RIGID POLYSTYRENE PACKAGING **BUSINESS CASE**

For the U.S. Plastics Pact

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Polystyrene Recycling
ALLIANCE

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Targeted Exclusion of Rigid Polystyrene Packaging

INTRODUCTORY NARRATIVE

We urge the U.S. Plastics Pact (USPP) to remove rigid non-foam polystyrene packaging from its list of “problematic and unnecessary materials” because a thorough assessment of problematic criteria reveals that the sustainability and recycling opportunities for this packaging format—like many other plastics—do not rise to the level of being labeled “problematic” and targeted for elimination.

Of relevant note, the other North American Plastics Pacts (Canada and Mexico) recognize the importance of High Impact Polystyrene (HIPS) to the dairy industry, for example, and are calling for collective partnerships to improve its circularity instead of eliminating it.

This request is focused specifically on rigid non-foam formats made from High Impact Polystyrene (HIPS) and/or General-Purpose Polystyrene (GPPS), such as cups, trays, and clamshells—items that can be collected, sorted, and processed for recycling in many parts of the country today, with infrastructure and access expanding. These materials have a track record comparable to other rigid and flexible plastics that are not designated as “problematic and unnecessary” and therefore warrant similar treatment. We respectfully urge the U.S. Plastics Pact to embrace a circularity-driven approach for rigid polystyrene—and other comparable formats—rather than defaulting to deselection, which is currently distorting market dynamics and slowing progress toward scalable recycling solutions.

Rigid polystyrene packaging refers to molded or thermoformed non-foam polystyrene products that maintain a fixed shape. These formats are commonly used in food packaging applications in the grocery store and other retail venues to keep food fresh and safe for human consumption. Examples include cups for yogurt, pudding, fruit, and dips, along with trays and clamshells for cookies, pastries, muffins, and fresh produce. Other applications include foodservice formats for food on-the-go, and protective retail packaging. These items are recyclable through a variety of mechanical, dissolution, and chemical recycling technologies.

Ongoing improvements in collection and processing capacity—combined with better transparency of end markets that desire these materials for feedstock—are opening the door to much greater circularity. In fact, several formats like cups, trays, and clamshells have recycling access in a range that would be considered “check locally” status under How2Recycle’s labeling program according to third-party research from Resource Recycling Systems (RRS).[i] Furthermore, innovative partnerships across the value chain—like the Polystyrene Recycling Alliance (PSRA) —are investing and collaborating with municipalities and other stakeholders to accelerate polystyrene recycling.

Scientific consensus also affirms the safety of polystyrene for use in food and consumer applications. Regulatory agencies including the U.S. Food and Drug Administration (FDA) and the European Food Safety Authority (EFSA) have repeatedly affirmed that polystyrene is safe for its intended uses, including food contact.[ii][iii]

Rigid polystyrene is also carbon efficient compared to some plastics in similar applications. Replacing polystyrene with alternative materials can result in heavier packaging, increased virgin plastic use, and higher emissions.

While rigid polystyrene packaging still has substantial circularity improvements to achieve before it is considered widely recycled—like many other packaging formats—it should not be labeled as broadly problematic and targeted for elimination. Instead, it should be recognized for the important role it plays in protecting food quality and safety, along with its proven recyclability and a pathway to circularity that should be accelerated and supported by stakeholders across the value chain. With ongoing efforts to enhance its circularity, we recommend removing rigid polystyrene from the US Plastics Pact's list of problematic materials, considering it in the same category as other rigid and flexible plastics on a journey to better circularity, and encourage stakeholders across the value chain to continue supporting its progress.

Making the Case that Rigid Polystyrene Packaging Is Recyclable

CRITERION ONE:

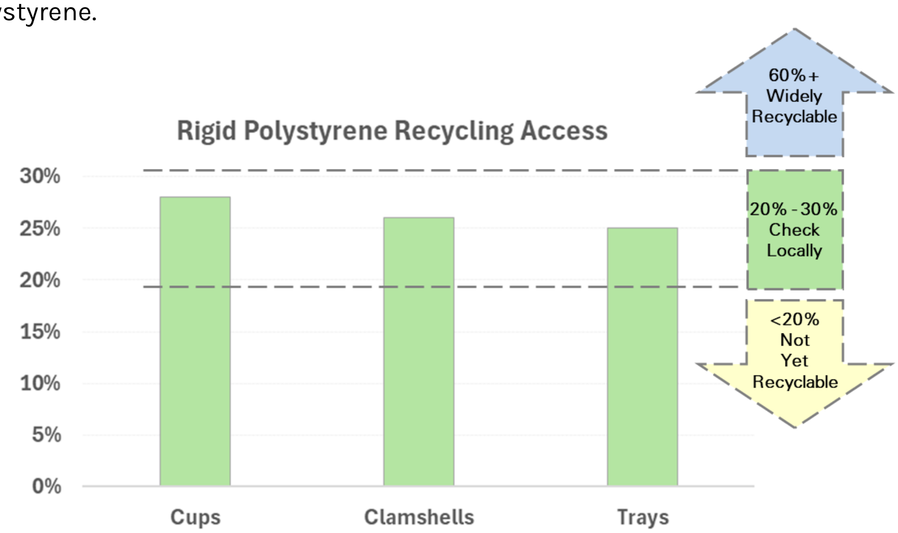
Recyclable

Background: Rigid polystyrene packaging—including cups, clamshells, and trays—is recyclable today with proven technologies and growing access. Nearly 100 million Americans have access to recycle these formats, supported by mechanical, dissolution, and chemical processes that deliver food-grade and high-performance applications. With expanding end markets, increasing supply chain transparency, and rising investment, rigid polystyrene is well-positioned to meet the U.S. Plastics Pact's recyclability criteria and deliver on the promise of a truly circular economy.

KEY POINT 1:

Access to Recycling Rigid Polystyrene

- **Significant Population Coverage**: An independent analysis by Resource Recycling Systems (RRS) found that **25–28% of the U.S. population—roughly 90 million Americans—have access to recycle rigid polystyrene cups, clamshells, and trays**. A follow-up analysis correcting survey inconsistencies suggests the true figure may be closer to **30% (100 million people)**.[iv]
- **"Check Locally" Classification:** At this level, rigid polystyrene falls into the **"check locally" category**—not yet "widely recyclable," but also inaccurate to label as "not recyclable." Consumers are advised to check with local programs.
- **Foam vs. Rigid Confusion**: The 2024 RRS study revealed that some programs state they don't accept "#6 plastic," referencing foam polystyrene, but in fact **do accept rigid polystyrene formats**. This distinction is often misunderstood, leading to underreported access.
- **Explicit vs. Implicit Access**: RRS defined access in two ways:
  - **Explicit Access** – programs clearly listed cups, clamshells, and trays.
  - **Implicit Access** – programs accepted "all plastic" or "#1–7," which by definition includes rigid polystyrene.



KEY POINT 2:

Rigid Polystyrene Is Compatible with Multiple Recycling Technologies

Mechanical Recycling

- **Proven Performance**: Rigid polystyrene is currently recycled through high-purity mechanical processes—including to **food-grade standards**—both in the U.S. and abroad. These processes recover material with consistent quality, enabling polystyrene to be reused in applications like foodservice packaging.
- **Food-Contact Ready**: Polystyrene's low diffusion characteristics, similar to PET, make it particularly well-suited for food-contact use. Its closed polymer matrix prevents contaminants from migrating through the material, allowing for safe, repeatable recycling.[v]
- **Durability Across Cycles**: Unlike many plastics, polystyrene retains its **integrity and performance** through multiple mechanical cycles with minimal degradation. This makes it a strong candidate for a circular model based on closed-loop recovery.[vi]
- **Process Flow**: Mechanical recycling involves **shredding, washing, and re-pelletizing** into clean resin, ready for reuse in rigid packaging, consumer goods, or durable products.

Physical (Dissolution) Recycling

- **How It Works:** Dissolution uses a **solvent to dissolve polystyrene** without breaking polymer chains. The material is then filtered, purified, and re-solidified—**retaining its original properties**.
- **Proven in North America:**
  - Since **2013**, one U.S. producer has used dissolution to recycle post-use rigid polystyrene back into **FDA-approved food packaging**.
  - Since **2023**, another producer has operated at **>8 kt/yr capacity**, achieving >99% polymer recovery and producing pellets with **25% certified recycled content cleared for direct food contact** under U.S. FDA criteria, demonstrating that dissolution can produce food-grade rigid polystyrene.
  - **Deep clean capability**. Because the polymer is solvated, fine inorganic residues (labels, pigments, fillers) and legacy additives are removed at ppm levels—an advantage over mechanical re-pelletizing when feedstock is heavily printed or holds food residues. Independent migration tests show residual styrene in the finished resin remains < 5 ppb (well below EFSA's 40 ppb SML).
  - **Low-carbon profile**. A cradle-to-gate LCA (ISO 14044-reviewed, 2024) found the process lowers global-warming potential by **≈25 % versus virgin polystyrene** and by >40 % versus rigid PET for the same container format, even after allocating solvent recovery energy. Carbon intensity is on par with recycled-PET but with higher retained mechanical performance.

Chemical Recycling

- **Process Overview:** Technologies such as **pyrolysis and gasification** break polystyrene into its **monomer or feedstocks**, enabling repolymerization into virgin-quality polystyrene or other polymers.
- **Solution for Hard-to-Recycle Streams:** Effective for rigid polystyrene and other polymers that are **contaminated or unsuitable** for mechanical or dissolution recycling.

- **Proven Technology**:
  - The Regenyx joint venture between Agilyx and Americas Styrenics successfully demonstrated the ability of pyrolysis to convert post-use rigid, expanded, and extruded polystyrene into styrene monomer for repolymerization into polystyrene.
  - Today, chemical recycling facilities in the United States are using mixed post-use plastic, including rigid polystyrene, as feedstocks to convert back into new products. Freepoint Ecosystems in Hebron, Ohio and ExxonMobil in Baytown, Texas are examples. This ability of rigid polystyrene to be collected and recycled comingled with other plastics like polyethylene and polypropylene is a significant advancement for rigid polystyrene circularity.
- **Growing Capacity**: Chemical recycling capacity in the United States is expected to continue growing and triple by 2030 compared to 2025 according to forecasts from AMI (Applied Market Information, LLC), opening more pathways for recycling rigid polystyrene.
- **U.S. Plastics Pact Recognition of Chemical Recycling**: The U.S. Plastics Pact has recognized that chemical and physical recycling technologies “offer solutions for specific hard-to-recycle formats.” Rigid polystyrene is a clear example of a material that will benefit from these technologies, expanding viable recycling pathways and supporting circularity goals.[vii]
- **RRS Recycling Roadmap**: RRS Recycling Roadmap: The Polystyrene Recycling Alliance (PSRA) commissioned Resource Recycling Systems (RRS) to develop a comprehensive roadmap identifying pathways to circularity for all polystyrene formats. RRS estimates that by 2030, growth in chemical recycling capacity could enable 50% to 66% of the U.S. population with access to recycle at least one type of polystyrene. As access expands and end markets continue to develop, more rigid polystyrene will be both recyclable and recycled, placing the material on a durable, scalable path to circularity.[viii]
- **Policy Recognition**: At the **2025 Canadian Circular Economy Summit**, the **U.K. Plastics Pact, U.S. Plastics Pact, and Canada Plastics Pact** acknowledged the role of chemical recycling as one of many essential technologies to achieve plastics circularity, including for rigid polystyrene.

Key Point 3:

Solid Backbone of End Markets for Rigid Polystyrene

- **End Markets**: There are 45 companies in the US and Canada with 50 facilities combined that use HIPS and GPPS as a manufacturing feedstock for a variety of consumer products. These end markets are in 22 U.S. states and four Canadian provinces according to Resource Recycling Systems (RRS), and they also reach into other states and provinces for recycled rigid PS feedstock.[ix]
- **End Uses**: Recycled rigid polystyrene is used in a range of applications, demonstrating viable and responsible end markets:
  - Food packaging suitable for food contact applications
  - Consumer goods (e.g., office products, horticultural trays, flowerpots, hangers)
  - Building products (e.g., architectural moldings)
  - Virgin replacement: plastic sheet manufacturers use lower cost, recycled PS in place of higher cost, virgin PS in applications where food-grade or high performance is not required
  - Color agent: recycled PS of various colors is used to help achieve color specifications in plastic sheet in lieu of higher cost inks
- **End Market Transparency**: With the assistance of Resource Recycling Systems (RRS), plastic circularity advocates like the Polystyrene Recycling Alliance (PSRA) are cataloging a database of rigid PS end markets across the U.S. and Canada to facilitate the connection of collection sources to users who want the material.

Addressing Safety Concerns About Polystyrene

CRITERION TWO:

Hazardous

Background: Polystyrene, the polymer used in rigid polystyrene packaging, has undergone decades of safety evaluation by global health authorities such as the U.S. Food and Drug Administration (FDA), the European Food Safety Authority (EFSA), and independent scientific bodies. These reviews consistently conclude that polystyrene is safe for its intended uses, including food-contact and medical applications. A clear distinction must be made between styrene, the liquid monomer, and polystyrene, the solid polymer formed through polymerization. In its polymerized form, polystyrene is inert and stable. Only trace amounts of residual styrene remain in finished products—well below FDA regulatory limits (0.5–1.0% by weight, depending on application)—and typical commercial levels are far lower. Risk assessments confirm that such exposures are negligible, especially when compared with natural dietary sources of styrene found in foods such as strawberries, cinnamon, coffee, and beef.

KEY POINT 1:

Clarifying styrene vs. polystyrene

- **Styrene vs. Polystyrene**: Styrene is a liquid monomer used in many consumer applications like rigid polystyrene packaging. Through polymerization, styrene is converted into polystyrene—a solid, stable material with very different properties.
- **Inert and Safe**: Once formed, polystyrene is inert and safe for everyday use, including in food-contact and protective packaging.
- **Regulated and Tested**: Strict regulations ensure that only trace amounts of residual styrene remain in finished polystyrene products. For food-contact uses, the FDA sets limits of 0.5%–1.0% by weight. Polystyrene resins consistently fall well below these thresholds.[x]
- **Perspective on Exposure**: The FDA's acceptable daily intake (ADI) for styrene is 90 milligrams per person per day. Actual exposure from polystyrene packaging is estimated at just 6.6 micrograms per person per day—more than **10,000 times lower** than the ADI.

KEY POINT 2:

Longstanding FDA Compliance

- **Decades of Approval**: Polystyrene has been approved for food-contact use by the U.S. FDA for more than 50 years.[xi]
- **Proven Safety in Use**: Its continued role in packaging and food contact appliances like the interior components of refrigerators demonstrate the FDA's confidence in its safety and inert properties when manufactured to regulatory standards.[xii]
- **Broad FDA Recognition**: Approval covers both direct and incidental food-contact applications, including containers, trays, and protective transport packaging.
- **Proof Point**: The FDA maintains a database of Re*calls, Market Withdrawals & Safety Alerts*, and there is no public record of a recall involving rigid polystyrene packaging that meets food-contact regulations in its 50-year history.[xiii]

KEY POINT 3:

European Food Safety Authority Reaffirms Safety of Polystyrene in Food-Contact Applications

- **No Evidence of Genotoxicity**: In June 2025, EFSA concluded there is no evidence that residual styrene is genotoxic when ingested, based on a comprehensive review of animal studies, toxicokinetic data, and human exposure research.[xiv]
- **Protective Migration Limit**: EFSA established a proposed Specific Migration Limit (SML) of 40 μg/kg food—well within safety guidance for non-genotoxic substances—indicating that compliant polystyrene packaging does not pose a risk.[xv]
- **Safe for Sensitive Supply Chains**: EFSA's conclusions support the continued use of rigid polystyrene for transporting sensitive goods—food, medical supplies, and cold chain logistics—so long as regulatory migration limits are met.

KEY POINT 4:

Peer-Reviewed 2019 Risk Assessment (Update to 2002 Harvard Study)

- **Updated Hazard Review**: A 2019 review titled "*Evaluation of potential health effects associated with occupational and environmental exposure to styrene – an update*" was published in Journal of Toxicology and Environmental Health, Part B: Critical Reviews (2019;22(1-4):1-130).[xvi]
- **Consumer Safety Conclusion**: This review maintains that styrene exposure from consumer and environmental sources (including packaging and incidental contact) is unlikely to cause health harms for the general population under normal exposure levels.
- **Cancer & Ototoxicity Findings**: The 2019 review found no consistent epidemiological evidence linking styrene exposure in the general population to cancer or other adverse health outcomes.

KEY POINT 5:

Comprehensive Human Health Risk Assessment by SIRC

- **Large-Scale Review**: The Styrene Information & Research Center (SIRC) published a capstone human health risk assessment in 2019, summarizing over 30 years of toxicological and epidemiological research.[xvii]
- **Negligible Consumer Risk**: The assessment concluded that exposure to styrene through everyday use of consumer products (including packaging) poses negligible risk.[xviii]
- **General Population Safety**: It found that the general population is very unlikely to experience adverse health effects from environmental or consumer exposures to styrene.[xix]
- **Styrene in the Workplace**: Comprehensive risk assessments have found no strong or consistent evidence that styrene causes cancer in humans, and occupational exposures are generally within acceptable risk limits for most workers. For job categories with the potential for higher exposure—such as open molding of fiber-reinforced polymer (FRP) composites—appropriate engineering controls and respiratory protection are recommended to further mitigate risk.[xx]
- **Weight of Evidence**: Importantly, the capstone assessment determined there is no strong or consistent evidence of carcinogenicity in humans, reinforcing the conclusion that styrene does not present a meaningful cancer risk under typical exposure scenarios.[xxi]

KEY POINT 6:

Styrene Is Naturally Occurring

- **Present in Everyday Foods**: Styrene isn't only used in plastics—it is a naturally occurring compound found in many foods, including strawberries, cinnamon, coffee, peanuts, and beef.
- **Comparable to Natural Dietary Sources**: The European Food Safety Authority (EFSA) found **that dietary exposure to styrene from polystyrene packaging is comparable to naturally occurring levels of styrene in food**.[xxii]
- **Regulatory Consensus**: Both the FDA and EFSA have concluded that styrene exposure from compliant polystyrene packaging is well below levels of concern and poses **no health risk to consumers**.

Lower Carbon Footprint and Environmental Impact

CRITERION 3:

Material Switching

Background: While recyclability is a key pillar of circularity, it's only part of the story. Rigid polystyrene combines performance with superior protection and insulation—qualities that translate directly into carbon efficiency across the product lifecycle.

KEY POINT 1:

Rigid Polystyrene is Versatile

- **Carbon Efficient**: Rigid polystyrene is also carbon efficient compared to some plastics in similar applications. Replacing polystyrene with alternative materials can result in heavier packaging, increased virgin plastic use, and higher emissions.
- **Excellent Performance Across Temperature Extremes**: Rigid polystyrene performs across a wide range of temperatures as demonstrated by its use for interior components in refrigerators and freezers, to high temperature tolerance in lids for hot beverages. Manufacturers prefer its wide range of temperature tolerance for ease and efficiency of production.
- **Material Density Matters**: Material Density Implication: PET's higher density (~1.38 g/cm³)[xxiii] versus polystyrene (~1.05 g/cm³)[xxiv] means that for a given performance (volume, strength, etc.), more PET mass may be needed, increasing embodied energy, transport weight, and emissions. This density penalty can erode or offset PET's GHG advantage per kilogram of resin in many real-world applications — depending on conversion, transport, and end-of-life assumptions.

KEY POINT 2:

Rigid Polystyrene Extends Product Life of Food and Reduces Waste

- **High product-to-package efficiency**: Rigid polystyrene enables a favorable product-to-packaging ratio, minimizing material use while effectively protecting goods.
- **Less damage, fewer returns**: Its robustness helps reduce product losses, returns, and spoilage—especially critical in the foodservice and retail sectors.
- **Extends freshness, reduces spoilage**: In food applications (trays, produce containers, etc.), rigid polystyrene helps preserve quality and extend shelf life, directly cutting food loss.
- **Cuts methane-emitting waste**: Reducing food waste is a powerful climate strategy—since decomposing food in landfills emits methane.

KEY POINT 3:

Recycled Polystyrene Delivers Superior Climate and Circularity Benefits

- **Significant CO_2 Reductions**: An independent life cycle analysis commissioned by Styrenics Circular Solutions confirms that food-grade polystyrene recycled through a variety of technologies including mechanical, dissolution, and depolymerization, achieves up to **80% CO_2 savings** compared to virgin polystyrene.[xxv]
- **Superior Circular Performance**: Recycled polystyrene outperforms many other recycled food packaging materials in both climate impact and resource efficiency For example, recycled

polystyrene has lower GHG emissions per kg than recycled PET, and when combined with a density advantage over PET for the same application, is a resin of choice for circular solutions.

Supports a Compatible and Efficient Recycling System

CRITERION FOUR:

Does Not Hinder the Recyclability or Composability of Other Materials

Background: A material should only be deemed "problematic" if it impairs the recyclability or composability of other packaging formats. Rigid polystyrene packaging does not meet this criterion. It is chemically distinct, easily sorted, and compatible with curbside recycling systems that process other rigid plastics like polyethylene (PE) and polypropylene (PP).

KEY POINT 1:

Rigid Polystyrene Does Not Contaminate the Waste Stream

- **Highly Sortable with Proven Technology**: Rigid polystyrene has a distinct molecular structure and optical signature that allows for efficient, high-purity separation in modern materials recovery facilities (MRFs) and secondary sortation facilities. Using automated optical sorters or manual systems, these facilities can sort polystyrene as stand-alone material or recover it as part of a mixed plastics stream.
- **Third-Party Validation**: Under the umbrella of Styrenics Circular Solutions (SCS), Tomra—an industry leader in collection and sorting—tested rigid polystyrene using near-infrared (NIR) sensor technology. After a multi-step process of sorting, grinding, washing, and flake sorting, the resulting polystyrene achieved >99.9% purity, far exceeding thresholds required for both conventional and advanced recycling.[xxvi]
- **Compatible with Density Separation**: Beyond optical sorting, rigid polystyrene is well-suited to sink-float separation systems, where it reliably sinks while lighter polymers like PE and PP float. Multi-stage systems further enhance purity and reduce cross-contamination.
- **Recycling-Ready**: These sorting and separation capabilities ensure that polystyrene can meet purity thresholds needed for mechanical recycling, chemical recycling, and even food-grade applications.
- **Scalable with Market Demand**: The technologies to sort and recover rigid polystyrene already exist and are proven. The key to scaling circularity is greater transparency and investment in end markets that use recycled polystyrene as feedstock. Highlighting and strengthening these markets will drive recovery and reduce waste across the recycling stream.

KEY POINT 2:

Compatible with Mixed Plastic Recycling (Curbside)

- **Curbside Collection**: Rigid polystyrene can be collected through curbside recycling programs alongside other rigid and flexible plastics such as polyethylene (PE) and polypropylene (PP).
- **Seamless Integration**: As modern MRFs increasingly process mixed plastic bales, polystyrene has proven to be a compatible and valuable feedstock for both mechanical and chemical recycling—expanding recovery opportunities and improving economies of scale.

- **Broad Access**: An independent analysis by Resource Recycling Systems (RRS) found that 25–28% of the U.S. population—roughly 90 million Americans—have access to recycle rigid polystyrene cups, clamshells, and trays through local recycling programs.[xxvii] A follow-up analysis correcting survey inconsistencies suggests the true figure may be closer to **30% (100 million people)**.[xxviii]

KEY POINT 3:

No Interference with Composability Systems

- **Not Marketed as Compostable**: Rigid polystyrene is not positioned as a compostable material and therefore is not designed to enter organic waste streams.
- **Easily Screened Out**: Composting facilities can readily detect and remove polystyrene using standard screening processes—unlike some bio-based or degradable plastics that often create confusion or contamination.
- **Clear Differentiation**: With its distinct look and material properties, polystyrene is easily identified and kept out of composting operations, ensuring it does not disrupt those systems.

KEY POINT 4:

Rigid Polystyrene is Suited for MRF Operations and Material Recovery

- **Mechanically Stable and Easily Handled**: Unlike flexible films, multilayer laminates, or shrink sleeves—which have been widely deemed “hard to recycle” due to their tendency to jam machinery or escape sorting equipment—rigid polystyrene maintains a consistent, moldable form that is readily captured by existing systems without causing mechanical issues.
- **Compatible with MRF Sorting Systems**: Rigid polystyrene is optically sortable and does not interfere with the separation of polyolefins or PET. Studies and pilot programs—including facility audits such as those conducted by RRS—have demonstrated that polystyrene can be efficiently recovered through standard optical and mechanical.
- **Sink-Float System Compatibility**: In downstream washing and separation systems, such as sink-float tanks, rigid polystyrene behaves predictably. It sinks—separating cleanly from PE and PP that float—supporting high-purity recovery without cross-contamination or operational disruption.

Rigid Polystyrene's Low Share of the Waste Stream Correlates with Low Litter Potential

CRITERION 5:

Litter

Background: Rigid polystyrene has a dense, structured form that reduces the likelihood of becoming windblown compared to many other materials. Litter audits and marine debris studies consistently show that rigid polystyrene is a minor component of environmental pollution, accounting for a fraction of plastic litter found in the environment.

KEY POINT 1:

Rigid Polystyrene Is a Small Portion of the Waste Stream

- **Small Share of Waste**: According to EPA and related sources, rigid polystyrene constitutes well under 1% of total municipal solid waste by weight.[xxix]
- **Lower Potential for Mismanagement**: Because rigid polystyrene constitutes such a small portion of overall discards, it inherently presents fewer opportunities to be improperly managed, littered, or mis-sorted than more voluminous materials.

KEY POINT 2:

Product Use and Collection Context Reduces Litter Risk

- Rigid polystyrene is used in a variety of applications—from cold chain transport and protective packaging to food applications like clamshells, trays, and cups. Despite some uses occurring in more public or consumer-facing settings, rigid polystyrene still shows a low tendency to become litter for several key reasons:
  - **Food and retail environments promote disposal**: Many rigid polystyrene foodservice items are used in structured environments like cafeterias, stadiums, restaurants, and grocery stores, where trash receptacles are readily available. This reduces litter risk.
  - **Consumer behavior trends matter**: Unlike lightweight, windborne items such as plastic bags or snack wrappers, rigid polystyrene has a denser form and is less prone to accidental littering. It doesn't easily blow away, and it's more often discarded intentionally.

KEY POINT 3:

Polystyrene Is a Minor Contributor to Marine Litter and Ocean Plastics

- **Rare in Cleanup Tallies**: Ocean Conservancy's *International Coastal Cleanup* reports repeatedly list rigid packaging (and polystyrene) outside their top categories of collected items, indicating it is not a dominant marine litter component.[xxx]
- **Low Presence in Marine Debris Composition Studies**: Global assessments of plastic waste in marine environments tend to highlight materials such as polyethylene, polypropylene, and fishing gear rather than rigid polystyrene.[xxxi]
- **Material Traits Limit Marine Intrusion**: Due to its density, structured geometry, and typical use in controlled disposal settings, rigid polystyrene is inherently less likely to become marine litter than flexible or fishing-related plastics.

- **Primary Pollution Drivers Differ**: The main contributors to ocean plastic pollution are often PE, PP, and polyamide—used extensively in packaging and fishing gear—not rigid polystyrene.[xxxii]

[i] Recycling Roadmap
[ii] Re-assessment of the risks to public health related to the genotoxicity of styrene present in plastic food contact materials | EFSA
[iii] Title 21 of the Code of Federal Regulations (CFR), Section 177.1640
[iv] Recycling Roadmap
[v] https://www.diva-portal.org/smash/get/diva2%3A12173/FULLTEXT01.pdf
[vi] https://styrenics-circular-solutions.com/circular-solutions.html#mechanical-recycling
[vii] U.S. Plastics Pact | Physical and Chemical Recycling Position Paper
[viii] Recycling Roadmap - Polystyrene Recycling Alliance (PSRA)
[ix] PSRA Polystyrene U.S. and Canada End Markets Study
[x] Title 21 of the Code of Federal Regulations (CFR), Section 177.1640
[xi] Title 21 of the Code of Federal Regulations (CFR), Section 177.1640
[xii] EPS+Cold+Chain+Solutions+8.5x11.pdf
[xiii] Recalls, Market Withdrawals, & Safety Alerts | FDA
[xiv] Re-assessment of the risks to public health related to the genotoxicity of styrene present in plastic food contact materials | EFSA
[xv] EFSA Clears Styrene Use in Food Packaging at 40 ppb Migration Limit | Packaging Reporter
[xvi] Evaluation of potential health effects associated with occupational and environmental exposure to styrene - an update - PubMed
[xvii] Styrene Risk Assessment - SIRC
[xviii] Styrene Risk Assessment - SIRC
[xix] Styrene Risk Assessment - SIRC
[xx] StyreneRiskAssessment2019_FactSheet_2020.pdf
[xxi] Styrene Risk Assessment - SIRC
[xxii] Re-assessment of the risks to public health related to the genotoxicity of styrene present in plastic food contact materials | EFSA
[xxiii] https://www.shop.amsler-frey.ch/en?category=28&cmd=generate_datasheet&utm
[xxiv] Polystyrene - an overview | ScienceDirect Topics
[xxv] https://styrenics-circular-solutions.com/circular-solutions.html#mechanical-recycling
[xxvi] https://styrenics-circular-solutions.com/scs-krones-and-tomra-demonstrate-recycling-process-for-xps-food-trays.html
[xxvii] https://psrecycling.org/recycling-roadmap
[xxviii] Recycling Roadmap
[xxix] https://www.epa.gov/facts-and-figures-about-materials-waste-and-recycling/plastics-material-specific-data
[xxx] https://oceanconservancy.org/wp-content/uploads/2024/09/ICCAnnualReport2024_Digital.pdf
[xxxi] https://www.sciencedirect.com/science/article/pii/S0025326X19302905
[xxxii] https://www.sciencedirect.com/science/article/pii/S0025326X19302905?utm