

# Responsible Design Guide Footwear

Impulses for sustainable design harnessing  
innovation in the footwear industry.

# Welcome to Sympatex

This is our manifesto. For everyone. For you and me. For the generations to come.  
On a large scale and a small one, as individuals and as a group, we have the power  
to use our sphere of influence.  
Let's change something together!

At Sympatex, we use our capacity to turn new ideas into action. This is our passion,  
and it requires creativity and courage.  
Creativity to imagine our world differently.  
Courage to connect seemingly unrelated phenomena.  
Can you imagine products with multiple life cycles?  
We can. And together, we will make it happen.  
What we need is you. Because you, too, have your own sphere of influence.  
Let's work together with enthusiasm as a team and inspire others along the way.  
**We will be Re>Closing the loop. Together.**



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# We are the first generation, to re>close the loop. Together.

Currently, we are consuming the Earth's resources 1.5 times faster than they can regenerate, making the urgency for sustainable solutions obvious and inevitable. After the oil industry, the fashion industry is the most harmful to the environment. Every stage in the lifecycle of a textile product impacts our planet. Our fast fashion culture, based on excessive consumption, has turned fashion items into disposable products. In this context, designers should ask themselves how they can reduce environmental impact.

Despite these challenges, many players in the fashion industry are showing innovative commitment to reducing environmental impact. Together with a shift in consumer habits, this has led to the development of concrete solutions to promote a more ethical and responsible fashion industry.

Shoes are an integral part of the fashion industry, both in terms of design and aesthetics as well as cultural and societal aspects. In this regard, shoe design is a key element of brand identity. It combines creativity, technology, and functionality. However, shoe designers face particularly complex and multi-layered challenges when it comes to sustainability. The extent to which the shoe industry can currently produce sustainable shoes is demonstrated by already implemented products and concepts from various best practice examples from brands like Vaude, Veja, or Adidas. Shoes like Adidas' „Futurecraft Loop“ or Reformation's „The Circulose Shoe“ are designed with sustainability and recyclability in mind, both in terms of material selection and innovative construction.

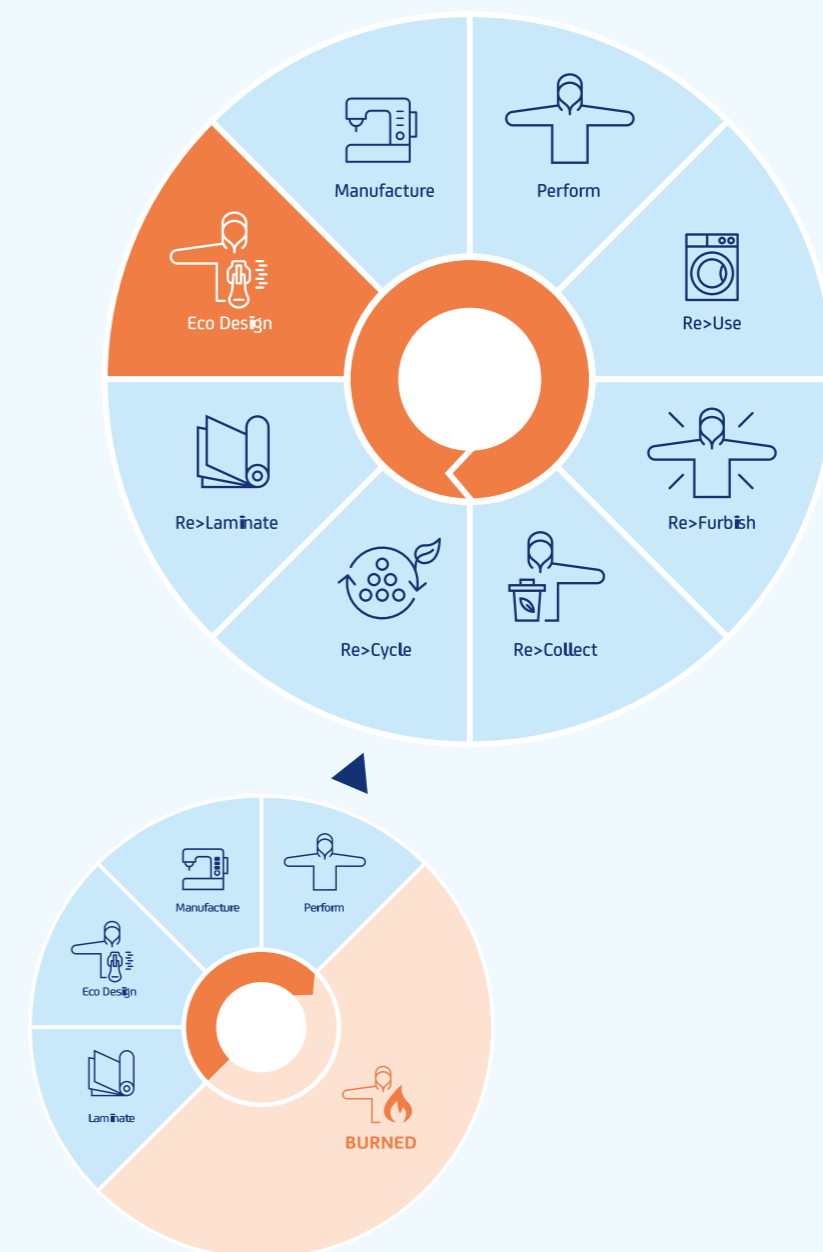
With the 100% recyclable PTFE- and PFC-free Sympatex membrane, which has been climate-neutral since 2017, Sympatex lays the ideal foundation to close the loop in the dynamic shoe industry. The recyclability of shoes is an active field of research and development, where the design phase is of critical importance: this is where the foundation of a shoe is set, and sustainability is largely determined. To create fully recyclable shoes, crucial decisions must be made in the design process. This phase forms the central pillar for establishing the optimal basis of a circular product.

Inspired by the richness of nature, the outdoor industry, in particular, should be a pioneer in sustainable innovation and textile solutions. As an outdoor ingredient brand, Sympatex works on various levels to contribute to this effort. We provide more than just a recyclable, waterproof, and windproof material: we maintain close collaboration with our customers and share our know-how to develop the best possible product together. Through continuous support from collection planning to the production process, we stand by your side, while the DNA, the soul of the product, and the final design decisions naturally remain in your hands. Trust Sympatex as an external functional specialist to pool expertise and develop a functional, holistically sustainable product through teamwork, utilizing the broad spectrum of possibilities for responsible design in the footwear industry. For us, this means considering every decision at every phase of the value cycle – from raw materials through design, production, end-consumer use, and recycling. The sum of these decisions determines whether a shoe can be sustainable and/or circular.

This „Responsible Design Guide“ with a focus on footwear provides you, as a designer, with valuable insights and strategies that you can benefit from in future designs. Through this initial touchpoint, we hope to open the door for joint projects that will contribute to the future of upcoming generations.

Together, we can develop new approaches, and as partners, we are deeply committed to stepping out of our comfort zone.

As a designer, you play a crucial role in developing innovative solutions to lay the foundation for change in the shoe industry. Your commitment and creativity are essential to meeting the challenges of sustainability and making a positive impact.



## About Sympatex Technologies

As a certified bluesign system partner and tested according to Oeko-Tex Standard 100, Sympatex supports designers in creating environmentally responsible products without sacrificing performance or comfort. Since 1986, we have been providing innovative textile solutions in the areas of footwear, apparel, and workwear that are both environmentally friendly and developed with social responsibility.

The name „Sympatex“ combines the words „sympathetic“ and „textiles,“ reflecting our commitment to sustainable practices. Since our founding in 1986, the company has become a pioneer of sustainability in the outdoor industry. In 2008, we introduced a PFAS-free DWR\* (Durable Water Repellent), followed by laminates made from recycled PET bottles in 2009. Our commitment to sustainability deepened in 2011 with the introduction of pre-consumer recycling, which allows us to convert production waste into valuable raw materials. In 2015, Sympatex joined the „Sustainable Apparel Coalition“ to promote sustainability in the textile industry, and the following year, we presented the world’s first 100% recycled membrane. In 2017, Sympatex launched the first recycled end product made from old functional jackets as part of the Wear2wear consortium. This consortium aims to establish a model where all clothing waste is reused as raw materials in the textile cycle, creating a closed resource loop. Later, a children’s shoe project in Italy showed that it is possible to implement designs with at least 80% recycled and recyclable materials. The brand VAUDE has also equipped its shoes with the Sympatex membrane, proving the same concept.

2018 marked another milestone with the introduction of UTMOSPHERIC®, an innovative vacuum-forming process for seamless, tape-free booties. Sympatex’s commitment to the highest sustainability standards was further highlighted by achieving B-Corp certification and winning the „Best For The World Award“ in 2019. Our ambitious plan „Close the loop by 2030“ aims to achieve complete circularity by 2030.

Sympatex not only leads in forward-thinking product development but also distinguishes itself through a unique company structure. Departments work within a transversal system based on guiding principles and values, fostering well-being at work and personal development. Flat hierarchies create a pleasant work environment, while agile management approaches with dynamic subgroups shape a corporate culture built on trust, transparency, and appreciation.

”

**„Entrepreneurial success is becoming increasingly dependent on a deeply human and sustainable corporate culture.“**

DR. RÜDIGER FOX, CEO SYMPATEX

## 1.1

### The Sympatex Membrane: The Heart of Our Technology

The intelligent Sympatex membrane, the core of our company, is produced under strict quality controls in the EU. It is used in laminates for clothing, footwear, accessories, and technical applications. Our membrane guarantees top-tier performance: it is 100% waterproof, windproof, and breathable. Additionally, it regulates the climate, with breathability increasing proportionally to higher activity levels.

To understand how laminates work, it's important to explain the purpose of membranes: they create a comfortable microclimate by maintaining a thin layer of air close to the skin, keeping it warm and regulating moisture at an optimal level. The three main functions of a membrane are protection from rain, wind, and efficient moisture transport. To achieve these properties, different types of membranes have been developed, which are divided into two main categories: microporous and hydrophilic membranes.

**Microporous membranes** are made from hydrophobic polymers and are produced using two methods: the dry process and the wet process. These membranes can block rain because their pores are smaller than water droplets. At the same time, water vapor particles (produced by sweat) can pass through the membrane since they are in gas form and smaller than the pores. However, one drawback of these membranes is that the pores can become clogged with dust, sunscreen, and other small particles.

**Hydrophilic, non-porous membranes**, on the other hand, do not allow liquid water to pass through but enable water vapor to diffuse chemically. These membranes are manufactured through polymer film extrusion.

The **Sympatex membrane technology** is a hydrophilic, non-porous membrane made from polyetherester copolymer. This special combination of polyester and polyether blocks gives the membrane stability and hydrophobic properties, while the polyether blocks provide flexibility and hydrophilic properties, which are essential for the transport of water vapor. The membrane is dynamically breathable: the more moisture it absorbs, the larger the polyether channels become, allowing more effective water vapor transport.

We offer our membrane in various thicknesses, ranging from 5 µm to 25 µm, with two main types:

- STA membranes (Standard)
- ELS membranes (Higher Elasticity)

#### Standards and Norms

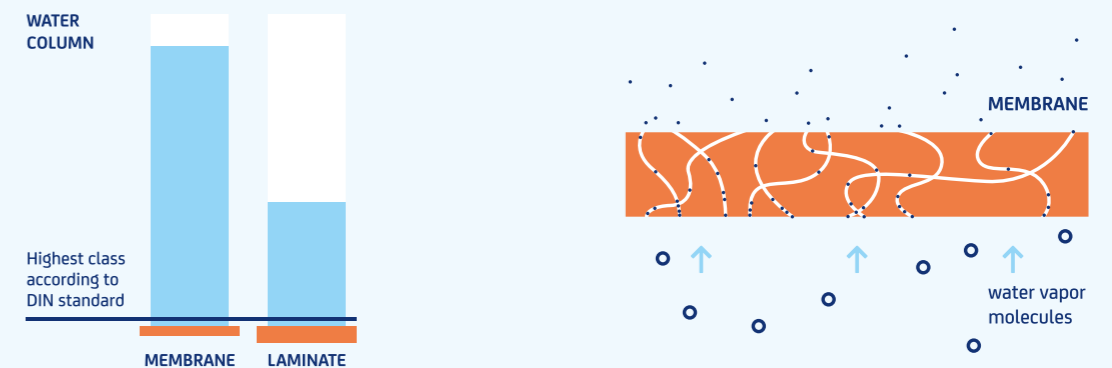
In the field of membrane and textile laminates for outdoor applications, various standards are crucial for evaluating product performance.

Waterproofness is assessed according to ISO 811, where the membrane is subjected to a hydrostatic pressure test. A membrane that withstands up to 2,000 mm (equivalent to 2 bar) is classified as water-repellent, while anything above that is considered waterproof. The Sympatex membrane consistently exceeds this standard.

Windproofness is evaluated using EN ISO 9237, which quantifies the wind resistance of a material by measuring air permeability in L/m<sup>2</sup>/s. Here too, the Sympatex membrane impresses with a value of 0 L/m<sup>2</sup>/s, meaning it is 100% windproof.

For breathability, the “water vapor resistance (WDD)” is measured according to DIN EN ISO 14268, which assesses how efficiently a material allows water vapor to pass through. The Sympatex membrane falls into the highest category and is therefore considered extremely breathable and comfortable during high activity.

Together, these three standards form the foundation for the quality and performance of the Sympatex membrane. Meeting or exceeding these benchmarks demonstrates our unwavering commitment to providing high-performance materials for outdoor enthusiasts that combine waterproofness, windproofness, and breathability.

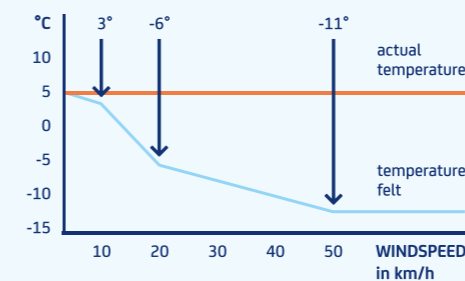


#### Waterproof

Our membrane has a water column of over 45,000 mm. For comparison: The highest standard class of DIN EN 343 is reached from 2000 mm.

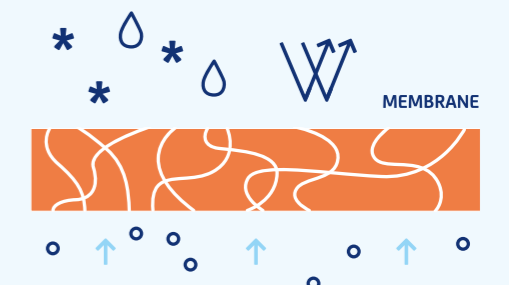
#### Breathable

The hydrophilic molecular chains conduct the water vapor to the outside. The effect increases dynamically with increasing temperature or humidity differences.



#### Windproof

Our membrane is absolutely windproof in accordance with DIN EN ISO 9237 and thus ensures that the warming layer of air is not carried away from the body.



#### Durable

We deliberately avoid using pores in our membrane that could become blocked over time. This ensures that our membrane retains its function for a long time.

## 1.2

### Laminate: The Foundation for High-Performance Shoes

The Sympatex membrane boasts outstanding properties in terms of breathability, waterproofness, and virus protection due to its poreless structure. Additionally, it is so elastic that the Polyetherester membrane can be thermoformed. The membrane is bonded on both sides with textiles to provide the foot with a comfortable fit and various design elements.

A laminate consists of several layers, including at least one textile knit and a continuous membrane. These layers are bonded together using various lamination techniques, often employing point adhesive to ensure the membrane's breathability. The most common lamination methods include „hotmelt lamination,“ „extrusion lamination,“ and „dry lamination.“ In hotmelt lamination, heat-activated adhesive is melted between the layers, while in extrusion lamination, molten polymer adhesive is applied directly to the fabric.

In the footwear industry, complex laminate structures are often used to provide optimal performance. These can range from 2, 2.5, 3, 4, or even 5-layer laminates. This multi-layering not only provides the necessary protection but also enhances fit and comfort. The outer material, which can be leather, synthetic textiles, or mesh depending on the design, is reinforced by the laminated system, contributing to the shoe's durability.

#### Categories and Standards

Sympatex classifies its laminate structures for footwear into two categories:

##### Performance and Professional.

These categories are tailored to different activities such as hiking, running, or skiing. Abrasion resistance is tested using the Martindale method according to ISO 12947. In addition to abrasion resistance, the same standards apply for waterproofness, windproofness, and breathability, which are also relevant for the membrane.

##### Environmental Protection and Chemical Avoidance

Sympatex laminates are not only distinguished by their high-performance characteristics but also by their environmentally friendly composition. They are PFAS\*-free and do not use hazardous chemicals, making them a sustainable choice for environmentally conscious designers.

With Sympatex as your partner, you can create innovative and high-performance shoes that meet both consumer needs and sustainability requirements. We demonstrate that highly functional outdoor and sports shoes can be made without harmful chemicals.



## 1.3

### The Footwear Portfolio of Sympatex

A standout feature of our laminate solutions in the footwear sector is the use of 100% recycled polyester (rPES) sourced from PET bottles. By utilizing recycled polyester and ensuring the recyclability of these materials, you actively contribute to reducing the ecological footprint while maintaining top-level performance. With Sympatex, material selection becomes a key step toward a more sustainable future in the footwear industry. Instead of polyurethane foam, we use 100% recycled PES „Nonwoven“ (NW) to combine comfort with sustainability.

Our laminate solutions for footwear are available in various constructions, including 2-, 2.5-, 3-, 4-, and 5-layer laminate structures, tailored to specific performance requirements. This flexibility allows you, as a designer, to create shoes that are perfectly suited for diverse applications, whether for hiking, running, work and safety, or everyday use.

#### Performance Category

These laminates offer an excellent combination of flexibility and durability. They combine lightweight materials with outstanding waterproofing and breathability, making them ideal for lightweight, sporty shoes that provide pleasant climate regulation and ensure high wearing comfort. Perfect for everyday shoes and sporty applications.

*Sympatex Performance Laminates:*

**Caserta Nonwoven (NW)**

**Monza**

**Benevento**

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#### Professional Category

These laminates have exceptionally high abrasion resistance, making them the optimal choice for demanding outdoor products. With their robust structure, they protect the membrane from mechanical stress while ensuring excellent breathability. Ideal for safety shoes with high abrasion resistance. In the future, these laminates will be replaced with a polyester tricot.

*Sympatex Professional Laminates with 100% recycled PES Nonwoven instead of polyurethane foam:*

**MT Teramo Nonwoven (NW)**

**Siena H<sub>2</sub>O Nonwoven (NW)**

**Sorrento Nonwoven (NW)**



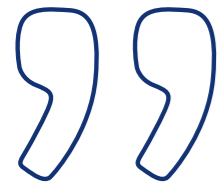


## 1.4

### Innovation

Innovation is more than just a creative idea; it involves the practical implementation of something with real value. While creativity often describes generating new concepts or solutions, innovation focuses on the **economic feasibility** and utility of these concepts. A company like Sympatex aims not only to develop new products or processes but also to optimize existing ones and adapt to changing market needs.

Innovation is often born from a combination of research, experimentation, and understanding customer needs. It is a dynamic process that requires creative thinking but also a structured approach to implementation and marketing. At Sympatex, this happens through close collaboration with **product developers, manufacturers, and end customers**, ensuring that new solutions are not only technically feasible but also provide real benefits.



**„Sometimes you have to forget what was in order to embark on new paths.“**



### Technological Progress in the Footwear Industry

#### *Automation*

The implementation of automated processes in footwear production can significantly enhance efficiency and precision. Sympatex promotes the development of technologies that support this transition. By utilizing modern automation solutions, production times can be shortened, and costs reduced, ultimately leading to faster market launches and improved competitiveness. These advancements allow manufacturers to respond more flexibly to market demands while simultaneously improving product quality.

#### *Knitted Uppers*

With the rise of knitted uppers in the footwear industry, elastic membrane linings are becoming increasingly important. This innovative combination not only improves fit but also offers more freedom of movement for the wearer. At the same time, the membrane's functionality, such as waterproofness and breathability, is maintained. As a result, shoes can be developed that offer optimal performance both in everyday life and in athletic activities.

#### *Bonding Instead of Sewing*

The use of bonding techniques in place of traditional stitching can significantly enhance the waterproofness of shoes while reducing weight. This is especially advantageous for lighter, performance-oriented models designed for sports or outdoor activities. Bonded constructions also allow for sleeker designs that meet modern aesthetic demands without compromising functionality.

#### *Recycled Materials*

Sympatex actively promotes the use of recycled materials in laminates. This strategy not only supports sustainability in production but also appeals to environmentally conscious consumers who value eco-friendly products. By integrating recycled materials into the manufacturing process, resource consumption is reduced, sending a positive message to customers that eco-friendly alternatives are achievable in the footwear industry.

#### *Dynamic Membrane Technologies*

The development of membranes that adapt to different activity levels enhances the breathability and comfort of shoes. Such innovative technologies allow for comfort optimization based on usage. This opens up new possibilities for creating tailored solutions for various applications and climate conditions.

#### *3D Printing and Digital Manufacturing*

The introduction of 3D printing and digital manufacturing techniques in the footwear industry enables flexibility and customization. Designers can create complex geometries and personalized designs that would traditionally be difficult to achieve. These technologies not only foster efficiency but also drive innovation by allowing rapid prototyping and testing, speeding up the entire development process.

#### *Smart Materials*

The integration of smart materials like the Sympatex membrane brings significant added value to wearer comfort. The membrane can adapt to different environmental conditions, providing additional functionalities such as temperature regulation or moisture management.

## 1.4.1

### moisture-tech by Sympatex®- Innovative Moisture Management

The **moisture-tech by Sympatex®** technology is a groundbreaking laminate system specifically developed for the demands of the footwear industry. It is an innovative **4/5-layer laminate** composed of the following components: **upper material, backing, membrane, intermediate layer, and lining**. This unique arrangement allows for optimal **moisture management** that meets the needs of active users.



#### How It Works:

**moisture-tech by Sympatex®** works in several steps that ensure effective moisture absorption and release:

##### 1. Moisture Absorption from the Foot

The special lining absorbs moisture from the foot, ensuring a comfortable wearing experience and preventing unpleasant dampness.

##### 2. Immediate Moisture Transport

The absorbed moisture is quickly transported into the hydrophilic intermediate layer. This layer is key to the fast removal of moisture, keeping the feet dry.

##### 3. Moisture Distribution and Activation of the Membrane

In the third step, moisture spreads across the hydrophilic membrane. This leads to optimal activation of the membrane, increasing the efficiency of water vapor transport outwards.

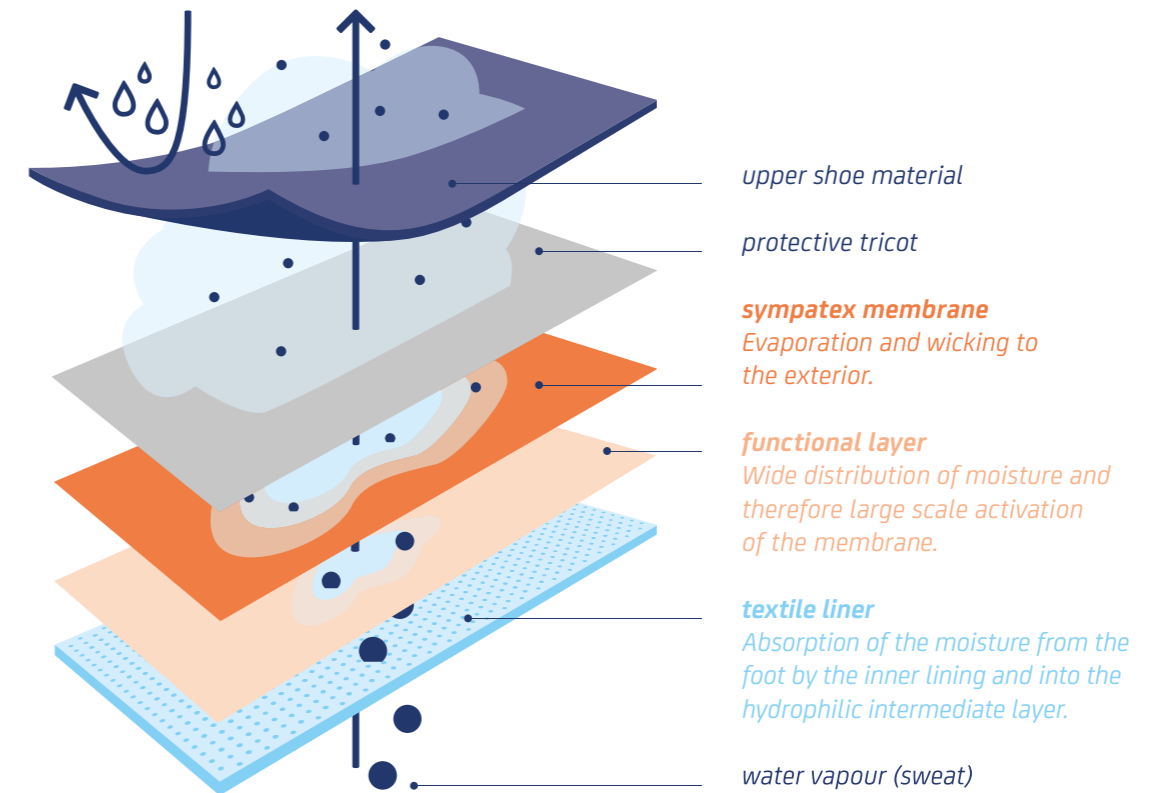
##### 4. Transfer and Evaporation of Moisture Outwards

Finally, moisture is effectively released outward, maintaining a comfortable microclimate in the shoe.

By following this mechanism, the **moisture-tech by Sympatex®** system achieves full activation of the membrane, optimizing dynamic breathability and promoting rapid moisture removal.

#### Benefits:

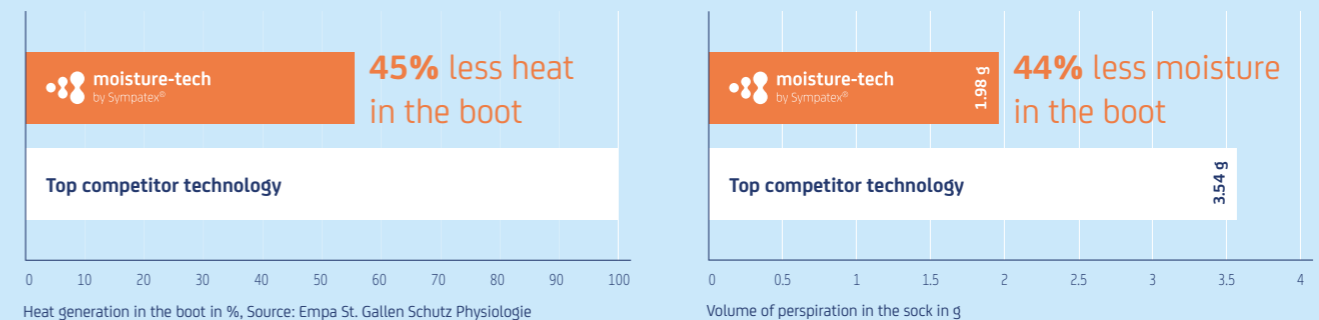
The advantages of **moisture-tech by Sympatex®** are manifold. The laminate keeps feet dry, even during intense activity, by quickly removing moisture and creating an ideal foot climate. The innovative layering maximizes the efficiency of the hydrophilic membrane, perfecting moisture management. With moisture-tech, moisture in the sock is significantly reduced, which increases comfort. This technology meets the needs of active users and ensures optimal conditions in the shoe, improving both comfort and performance.



#### Test Results:

The effectiveness of **moisture-tech by Sympatex®** has been tested by EMPA (Swiss Federal Laboratories for Materials Science and Technology) in St. Gallen. The tests measured the amount of sweat retained in socks for various shoe types, both while standing and moving. In the socks equipped with moisture-tech laminate, only 1.98g of sweat remained, compared to 3.54g with competing technologies – **a 44% reduction in residual moisture**, leading to a noticeable comfort improvement.

Additionally, the laminate proved significantly more effective in thermal insulation, storing **45% less heat in the shoe**. This prevents overheating of the feet and contributes to a more comfortable wearing experience.



1.4.2

## UTMOSPHERIC®

### A New Level of Waterproof Shoe Production

The **UTMOSPHERIC® technology** revolutionizes shoe design by combining advanced functionality with innovation to create a unique wearing experience that meets the highest demands. At Sympatex, we follow the philosophy of minimizing our **ecological footprint** while maximizing product performance -this principle also applies to UTMOSPHERIC® technology.

In an industry where many brands strive to stand out with creative design solutions, **UTMOSPHERIC®** offers an entirely new innovation: it uses a **thermal forming process** to create a bootie that fits seamlessly and wrinkle-free to the foot -without compromising the quality or function of the laminate.

# UTMOSPHERIC®

#### UTMOSPHERIC® Bootie Production:

The UTMOSPHERIC® booties are fully automated and seamlessly integrated into the manufacturing process. Our **high-performance polyester membrane**, combined with optimized textiles, forms the ideal base material. Using the **thermoforming** process, the elastic membrane is bonded with the outer fabrics to create a waterproof and breathable bootie. The thermoforming process creates **3D seamless inserts** that retain their performance without the need for additional sealing.



MORE QUALITY



NO TAPE



LESS WASTE



LESS COSTS



LESS TIME



-  **COMFORT**  
seamless =  
blisterfree
-  **SILENT**  
material,  
noise cancelling
-  **100%**  
waterproof,  
rain protection
-  **BREATHABLE**  
no sweat
-  **DURABLE**  
PFAS & PTFE free,  
recycled material

#### Background of the Development:

Traditional bootie production begins by cutting **2D laminate pieces** (side panels, front, and tongue). These pieces are then sewn together, and the seams are taped to ensure waterproofness. While sole injection molding is highly industrialized, the production of the shoe upper remains labor-intensive handwork. Developing a shoe that is both waterproof and breathable has been particularly challenging, as the functional laminate has always existed in two-dimensional form.

Sympatex CEO **Rüdiger Fox** saw the inefficiency in this approach. Why cut and sew waterproof material only to tape it afterward? This resulted in material damage and a complex recovery process. In 2018, Fox had the idea to use thermoforming to shape laminates without impairment, creating a **seamless one-piece bootie**. The name „UTMOSPHERIC“ reflects the perfect, seam- and tape-free surface.

## Material Properties and Production of UTMOSPHERIC® Laminates

The UTMOSPHERIC® laminates consist of 3-layered structures made from 100% polyester knits that are sufficiently stretchable for thermoforming and certified according to OEKO-TEX® STANDARD 100. This makes the bootie an attractive monomaterial component of your shoe. Completed 3D booties undergo comprehensive laboratory testing and are field-tested in real-world environments – from outdoor trails to sports arenas. This ensures constant control over performance, durability, and comfort.

## Machine and Process

The UTMOSPHERIC® technology is implemented on a specially developed machine that allows for the adjustment of various parameters such as heating time, temperature, shoe size, and material input. The machine integrates the following work steps:

### *Printing*

The laminate is fixed at the sides while auxiliary lines for processing, size, side indication (right or left), and production date are printed on it.

### *Forming*

The tempered laminate is thermoformed under vacuum over the shoe.

### *Cutting*

A robot cuts along the top and bottom contours of the booties.

### *Transport*

The finished bootie is placed on a conveyor belt using a gripping basket and automatically sorted.



**sympatex®**

high performance  
**membrane**



**UTMOSPHERIC®**

state of the art  
**technology**

## Thermoforming Technique: A Familiar Approach Transforming the Footwear Industry

The seamless thermoforming under vacuum technique offers numerous advantages that revolutionize both the manufacturing process and the end product in the footwear industry. By eliminating manual processes such as 2D cutting, sewing, and seam sealing, production time is significantly shortened, and labor costs are minimized. Additionally, the complete removal of tape leads to substantial material savings.

In terms of circularity, this technique allows for the production of a waterproof inner shoe that is made from pure materials and fully recyclable, preserving the value of the material. The high level of industrialization also ensures reliable waterproofing, resulting in a product of consistently high quality.

For shoe designers, this means they can offer their customers a remarkable wearing experience. The absence of seams noticeably enhances comfort, and the laminates achieve double the breathability compared to conventional materials through the innovative process. Moreover, the natural stretch properties of the Sympatex membrane ensure a comfortable fit, regardless of weather conditions or activity level.



## The Outstanding Benefits of UTMOSPHERIC® at a Glance:

- 100% better breathability than standard laminates
- 100% waterproof
- 100% recyclable
- PFAS and PTFE free
- Circular design through monomaterial construction
- No tape – avoiding quality issues
- 3-dimensional, seamless comfort
- Financial contribution to climate offset for CO<sub>2</sub> emissions
- Simplified disassembly in the recycling process
- Minimization of material waste and glue usage

90% of issues with waterproof shoes arise from seam sealing. UTMOSPHERIC® technology has eliminated this major weak point in conventional booties. During the vacuum thermoforming process, any kind of leak is immediately visible due to the airtight membrane used. The many advantages not only open up new design possibilities but also contribute to the sustainability and comfort that modern consumers expect.

## Your Custom UTMOSPHERIC® Project

At Sympatex, we are committed to minimizing the ecological footprint and maximizing product performance. We see ourselves as supportive partners for designers and product developers seeking innovative solutions.

If you're interested in a custom UTMOSPHERIC® project, we'd love to hear from you. Whether you have specific requests or creative ideas, we're ready to assist in developing a shoe with injected, glued, or stitched soles. With Generation Alpha and Omega, all sole technologies can be created.

We are happy to share our expertise in advanced technologies and sustainable materials to collaborate on the future of the footwear industry.

Generation Alpha for injected soles:



Generation Omega for glued and stitched soles:



### 1.4.3

## Sustainability in Shoe Design

**Sustainability** is now a necessity, and the footwear industry faces the challenge of developing innovative and environmentally friendly solutions. One promising approach is the use of **monomaterials**, which ensure **easy and effective recyclability**.

The entire process of collection framework planning ensures that your styles are both **creatively and commercially viable** while also being sustainable. To develop a coherent and marketable collection, it requires **trend research, target group analysis, material and color conception, design development, cost calculation, and production planning**. All these aspects and decisions throughout the process must be evaluated from a sustainability perspective.

### Monomaterials and their Advantages:

Monomaterials are composed of only one type of material, which greatly simplifies their recycling. Unlike conventional shoes, which are often made of numerous different materials and adhesives, monomaterials allow seamless recycling into new products. This reduces material waste and minimizes the complexity of recycling processes.

*Simplified recycling processes:* Monomaterials allow shoes to be recycled directly at the end of their life without the need for complicated sorting procedures.

*Sustainable material choices:* Designers can use recycled or recyclable materials that are environmentally friendly while still allowing aesthetically pleasing designs.

*Reduced ecological footprint:* Monomaterials minimize resource consumption and environmental impact throughout the entire lifecycle of a shoe.

### The Future and Innovation Potential:

**Circularity in shoe design** is becoming more widespread, not only for the benefits of recycling but also to meet the demands of environmentally conscious consumers. Sympatex is committed to using **recycled and recyclable monomaterials**, which can be efficiently integrated into production using proven technologies. Sympatex products have a significantly lower **CO<sub>2</sub> footprint** and **water consumption** and are already fully circular.

Another focus is on **fiber-to-fiber recycling**, where **recycled granulate** from old garments is used to produce new polyester fibers. Through collaboration across the value chain, business models are being developed to enable **industrial-scale recycling**.



*With **23 billion pairs of shoes produced annually**, they represent a significant **source of raw materials** when they reach the end of their life.*



## EU Guidelines – Key Laws for Sustainable Design

As part of the **European Green Deal**, the EU Commission published the **EU Textile Strategy** on March 30, 2022. This strategy outlines that the textile sector should be the first industry to fully transition from a linear to a **circular economy**. The publication states:

*„By 2030, textile products placed on the EU market will be **durable and recyclable**, made to a large extent from **recycled fibers**, free from hazardous substances, and produced with respect for social rights and the environment.“*

*„The extension of the lifespan of textile products is the most effective way to significantly reduce their climate and environmental impact.“*

Many people feel pressured by regulations, leading to tension in the political landscape. However, societal discussions are important as they form the foundation for living together. When we agree that certain issues from the past are unacceptable and we want to change them, this is a positive step forward. At Sympatex, we welcome new legislation in the context of the pressing climate crisis and see it as an opportunity to work together on solutions for our future.

European legislation is continuously evolving and has far-reaching impacts on the footwear industry. It is becoming increasingly important for shoe designers to familiarize themselves with these new regulations to meet legal requirements while also developing innovative, sustainable designs. The EU is pursuing ambitious goals in the areas of sustainability, circular economy, and consumer protection, which directly affect materials, production methods, and shoe design.

Below, you will find an overview of the relevant laws and directives that are important for you as a shoe designer. These range from ecodesign criteria to mandatory reporting on CSR (Corporate Social Responsibility) activities. EU regulations are constantly changing and can be complex, but Sympatex provides you with a helpful guide to the latest political developments in the EU. In the next section, we will explain how the different laws are interconnected and which specific regulations are particularly relevant to you as a designer.

The principles of this legislation – **resource efficiency, waste reduction, low toxicity, and recyclability** – are crucial for the European textile market. For the footwear industry, this means that designing recyclable products is not an option but a necessity to remain competitive in the future. Manufacturers will need to take responsibility for their products along the entire value chain, in line with the Circular Economy Act and the Supply Chain Due Diligence Act.

Sustainable design strategies, implemented early in the design process, play a central role. While collection, sorting, and recycling technologies are continuously evolving, adjusting the design process is fundamental to overcoming future technical challenges.

The circular economy model encompasses several interrelated elements across industries to form an effective system. Reducing textile waste and efficient recycling are essential components of the EU's strategy for sustainable and circular textiles.



**„The most fascinating aspect of this legislative process is that the European Commission regulates both parts together: one can call one part sustainability, which includes everything done in the product's creation, and the other circularity, which means that when the product leaves the store, it must return to where the raw material came from.“**

DR. RÜDIGER FOX, CEO SYMPATEX

## 2.1

### „ESPR“ - Ecodesign for Sustainable Products Regulation

The **ESPR** directive is central to the **EU Green Deal** and is considered groundbreaking for the textile sector. It offers shoe designers a framework to improve the **circularity** of products and is expected to come into effect between 2025 and 2027.

#### Impacts:

Designs will need to integrate requirements for **reusability, repairability** and **resource efficiency**. The **ESPR** will make sustainable products the norm and will ban the destruction of unsold textiles. Key aspects include promoting product lifespan, avoiding materials that hinder recycling, and integrating recycled content. Additionally, a **digital product passport** will be introduced to ensure transparency.

## 2.2

### „WFD“ - Waste Framework Directive

The revision of the **Waste Framework Directive (WFD)** brings significant changes to the footwear industry, particularly with the introduction of **Extended Producer Responsibility (EPR)**, which promotes the collection of textiles for **reuse** and **recycling**.

#### Impacts:

The **WFD** will increase the amount of collected textiles, reduce waste, and build an industrial ecosystem for the collection, sorting, and recycling of shoes.

## 2.3

### „WSR“ - Waste Shipment Regulation

The revision of the **Waste Shipment Regulation (WSR)** aims to facilitate the transport of waste within the EU and restrict exports to **non-OECD countries**, helping to combat illegal waste shipments.

#### Impacts:

Textile waste within Europe will increase while exports to non-OECD countries will be restricted. Companies will need to maintain comprehensive data records, and designers should closely monitor the development of these guidelines to prepare for new regulations.

## 2.4

### „TLR“ - Textile Labelling Regulation revision

The revision of the **Textile Labelling Regulation (TLR)** introduces significant changes. These include new requirements for both physical and digital labelling of textile products, as well as the introduction of a **sustainability and circularity label**. Furthermore, the **fiber identification regulations** will be updated to improve **traceability** and transparency.

#### Impacts:

Textile manufacturers will be required to disclose **environmental** and **circularity parameters**, increasing transparency for consumers and enabling designers to provide clear information on the sustainability of their products.

## 2.5

### „CSDDD“ - Corporate Sustainability Due Diligence Directive

The **Corporate Sustainability Due Diligence Directive (CSDDD)** promotes responsible corporate conduct in the EU and aims to **integrate human** rights and **environmental factors** into corporate decision-making. These requirements are expected to come into effect from 2025.

#### Impacts:

Companies with over 250 employees must identify and mitigate negative impacts in the value chain. It's crucial for designers to be involved in decision-making processes to develop sustainable designs that are both ecologically and ethically responsible.





# 3

## Design Thinking

Before starting implementation, it's crucial to foster creativity and sensitivity to problems. **Design Thinking** is a methodology aimed at solving problems and developing innovative ideas. This **user-centered approach** is particularly suitable for designing sustainable footwear and can lead to extraordinary results. Curiosity, entrepreneurial spirit, and a desire for discovery are essential qualities that will guide you through this process.

### Identity:

The process of design becomes apparent in the early stages of the methodology: understanding and observation are key here. The motto „**form follows function**“, which originated in the 19th century, remains relevant today. The outer form of a product should derive from its function. Good design, therefore, is not just decorative but is based on a meaningful concept that supports practical function. Especially for performance footwear, finding the balance between aesthetics, purpose, and functionality - while considering sustainability - is a challenge. To foster innovation, it's essential to engage deeply with the needs of the users. Today, designers must go beyond mere styling. They need to actively engage with anatomy, materials, and durability. But remember: product design is more than just drafting; it's about moving into the implementation phase once you've developed a clear identity for your product. Only then does the aesthetic design follow - similar to graphic design, where **corporate identity** is defined before **corporate design**.

### Shifting Perspectives:

It's important to bring your own perspective into the design process and to recognize that every product can be approached differently. Two factors play a crucial role here: on one hand, it's essential to engage deeply with yourself and your counterpart, so you can understand your own opinions and attitudes. On the other hand, this understanding should be incorporated into an **open dialogue**. Designers and clients should act as **sparring partners**, benefiting from each other's exchange to develop innovative solutions that are based on users' needs. A controversial discussion is part of this discourse. Social topics should be picked up and moderated to ensure a broad perspective. It's important to include various and even divergent viewpoints to reframe and redefine the problem. This is what we call **empathic design**, which ultimately allows you to view your design through your unique lens as a designer.

### Reflection:

Throughout the process, **self-reflection** is essential. What goals or intentions are you pursuing? As a designer, you never act without meaning, unlike in art. It can help to ask yourself: **What is the real problem? What do I want to change?** Too often, we feel like we already know the problem. **Design Thinking** is about challenging those assumptions. Participants are encouraged not to rush into a solution before thoroughly understanding the problem.





**„The greatest superpower is the ability to change oneself.“**

NAVAL RAVIKANT, ENTREPRENEUR & INVESTOR

#### Phase 1: Understanding

- What is the intended purpose of the product?
- When, how, and by whom will the shoes be worn?
- What will happen to the product once it's no longer used?
- Why am I designing this product?

#### Phase 2: Defining

- What challenges will I face?
- What categories and structures of product use can I imagine?
- Reflect on the problem carefully and precisely.

#### Phase 3: Ideation

- Is trend-oriented design necessary, or are there timeless alternatives?
- What could the future of the collection cycle look like?
- Generate rich visual material.
- Take a conscious shift in perspective.
- Be open to unconventional ideas, chance occurrences, naivety, and the unexpected.

#### Phase 4: Prototyping

- Move from cognitive thinking to action.
- Experiment with various tactile elements.
- Dare to try new combinations and improvise.
- Exaggerate, minimize, or enlarge elements consciously. Play with weight, format, and volume.
- Depending on strengths, assemble interdisciplinary teams to foster creative exchange.
- Proceed with passion while remaining logical and focused.
- Stay flexible and be ready to discard ideas and learn from setbacks.

#### Phase 5: Testing, Failing, Learning

- Test your prototypes, learn from mistakes, and implement optimizations quickly.
- Create your own prototypes and utilize your skills in 3D printing or material processing.
- Develop a clear specification sheet to accelerate the final sampling process.
- Maintain transparent communication to quickly share new insights.

# 4

## Responsible Design

Responsibility has many facets and has been redefined for decades. Given the current climate crisis and social injustices, it is essential for designers to be aware of their responsibilities and take active steps. What responsibility do you bear personally, both as an individual and as a designer? Your design decisions not only impact the product but also **society** and the **environment**.

We aim to show you how to use your work to not only create functional and aesthetic products but also to integrate **sustainability**, **social justice**, and **ethical principles** into your process. Our goal at Sympatex is to inspire and encourage you to embrace your role as a change-maker and innovator. Constraints can act as a catalyst for creativity and innovation. It is important to communicate complex and meaningful topics beyond product design -not as a burden, but as a societal discourse that is inevitable and ideally seen as a goal or desire.

### Influence Equals Responsibility

Designers are not just aesthetes; they are also key players in a larger social context. Your designs influence people's daily lives as well as **cultural** and **social structures**. This responsibility requires you to make not only creative decisions but also **ethical** ones. Economic success should not be the only focus -reflection on how your work impacts society and the environment is equally important.

Today, design is more complex than in past decades. In the 1980s and 1990s, the focus was more on aesthetics and brand identity, while content was often neglected. That lightness has given way to more sophisticated design, responding to social and cultural changes and opening up new perspectives. It is important that product design does not only target lifestyle but also reflects the complexity of our time. **Designing** means, as the saying goes, „**dancing in chains**“ (Rüdiger Quass von Deyen): You have freedom, but you also need to adhere to social norms.

### Your Role as a Designer

The **Theory of Planned Behavior** by **Icek Ajzen** demonstrates that your actions are shaped by your intentions, attitudes, and perceived control. In times when we feel we have less control, we tend to act impulsively. Therefore, it's important to design with **consciousness** and **reflection**, aligning your ethical principles with the needs of the target group and the brand. Which beliefs and norms influence your decisions? By questioning these aspects, you can develop both your stance and your design further.



„Between stimulus and response, there is a space.  
In that space lies our power to choose our response.  
In our response lies our growth and our freedom.“

VIKTOR FRANKL

## Aspects of Responsible Design

### *Economic Responsibility:*

The economic dimension of design goes beyond costs and encompasses long-term impacts on the environment and society. Choose sustainable materials and optimize production processes to conserve resources.

### *Ecological Responsibility:*

Ecodesign is essential for responsible design. Pay attention to the materials you use and how your products are treated at the end of their lifecycle. A life-cycle assessment helps you understand and minimize the environmental impact of every design phase.

### *Social Responsibility:*

Designers should create products that are inclusive. Consider how you can design shoes for people with prosthetics or foot deformities. Take into account the needs of different target groups and provide them access to your designs. Be transparent about why you made certain decisions to maintain credibility in stakeholder communication. Ensure that your supply chains are ethical and sustainable, especially regarding fair working conditions, as the footwear industry has a history of labor rights violations. Consumers are increasingly demanding transparency regarding material origins and production conditions.

### *Cultural and Social Influence:*

Society reflects the spirit of the times and reveals current needs and impulses. Designers have the power to shape or alter cultural identities, set trends, and influence tastes. Be cautious to avoid cultural appropriation and respect the diversity of perspectives you bring into your design process. Footwear often carries cultural and social meanings that are associated with certain lifestyles or social groups.

### *Aesthetic and Emotional Impact:*

Your designs can influence people's well-being and quality of life. By incorporating social messages and values, you raise awareness for important topics and can initiate social discourse (public value). Consider the societal benefit and added value your design creates and the positive changes it can bring.

# 5

## Ecodesign

In the dynamic world of the footwear industry, numerous creative possibilities arise to meet the demands of sustainability. The shift towards more sustainable practices goes beyond purely ecological and economic considerations; it also requires a profound change in our behaviors, perceptions, and understanding of what shoes are and can be. By collaborating closely with various disciplines and experts within the industry, new standards can be set that account for the entire lifecycle of a shoe.

The challenges that come with implementing ecodesign are multi-faceted, but they also bring numerous opportunities. It is crucial to resist the urge for overperformance and instead find a balance between functionality, environmental awareness, and social responsibility. For holistic-minded designers, this means creating products with purpose, aiming to meet real needs rather than focusing solely on maximum performance.

### 5.1

#### Durability

As a designer, you should aim to create shoes that are functional, stylish, and durable. Durable products reduce waste and contribute to sustainability. How can you design a shoe that gains value over time and appeals to a wide range of users? Consider three key aspects:

##### *Physical Durability*

A durable shoe withstands wear and tear while remaining functional. This requires high-quality materials, technical excellence, and careful craftsmanship.

##### *Emotional Durability*

A shoe should create an emotional connection with its users. It needs to not only perform well but also be aesthetically pleasing and aligned with the values of the wearer.

##### *Aesthetic Durability*

A shoe should be adaptable, comfortable, and user-friendly. It must meet the evolving needs of users.

Ideally, these elements should be harmoniously combined to maximize the product's longevity. The more durable, emotionally engaging, and functional a shoe is, the more it will be appreciated and worn. As a designer, your goal should be to create high-quality, long-lasting shoes that become indispensable to the user while also having a positive environmental impact.





### 5.1.1

#### Quality

The quality of a shoe is crucial for its durability and sustainable success. As a designer, you should consider both durability and functionality when selecting all components. Start with the careful selection of materials, paying attention to factors like fabric weight, tear resistance, and abrasion resistance. Focus on the strengths of your previous designs and reflect on what you have already achieved, rather than just what is lacking.

For precision products such as eyelets and stoppers, use high-quality materials to ensure waterproofing and longevity. Also, consider incorporating unconventional materials like mineral composites or bio-based raw materials.

Stay aware of current fashion trends, but deliberately choose against short-term fads in favor of timeless design. Classic designs with modern influences are advantageous. Colors like black or white suit various occasions and seasons, but unique pieces with distinctive colors or shapes can also become long-term favorites.

The durability of a shoe also depends on comfort and fit. Pay attention to thoughtful construction that meets the users' needs. Reinforce high-stress areas with double layers or alternative joining technologies. Analyze the usage pattern of the shoe to increase its physical durability.

Design your shoe so that it is easy to repair. Avoid strong bonding methods and opt for removable parts that can be replaced if necessary. Provide simple care and repair instructions, and encourage customers to perform repairs themselves by offering replacement parts. Retail models that offer repair services strengthen brand loyalty and promote sustainable behavior.

### 5.1.2

#### Adaptability

The ability to transform offers shoes great potential to adapt to the changing needs of the wearer. A shoe that can change over time extends its usage and remains relevant. Changes such as recoloring or redesigning add new aesthetic and functional value, minimizing the risk of the user losing interest.

Designing for adaptability means creating products that can be adjusted to different styles and occasions. Here are some recommendations for shoe designers:

##### *Modular Design*

Develop shoes with modular components that can be individually used or recombined. Removable uppers, interchangeable sole elements, and adjustable fastenings allow users to customize their shoes based on the occasion or style. This flexibility fosters individual style identity and reduces the need for new shoes, benefiting the environment.

##### *Changeable Surfaces*

Use technologies that allow the color or pattern of the shoe to be changed. Materials that react to pressure or temperature can adapt the appearance to the wearer's mood or outfit.

##### *Functional Add-ons*

Integrate functional elements that make the shoe adaptable for different activities. A removable insole can provide extra comfort for sports, while a water-repellent layer ensures protection on rainy days.



### 5.1.3

## Participatory Design

Participatory design promotes a less autocratic design process by placing user co-creation at the center. It's not about working together on a laptop but actively communicating with people, capturing their input, and designing based on their needs. Designers act as facilitators, developing relevant and sustainable solutions by engaging with the community.

#### *Indirect Co-creation*

Participatory design involves incorporating external individuals (non-designers) into the process without attempting to turn them into designers. The role of a designer is increasingly transforming into that of a curator or consultant, orchestrating the positions and needs of users. This diversity and responsibility towards various stakeholders are crucial for success.

#### *Direct Co-creation*

Designers can also involve users actively in the design and manufacturing process, which strengthens the emotional connection between the end consumer and the product. In an era where many shoes are replaced due to fading interest, it's important to design products that users will value in the long term. Interactive design options foster product longevity and user attachment.

## Recommendations for Shoe Designers

#### *DIY Kits*

Develop kits that allow users to design their own shoes by choosing different colors and materials.

#### *Personalization Elements*

Offer customizable designs like embroidery or monograms to increase emotional durability.

#### *Storytelling*

Tell a story through your design that reflects the personality of the user and conveys your brand's values.

#### *Open-Source Designs*

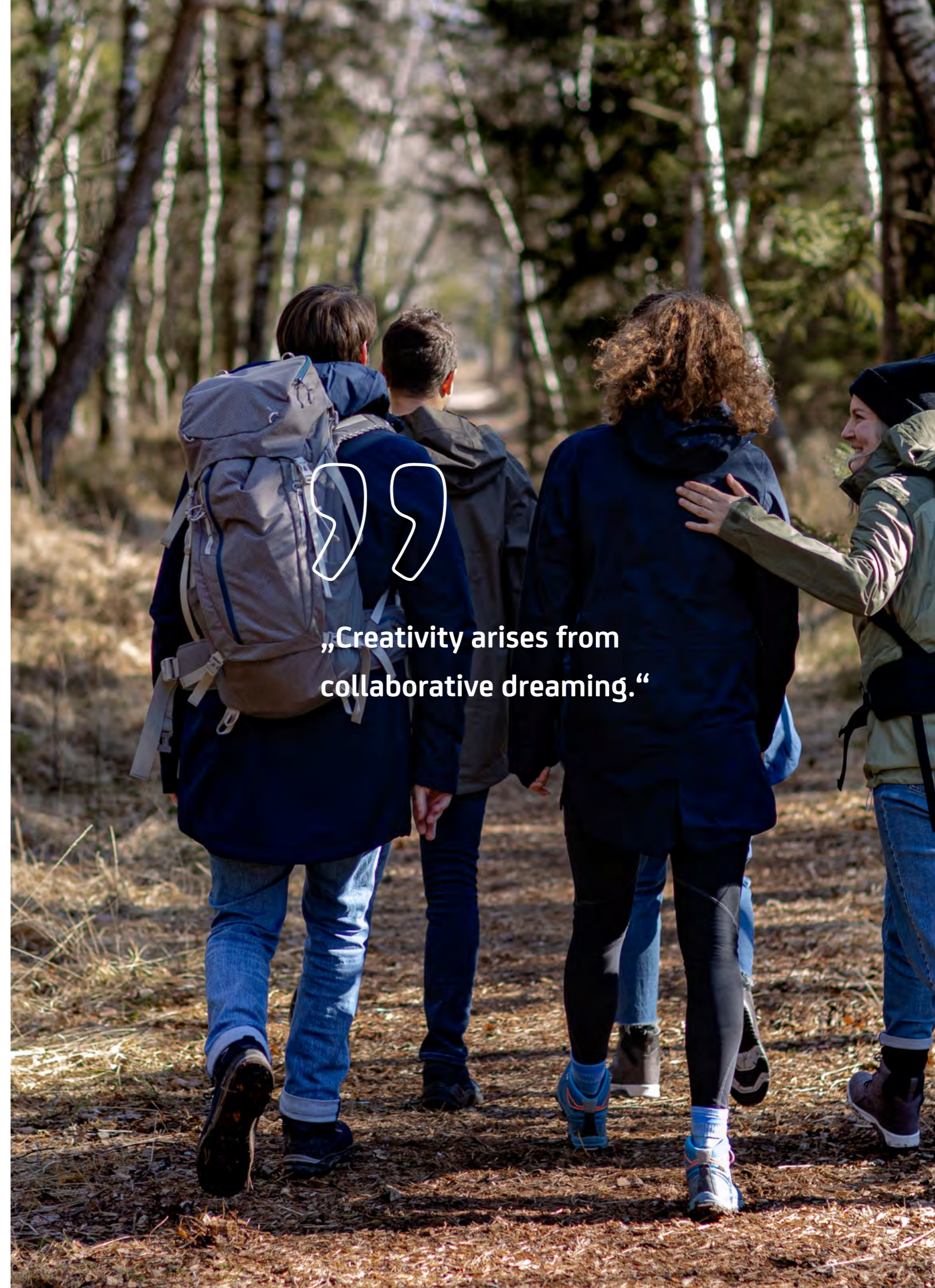
Provide guides and designs that engage users with the design process, for example, through workshops.

#### *Co-Creation Workshops*

Organize workshops and surveys to gain insights into the needs of your target audience.

## Synergy Effect

Close collaboration between designers, engineers, and material experts is the most productive way to develop innovative solutions. The exchange of knowledge and resources fosters creativity and engagement in the design process. Partners and networks play a crucial role in achieving sustainable goals. In this way, shoe design becomes a shared experience that goes beyond individual achievements.



## Design2Recycle

Today's shoe production often leads to a dead end, generating massive amounts of waste. To change this, a shift in the footwear industry is essential. The goal is to minimize environmental impact by embracing the principles of the circular economy. „Circular Footwear“ requires a thoughtful design approach.

A shoe is only recyclable if all materials, including accessories, are carefully and purposefully selected. Sympatex introduced the Design2Recycle strategy as early as 1996 to promote single-material products for the recycling process. These principles are more relevant today than ever. Recycling considerations should be incorporated from the design phase, with the aim of selecting materials that can be easily separated and recycled.

Design2Recycle demands continuous adjustments and a shift from a linear to a circular approach in all process steps. The Sympatex membrane, made from polyetherester, is recyclable and helps reduce material consumption by up to 15% through the recycling of production waste.



### Opportunities of the Circular Economy

The circularity of materials aims to minimize waste and reduce the need for new resources by ensuring products are either recycled or biodegraded. The availability of 100% recycled and recyclable materials presents significant challenges for designers. Sympatex footwear laminates, made from 100% polyester, can be chemically recycled and regenerated as technical nutrients. However, to achieve full recycling, all shoe components must belong to the same recycling loop, which is difficult due to the variety of materials and melting points. Therefore, Sympatex recommends focusing on disassembly in footwear design.

### Challenges in Shoe Recycling

Approximately 20 billion shoes are produced annually, with an alarming 95% ending up in landfills or incinerators. Shoes often consist of up to 40 different materials, such as leather uppers, rubber soles, and various plastics, which pose a significant challenge. This variety complicates sorting and recycling, as each material requires specific recycling processes.

However, the EU Circular Economy Act will also apply to shoes, creating a legal framework for sustainable practices. Since 2014, innovative footwear recycling pilot projects have established the first shoe recycling plants, while companies like Adidas and Vaude are developing concepts for recyclable shoes.

Consumer behavior is also crucial: many are unaware of recycling options for shoes. To increase recycling rates, awareness campaigns and incentives for returning old shoes are needed. Achieving a sustainable footwear market requires collaboration between manufacturers, recycling companies, and consumers to find practical solutions.

### Design Guidelines

- Choose trims and parts made from monomaterials, preferably 100% recycled polyester.
- Keep the design minimalist and consistently use recyclable materials.
- Prioritize monomateriality for effective recycling.
- Reduce the use of reflective materials and focus reflections on single parts to minimize material loss.
- Use metallic alternatives instead of PES-based trims to facilitate recycling.
- Opt for simple fabrics and reduce elaborate logo designs.
- Integrate trims without harmful chemicals to avoid disrupting upcycling.
- Invest in high-quality materials to preserve resources for future reconstructions.
- Shift from high-performance designs to sustainable, necessary constructions.

### Monomaterial

More brands are adopting materials designed for recycling, such as thermoplastic elastomers and bio-based plastics, which can be efficiently recycled at the end of their life cycle. It is essential to consistently choose mono-based and recyclable fabrics to ensure circularity. Comprehensive documentation of all shoe components and close collaboration with suppliers are crucial for utilizing current materials and technologies. However, a mono-based approach may bring compromises in aesthetics and quality. High-quality synthetic polyester fibers should be prioritized, while environmentally harmful materials should be avoided.



## Disassembly

As a designer, you should create shoes in a way that allows for easy disassembly and recycling at the end of their life cycle. Technologies such as 3D printing and innovative polymers expand the possibilities of producing parts in various shapes from a single material. Modular prototypes, such as inner socks with reinforced soles or flexible shells, are optimized for recycling because they can be mechanically connected without the need for adhesives. Use removable fastening mechanisms like cords or buckles to facilitate the separation of components at the end of the shoe's lifespan. Dissolvable threads, which break down under heat or pressure, and thermal disassembly systems can also aid in the separation of materials during the recycling process, without compromising the creativity or quality of the designs.

It is essential to assess each design individually. The separation of different materials can be complex, especially when many seam sealing tapes and adhesives are polyurethane (PU)-based. Therefore, it is important to use polyester (PES)-based solutions for laminates to enhance recyclability.

# 7

## Innovative Tools & Future Trends

The footwear industry is on the brink of an exciting transformation driven by technological innovations and an increasing awareness of sustainability. Currently, there is a lack of effective tools to support designers in making sustainable decisions and visualizing the environmental impacts of their designs. However, the future promises several promising developments:

### AI-Powered Design Software

AI-based design software is becoming the norm and could offer suggestions for sustainable materials and designs, while also analyzing environmental impacts such as carbon emissions and water usage in real-time. This software could even simulate different design approaches virtually before production, reducing waste and optimizing efficiency.

### VR and AR Technologies

Virtual reality (VR) and augmented reality (AR) technologies allow designers to visualize their concepts in an immersive environment. Designers can not only create a shoe in 3D but also immediately see how it performs in the real world. These technologies could also enhance customer communication, helping buyers understand sustainable materials and processes more clearly.

### Blockchain Technology

Blockchain could make the entire supply chain of a shoe transparent. Designers and consumers could track the origin of materials, production conditions, and environmental footprint in real-time. This transparency would strengthen brand trust and increase pressure on companies to adopt sustainable practices.

### Adaptive Materials

In the future, adaptive materials could increase comfort and extend the lifespan of shoes by adjusting to environmental conditions, such as altering their shape or breathability. These materials open new possibilities for designers to create innovative solutions for specific needs.

### Cloud-Based Design Platforms

Cloud-based platforms could enable real-time collaboration between designers, engineers, and customers. These platforms could also offer suggestions for improvements based on past projects and user feedback, significantly speeding up the innovation process.

### Bio-Inspired Designs

Bio-inspired designs are expected to play a greater role in creating functional and sustainable products. Materials that are biodegradable or interact with natural organisms could be more widely used in the future.

### On-Site Shoe Printing

The possibility of printing shoes on-site could become a reality. 3D printers for footwear would enable the creation of custom designs tailored to the specific needs of customers—all using sustainable materials.

### Circular Design Workshops

Circular design workshops could be in high demand to train the next generation of designers. These workshops would teach not only technical skills but also the ethical considerations behind sustainable design. Collaboration with environmental scientists, social scientists, and economists would ensure an interdisciplinary approach. These developments could help the footwear industry transform sustainably while fostering creativity and innovation.

These innovative tools and trends hold the potential to reshape the footwear industry, ensuring that sustainability and cutting-edge design go hand in hand.



# 8

## Value Chain

The value chain in the footwear industry is increasingly shaped by the Supply Chain Due Diligence Act, which for the first time establishes clear rules for corporate responsibility regarding human rights compliance in supply chains. This legislation not only provides legal certainty but also forces companies to take responsibility for the materials and chemicals used in their products. In shoe production, where a wide variety of materials are often used, it is essential to identify and avoid harmful chemicals to protect both the health of the end consumers and the well-being of workers in the production chain.

Social and environmental requirements are critical at every stage of the complex supply chain. From raw materials to the finished shoe, companies must ensure they adhere to ethical standards and make responsible decisions.

The production processes in the footwear industry require significant amounts of water and energy. Designers must develop new approaches to minimize resource consumption and reduce the environmental impact of their designs. Sustainable materials and efficient production methods play a central role in this effort.

Another important aspect of the value chain is waste management. Shoe production often generates considerable amounts of waste, whether through material off-cuts or excessive packaging. The challenge lies in minimizing this waste and, where possible, reintroducing it into the production cycle. Approaches such as implementing circular economy models and developing products that can be easily disassembled and recycled at the end of their lifecycle are crucial for significantly reducing waste.

Responsibility towards consumers and consideration of production conditions are not only legal obligations but also essential elements that determine the long-term success and credibility of the sustainable footwear industry. Through transparent communication and sustainable practices, companies can not only gain customer trust but also actively contribute to improving social and environmental conditions in their value chains.

### 8.1

#### Production and Water Consumption

Shoe production is resource-intensive and presents both ecological and social challenges. Designers and manufacturers should optimize their resource use, minimize material waste, and select local production sites where possible to ensure fair working conditions. A transparent value chain ensures dignified production conditions, and regular visits to producers help maintain standards.

Producing a single pair of shoes can consume up to 2,500 liters of water. Sympatex, through the use of spin-dyed laminates, has managed to reduce water consumption by up to 75%. In addition, avoiding harmful chemicals is crucial for responsible design and environmental protection during production.



**„Digital tools like DMIX help evaluate colors earlier and make better decisions, thereby reducing unnecessary revisions.“**

CARMEN KEIM, COLOR MANAGEMENT, SYMPATEX





## 8.2

### Improving the Environmental Footprint

Climate change is one of the biggest challenges of the 21st century. Sympatex has committed to reducing its CO<sub>2</sub> footprint by 30% by 2030 compared to 2017. In footwear production, using a Sympatex membrane results in a lower carbon footprint compared to traditional materials like PTFE.

The use of Sympatex's polyester membrane saves around 15% of CO<sub>2</sub> emissions in shoe manufacturing. By incorporating bio-based materials, as featured in our membranes, you can further reduce CO<sub>2</sub> emissions. With a 25% bio-based content in our membrane, we reduce CO<sub>2</sub> emissions per kilogram of polymer by 12% compared to fully fossil-based materials. These developments help you meet your climate goals while ensuring the performance and recyclability of the materials. Sympatex laminates are 100% climate neutral, as we offset all greenhouse gases generated during the membrane production process, and we offer our customers the opportunity to invest in internationally recognized climate protection projects.

Use tools like the HIGG Index to calculate your company's carbon footprint, providing transparency on emissions and resource consumption. Since over 70% of a product's environmental footprint is determined in the design phase, it is crucial to question the necessity of each shoe model and strategically reduce collections.

## 8.3

### Logistics

In the footwear industry, logistics play a critical role in both environmental impact and supply chain efficiency. To minimize CO<sub>2</sub> emissions, companies should use low-emission transportation methods such as rail, which is more cost-effective for large shipments. Ensure containers are fully loaded and consolidate multiple shipments to reduce both emissions and costs.

A key aspect is packaging design: avoid plastic packaging and opt for environmentally friendly alternatives, such as recycled or biodegradable materials. Reduce packaging waste by implementing reusable packaging systems, such as multi-use containers.

Analyze and optimize your logistics strategy by collaborating with eco-friendly logistics providers. Route optimization technologies can help reduce fuel consumption and improve delivery times. Close collaboration with suppliers and retailers promotes sustainable logistics and enhances customer satisfaction.

# 9

## Consumers

Sympatex is dedicated to encouraging consumers to stay informed and take action. You can also promote the purchase of regional products and the reduction of packaging waste. Organize events that build a bridge to consumers, educating them about ecological alternatives in the footwear industry. Encourage your customers to actively support environmental protection - because every individual can contribute to safeguarding our planet.

### Consumer Behavior

Consumers view shoes not only as functional items but also as an expression of their style and individuality. While some invest in high-quality, stylish models, it's equally important that they actively participate in the recycling process—even though this can sometimes be challenging. Technological advances and innovative systems are increasingly opening pathways to make shoes more sustainable and recyclable. However, we still face the challenge of implementing these approaches on a broader scale and fostering acceptance among consumers. Some consumers continue to opt for cheaper shoes that wear out quickly. Designers are called upon to create durable and high-quality products to change this habit. By creating appealing and sustainable designs, you can positively influence consumption behavior and foster a new appreciation for quality and environmental consciousness.

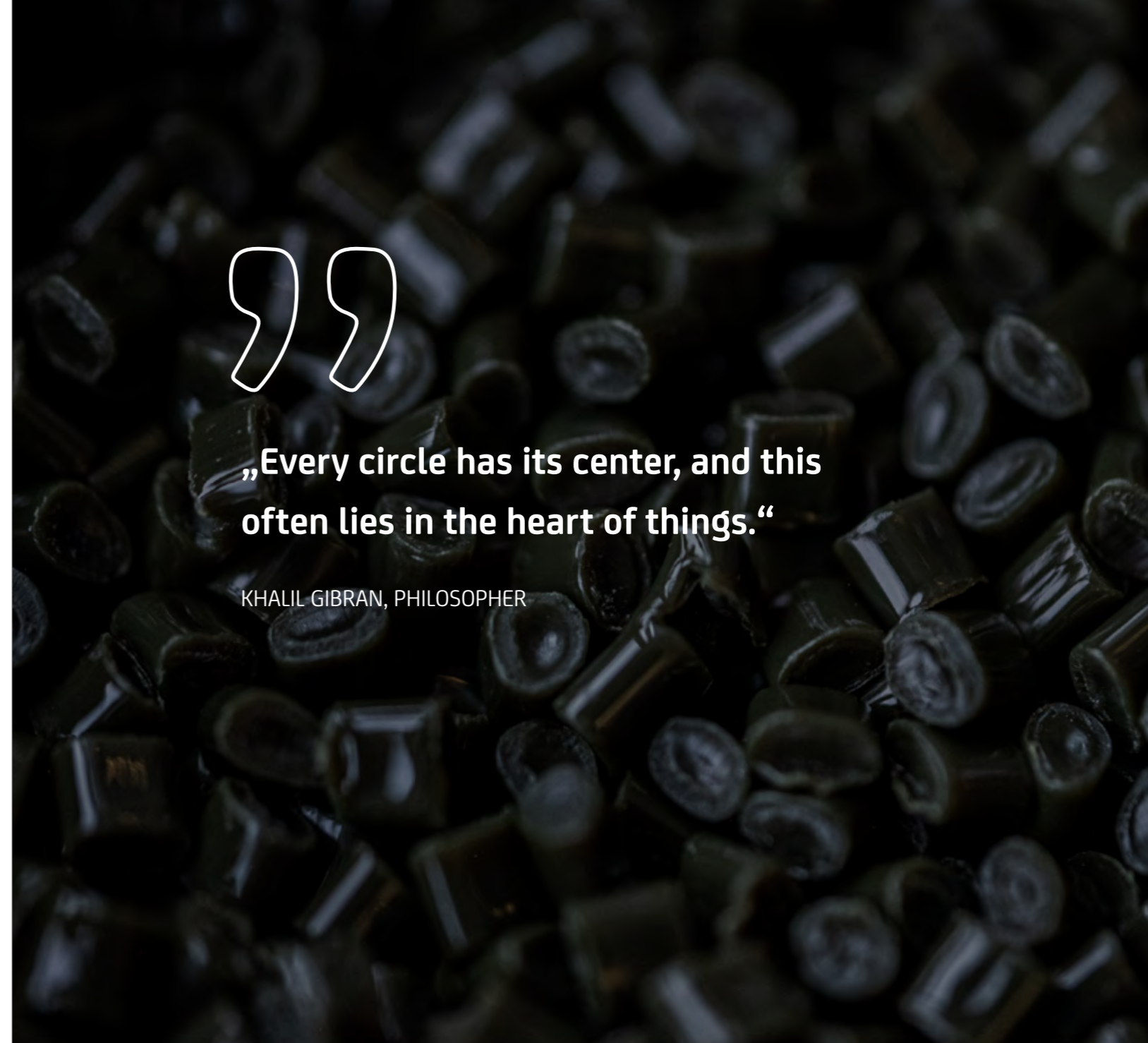
# 10

## End-of-Life

What happens after a product is used? This question often remains unanswered in the fashion industry, yet it is crucial for a sustainable future. Consumers need to be informed and guided on how to effectively return their worn products, particularly shoes, to the material cycle. A well-thought-out take-back system plays a key role in this. It enables recycling companies to access resources and recover high-quality fibers from old products.

Disassembly is closely linked to the end-of-life process. To ensure that old shoes or parts of them, like the UTMOSPHERIC® booties, do not end up in landfills, effective take-back and recycling programs must be implemented. These programs allow the various materials of the shoes to be collected and reprocessed separately. UTMOSPHERIC® booties can be effectively recycled or reused, significantly reducing the environmental footprint.

By collaborating closely with sorting and recycling companies, we ensure that the resources from our shoes are maximally utilized. This is a crucial step in extending the lifespan of materials and promoting the transition to a circular economy.



„Every circle has its center, and this often lies in the heart of things.“

KHALIL GIBRAN, PHILOSOPHER

### 10.1

#### Sales Channels

Digital accessibility can be enhanced through **Augmented Reality (AR)**, allowing customers to virtually try on shoes. This improves the shopping experience and helps reduce returns.

**Community engagement** fosters the exchange and recycling of shoes. Encourage customers to share their stories about your shoes, for example, through social media campaigns.

**Climate-neutral shipping** and take-back programs for old shoes are also important approaches. Offer climate-neutral shipping options and create incentives for returning old shoes, which can be refurbished or recycled.

## Collecting, Sorting & Recycling

Sympatex is committed to developing solutions for shoe recycling and closing the material loop. Consumers should have easy options for returning old shoes, which should be supported by policies to regulate these practices. Brand take-back programs are essential to facilitate the transition to a circular economy.

Partnerships with recycling companies are crucial to efficiently process materials. Smart sorting systems are key to effectively separating different materials. Digital product IDs created during production can store vital information that is essential for recycling. Sympatex collaborates with companies like „Worn Again Technologies“ to chemically recycle materials like polyester and cotton, ensuring they can be reintegrated into the production cycle. Designers should prioritize recyclability from the early stages of product development. Brands like Allbirds and Adidas are already using recyclable materials and offering take-back systems. Transforming the infrastructure for collecting and recycling shoes is vital for achieving a sustainable circular system.

# 11

## Support at Sympatex

### *Support for Designers*

We provide comprehensive assistance to help you develop your collections in a resource-efficient way using our materials. Our commitment begins before prototyping, as we support you with ecodesign and Design2Recycle processes.

### *Sample Testing in the Sympatex Lab*

During the sampling process, your products undergo extensive testing in our laboratory. Upon completion, you will receive a detailed evaluation report with laboratory results and expert recommendations.

### *Technical Support in Production*

Our technicians assist with on-site production, conduct quality controls, and adjust machinery as needed.

### *Knowledge Transfer and Consultation*

We share our expertise on materials for disassembly and recycling options. Additionally, we offer our technical guidelines for footwear, which illustrate our patented processing constructions.

### *Transformation for the Future*

Sympatex supports partners in becoming future-oriented companies that contribute to the circular economy. Our experts share their knowledge to drive progress in the circular economy, providing valuable insights into sustainability and circularity in the textile and footwear sectors.

## We support you ...

### Corporate Social Responsibility

- ... being on the safe side for all upcoming regulations.
- ... becoming compliant with the LksG/CSRD.
- ... with access to sustainability data, standards and certificates.
- ... with our 35 years of experience with PFAS-free products.

### Cloud Digitization

- ... with a digital solution: check out the digital twins of our laminates online.
- ... in designing your samples with our laminates directly on the screen.
- ... in speeding up the lab dip process to save time and shipments.

### Technical Support

- ... with intensive evaluation of your products for the best possible function.
- ... with closely supervised teamwork from sampling stage to bulk production.
- ... reaching the best performance values with our expertise.

### Circular Design

- ... with offering our Responsible Design Guide and Trim List.
- ... with sharing ideas for prototyping stage.
- ... with checking your Tech-Packs.


 CSR

DMix



# Contact

## Let's Talk. About Better Shoes for Tomorrow.

We are proud and grateful to collaborate with innovative partners across the entire value chain, beyond the outdoor industry, to advance the vision of circular economy and sustainability. Only together can we effectively work towards a circular future for footwear.

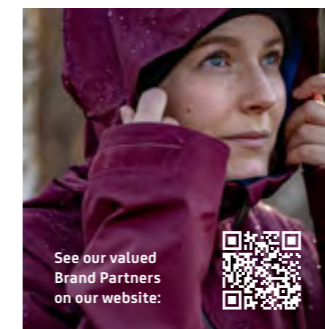
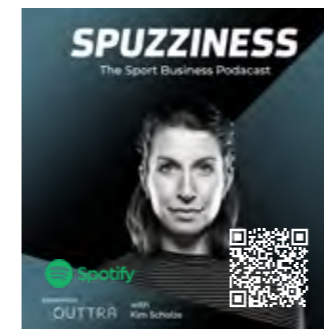
Are you interested in using our climate-neutral and recyclable Sympatex membrane? We'd be happy to show you our material samples to lay the foundation for your circular or sustainable shoe design.

### Contact Information for Sympatex Technologies GmbH:

Product Management Footwear: [Yasemin.Malcolm@sympatex.com](mailto:Yasemin.Malcolm@sympatex.com)

Consultation on Footwear Design and Technical Support: [Mario.DiPippo@sympatex.com](mailto:Mario.DiPippo@sympatex.com)

UTMOSPHERIC®: [Ann-Katrin.Machatschek@sympatex.com](mailto:Ann-Katrin.Machatschek@sympatex.com)



### Let's connect!

Use our credible platforms to collaborate and spread the words for change:

Meet us at the **Ingredient Roundtable** and **Young Designers – Sustainability Impact Program**.

Let's work together on **social media**:



Develop **press releases, print media and collaborations at fairs** and **panel discussions** with us.

Contact Marketing: [marketing@sympatex.com](mailto:marketing@sympatex.com)

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# Sources & References

## Resources

www.din.de  
DIN-Normenausschuss Grundlagen des Umweltschutzes (NAGUS)  
DIN EN 45560 „Methode zur Gestaltung von zirkulären Produkten“

Study Federal Environment Agency Germany:  
„Erarbeitung möglicher Modelle der erweiterten Herstellerverantwortung für Textilien“

GRID. Design als Podcast „Ohne alles ist nichts! Design und Verantwortung.“, 2024

Nicole Kösegi, Webinar „Kreislaufwirtschaftsgesetz“, Bündnis für nachhaltige Textilien, 2020

Dr. Rüdiger Fox, „Der 0,1-Prozent Joker“, Murmann Publishers GmbH, Hamburg, 2021

## Glossary

### **DWR (Durable Water Repellent)**

A special coating applied to textiles to increase water resistance. This treatment ensures that water beads up on the surface and rolls off, rather than soaking into the fabric.

### **B-Corp (Benefit Corporation)**

Companies that meet high social and environmental standards. To earn B-Corp certification, a company must complete the B-Impact Assessment, which evaluates performance in five categories: Environment, Workers, Customers, Community, and Governance. A score of at least 80 points is required for certification. B-Corps are committed to making positive social and environmental impacts and must regularly report their progress.

### **EMPA (Swiss Federal Laboratories for Materials Science and Technology)**

A Swiss research institution specializing in materials science and technology. EMPA conducts testing, research, and development to foster innovation and improve material quality. It supports companies and institutions in applying new materials and technologies.

### **PFAS (Per- and Polyfluoroalkyl Substances)**

Synthetic chemicals known for their highly stable carbon-fluorine bonds. They are persistent in the environment and potentially harmful to health and ecosystems, leading to growing concern.

### **Fiber2Fiber Recycling**

The process of reusing textile fibers to produce new textile products. Old textiles are collected, sorted, and their fibers are extracted to be reintroduced into the production chain for new fabrics. This method supports the circular economy, reduces waste, and lessens the need for new raw materials.

### **OECD Countries**

The Organisation for Economic Co-operation and Development (OECD) is an international group of 38 countries working toward economic stability, sustainable development, and social progress. Member states collaborate to share best practices, improve policy-making, and address global challenges in areas such as the environment, education, and economic growth.



**Sympatex, as an ingredient brand, provides more than just a membrane:**

We foster close collaboration with our customers, sharing our expertise to jointly develop the best possible product. As a designer, we offer you continuous support and recommend tailored strategies to help you make your product circular and sustainable.

**The Responsible Design Guide – Footwear** is designed to support you from the start, helping you thoughtfully plan your designs from the outset and ask the right questions with the circular economy in mind.

