

INTRO TO SUSTAINABLE DESIGN

What
&
How



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INTRODUCTION

Recycling textiles requires proper input material. The more complex the input material is, the more complex the recycling will be (and the lower the quality of the output will be). Because most decisions about the use of the materials, the structure, the colour, and the haberdashery are made in the design phase, huge environmental benefits can be obtained when using the principles of design for recycling.

More often than not, when people use the term “recycling”, they are referring to mechanical recycling. As we previously discussed, there are a variety of ways to recycle textiles, each with different restrictions regarding input material. This means that “design for recycling” is not a very useful phrase, but it’s often used by designers when they believe they have designed a sustainable product.

However, some modern designers also make use of recycled materials in their designs. Recycled materials are almost always more sustainable than virgin materials. Thus, from an environmental standpoint, it is clear that **recycling in design** is preferable to design for recycling.

DESIGNING TEXTILE PRODUCTS

A textile product designer has a lot of freedom, and consequently a lot of decisions to make, throughout the design process. Firstly, there is the freedom of aesthetic, which sets certain designers apart from others. Secondly, there is technological freedom, which allows the designer to choose from a broad range of methodologies, materials, fabric structures, colours, prints, finishes, closures, and more when creating a textile product. Many designers do not realise the extent to which their design choices impact the environmental footprint of the product they create.

Some designers, however, are very aware of their impact on the planet. Stella McCartney, for instance, calculated the environmental impact of her designs (not only textiles, but also the metals and wood she uses in her designs). Material choice is the most important factor with respect to the overall footprint, followed by the textile finishing processes and the production of the final products (all of which are determined by the design process). More detailed information can be [found here](#).

DESIGN FOR RECYCLING

Design for recycling (or D4R) is a popular term amongst designers and textile producers because it, theoretically, indicates sustainable product design. However, this term is occasionally applied to existing products (those that do not use blends, for example) for marketing reasons. In these cases, the environmental benefits are dubious. Most cotton T-shirts, for instance, could be considered D4R because they are not manufactured with blends. Yet, conventional cotton requires copious amounts of water, fertiliser, and pesticide use. We can gather some best practices for Design for Recycling from the Swedish [Mistra Future Fashion project](#).

DESIGN FOR RECYCLING

D4R GUIDELINES

GENERAL

- Avoid finishing with water repellent coatings and anti-bacterial treatments.
- Create mono-material designs (unless this shortens life length of product).
- Contact the fibre producer to ask which dyes and additives may be present to avoid problems in recycling.

POLYESTER

- Use 100% polyester (PET) in fabric, membranes, coatings, and trims.
- Engage with one of the few polyester fibre-to-fibre recyclers that exist on an industrial scale (e.g. Teijin/Jiaren).

COTTON

- Use 100% cotton and/or regenerated cellulose in fabric and accessories.
- Encourage the expansion of pilot plants that are available for post-consumer textiles (e.g. Re:newcell and SaXcell).

NYLON 6

- Use 100% Nylon 6 in fabric (other names are polyamide 6 or PA 6).
- Accessories should, if possible, also be made of nylon 6.
- Nylon 6.6 is NOT the same fibre. In terms of recycling, it counts as a contaminant.
- Engage with one of the few nylon 6 fibre-to-fibre recyclers that exist on an industrial scale (e.g. Aquafil).

NYLON 6.6

- Today, post-consumer nylon 6.6 (i.e. polyamide 6.6 or PA 6.6) waste cannot be recycled into textile fibres. Consider replacing this fibre until this situation changes.

Design for Recycling concepts impact not only the choice of fibre materials used, but also the choice of buttons, zippers, labels, and haberdashery.

The product can only be considered D4R if all its fabrics and accessories are made from the same material (e.g. polyester) or are easy to remove (e.g. by using Wear2 stitching yarn). See [this article](#) for more information.

RECYCLING IN DESIGN

CIRCULARITY & SUSTAINABILITY

A better way to promote circularity and sustainability is to start with recycled fibres instead of virgin fibres. Because recycled fibres generally have a much lower footprint than virgin fibres, products made from recycled materials will also have a smaller carbon footprint.

Mechanically recycled cotton has a footprint at least 50% lower than virgin cotton. Additionally, some finishing processes (like dyeing) may not be necessary (because recycled fibres have already been dyed). If the recycled fibre's pre-existing colour can be used, then bleaching and dyeing processes can be skipped. This means saving water, energy, and chemicals.

Using (mechanically) recycled fibres isn't simply a matter of replacing virgin fibres with recycled ones—it has consequences. The colour of the fibres might be one compromise for the designer because the range of colours in recycled materials is limited.

Designers sometimes overcome this limitation by adding virgin fibres with a certain colour (preferably spun-dyed polyester or viscose fibres). The structure of the yarn may also be a bit more irregular than yarn from virgin fibres. With the right techniques (e.g. certain knitted stitch patterns), however, these irregularities can either serve as an accent or be rendered virtually invisible.

HOW DOES THIS CONNECT TO REFLOW?

Using recycled fibres in design is not only good for lowering the footprint of your product, but it also generates a "pull effect" for recycled fibres. In this way, you help the textile recycling industry and the circular textile economy to grow. So use recycled fibres in your product design whenever possible!

DESIGNING FOR SUSTAINABILITY

Design for Recycling and **Recycling in Design** are both interesting concepts for helping to lower the footprint of the textile supply chain. **Design for Sustainability**, however, is the overarching concept. With Design for Sustainability, you not only take the materials that are used into consideration, but also the processing, the use, and the end-of life scenario.

In another report from the Mistra Future Fashion project, a number of issues important to Design for Sustainability are mentioned. These issues are summarised in the table below:

Action	Climate	Water	Chemicals
1. Increase life span (resulting in increased number of uses)	impact/ number of uses	impact/ number of uses	impact/ number of uses
2. Better production technology	LESS ENERGY	LESS WATER USE	WASTE WATER TREATMENT
3. Better energy sources	LESS FOSSIL FUEL	-	less toxicity
4. Better chemicals selection and reduction of chemicals' use	LESS CLIMATE IMPACT	LESS POLLUTED WATER	LESS TOXICITY
5. Better materials	-	LESS WATER USE	less toxicity
6. Minimizing microfiber shedding	-	less polluted water	less toxicity
7. Optimize transport and packaging	less fossil fuel	-	less toxicity

From this list, the most important concepts are: "increase life span" and "better energy sources" (read renewable energy sources with no CO₂-emissions).

Design for Sustainability can be thought of as the method by which the current supply chain can be transformed into a circular supply chain.

To change the supply chain from linear to circular, cooperation with companies and knowledge of company processes is necessary. A designer must be educated about every aspect of the supply chain in order to design sustainably.



Above: Design for Recycling concepts impact the choice of fibre materials used, buttons, zippers, labels, and dyes. TextileLab Amsterdam experiments with bacterial dyes, which are less harmful to the environment. Photo by Waag and was retrieved from Flickr in June 2021.

HOW DOES REFLOW FIT IN?

Because almost no one has access to all of this knowledge and expertise, teamwork is vital. This is where Reflow comes in. Reflow has specialists in every area of the circular textile supply chain. So, if you need help, you know where to look:

- Reflow Project on the [Waag website](#)
- Reflow Project on [Amsterdam.nl website](#)

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