Global EPS SUSTAINABILITY Alliance

Expanded Polystyrene: Why EPS Matters

There is a need for improved understanding of the performance properties and recyclable qualities of expanded polystyrene (EPS) transport packaging. As negotiations continue for an international legally binding instrument (ILBI) on plastic pollution, some policies that have been put forth demonstrate troubling misunderstandings of this important packaging application.

Call to Action

The Global EPS Sustainability Alliance (GESA) calls upon policymakers to take the following steps when determining sound policy for the environment concerning EPS:

- Engage in a scientific review of EPS performance properties and life cycle impacts.
- Ensure policies implement a checks and balances protocol to evaluate successful implementation on an ongoing basis, allowing for continuous adjustments.
- Ensure suggested alternative materials receive sufficient scientific study and scrutiny.

What is Expanded Polystyrene (EPS)?

EPS is a lightweight, cellular plastic material composed of spherical shaped particles. EPS is primarily air and is made up of only 2% polystyrene. While extremely lightweight, the structural composition of EPS makes it exceptionally strong with high indentation force deflection and anomalous thermal insulation properties. This makes EPS an optimal material for a multitude of industries in a variety of applications that serve vital functions in our society.

How Is EPS Used?

In the **construction industry**,[1] EPS applications are used as insulation in roofing, exterior cladding, below grade foundations, cold room refrigeration, and in civil engineering to build transportation infrastructure. When mixed with concrete, EPS can also be used to produce lightweight concrete with low thermal conductivity, as well as lightweight composite materials, porous carbon materials, and adhesives.

In the **healthcare industry**,[2] EPS is widely used as packaging for medical equipment, ensuring sterility and safeguarding items during transportation. EPS insulation boxes are also used for the transportation of transplant organs and temperature-sensitive medication.

In the **automotive industry**,[3] EPS serves a multifaceted role due to its impact-resistant properties. EPS applications are commonly used in vehicle interiors as seat cushions, headrests, armrests, and door panels. The ability of EPS to absorb impact energy enhances passenger safety by reducing the force of collisions. Its lightweight nature also aids in fuel efficiency.

In the **food supply chain**,[4] EPS packaging is a preferred material within commercial distribution channels especially for fragile food products such as fresh fish, and delicate fruit. Commonly used in cold chain shipping,

[1] "Foam for Construction: EPS Foam," Engineered Foam Products, November 2022, https://www.easybib.com/project/style/mla?id=db592dbf-fc26-4875-b8f8-563a65eb6ef1

[2] "The Importance of Expanded Polystyrene in Medical and Pharmaceutical Industries," Polyform, October 2018, https://www.polyform.com/news/limportance-du-polystyrene-expanse-dans-les-milieux-medical-et-pharmaceutique/?lang=en

[3] "EPP and EPS for the automotive industry," Schaumaplast, https://schaumaplast.com/us/automotive/

[4] "Polystyrene – An Overview," ScienceDirect, https://shorturl.at/CIMY3

EPS extends the shelf life of food in domestic and international markets. Meeting stringent global regulations for food distribution, EPS is an indispensable material that can meet longer shipping cycles in these low-margin commodities.

As a **packaging material**, EPS is chosen for its impact resistance, shock absorption, and vibration blocking which are further enhanced by its ability to be custom molded for optimized product protection and lower damage rates.[5,6] Customizable molding offers design capabilities that allow it to be tailored to meet shipment needs with the least amount of raw material. For these reasons, brand owners rely on EPS for safe product delivery, as well as lower shipping costs, maximized pallet loading and increased shelf utility. These properties translate into environmental gains in raw material use, production, and transportation. Additionally, they minimize damage, avoiding the need to return, remanufacture, and redistribute products when the correct packaging materials are not employed.

Expanded Polystyrene In A Circular Economy

Research validates the use of **multiple mechanisms to efficiently recycle EPS**. Expanded polystyrene is a unique material that can be ground into small particles and reincorporated into the EPS molding process as recycled content. This results in a closed-loop recycling method typically used at a rate of 10%-20%. EPS recycled content resin is made possible through proprietary polymerization techniques and is now available in North America and China, making up to 30% recycled content EPS possible. Other recycling technologies include radio frequency[7], microwave[8], and chemical dissolution processes[9] that lend themselves as solutions to contaminated materials.

Increasingly consumers have access to EPS recycling from local recycling efforts, including cooperative initiatives such as StyroCycle in Australia and Foam Cycle systems in the US. The Indian Center for Plastics in the Environment is coordinating a country-wide EPS collection effort in six regions that is recycling upwards of 1,705,000 metric tons per month. In 2019, more than 30% of EPS was diverted from landfills in North America through recycling. In Europe, the average recycling rate for EPS packaging is 40%, while Japan, China, and South Korea have recycling rates above 50%.[10]

Recycled EPS packaging is used in numerous end-market industries such as building and construction, safety helmets, furniture, packaging, and automotive applications among others. In addition, major multinational companies increasingly recycle EPS internally through delivery take-back programs and other novel collection methods. Research also shows there are successful end market applications to sustain EPS recycling growth.

EPS can have lower environmental impacts compared to alternative materials

Due to its unique strength to weight ratio, EPS achieves greater fuel efficiency, contributes to higher energy savings, and reduced emissions.[11] Research shows that during the transportation of healthcare goods,[12]

[5] "Properties, Performance and Design Fundamentals of Expanded Polystyrene Packaging" EPS Industry Alliance Technical Bulletin: https://www.epsindustry.org/s/Properties-Performance-Design-8-2019-yxts.pdf

[6] "Cushion Curve Properties of Expanded Polystyrene" EPS Industry Alliance Technical Bulletin, https://www.epsindustry.org/s/Cushion-Curve-Properties-4f8w.pdf

[7] Wave Foamer technology welding particle foam for more efficient EPS production: https://www.kurtzersa.com/products/protective-solutions/shape-moulding-machines/wave-foamer

[8] Pyrowave technology for recycling of post-consumer polystyrene: https://www.pyrowave.com/en/microwave-technology

[9] Polystyvert: Dissolution Technology for Polystyrene Recycling https://polystyvert.com/en/technology/

[10] These statistics reflect recycling calculation rates as specified in ISO 14021 Environmental Labels & Declaration.

[11] "Expanded Polystyrene (EPS): Ultimate Guide on Foam Insulation Material," Omnexus, https://omnexus.specialchem.com/selection-guide/expanded-polystyrene-eps-foam-insulation

[12] "The Importance of Expanded Polystyrene in Medical and Pharmaceutical Industries," Polyform, October 2018

EPS reduces transportation costs due to its lightweight composition, compared to similar paper-based alternatives.[13]

Research also demonstrates the use of alternative materials would result in substantially more packaging weight and increased energy use and emissions, negatively impacting the environment.[14] Although EPS transport packaging is not restricted, certain areas have imposed bans on polystyrene foam foodservice. A recent study, "Disposable Paper-Based Packaging for Food. The False Solution to the Packaging Waste Crisis," details how paper-based alternatives for food and beverage packaging are often combined with plastics and chemical coatings, limiting its recyclability.[15] Produced by Profundo, an independent research organization, the study also details the risks from the production of paper-based products on climate change, biodiversity loss, water stress and deforestation.[16] Significantly, a review of bans covering EPS plastics for food containers at global levels found little evidence of the effectiveness or ineffectiveness of bans, demonstrating the need for further research on net environmental impacts.[17]

Conclusion

EPS is a valuable packaging material that has critical functions, that demonstrates lower environmental impacts than alternative materials, including paper and other plastics, in many life cycle impact categories. Contrary to popular belief, and not to be confused with contaminated foodservice packaging, EPS is recycled in practice and at scale. Scientific fact is the most important policy driver to achieve the intended results.

[13] "Life Cycle Inventory of Foam Polystyrene, Paper-Based, and PLA Foodservice Products," Franklin Associates, published by the American Council of Chemistry, February 2011, https://www.americanchemistry.com/better-policy-regulation/plastics/resources/life-cycle-inventory-of-foam-polystyrene-paper-based-and-pla-foodservice-products

[14] Franklin Associates, A Division of Eastern Research Group (ERG), "Life Cycle Impacts of Plastic Packaging Compare to Substitutes in the United States: Theoretical Substitution Analysis," American Chemistry Council, April 2018, https://www.americanchemistry.com/better-policy-regulation/plastics/resources/life-cycle-impacts-of-plastic-packaging-compared-to-substitutes-in-the-united-states-and-canada-theoretical-substitution-analysis

[15] Stravens, M. (2023, July 28), Disposable Paper-based Packaging for Food. The false solution to the packaging waste crisis, Amsterdam, The Netherlands: Profundo.

[16] Ibid

[17] "A global review of plastics policies to support improved decision making and public accountability." University of Portsmouth Global Plastics Policy Centre, 2022. https://plasticspolicy.port.ac.uk/wp-content/uploads/2022/10/GPPC-Report.pdf