



Trinseo S.A. Recognized for

2021

Competitive Strategy Leadership

Global Plastics

Circular Economy Industry

Excellence in Best Practices

Best Practices Criteria for World-Class Performance

Frost & Sullivan applies a rigorous analytical process to evaluate multiple nominees for each award category before determining the final award recipient. The process involves a detailed evaluation of best practices criteria across two dimensions for each nominated company. Trinseo excels in many of the criteria associated with the circular economy in the plastics space.

AWARD CRITERIA	
<i>Strategy Innovation</i>	<i>Customer Impact</i>
Strategy Effectiveness	Price/Performance Value
Strategy Execution	Customer Purchase Experience
Competitive Differentiation	Customer Ownership Experience
Executive Team Alignment	Customer Service Experience
Stakeholder Integration	Brand Equity

Industry Challenges: Plastics in General and Polystyrene in Particular

About 370 million tons of plastics were consumed in 2020, and overall plastics waste collection volumes were estimated to be about 45 to 50% of the total consumption. The grim reality of the existing shortfall in plastics waste handling, however, can be attributed to the fact that only under one-third of the plastics waste collected is recycled, whereas over two-thirds of the volume are either sent to landfills or sent for incineration/energy recovery.

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- *Gautam Rashingkar, Industry Analyst*

The general packaging application, which accounts for over 40% of overall plastics consumption, constitutes over 55% of the total global plastic waste generation, in terms of volume. Less than 15% of the generated plastics packaging waste, however, is collected for recycling.

Polystyrene, characterized by its versatility, exceptional physical and chemical properties, durability, ease of processing, lower density, and cost, continues to be an ideal material for a diverse set of

applications across industries, including food packaging, consumer goods, electrical and electronics, transportation, furniture, building and construction, and consumer goods. Over 19 million tons of polystyrene were consumed in 2020, and the demand is slated to expand by 3 to 4% over the next five

years. The average global recycling rate for polystyrene, however, is still about 2%, which is significantly lower than polyolefins and polyethylene terephthalate (PET), even though the chemical structure of polystyrene renders it best suited to infinite recycling without down-cycling.

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Brand Equity

Incorporated in 2010, Trinseo S.A manufactures plastics (e.g., styrenics, polycarbonate, and polymethyl methacrylate (PMMA)), latex binders, and synthetic rubber, with operations worldwide. Trinseo has 24 manufacturing facilities and 14 research and development (R&D) facilities and has 3,500 employees across geographies. The company's net revenue for 2020 was \$3 billion. Trinseo is among the key stakeholders in the styrenics space and a leading global polystyrene producer, with its polystyrene business contributing over 23% to its total net revenue in 2020.

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In the wake of the ever-evolving demand landscape and with the quest to establish itself as a leader in the circular plastics space, the company has undertaken an all-encompassing approach toward developing infinitely recyclable, certified polystyrene resins, comprising completely circular polystyrene offerings with virgin resin-like properties and performance, especially for demanding applications such as food packaging. Time-tested expertise; a well-established geographical presence; pioneering efforts toward delivering innovative, sustainable, and collaborative value-creating solutions, especially in styrenics, provide Trinseo with a competitive edge and enable it to cater to consumers' ever-evolving needs.

Competitive Differentiation as a Measure of Strategy Effectiveness

A testimony to Trinseo's efforts is its commercial launch of dissolution technology-based recycled polystyrene grades in May 2021, under the STYRON™ CO₂RE™ brand. The process involves the dissolution of post-consumer recycled (PCR) material in a solvent and then subjecting it to a series of purification steps to separate the material from contaminants and additives. The purified material is then fed into the reactor to obtain polystyrene resin comprising 30% PCR content. The resin grades are touted as sustainable alternatives to conventional grades in consumer electronics, packaging, and food contact applications using a functional barrier.

Initial findings of the LCA study (conducted in partnership with SCS) comparing 100% fossil-based polystyrene grades with the aforementioned 30% PCR-based polystyrene grades suggest that the latter helps customers materialize a 15% reduction in CO₂ emissions, compared to the former. Furthermore, recycled resin grades exhibit comparable performance and characteristics, such as transparency.

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conventional feedstock to yield greener polystyrene resins suitable for demanding applications, including food contact applications. Furthermore, these resin grades are ISCC PLUS certified (i.e., mass balance chain of custody model), ensuring adequate transparency and traceability.

To further its resolve toward achieving complete circularity, the company announced in March 2021 its collaboration with BASF to develop renewable and recycled feedstock-based styrene characterized by an improved environmental profile. Trinseo is expected to launch its range of renewable feedstock-based polystyrene resins comprising second-generation bio-waste-derived styrene monomer in the short term, thereby establishing itself as a completely circular polystyrene solutions company. Trinseo’s pioneering efforts involving a 360-degree approach toward circular polystyrene solutions that comprise advanced recycling, dissolution, and bio-based feedstock-derived resins have enabled it to carve out an edge over the competition.

Strategy Execution by Means of Stakeholder Integration: Collaborative Application Development to Ensure a Favorable Customer Ownership Experience

Accurate collection, sorting, and pre-treatment remain the key bottlenecks in the path toward circularity; therefore, Trinseo has been working to strengthen the critical infrastructure to facilitate the development and consistent production of high-quality recycled polystyrene resin grades.

With its robust range of completely circular polystyrene solutions, Trinseo is well positioned to engage in collaborative partnerships with customers that are increasingly demanding sustainable alternatives.

Among the noteworthy developments is the company’s recent successful commercial collaboration with Intraplás, a leading extruded plastic sheet provider for food applications, aimed at developing a sustainable, recycled polystyrene-based packaging (yogurt pots) for General Mills’s Yoplait brand of yogurt. Conventionally, thermoformed or injection molded virgin polystyrene or PET resins are used for manufacturing billions of yogurt cups worldwide. Trinseo’s certified depolymerization process-based STYRON CO₂RE Polystyrene Resin has been successfully used to commercially replace virgin resins and to develop yogurt pots comprising 50% recycled content (e.g., mono-material and multi-layer structure). The initial results of the LCA study point to promising environmental benefits.

Similarly, Trinseo has developed a range of recycled polystyrene resin grades based on the depolymerization technology. For instance, in May 2021, the company launched its STYRON CO₂RE CR55 Polystyrene Resin comprising 55% recycled content obtained through the depolymerization of polystyrene waste. The polystyrene waste is depolymerized through a chemical process into monomer (styrene monomer), which is used to partially substitute

Similarly, Trinseo collaborated with Fernholz, a leading European packaging solutions provider, to develop a 30% recycled content-based polystyrene grade as an alternative to virgin polystyrene for form-fill-seal (FFS) applications in food packaging. This novel initiative demonstrates the successful substitution of virgin resin grades with sustainable alternatives, without incurring capital investment to upgrade FFS equipment. Welcome breakthroughs in the commercial substitution of fossil-based resins with Trinseo's sustainable polystyrene grades in the ever-demanding food packaging application are expected to accelerate the shift toward circularity across the value chain.

Strategy Execution through Stakeholder Integration: Recycling Infrastructure Development

Considering the high-volume, demanding nature of food packaging applications and the growing adoption of sustainable alternatives, the supply of high-quality recycled resins needs to be ramped up. Accordingly, a joint industry consortium called Styrenics Circular Solutions (SCS) was formed with the common aim to increase circularity in the styrenics value chain. Trinseo was a founding member of this consortium and has partnered with another leading polystyrene supplier Ineos Styrolution and technology provider Recycling Technologies to set up polystyrene recycling plants in Europe. The first pilot plant for the depolymerization of polystyrene is expected to be operational by mid-2022 in the United Kingdom.

Furthermore, Trinseo announced its plan to build its own full commercial 15-kilotons-per-annum (KTA)

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polystyrene recycling plant in Tessenderlo, Belgium, which is expected to be operational in 2023. In the United States, Amsty, which is Trinseo's joint venture (JV) with Chevron Phillips Company in the United States, operates integrated polystyrene facilities and has partnered with recycling technology provider Agilyx to set up Regenyx LLC, a JV aimed at recycling polystyrene waste into styrene monomer. The robust recycling infrastructure in Europe and North America is expected to help Trinseo cater to the ever-

increasing demand for high-quality recycled polystyrene resin grades from across industries. In an ever-competitive industry witnessing an upsurge in demand for sustainable alternatives, Trinseo, with its integrated global footprint, is well positioned to facilitate an accelerated shift toward circularity across the value chain.

Conclusion

In its quest toward circularity, Trinseo has effectively developed and commercialized a range of differentiated and environmentally friendly grades of recycled polystyrene resins. With a well-developed portfolio of sustainable materials, collaborative applications, infrastructure development initiatives, and well-established technical and technological capabilities, Trinseo continues to gain an edge in the competitive market.

For its strong overall performance, Trinseo earns Frost & Sullivan's 2021 Competitive Strategy Leadership Award in the global circular economy plastics industry.

What You Need to Know about the Competitive Strategy Leadership Recognition

Frost & Sullivan's Competitive Strategy Leadership Award recognizes the company with a stand-out approach to achieving top-line growth and a superior customer experience.

Best Practices Award Analysis

For the Competitive Strategy Leadership Award, Frost & Sullivan analysts independently evaluated the criteria listed below.

Strategy Innovation

Strategy Effectiveness: Effective strategy balances short-term performance needs with long-term aspirations and overall company vision

Strategy Execution: Company strategy utilizes Best Practices to support consistent and efficient processes

Competitive Differentiation: Solutions or products articulate and display unique competitive advantages

Executive Team Alignment: Executive team focuses on staying ahead of key competitors via a unified execution of its organization's mission, vision, and strategy

Stakeholder Integration: Company strategy reflects the needs or circumstances of all industry stakeholders, including competitors, customers, investors, and employees

Customer Impact

Price/Performance Value: Products or services provide the best value for the price compared to similar market offerings

Customer Purchase Experience: Quality of the purchase experience assures customers that they are buying the optimal solution for addressing their unique needs and constraints

Customer Ownership Experience: Customers proudly own the company's product or service and have a positive experience throughout the life of the product or service

Customer Service Experience: Customer service is accessible, fast, stress-free, and high quality

Brand Equity: Customers perceive the brand positively and exhibit high brand loyalty

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- **ROI & Margin:** Implementation Excellence
- **Transformational Growth:** Industry Leadership



The Innovation Generator™

Our six analytical perspectives are crucial in capturing the broadest range of innovative growth opportunities, most of which occur at the points of these perspectives.

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- **Mega Trend (MT)**
- **Business Model (BM)**
- **Technology (TE)**
- **Industries (IN)**
- **Customer (CU)**
- **Geographies (GE)**

