BASF's Sustainable Footwear Solutions

National Plastics Expo 2024, Orlando, Florida

Greg Sanders - Performance Materials Account Manager

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BASF's Sustainable Footwear Solution

Greg Sanders

Performance Materials

Key Account Manager • BASF

Agenda

1. BASF Sustainability Story
2. BASF Performance Materials Footwear ‘Footprint’
3. BASF Sustainability Initiatives in PU/TPU/ETPU with Customer Examples
4. The Future


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The climate is changing,
so are we.

We create chemistry for a sustainable future – BASF's emission targets

25%

CO_2 emissions reduction

(compared with 2018)*

net zero

CO_2 emissions

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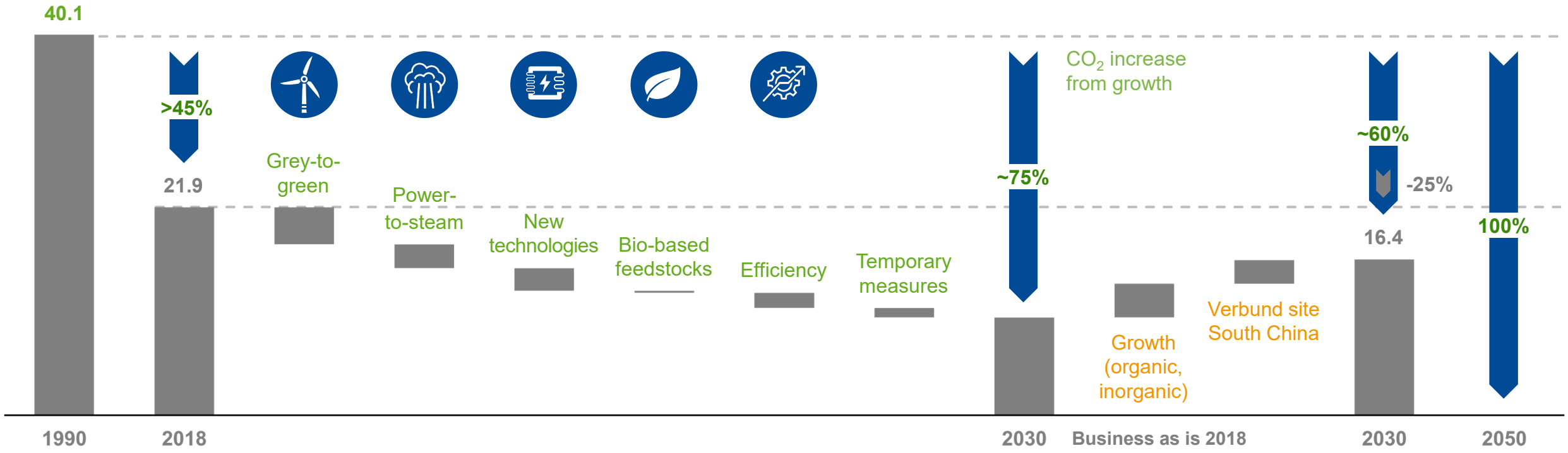
Our path to reduce BASF emissions from 1990 to 2050

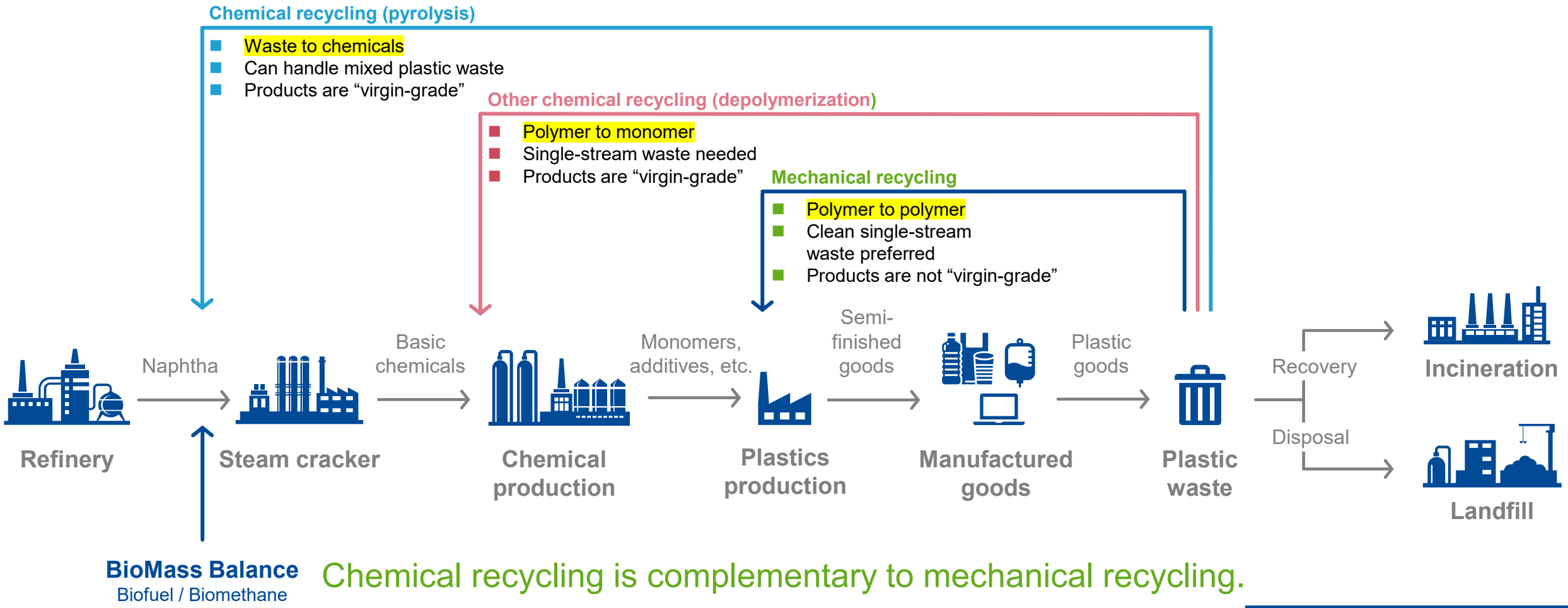
BASF greenhouse gas emissions (Scope 1 and Scope 2)

Million metric tons

net zero



Different loops are necessary for a successful transition towards circularity



Chemical recycling is complementary to mechanical recycling.

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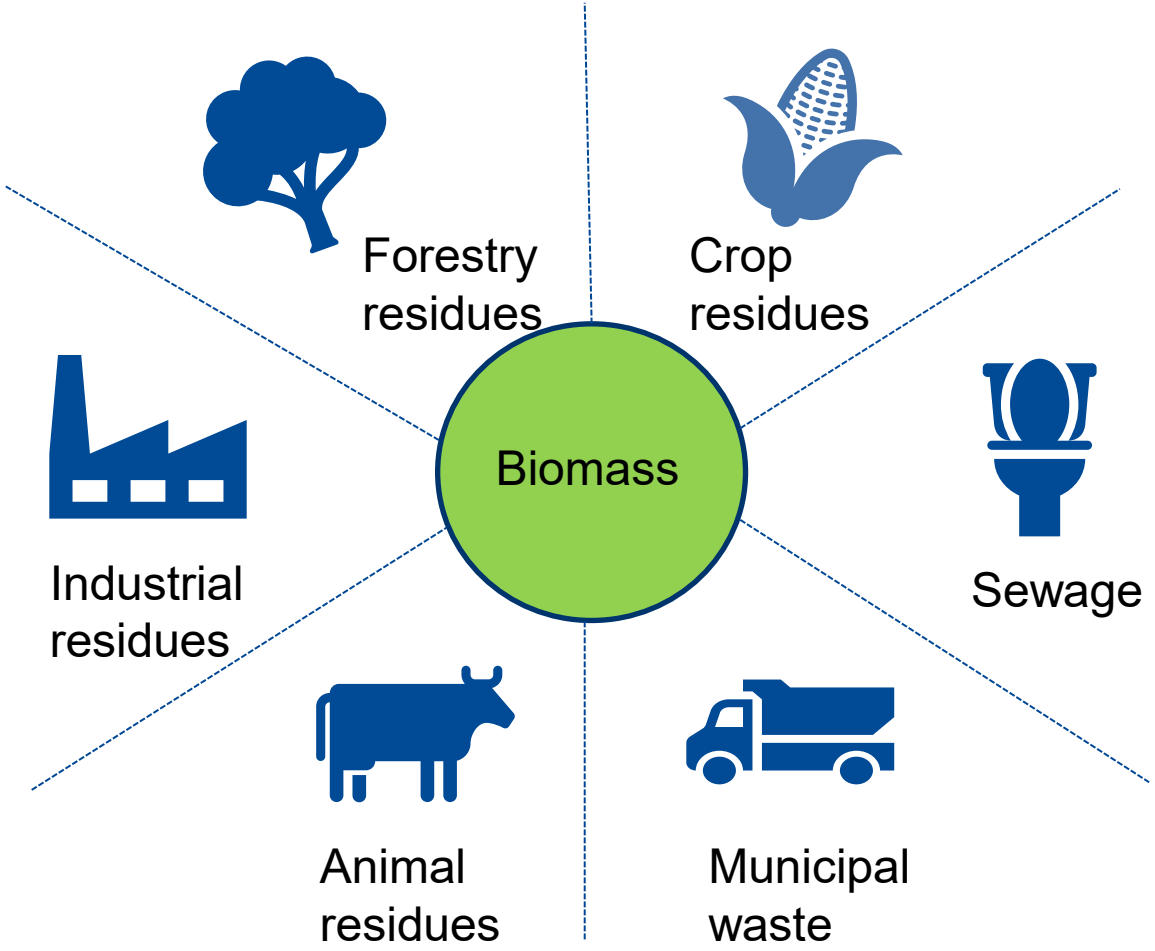
What are the sources of biomass?



Biomass must be processed to transform it to feedstock suitable for chemical production

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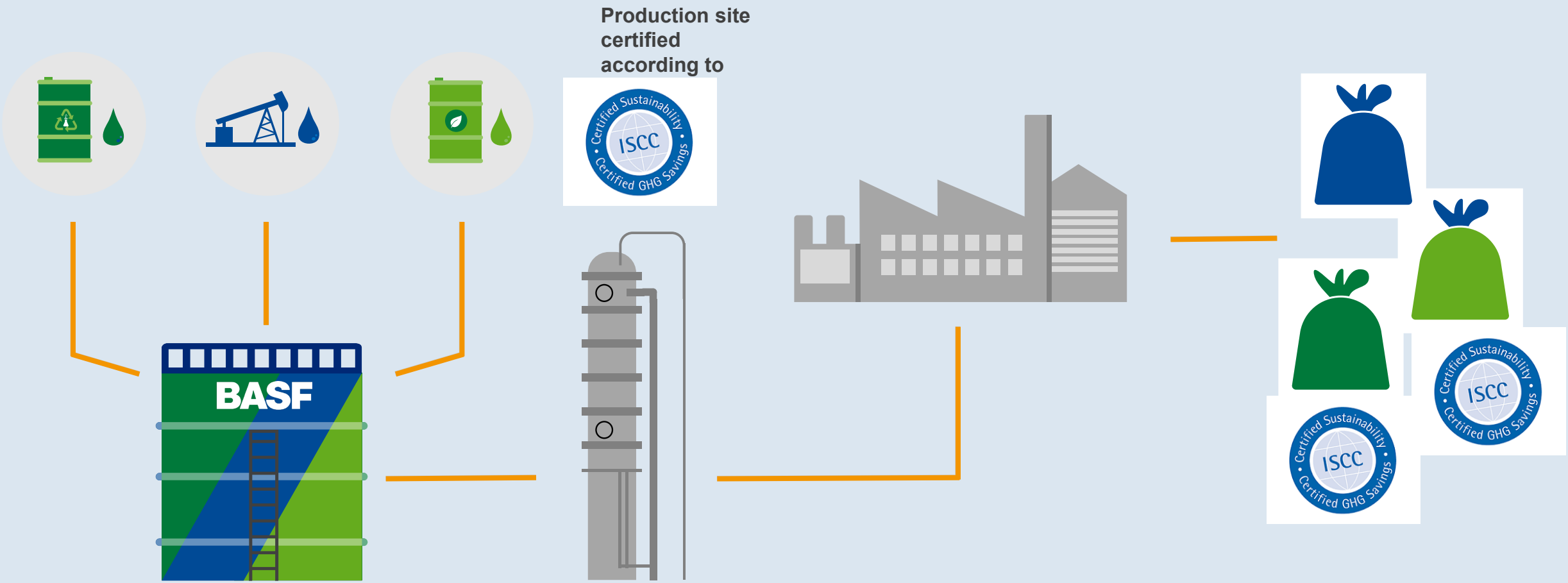
Upstream: Combination of Fossil & Non-Fossil Feedstocks
Finished Product: Mass balanced BMB product



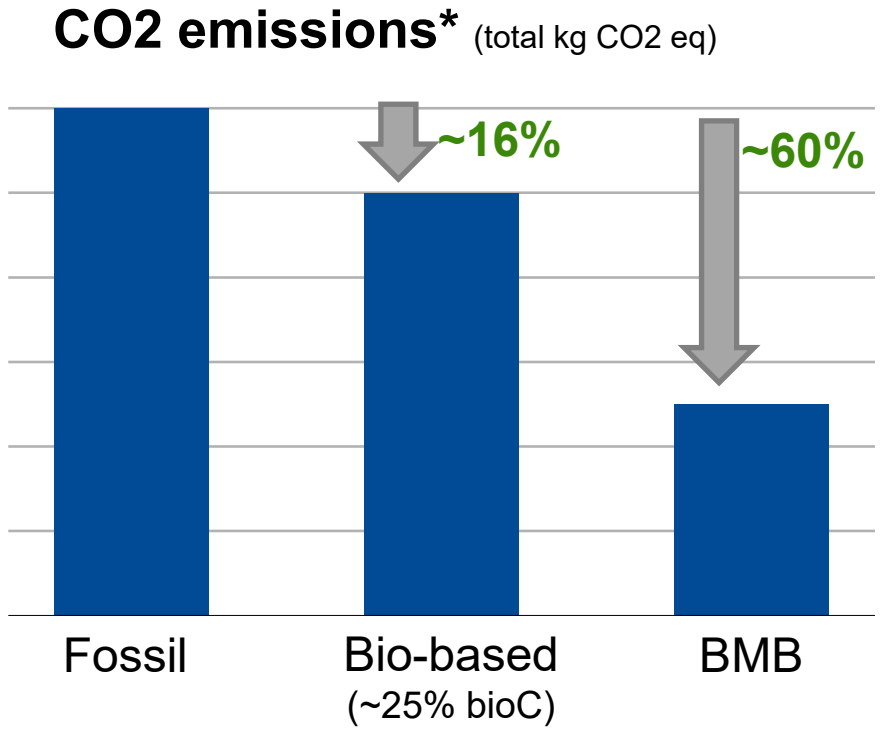
*connection can be plants, between plants and sites via pipelines, trucks, trains, etc.

Bio-Mass Balance PU system helps reduce CO2 Emission Significantly, without any change on product performance

Developing
Digital application to calculate greenhouse gas emissions

Compilation and evaluation of the inputs, outputs and the potential environmental impacts of a product system throughout its life cycle. The calculation is based on ISO 14040.

Cradle-to-gate Product Carbon Footprints for BASF's portfolio based on process emissions, energy demand and upstream emissions readily available



Product Carbon Footprints create transparency for our customers (SCOTT)

20,000
Raw materials
Scope 3

10 TWh/a
Energy
Scope 2

700
Production plants
Scope 1

CO_2

Product Carbon Footprints of

~45,000
Sales Products

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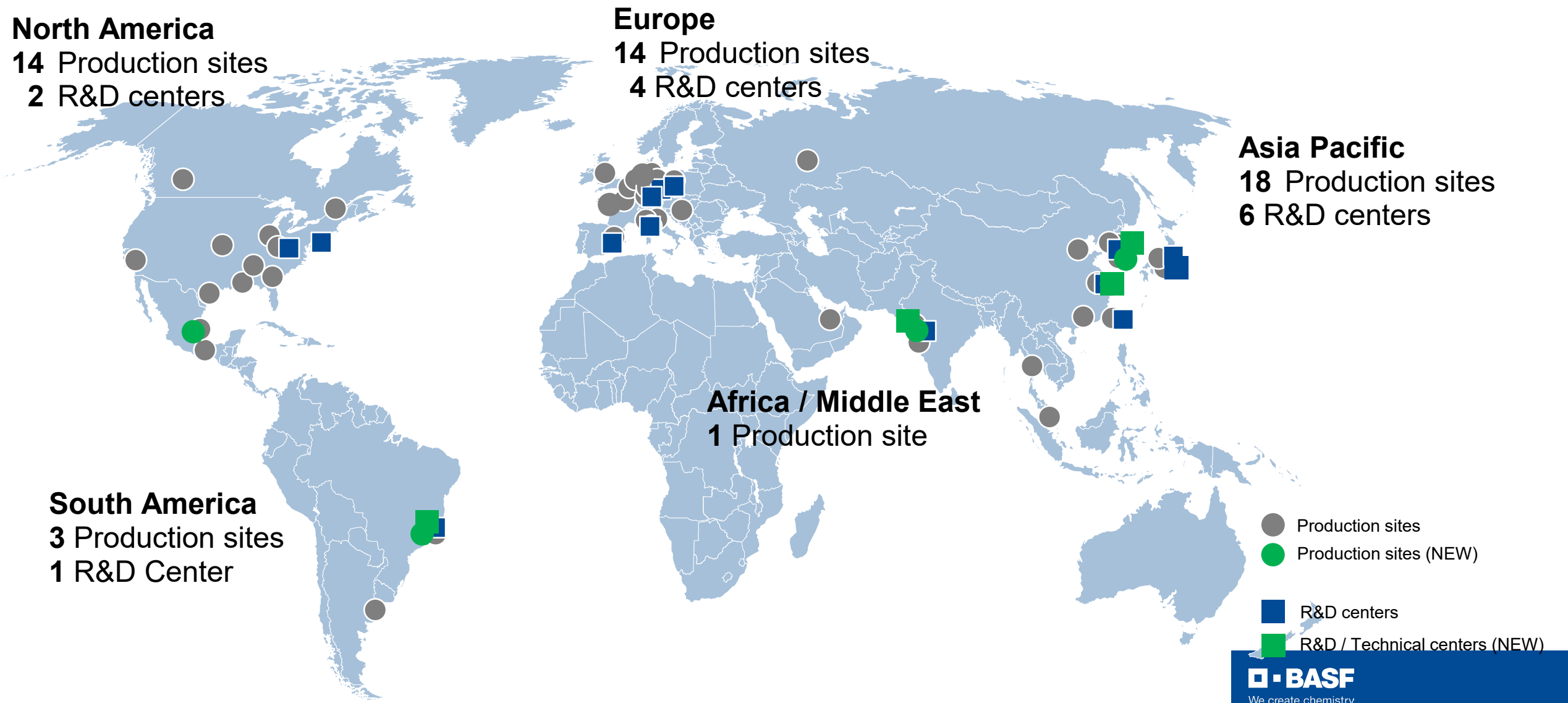
Performance Materials Footwear ‘Footprint’

BASF Performance Material's global production and R&D network

We offer a global network for local production and R&D



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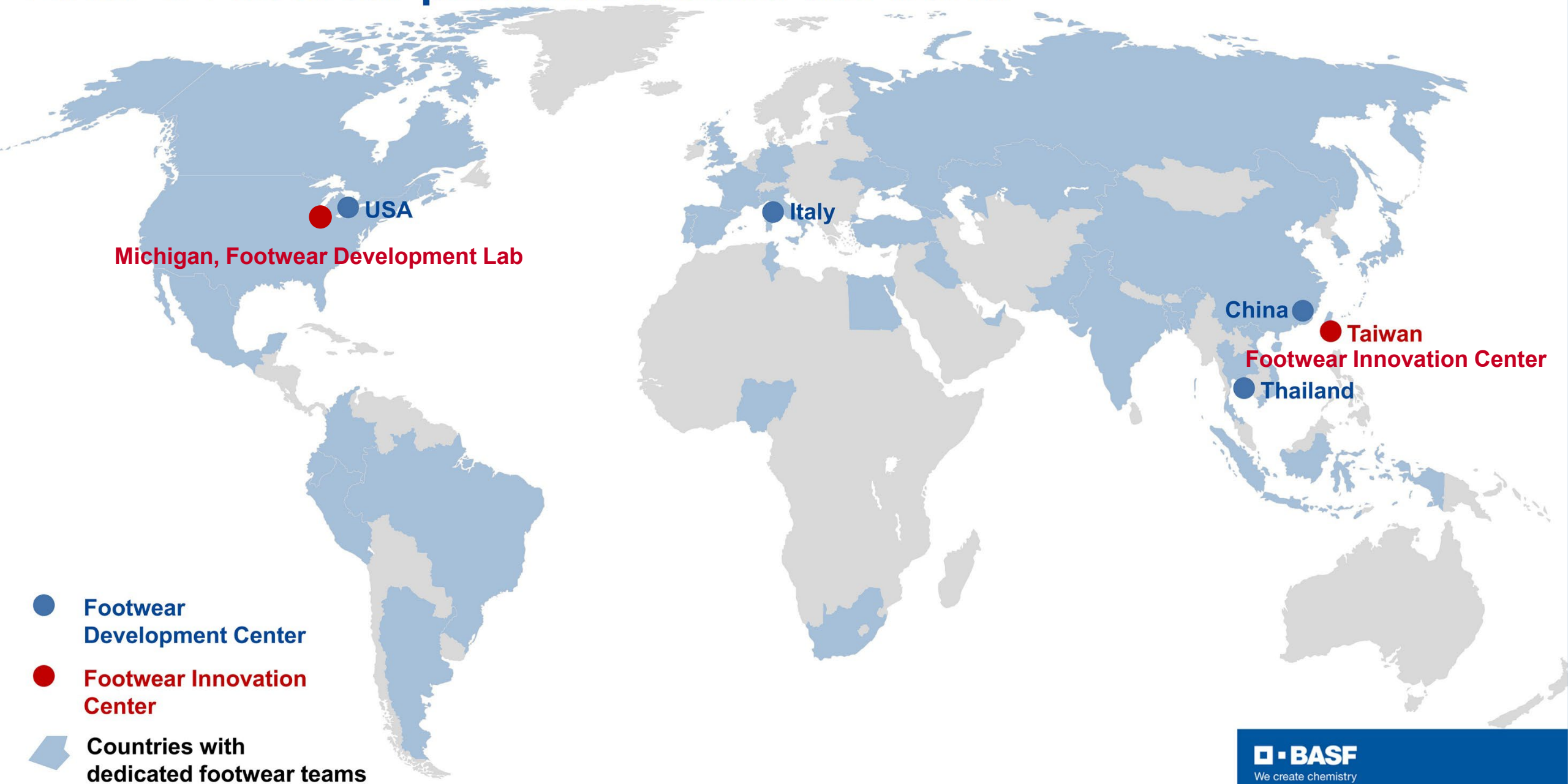
BASF's Footwear presence around the world



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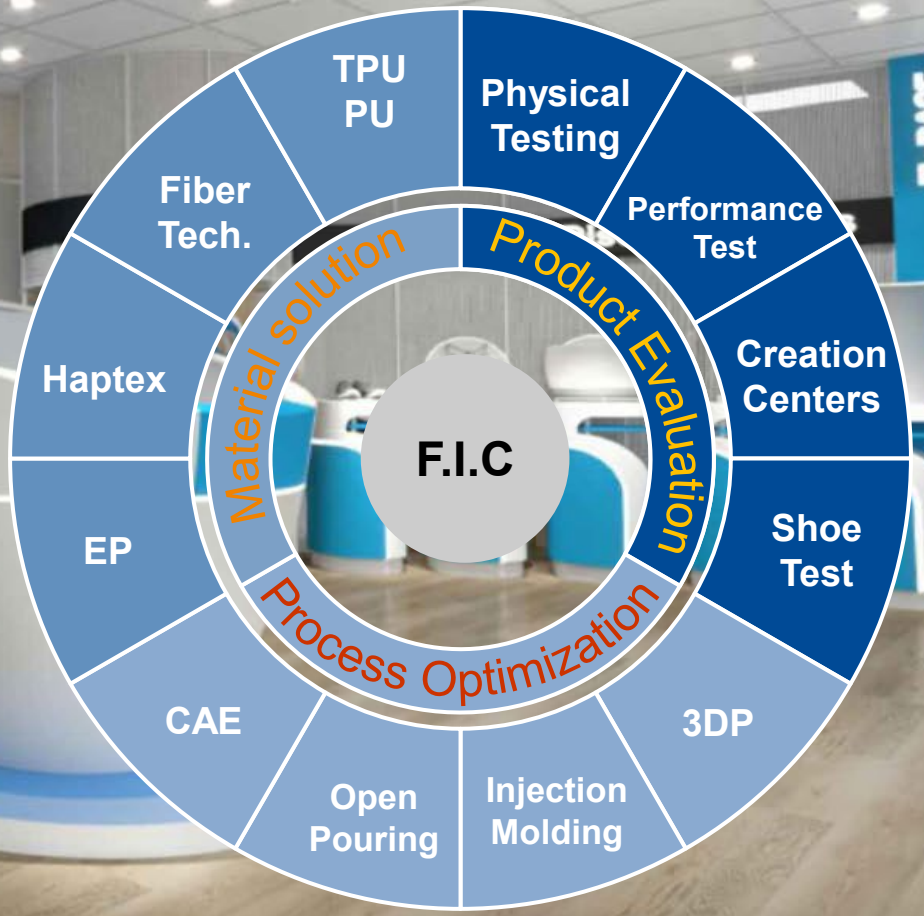
Footwear Innovation Center: A Cross Function Solution platform, Taiwan

- Rapid prototyping and shoe physical testing
- Shoe performance testing
- Process & machinery innovation and optimization
- Seminar, workshop, inspiration platform
- Design and material footwear library
- And more…



Performance Materials
Wyandotte, MI Footwear Development Lab

Latest technologies and innovative solutions accelerate go-to-market process for customers

BASF connects designers and brand owners to material innovation and production

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Footwear Sustainability Customer Applications

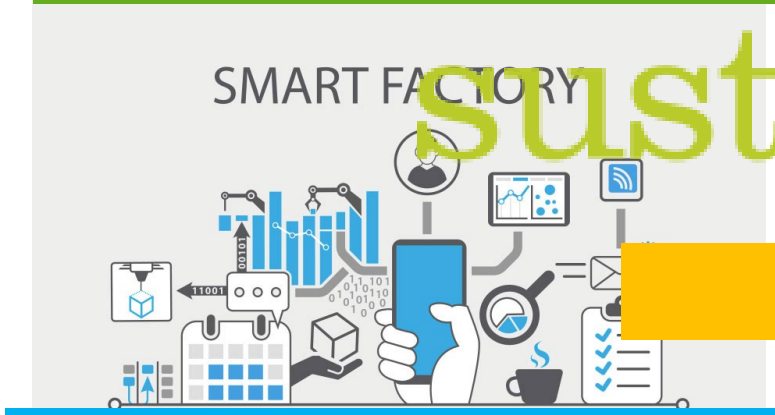
What are the Footwear Trends?

Light, Lighter, Lightest

Green Friendly

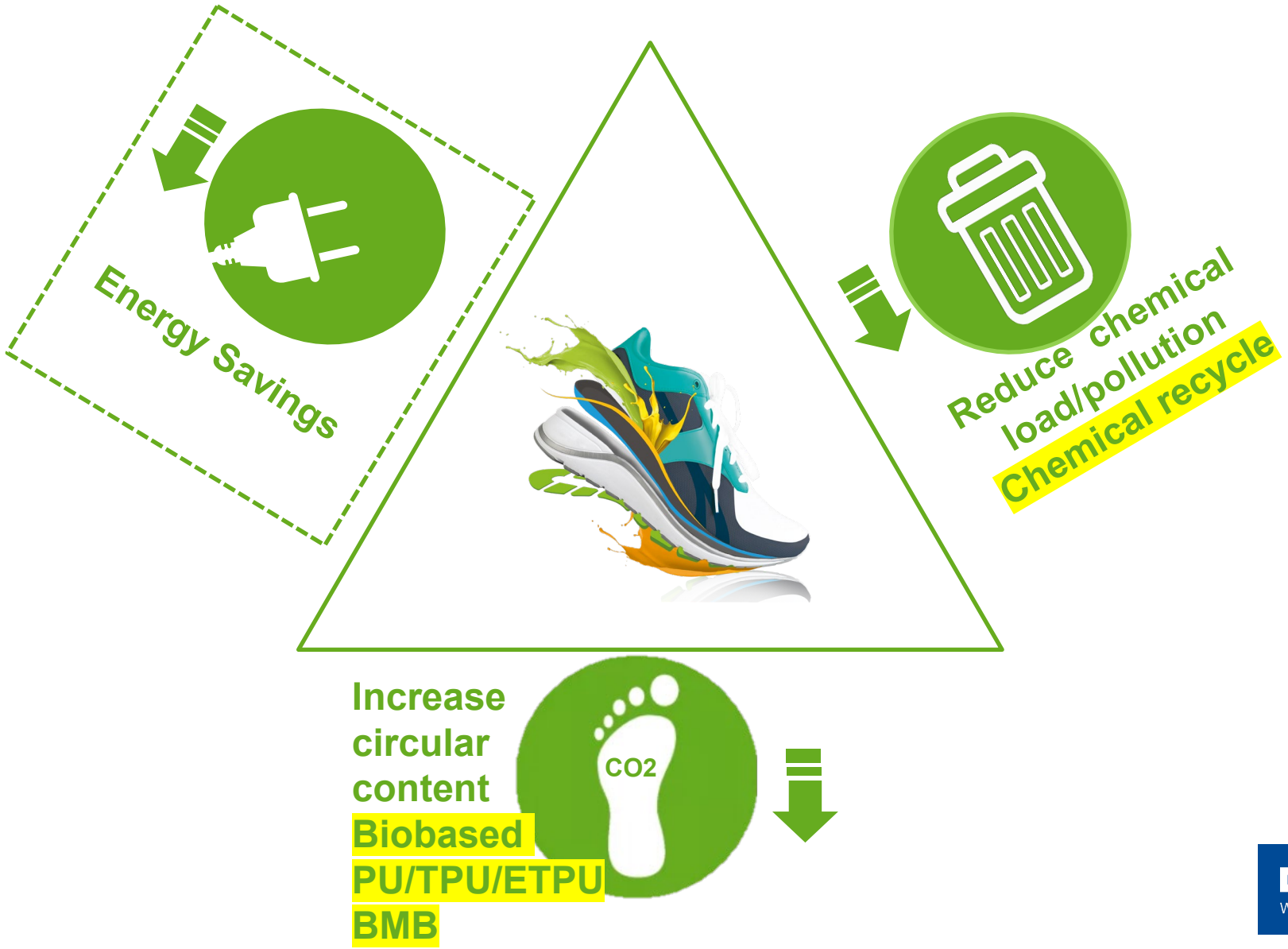
sustainability

Sustainability



Process optimization

We aim to make sustainable footwear achievable



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Insole/Midsole Sustainable Solutions

PU Solutions

- ❑ **LWHR(Light-Weight/High Rebound) PU**

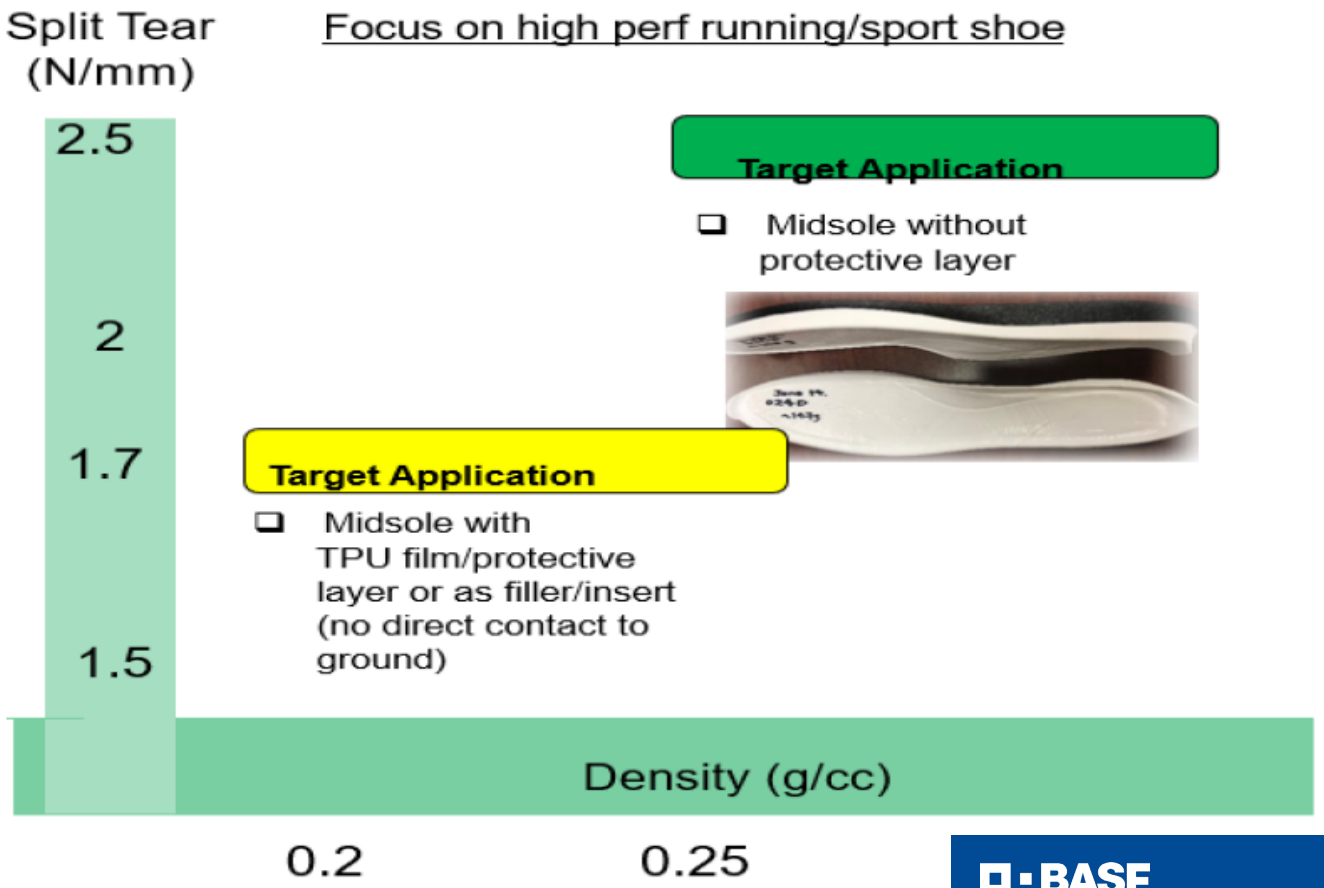
TPU Solutions

- ❑ **SCF Direct Injection Foaming**
- ❑ **Infinergy® Revolution**

BASF Elastopan® LWHR (light-weight High Resilience) PU System

DIN	Unit	PU
Hardness	Asker C	40-46
Density (g/cm3)	g/cc	0.23-0.26
Tensile strength	Kg/cm2	>20
Elongation	%	>300
Tear Strength	Kg/cm	>7
Split Tear Strength	Kg/cm	>1.7
Compression Set	%	<20
Vertical Rebound	%	>55

- ✚ Underfoot Comfort
- ✚ Light Weight
- ✚ Sustainability: Bio-based or BMB version available to reduce CO2e



Casual Footwear Insole Solution

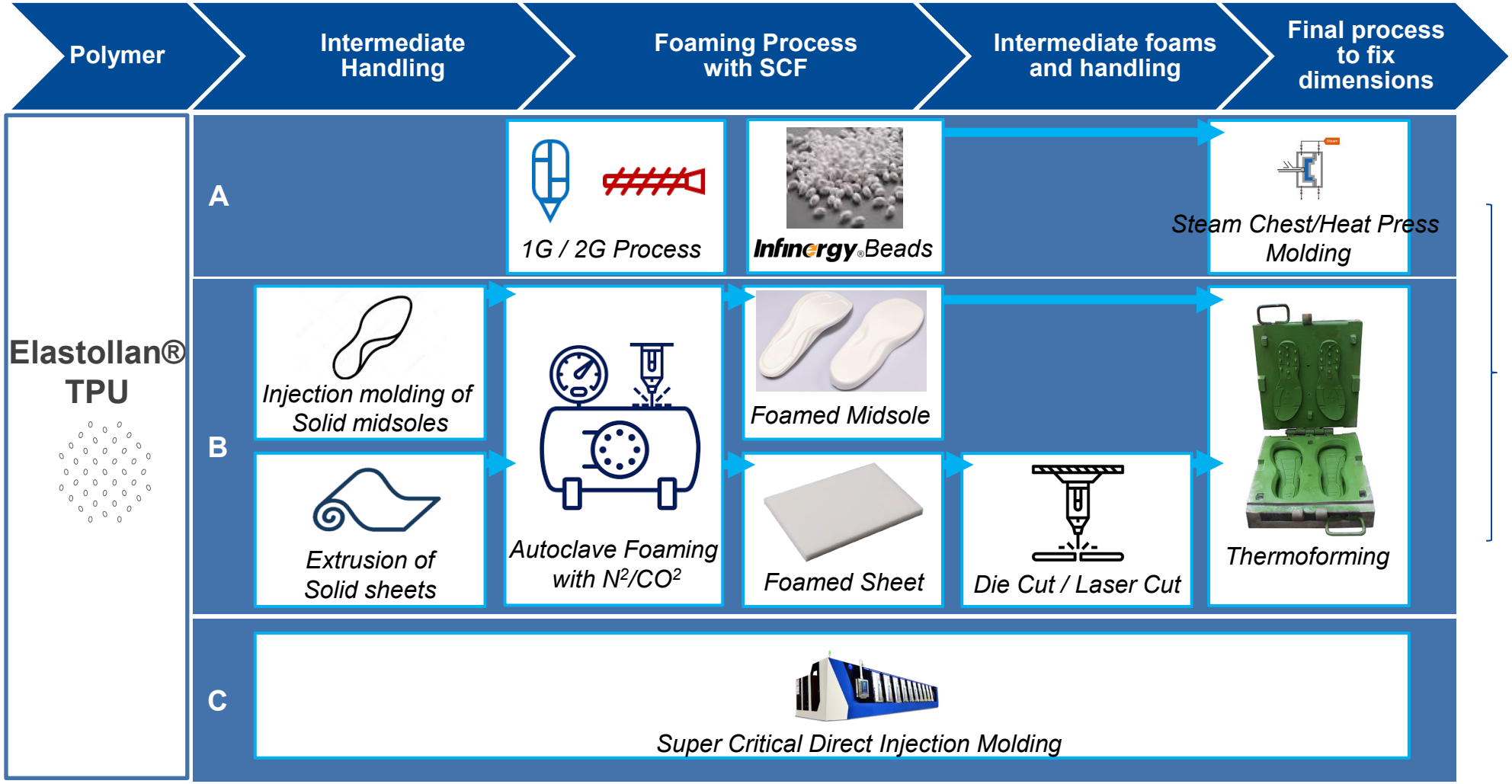
Elastopan® Polyurethane (PU) CS7579/168

Key Benefits:

- Low carbon insole/sock liner material: Bio-based PU (30%)
- Lighter weight :0.25g/cc (25% lighter vs standard PU with density at 0.33g/cc)
- High resilience performance > 50% to improve comfort

Reference: VANS Sustainability webpage

Elastollan® TPU Foam – Current Technologies



Elastollan® Portfolio for SCF Direct Injection Foaming

	Grade Name	Features	Status	Price Indication
Polyether TPU	**ELASTOLLAN SP 9552**	Hardness: 40 – 50 Asker C Density: 0.2 – 0.25 g/cm^3 Rebound: > 50 %	Commercialized	Medium
	ELASTOLLAN EXP SP 9595 (lower density, higher rebound)	Hardness: 40 – 50 Asker C Density: 0.16 – 0.2 g/cm^3 Rebound: > 60 %	Development (Commercialization in 2023)	Medium-High
	ELASTOLLAN SPN 9552 (bio-based)	Bio-equivalent of SP 9552 Bio-content: ~ 60 %	Development (Commercialization in 2023)	High
Polyester TPU	**ELASTOLLAN EXP SP 9601** (low abrasion, lower price)	Hardness: 30 – 40 Asker C Density: < 0.25 g/cm^3 Rebound: ~ 50 % **Abrasion: < 800 mm^3**	Development (Commercialization in 2023)	Low
Aliphatic TPU	**TBD** (lowest density, highest rebound)	Hardness: 40 – 50 Asker C Density: < 0.16 g/m^3 Rebound: > 70 %	Development (Commercialization in 2024)	High

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Footwear Midsole Solutions

Elastollan® Thermoplastic Polyurethane (TPU) SP9552

Key Benefits:

- Super Critical Fluid Foaming (SCF) TPU midsole with lighter weight, high resilience and improved comfort.
- Enable automation: One-step injection with insert upper and outsole to simplify manufacturing processes.

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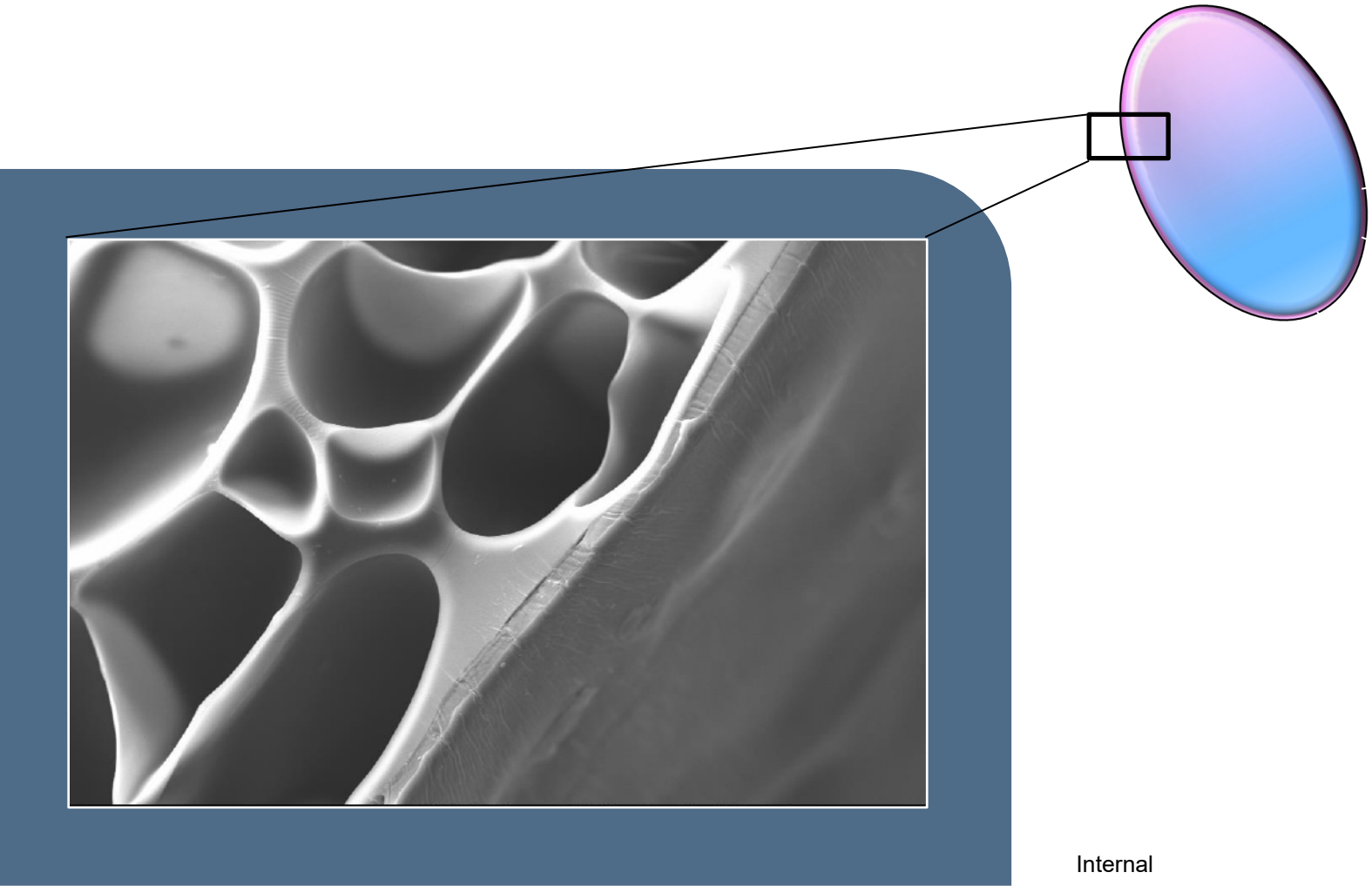
Reference: SALOMON Sustainability webpage

UNIQUE IDENTITIES INFINERGY® REVOLUTION

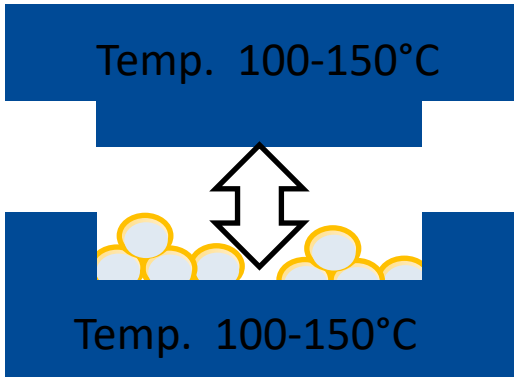
SURFACE TUNING – BOOSTED PROCESSIBILITY

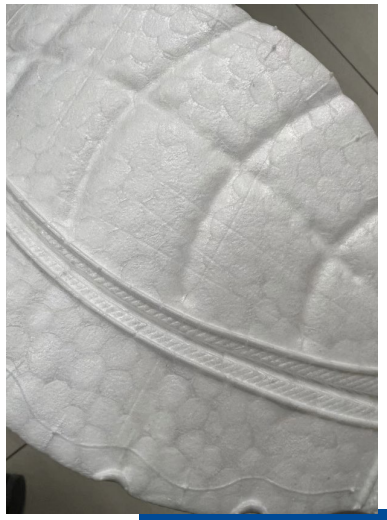


- BOOSTED PROCESSIBILITY
- REDUCED CYCLETIMES
- TUNED MECHANICS
- MORE STEADY QUALITY
- ADJUSTABLE OPTICS
- COMPATIBILITY WITH DIFFERENT BEADS

Infinergy® Revolution
Surface Tuning – Boosted Processibility

Only Temperature is needed for the bonding of the beads!

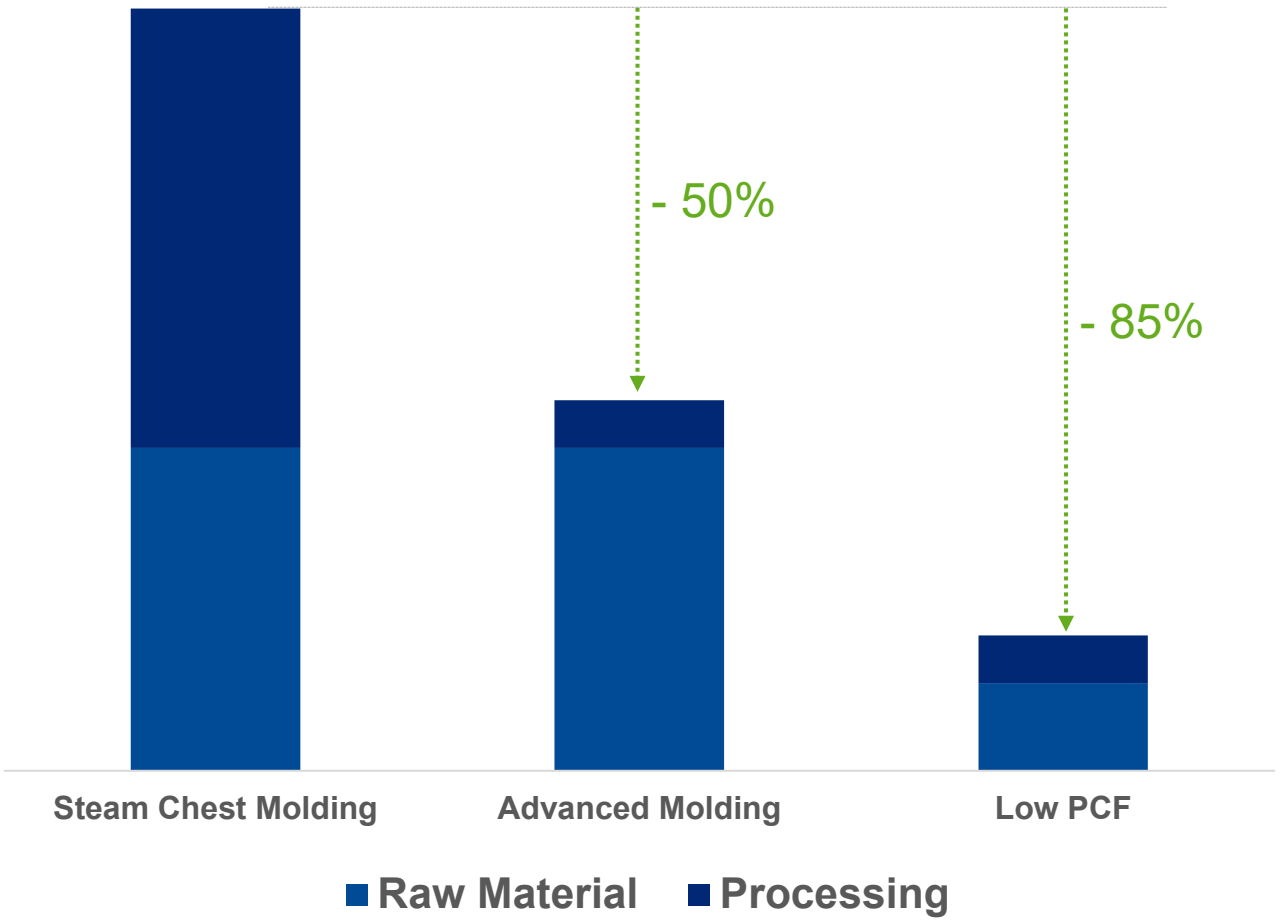




- SIMPLIFIED PROCESS (HEAT PRESS MOLDING)
- EASIER REALIZATION OF COMPLEX GEOMETRY
- EASY EMBOSSING

Product Carbon Footprint of Molded Part

First Evaluation (CN)



- Processing is responsible for ~60% CO_2 emission in conventional steam chest molded Infinergy® part
- Steam-free heat compression molding could lower processing emission
- Low PCF Infinergy part with BioMass Balance

Safety Footwear Midsole Solution

Infinergy® Expandable Thermoplastic Polyurethane

Key Benefits:

- High resilience performance > 70% to improve comfort
- Low PCF **Infinergy** part with BioMass Balance
- Durability (longer product life)
- Improved bio-mechanics

Our philosophy Don't worry... be happy! reflects our Mission, which has always been our commitment to those who wear U-POWER: each shoe is a guarantee of true comfort and functionality under the sign of true Italian design.

Reference: U-Power webpage

Outsole Sustainable Solutions-Rubber O/S Replacement

PU Solutions

- ❑ CPU

TPU Solutions

- ❑ High Traction TPU

High Traction TPU For Rubber Outsole Replacement

DIN	Standard	SP9561 Plus
Hardness	ISO 7619	70 A
Abrasion Loss(mm3)	ISO 4649-A	20
Transparency (2mm)	-	90%

Test @ BASF		Rubber	SP9561 Plus
Abrasion loss (mm3)	RT	35	20

TPU for rubber replacement

Benefits vs rubber for outsole use

- ✚ Superior abrasion loss and melt strength.
- ✚ Design Freedom: Higher transparency than rubber.
- ✚ Simpler manufacturing processes than rubber.
- ✚ TPU outsole with better recyclability than rubber.

Elastopan® Prism

PIONEERING TRANSPARENCY

Illuminating 2K Polyurethane Soling Solutions

Transparent / Translucent
Elevate Aesthetics

Thinnest & Lightweight
Surpasses Traditional Rubber Soles

Durability & Slip Resistance
Comparable to Rubber

Sustainable
- Bio-based / Bio-Mass Balanced
- Minimized Energy Consumption

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Safety Footwear Outsole Solution

Elastollan® Thermoplastic Polyurethane (TPU)
SP9324

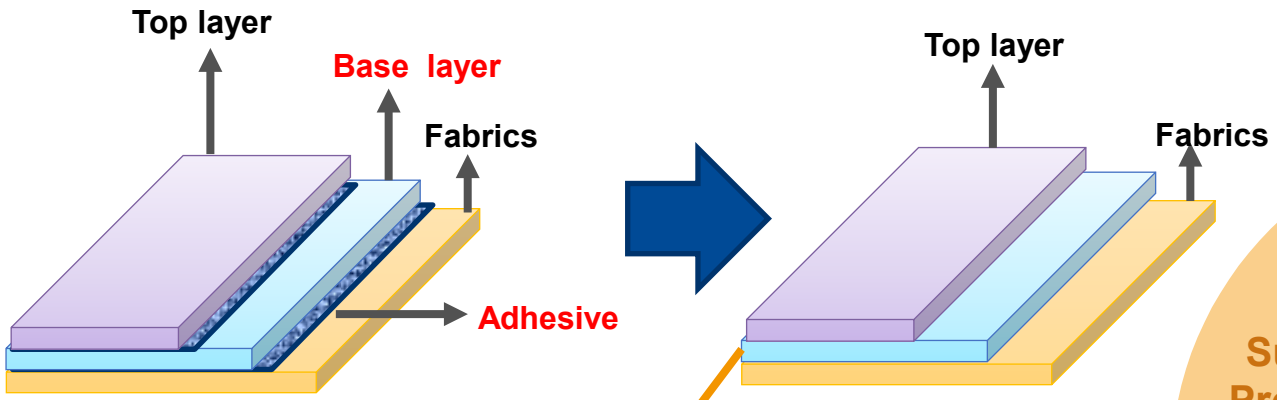
Key Benefits:

- Provides flexibility, durability, and high performance in extreme weather conditions
- Enhanced traction on wet and icy surfaces
- Improved abrasion resistance

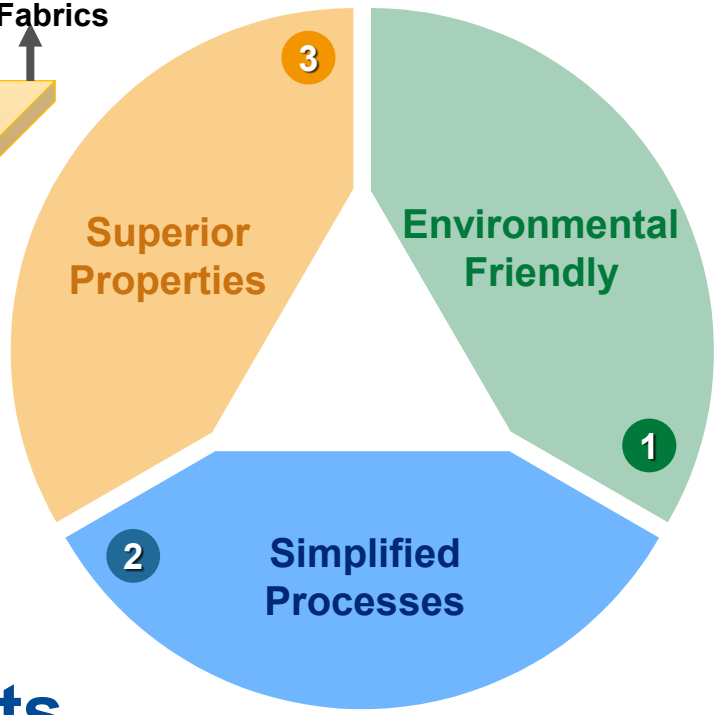
Reference: Timberland PRO Responsibility webpage

What is Haptex® ?

Haptex® is a polyurethane system for synthetic leather which does not use any organic solvent



$$HAPTEX® = Baselayer + adhesive + solvent\ free!$$



Upper/Vamp Sustainability Shoe Concepts

The Future

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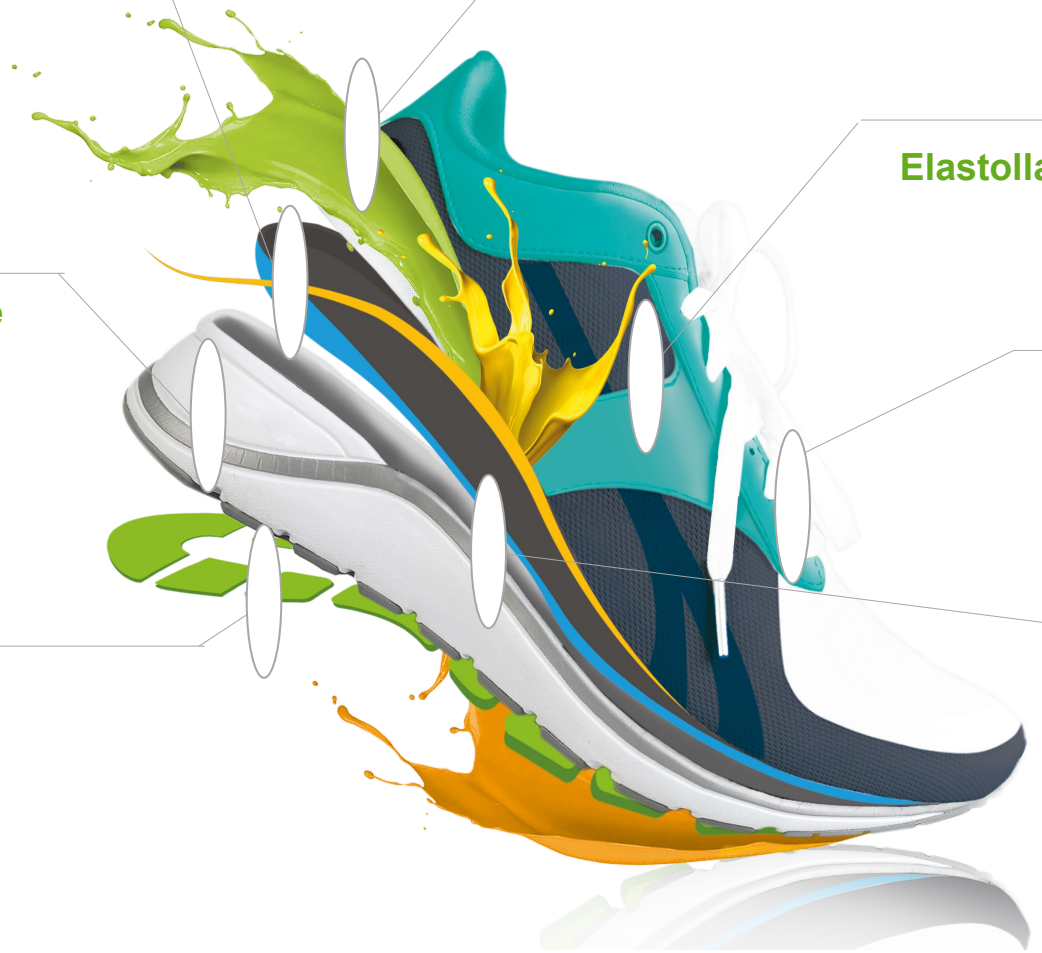
Elastollan® TPU Portfolio for Sustainable Footwear



Elastollan® foamed insole

Elastollan® Hotbond adhesive

Elastollan® decoration parts

Elastollan® foamed midsole
Elastollan® airbag

Freeflex™ TPU Fiber upper

Elastollan® outsole

Elastollan® shank

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100% TPU!

BASF ToTal Solution Shoe – BTTS Shoe

100% Recyclable!

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Questions

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Visit us at Booth
S-19033, SH-1

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