

# Novelis Transportation Solutions

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A Global Leader in  
Commercial Transportation



# Novelis



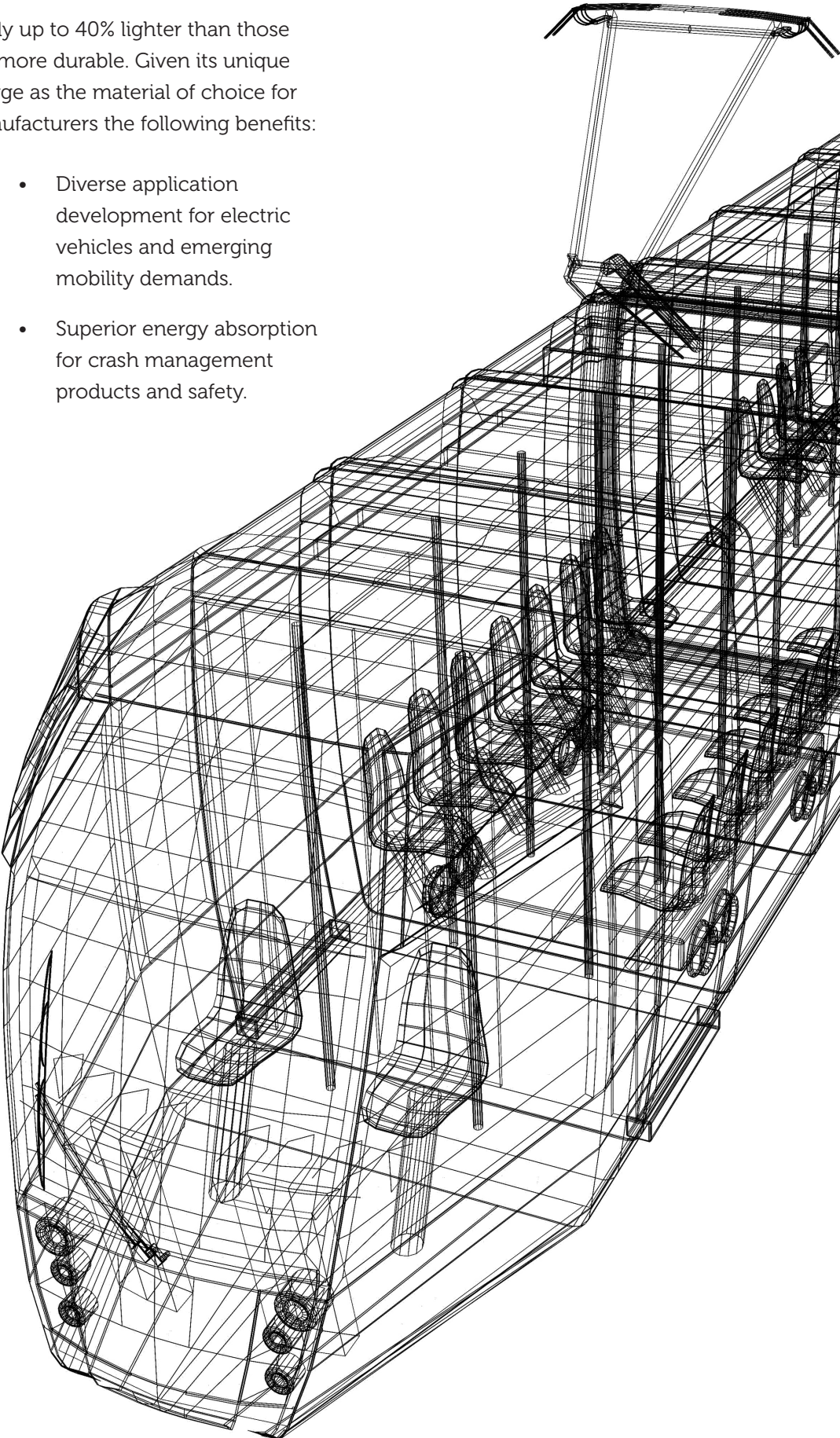
# Why Aluminum in the Transportation Industry?

As our cities and urban centers continue to grapple with increased congestion, governments around the world are instituting more stringent regulations aimed at bolstering fuel efficiency and reducing greenhouse gas emissions. Novelis continues to accelerate the development of its innovative aluminum solutions and to expand its global product offerings for more sustainable buses, trucks, trailers, trains and other forms of commercial transportation.

**2x** Pound for pound, aluminum can absorb twice as much energy as steel.

Aluminum-intensive vehicles are not only up to 40% lighter than those made with steel, they are also safer and more durable. Given its unique properties, aluminum continues to emerge as the material of choice for the transportation industry, offering manufacturers the following benefits:

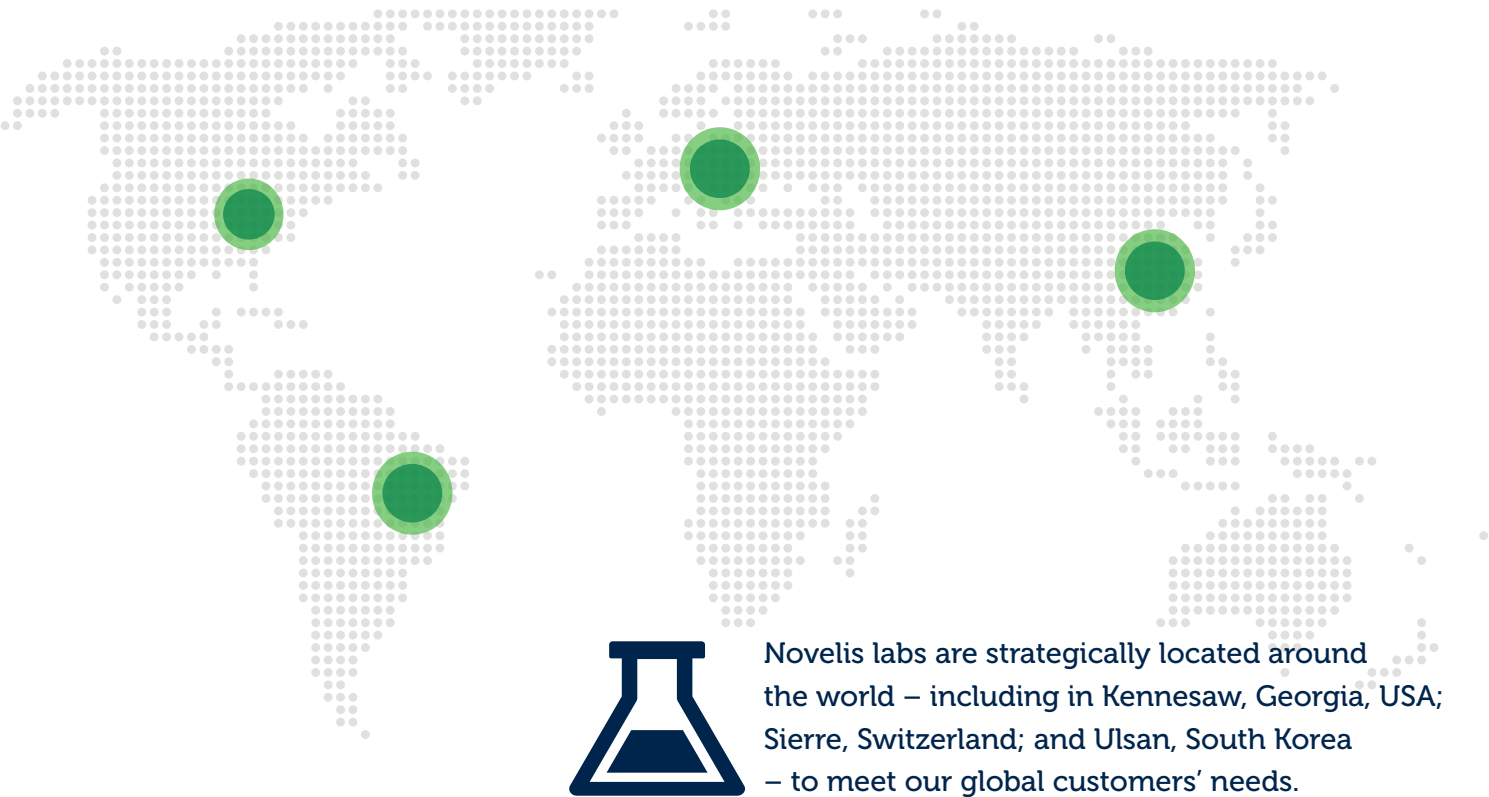
- Overall weight reduction to meet government regulations globally, without compromising safety, comfort, performance, durability or quality.
- Improved sustainability as aluminum is infinitely recyclable and helps minimize environmental footprints and CO<sub>2</sub> emissions.
- Greater design flexibility due to its strength, joining and formability properties, enabling better driving dynamics and vehicle agility.
- Diverse application development for electric vehicles and emerging mobility demands.
- Superior energy absorption for crash management products and safety.





## About Novelis

Novelis is the leading producer of flat-rolled aluminum products and the world’s largest recycler of aluminum. A leader in innovative alloy development, we work alongside our customers to provide high-performing and sustainable transportation solutions for the commercial vehicle industry.



Novelis labs are strategically located around the world – including in Kennesaw, Georgia, USA; Sierre, Switzerland; and Ulsan, South Korea – to meet our global customers’ needs.

### Manufacturing Facilities

- Asia
- Yeongju, South Korea
- Ulsan (Ulsan Aluminum), South Korea
- Europe
- Pieve, Italy
- Bresso, Italy
- Göttingen, Germany
- Ohle, Germany
- Lüdenscheid, Germany
- Nachterstedt, Germany
- Norf, Germany
- Sierre, Switzerland
- Latchford, UK

- North America
- Oswego, New York
- Kingston, Ontario
- Logan, Kentucky
- Fairmont, West Virginia
- Terre Haute, Indiana
- Berea, Kentucky
- South America
- Pinda, Brazil
- Santo André, Brazil

### R&D Facilities

- Asia – Ulsan, South Korea
- Europe – Sierre, Switzerland
- North America – Kennesaw, Georgia USA

## Driving Aluminum Innovation in Transportation

From catwalks and heat shields to stress panels and heat protective sleeves and mats, aluminum transportation solutions are replacing incumbent materials across various structural components, helping manufacturers build safer, lighter and more sustainable commercial vehicles.

For commercial trucks, Novelis uses aluminum for enhanced performance and lightweighting throughout the chassis. Focusing on the intra-chassis and chassis hang-on components, Novelis offers solutions for the frame rail, cross member, gusset, bumper, fuel tank hanger and stabilizer, among other components.

Aluminum not only creates lightweighting benefits in the chassis, but it also provides design and engineering flexibility in cabs.

For manufacturers developing over-the-road (OTR) trucks or commercial electric vehicles, the weight savings realized through aluminum usage – up to 350 kg – offer new engineering opportunities for in-cab driver comforts and increased electrical components.

### Global Presence

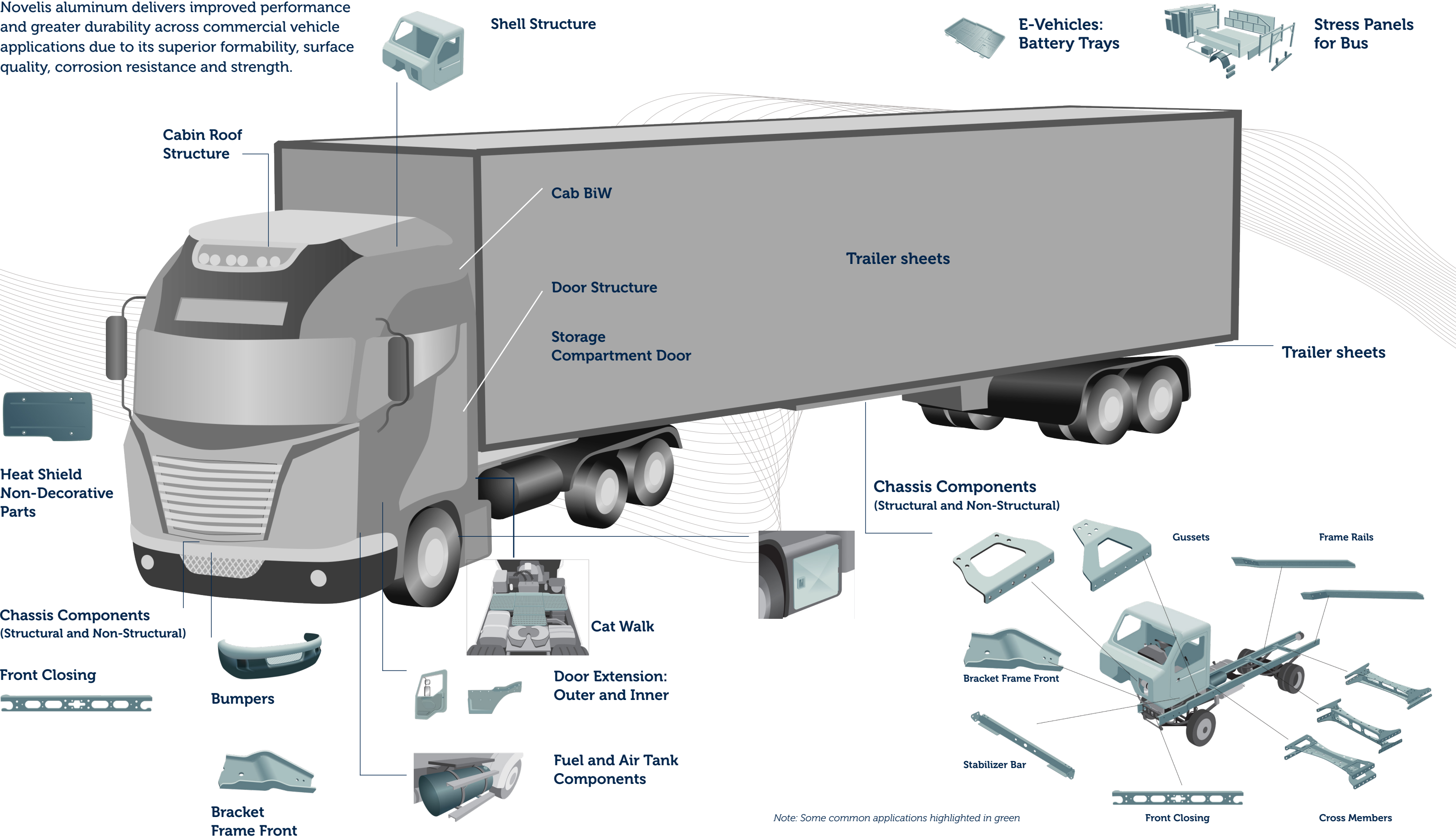
Novelis is the only company producing premium rolled aluminum products on four continents - North America, South America, Europe and Asia. Our unmatched global footprint allows us to meet the unique and growing needs of our customers – from small, custom-made products to large, regional product offerings. We do all of this with a commitment to the highest industry standards in order to deliver superior solutions.

### Our Partners

We partner with many of the leading manufacturers in the commercial vehicle industry. From providing product samples in the testing phase to large quantities of aluminum for mass production, our customers can count on us to deliver state-of-the-art transportation products with the same properties and technical specifications, no matter where they are in the world.

# Novelis Transportation Applications

Novelis aluminum delivers improved performance and greater durability across commercial vehicle applications due to its superior formability, surface quality, corrosion resistance and strength.





# Leadership in Engineering Material Solutions to Meet Stringent Formability and Strength Specifications

Novelis leads the industry with alloy versatility by innovating with customers to surpass industry standards – making Novelis the world leader in technology development for:

- Joining aluminum to aluminum: Metal Inert Gas (MIG) joining, laser joining.
- Dissimilar metals joining (aluminum-steel): Friction stir welding, Self-Pierce Riveting (SPR).
- Fatigue Testing (S-N and E-N) Curves.
- Thick gauge bending capabilities.
- Aggressive material stamping assessments.
- Structural modelling and novel engineering solutions support.
- Dissimilar metals corrosion mitigation and testing.



## Fast Facts

**40+**   
years of experience

**134**   
transportation  
specific patents

**250%**   
increase in capacity  
since 2015

## High Performance in Heavy-Duty Chassis

To meet strength and durability requirements, Novelis engineers developed several new high-performance 6xxx series alloys for use in the heavy-duty chassis and chassis bolt.

### Case Study

#### Partnership with Global OEM Leads to Chassis Mass Reduction

Working with a global OEM, Novelis co-engineered an alloy that reduced the mass for selected chassis components by 35-50%. As a result of the partnership, the OEM implemented the innovative alloy to launch next-generation medium-and heavy-duty commercial vehicle platforms. In addition, the manufacturer adopted and commercialized the first fiberglass-reinforced polymer (FRP) aluminum cross members and supporting components for Class 6, 7 and 8 platforms.

Using flat-rolled aluminum can reduce chassis weight up to 55% while maintaining “Higher Strength to Weight” and “Higher Stiffness to Weight” ratio requirements.

## Unmatched Expertise

- With more than 40 years of experience supplying the commercial vehicle market, Novelis has developed the industry standard for aluminum alloys, owning more than 134 transportation specific patents.
- Novelis engineers, metallurgists, chemists, computer scientists, commercial teams and technical experts work alongside our customers from program development to create new products and processes to meet the industry’s evolving needs.
- Novelis is the largest global supplier of commercial vehicle fuel and air tank aluminum sheet products, which feature superior surface quality, machinability, bendability and weldability.

## Collaborative Innovation

- 40% of all Research & Development investment at Novelis is dedicated to innovating transportation solutions.
- Novelis has expertise in mixed-material construction and provides technical guidance to manufacturers from design to production – allowing manufacturers be highly flexible and cost-conscious when choosing the right mix of materials.
- Novelis’ products and welding/joining technology make it possible to integrate aluminum into a mixed-material commercial vehicle without requiring a significant investment in new manufacturing equipment.



# Leading Aluminum Products for Transportation

Technology and development are central to everything we do. We have created industry-leading high-strength alloys that have become industry standards:

## 5xxx

5000 series alloys have excellent strength-to-weight ratio, formability properties and full recycling compatibility. Specific examples are:

- 5754M, an alloy offering superior surface quality, machinability and bendability.
- 5182, an alloy offering corrosion resistance and high formability.
- 5083M, an alloy offering excellent corrosion resistance and high strength.

## 6xxx

6000 series alloys are versatile, heat-treatable, highly formable and weldable.

Novelis aluminum is extensively used to reinforce the cab roof, inner /outer door and shell structures for renowned truck brands around the world.

## Novelis Advanz™

Derived from the verb “to advance” and illustrating our continuous commitment to advancing aluminum technologies, our unique products are designated Novelis Advanz™. This portfolio of products offers a diverse range of solutions for transportation applications and is an ideal candidate for mixed-steel aluminum applications.

## e600

Advanz™ e600 is a heat treatable, balanced alloy specifically designed and optimized for high-strength requirements, both for skin and structural applications.

- Superior in-service strength is ideal for down-gauging both skin and structure components.
- It exhibits better hemming performance and corrosion resistance compared to other high-strength alloys.
- An all-round alloy that can be used for hoods, fenders, roofs, as well as for structural parts offering the potential of a uni-alloy solution.
- An ideal candidate for mixed steel-aluminum applications due to its unique strength-hemming capability.

## 6F-e170

Advanz™ 6F – e170 is heat treatable and developed for skin applications.

- Excellent formability and excellent hemming behavior enabling use in critical exterior closure panels and for demanding inner applications.
- Application potential in hood outers, door outers, fenders, deck lids and critical inners.
- Best-in-class press forming behavior.

## s360T

Advanz™ s360T is a key structural alloy that features all of the characteristics of the 6xxx Series alloys.

- Outstanding formability in T4, whereby aggressive profiles and bends (at a radius over thickness ratio of 1.15\* and above) can be stamped with limited thinning, up to 15mm gauge.
- Excellent control on grain structure leading to elimination of orange peel and superb aesthetic appearance of stamped parts.
- Excellent strength in T6 condition, where a minimum guaranteed yield strength of 345 MPa is achieved, making it ideal for structural applications in chassis and cross member components.
- Robust production process with guaranteed gauge tolerance of +/- 3% from nominal gauge.

\*dependent on lubrication type and forming parameters



# Sustainability

As the world's largest recycler of aluminum, sustainability is core to our business. Using Novelis aluminum allows our customers to reduce weight, while simultaneously meeting their sustainability goals and without compromising performance requirements, safety, quality, strength or durability. In addition, using aluminum in hybrid and electric vehicles, which are growing in popularity, reduces battery weight, extending driving range and lowers total cost of ownership.

## Fast Facts

- Freight Efficiency (Ton – miles/gallon) can increase by 13% with just a 6% weight reduction due to the use of lightweight aluminum.
- Recycling aluminum produces only 5% of the greenhouse gas emissions compared to primary aluminum production.
- 95% less energy is spent recycling aluminum than during primary aluminum production.
- 400,000 metric tons of aluminum scrap are processed each year at our state-of-the-art recycling center in Nachterstedt, Germany.
- Novelis has increased its use of recycled contents across the entire product range to 55%.



### Contact Novelis

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Not just aluminum, Novelis Aluminum.™

