

**BASF**  
We create chemistry

# Performance Materials

## Polyurethane Systems

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07.11.2018

# BASF at a glance



Sales 2017: €64,475 million (12% growth)



Thereof Automotive Driven Sales:  
€11,400 million



EBIT 2017: €8,522 million



Expenditures for R&D: €1,888 million



Thereof ~ €210 million with direct  
automotive relevance



Number of research and  
development employees:  
10,110.

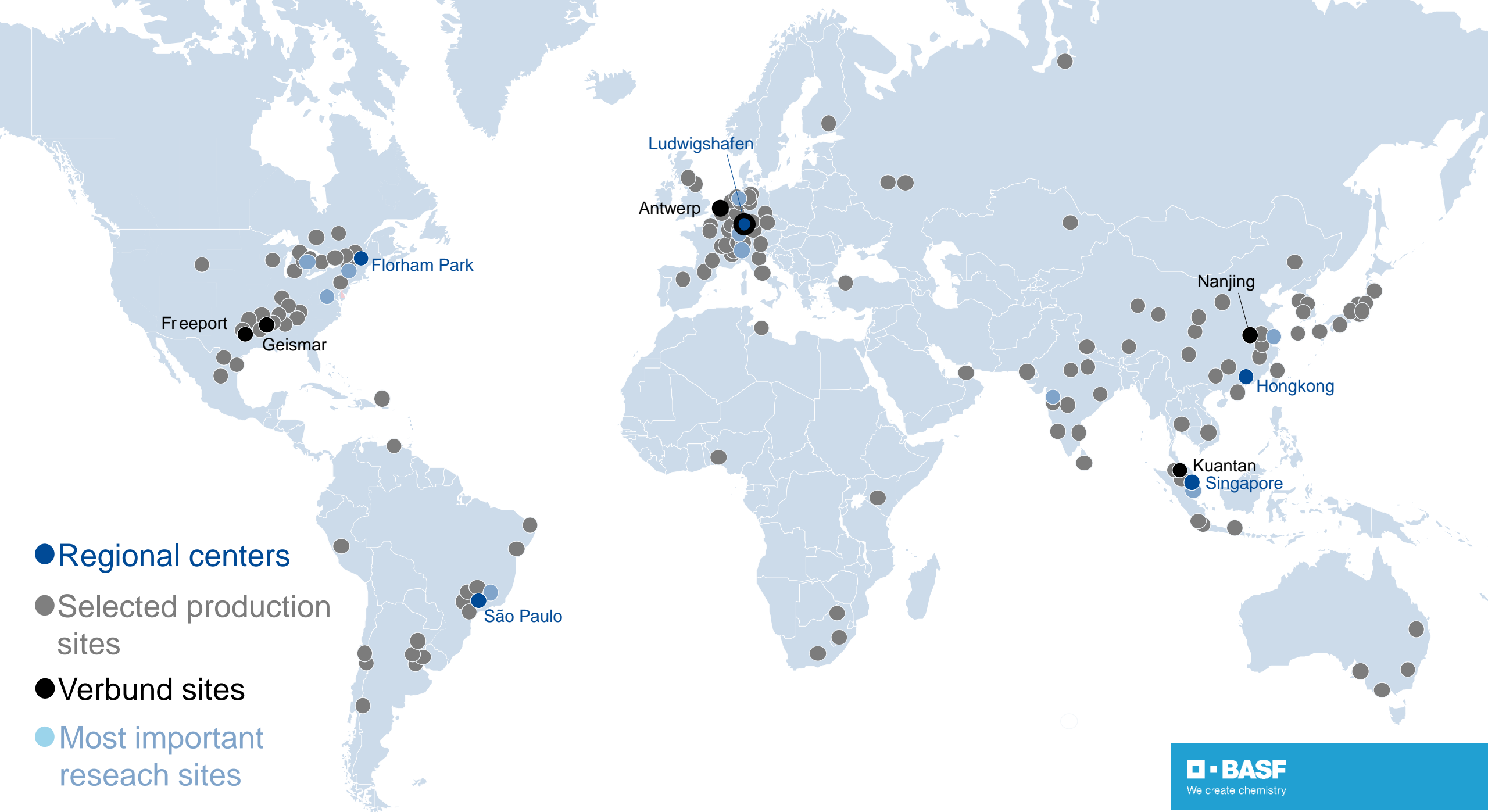


Over than 130,000 customers.

# Biggest Chemical Supplier for Automotive Industries.

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- Regional centers
- Selected production sites
- Verbund sites
- Most important research sites

# Brasil



Sales  
€2.1bn



Employees  
~3,833

# BASF diverse portfolio contributes to sustainable future



## Chemicals

- Petrochemicals
- Monomers
- Intermediates



## Performance Products

- Dispersions & Pigments
- Care Chemicals
- Nutrition & Health
- Performance Chemicals



## Functional Materials & Solutions

- Catalysts
- Construction Chemicals
- Coatings
- Performance Materials



## Agricultural Solutions

- Crop Protection



## Oil & Gas

- Oil & Gas

# BASF Automotive Solutions



## Interior

- Dispersions
- Engineering plastics
- Elastomers
- Foams
- Leather and textile chemicals
- Plastic additives
- Polyurethanes



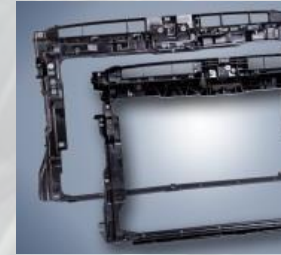
## Exterior

- Coatings
- Chemicals for coatings
- Engineering plastics
- Pigments
- Polyurethanes



## Powertrain

- Battery materials
- Brake fluids
- Catalysts
- Engine Coolants
- Engineering plastics
- Fuel additives
- Lubricants and oils
- Polyurethanes



## Chassis

- Composites
- Engineering plastics
- Metal treatment chemicals



## E&E

- Engineering plastics
- Elastomers
- Polyurethanes

# We are a leading partner for future mobility

## BASF Automotive Solutions



### Mobile Emissions

- Global market leader



### Automotive Coatings

- N° 2 in automotive OEM coatings
- Chemetall acquisition



### Cellasto®

- Global market leader in NVH solutions



### Performance Materials

- N° 1 in plastic solutions for lightweight



### Fuel and Lubricant Solutions

- N° 1 for coolants since 1929

We offer a broad portfolio to meet main automotive trends, working in synergy with our customers to develop more efficient vehicles, with technology, innovation, safety and quality.



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# Polyurethane Systems

## Automotive Application



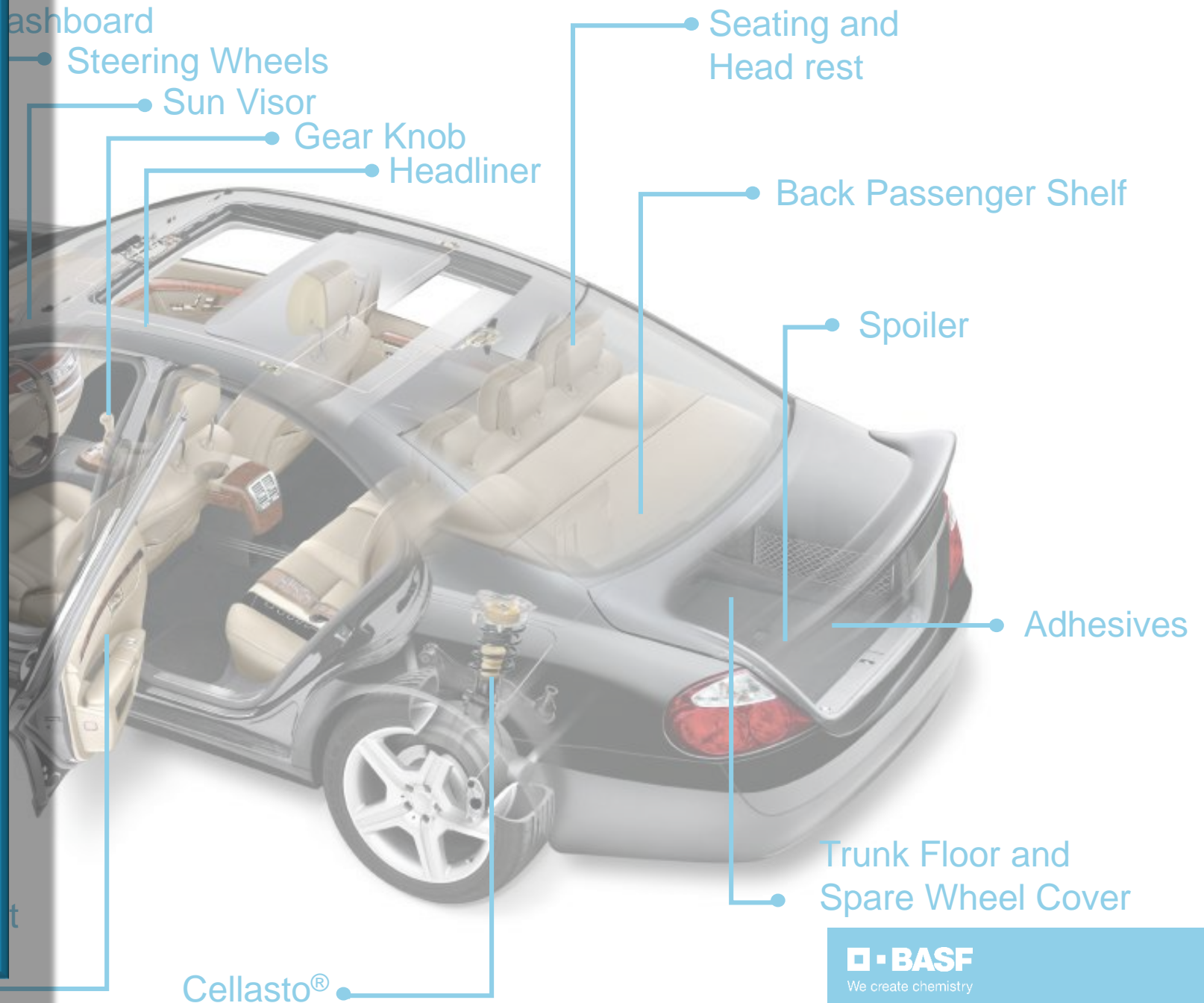
**Elastoflex<sup>®</sup>**

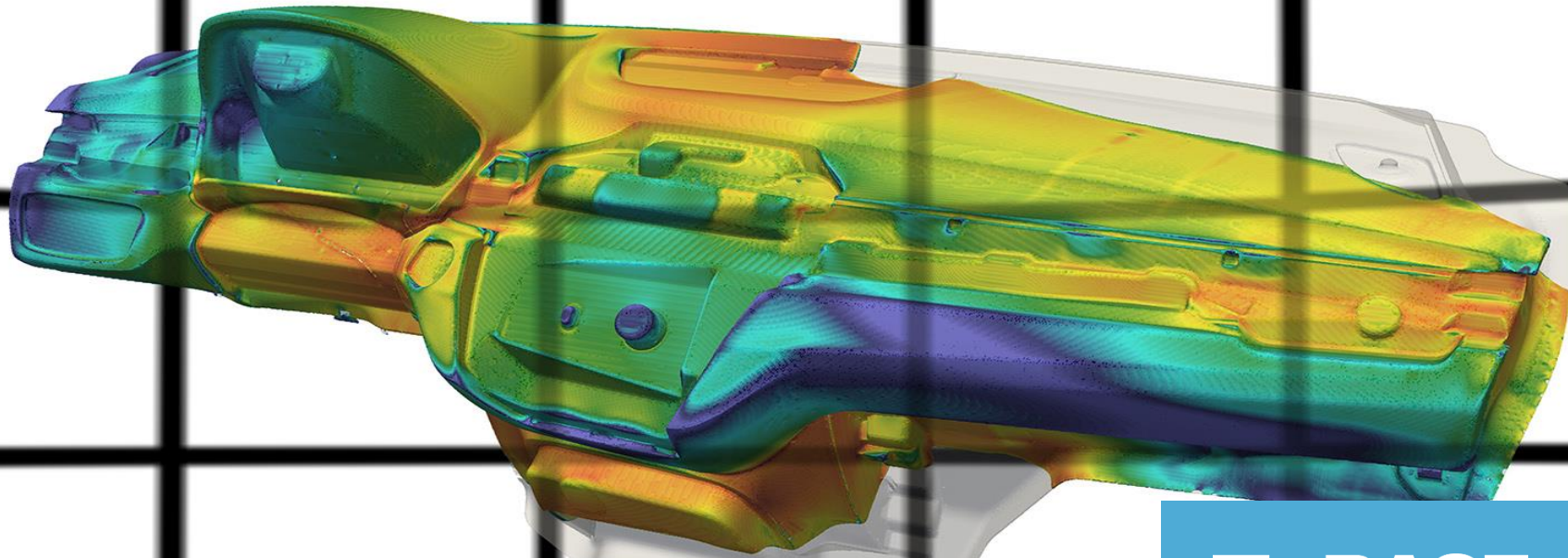
**Elastofoam<sup>®</sup>**

**Elastolit<sup>®</sup>**

**Elastonat<sup>®</sup>**

**Elastoskin<sup>®</sup>**





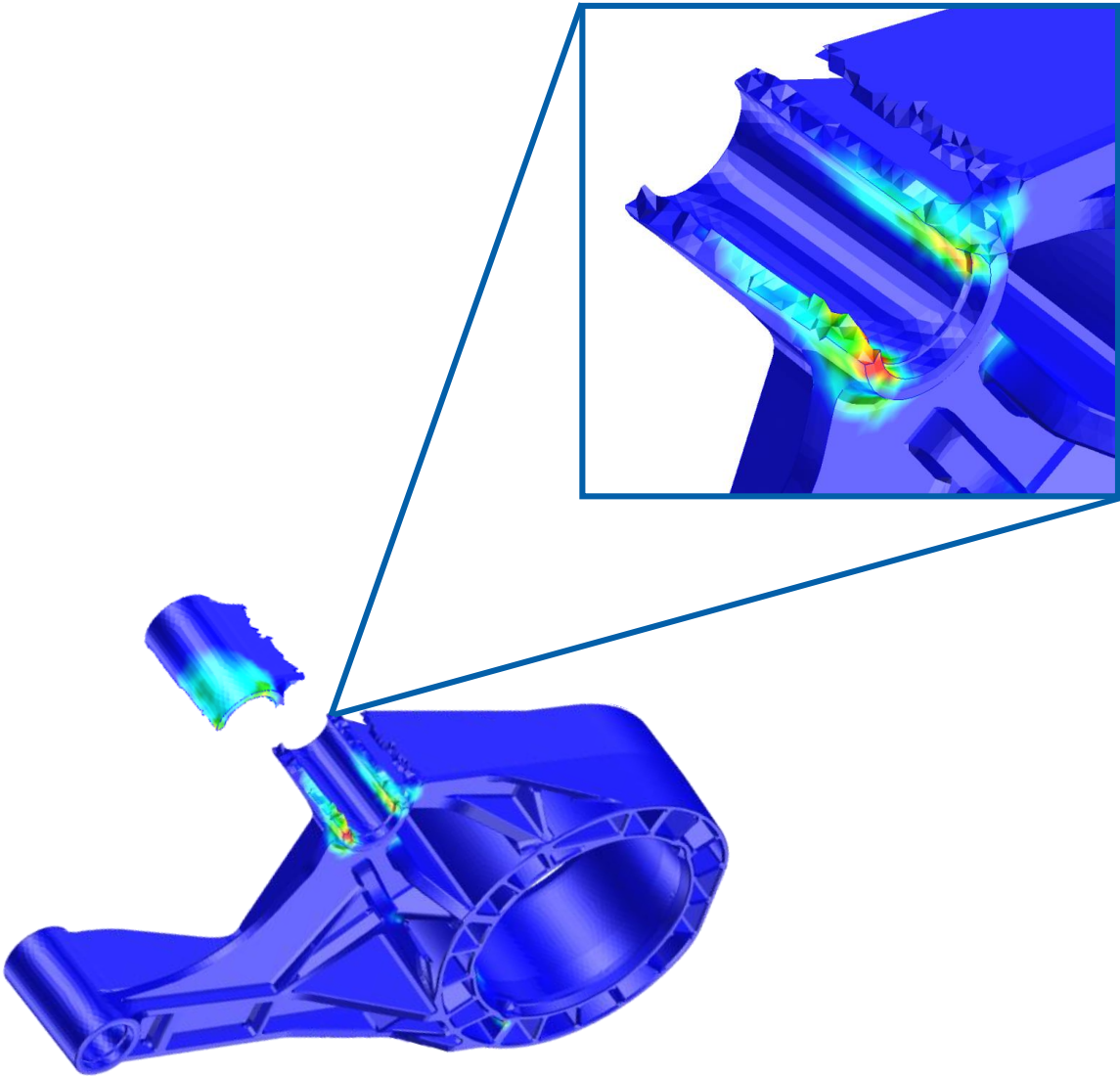
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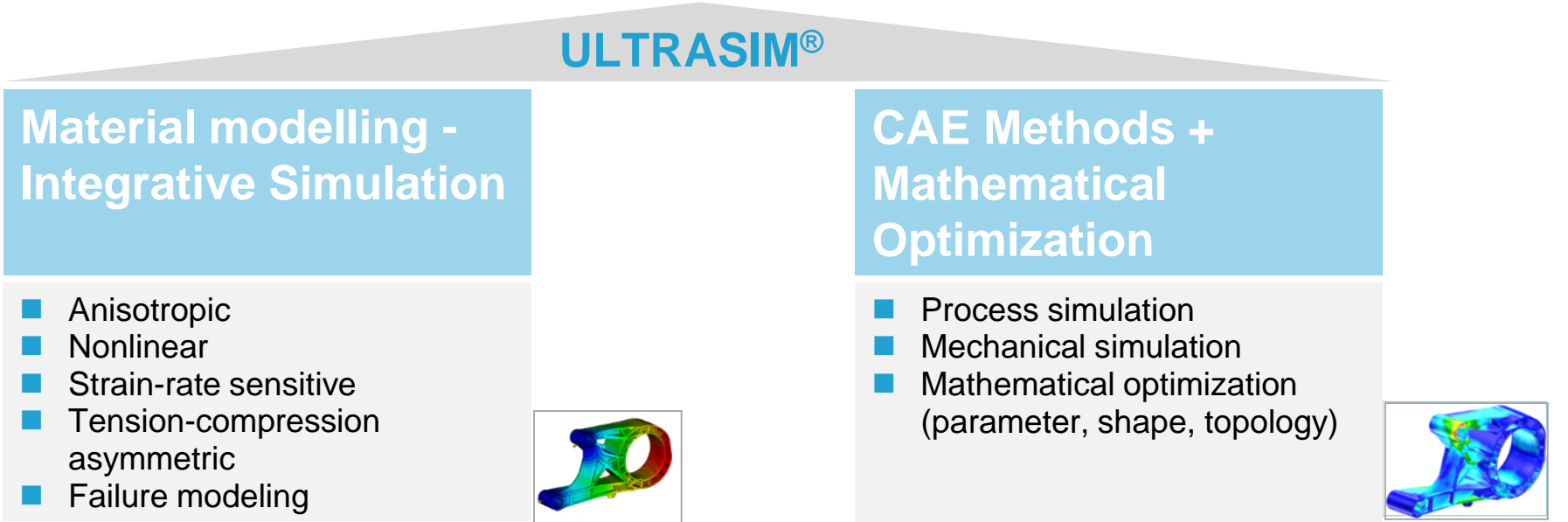
**Ultrasim<sup>®</sup>**

Foaming simulator for  
automotive interior



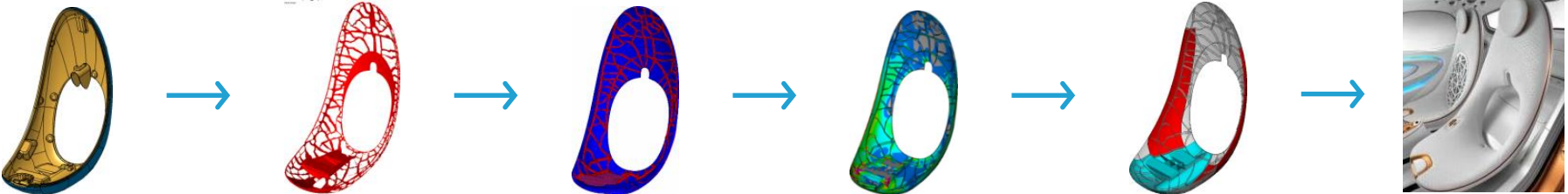


# CAE Tool Helps to Optimize the Design of Plastic Parts



Calculate the part right

Calculate the right part



# Front end carrier for Golf 7



## Need

- Lightweight
- Meet or exceed safety standards
- Optimize manufacturing time

## BASF Solution

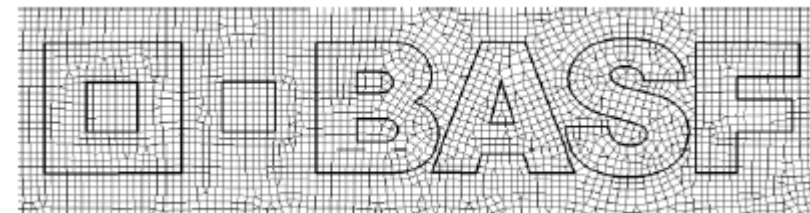
- Design and simulation expertise using Ultrasim®
- Polyamide chemistry and processing expertise

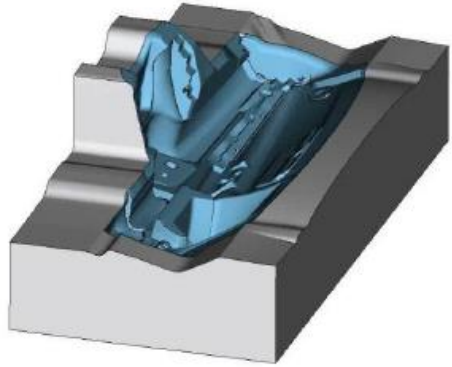
## The Results

- One of the world's 1<sup>st</sup> front end carriers made entirely of plastic
- Lightweight, safe
- Reduces assembly time



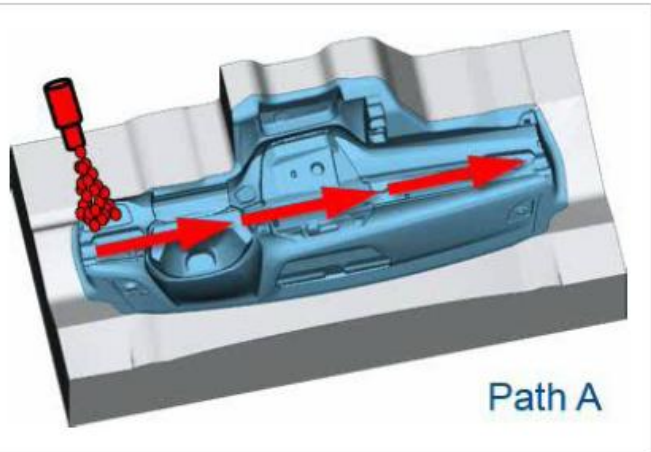
PU foaming simulation identifies critical aspects at an early stage of a project and therefore can increase production efficiency at our customers!





## Mold settings

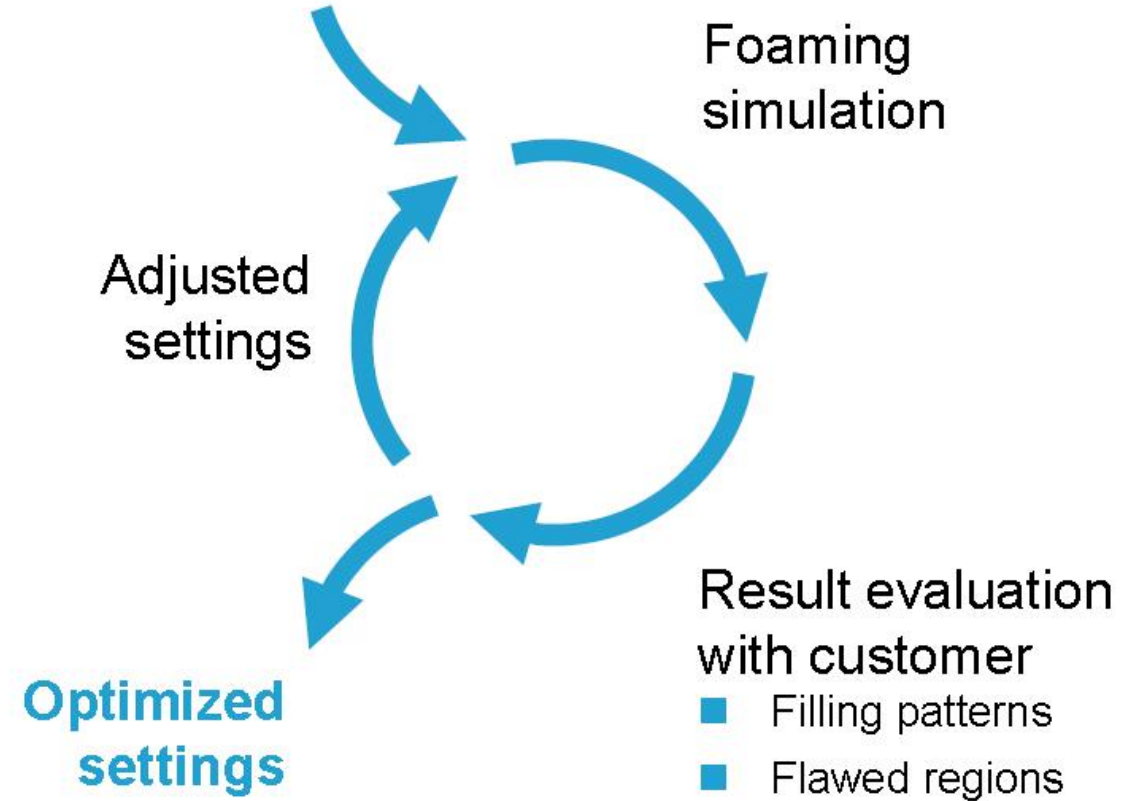
- Mold orientation
- Closing times
- Venting system
- Mold pivoting



## Injection settings

- Injection rate
- Injection time
- Nozzle path
- Nozzle orientation

## Initial process settings





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## Honeycomb

Composite based on PUR matrix.



# HONEYCOMB



Low density composite



High Mechanical Properties

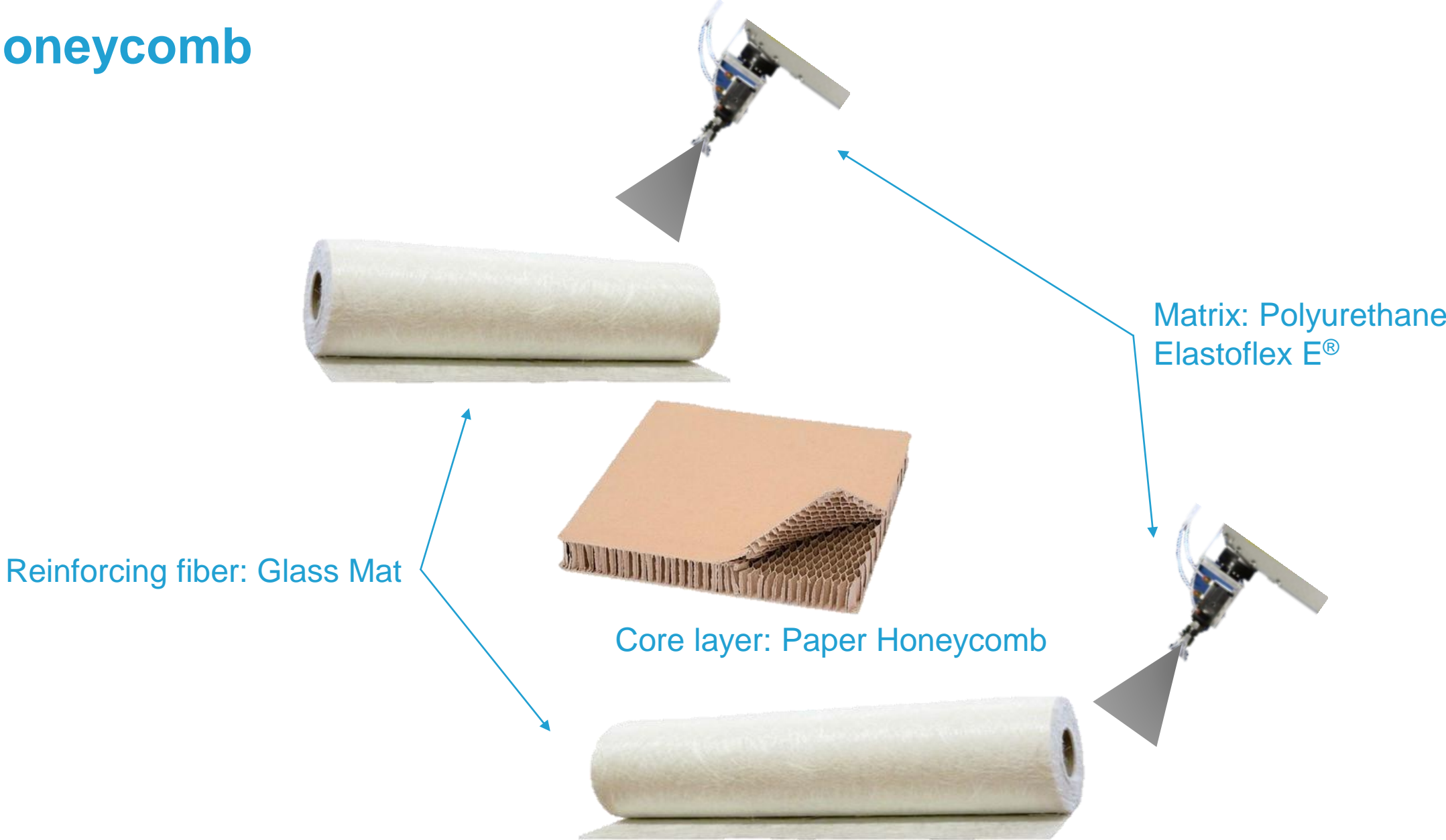


Low emission (VDA 278)

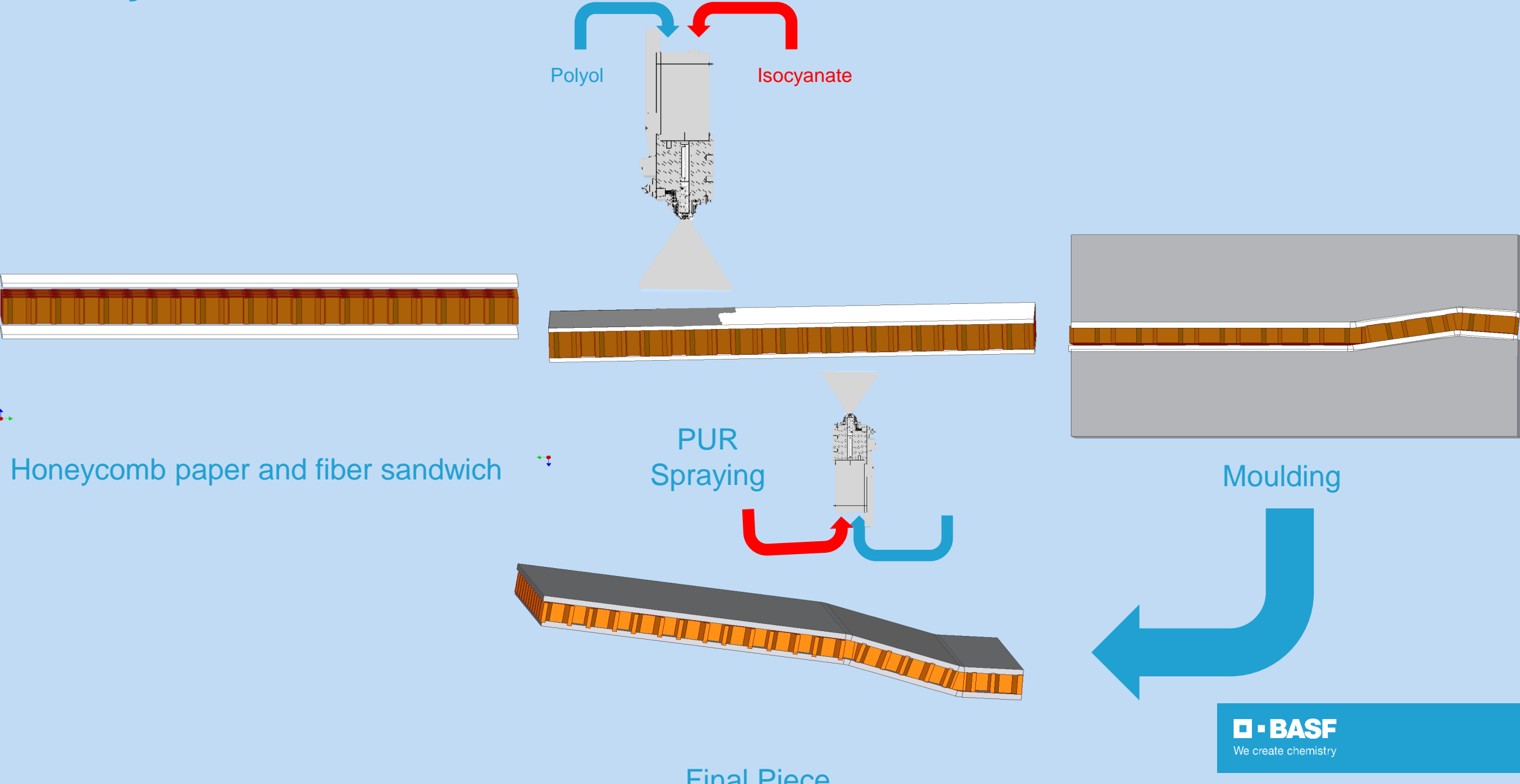


Sub-sequent adhesion

# Honeycomb



# Honeycomb



# Honeycomb



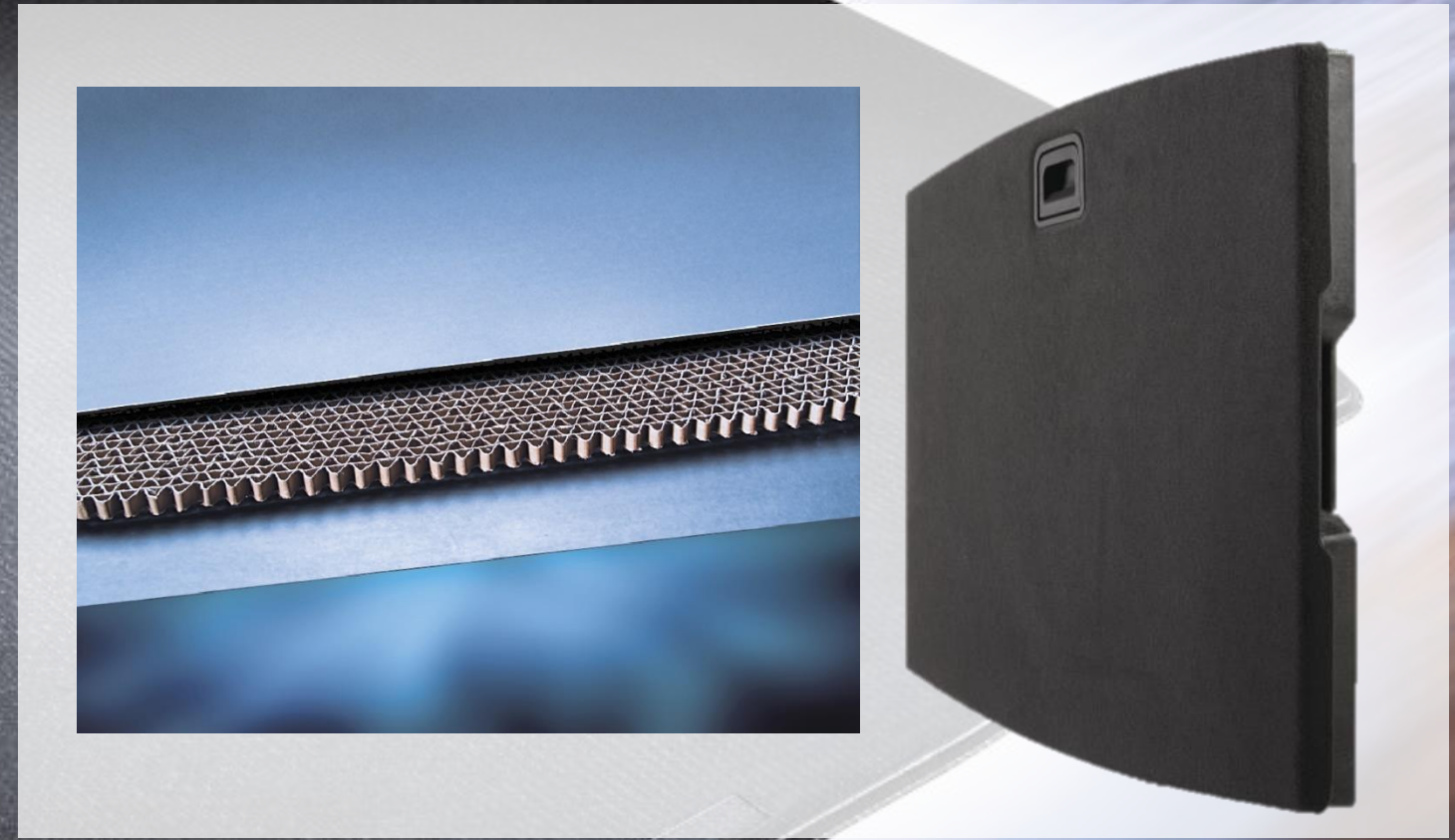
# Honeycomb

■ Core	A-wave 90 g/m <sup>2</sup>
■ Core thickness	10 mm
■ Reinforcing fibre	450 g/m <sup>2</sup> glass
■ Density [DIN EN ISO 845]	314 kg/m <sup>3</sup>
■ Modulus of flexure longitudinal [DIN EN 310]	2650.0 N/mm <sup>2</sup>
■ Impact strength longitudinal [DIN EN ISO 179-1/1fU]	27.90 kJ/m <sup>2</sup>
■ Modulus of flexure transversal [DIN EN 310]	2018.3 N/mm <sup>2</sup>
■ Impact strength transversal [DIN EN 179-1/1fU]	17.61 kJ/m <sup>2</sup>

The given properties are exemplarily measured from one part, the mechanical properties depends a lot on the used core layer, type of reinforcement fibre and fibre area weight.

# Honeycomb

## Features and Information



- Low density: 350kg/m<sup>3</sup>
- High productivity
- Anti dropping systems



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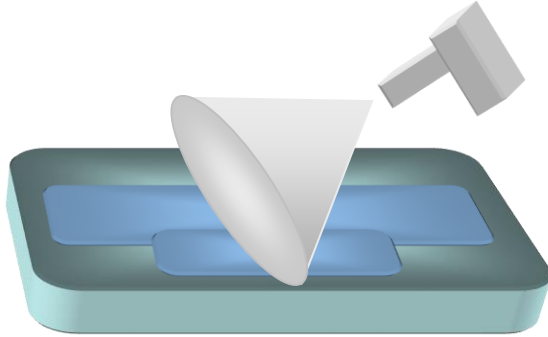
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**ELASTOSKIN®**

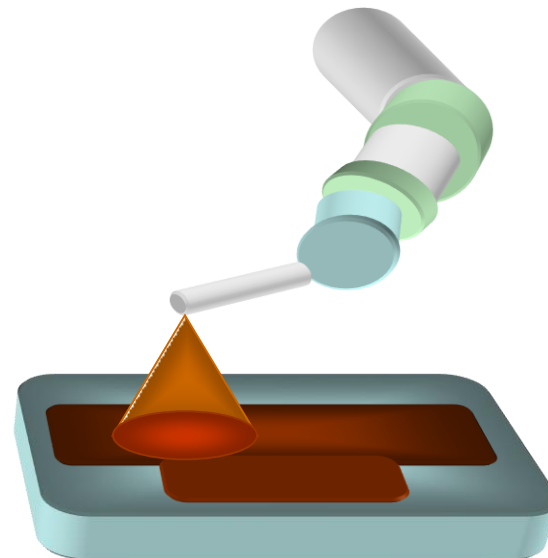
Soft polyurethane elastomer  
based on aromatic MDI

# Elastoskin®

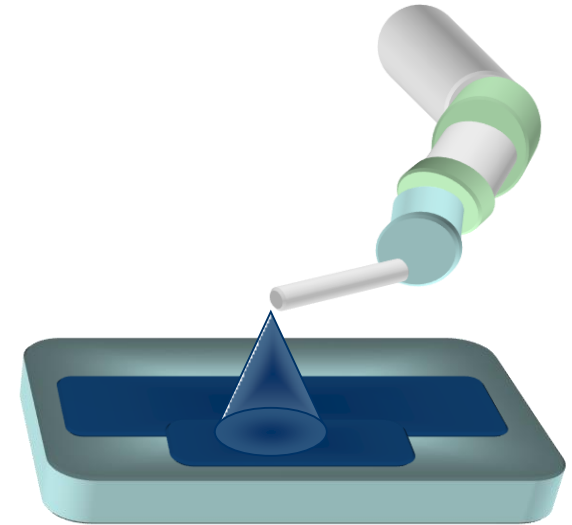
## Application



Release agent - 15 Seg.



IMC application - 60-75 sec.



Elastoskin application - 90-120 sec.



## Elastoskin® Two-Tone Seat Production Process



# Elastoskin®

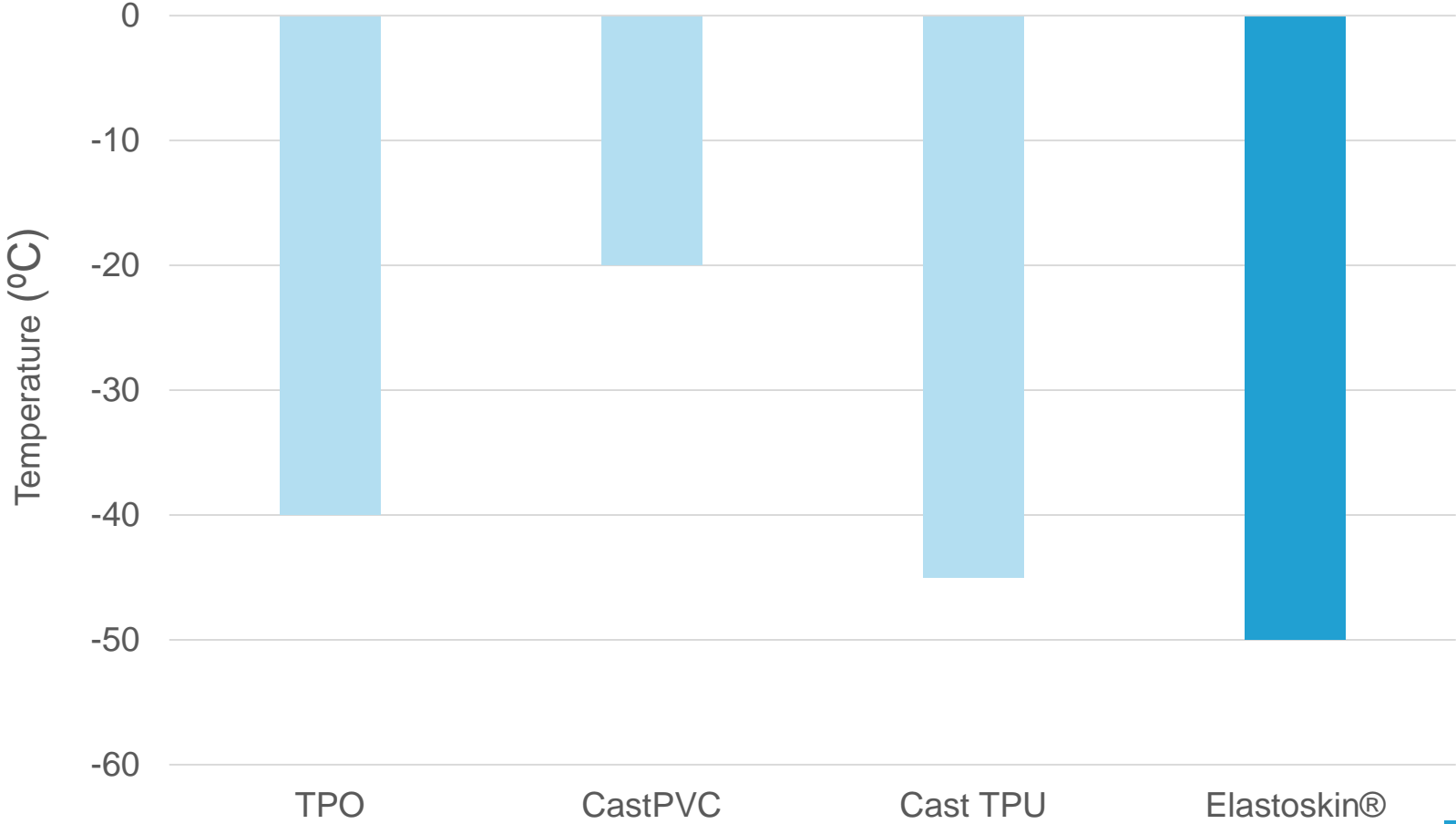
## Mechanical Properties

	Hardness Shore A	Tear strenght (kN/m)	Elongation (%)	Tensile Strenght (Mpa)
Elastoskin® Aromatic PUR	67	50	350	14
Cast PVC	77	40	250	13
Cast TPU	77	50	350	8
Vacuum Form TPO	75	25	330	10
Vacuum Form PVC/ABS	93	64	140	16
Aliphatic Spray PUR	80	25	120	6

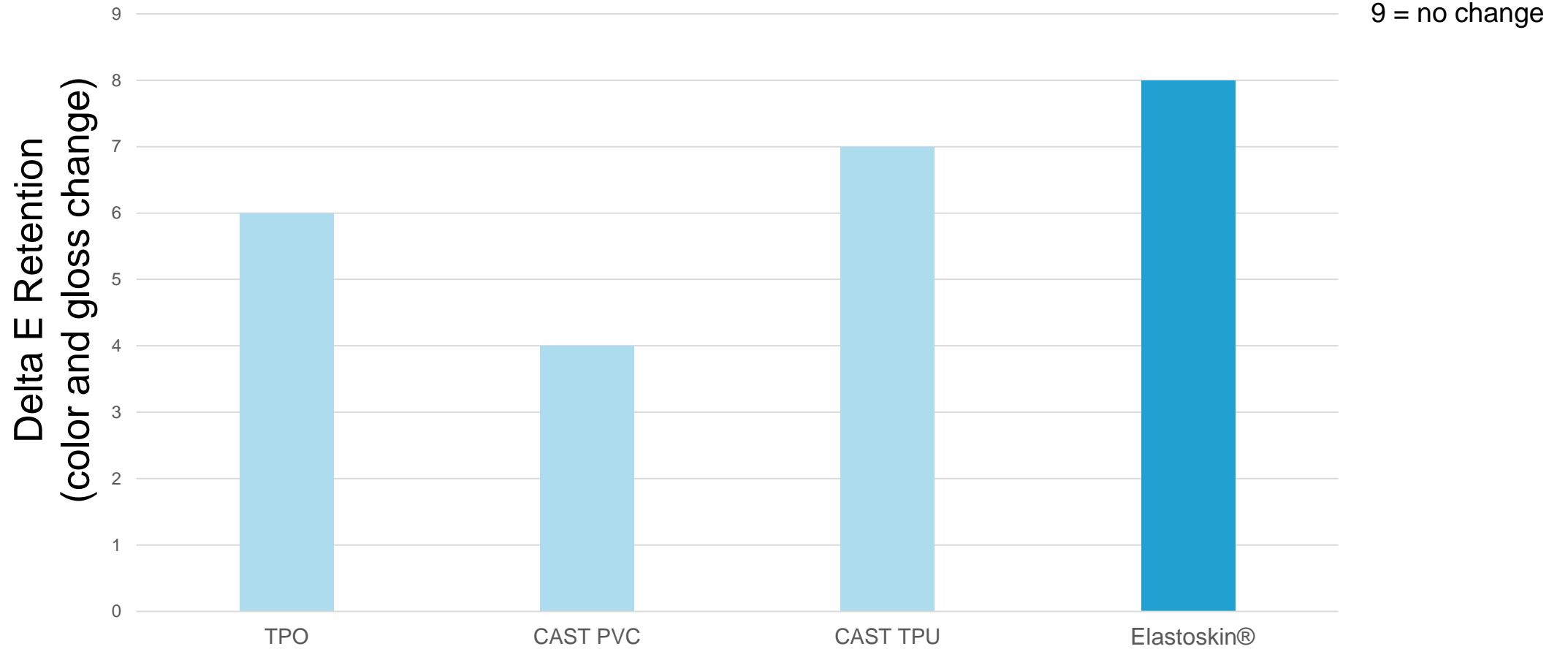
**Elastoskin®**

Temperature stability

## Glass Transition Temperature



### Arizona Sunlight Exposure - 200,000 Langleys (47,962KJ) @ 110°C



# Elastoskin®

## Technology comparison

	PVC/ABS Vacuum molded	PVC Rotomoulding	TPU aliphatic Rotomoulding	PUR aliphatic Spray	Elastoskin PUR
Cost	++	+	--	--	+
Texture Definition	-	+	++	++	++
Fogging	--	-	++	++	++
Colored Flexibility	--	--	--	+	++
Color and gloss maintenance	-	+	-	+	++
Abrasion Resistance	+	+	++	++	++
Soft Touch	--	-	+	+	++

# Elastoskin®

## Features and Information



- High quality texture.
- Low fogging.
- High abrasion and UV resistance.
- Large color and gloss range.



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## Headliner and Hoodliner

Semi rigid thermoformable  
acoustic foam

# HOODLINER AND HEADLINER



Low density foams (20 to 35kg/m<sup>3</sup>)



Acoustic Insulation



Thermoformable technology

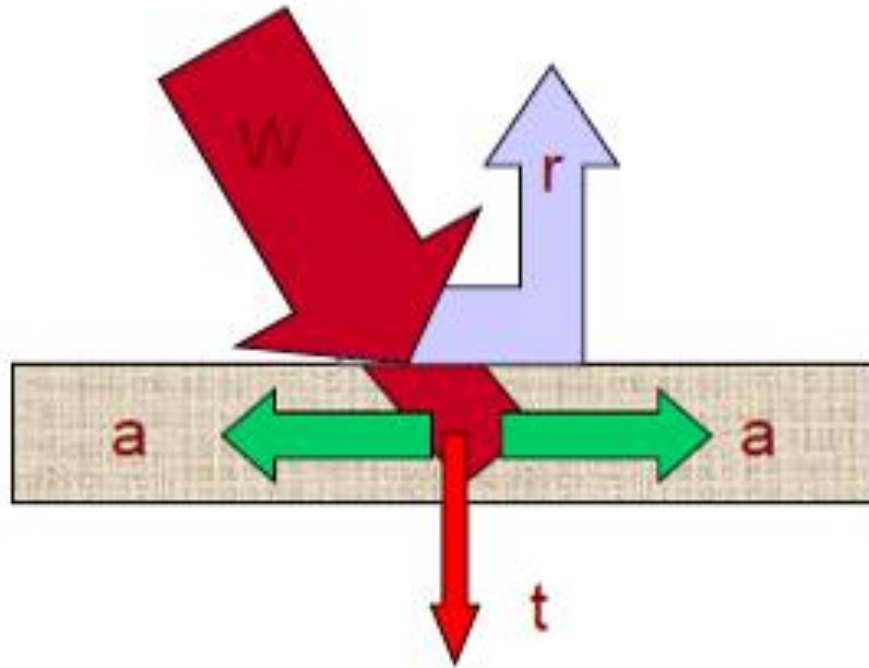


Low emission



# Hoodliner and Headliner

## Acoustic Behavior

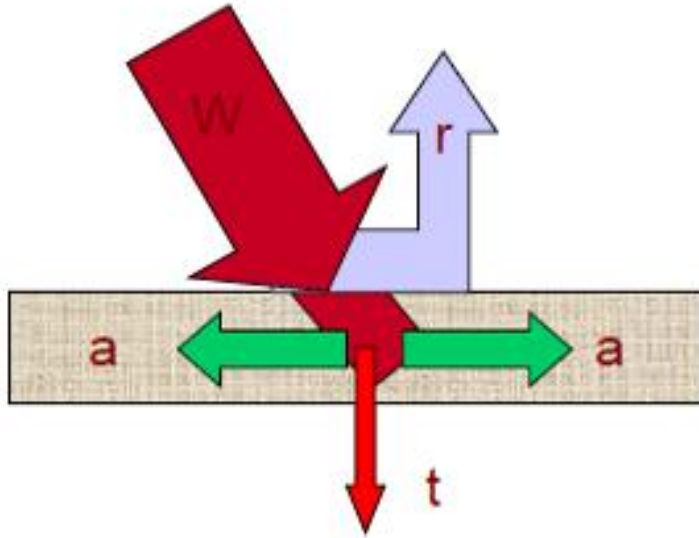


When the mechanical wave, represented by “W”, reaches the surface, it is divided in

- R = Reflexed portion
- A = Absorbed portion
- T = Transferred portion

# Hoodliner and Headliner

## Acoustic Behavior



When the mechanical wave, represented by “W”, reaches the surface, it is divided in

- R = Reflexed portion
- A = Absorbed portion
- T = Transferred portion

As higher is the absorbed portion, higher is the acoustic absorption and comfort.

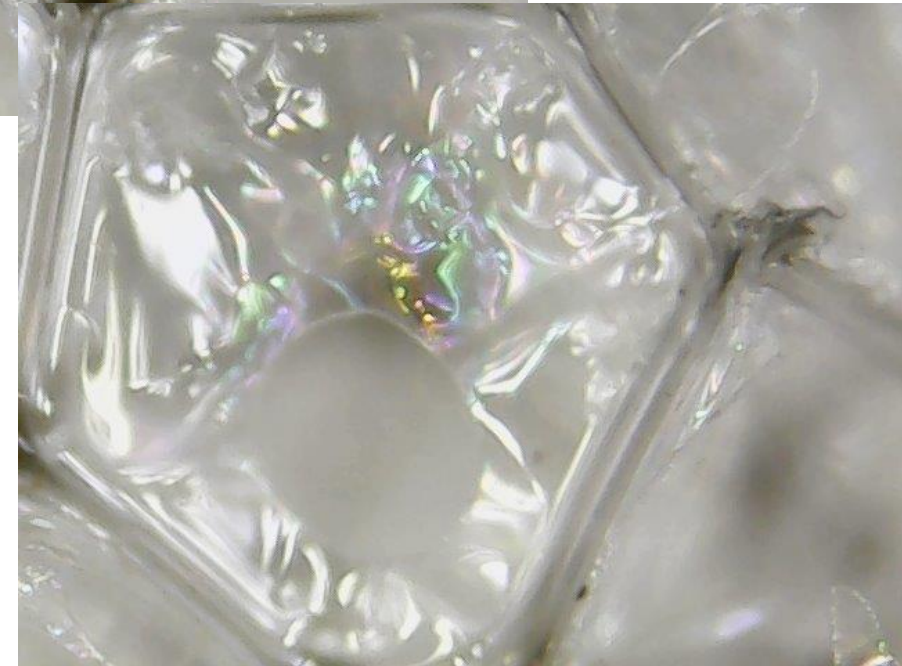
# Hoodliner and Headliner

## How we increase the absorption:

- The bigger is the internal surface (porosity), the better is the absorption
- The thicker is the skin, lower is the percentage of the absorption
- Open and connected cell structure is the best option to increase the absorption.



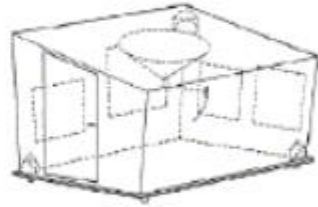
Close cell



Open cell

# Hoodliner and Headliner

## Analysis

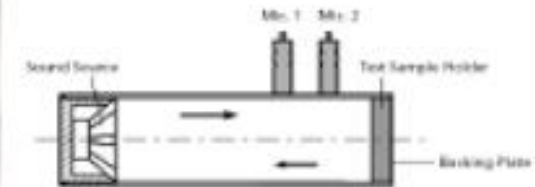


## $\alpha$ -Cabin

- Big Machine
- Sound waves in random direction
- Big sample needed

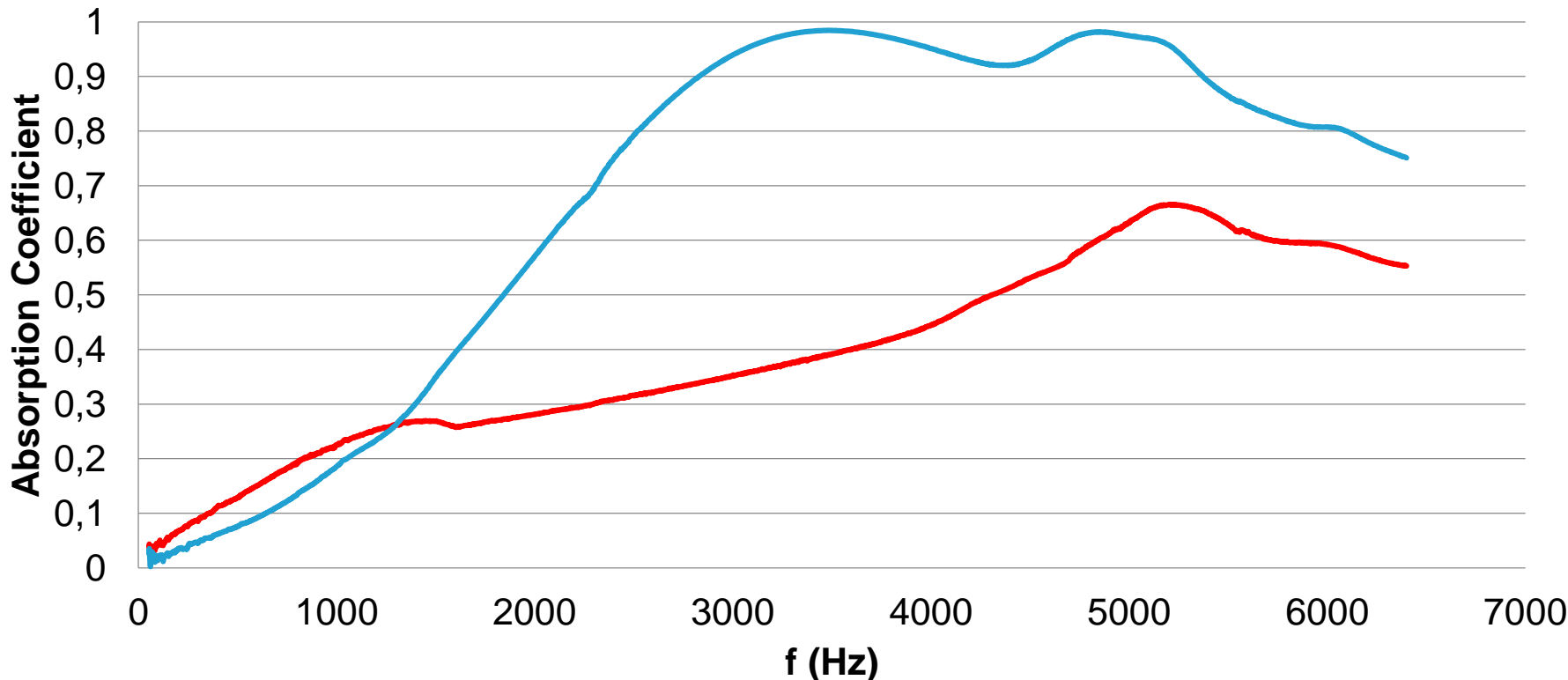
## Kundt`s Tube

- Small size machine
- Sound wave moves in normal direction
- Small sample needed



# Hoodliner and Headliner

## Analysis



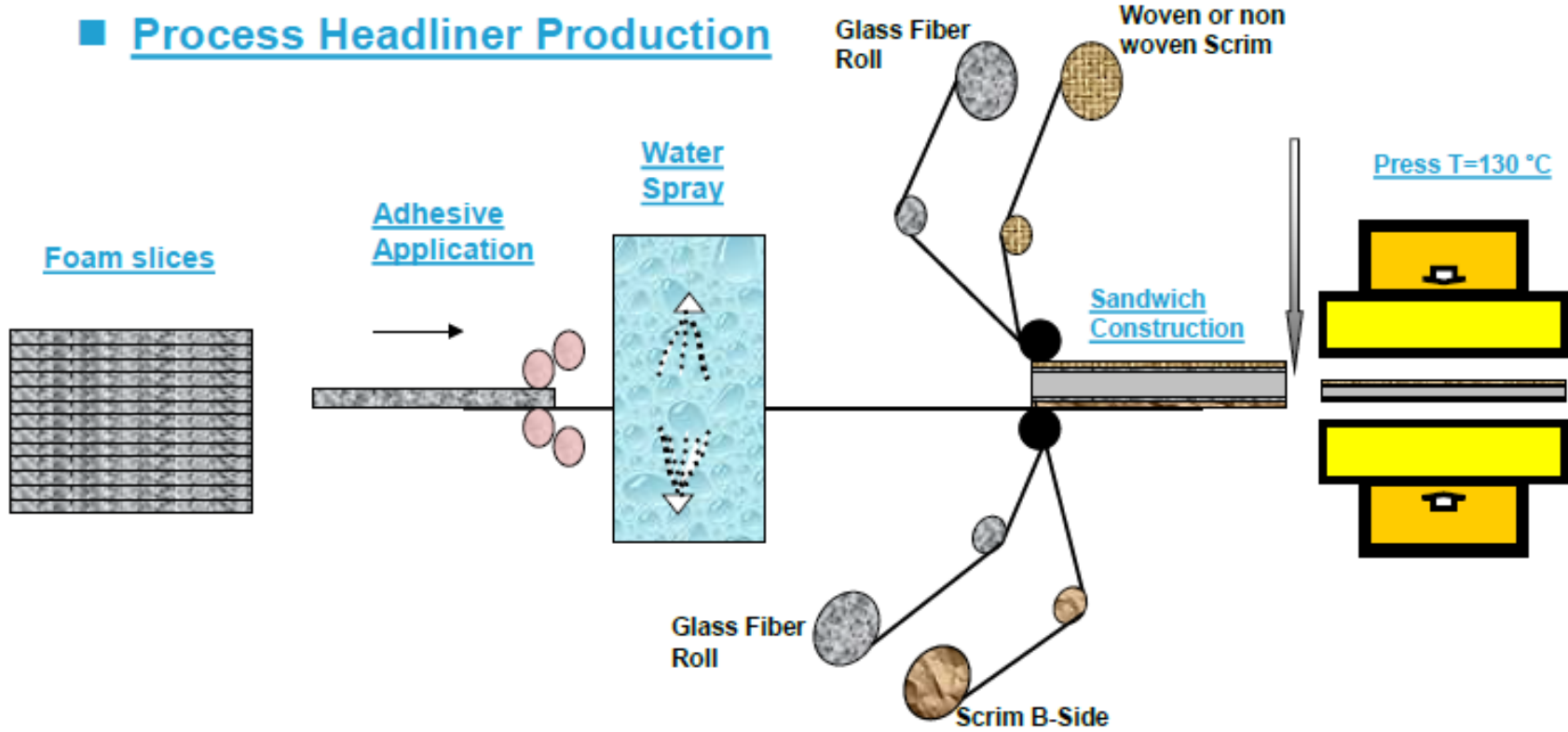
— Normal — Acoustic

# Hoodliner and Headliner

## Process

- Flow chart

- Process Headliner Production

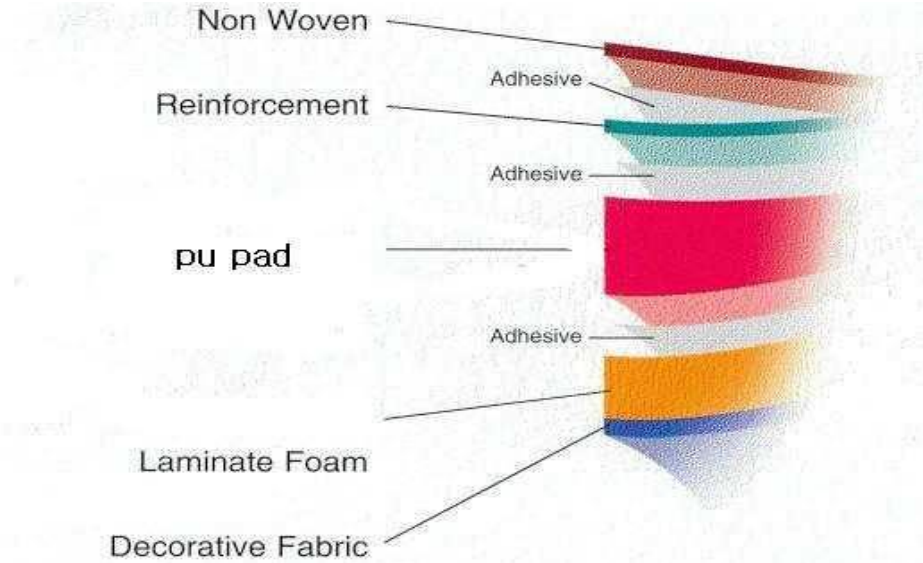
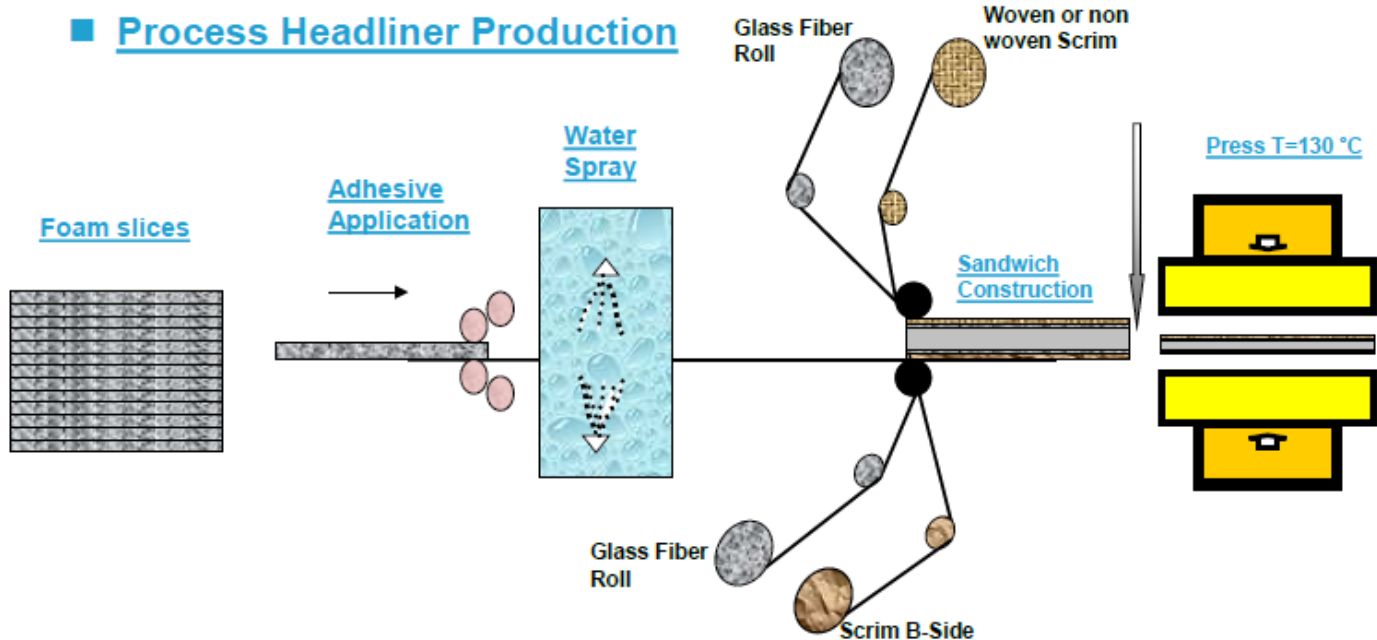


# Hoodliner and Headliner

## Process

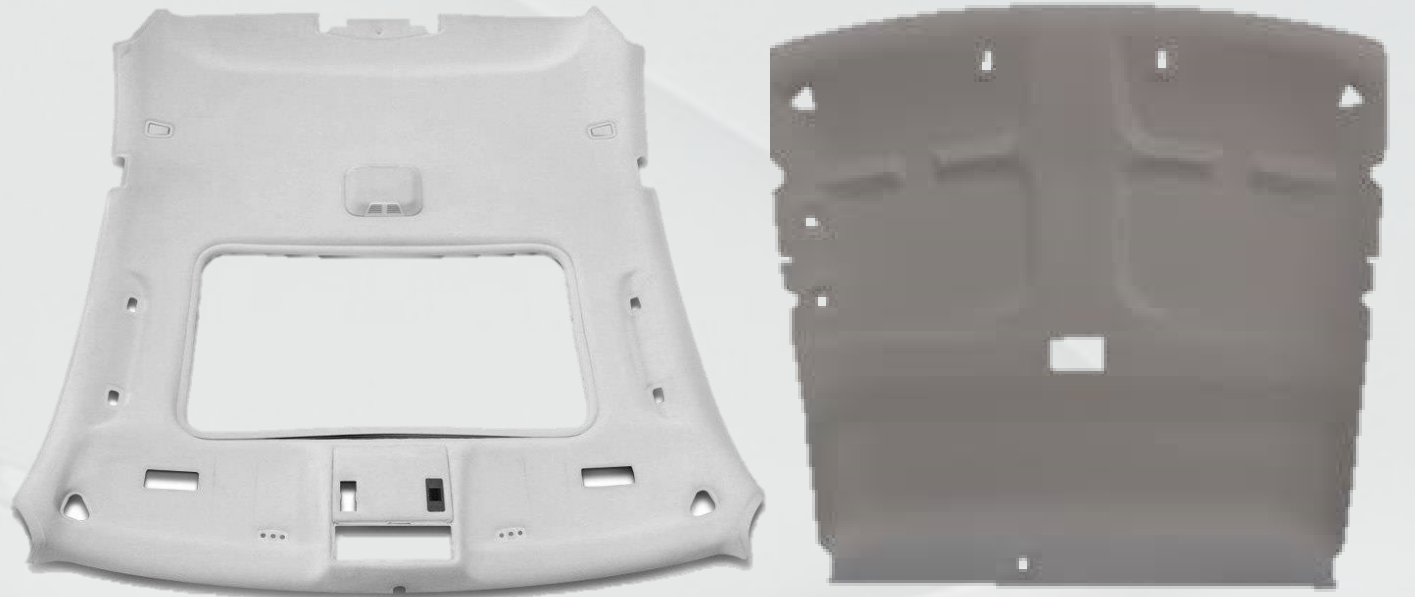
### ■ Flow chart

#### ■ Process Headliner Production



# Headliner and Hoodliner

## Features and Information



- High acoustic properties.
- Low odor and VOC.
- Low density.
- High productivity.





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## Other Applications

Performance Materials for  
Automotive Industry

# Other Applications

Performance Materials for Automotive Industry



Automotive Filter – Elastof foam®

# Automotive filter

■ Density [DIN EN ISO 845]	260 - 490 <sup>kg</sup> / <sub>m<sup>3</sup></sub>
■ Demould time	120 sec.
■ Elongation at tear After aging 21 days of aging in deionized water at 80 °C	342,5%
■ Compression stress at 40%, N/cm After aging 500 h at 110°C	26,5%

The results were obtained from parts collected from our customers, and met all standards. Ex. TL 848 2017.

# Other Applications

Performance Materials for Automotive Industry



Undercarpet – Elastoflex W<sup>®</sup>

# Other Applications

Performance Materials for Automotive Industry



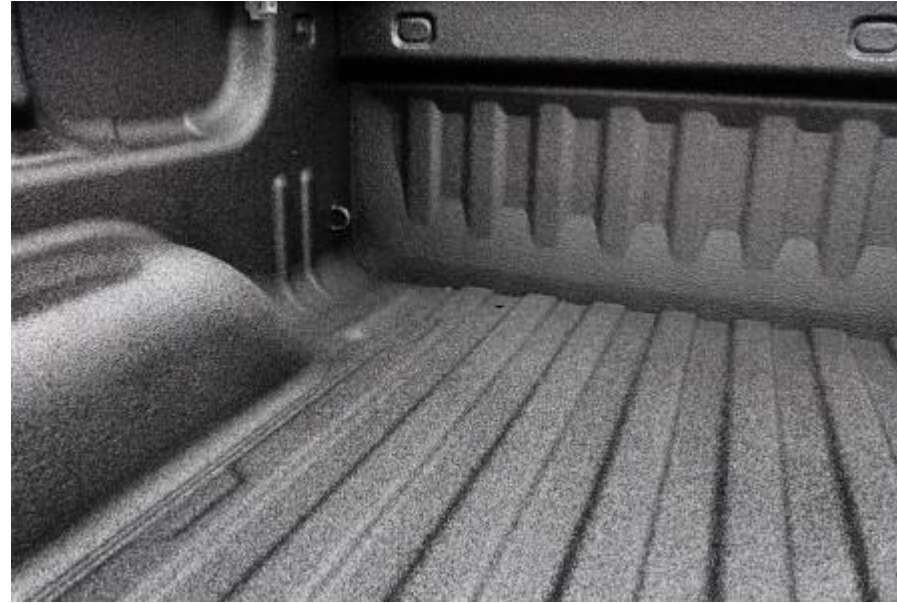
Cavity Filling – Elastoflex W<sup>®</sup>

# Other Applications

Performance Materials for Automotive Industry



Cavity Filling – Elastoflex W<sup>®</sup>



Truck Bed Liner– Elastocoat<sup>®</sup>

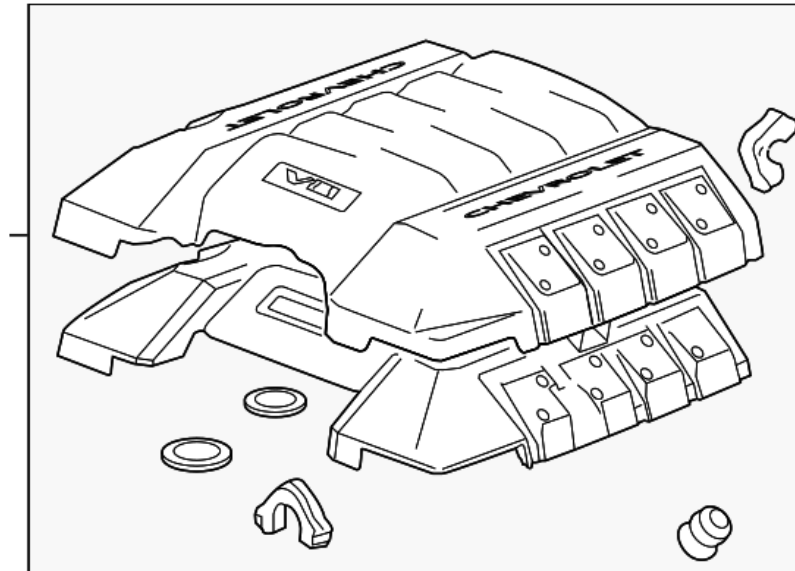
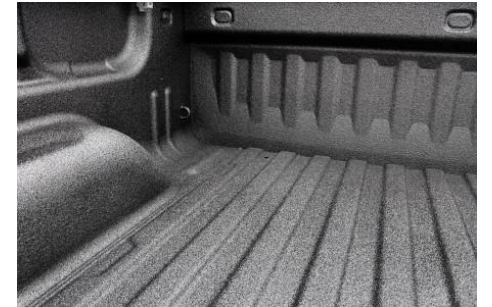
# Other Applications

Performance Materials for Automotive Industry



Cavity Filling – Elastoflex W<sup>®</sup>

Truck Bed Liner– Elastocoat<sup>®</sup>



Engine Cover– Elastoflex<sup>®</sup>

# Engine Cover for Volvo



## Need

- Lightweight
- Safe
- High quality appearance
- Functional design

## BASF Solution

- Material expertise (tailor made Elastofoam® for application)
- Design expertise

## The Results

- One step production process
- Design integrates acoustic and mechanical properties
- Lightweight (< 2kg!)
- Complies with safety standards

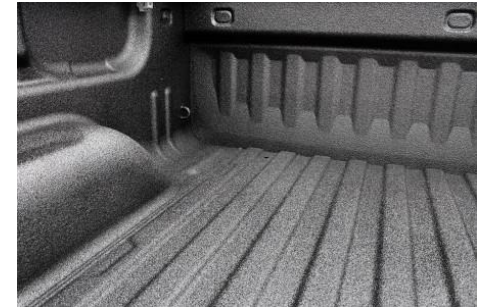


# Other Applications

Performance Materials for Automotive Industry



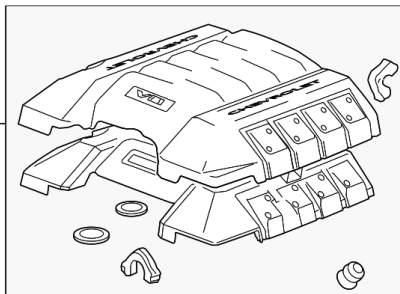
Cavity Filling – Elastoflex W<sup>®</sup>



Truck Bed Liner– Elastocoat<sup>®</sup>



Ultramid<sup>®</sup> Deep Gloss - EP



Engine Cover– Elastoflex<sup>®</sup>

# Other Applications

Performance Materials for Automotive Industry



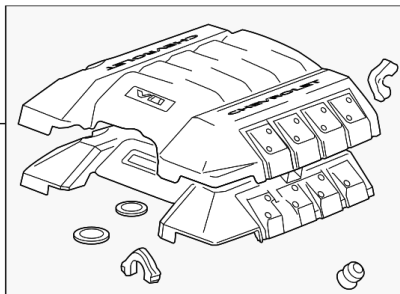
Cavity Filling – Elastoflex W<sup>®</sup>



Truck Bed Liner– Elastocoat<sup>®</sup>



Basotect<sup>®</sup> - Acoustic Insulation



Engine Cover– Elastoflex<sup>®</sup>



Ultradid<sup>®</sup> Deep Gloss - EP

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Daniel Sabadin 55 11944483031

# Thank You!

Chemie, die verbindet.  
Damit Kreativität  
Effektivität liebt.

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