

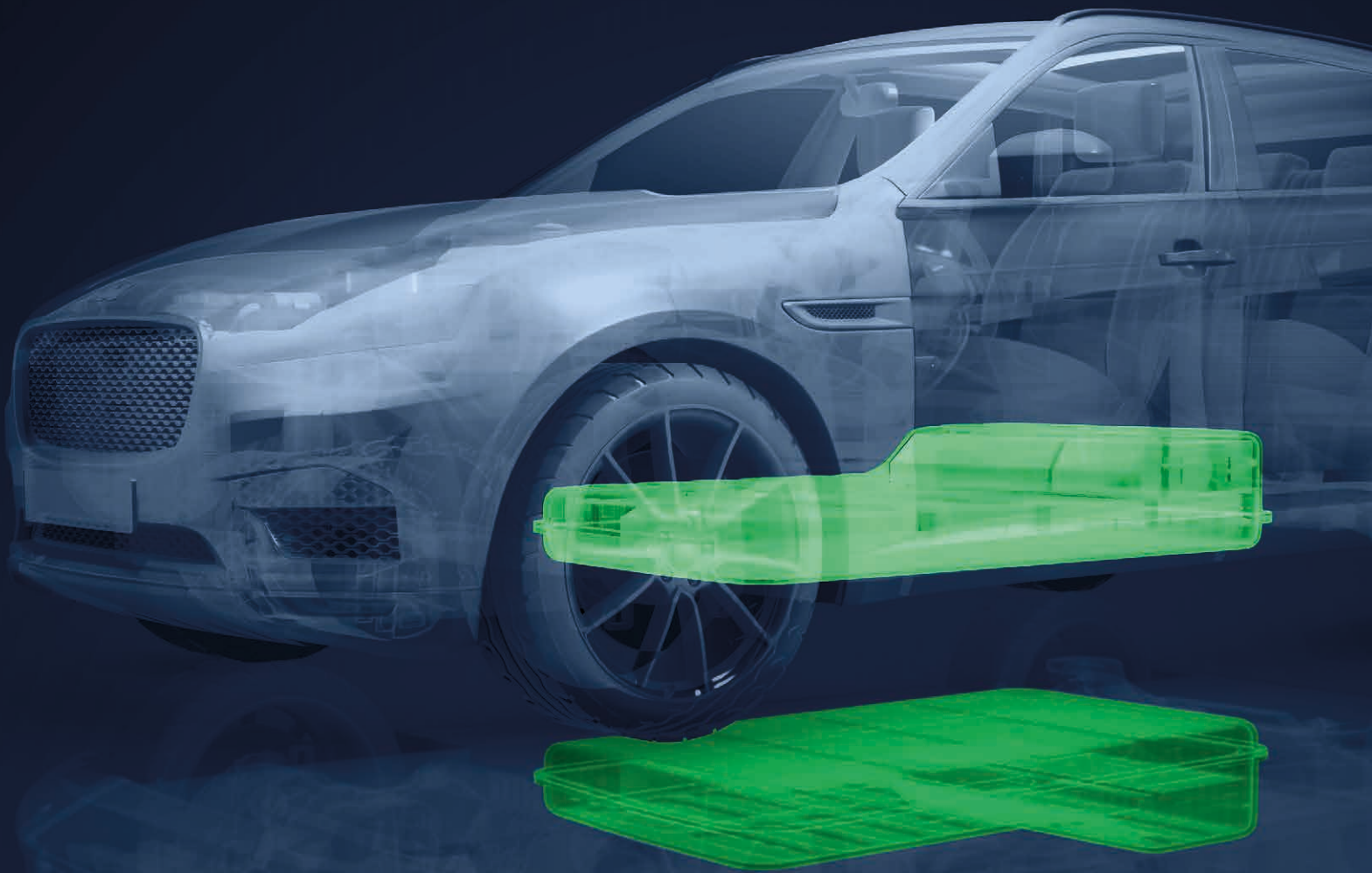
HUNTSMAN

Enriching lives through innovation

Polyurethanes

VITROX[®] and RIMLINE[®] composite solutions

Lightweight design with innovative chemistry



Performance through partnership

With over 20 years' experience in developing class-leading composite resin technologies, Huntsman provides MDI and MDI-based polyurethanes for the automotive industry through our trusted VITROX® and RIMLINE® brands.

As your lightweight materials partner, we will work closely with you to help you to create solutions that have the potential to be cleaner, lighter, stronger and circular. Our composite technologies and expertise can give you greater design freedom and help lower costs, from initial concept through to final production.

Why Huntsman polyurethane resins and core systems?

Typical benefits can include:



Cleaner

Help to minimize VOC emissions depending on your application requirements.



Lighter

Create strong yet lightweight materials that reduce the weight of your car to lower fuel consumption and emissions.



Faster

Speed up cycle times and gain flexibility in your production processes.



Towards circularity

Our MDI-based polyurethane technologies can enable manufacturers to maintain technical performance while integrating bio-based or recycled material content. Our products can also be manufactured using mass balance principles to support customers' carbon footprint reduction efforts.

Versatile solutions developed for car interiors and exteriors

Our MDI and MDI-based polyurethane solutions have been developed to help you improve weight, design, productivity, and performance for your composite applications. By collaborating with you early in the process, we can help you to make products that meet specific properties, while maintaining high-quality standards in passenger safety and comfort.

Typical benefits can include:

Productivity:

- High volumes without frequent tool cleaning
- Low material waste
- Tunable snap cure
- Fast curing

Performance:

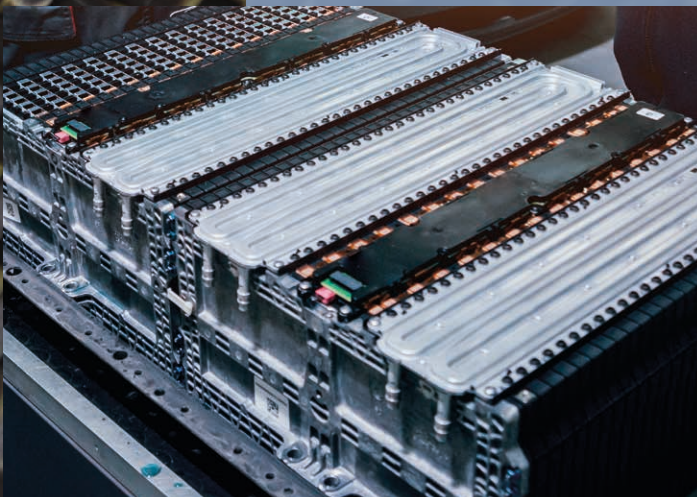
- Helps to achieve high structural performance of the final part
- Temperature resistance
- High resin toughness
- Very good stiffness

Design freedom:

- Good edge-filling capabilities for complex shapes

Targeted application areas:

- Floor/seat pans
- Truck beds
- Roof modules
- Battery top cover
- Battery underfloor
- Bonnets/hoods
- Load floors
- Parcel trays and sunshades

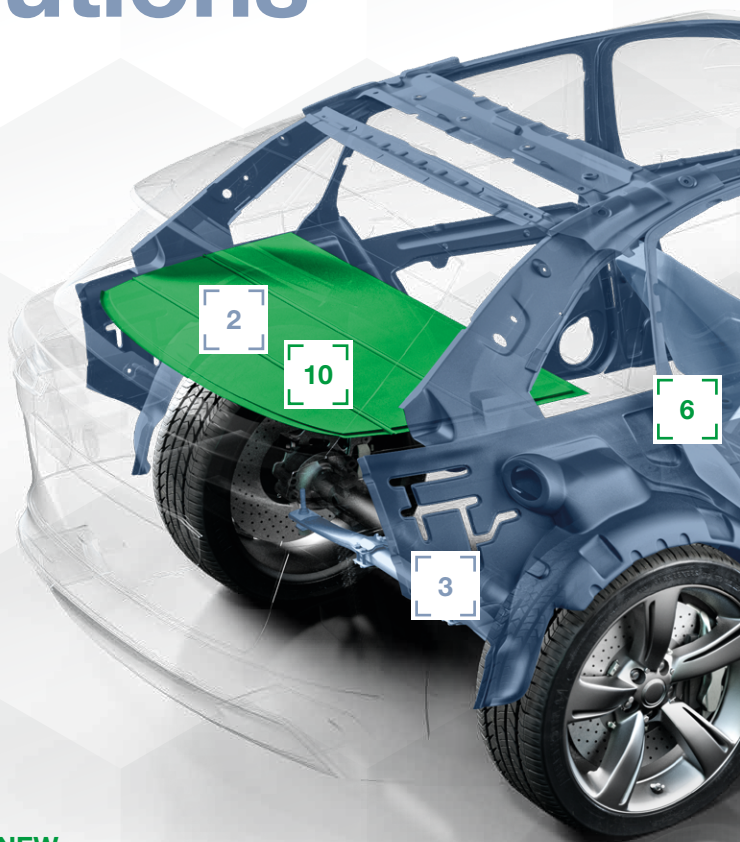


TYPICAL PROPERTIES CAN VARY DEPENDING ON LOCAL CIRCUMSTANCES, PRODUCTION PROCESS AND APPLICATION. THESE PROPERTIES ARE NOT PART OF THE PRODUCT SPECIFICATIONS. SEE DISCLAIMER FOR FURTHER INFORMATION.

The art of lightweight: VITROX[®] and RIMLINE[®] polyurethane solutions

Our VITROX[®] product portfolio is a family of highly cross-linked isocyanate resins with tunable Tg 100-140°C and flexible, adjustable open times developed for accurate control over parts processing, plus high toughness levels.

Our RIMLINE[®] solutions are formulated as a standard cross-linked polyurethane, and can enable high toughness and durability combined with a high reactivity and fast cure.



1 **NEW VITROX[®] WCM**
polyurethane system developed for lightweight upper battery casing covers with very good thermal resistance to help limit flame spread

2 **VITROX[®] HC**
polyurethane system developed for advanced Honeycomb (HC) applications, such as instrument panels, truck beds, bonnets/hoods as well as convertible roofs

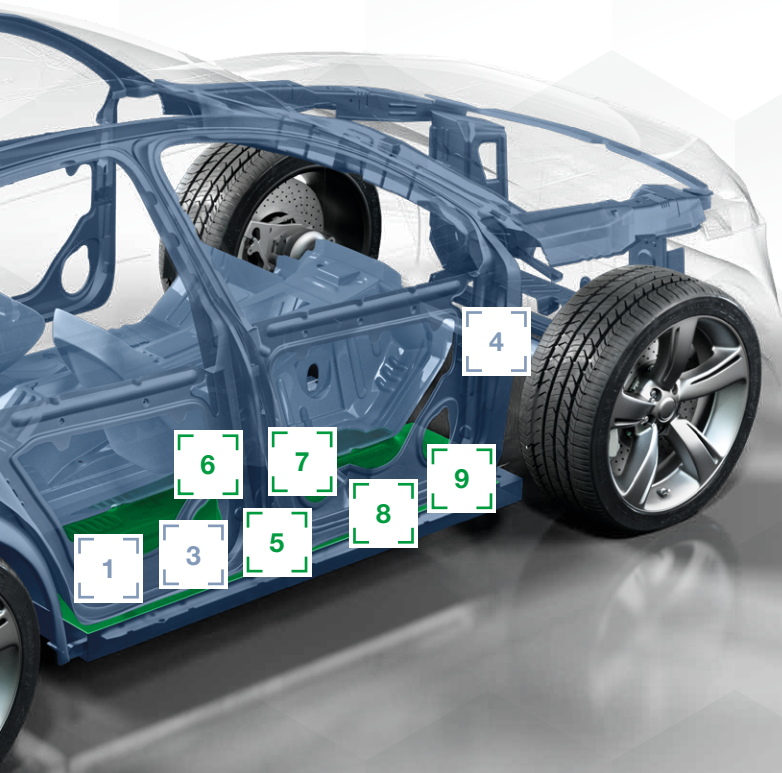
3 **VITROX[®] RTM**
polyurethane system developed for interior and drive train components, such as leaf springs, seat structures, and EV battery cases

4 **VITROX[®] PUL**
advanced polyurethane system developed for Pultrusion (PUL) manufacturing process

5 **NEW RIMLINE[®] WCM**
polyurethane system developed for overmolding core sandwich composite structures and giving underbody battery protection panels their final shape and strength

6 **NEW RIMLINE[®] RSM**
polyurethane system developed for the fast efficient creation of lightweight components for rear seat pan applications

7 **NEW RIMLINE[®] SRIM**
polyurethane system for Structural Reaction Injection Molding developed for lightweight and durable battery enclosure applications



8

NEW RIMLINE® LFI

polyurethane system developed for reducing the thickness and improving the damage tolerance of heavy-duty composite structures used in the underfloor protection of batteries

9

RIMLINE® FC

polyurethane rigid foam system developed for use as a core material in the manufacturing of sandwich composite structures

10

RIMLINE® HC

polyurethane resin system developed for interior sandwich components with paper honeycomb core (HC), such as load floors and interior trims

Composite Spray Molding (CSM)

– lightweight and durable

A technology which can enable complex structural part design. Its low-cost and rapid processing window achieves cycle times between 1-2 minutes with selected glass or carbon fiber, thermoplastic or paper core.

RTM/HP-RTM/WCM – advanced design and processability

Wet Compression Molding (WCM) – Resin Transfer Molding (RTM) and the fast adoption of High Pressure RTM (HP-RTM) can enable you to manufacture integrated, lightweight structures with cycle times of less than ten minutes. We offer a fully formulated system that offers low initial mixed resin viscosity with good wetting characteristics and low VOC emissions. New systems are offered with or without Internal Mold Release (IMR) and have a tunable catalyst level tailored to your needs.

Long Fiber Injection (LFI) – durability for load-bearing applications

A technique developed for creating core materials for the manufacture of sandwich composite structures, which can be overmolded with RIMLINE® and VITROX® Resin Transfer Molding (RTM) or Wet Compression Molding (WCM) resin systems.

Foam Core Technology (FC) – a lightweight solution for sandwich composite structures

Employed alongside glass or carbon reinforcements to build a preform, molded two-component polyurethane foam core systems can help create lightweight, durable parts, such as battery enclosure components for electric vehicles.

Pultrusion – cost-efficient mass production

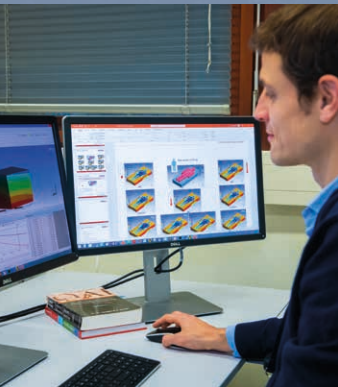
Pultrusion's cost-efficient manufacturing method can enable lightweight replacement solutions for existing vehicle and industrial metal parts.

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Developed for a cleaner, lightweight future

MDI-based solutions can enable manufacturers to improve operational efficiency, reduce environmental impact, and create lightweight, cleaner, and more durable composite end-products that meet performance expectations.

While composite material solutions offer many invaluable benefits for automotive production in general, they are particularly relevant for use within key areas such as electrification of the drive train.



How can we help?

At Huntsman, we build partnerships with our customers based on knowledge, trust, and experience. With our broad product portfolio and via dedicated technical support, we can help you select a system suited to your requirements. Across our research and development centers, customers have access to:

- Simulation and modeling capabilities for processing and final part performance
- Extensive characterization equipment for mechanical testing of resins, composites, and thermomechanical properties
- Dedicated Composite Spray Molding, HP-RTM and Pultrusion set-ups to develop customer specific formulations
- On-site testing and staff training



Whether you want to protect batteries at a material, cell or full pack level, we can explore requirements in detail. We can help you to develop systems with mechanical, NVH, thermal, fire and impact protection performance characteristics for your application and to help optimize manufacturing processes.

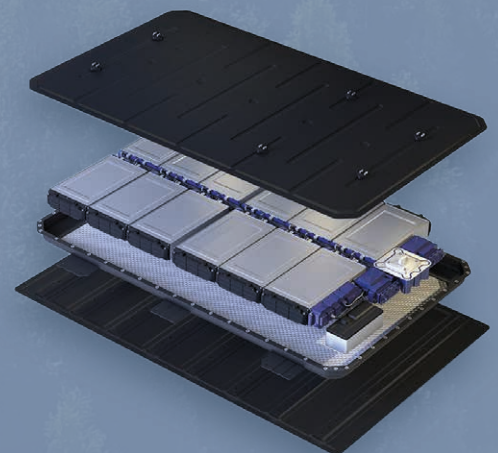
Why MDI-based composites?

Benefits can include:

- Lightweight
- Greater design freedom
- Tunable physical properties
- Low emission
- Flexible manufacturing process

Far more than PU systems

Our global network includes strategically located system houses and key manufacturing hubs worldwide with dedicated local associates. In addition, we have well-equipped competence centers in Europe, Asia and the United States of America with state-of-the-art prototyping and physical testing capabilities.



Scan here to submit an inquiry

Contact us today:

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Towards sustainability

As we move towards a more carbon neutral and circular society, automotive businesses are searching for alternative resources to fossil-based chemistry. This involves moving towards renewable bio-based, recycled materials and low carbon e-mobility. At Huntsman, we are dedicated to the development of sustainable solutions that can support the automotive industry's environmental ambitions.



With the ability to help track and certify the use of bio-, bio-circular, or recycled-based feedstocks in its MDI production, Huntsman can help customers looking to further reduce the attributed carbon footprint of automotive products. In November 2022, Huntsman's European MDI manufacturing facilities achieved the International Sustainability & Carbon Certification (ISCC PLUS) for mass balance.

Our RIMLINE® and VITROX® technologies can be manufactured using mass balance principles, offering attributed carbon footprint reduction opportunities. Our polyurethane solutions can also enable manufacturers to maintain technical performance while considering the integration of bio- based or recycled material content.

As a signatory to the United Nations Global Compact (UNGC) – the world's largest voluntary corporate citizenship initiative – our work is guided by the UN's 17 Sustainable Development Goals. All 17 UN Sustainable Development Goals are important to our business – with three of particular relevance to our VITROX® and RIMLINE® product lines.



Enabling higher productivity



Optimal use of resources, improved productivity and lightweight design



Reduce fuel consumption

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Products may be toxic and require special precautions in handling. The user should obtain Safety Data Sheets from Huntsman Polyurethanes containing detailed information on toxicity, together with proper shipping, handling and storage procedures, and should comply with all applicable safety and environmental standards.

Hazards, toxicity and behaviour of the products may differ when used with other materials and are dependent on the manufacturing circumstances or other processes. Such hazards, toxicity and behaviour should be determined by the user and made known to handlers, processors and end users.

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