EuRIC CALL FOR RECYCLED PLASTIC CONTENT IN CARS -POSITION PAPER-

Plastic is the second most commonly used material in vehicles after metals. Modern cars contain several plastic parts and components (e.g., dashboards, bumpers, handles, buttons, casings, ceiling fabric, seats, seat belts, airbag, carpeting, etc.). The use of plastics in the car manufacturing industry presents several advantages, such as a vehicle mass reduction, which leads to lower fuel consumption and a decrease in emissions of Green House Gasses (GHG). **For example, lowering the overall weight of a vehicle by 10 kg can cut 1 g/km of CO_2 emissions[1] that is 480 kg of CO_2 over its lifetime (considering a maximum life expectancy of up to 480,000 km)[2].** Furthermore, plastic parts have several technical properties, such as impact strength, thermal insulation, noise reduction, and corrosion resistance that make them an optimal material to be used in vehicles[3].
Assuming that an average car weighs 1,300 kg and that plastics content represents 12-15% of its mass (50% of car volume), this amounts to 150-200 kg of plastic per vehicle[4], and this is expected to increase in the coming years due to a growing demand from the market for high-performance, lightweight and fuel-efficient, safe vehicles[5].

EuRIC represents authorized treatment facilities (ATFs) and the vast majority of end-of-life vehicles (ELV) recycling facilities (i.e., shredders and post-shredder installations), as well as of technical plastics recyclers which recycle ELVs including ELV plastics. These companies have pioneered for the last twenty years technical plastics recycling, not only in Europe but globally, by recycling the most common types of polymers present in cars, and meeting similar performance standards as virgin polymers used in new cars.

Yet, **the untapped potential to increase plastics circularity in cars is substantial** and hampers investments into mature technologies to recycle more plastics from ELVs in Europe incidentally bringing huge environmental, social and economic benefits.

Binding post-consumer recycled content targets for plastics in cars are the much-needed signal to boost circularity and combat global warming as it:

- Provides the certainty needed by Europe's technical plastics recyclers to invest and scale up capacity in mature technologies providing quality recycled plastics for the automotive sector;
- Rewards plastics recycling substantial benefits in terms of GHG emissions and energy savings that the market fails to internalise in prices;
- Improves design for recycling of plastics in cars and investment into innovative technologies to recycle certain types of polymers which are currently not recycled.

Types of plastics used in car production

There are currently about 39 different types of basic plastics and polymers used to make an automobile[6]. The most common ones (approx. 74% of the plastic used in cars) are **polypropylene (PP)** (35%) (e.g., bumpers, cable insulation carpet fibres, etc.), **polyurethane (PU)** (19%) (e.g., foam seating, insulation panels, suspension bushings, cushions, electrical compounds, etc.), **polyamides (PA)** (11%) (e.g., battery casings, brake hoses, oil sumps, etc.) and **polyvinyl chloride (PVC)** (9%) (e.g., instrument panels, electrical cables, pipes, doors, etc.)[7]. A variety of other plastics and polymers, including engineering plastics, are also used and combined for other automotive parts (e.g., acrylonitrile butadiene styrene (ABS), polystyrene (PS), polyethylene (PE), polyoxymethylene (POM), polycarbonate (PC), acrylic (PMMA), etc.)[6].

Plastics recycling from ELVs – State of play

Automotive is a major industrial and economic force worldwide with an annual estimation of **40 million ELVs globally**[8]. The proper management of ELVs in accordance with the ELV directive is of paramount importance to move towards a more circular economy as defined in the Circular Economy Action Plan (CEAP).

In Europe, between 6 to 7 million of ELVs are treated annually in compliance with the ELV Directive while around 4 million vehicles ended up in unknown whereabouts[9]. The 6.6 million of ELVs treated in 2017 generate over eight million tonnes of waste[10], from which more than one million tonnes corresponds to plastics. Circular plastics in ELVs should translate in proper recycling of plastics parts to ensure they find their way back into new cars[11].

The development of mechanical and thermal recycling of plastics from Automotive Shredder Residue (ASR) in the EU stems directly from the ELV Directive which imposes high weight-based recovery targets, namely 85% of material recovery and 10% of energy recovery. State-of-the-art post-treatment technologies enables to recover ELV plastics' fractions which are then separated per polymer using different separation technologies, such as float-sink tanks (i.e., density separation), or laser and infra-red systems used to separate plastics based on colour. The final recycling steps consist in shredding and extrusion, which results in the production of post-industrial pellets by polymer-types meeting industry specifications for their re-incorporation into new cars. In addition, polymers containing volatile and solid contaminants that need to be thoroughly extracted in order to produce high-quality re-granulate suitable for reuse, are re-processed by special vacuum degassing extruder modules.

The increasing complexity of multi-material vehicle design has created several challenges for vehicle recycling. For example, the wide variety of plastics used in automobiles (incl. a large number of resins, different additives, etc.), or the presence of reinforced plastics (containing fillers such as glass fibre, carbon fibre and glass beads) that are difficult, if not impossible, to recycle. Mainly due to those challenges and the lack of incentives to encourage an increased demand of recycled plastics in the automotive sector, only polymers present in higher amounts (e.g., PP, ABS, PS) are currently being recycled.

The need for recycled plastics content in cars

Front runners in the automotive industry are already sourcing post-consumer and post-industrial recycled plastics for several parts of new cars, primarily interior and drivetrain components. To quote only a few publicly-available examples, a major French car-maker incorporates up to 20% recycled plastics in the cars manufactured in Europe that translates into more than 50 kg of recycled plastics[11]. The same company has set a recycling scheme for polypropylene (PP) shields. As a result, seven qualities of PP from the automotive recycling sector have already been validated, three of which are used for serial applications, in particular for wheel arches, while the others are being validated on vehicle projects[12]. Plastics from industrial or household waste, which given their degradation are no longer suitable for similar applications, are increasingly being recycled into durable plastics to make new car parts. For instance, other automobile manufacturer uses recycled polyurethane foam plastic in the seat cushions of one of its flagship models and the wheel liners of another model are made with 64% recycled plastics[13]. A premium Scandinavian automotive manufacturer aims to integrate 25% of recycled plastic in cars by 2025[14].

Technical plastics recyclers have proven for the last decade that the technology to recycle the most commonly used polymer types (PP, PE, PP, PS, ABS) in ELVs is mature enough to deliver the quality required by the car industry at a competitive price except if oil prices drop significantly. **Yet, the vast majority of ELV plastics are not recycled or are down-cycled due to the lack of end-markets and design for circularity; hence, the untapped potential is extremely significant and will certainly keep growing as plastics contained in vehicles is expected to further increase.**

A rough estimate shows that if the plastics from all ELVs generated in Europe were recycled, it could potentially avoid about 1 Mt of CO_2 eq.[15], which could compensate for the carbon footprint of producing 100,000 new cars. A plastic amount that if not recycled would be otherwise landfilled or incinerated; therefore, **plastics recycling results in major environmental benefits not only in terms of circularity but also in terms of global warming mitigation**, confirming that ELT recycling supports the overarching objectives set in **The European Green Deal** to speed up the transition towards a circular economy and achieve climate neutrality by 2050.

Binding recycled content targets for plastics in cars instrumental to boost plastics circularity in the automotive sector

To achieve a truly circular economy and combat climate change, measures to pull the demand for recycled content are instrumental to bridge high recycling targets with end-markets and proper design to avoid material down-cycling. Technical plastics recyclers and front runners of the automotive sector have proven over the last two decades that it is possible to gradually increase the share of recycled plastics into new cars.

Binding post-consumer recycled content targets for plastics in cars are vital to:

- **Increase circularity** of plastics used in the automotive sector;
- **scale-up recycling** capacity in Europe by securing long-term demand; and
- **maximize resources**' as well as **greenhouse gas emission savings**.

In line with the Plastics Strategy, it is vital to scale up plastics recycling cars by securing long-term demand through binding recycled content for thermoplastics used in new cars.

This can be accompanied by targeted eco-design measures in the form of best practices to, for example, reduce additives, ensure that paints used on plastic parts can easily be separated at recycling stage, or avoid the use of plastics made with a mixture of polymers. Also, economic incentives for car manufacturers to incorporate recycled plastic in vehicles could be considered.

Gradual and fully achievable recycled content targets for post-consumer thermoplastics in new cars should be set as follows:

- **25% by 2025,**
- **30% by 2030 and,**
- **35% by 2035.**

The recycled content targets shall be calculated on the basis of the total weight of thermoplastics used in each car. Such recycled content targets would directly support the objectives set in the Plastics Strategy of reaching 10 million tons of recycled plastics used to make products in the EU by 2025.

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The European Recycling Industries' Confederation - is the umbrella organisation for recycling industries. Through its Member Federations and Companies from 21 EU&EFTA countries, EuRIC represents across Europe over:

- 5,500+ companies generating an aggregated annual turnover of about 95 billion €, including large companies and SMEs, involved in the recycling and trade of various resource streams;
- 300,000 local jobs which cannot be outsourced to third EU countries;
- Million tons of waste recycled per year (metals, paper, glass, plastics, WEEE, ELVs, tyres, textiles and beyond).

By turning wastes into resources, recycling is the link which reintroduces recycled materials into the value chains again and again. Recyclers play a key role in bridging resource efficiency, climate change policy and industrial transition.

REFERENCES

[1] Plastics Europe (2013). Automotive – *The world moves with plastics*. Retrieved from: https://www.plasticseurope.org/download_file/force/935/750

[2] Weisbaum, H. (2006) *What is the life expectancy of my car?* NBC news. Retrieved from: http://www.nbcnews.com/id/12040753/ns/business-consumer_news/t/whats-life-expectancy-my-car/#.XkEc_GhKhPY

[3] Pradeep, S.A., et al. (2017) *Automotive applications of plastics: past, present, and future*. Applied Plastics Engineering Handbook. William Andrew Publishing, pp. 651-673). Retrieved from: https://www.sciencedirect.com/science/article/pii/B9780323390408000316

[4] Merkisz-Guranowska, A. (2018). *Waste recovery of end-of-life vehicles*. IOP Conference Series: Materials Science and Engineering. 421. Retrieved from: https://www.researchgate.net/publication/-328227295_Waste_recovery_of_end-of-life_vehicles

[5] Kosacka-Olejnik, M. (2019). *How manage waste from end-of-life vehicles?* - method proposal. IFAC-PapersOnLine. 52. Retrieved from: https://www.sciencedirect.com/science/article-/pii/S2405896319314326

[6] The Plastics Industry Trade Association (2016). *Automotive Recycling – Devalued is now Revalued*. Plastics Market Watch – *A series on economic-demographic-consumer & technology trends in specific plastics in markets*. Retrieved from: https://www.plasticsindustry.org/sites/default/files/2016-03256-SPI-PMW-Auto-Recycle-web.pdf'

[7] ICIS. EU passenger car sales fall 76% in April. Retrieved from : https://www.icis.com/explore/resources/news/2020/05/19/10508916/eu-passenger-car-sales-fall-76-in-april

[8] Sakai S., et al. (2014) *An international comparative study of end-of-life vehicle (ELV) recycling systems.* J Mater Cycles Waste Management. 16:1–20. Retrieved from: https://www.academia.edu/26565249/-An_international_comparative_study_of_end-of-life_vehicle_ELV_recycling_systems

[9] Mehlhart, G.; Kosińska, I.; Baron, Y.; and Hermann, A. (2017). *Assessment of the implementation of Directive 2000/53/EU on end-of-life vehicles (the ELV Directive) with emphasis on the end-of -life vehicles of unknown whereabouts*. Oeko-Institut e.V. Retrieved from: https://ec.europa.eu/environment/waste/elv/pdf/ELV_report.pdf

[10] Eurostat (2017). *Recovery and recycling rate for end-of-life vehicles*. Retrieved from: https://appsso.eurostat.ec.europa.eu/nui/submitViewTableAction.do

[11] European Commission (2019). *End of life vehicles – Introduction*. Retrieved from: https://ec.europa.eu/environment/waste/elv/index.htm

[12] Champagne, X. (2018) Jean-Denis Curt, Groupe Renault: *We integrate up to 20% recycled plastic in our vehicles made in Europe*. Autoact.com – The newspaper. Retrieved from: http://www.autoactu.com/jean-denis-curt--groupe-renault----on-integre-jusqu-a-20--de-matiere-plastique-recyclee-dans-nos-vehicules-fabriques-en-europe-.shtml

[12] Gallone, T. and Zeni-Guido, A. (2019). *Closed-loop polypropylene, an opportunity for the automotive sector*. Field Actions Science Reports (19) 48-53. Retrieved from: https://journals.openedition.org-/factsreports/5225

[14] FIAT (2013). Sustainability Report – *Economic, Environmental and Social Responsibility*. Retrieved from: https://www.fcagroup.com/en-US/sustainability/overview/pubblicazioni/FiatDocuments/2013_sustainability_report.pdf

[15] Soo, V. et al, (2017). *Comparative Study of End-of-Life Vehicle Recycling in Australia and Belgium*. Procedia CIRP. Retrieved from: https://www.sciencedirect.com/science/article/pii/-S2212827116313919