



SERVICE 4.0

A solution that sticks –
Choosing the right
adhesive for your
vehicle's exterior parts

Choosing the right adhesive for your vehicle's exterior parts

The global automotive industry is growing continually¹ due to rising requirements for increased mobility around the globe. The sustained increase in vehicle demand, combined with the need to cut vehicle weight to increase fuel efficiency and reduce emissions is driving a forecasted 4.4% growth in the automotive adhesives market by 2025².

Today, there are a wide and growing number of self-adhesive attachment solutions for original equipment suppliers (OESs) in the automotive industry to choose from. Selecting the right one to meet the attachment part mounting requirements of original equipment manufacturers (OEMs) while also ensuring optimal process efficiency is a critical challenge.

This paper explores the key factors for automotive OES design engineers and process engineers to consider when choosing an automotive exterior tape. It compares the benefits of polyethylene (PE) and acrylic foam adhesives and examines various acrylic foam solutions in detail. It also suggests what an OES should look for from an adhesive solutions manufacturer and offers opinions on the future of automotive adhesives.

Where are adhesive tapes used on a vehicle?

Exterior applications

Adhesives provide effective solutions in many places on the exterior.

- Aeroflap
- Emblem
- Rocker panel
- Body side molding
- Door edge molding
- Roof trim
- Brake light spoiler
- Headlight washer
- Fender flare
- Shark fin antenna
- Window frames
- Park distance sensor
- Front and rear molding
- Seals



When deciding what to use for plastic bonding it is important to consider the OEM’s specifications, the bonding substrates and the design parameters.

The OEM usually defines the specifications for attachment parts, but only some issue the material approvals for the tape itself.

More and more OEMs are focusing on part approval, which places the responsibility for car body tape selection on the OES. However, there are several issues for the OES to consider when choosing the appropriate tape.

One of these is how the adhesive tape will perform with low surface energy (LSE) plastics like PP/EPDM (polypropylene/ethylene propylene diene monomer) or medium surface energy (MSE) plastics like ABS (acrylonitrile butadiene styrene), PMMA (polymethyl methacrylate), PC (polycarbonate) and ASA (acrylonitrile styrene acrylate). LSE and MSE plastics are commonly used as exterior substrates. Another consideration is the impact of diverse OEM clear coats, which can create bonding challenges for adhesive tape. The matching of both the substrate and the clear coat makes choosing the right tape a complex decision.

The tape provides both mounting and sealing functions for exterior parts. A tape thickness of 0.5 mm – 2 mm is typically used. Both filmic (e.g. curved applications) and paper liners (e.g. converter die-cuts) are established in the market. Tapping and bridge tape can be added to enable easy peel-off of the liner by the OEM.

**Making the right choice:
PE or acrylic foam tapes?**

Knowing what tape has strong bonding for plastic parts is critical.

PE foams have been used in the automotive industry for many years and offer good cold shock performance below -40°C because of their superior stability. However, acrylic foams also operate well within OEM cold shock resistance requirements. They provide an excellent tape for plastic and can offer a wider performance envelope overall.

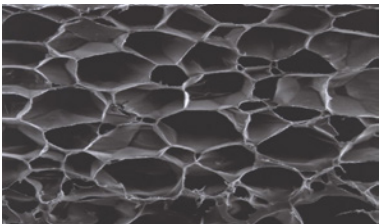
The table below compares the performance of PE and acrylic foam tapes in four key areas:

Properties	PE Foam Tape	Acrylic Foam Tape
Density	50–400 kg/m ³	500–900 kg/m ³
Cold shock resistance	Below - 40°C Better cold shock performance	Max. - 40°C
Max. peel adhesion with cohesion failure	20 N/cm	60 N/cm
Compensation of the thermal elongation of parts	Very limited, therefore only suitable for smaller parts	Yes, therefore suitable for all kinds of exterior parts

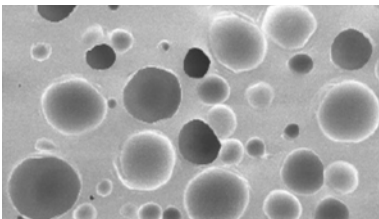
The matching of both the substrate and the clear coat makes choosing the right tape a complex decision.

In most cases, OEMs use acrylic foam tape because its viscoelastic feature can compensate for the thermal expansion of different materials. The higher density of acrylic foam tapes provides greater viscoelasticity and more durability for improved sealing against visible gaps, humidity and liquids. PE foam tape has a very limited ability to compensate for thermal expansion.

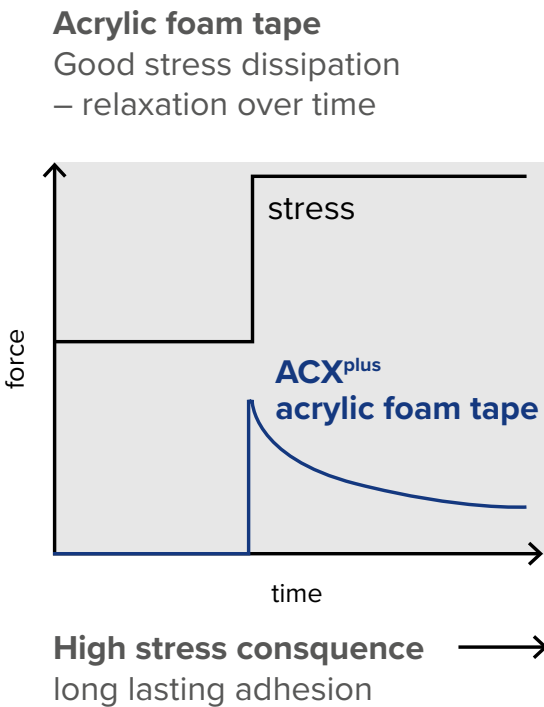
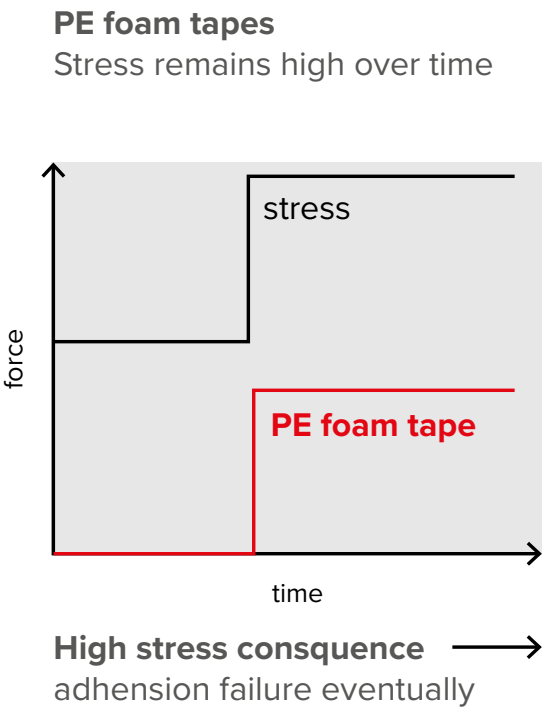
Because of their rigid mechanical structure, the limited ability of PE foams to compensate for the thermal elongation of external vehicle parts means they are only suitable for mountings on smaller components. In contrast, acrylic foams can dissipate component stress and compensate for thermal elongation. This makes them suitable as a high-performance solution for all exterior parts.



PE Foam Tape - low density 67 kg/m³



Acrylic Foam Tape - high density 800 kg/m³



Viscoelasticity: Special feature of an acrylic foam core tape

How to choose the right acrylic foam tape

There are several issues for design and process engineers to consider in selecting an acrylic foam tape.

Make sure the tape is thick enough for thermal elongation.

Thermal elongation affects different body parts and attachments in different ways. It is important to select an acrylic foam tape that is thick enough to withstand the thermal elongation of the required part.

For example, the table below shows the effects of different temperatures on material bonding combinations - ABS plastic and steel, and polypropylene plastic and glass.

Part with 800 mm length (at RT)	Difference in length in mm	
	Expansion at 90°C	Contraction at -40°C
Material combination		
ABS / Steel	3.42 mm	-2.93 mm
PP / Glass	4.34 mm	-3.72 mm

E.g. $4.34 \text{ mm} / 2 = 2.17 \text{ mm}$ length difference on each side
 $2.17 \text{ mm} / 1.5 = 1.45 \text{ mm}$
→ ACX^{plus} in 1.5 mm thickness

Surface energy and tape performance

Plastics used for parts in the automotive industry usually exhibit medium or low surface energy. The lower the surface energy of the substrate, the more difficult it will be for the tape to adhere to it. As primer is usually needed for low surface energy substrates, primerless acrylic foam tapes become increasingly popular, enabling production to skip primer use, which has positive safety and environmental impacts.

It is also important to consider the effects of the clear coat being used by the OEM, and its impact on tape adhesion performance. Each OEM has several types of clear coat and some are easier to bond to than others. Testing on the original clear coat is always recommended in case the OEM has not issued a material approval for the adhesive tape.



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The road ahead for automotive adhesives

There is a varied assortment of acrylic tapes for a wide range of applications. No single tape will solve every challenge. Thorough testing and discussions with the adhesives manufacturer beforehand will enable the selection of the most suitable adhesive product.

The introduction of black tape to replace grey tape is a recent development that is delivering benefits to the automotive industry. Used on items such as vehicle emblems and larger attachment parts, black tape can effectively hide any gaps between the component and the body part for a better visual finish.

As OEMs increase the degree of electrification and smart functions in automotive parts (such as fingerprint sensors and advanced lighting features) these will require electrical connections and will generate heat. This will enhance the need for functional adhesives that can provide electrical and/or thermal conductivity on top of the mounting feature.

Developments in automotive body coatings will continue to challenge the mounting capabilities of adhesives, and aesthetic advances such as clear tapes may feature in the near future.

What you should expect from your automotive adhesive provider

Selecting the right adhesive material is essential, but there is more to a successful solution than delivering a product.

Sticking with what you know is not always the best option. Modern improvements in materials are encouraging OESs to consider the benefits of new and advanced tapes for their operations.

However, they must be confident that their production processes will not be negatively impacted by changing their tape. In these situations, the adhesive provider can offer real value by advising on the most suitable tape, how to apply it and any recommended process or manufacturing improvements that should be considered to achieve the best results during the application of the tape to the part by the OES and for the attachment of the part to the vehicle by the OEM. The OES should be able to confidently rely on the automotive adhesives manufacturer as a trusted solutions partner as well as an effective product provider.

Efforts for sustainability

With sustainability such an important issue in modern manufacturing, adhesives manufacturers that comply with all national and international environmental standards and use products free of harmful substances such as perfluoroalkyl and polyfluoroalkyl (PFAS) systems can provide peace of mind to customers.



Supply security

Having more manufacturing options to choose from can increase supply security for the OES or OEM.

Ensuring the manufacturer can guarantee the delivery of high-performing adhesives in time is vital to operational efficiency.

Customer support

Comprehensive customer support can be critical in helping the OES select the most appropriate tape and ensuring operations run effectively and with certainty.

A full-service offering from an adhesives manufacturer will include:

- a close sales service with on-site support
- focus and dedication to the customer, and, where appropriate, to the customer's customer
- technical sales support from knowledgeable and experienced engineers
- comprehensive testing facilities so that parts and substrates from the OES and the OEM can be tested against adhesives to identify the right product
- a thorough assessment of the OES's production processes (and sometimes the OEM's production processes) to identify any potential improvements
- Supporting the customer in choosing the right tape

A reliable partner

tesa is one of the world's leading manufacturers of self-adhesive products and systems solutions in the automotive industry. We go beyond delivering world-class tesa automotive tape for OEM and OES operations by providing a trusted service that is second to none.

We listen to our customers and work closely with them, wherever they are. Whether assisting with engineering innovations, aiding design or consulting on things like the best PP-EPDM adhesive or double sided tape to use, our engineers are always available, offering hands-on support and expertise.

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Case study: Global expertise at the local level

A European-headquartered OEM was experiencing adhesion challenges with plastic components and enlisted tesa for support.

Firstly, our application process engineers considered the surface of the vehicles to cause the issues. They visited the OEM's production line and identified some process improvements. After a thorough review of attachment parts, analytics, extensive testing at our laboratories in Norderstedt, Germany, and on-site discussions with the OEM and the OES in different countries, we identified that the issue was due to the relationship between the plastic used in the moldings and the adhesive.

We delivered a solution. Switching to a different acrylic foam tape more suited to the specific materials being used created an excellent bond for plastic mounting. Our quick and comprehensive support and response allowed continuous production for the OES and the OEM.

Case study: Understanding your needs

At tesa, being close to our clients is important to us. We take time to understand their requirements before delivering the right solutions. This includes detailed engineering discussions between both sides on subjects such as materials composition, shape, design of the parts and production characteristics.

We call it collaborative problem solving.

Obtaining detailed information from a customer at the design stage enabled us to consider the most appropriate products. We then undertook extensive material tests to confirm suitability and guided the customer through to the right tape choice.

Sometimes our product range may not fully match the initial requirement. In such cases, we work to find a solution for a product adaptation incorporating our extensive research and development capabilities in the process.

Through our global network of production sites, customer solution centres and local sales support delivering consistent quality we aim to provide a personal touch.

To us, small things make a big difference

With 125 years of experience, tesa has the expertise to provide peace of mind that every aspect of the automotive adhesive process is fully taken care of. Our quality is OEM quality.

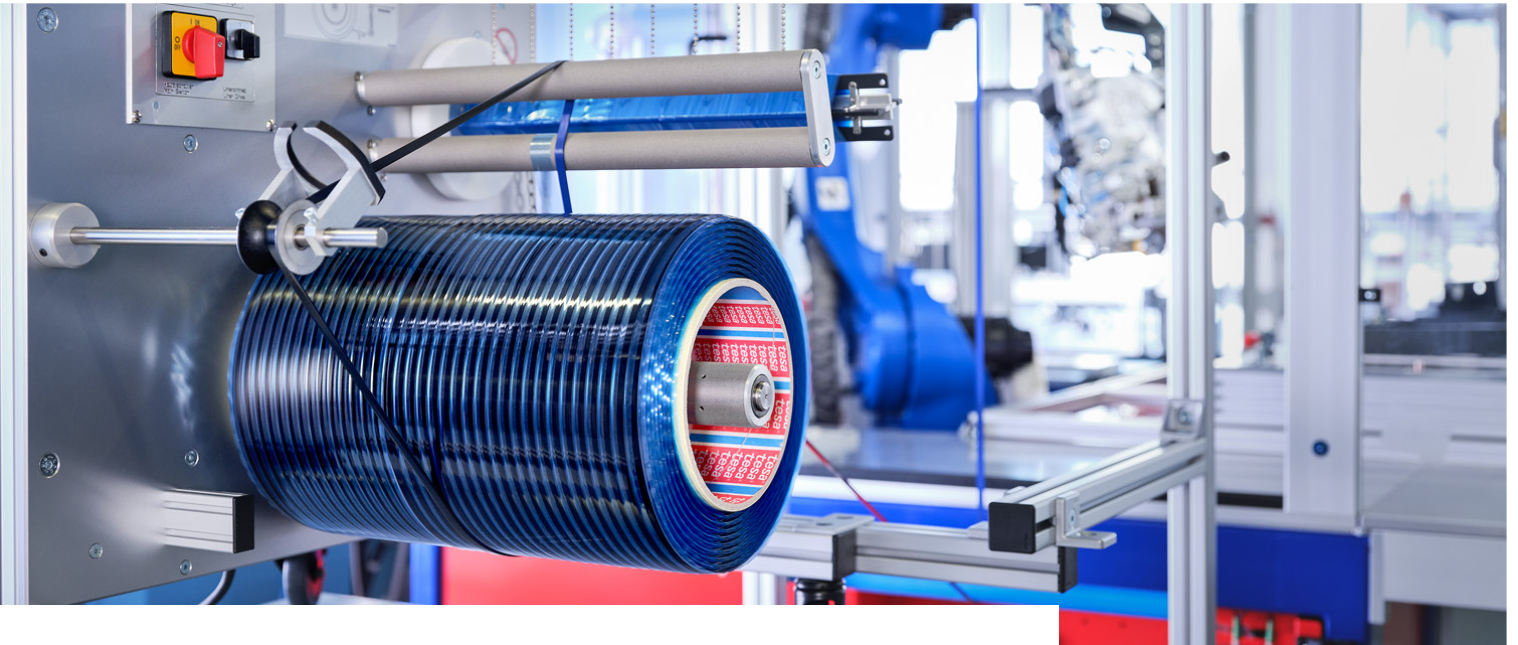
With regional expertise, innovative engineering and fully collaborative solution identification, we go the extra mile to deliver the right results. Together, we make the automotive experience better.

Let's solve your adhesive issues today.

Contact us here: automotive.global@tesa.com

References

- 1) <https://www.globenewswire.com/en/news-release/2021/10/07/2310152/0/en/Automotive-Industry-to-grow-205-Million-Units-by-2028-registering-a-CAGR-of-4-5-Report-by-Market-Research-Future-MRFR.html>
- 2) <https://www.grandviewresearch.com/industry-analysis/automotive-adhesives-market>



Certifications

Our company is focused on international quality, environmental, and occupational safety standards.

Please find more information regarding our certifications at:
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