business case is interesting. The ownership stays with the company, thereby being responsible for the end of life of the products. The company now also has an incentive to prolong the life of the product to reduce costs on delivering a new one. At the other side customers want a perfect floor and if something is wrong they expect a new or fixed fully functional beautiful floor. If this will increase of decrease the life of flooring is not clear.

Currently fitness equipment is most of the time already leased. This is because of the high prices of the machines and the slow depreciation of the value of these products. Sometimes the floors can also be leased within this same contract as the fitness equipment.

A hire contract is only possible if you have direct contact with the end user. So for most users of Stockz's flooring this will be a hire contract with the clients of Stockz. But the direct sales of Stockz, basicfit and fitforfree, could be interested in hiring.

Unfortunately I have not yet spoken to 1 of these direct sales companies. This I want to do after the green light meeting.

If a hire business of sport flooring will be established additional services are expected by customers (home gym owner 4). So the flooring should be picked up when the client is finished with it. Cleaning product could be delivered for free or with a discount and if flooring is broken or worn out, it should be replaced. Because of this the costs of a hire contract will be higher for end users after some years compared to buying the flooring themselves. This is not only because of the additional services but also the risk of clients finishing the contract before the breakeven point. Maybe a minimal time of hiring should be in the contract. From the other side users should not be forced give the flooring back.

From interviews
Gym owner 1: Hiring flooring is a no go for me. I do not like the costs. That is why I buy most of my equipment and flooring 2nd hand. Than it is affordable.

Home gym owner 3: "The company is obliged to take the flooring back"
"watch out that the company ownership not creates bad conditions for users in a contract. So for example that the company can oblige you to give the flooring back would be bad. You as a user should be able to do what you want with the flooring. Even selling it 2nd hand should be still possible."
"Also I would think some kind of service should be included in a hire contract. So if you have some wear that the flooring will be replaced. And that it will be retrieved when you are done with it."
I would not like to rent because I think this is more expensive and there is more hassle with a contract.

Client Austria: It depends of the cash flow of the client.
I work already with a leasing company, our clients can lease the flooring via this partner leasing company. We do this for a minimum of 10 years already. For 75% of the clients we work with the leasing company. For equipment it is all leasing. Flooring is almost always combined with the equipment in a leasing contract.
Sometimes I even don't know if they lease because they just pay us but maybe they have a contract with the bank or a leasing company.
The ownership of the flooring stays with the leasing company.

Client Belgium: It could be interesting but how would it work with the cashflow. We need the money when flooring is sold. And what if end users stop the hire contract before break even? “Clients want to pay monthly”

Client Sweden: If a big installation is sold with a lot of equipment 80% of the clients take a lease, flooring included. If people will hire flooring but stop the contract after a short period the transport costs will be really high. It is not interesting yet for clients

Additional services
Client Austria: Cleaning (products) will be appreciated by clients
Client Belgium: A yearly cleaning service would be great for our clients I think
Also new flooring after some years could be a service. The used flooring could be sold as 2nd hand flooring

5.5.2 Pay to return

The pay to return business case is very useful when a party is in between your company and the end user. The floor specialist and fitness equipment distributors can figure out themselves how to retrieve the flooring from their clients. Of course Stockz could help them in this process. If they do so a price is paid for all the flooring that is brought back to Stockz. This way is often used for BtoBtoB/C kind of businesses who want to become circular according to Martijn ten Kate, a circular project manager of the Bin who I spoke about my project. Martijn was the project manager of the climbing shoe project (see paragraph 7.2.2 recycling tests)

It could be useful to pay more for reusable flooring then recyclable flooring. In this way clients of Stockz have an incentive to remove flooring in a gentle way and at installing create the right circumstances to remove it in the best way.

5.6 Conclusions Retrieval

In the first steps towards a circular product and business retrieving floors from webshops will be excluded. Even though this is a very big chunk of the cake it will not be easy to start retrieving flooring from users who bought flooring at a webshop. A nice thing is that in the current year 2022 webshops generate less revenue in % because corona is decreasing its influence.

Start the retrieval business with the indirect sales client category. Search for clients who have a big turnover, have storage, install themselves and are not too far away from the Netherlands or Poland.

Both the 2 retrieval services are interesting. 1) a free service of taking flooring out themselves and putting it on delivered pallets which will be collected when the new flooring is delivered (and installed). 2) the flooring will be taken out by the client of Stockz. The costs will be 1 euro per m2. Find out which retrieval service has the biggest desirability and check the costs in practise.

Find out how much time and money is needed for sorting the products. Is retrieval service 2 used a lot, then it makes sense to let the clients sort the tiles when taken out of the gym.

More research has to be done for the lease/hire contract with direct sales clients. It has a potential to fit better to the cashflows of gyms and at the same time let the ownership stay at Stockz. At the other hand if the contract is stopped early the breakeven point is not met. But if Stockz creates the circumstance for a long product life more can be earned from 1 produced flooring. Which is environmentally beneficial.

6 Circular Strategies

This chapter takes a look at the 3 chosen circular strategies Recycle (7.2) Remanufacture (7.3) and Reuse (7.4). Every paragraph will start with an introduction of the strategy followed by an evaluation done by interviews. A cost calculation will be done to analyse the viability of the business case and an analysis of the sustainable benefit will be done through a LCA comparison. All separate strategies have their own final conclusions The last paragraph of this chapter (7.5) will compare the different strategies with each other by showing a overview of the benefits and disadvantages.

6.1 Recycle

6.1.1 Introduction

Rubber sports flooring is already a recycled product so recycling sports flooring to create sports flooring again is a very plausible. This 2nd time the rubber is becoming a flooring is called a 2nd cycle product in this report.

Like stated in the analysis of the production (paragraph 2.4), the recipe of the production process is very important for a high quality product. Therefor it is important that the flooring that is retrieved is contaminated as least as possible to guarantee cleanliness and product categories need to be mixed as least as possible.

Cleaning

Used tiles need to be cleaned. For recycling the production partner stated that Chalk, Sweat or other materials/fluids don not have an effect on production. Only stones just like with tyres have a big impact. Therefore flooring should be vacuumed before taken out of the gym.

Product analysis

All products sold in 2021 were analysed. Using the length, width and height and the average density of the product gives an estimated weight of every product that is sold. Multiplied with the amount of products sold gives a total weight per product sold. Sum these weights and an estimation of the total rubber flooring that is sold is calculated. The total amount of sold rubber in 2021 was 4891 tons. For all analysis made further, this data of 2021 is used (see Appendix C for this excel sheet)

Category

Rolls and outdoor tiles have higher contamination compared to the other product categories which will affect the recycling process in a negative way. Rolls are glued on the base floor taking material from the base layer (for example concrete) when removed. Outdoor tiles are obviously laying outside and therefore have low cleanliness. These categories, together with other because it is too small, will be excluded for recycling. In figure 30 it is shown rolls take 11.18% and outdoor tiles take 4.12% and other takes 0.83% of the total weight of rubber sold in 2021. This leaves 83.87% or 4102 tons of rubber available to recycle. For the circular strategy reuse rolls and outdoor tiles could still be interesting.

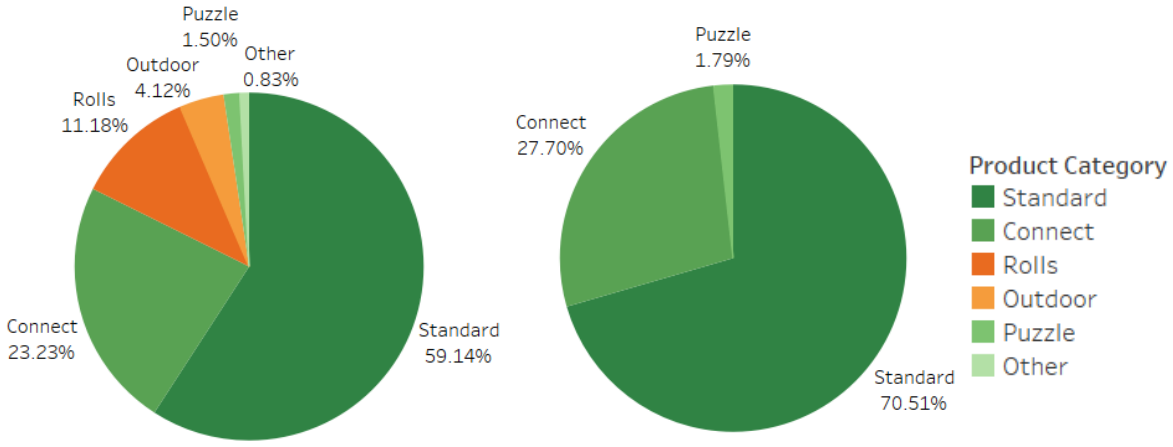


Figure 30: weight % per product category

Sorting

Like stated in chapter 5 Retrieval, sorted flooring by category will probably keep the 2nd cycle granules more consistent and therefore the quality of recycled products higher. It could be possible to mix certain product groups but this should be tested and optimized with an specific mixed retrieval recipe. A pretty good representation of mixed rubber granulate is the test 2 which used connect tiles. More is explained further in this paragraph.

In practice it would take a lot of time to separate all the retrieved flooring into categories. Looking at figure 32 it is only possible to separate standard tiles and connect tiles from all other product categories.

The minimal amount of kilograms needed to create a batch of 2nd cycle products is 1 ton. This is around 2 pallets of products. For 20mm tiles this is 100m2. This is not a strange amount of m2 for a gym so it could be beneficial for flooring above 100m2 to separate it from other retrieved material to create 2nd cycle granules and products. The kind of contamination and the amount of contamination will more the same which increases consistency.

Colour

When rubber flooring is recycled the whole product is shredded into granules. Many products have a coloured granule mixture which will create mixed coloured 2nd cycle granules and products. But some products, 25 of the 207 products in the portfolio (see Appendix A 1), are fully black.

Fully black flooring has the benefit that a 2nd cycle product made from these black 2nd cycle granules can made into every kind of product of the portfolio of Stockz. Mixed coloured products will be only useful for a bottom layer or will create a mixed coloured appearance.

Looking at figure 31 it is shown that black products generate around 68% of the rubber kg's sold in 2021. This is a positive statistic that increases the useability of 2nd cycle granules. Grey products could be interesting to separate but looking at figure 31 only a small part of the sold products are grey. Therefor it is only interesting so separate these products if more than 2 pallets are retrieved.

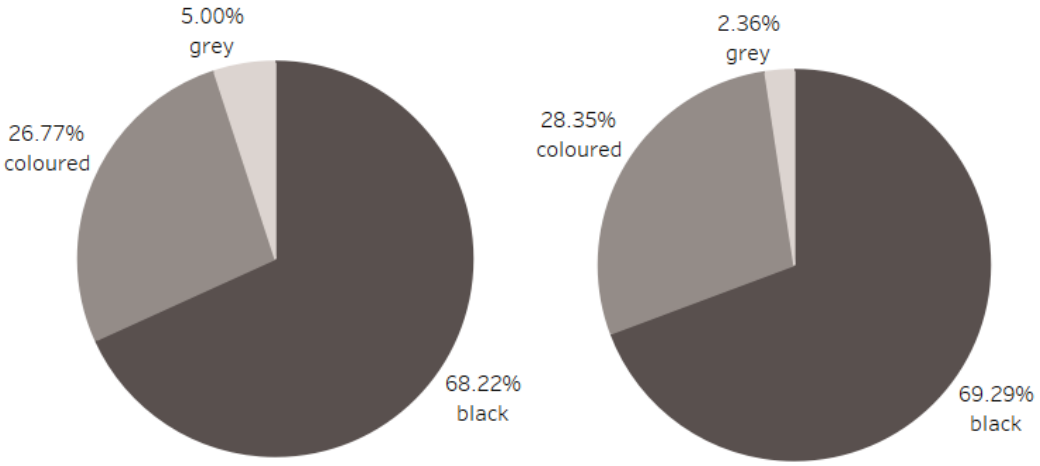


Figure 31: weight % by colour, left - all products, right - rolls, outdoor tiles and other excluded

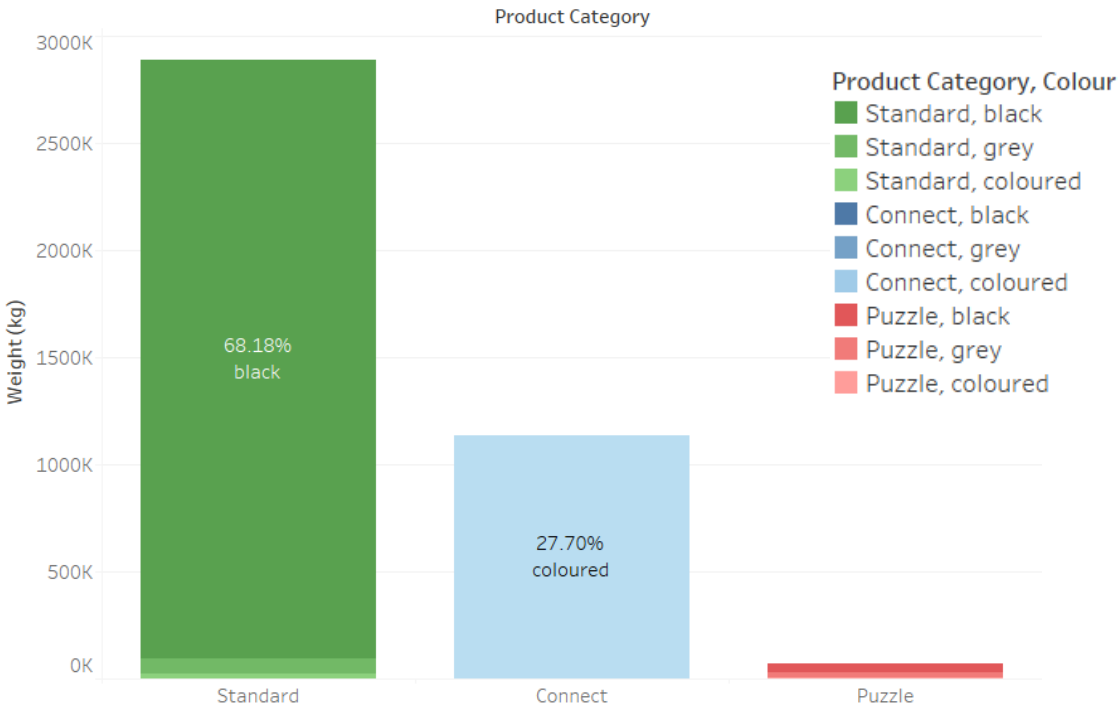


Figure 32: weight of different product categories and colour (% is without rolls, outdoor and other)

Turnover/revenue

But which products are sold the most? To get a good view on which products are most interesting to retrieve back and to see which products could be possibly mixed, an overview of all granulate rubber sports flooring products that Stockz sold in 2021 is made.

In the year of 2021 almost 4900 tons, just over 300.000 m2 and just under 5000 m3 of rubber flooring was sold. The Polish production partner, shown in green in figure 14, has produced the largest amount of these products with 62.85%.

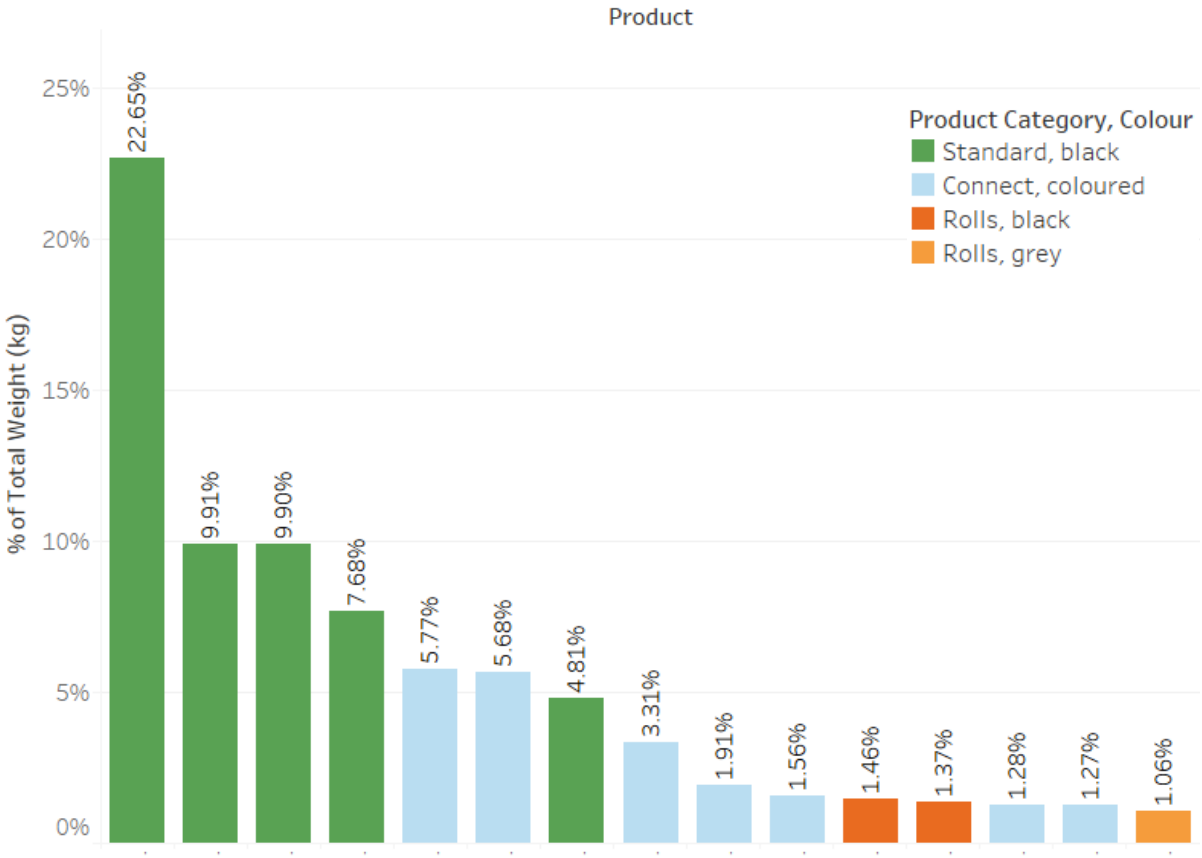


Figure 33: Individual product contribution to total weight in %

In figure 33 the amount of kg rubber sold in 2021 is shown by the top 15 individual products. The green bars, which are the standard tiles 11,15,20,30 and 43 mm, produced by the Polish manufacturer are responsible for 54.94% of the total weight of rubber sports flooring sold in 2021 by Stockz. These 5 products are 65.5% of the rubber that can be recycled (when the product categories rolls, outdoor and other are excluded). 2687 tons of rubber is sold by these 5 products.

Also the colour of the granules of the products that are sold is shown in figure 33. The 5 standard tiles mentioned above are fully black which means that these can be used for 1 layer products and top layers. The light blue bars are the connect tiles from the Chinese production partner. These products have an mixed rubber bottom layer. Therefor these products will become create a mixed rubber 2nd cycle product. If the appearance of mixed rubber products is not wanted this material can be used in the bottom layer of 2nd cycle products.

6.1.2 Tests

To know if 2nd cycle granulate or even mixed granulates are possible to use in the current production method some test have been done. Prior to this graduation project Stockz already started to take part of a circular project. Clean Climber they started a circular climbing shoe project where Stockz created some tiles. Next to this 2 different 2nd cycle granule tests were done during this project.

The climbing shoe project

Figure 34: Climbing shoe tiles, 10% climbing shoe with 90% car tyre granulate

With several parties Stockz is creating flooring from retrieved rubber climbing shoe soles. These soles are made into granules and mixed in rubber sports flooring. For this project the Polish production partner of Stockz is producing the tiles. The shoe soles are separated from the shoe and made into granules at Fast Feed Grinded, a Dutch recycling company. The shoes are retrieved by collecting bins at climbing halls. The climbing gyms will buy the end product of rubber puzzle tiles (see figure 34)

This project is made possible because of the great sustainable responsibility climbers have. Climbers are usually in nature practising their sports but at places like the Netherlands where there are no mountains climbing gyms are used. Climbing shoes wear out quickly if used regularly, and this does not fit the sustainable or circular responsibility.

This mix of used climbing shoe granulate with car tyres granules are made into puzzle tiles. The climbers and climbing hall owners, want to see the climbing shoe granules in the tile. So a reasonable % of climbing shoe granules should be used. The downside are the costs of the recycling of climbing shoes. It is quite costly to retrieve, ship, separate the different materials and finally ship the rubber soles to Poland. Here the soles are made into granules. The base material, which is the rubber sole of the climbing shoe is compared to tyres really expensive. Creating granulate from soles is 10 times more expensive compared to granulate from tyres. A balance had to be found between the amount of shoe granules that are used in a tile. The more shoe granules the more expensive the product. Yet the climbing halls are willing to pay this price to show their members that their shoes are used again in the flooring.

This shows that granules made from another base material than tyres will increase the costs. But it can be imagined that recycling flooring will be easier compared to recycling climbing shoes. Shoes are made of many different materials. Floors are just made out of rubber granules and a bit of glue. So how expensive is the retrieval and how does the glue affect the production process?

2nd cycle granulate test 1

To test if the current production method could be used to recycle flooring the polish production partner did a first 2nd cycle test.

With the product category standard fitness tiles, which are made by the Polish factory themselves, the test was done. Freshly produced standard tiles were put into the process again. So unused standard tiles where shredded into 2nd cycle granules.
To optimize the recipe they increased the temperature a bit and used a little bit more glue. Unlike normal standard tiles 1 layer of the same size granules were used. The result of this test is shown in figure 35. This product had a high quality based on their first look at the product.

1 ton of tiles were used and 950 kg of granulate was produced. 50 kg of the flooring were not useful anymore after shredding because the granules became too small. This material will, just like other pre consumer waste material, be sold to another company which creates other rubber granulate products.

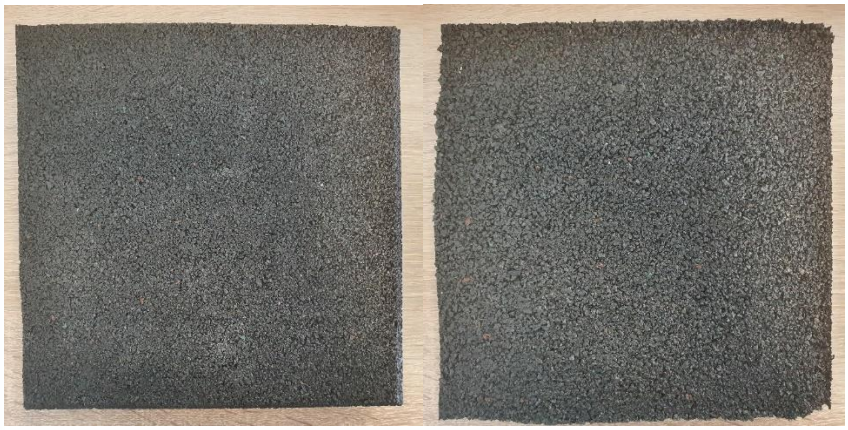


Figure 35: Test 1 – Used standard tile made into a standard tile again

2nd cycle granulate test 2

For the second test not standard tiles were used but connect tiles made by the production partner in China. The recycling and production of 2nd cycle tiles was done by the Polish production partner again. Therefore the connect tiles will become 2nd cycle standard tiles. Connect tiles with 15% red EPDM in the EPDM top layer were used. Connect tiles have a mixed granule bottom layer, and a EPDM top layer. Because of this 2nd cycle granules made from connect tiles are made from mixed rubber and colour. The consistency is lower which could result in a lower quality product. 3 test were done to see what will happen.

A = toplayer of 1st cycle granules – bottom layer of used connect tile
B = one layer of used connect tile
C = toplayer of used connect tile – bottom layer 1st cycle granules

The 1st cycle granules in the top layer are smaller than the 1st cycle granules in the bottom layer of 1st cycle standard tiles. The results can be seen in figure 36 top view and 37 bottom view.

Figure 36: Test 2 – Used connect tiles recycled and made into standard tile – top view (from left to right A, B, C)

Figure 37: Test 2 – Used connect tiles recycled and made into standard tile – bottom view (from left to right A, B, C)

(See Appendix A 4 for bigger pictures of the tests)

The results show that the top is always smoother than the bottom. This is because the top of the mould has a better finish. The top of B&C are both made of used connect tile granulate so they are the same just like the bottom of A&B.

The difference of the top of A compared to B&C is clear. A has a smoother surface because the 1st cycle granules have better consistency. The size of the granules are not that different. Also A is fully black and B & C have different colours. B&C have a circular look of mixed rubber and colours.

The difference of the bottom between C and A&B is also clear. The bottom of A&B look really similar to the top of B&C. This is also the same except to the finish of the mould top is different from the finish of the bottom. The bottom of C shows the bigger 1st cycle granules that are used in every standard tile above a thickness of 15 mm.

It could be asked why test 2C is interesting. If you chose to have a 2nd granule top layer why do you create a 1st cycle bottom layer? The reason could be that the 2nd cycle granules need a solid base of 1st cycle bottom layer to not break the product. Or users really want to have a mixed rubber appearance to show their circular product.

Evaluation tests

After test 2, it became clear the options A, B and C were also possible for test 1. Only test 1B was executed but test 1A (1st cycle top layer + used standard tiles bottom layer) and 1C (used standard tiles top layer + 1st cycle top layer) were taken into account at evaluation. An evaluation of all tests was done with Stockz and the owner and the production manager of the Polish production partner. In table 2 a ranking was made.

	*1**	*2*	*3*	*4*	*5*	*6*
Quality	1A	2A	1C	2C	1B	2B
Durability				?		
Production Costs		B		C		A
Desirability		A		1B & 1C		2B & 2C

*Rank 1 is the best, so the highest quality or durability or the lowest costs.

Table 2: Test products ranked on quality, durability and costs

The quality looked good for every test product so from the test tiles themselves a ranking was hard to create. Only the test 2A looked a bit better because of the 1st cycle granules on top. Therefor 1A and 2A were ranked best. 1A even better because the consistency of the 2nd cycle standard tile granules is better. The other choices were based on knowledge and not the tests. B would be worst because only 2nd cycle granulate were used no advantages of bigger granules in the bottom and smaller granules on top. C would be a bit better because of the advantage of having bigger granules in the bottom and the fact these are 1st cycle.

About the durability of the products could not be said anything. It is logical to think 2nd cycle granules are worse compared to 1st cycle granules but this is just not known yet. If 1st cycle granules are better than 2nd cycle granulate on durability the products with the least amount of 2nd cycle granulate will probably win. Top layer is less thick than the bottom layer so this will rank best to worse C, A, B. But a top layer is most important so A could be better than C. Durability test should be done to find out.

Production costs were easy because the 2nd cycle granulate was free for now. The more 2nd cycle granulate the cheaper the product. But asking about costs more closely the small granule 1st cycle top layer is expensive because of more shredding and more glue. Even though the layer is 1/3 of the tile A will be most expensive and worst ranked. Big granules 1st cycle are just as costly to produce as 2nd cycle granules but a 2nd layer product takes more time to put into the mould so C will be more expensive to B.

The desirability was also discussed and Stockz and the polish production partner agreed it is a personal choice but that still black would be bought more often. Next to this the top layer should be made from the smallest granules so that is why 1A & 2A are the best. 1B&C are better compared to 2B&C because they have a black top layer.

Conclusions tests

The results of the tests show that it is very feasible to create 2nd cycle recycled products with the current production method. The quality looks good but use test have to show if the durability is also good. Also the costs will not be higher compared to the current product. The feasibility and viability of 2nd cycle products is now about a good retrieval business.

6.1.3 Evaluation Recycling

Recycling flooring in comparison to recycling tyres has some benefits and disadvantages from a production perspective.

- No metal and textiles
  - Less separation
  - No money earned from metal
- Quality of the rubber is already tested before it became a floor
- Glue
  - Could create inconsistencies in the 2nd cycle granules
  - Could help the production process, maybe less new glue is needed

Yet recycling of rubber sports flooring will always be downcycling.

From Interview

Gym owner 1: I expect the life time to be the same as the current product.

Home gym owner 1: Interesting if the price is the same as the current one.
Home gym owner 3: "For me it doesn't matter if a product is made from car tyres or other flooring. They are both recycled right!?"
Home gym owner 4: "A more sustainable product will always be interesting to me"

Price:
Home gym owner 1: 100%
Home gym owner 2: 100% or maybe a bit more
Just like tony chocolonely the story makes you want to pay just a little bit extra.
Home gym owner 3: 100%, I would not buy a more sustainable flooring which is more expensive than an already recycled product.
Home gym owner 4: 100%, "paying more for a 2nd cycle product will not be an option"

Client Belgium: 100% More expensive than the current product will not work, clients never ask about sustainability.
Client Sweden: 100%

Concerns
Home gym owner 1: No I would not expect the flooring to last less long.
Home gym owner 2: I assume the quality is good and otherwise is communicated by the company. If they don't they will be roasted and get bad reviews.

Gym owner 3: It should fit the companies quality demands so no concerns.

Client Austria: No concerns, why should I have concerns? The current product is already recycled.

Coloured dotted 2nd cycle flooring

Gym owner 1: It is not necessary to have a circular indicator on the flooring itself. I would like to let my members know that the flooring is sustainable and that we as a company are thinking about the environment. The multi coloured flooring I really like, but my son does not like it. The members would like the story behind the flooring. If the top layer is black it will be perfect for everyone!

Home gym owner 1: Looks very nice, an circular indicator like this is looks very cool. The coloured spots should be a marketing factor. These colours should be the marketing for circular flooring!
Home gym owner 2: I would like to see a circular indicator on the packaging but not on the product. But the mixed colour products looks nice, maybe it could be an indicator.
Home gym owner 3:" I would like to have more colour in my current flooring so I like this!"
Home gym owner 4: "I don't want a rainbow floor but this is fine, the price is more important. "

Client Austria: It depends on the customer.
Client Belgium: I do not think customers would like a circular indicator. The colours I do not know if they like it.
Client Sweden: If you explain to clients why the colours are in the flooring they will understand. A lot of people don't really care how the flooring is looking. The quality is more important. But it will not be nice for everyone.

6.1.4 Cost calculation

The polish production partner of Stockz calculated that with the free used flooring they got from Stockz they could decrease the production price with about 10%. The costs of 11.90 euros per 20 mm standard tile therefore is becomes 10.71 euros. So if the 2nd cycle recycled product gets the same price as the current product the retrieval from end user to the polish factory has to be done for 1.19 euros per tile.

6.1.5 LCA Recycling

To compare a 2nd cycle product with the current product a big part of the LCA can stay the same. Only some small changes have to be done. In the LCA we look at production test B, so a fully 2nd cycle granulate product.

At first the rubber materials impact has to be divided by 3 with the assumption the product life of a 2nd cycle product will be the same as the current flooring. The functional unit (fu) or rubber is increased by 1 (1fu as a tyre, 1fu 1st cycle flooring, 1fu 2nd cycle flooring). For the 3rd cycle flooring the fu will be 4. Next the removal of metal in the manufacturing phase is not applicable anymore. The transport will be 2 times the distance of a new standard tile. From the client to Stockz to Poland and back to Stockz and to the client again. Nothing will be changed for the EOL phase.

Results

Looking at table 3. The is carbon footprint is decreasing every cycle. Recycling of 1 standard tile with a thickness of 20 mm has a reduction of 6.91 kg of CO2 or 17.08% the first time and 4.11 kg CO2 or 12% the second time. The results of the connect tile are shown in table 4.

	Standard Tile 20 mm	*2nd Cycle Standard Tile*	*3rd Cycle Standard Tile*
Total (kg CO2)	**40.48**	**33.57**	**29.46**
Materials (% kg CO2 of total)	65.83%	54.92%	48.64%
Manufacturing (% kg CO2 of total)	28.40%	30.80%	35.10%
Transport (% kg CO2 of total)	6.06%	14.63%	16.66%
Use (% kg CO2 of total)	0.00%	0.00%	0.00%
End of Life (% kg CO2 of total)	-0.29%	-0.35%	-0.40%
Reduction (kg CO2)		6.91	4.11
Reduction Percentage (% kg CO2)		**17.08%**	**12.23%**

Table 3: Total and per life cycle stage, kg CO2 impact of recycled standard tiles

	Connect Tile	*2nd Cycle Connect Tile*	*3rd Cycle Standard Tile*
Total (kg CO2)	**42.19**	**35.70**	**31.90**
Reduction (kg CO2)		6.50	3.79
Reduction Percentage (% kg CO2)		**15.40%**	**10.62%**

Table 4: Total kg CO2 impact of recycled connect tiles

It is also seen in table 3 that the impact of the different life stages change. The materials have less and less influence on the total impact whereas al other stages increase. This is of course because of the increasing life age of the material. Simulated in the LCA by dividing the impact by the number of cycles/loops. This is also the case for the connect tile. See Appendix B for the LCA excel file.

In table 3 and 4 the average numbers are used, but because everything is based on assumptions and estimates an uncertainty factor used. The results with uncertainty is shown in figure 38.

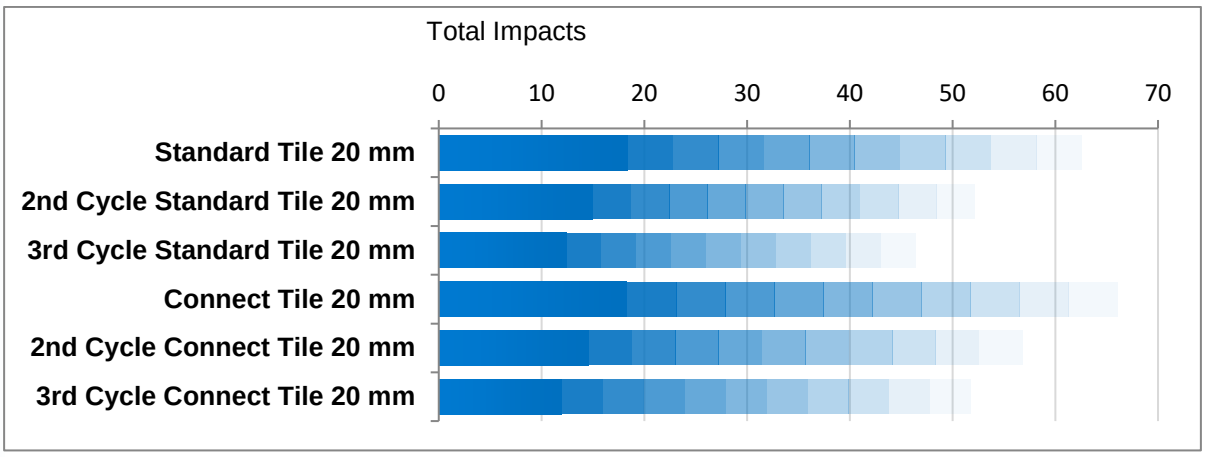


Figure 38: LCA results of Recycling of the standard and connect tile with uncertainty factor

If every standard tile 20 mm sold in 2021, which contributes 28.45% to the total weight of rubber sold, will be recycled and made into a 2nd cycle standard tile 20 mm, 382 tons of CO2 will be saved. This is comparable to 19 million trees growing for 1 year (Climate Neutral Group, 2022).

6.1.6 Conclusion recycling

Creating 2nd cycle granules will always be downcycling. The consistency of the granulate will become lower and lower the more cycles the rubber has made. Yet the tests were very promising. The recycle strategy is proven feasible. The current production process could be used to create 2nd cycle flooring and the 1st cycle glue is not a bad thing.

It will not be possible to sort all products by category but a sorting step black standard tile vs the rest can be done. This will create a new material stream of fully black 2nd cycle granules and mixed rubber and colour 2nd cycle granules.

A full 2nd cycle granulate flooring will have the cost benefit but a 1st cycle top layer with a 2nd cycle bottom layer can have better properties and quality. This probably increases the costs slightly. But the durability of all 2nd cycle products has to be tested.

Because 2 pallets are enough to create one batch of products some retrieved flooring could be kept together for optimal consistency of the granules.

Clients don't see a lot of difference between a recycled car tyre flooring product or a 2nd cycle flooring product made from flooring. Both are recycled right. The story and explanation of the sustainable benefit should be explained and communicated very well.

The costs of a recycled product will be higher compared to the current product. But clients are not willing to pay more for a 2nd cycle product. Therefor the viability of this strategy is not proven. Still it could be a viable business in combination with (an)other circular strategy.

The sustainable reduction of CO2 emissions is very promising. With a 15-17% reduction the 2nd cycle and a 10-12 reduction in the 3rd cycle recycling flooring could make the sport flooring business of Stockz a lot more circular.

6.2 Remanufacture

6.2.1 Introduction

Remanufacturing of rubber flooring could be very interesting. Looking at the use of rubber flooring actually only the top is worn out. If the top of the product could be taken of and a new top or top layer could be produced and added, a lot of material in the bottom can be used for a longer period. The remanufacture strategy could make it happen to maintain the bottom longer.

Using current production techniques

The top and bottom layer could be separated by a cutting machine. The polish production partner of Stockz already uses a machine which cuts layers of a small thickness (around 10 mm) from a big block of 1000x1000x?00 mm. This could also be done with used tiles cutting the top layer off and putting the bottom layer in a mould with some new granulate for the top layer.

Unfortunately this cutting machine is very delicate and cannot handle any dirt. This is already a problem currently so cutting used flooring will be not possible. Still a dedicated machine cutting used flooring could be an option.

6.3.2 Creative session

With the use of the design method 'How can you' different ways of replacing, separating, fixating and making something removable were explored.

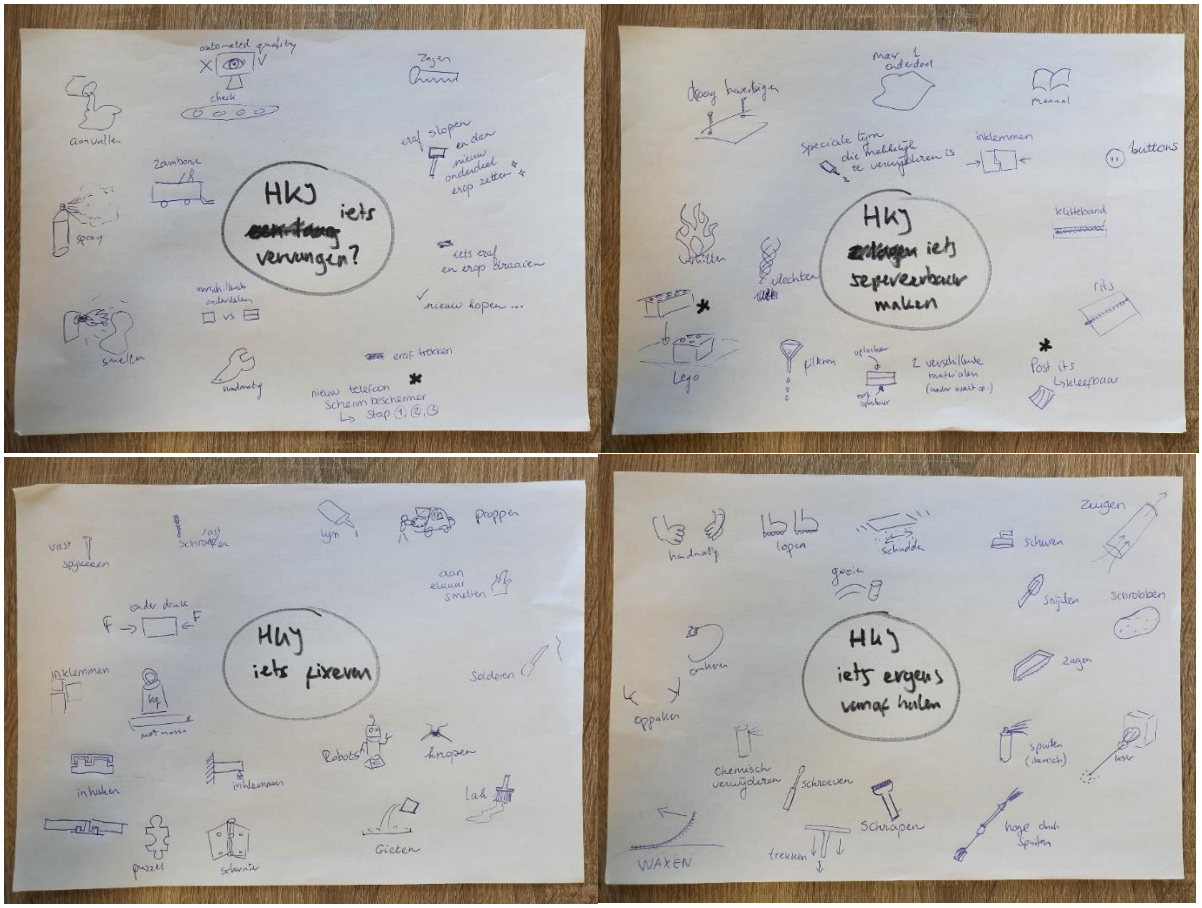


Figure 39: How can you? Design method results

See figure 29 for some pictures of the HCY results. All pictures of the material created during the creative design session can be seen in the Appendix A 3.

The best ideas that came up where a multi layered product, a 2 layered product with special connectors and finally a 2 sided product

2 sided product

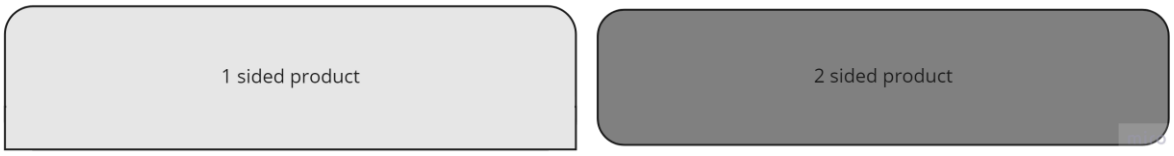


Figure 40: one and two sided product illustration

If the top half of the mould also will be the bottom part of the mould both sides have the nice finish and both sides have bevels / rounded corners (see figure 40). Only a half new mould is needed to create a product which can be turned around after some years. This could increase the life time of a flooring by 1 functional unit (x2). Also home gym owner 3 thought of the same idea: “Create a product which can be turned around for a doubled life time”

Top layer granules are smaller and therefore the product will be more expensive. But this could not be a problem because the product has a higher lifetime. Using bigger granules in the middle will not work because it is very labour intensive.

Tests need to be done to see what happens to the bottom of a flooring product after all these years. Is it moulding because of fluids? Is the quality still good after the years pressed to the base floor? Learning from the current product could be a start, looking at the bottom after use.

Layered product

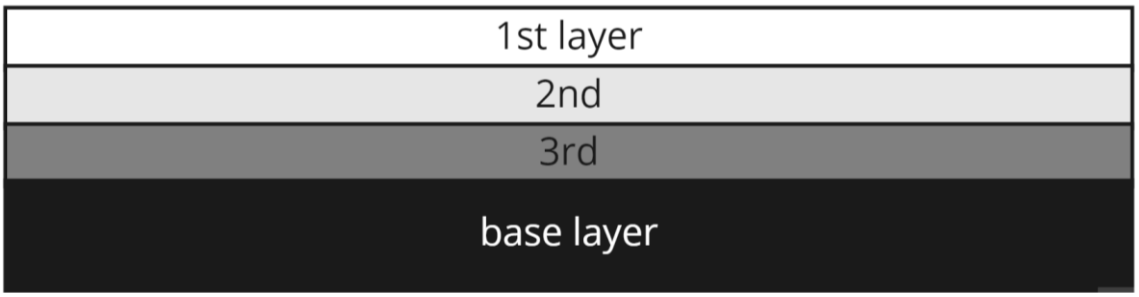


Figure 42: layered rubber sport flooring

Just like the visor of a F1 helmet every now and then the old used and dirty layer is pealed of and a new fresh layer is revealed. For a rubber granulate product this could be done every year to keep the flooring fresh. Of course every time the flooring gets thinner some properties, like damping, will decrease. Multiple top layers could be put onto a product with a thicker base/bottom layer (see figure 42).

How this exactly would work is not known yet. Experiments on how to separate layers easily when you want it and keeping them fixated during use have to be done.

2 layered product with special connectors

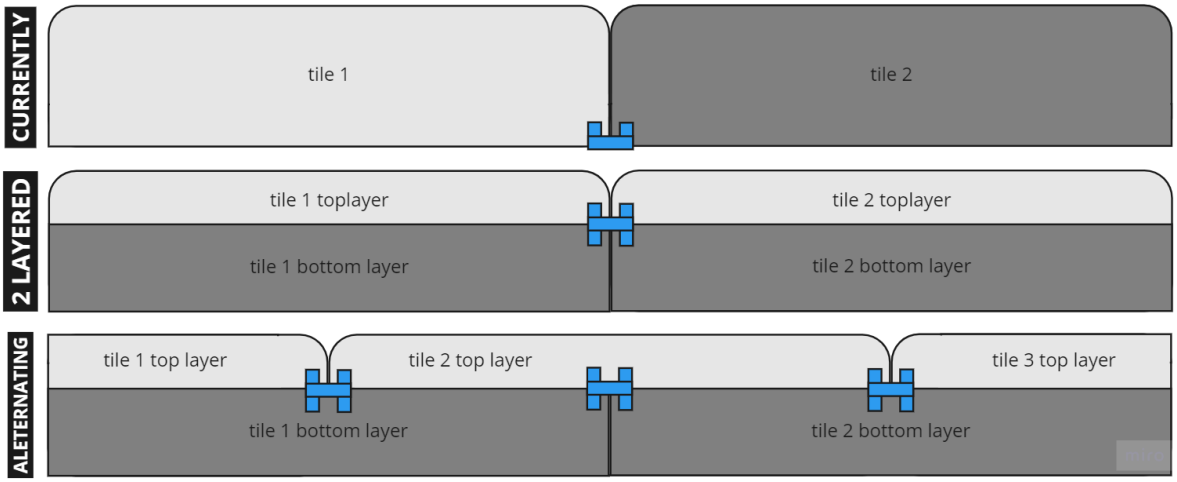


Figure 41: Special connector at the left, and tile-wise laying of the bottom and top layer for improved fixation.

What if a product can exist of 2 layers where the bottom layer can be used 2 lifecycles. After the first lifecycle the old top layer is replaced. Just put the top and bottom layer floating on top of each other. This is of course not a good idea so how to connect them? Just like the current connectors of the connect tiles special connectors need to be created (see 2 layered example in figure 41). If this will not fixate the two layers good enough a alternating roof tile laying technic could maybe help. Or even rims in the bottom of the toplayer and the top of the bottom layer that fit into each other could solve this problem.

This idea has the greatest potential based on the idea generation session with the peer designers. This idea is explained to the clients and end users during the interviews and is used in the LCA calculation.

6.2.3 Evaluation Remanufacturing

It is assumed that the bottom layer will be used 2 times as long as the current product. The top layer will be used as long as the current product.

For some end users the idea of a separable top layer were creating some concerns about a hassle with installation, removal and renewing the top layer. For others it was interesting because they thought it could decrease the hassle of moving these very heavy tiles. Replacing the top layer only was looking more manageable.

A redesign with a separable top and bottom layer will decrease the ability to sell the product 2nd hand.

This idea of a separable top and bottom layer also is only possible from a certain thickness.

From interviews

Gym owner 1: "If I only have to put a new top layer on my flooring it will be much less work I think. If you are selling this product I will be the first customer!"
I expect the life time to be the same as the current product.

Home gym owner 1: This will be more interesting to me than used flooring because it has the look and feel of a new product.
Home gym owner 2: The remanufactured option sounds interesting. I would not mind if the company sells the product like new.
Home gym owner 3: The sustainable story should be on point
Home gym owner 4: "if I have to order a new top layer if it is not good enough anymore it feels like a big hassle." "If a product is more sustainable and cheaper I will buy it. If the use quality is the same. "

Client Austria: Interesting idea, if you could use the old bottom why not
Client Belgium: How would this work? Put another layer on top, like epoxy? Maybe we should not explain the old bottom layer. Just sell it as a new tile.
Client Sweden: More and more people think about the environment so this message helps.

Price:
Home gym owner 1: 90-95%
Home gym owner 2: 100%
Home gym owner 3: 80%
Client Belgium: 100%
Client Sweden 70%

Concerns
Gym owner 1: No if the quality is good and the properties are the same as normal flooring
Gym owner 3: It should fit the companies quality demands so no concerns.
Client Austria: No concerns, why should I have concerns? yeah 5 years ago we had our doubts but now it is proven that 2nd hand or refurbished products work and we all want to do something to reduce climate change.
Client Sweden: I don't think people have concerns about remanufactured products

6.2.4 Cost calculation

To make the remanufacture strategy work the product has to be redesigned. This will create some additional costs to start this business. Test have to be done how to make the top and bottom layer separatable. When a good design is made a mould should be made. And at last the production recipe should be optimized.

The production costs will be lower compared to the current product. This is because less rubber is needed per functional unit. It is assumed that the bottom layer is able to be used 2 fu. The top layer is 1/3 and the bottom layer is 2/3 of material. So 2 times a top layer + 1 time a bottom layer is 4/3 of the rubber needed for 2 fu. So for 1 fu 2/3 of the rubber is used. But manufacturing costs will increase because the flooring has 2 layers who will be produced separately. Compared to producing the current flooring for 2 fu, so 2 products, the redesign has a production of 3 products in 2 fu. 1 bottom layer and 2 times a top layer. So the costs of the production for 1 fu will be around 1.5 times higher.

Selling this redesign should be a bit cheaper or just as expensive for the clients. But if a second top layer will be bought after 1 fu, 8 years, customers assume the price will be lower because they already have the bottom layer. So the initial price of 1 bottom + 1 top layer should be higher to earn the same amount of money as the current product.

6.2.5 LCA comparison

To compare the current product with a remanufactured redesigned product things have to be changed in the LCA. A LCA is created for the 2 layered product redesign idea.

At first to be able to compare the current product with the remanufactured redesign the functional unit of rubber needs to become equal. The redesign has a fu of 3 (1 fu as a tyre, 2 fu as a floor) and the current product 2 (1 fu as a tyre & 1 fu as a floor). Therefor the materials rubber are divided by 3 (1fu being a tyre) & glue divided by 2. The manufacturing, transport and EoL are all divided by 2.

But the redesign has a bottom layer with 2 fu and a top layer of 1 fu. The top layer is 1/3 and the bottom layer is 2/3 of material. So 2 times a top layer + 1 time a bottom layer is 4/3 of the rubber needed. So weight of the redesign has to be multiplied with 4/3. This gives a weight of 27.3 kg for the Standard Tile and a weight of 24.9 kg for the Connect Tile.

The impact of manufacturing will increase because the flooring has 2 layers who will be produced separately. Compared to producing the current flooring for 2 fu, so 2 products, the redesign has a production of 3 products in 2 fu. 1 bottom layer and 2 times a top layer. So the impact of the production for 1 fu will be multiplied with 1.5.

It is assumed that the granulate of the top layer has the same impact as the granulate of the bottom layer. Top layers are made of smaller granulate and have a higher impact because of longer shredding and more glue. This is neglected in this LCA.

	Standard Tile 20 mm	*Remanufacture Redesign Standard Tile 20 mm*
Total (kg CO2)	**40.48**	**34.22**
Materials (% kg CO2 of total)	65.83%	67.93%
Manufacturing (% kg CO2 of total)	28.40%	27.52%
Transport (% kg CO2 of total)	6.06%	4.78%
Use (% kg CO2 of total)	0.00%	0.00%
End of Life (% kg CO2 of total)	-0.29%	-0.23%
Reduction (kg CO2)		6.27
% Reduction (% kg CO2)		**15.48%**

Table 5: Total and per life cycle stage, kg CO2 impact of the redesign standard

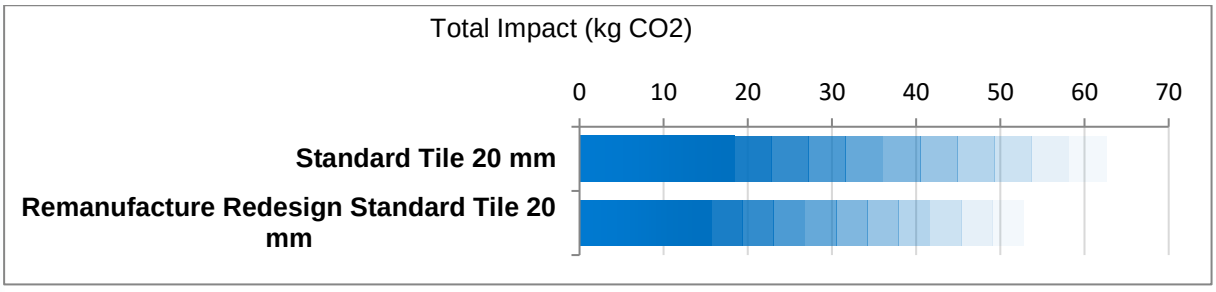


Figure 43: LCA results of Remanufacture Redesign of the standard tile with uncertainty factor

6.2.6 Conclusions Remanufacturing

For the remanufacturing strategy more research has to be done into the redesign. When a good design has been tested and proven to work an investment in new moulds and tests to optimize the product are necessary.

It is not proven that the costs are lower compared to the current product but a lot less rubber is needed so the potential is there. If the costs are lower the investment could be earned back.

Environmentally a remanufactured flooring product emissions around 15% less CO2. And above all, this reduction can be put on top of the recycling and reuse strategy. Because these new designed flooring can also be recycled. The reusability of the redesign could be lower because of the 2 separable layers.

So remanufacturing is not proven feasible or viable and clients + production still have questions about the redesign. But the potential of reducing the CO2 emissions with another 15% is promising.

6.3 Reuse

6.3.1 Introduction

The reuse strategy is about selling used or so called 2nd hand flooring. For the reuse strategy the product should not be worn out completely. The flooring products of Stockz have potential to be reused. A gym is filled multiple rolls or tiles so there will be a difference in wear between the different pieces. Especially the smaller products have a high change of laying at a unused spot. Therefor rolls have less potential compared to tiles. Also all cut pieces will not be sellable anymore. Next to this rolls, like stated before, are glued on the base floor. These are the reasons why roll flooring has low potential for reuse.

The flooring has to be retrieved, sorted, stored and cleaned. If there is a significant amount collected these can be sold as 2nd hand product.

The biggest challenge for the reuse strategy is the retrieval and the sorting. The retrieval is already explained in chapter 5.

Cleaning

For reuse a clean tile will be neccacery for a new client. But cleaning the tiles before taking it out does not make sense. Even with new produced products the flooring is cleaned at the final stage.
“Cleaning 2nd hand tiles has to be done after reinstallation. The tiles will become dirty again during collection, transport and installation. So after reinstallation it has to be cleaned” – Belgium Client
If flooring was cleaned earlier in the process they would get dirty again during installation. This is also the case with used products. So cleaning of 2nd hand tiles should be done after installation like it is already done.

Sorting

Not all retrieved tiles will have a high enough quality for reuse purposes. Therefor sorting is necessary for the reuse strategy of selling used products.

6.3.2 Current 2nd hand market

Currently there is already a 2nd hand market for gym equipment and flooring. To compete in this market could be challenging. Price is everything so too expensive used flooring will not be bought. Yet used flooring with a fair price will be sold quick. Especially when the product producer / distributer is selling because clients assume the quality is checked and they have no concerns anymore.

6.3.3 Evaluation Reuse

A used product can be called a 2nd hand product or a used products but this does not really stimulate the senses. Selling used flooring as urban-mined or pre-loved products will attract people more.

From 100m2 flooring it is assumed only 50m2 can be used to sell as a used product. This is based on the fact that all the flooring at the walls are cut and some tiles will have to much wear on top. Therefor used flooring will be mostly sold to smaller businesses. Stockz has to find the right fit with a client to sell these used products to. Webshops could also be interesting because they sell a lot to home gym’s. These end user group is especially interested in used flooring because price is the most important factor when buying flooring.

From Interviews

Gym owner 1 bought the newest flooring they have from a basic-fit location who renewed the gym. This gym owner really likes to buy 2nd hand because it is much cheaper. She does not like leasing or hiring but to make it possible to buy everything she buys equipment and flooring 2nd hand. And she has no concerns about this. She estimated that the used flooring can still be used for more than 10 years.

Home gym owner 1: I would not buy it but it could be interesting to buy higher quality products for a reduced price used.
Home gym owner 2: The explanation about the fact that using a product longer is the most sustainable thing you can do, makes me want to have a used flooring.
Home gym owner 3: For 50% off I would have bought 2nd hand products.
Home gym owner 4: I would buy used flooring if it meets my expectations

Client Austria: "Most attractive idea, you already see it with many other products. Phones and things like that. But even fitness equipment is sold 2nd hand a lot!"
Client Belguim: 2nd hand products should have some sort of quality label from Stockz. 2nd hand products are interesting.
Client Sweden: 2nd hand flooring is a market and the future. more and more people will be into 2nd hand products. smaller clubs or home gyms would be interested I think.
We even sell used flooring sometimes. We deliver flooring for competitions and then sell it after the competition to a client sort of 2nd hand. This is sold with a 30-35% discount.

Price
Home gym owner 1: 75-80%
Home gym owner 2: The difference in life time. So if a floor can be used for 8 years and it is 2 years old you should get a 20-25% discount. So 75-80%
Home gym owner 3: For 50% If the difference with new is too low I would have bought a new product. People with a home gym have the money.
Home gym owner 4: 50%

Client Belgium: 33%
Client Sweden: 50%

Concerns
Gym owner 1: None, I already have 2nd hand flooring
Home gym owner 1: If sold by the production company they assure good quality so I trust the product.

Home gym owner 2: The quality of 2nd hand products can really differ
Home gym owner 4: "2nd hand is always a bit tricky"
"If the production company will sell 2nd hand like coolblue selling refurbished or 2nd chance products I will trust it. It should be clear what about the product makes it remanufactured or refurbished." "Still I would have some doubts about the quality of products like this "

Client Austria: No concerns, why should I have concerns?

6.3.4 Cost calculation

The cost calculation for reuse is actually quite simple. Just take the costs of the retrieval service without the transport to Poland and that are the costs. Transport will be 600 / 26 = 23 euros.

Total costs per pallet (1 ton) = 50 + 23 + 50 = 123 euros
Total costs per m2, 20 mm = 123 / 50 = 2.46 euro per m2 or 20mm tile.

To make around the same profit on a used tile as a 1st cycle product the selling price will be 3.91 euro. The normal selling price of a 20 mm standard tile is 18.90 euros. All interviewees gave the advice to sell used flooring for 50% of a new 1st cycle product. This is 9.45 so an additional profit of 5.54 could be made.

But used flooring from a location of 100m2 will have a lot of cut pieces. These are not sellable as used flooring. Next to this some pieces will be worn out to much. Therefor it is assumed only 50m2 could be used in the reuse strategy business. Therefor the costs should be higher per m2. Still even if the costs are twice as much as calculated a bigger margin of profit compared to new 1st cycle products will be on the used product.

Instead of extra profit It is also possible to decrease the retrieval costs for end users to make it even more desirable to buy new products or to make sure as much as possible flooring is retrieved.

6.3.5 LCA comparison

To compare the current product with a used product 2 things are changed in the LCA. At first the fu has to change, second the transport is different.

The fu is a bit tricky because a used flooring of a full fu of 8 years will have a slim chance to have an enough quality to sell another time. A flooring product that is used a half fu of 4 years will have quite a high chance to have enough quality to sell. The fu of a used flooring will be assumed a half fu. Therefor the materials will be divided by 2 fu for the realistic scenario (1 fu as a car tyre, 0.5 fu as a first cycle product and 0.5 fu as a 2nd hand product) and 2.5 for the best case scenario (first cycle product fu of 1).

	Car tyre	*1st cycle (current product)*	*2nd cycle (reuse product)*	*Total life time flooring*	*Total life time rubber*
0.5 of usage	1 fu	0.5 fu	0.5 fu	8 years	16 years
1 fu of usage	1 fu	1 fu	0.5 fu	12 years	20 years

Table 6: Reduction on the total kg CO2 impact of reused standard & connect tiles

The transport distance is different from the current product because a used product only has to be transported back to Stockz and again to a client. With 600 km this is 800 km less compared to a first cycle flooring.

	Connect Tile	*Used Connect Tile (½ fu)*	*Used Connect Tile (1 fu)*	*Standard Tile*	*Used Standard Tile (½ fu)*	*Used Standard Tile (1 fu)*
Total (kg CO2)	42.19	40.82	32.51	40.48	37.92	28.88
Reduction (kg CO2)		1.37	9.68		2.56	11.60
% Reduction (% kg CO2)		**3.26%**	**22.95%**		**6.32%**	**28.66%**

Table 7: Reduction on the total kg CO2 impact of reused standard & connect tiles

Both the realistic (0.5 fu of usage) and best case scenarios (1 fu of usage) are compared to the current product LCA. See table 7 and figure 44 for the reduction in CO2 compared to the current product.

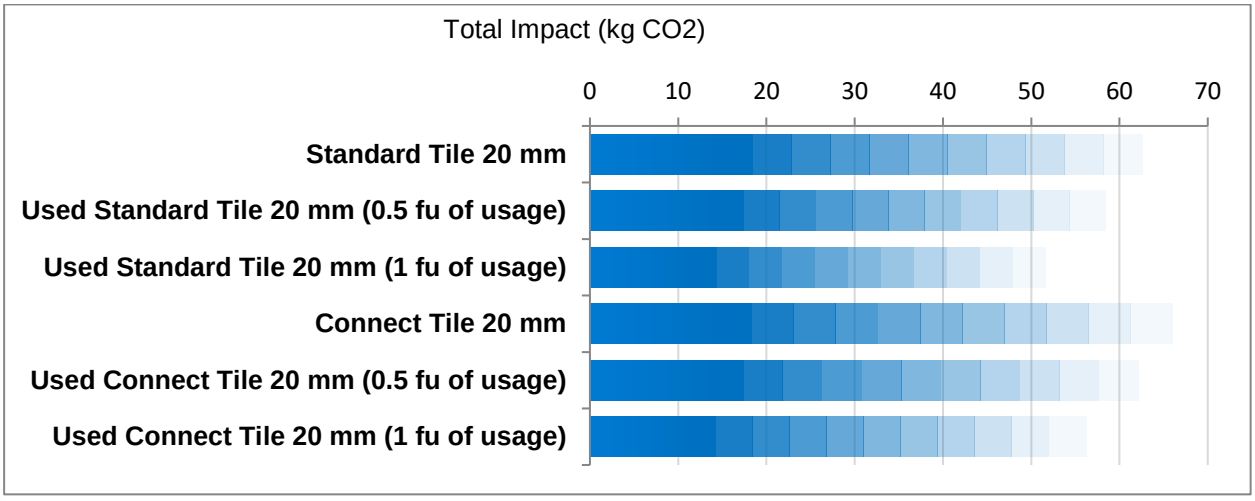


Figure 44: LCA results of Reuse of the standard and connect tile with uncertainty factor

6.3.6 Conclusions Reuse

The reuse strategy creates a feasible, viable and desirable business case. The retrieval is possible, the costs are very positive and clients are waiting for pre-loved products to be bought. It is the only strategy that creates cheaper products for clients. And price is the most important factor in the market of rubber sports flooring. Looking at a circular standpoint the loop is the smallest and thereby the environmental friendliest strategy. Also the LCA gave a nice reduction of CO2 by worst case 3.26% and best case 22.95% for the connect tile and 6.32% worst case and 28.66% best case for the standard tile. Still only about 50% of retrieved tiles will be useful because all cut tiles at the walls are not usable together with heavy wear locations. Taking the average between the best and worst case use case and dividing this by 2 because of the unusual cut flooring the reduction will be 9.85% for the connect tiles and 11.17% CO2 reduction for the standard tiles.

The currently missing logistical part of the business of retrieving the products is not viable on its own. And with the other circular strategies the business will not become more viable. So the reuse strategy will be the way to start becoming more circular for Stockz.

- CONCLUSION & DISCUSSION -

7 Conclusions

7.1 Conclusions

Start with a Minimum Viable Product or in other words a trial business. Together with 1 or 2 enthusiastic clients who sell a lot of products of Stockz, have storage, install themselves and are not too far away. For example the Danish and Belgium clients who have been interviewed.

Give the end user the possibility to use both the 2 retrieval services. 1) a free service of taking flooring out themselves and putting it on delivered pallets which will be collected when the new flooring is delivered and installed. 2) the flooring will be taken out by the client of Stockz. The costs will be 1 euro per m2. Find out which retrieval service has the biggest desirability and check the costs in practise.

Find out how much time and money is needed for sorting the products. Is retrieval service 2 used a lot, then it makes sense to let the clients sort the tiles when taken out of the gym.

The main goal of this MVP is to retrieve tiles for investigation. How many tiles have good enough quality to sell as a used or pre-loved product? Because with these products Stockz can make a profit. Is the amount high enough to compensate for the costs of recycling making it possible to sell 2nd cycle products for the same price as 1st cycle products. This is the only way to make the recycling strategy viable.

The recycling business will be not profitable if the 2nd cycle products are sold for the same price as a current product. From the interviews it was very clear clients are not willing to buy 2nd cycle products for a higher price. Still it could be that there is a early adaptor group of clients who want to pay for the more sustainable product.

The communication is key, let clients understand the sustainable benefit these circular or 2nd cycle tiles have. A 15-17% reduction in CO2 emissions. Communication will be very important in general. Let clients know Stockz circular mission and explain how these product help to get to the sustainable goals we all should embrace.

To be able to sell both black and mixed coloured recycled products the full black retrieved products should be sorted out from the mixed coloured ones. More sorting will increase consistency of the granules but also increase costs. 2nd cycle granules can also only be used for the bottom layer, sorting is thereby not neccacery.

It is advised to start selling black top layer and mixed rubber coloured top layer 2nd cycle products. Hereby the desirability of the 2 options can be examined.

Using 1st cycle granules for the top layer will probably increase the costs of a 2nd cycle product. Therefor it is advised to start producing fully 2nd cycle granulate products. Still to see the desirability and durability of all available options the 1st cycle + 2nd cycle mixed product could be produced and sold next to the fully 2nd cycle granulate products.

Try to set up connections with clients who sell smaller amounts of m2. And look for a webshop client who is willing to sell used products. Webshops sell to home gym owners and these end users are particularly interested in used flooring. Test this with 1 or 2 webshops.

During the MVP the business will be able to get subsidised. Just like the climbing shoe project until a viable business is proven a subsidy from the government is possible.

Redesign for Remanufacture

Invest in projects around redesign for remanufacture. This strategy has the same circular potential as recycle and reuse but when applied the reduction of CO2 emissions can be put on top of the reduction of recycle and reuse.

For the remanufacture strategy still a lot of questions are unanswered mainly about the feasibility of the usage of a 2 layer separatable product. So start with a small investment like another graduation project. Following up this research with the focus mainly on redesigning the product for the circular strategy remanufacture. An Integrated Product Designer could give a lot of insights into this topic.

Hire contract

Next to this try to get in contact with your direct sales clients. A hire contract could be the way to stimulate Stockz to redesign the product for circularity.

7.2 Strategic Roadmap

Looking at the strategic roadmap on the next page a creative and a tactical roadmap is shown. In the creative roadmap the 4 main to do's for 3 horizons are shown. The first horizon can be seen as the MVP setting up the retrieval service. Together with a willing client a plan should be made for retrieval. When this is done the retrieved flooring will give knowledge about the reusability. The flooring can also be used for 2nd cycle recycling products. Next to these steps a further exploration of redesigning the product for remanufacturing should be done. At the second horizon circular products are sold, pro-loved or used products and 2nd cycle products will be sold from 2024. Also a hiring contract should be signed by a direct sales client. If possible this milestone can be done earlier. After the exploration of redesigning the product an investment could be done in this redesign. The last horizon which is still quite a while away, in 2030, the vision could be reality. The business of Stockz could be circular being socially responsible prepared for changing regulations and having the competitive advantage.

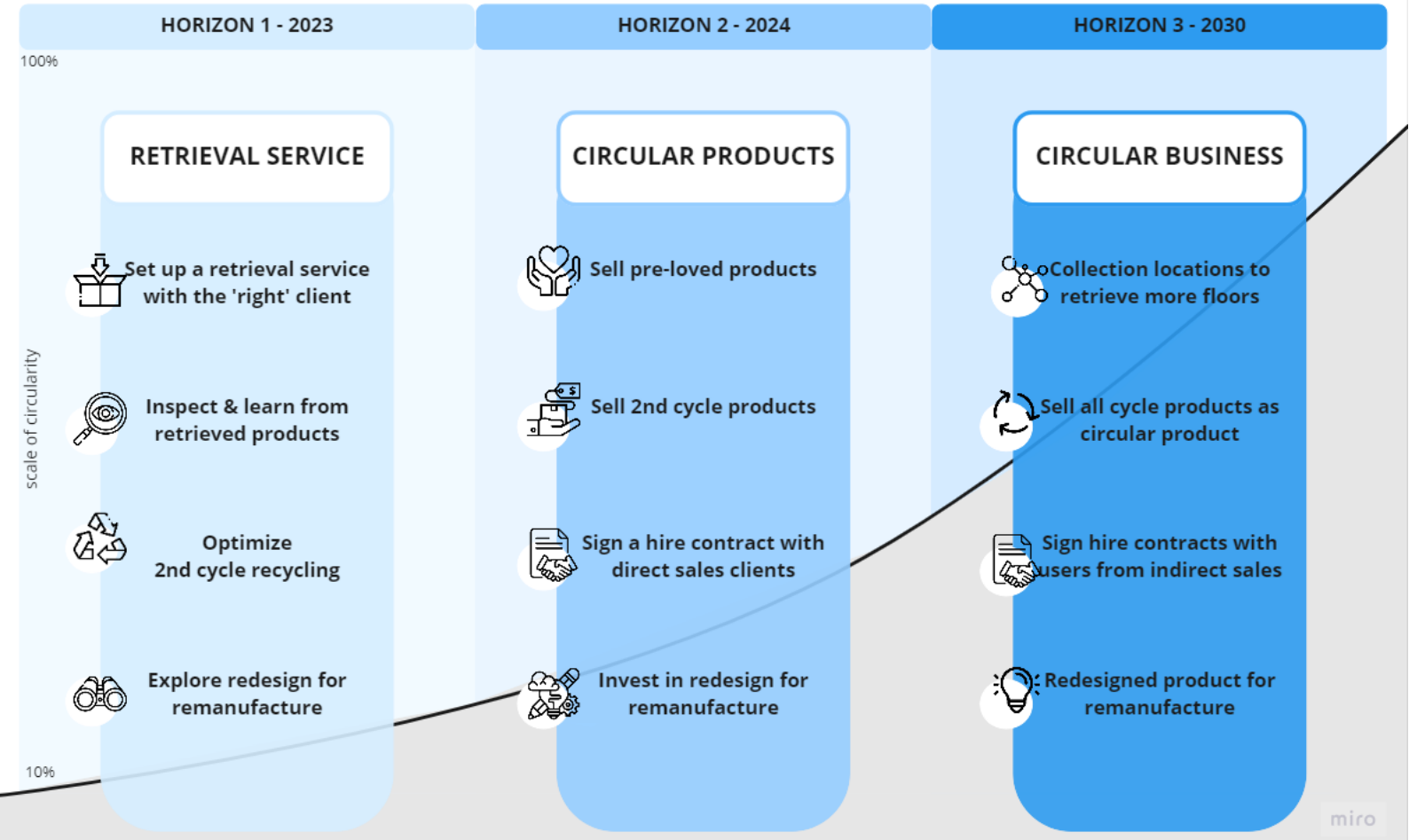
Here collection of flooring should be extended to other client categories such as webshop clients. Collection hubs should be created. The product is redesigned for circularity and renting/hiring flooring will be very interesting for Stockz. In the tactical roadmap the steps per horizon are shown in more detail and connections between are shown.

A bigger size image of the strategic roadmap can be found as Appendix D.

CIRCULAR RUBBER SPORTS FLOORING

creative roadmap

STOCKZ



	HORIZON 1 - 2023	HORIZON 2 - 2024	HORIZON 3 - 2030
Client Category	indirect sales	indirect sales & direct sales	all client categories
Retrieval Service	big client with storage and installation knowledge	all big clients with storage	all clients with storage
	starting in benelux or scandinavia	benelux, england and scandinavia	all countries in EU
	service 1 & 2 (if new flooring is installed)	service 1 & service 2	
FOCUS	RETRIEVAL SERVICE	CIRCULAR PRODUCTS	CIRCULAR BUSINESS
Hire Contract		first hire contract	additional services added
Redesign	exploration remanufacturing	new product made for remanufacturing	all products are circular
	IPD graduation project	product design employee	
	current product based on retrieved products		redesign product based on hire business
Trends		sharingand hire contracts will increase	recycling is not a USP anymore
Government	subsidy for the retrieval MVP	subsidy for redesign for remanufacturing	50% less raw materials

CIRCULAR RUBBER SPORTS FLOORING

tactical roadmap

STOCKZ

miro

8 Discussion

8.1 Discussion

Business versus Sustainability

There is always a tension between the feasibility + viability of the business and the sustainable impact. Stockz is selling a recycled product and therefore it is easy to recycle more. But this is not the best circular strategy. Investments have to be done to make use of smaller loop strategies like repair, refurbish or remanufacture.

Looking at remanufacture vs recycling the investment to create a new product that is able to be remanufactured is quite large. This money could be invested but will the idea create a good product? The main reason why this investments are hard to make is because of risk. The risk of a worse product compared to the current one. Maybe a more circular one but the properties and functionality cannot decrease. Test and more research has to be done to decrease this risk.

Roll flooring

Rolls are mainly excluded in this report because they are glued onto the base flooring. This will create contamination with concrete bits and pieces. But is this really true? Maybe it would be possible to take away these contaminations? More research should be done into this matter to let 11.18% or 547 tons of the rubber sold in 2021 be possibly useful for recycling.

Rubber pyrolysis

To create a 100% circular business in rubber sport flooring a solution for the downcycle has to be found. Rubber pyrolysis could be the last step that is needed to create a 100% circular business. It is already possible to use pyrolysis on rubber flooring (source). This technology will improve the coming years and by the time Stockz flooring is downcycled to much who know what will be possible with pyrolysis or other chemical recycling.

8.2 Recommendations

Glue

Try to never use glue to fixate flooring because:

- Not easy to recycle
  - Glued flooring takes parts of the concrete floor underneath out when removed.
- Clients never want it
  - If there is an alternative like a floating flooring solution
  - If they hire a building it is most of the time not permitted to glue flooring on the base floor.
  - If the building is their own, still a floor without glue that keeps position is preferable.
- It is not relocatable
- Not possible to sell 2nd hand.

So do not sell rolls anymore. This is possible because the amount of rolls that are sold is not that big. There is even a trend to not use rolls anymore. In the 5 years Stockz exist rolls are becoming less and less fashion. The trend of more free weight space, which needs thicker flooring as protection, could be the reason for this.

If Stockz want to keep selling rolls look into how the contamination can be excluded from the product.

For turf this is another story. Turf is not part of Stockz but Trackz, a sister company. Without glue to fixate turf this company cannot exist. Still I think Stockz/Trackz should invest in development of turf that does not need glue. This gives opportunities in the future.

This could be seen as the circular strategy of refuse. Refuse to use glue to fixate flooring.

Subsidies

Just like the climbing shoe project subsidies could help to set up and test circular strategies.

Certificates

Look at C2C for specific products and for other certificates like for example B-corp for a circular business certificate.

Other manufacturers

Almost all companies with rubber sports flooring use recycled granules which explains the fact it is not a USP anymore. The main factors competition is made in this market is the production method. This can give advantages in costs, tolerances and environmental impact. This can be supported with certain (sustainable) certificates like a VOC Test or a Reach & PAH Test which Beka Rubber provides with their cold moulded tiles.

- Search a manufacture to replace china
- Search a manufacture who can create tiles from cold molds
- Search a manufacture who can create flooring which benefits remanufacturing / repair

Retrieval

- Retrieval
    - Needs to be communicated well

      Now even if clients don't install flooring themselves cleaning is an important thing that is communicated. Together with cleaning, retrieval can be explained.

Retrieval hubs

Looking at all products sold by Stockz in 2021 more than 53% of their revenue is made with webshop clients. Almost 34% is made with one webshop client in the UK and more than 16% is made with a webshop client in the Netherlands. It would be great if Stockz could retrieve products sold by webshop clients.

Home gym and gym owners are willing to transport flooring to a retrieval location if the distance is not significantly higher compared to the closest recycling centre. Especially if there will be no costs. (some municipalities ask money for waste treatment, some not, some above a certain weight). Some end users are even willing to transport the flooring a bit further for a contribution to the sustainable cause (see interview xxx)

A possibility to create a lot of retrieval locations is to ask clients of Stockz if they are open to receive used flooring. Not with a retrieval service which can be seen as a active retrieval service. But with retrieval hubs, a passive retrieval service, where end users can deposit used rubber sports flooring.

The easiest way to create a lot of hubs is to use locations of BasicFit or FitForFree. BasicFit has more than a 1000 locations in the Netherlands, Belgium, Luxembourg, France and a couple in Spain. In the Netherlands there are around 90 clubs (see figure 45). FitForFree has also around 90 clubs in the Netherlands (see figure 46) and a couple of locations in other countries. A contract could be made with just one client to create a lot of retrieval hub.

Figure 45: BasicFit locations

Figure 46: FitForFree locations

Still it is quite a big question if price fighter sportsclubs like BasicFit and FitForFree will be willing to create retrieval hubs at there locations. Their business model is made around as many athletes as possible in a gym with the lowest possible amount of personal. The retrieval hub therefor should have (almost) no labour. Therefor Stockz could also look at other clients in the indirect sales category. Looking at indirect sales clients with a minimal order size of 5000 euros in 2021, gives at least 15 potential retrieval hubs in the Netherlands (see figure 47). Looking at the UK, there are 14 potential retrieval hubs (see figure 17). This will of course not be enough to cover all users of Stockz's rubber sports flooring in these countries, but it could be a start.

The companies that will retrieve flooring actively could of course also become a retrieval hub

Figure 47: Map of potential retrieval hubs close to the Netherlands

A retrieval hub should be very simple. The cooperating client of Stockz need to have the least amount of work possible for the retrieving operation. The easiest for transport would be stacked flooring on pallets. The cut pieces could be thrown in a container. An easy and low labour intensive retrieval system should be created.

Communication

Stockz need to let clients know it is the ambition to retrieve all flooring. Let client think together to create solutions for retrieval.

Start by communicating the circular ambitions to all new orders of new and current clients. Mainly the retrieval is what should be done, why this is important can always be explained.

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