Sustainability assessment of polyvinyl butyral management alternatives in end-of-life of laminated glass

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Keywords: construction waste, end of life vehicles, LCA, PVB, plastics recycling
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Laminated glass is a product commonly used in widespread applications such as vehicle windshields and safety windows and glazing present in construction elements and public transport (buses, trains). In the end-of-life stage of these applications, it is possible to recover for subsequent recycling the glass panels making part of the glazing without any major technical difficulty; however, the same does not happen with the plastic sheet which is adhered as interlayer between the panels to keep them fixed together (Martín et al., 2020). These sheets are typically made of polymers, among which polyvinyl butyral (PVB) has the largest market share (Swain et al., 2022). The main constraint hampering the recyclability of PVB is the large degree of contamination with glass particles which remains on the interlayer sheets after removing them from the glass panel fragments. The mixing of different formulations and the presence in PVB of additives modifying the polymer properties – e.g., plasticisers – as well as degradation induced by outdoor storing of waste laminated glass further affect the quality of waste PVB, therefore complicating the feasibility of recycling (Martín et al., 2020; Tupý et al., 2012). Due to these problems, the recycling of PVB reaches currently – according to FERVER, the European Federation of Glass Recyclers – a mere 9% of the total amount produced in Europe (roughly 30,000 tonnes), with the largest part being sent to either landfills or incineration facilities. This happens in spite of PVB being a highly added value material – roughly: 4–5 €/kg – which is currently experiencing a growing trend in demand (Swain et al., 2022).

The SUNRISE project aims at providing a technically and economically feasible and sustainable solution for the recovery of waste PVB, mainly based on an automatised optical sorting of different quality fractions and a subsequent mechano-chemical treatment for removing contaminants. Although technically possible (Swain et al., 2022, 2015; Dhaliwal and Hay, 2002), in terms of sustainability the end-of-life management of PVB has not been – to the knowledge of the authors – addressed in life cycle studies, neither its fate as a waste for disposal through landfilling or incineration, nor the evaluation of its recycling potential as compared to the conventional production from primary raw resources; e.g., oil. The work performed within the project comprised the evaluation of performance of the solution proposed through Life Cycle Assessment (LCA) and Life Cycle Costing (LCC), setting as benchmark the current PVB production based on primary raw resources and its end-of-life management as waste. It is expected that the datasets generated will contribute to fill the information gap regarding the sustainability performance of PVB and better illustrate the environmental outcome associated to its recycling.

Acknowledgments

The authors wish to express their gratefulness for the financial support to the SUNRISE project received from the European Union's Horizon 2020 research and innovation programme, under grant agreement No. 958243.

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