



TRINSEO™

ENLITE™ ABS LGF

Engineering Expertise
in Innovation



The New ENLITE™ ABS LGF

A Solution for Lightweight Semi-structural Components

Lightweighting is essential

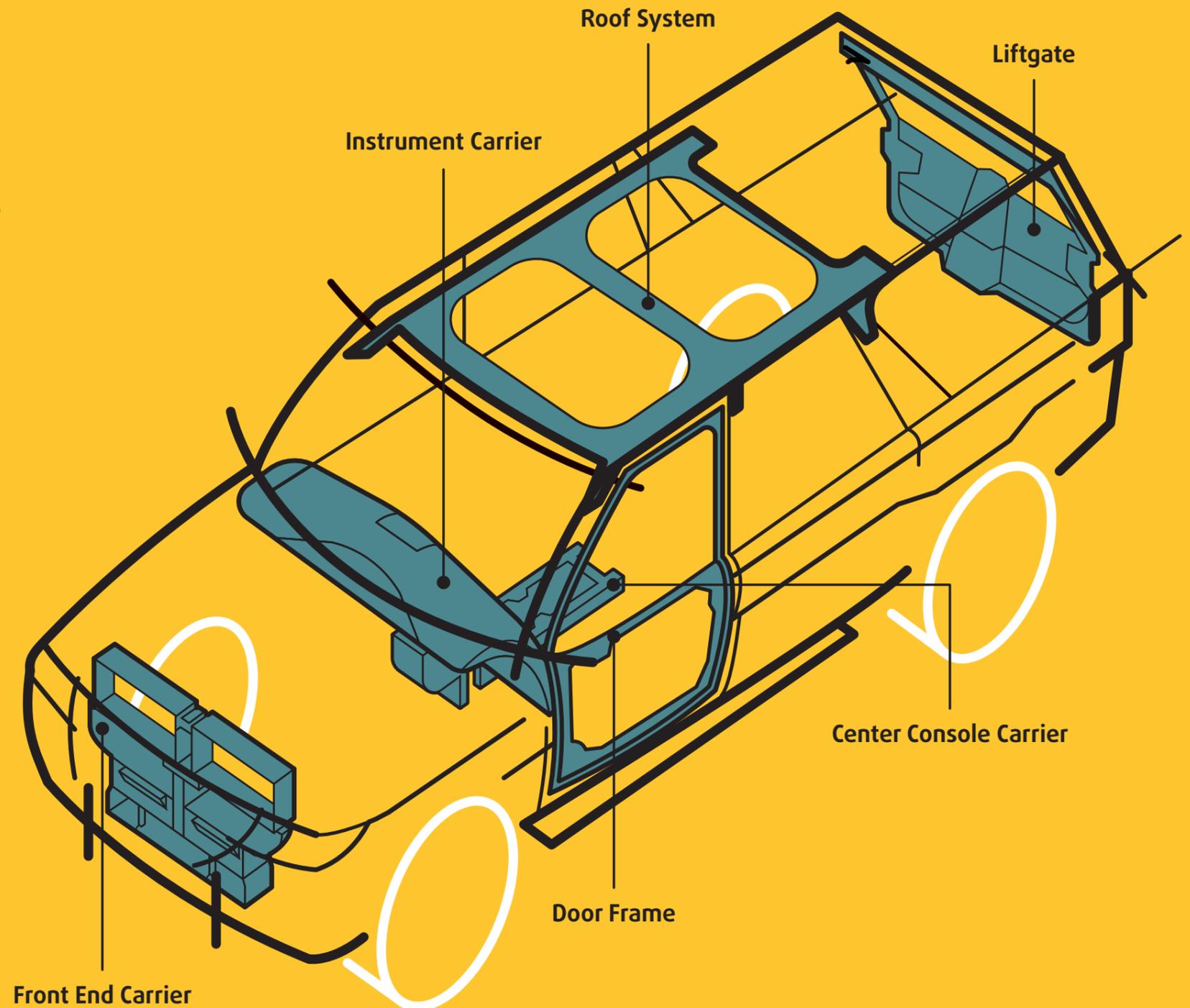
As a global leading partner for the automotive industry, Trinseo supports car manufacturers and their suppliers to achieve weight and cost reduction with our broad range of technical plastics. In addition to the needs of mega trends such as electrification and assisted and autonomous driving, the automotive industry has to meet increased requirements of fuel consumption and carbon emissions reduction. Therefore, lightweight is an essential attribute for today's and future automotive design.

A strong alternative for metal

Car makers traditionally try to reduce a vehicle's weight using conventional metal materials such as steel, magnesium, or aluminum. Our brand-new ENLITE™ ABS LGF offers an alternative to metal and surpasses PP LGF and PA GF solutions by contributing many advantages desirable for this application. ENLITE™ ABS LGF provides high stiffness, excellent dimensional stability, and low VOC & odor, particularly for complex semi-structural components such as instrument carriers and panels, roof systems, and liftgates. It is globally available and supports automotive OEMs and their suppliers to achieve significant part weight reduction and cost savings.

Proven weight reduction potential

Our experienced Application and Engineering Design Center (AEDC) collaborated with an automotive supplier for an instrument carrier in a premium OEM's compact executive car. Replacing a magnesium die-cast solution, ENLITE™ ABS LGF enabled 30 percent part weight and cost savings in a highly dimensionally stable application. A recent example of Trinseo's engineering expertise in innovation.



ENLITE™ ABS LGF Makes the Difference

Our ENLITE™ ABS LGF products are based on Trinseo's market-leading MAGNUM™ ABS, which contributes outstanding features such as high purity and low emissions as a result of the mass polymerization manufacturing process. ENLITE™ ABS LGF offers differentiated advantages for lightweight design when it comes to stiffness, dimensional stability, density, and emissions.

Low density for lighter part weight

Compared to an equivalent PA GF, ENLITE™ ABS LGF provides a lower density resulting in **7% part weight reduction** for semi-structural applications.

	Test Method	Units	MAGNUM™ 3416SC + 50% LGF50 ABS Alloy	GF30 PA
Density	ISO-1183-1	kg/m ³	1.25	1.35
n. Charpy RT (conditioned)	ISO 179	kJ/m ²	22	8 (25)
Charpy RT (conditioned)	ISO 179	kJ/m ²	31	50 (110)
Elongation (conditioned)	ISO 526	MPa	2	3.5 (7)
Tensile Yield (conditioned)	ISO 527	MPa	120	132 (110)
Tensile Modulus (conditioned)	ISO 527	MPa	8,000	8,600 (6,000)
Tensile Modulus 85°C	ISO 527	MPa	5,700	5,300
Vicat 50/5	ISO 306	°C	113	215
HDT (1.82 Mpa)	ISO 75	°C	120	205
Glass content		%	25	30



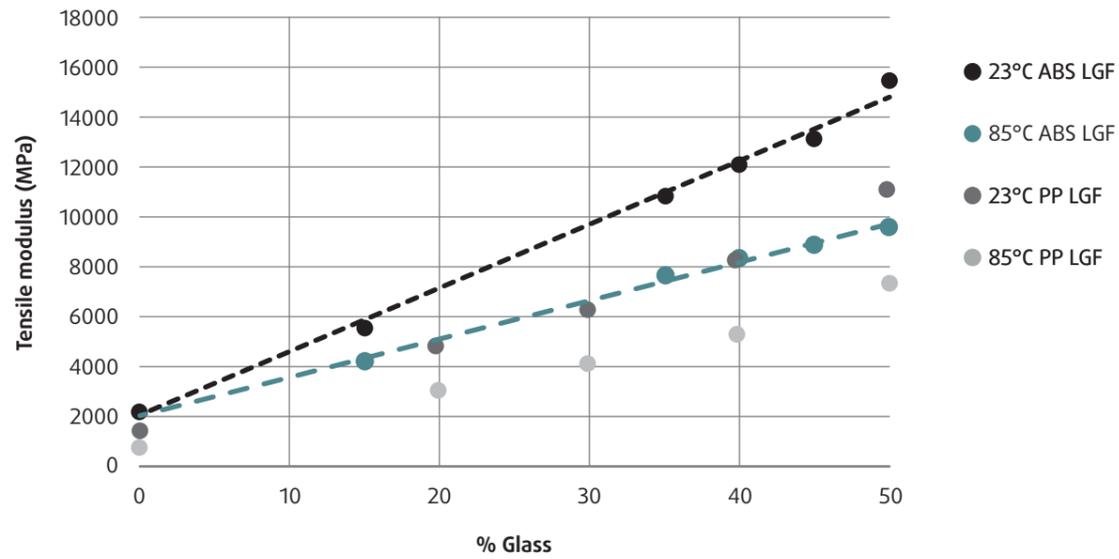
Low VOC, odor, and emissions

ENLITE™ ABS LGF offers significantly lower VOC emissions and odor than PP LGF. It also addresses more stringent OEM requirements, e. g. the reduction of carbon emissions.

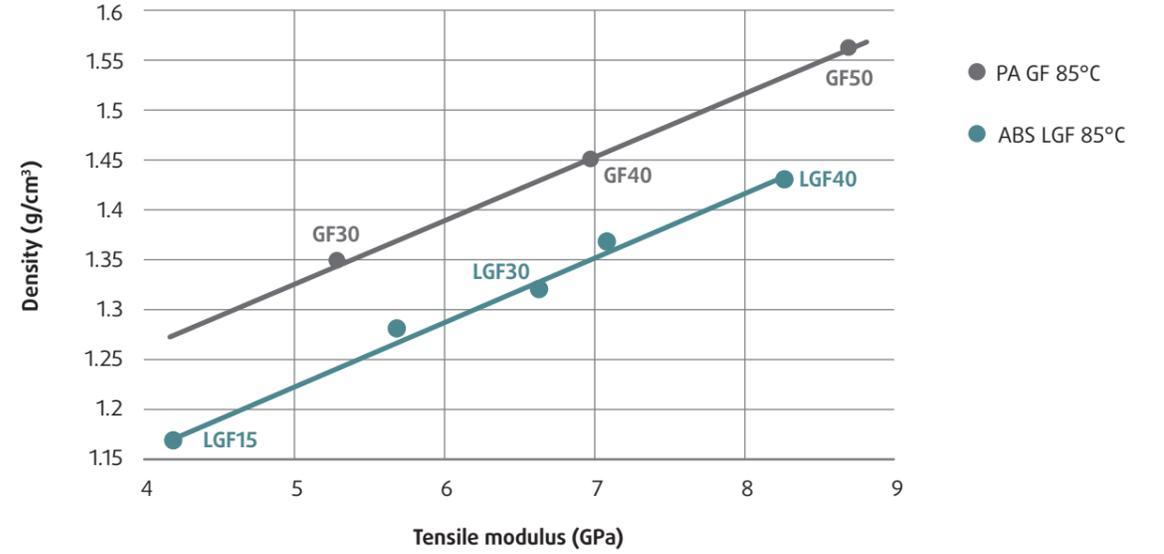
Material	Fogging A (%)	Fogging B (mg)	VDA 277 (ppm)	Odor VDA 278
PP LGF40	91	1	40	3.5-4.5
ENLITE™ LGF2601 + MAGNUM™ 3416SC	100	0	35	2.5-3.5



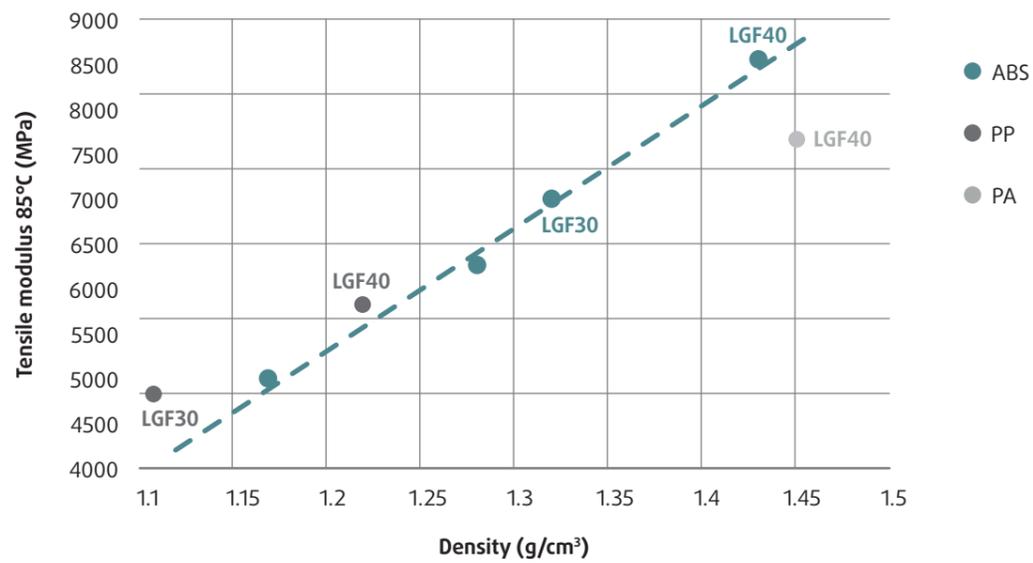
Stiffness vs. glass content (ABS, PP)



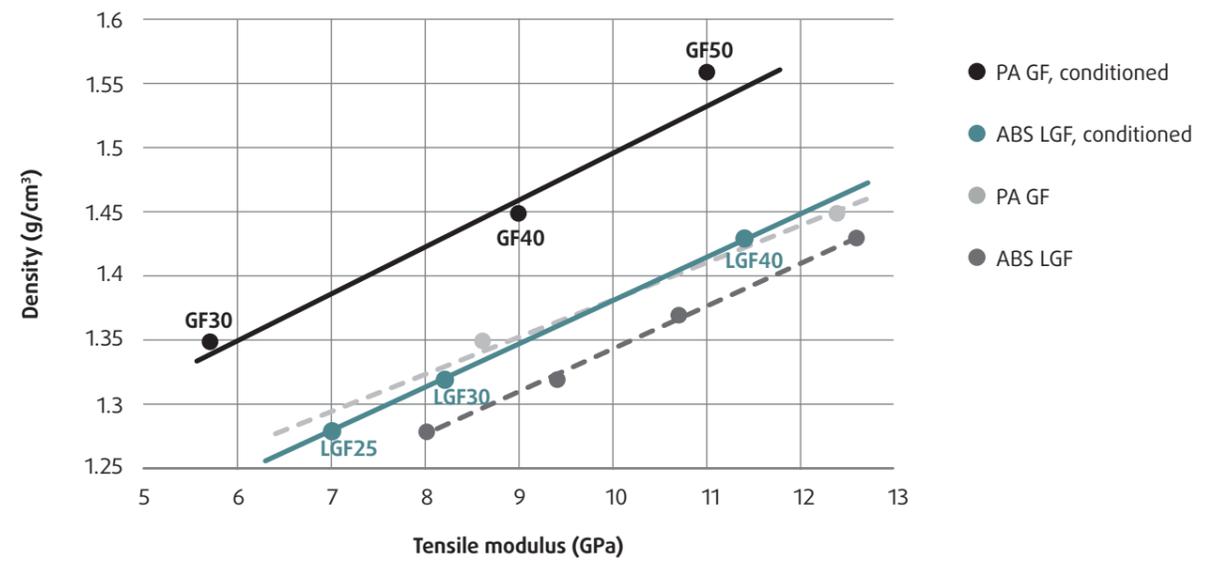
Stiffness vs. density at 85°C (ABS, PA)



Stiffness vs. density at 85°C (ABS, PP, PA)



Stiffness vs. density at 23°C (ABS, PA, conditioned)



High stiffness & high dimensional stability

Long-glass-fiber-reinforced thermoplastics provide high stiffness values, an essential factor for the weight reduction achievable in the final application. Higher glass content enables very high stiffness values to be achieved at both room and elevated temperatures.

ENLITE™ ABS LGF with amorphous polymer offers high dimensional stability. After conditioning, it shows a 35 – 50% higher stiffness at the same density, and a 7% lower density at the same stiffness. The material's low water absorption results in high dimensional stability.



Changeover with ENLITE™ ABS LGF

Our material development team and the Trinseo Application Engineering & Design Center (AEDC) supported a worldwide operating tier supplier for automotive interiors in using ENLITE™ ABS LGF for an instrument carrier. The premium OEM's series application was formerly planned to be made of magnesium.



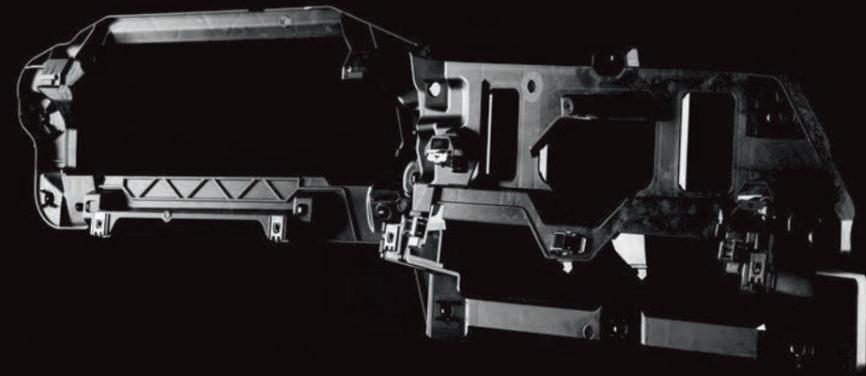
From an existing metal solution to an innovative plastic solution

Replacing semi-structural metal components with reinforced thermoplastic parts is an effective way to successfully reduce vehicle weight. However, it is not a simple task if the plastic part must achieve comparable performance. Since magnesium has a much higher stiffness than plastic, the semi-structural polymer part had to be fully ribbed to achieve a performance comparable to that of magnesium.

Joint expertise in design and processing

The engineers from the simulation departments at the supplier and Trinseo worked together right from the start on the stiffness optimization. A topology optimization was carried out in order to define reinforcement ribs. The original CAD geometry was then modified according to the optimized rib structure and went through a further structural FEA process.

The result was an initial weight-optimized part concept which takes into account the defined load cases. The supplier defined the final part concept for the instrument carrier that should be dimensionally stable after injection molding. In addition, a gate configuration was developed to ensure minimum warpage with the aid of process analysis (FEA), and proved to be successful in tool tests.



The collaboration also included the extensive optimization from prototype status to serial production. The results of calculations and prototype assembly were implemented in the series version, and all later relevant tests with the production version showed positive results.

Summarizing the successful material substitution in an instrument carrier, the advantages of the globally available ABS LGF system solution made of ENLITE™ LGF2601 and MAGNUM™ 3416SC ABS as a dilution polymer, become obvious:

- Proven weight reduction of 25-30% in its first commercial implementation in a BMW 3-series part
- High stiffness with lower glass fiber content
- Very good stiffness retention even at high temperatures
- Good flow properties as compared to PA GF and PC/ABS
- Excellent dimensional stability (significantly lower water absorption than PA GF)



Original metal die-cast part weight:

ca. **570 g**

ENLITE™ ABS LGF part weight:

ca. **430 g**

Weight saving potential:

ca. **25-30 %**



Technical Specifications

ENLITE™ ABS LGF15 Alloy System

ENLITE™ LGF2501 concentrate plus 70% MAGNUM™ 3416SC ABS dilution polymer

APPLICATIONS
Instrument panels/
carriers, center/mid console
components, front end carriers,
roof systems, liftgates

ENLITE™ ABS LGF15 is a 15% long-glass-fiber-reinforced material which provides high stiffness even at elevated temperatures in combination with easy flow and good ductility. ENLITE™ ABS LGF is particularly suitable for (semi-)structural components requiring lightweight and dimensional stability.

Benefits

- Significant weight reduction potential
- High stiffness with lower glass fiber content
- Very good stiffness retention even at high temperatures
- Good flow properties as compared to PA GF and PC/ABS GF
- Excellent dimensional stability (significantly lower water absorption than PA GF)

Properties

		Test Method	ENLITE™ ABS LGF15
General:			
Density	g/cm ³	ISO 1183B	1170
Mold Shrinkage	%	ISO 294	0.2-0.5
Mechanical:			
Tensile Modulus	MPa	ISO 527	5700
Tensile Stress at Yield	MPa	ISO 527	86
Tensile elongation	%	ISO 527	1.9
Flexural modulus	MPa	ISO 178	5300
Flexural strength	MPa	ISO 178	128
Tensile Modulus at 80 °C	MPa	ISO 527	4300
Charpy Notched	kJ/m ²	ISO 179-1eA	12
Charpy Unnotched	kJ/m ²	ISO 179	22
Thermal:			
HDT, 1.82 MPa	°C	ISO 75/A	110
Softening point 50/5	°C	ISO 306/A	110

Globally Available Knowledge and Expertise: The Trinseo Application Engineering & Design Center (AEDC)

Our AEDC combines specific expertise as well as Computer Assisted Engineering (CAE) to cater to our customers' engineering projects around the world. Our virtual prototyping reduces our customers' project lead-time and financial risks during their application development process.

Utilizing a number of software tools, we offer our customers a broad range of services, including structural and process simulation. We are able to define process parameters for materials, provide ideas on applications, demonstrate the projected appearance of the end-products, and provide design or process improvement recommendations.

About Trinseo – a Leading Global Partner for the Automotive Industry

We are a global materials solutions provider and producer of soft and rigid technical plastics, latex binders, and synthetic rubber. Trinseo's soft and rigid polymers for automotive applications are optimized for lightweight design, premium aesthetics, and high performance in interior, exterior, and semi-structural vehicle components.

We are able to directly support car manufacturers and their suppliers with innovation from 11 research and development centers and 16 manufacturing sites worldwide.



\$4.6 B

REVENUE IN 2018



2,500

EMPLOYEES IN 25 COUNTRIES



11

R&D FACILITIES GLOBALLY



16

MANUFACTURING SITES GLOBALLY



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Product Stewardship

Trinseo and its affiliated companies have a fundamental concern for all who make, distribute, and use their products, and for the environment in which we live. This concern is the basis for our Product Stewardship philosophy by which we assess the safety, health, and environmental information on our products so that appropriate steps may be taken to protect employee and public health and our environment. The success of our product stewardship program rests with each and every individual involved with Trinseo products – from the initial concept and research, to manufacture, use, sale, disposal, and recycling of each product.

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