FEICA The European voice of the adhesive and sealant industry

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Adhesives in the regulation of end-of-life vehicles (ELVR)

In July 2023, the European Commission published a proposal for a regulation on *circularity requirements for vehicle design and end-of-life vehicles* ('ELV regulation proposal', document COM 2023/451, 'ELVR'). The proposal describes various measures to increase the circularity of vehicles, e.g., through *vehicle design* or through an *extended producer responsibility* (EPR) system.

Both in the requirements on vehicle design ('circularity strategy', Article 9 and Annex IV) as well as in the requirements on EPR ('fee modulation', Article 21), adhesives are mentioned explicitly as potential impediments to end-of-life-vehicle circularity, that shall be addressed in the vehicle design process and in the EPR fee setting. The text of the articles and the Annex imply that adhesives are *in **general*** a substantial challenge for the ***dismantling*** and for the ***recycling*** of end-of-life vehicles.

FEICA fully supports the EU's Circular Economy strategy and the goals of the ELVR, and indeed, many adhesives' applications have been allowing the successful dismantling of vehicles, including for repairs, for many years. The adhesive industry invests heavily in innovation to further improve the recycling of bonded parts, e.g., through 'debonding by design' and the use of adhesives that do not impact the quality of recycled materials. The explicit mentioning of adhesives as an arbitrary example for materials creates regulatory insecurity and jeopardises investment into research and innovation, and hence should be removed.

To ensure that the adhesive industry can continue enabling innovative solutions for vehicles, *FEICA strongly insists:*

- ***Removing the negative example of adhesives** as a challenge for the dismantling and for the recycling of the end-of-life vehicles, both in the requirements on vehicle design ('circularity strategy', Article 9 and Annex IV) as well as in the requirements on EPR ('fee modulation', Article 21)*
- *And secondly, **changing the wording of the definition of 'plastic'** in the regulation proposal to align with the definition provided in Directive (EU) 2019/904*

Adhesives enabling repair, dismantling and recycling of vehicles

A typical mid-sized car contains less than 10 kg of adhesives in total, spread over numerous specialised applications and application-specific formulations. Although negligible in terms of mass, the positive contribution of adhesives to the sustainability and performance of vehicles is significant.

Adhesives in automotive applications

Adhesives play a critical role in the production and assembly of most vehicle components, including the body, windows, drivetrain (for both electric and internal combustion engine vehicles), suspension, trim and interior, and electrical systems, including the high voltage batteries in battery electric vehicles. Adhesives enable optimal bonding of parts, with a focus on performance, durability, longevity and crash safety. Additionally, adhesives are key to combining dissimilar materials,

enabling light-weight designs such as mixed-metal vehicle bodies and the use of composite materials as structural components. In electric vehicles, adhesives provide crucial bonding solutions for the battery systems. An extensive list of adhesive applications is provided at the end of this document.

The benefits of using adhesives in vehicle construction include enabling ***lightweight*** vehicles with lower energy consumption and emissions, increased ***safety*** and crash resistance, and improved longevity, ***durability*** and ***reusability*** of car parts.

The use of adhesives in modern vehicle production is essential, as they cannot be substituted without substantial negative consequences. As such, regulating or discouraging the use of adhesives in a generalised way, without a **detailed impact assessment**, can incur potentially severe negative consequences for vehicle safety and sustainability.

Adhesives in the dismantling of end-of-life vehicles

Adhesives have a long history in vehicle production and assembly and have, in many cases, been allowing the successful dismantling of vehicles, including for repairs. This is evidenced by the large market in Europe for used vehicle components, which have been secured by thread lockers, adhesive tapes, and other adhesive bonds during the vehicles' service life.

The ***mechanical separation*** of various adhesive bonds is well established and routinely practiced in repair jobs. For example, in windscreen replacement, this separation is performed by cutting the adhesive bond with a wire. Protective and decorative films on the bodies of vehicles can be removed by hand after gentle heating thanks to the adhesives which thus contribute to enhance the lifespan and value of vehicles. Many other adhesive bonds, such as those on aerodynamic elements and trim components, can also be separated readily by mechanical force, requiring no more or a less effort than releasing mechanical fasteners such as rivets. Using mechanical force for dismantling adhesive bonds may also be quicker than removing many mechanical fasteners like screws. Adhesives, which are applied in addition to mechanical fasteners, such as thread lockers, release with the mechanical fastener they secure in place. Therefore, they generally do not introduce additional hurdles or steps in the dismantling of vehicles.

At the same time, ***not all adhesive bonds need to be dismantled*** for successful reuse or recycling. For example, structural adhesives applied between metal components or parts of the same metal family (e.g., structural adhesives and foams in the vehicle bodies, or seam sealers) generally do not need to be released, as the entire bonded component or part may be sent to metal recycling or preparation for metal recycling (see below).

Adhesive bonds *within* the vehicle components, such as textile and trim lamination, stickers and the adhesives within electrical and electronic components, are typically not targeted for further dismantling. In such cases, subsequent recovery and recycling processes for these components or parts may be set up to perform by separation of the adhesive bond, where required, as described in the following section.

Innovative adhesive concepts can also allow for ***debonding on command***, where the adhesive bond is specifically weakened through an external trigger, allowing for easy separation of the bonded surfaces[1] during repair and during preparation for reuse or recycling.

The use of adhesives in vehicles, therefore, **does not present a general impediment** to the dismantling of end-of-life vehicles or the removal and replacement of specific parts and components in vehicles.

Adhesives in the recycling of end-of-life vehicles and their parts

After refurbishment and remanufacturing, vehicle recycling is the most important strategy for a circular economy for vehicles. When the impact of adhesives on recycling operations is considered, two principal distinctions need to be made that relate to the materials being bonded:

- Whether the adhesive was used to bond similar or dissimilar materials together
- The nature of the target material for recycling, e.g., a certain metal, a certain plastic material, or glass

Where an adhesive bonds similar or identical materials together, the bond may not need to be released for recycling. For example, adhesives are known not to impede metal recycling processes, such as steel and aluminium recycling, which both exhibit very high recycling rates from automotive applications[2, 3]. Adhesive applications are destroyed before melting in the melt processes applied to steel, and in the de-coating processes applied to aluminium waste[1, 4]. This includes not only structural adhesives used on metal body and drivetrain components but also residues left by thread lockers, retaining compounds and similar products on metal components. The quality of recycled glass is also typically not substantially affected by adhesives[1, 4]. Similarly, adhesives can be designed to be ***compatible with recycling*** processes for plastic materials. This is an already widely followed approach in the design-for-recycling of plastic packaging materials that are produced using adhesives. In the vehicle sector, an example is the recycling of self-adhesive decorative vehicle wrapping films[5].

Where dissimilar non-metal materials are bonded by adhesives, separating the different materials may be required. The release of the adhesive bond typically occurs ***mechanically***, e.g., by manual release or shredding, followed by density-based separation, sensor-based sorting, or sieving to separate the released materials into two or more fractions. Separation of bonded materials depends on the specific combination of materials and adhesives and therefore requires specific consideration[1]. However, such cases are not representative of adhesives' applications in vehicles as a whole.

The use of adhesives in vehicles **does not present a general impediment** to the recycling of materials from end-of-life vehicles. The individual cases where a release of an adhesive bond is necessary for recycling require specific consideration **and cannot be successfully regulated in a generalised way**.

Adhesives are not plastics

Unlike other EU legislation aiming at contributing to the transition to a circular economy (e.g., Directive (EU) 2019/904), the draft text of the ELVR cites the definition of plastics in Regulation (EC) No 1907/2006 without further specifications. This can lead to misunderstandings in the supply chain where the adhesive is wrongly considered as a plastic.

To avoid difficulties in the calculation of recycling rates, in meeting recycled content quotas and in distinguishing between monomaterial and multimaterial ('composite') components, FEICA strongly advocates for **changing the wording of the definition of 'plastic' in the regulation proposal to align with the definition provided in Directive (EU) 2019/904.**

Adhesives in automotive applications are polymeric materials, but they do not fulfil the key requirements of the established technical definitions of a 'plastic' in standards (e.g., ISO 472, EN 17615) or the definition of 'plastic' in existing European law (e.g., Directive (EU) 2019/904, Regulation (EU) No 10/2011). Unlike plastics, adhesives and sealants are never the main (structural) component of a finished product as required by the legislation mentioned above. In another differentiation from plastics, adhesives enter the recycling processes for the materials they are applied to, rather than being the target of recycling themselves.

Considering adhesives as plastics in the regulation will lead to difficulties in the calculation of recycling rates, in meeting recycled content quotas and in distinguishing between monomaterial and multimaterial ('composite') components.

Conclusion

FEICA is convinced that **the explicit and generalised mention of adhesives as an impediment to dismantling and recycling in the ELV regulation proposal is inaccurate, as adhesives can allow for and even enable successful dismantling and recycling**.

FEICA also believes that the current wording constitutes an uneven playing field, as other materials and bonding technologies that may affect dismantling and/or recycling are not mentioned. Therefore, FEICA strongly advises to **remove the mention of adhesives from the text of the ELV regulation proposal.**[1]

Furthermore, FEICA would like to highlight the danger of **wrongly classifying adhesives as plastics** due to the current wording of the plastics definition in the regulation proposal, being too general and omitting the key requirements for structural properties provided in prior legislation.

To avoid difficulties in the calculation of recycling rates, in meeting recycled content quotas and in distinguishing between monomaterial and multimaterial ('composite') components, FEICA strongly advocates for **changing the wording of the definition of 'plastic' in the regulation proposal to align with the definition provided in Directive (EU) 2019/904.** For regulatory clarity, the exclusion of adhesives from the definition of 'plastic' should be explicitly stated in the recitals or the legal text of the regulation itself.

[1] Specifically, removal of 'such as adhesives' from Article(21)(e) of the proposal and 'for example adhesives' from Annex IV, Part A, Point 5(d), and from Annex IV, Part B, Point 3(c).

Examples of applications of adhesives in vehicles

Key adhesive applications in vehicles include:

- Adhesives for bonding different components of the body, including light-metal and composite components that reduce vehicle weight
- Adhesives for reinforcing lightweight metal body components and improving crash safety (e.g., in bumper beams, pillar reinforcement)
- Adhesives for bonding the windscreen onto the body as a structural element, increasing rigidity, reducing vehicle weight and improving safety
- Crash-proof bonding of the rear-view mirror to the windscreen
- Lamination of the surfaces of interior panelling, cladding, trim and dashboards, including lamination with safety-improving soft surface materials
- Adhesives for upholstery and other automotive textiles, and for the production of airbags
- Attachment of exterior functional elements with self-adhesive tapes, such as aerodynamic elements
- Thread lockers, retaining compounds and other adhesives that ensure reliability and ruggedness of vehicle components, especially in the drivetrain and the suspension
- Various adhesive applications in the production of electrical and electronic components
- Adhesives for the production, assembly and casing of high voltage electric batteries
- Self-adhesive protective and decorative films for vehicle bodies, preventing paint damage and reducing the need for repainting
- Various legally required stickers, such as type codes, airbag warnings, and fuel, charging and operating fluid type information

For **concrete examples** of specific applications of adhesives and their benefits, see [6–9].

References

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FEICA, the Association of the European Adhesive & Sealant Industry, is a multinational association representing the European adhesive and sealant industry. Today's membership stands at 16 National Association Members (representing 17 countries), 25 Direct Company Members, and 25 Affiliate Company Members. The European market for adhesives and sealants is currently worth more than 19.9 billion euros. With the support of its national associations, direct members and affiliated members, FEICA coordinates, represents and advocates the common interests of our industry throughout Europe. In this regard, FEICA works with all relevant stakeholders to create a mutually beneficial economic and legislative environment.

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