CIRCULARITY QUICKSCAN

Subject	Circularity Quickscan Feltouch	
Client	ZeroBurn / Feltouch	
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0 SUMMARY

The circularity quickscan aims to find ways to reduce effects on the environment and on society by closing material cycles. Also, from a business point of view, being more circular decreases a company's dependency on outside sources. The quickscan for Feltouch showed how material use can be reduced and how material cycles can be closed by assessing the 10 R-strategies on the circular processing ladder. By replacing virgin polyester by recycled PET Feltouch has already made an important step towards circularity. However, to become fully circular it is important to factor in all steps in a products life cycle while designing it. Multifunctional design, like lamps with acoustic characteristics, reduce the need for products, materials and energy. Designing products that can easily be repaired, that can have parts replaced or that can be updated to modern wishes increases the life span of products. And finally, taking back products to recover parts or recycle materials decreases the environmental impact of the end of life stage. So, ZeroBurn is a great starting point for the transition to a circular economy, but hopefully it will make itself redundant by promoting design that doesn't result in waste materials that could possibly be burnt.

1 INTRODUCTION

On 16 September 2021 a delegation of Feltouch and ZeroBurn visited Feltouch's office, warehouse and production location. Feltouch produces acoustic and lighting solutions. The ZeroBurn project is meant to find more valuable ways to deal with their waste materials. This short memorandum contains a quickscan of the Feltouch production process' circularity. Therefore, at first the current production process is described. This shows the materials and energy going into the products, but it also shows the residual flows: products and waste flows. By analysing this process, opportunities for interventions can be identified. In the conclusions and recommendations part of the memorandum these opportunities are summarised. Part 4 describes the proposed transition to a more circular product and production process.

A short introduction into circular economy

First of all, I would like to stress that circularity is a means and not a goal. **The goal is to reduce effects on the environment and on society**. The way in which we plan to do this is by minimizing inputs and outputs and closing material cycles, which is improving circularity. An added bonus to this is that companies (and countries) are less dependent on outside sources (e.g. virgin materials like iron ore or mined phosphorous). As was seen during the corona pandemic, when prices of building materials rose, being dependent on outside sources can result in supply issues and smaller profit margins.

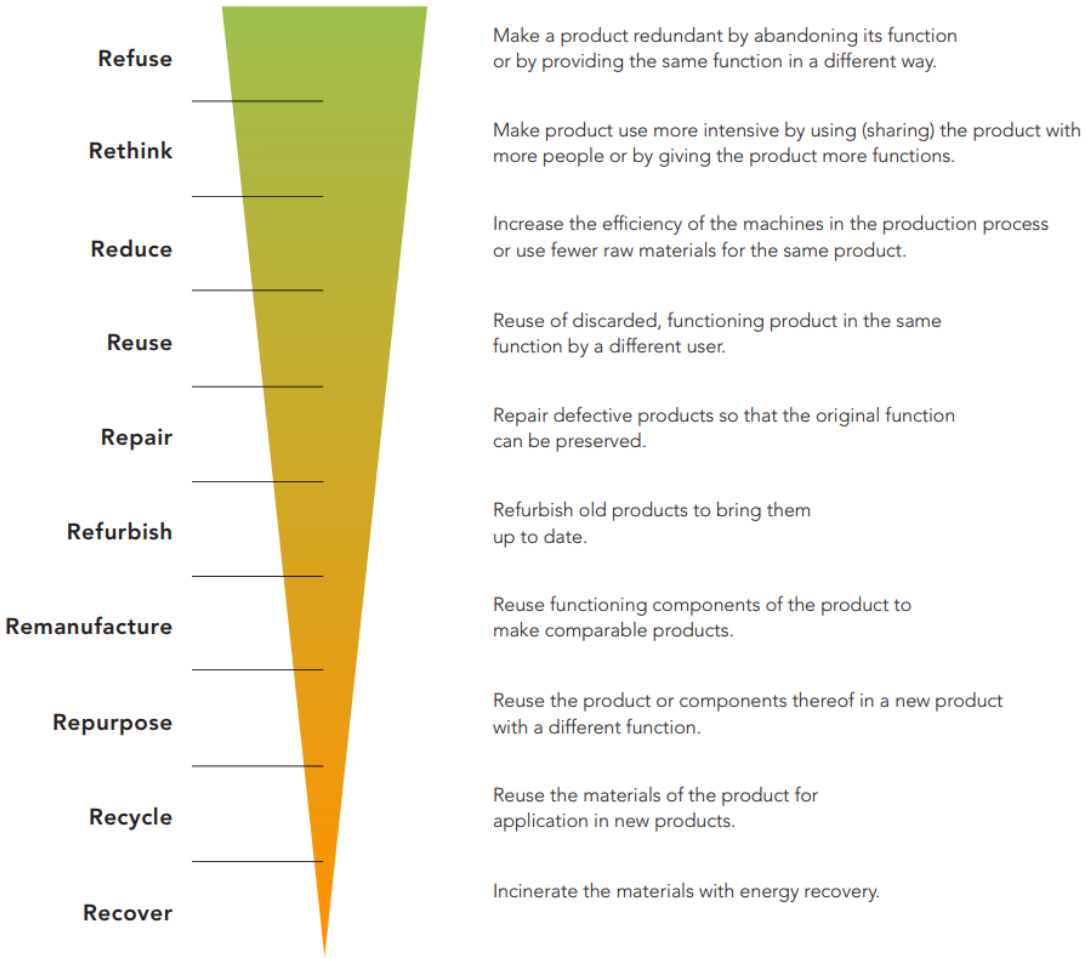
R-strategies

In this memorandum I will refer to the so-called R-strategies. These are ten ways of improving the circularity of products and are sorted from most to least effective (Figure 1). The most effective is to make a product redundant (refuse), for Feltouch one way of refuse is the multifunctional design they are doing. They combine acoustic characteristics to lighting and thereby making separate acoustic elements redundant. Instead of needing two products (e.g. a lamp and a wall panel) a room now only needs to be fitted with one acoustic lamp. Other examples of multifunctional design are the room dividers or the wall panels that double as bulletin board.

Lower on the circular processing ladder are methods to reduce the amount of materials or energy needed in the product. This is where the design team is being challenged into reducing the inputs. Reuse and repair are methods to expand the life span of products, which is also a way to reduce the need of new products. Modular design is an example of enabling reuse and repair. For instance, the Diagon room dividers. When one element is dirty or broken it can be replaced by a new one without having to buy an entirely new room divider. Also, when the Diagon system is no longer needed in one place it can be moved to another place and it can also be made smaller or bigger by removing or adding elements.

At the bottom of the processing ladder the recycling and recovery are placed. These are end-of-life measures that can reduce the environmental impact after the product has been used. These are also possibilities for the waste materials of Feltouch, but, as mentioned, it is better to prevent these wastes being produced than to recycle the materials or to recover energy (heat and power production by burning it).

Figure 1 The 10 R-strategies on the circular processing ladder (Municipality of Amsterdam, 2020)



2 PRODUCTION PROCESS

Feltouch makes wall panels, room dividers, lamps and other elements that improve the acoustic characteristics of a room. For all their products they use felt made from 50% virgin polyester fibers and 50% recycled PET. This material is supplied by a another company, but Feltouch has a say in the materials provided to them and they can suggest changes to the material. This chapter describes the production process and the basic material flows.

2.1 Products/outputs

- Wall panels: only felt
- Shaped wall panels: felt + plastic for attaching to wall
- Room dividers standing or hanging: felt + plastic/aluminium construction elements
- Lamps: felt + lighting fixtures

2.2 Inputs

Feltouch has a large warehouse where they keep different sizes and different thicknesses of felt. The rolls are either grey or white, they are 140, 160 or 210 cm wide and they can be of different thicknesses. Feltouch products have between one and three layers of felt. The basic felt is, as mentioned, grey or white, but it can be pressed together with a thin layer of coloured felt (mandarin) on one or both sides.

Materials that end up in the product:

- Felt: 50% virgin polyester and 50% recycled PET
- Filling felt
- Paint for the mandarin: water based; available in 25 colours
- Aluminium for the sliding (dividing) panels
- Plastic for attaching the wall panels
- Velcro for attaching the wall panels

Other materials and energy used:

- Energy:
  - grey electricity (Feltouch plans to get solar panels)
  - Euro 6 petrol for company cars and transportation trucks
- Plastic foil for vacuum of cutting screen with v-cuts
- Cardboard for packaging
- Plastic for packaging
- Bubble wrap for packaging
- Wood for making molds

2.3 Production steps

Not all products follow the same production steps: some are more complicated than others. But as an example one of the more complicated products is chosen: hanging wall panels. This way, less complicated production processes are mostly similar but without certain steps.

The hanging wall panels consist of a felt screen that has been pressed and then cut outs have been made to make them partly see-through. The panels are hung from a aluminium rail with plastic stops at both ends.

When an order comes in the factory manager makes a schedule and determines what will be produced when. Below the different steps of the production process are described. At the moment Feltouch has three working locations: their office in Istanbul and a warehouse and factory in Düzce (2 hours east of Istanbul). The warehouse and factory are currently at different locations, but Feltouch wants to bring these together in one location. Which is recommendable from a transportation perspective and could save significant transportation fuels[1].

[1] At the beginning this may however result in more transportation kilometres in workers' commutes, as they will likely work further from their home.

- **Warehouse**
- Cut of length from a roll of felt (loss: negligible)
  - Between 1 and 3 layers
- Cut of width (loss > 20 cm ≈ 10-15%)
  - Between 1 and 3 layers
- **Production location**: transport pieces of felt from warehouse to production location
- Paint the 0/1/2 layers of mandarin
- Warm the felt: currently using infrared ovens, but Feltouch is developing an oil-based heating system
- Press the felt: either flat or in a shape (e.g. Topolight or Cracker panels)
- **Warehouse**: transport pressed pieces from production location to warehouse location[1]
- Cut the end product: for all products this leads to loss because the edges are cut of; for Mesh products this also leads to loss because of the cut-outs
- Attach other elements, e.g. hanging rails (loss: some)
- Packaging: wrapping the elements in plastic or bubble wrap. Products are grouped per room or office location (e.g. meeting room 1 or reception area).
- Transportation via truck (and plane) to wholesaler or end-user.

3 RECOMMENDATIONS AND CONCLUSIONS

3.1 Recommendations

First of all, consider the R-strategies when developing new products:
- refuse/rethink: multifunctional design
- reduce: make designs and cut-outs so they result in minimum waste and reduce the environmental impact of the resources used (e.g. biobased materials and sustainable energy)
- reuse: design for a long life span by using durable materials and construction
- repair: make sure that parts can be replaced (modular design) and that products can be kept and made clean
- refurbish: timeless designs that can be updated (i.e. by changing their colours)
- remanufacture/repurpose: if repair/refurbish is no longer possible, with modular design you can reuse parts of the design in the same or in other designs
- recycle: use the materials in the products to make new products
- only then, recover the energy from the materials by burning it and using the heat (e.g. for electricity production)

Practical examples of this could be:
- using materials with a lower Environmental Cost Indicator (ECI)[2]. The ECI measures the impact of the materials on the environment (a.o. CO_2-emissions and acidification). Biobased materials from local origin have a lower ECI than fossil materials from further away.
- replacing filling felt by a biobased product and allergies will be a lesser concern as it is not on the outside of products (when it is placed inside elements, like the Diagon or Make up collections).
- using a PET-based product the risk of microplastics ending up in the environment, either in the factory or in its place of use, are substantial. Reduce this by isolating the materials and ideally changing it to a biobased product.

Outputs:
- take products back after a client doesn't want/need to use it any longer: based on the state of the products find the highest value R-strategy. Preferably the products would be sold or donated (reuse), but also repair, refurbish and remanufacture are possibilities. From a commercial point of view this is also a way to stay in contact with the client and to sell them new products (i.e. give discount for the returned products).

[1] Some products are cut into the end product at the warehouse, others at the production location.

[2] Witteveen+Bos could perform these calculations.

- an alternative to taking back products is by changing the business model from a product to a service based one. Providing the service of good acoustics and/or lighting and renting the products to the consumers. This way Feltouch controls the products' entire life cycles.

Energy:
- refuse: reduce heating and cooling energy by adding thermal insulation to the warehouse and/or factory.
- reduce the environmental impact of energy consumption by becoming energy neutral and producing your own sustainable energy (wind and/or solar)
- reduce the environmental impact of energy consumption by electrifying cars and trucks. This also reduces air pollution. Side note: in the bigger scheme of things this only really impacts the environment when you use (your own) sustainable electricity.
- reduce environmental impact by changing international transport via air to transport via water. This will lead to longer delivery times, but perhaps in some cases this is acceptable.

Miscellaneous:
- encourage vegetarian/vegan meals for employees and visitors as it has a lower environmental impact 😉
- ensure workers work safely: dangerous working environments are a risk for production capacity. An example: during my visit I saw workers without safety glasses spraying glue. This could seriously injure their eyes.

3.2 Conclusions

Feltouch is taking initiative to become more sustainable. The proposed efforts to combine the warehouse and factory, to produce solar power and to reduce incineration of waste (ZeroBurn) are commendable. This quickscan suggests other ways to improve sustainability and circularity. The most important conclusion is that circular design starts, as the term suggests, at the design. When Feltouch designs with the R-strategies in mind, the biggest impact can be reached. ZeroBurn is a great starting point for the transition to a circular economy, but hopefully it will make itself redundant by promoting design that doesn't result in waste materials that could possibly be burnt.

4 POSSIBLE FURTHER STEPS AND RESEARCH

Life cycle analysis

A method to determine the sustainability of a product is by doing life cycle analysis. This type of analysis shows the impact of a product (and its resources) from cradle to grave. Feltouch could have an analysis like this done to see where the biggest impacts of the production process lay. This enables them to start improving the parts of the production process, or the materials going into it, where the impact is greatest.

Roadmap

The suggestions made in this quickscan provide a long (but not complete) list of possible ways to improve sustainability. It is recommended that Feltouch (employees from both the design and production departments) further expand this list and sort them in a so-called feasibility-impact matrix (see Table 1). The feasibility shows when measures could be implemented (both financially and technically) and the impact shows the impact on improving sustainability (i.e. as determined using life cycle analysis).

Table 1 Example of a feasibility-impact matrix

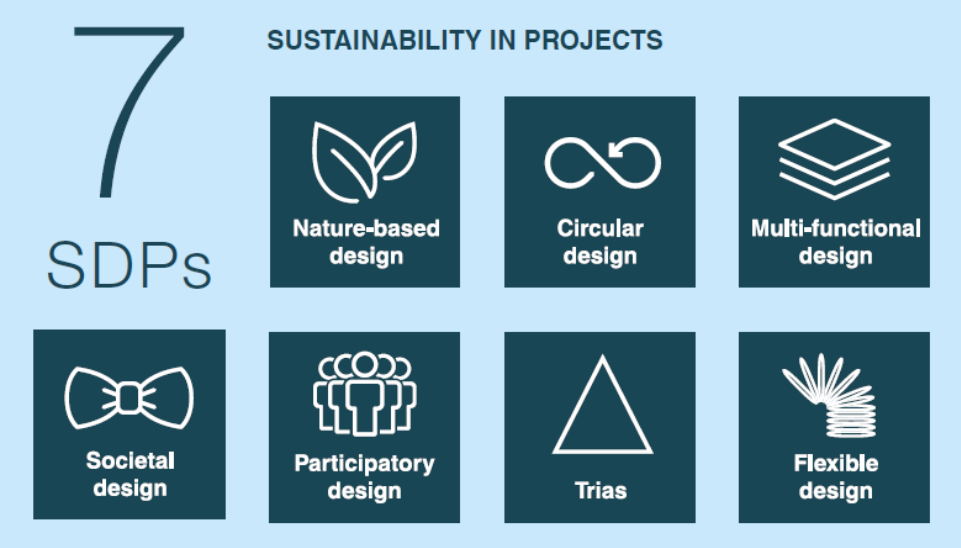
	Feasible in 2024	Feasible in 2025-2030	Feasible after 2030
High impact			
Medium impact			
Low impact			

The matrix can then be used to prioritize measures and to make a roadmap. The roadmap will show when what measures are planned to be taken. If wanted/needed, it is also possible to make this roadmap adaptable[1].

Sustainable design

Witteveen+Bos' seven sustainable design principles[2] are based on the sixteen sustainable development goals of the United Nations and provide a framework for applying sustainability in projects and design (see Figure 2). These principles can be used to further improve the sustainability of Feltouch's products.

Figure 2 Witteveen+Bos' Sustainable Design Principles



[1] For example, developing a dynamic adaptive policy pathway that shows what roads (measures) to take when circumstances (i.e. energy or material prices) change.

[2] Sustainable design principles | Witteveen+Bos