# LIGHTWEIGHTING IN COMMERCIAL VEHICLE BUILDING – THE ROLE OF ADHESIVE TAPES

**The use of adhesive tapes in commercial vehicle building can help converters meet growing customer demand for lighter, more efficient vehicles**

In common with other forms of road transport, the weight of commercial vehicles has been increasing in recent years. That tendency has been driven by a number of factors, including the addition of new features to improve operator comfort and convenience, and the extra equipment required to meet modern emissions legislation.

It is now becoming clear that the weight-gain trend is running out of road. In almost every part of the commercial vehicle market, customers are increasingly looking for products that can do more with less weight. Lightweighting provides multiple benefits for vehicle operators:

- **Higher payloads.** In weight-limited applications, every kg saved in the vehicle structure allows an additional kg of cargo. And that extra capacity translates into fewer trips, and fewer road miles, saving time, fuel and labour.
- **Lower emissions.** With commercial vehicles responsible for more than 27 percent of road transport $CO_2$ emissions in Europe[1], the sector is under increasing pressure to improve the fuel efficiency of its fleets. Studies have shown that a 100kg reduction in the mass of a commercial vehicle results in lifetime $CO_2$ emissions reduction of 1.8 to 3 tonnes, with the highest savings achieved by vehicles operating in multi-stop urban driving environments.[2]
- **Smaller fuel bills.** For operators, greater efficiency isn't just good for the environment, it translates directly into meaningful fuel cost savings. On average, a 5 percent reduction in total truck weight translates into a 1 or 2 percent reduction in fuel consumption, for example.[3]
- **Operating cost savings.** In some markets, operators of lighter vehicles enjoy other important benefits, such as reductions in taxes or road tolls.

## Lightweighting approaches

Opportunities to reduce weight exist across commercial vehicle design. While some of those opportunities involve modifications to vehicle architecture, such as a change from rigid axle designs to independent suspension, the majority result from materials substitution. Replacing conventional materials such as steel or plywood with lighter-weight alternatives such as aluminium, plastics or fibre reinforced composites can deliver weight reductions of up to 74 percent in specific components.

The value delivered by different weight reduction approaches is dependent on a range of factors, including the absolute mass of the components involved, the additional cost of the lightweight alternatives and the engineering complexity of the substitution. Total cost of ownership over the lifecycle of a vehicle is also affected by issues around durability, repairability and the availability of appropriate spare parts.
In many commercial vehicle applications, including trailers and rigid truck bodies, lightweight body panels can deliver significant overall weight reduction at acceptable cost. Replacing plywood with polypropylene panels, for example, can reduce mass by 11 kg per m2, saving around a tonne in a standard semi-trailer application.[4]

## Construction challenges

The adoption of lightweight materials in vehicle body applications does create manufacturing challenges, however. The concentrated stresses created by conventional mechanical fasteners, for example, can distort panels or be susceptible to cracking in service. And construction methods may have to accommodate differences in thermal expansion coefficients between panels and frame components.



## How tapes can help

One solution to lightweight material assembly challenges is the use of adhesive bonding. In particular, commercial vehicle builders are increasingly making use of modern adhesive tapes. Bonding with tape offers several advantages in lightweighting applications:

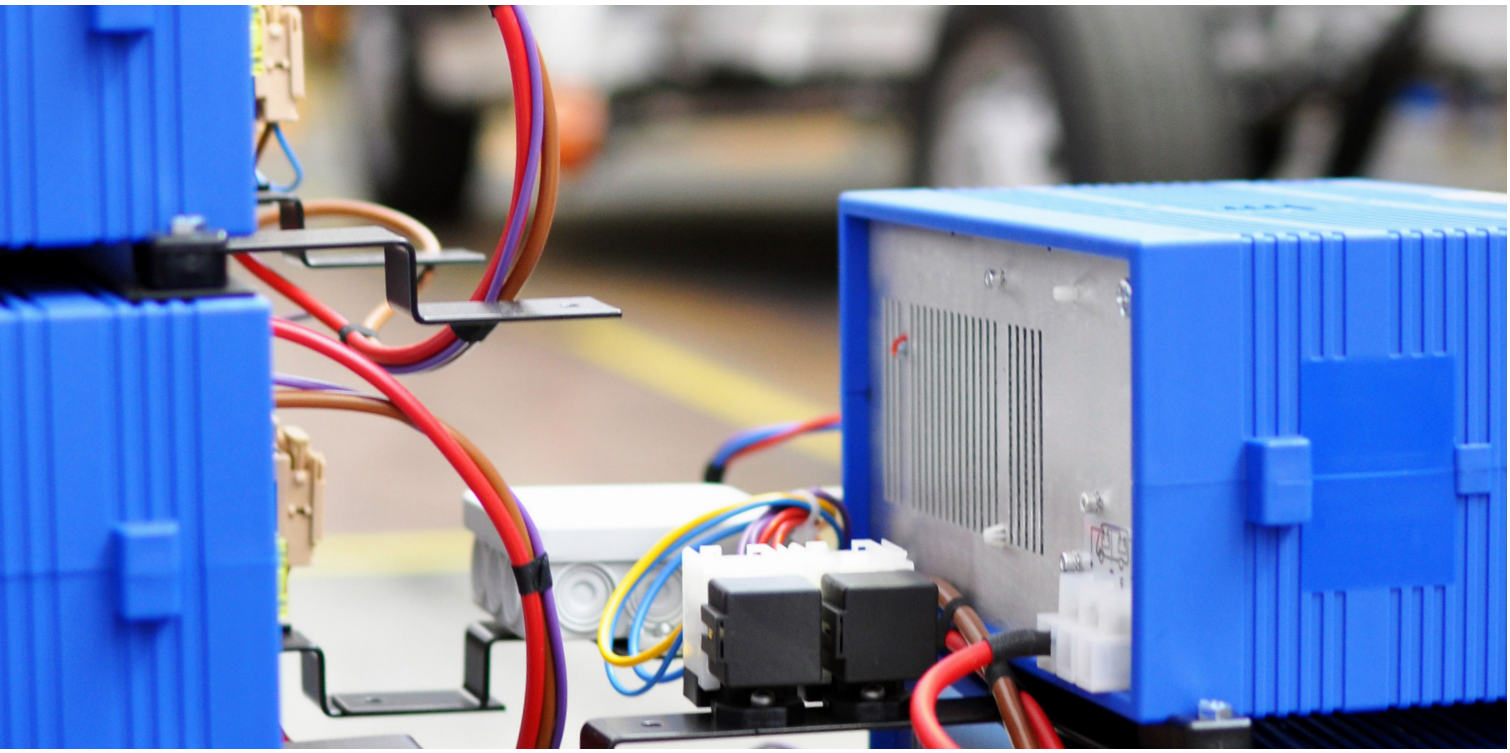
- Load is distributed along the full length of the joint, enabling the use of thinner, lighter materials without stress points or distortion. Tapes bond without requiring the high compressive forces that can damage hollow or honeycomb materials
- Tapes with flexible foam or polymer cores can accommodate differential expansion between components
- Tapes provide a strong, waterproof and fatigue-resistant bond
- Tapes can bond dissimilar materials
- Modern adhesives and surface treatments achieve a durable bond on difficult materials, such as low surface energy plastics e.g. PP
- Tapes can bond and seal in a single process, and reduce or eliminate the requirement for holes and mechanical fasteners, further enhancing durability and weatherproofing
- Tapes are invisible once installed, providing aesthetic benefits and smooth interior and exterior surfaces that are easy to clean
- Tapes are quick and clean to install, with minimal waste, simple surface preparation and no post-assembly clean up
- Unlike liquid adhesives, tapes provide immediate handling strength reducing cycle times and simplifying manufacturing sequences
- Tapes improve ergonomics in manufacturing operations, reducing operations such as drilling or abrasive finishing that can be noisy and present hand-arm vibration risks

## Adhesive tape applications on commercial vehicle bodybuilding

Leading OEMs, suppliers and vehicle conversion specialists are already using adhesive tapes in a range of lightweighting applications. They include:

- Mounting of stiffening bars to sidewalls
- Roof system installation
- Securing floors
- Mounting rub strips and other exterior components

With operators and regulators paying increasing attention to the energy efficiency and emissions performance of commercial road transport, vehicle weight is firmly in the spotlight. The use of high-performance adhesive tapes can help vehicle OEMs and bodybuilders to overcome the assembly challenges involved with advanced lightweight materials, enabling the cost-effective production of designs that perform better in service, reduce environmental impact and save money for their owners.



Our management system is certified according to the standards ISO 9001, IATF 16949, and ISO 14001. All our products delivered to automotive customers are listed in the International Material Data System (IMDS).

1 Light weighting as a means of improving Heavy Duty Vehicles' energy efficiency and overall $CO_2$ emissions, Ricardo report for DG Climate action, P1 (https://ec.europa.eu/clima/sites/clima/files/transport/vehicles/heavy/docs/hdv_lightweighting_en.pdf)

2 https://www.european-aluminium.eu/media/1878/ifeu-energy-savings-by-light-weighting-2016-update-full-report.pdf

3 Ricardo report

4 Ricardo report P10

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