



Revolutionizing Tire Recycling

From recycling to creating innovative products



Liberty Tire Recycling

Waste-to-Value

Company Description

Liberty Tire Recycling (Liberty Tire) is a materials management and recycling company specializing in the recovery and repurposing of end-of-life tires into high-value secondary materials for infrastructure, construction, and industrial applications. Through advanced processing and material blending technologies, Liberty Tire transforms recycled tire rubber into engineered products designed to improve performance while supporting circular economy objectives and waste diversion. This report assesses the Greenhouse Gas (GHG) Footprint of four Liberty Tire Recycling products: crumb rubber, SmartMIX®, DOT Additive, and TRXP.

Results presented in this report are based on material composition, processing, and manufacturing data provided by Liberty Tire Recycling to Boundless and reflect the defined production assumptions and system boundaries used for the GHG Footprint analysis.

Headquarters	Pittsburgh, PA
Founded	2000
Stage	Growth & Expansion
Employees	3,500
Website	libertytire.com

Alignment with the United Nations (UN) Sustainable Development Goals (SDGs)



Industry, Innovation and Infrastructure

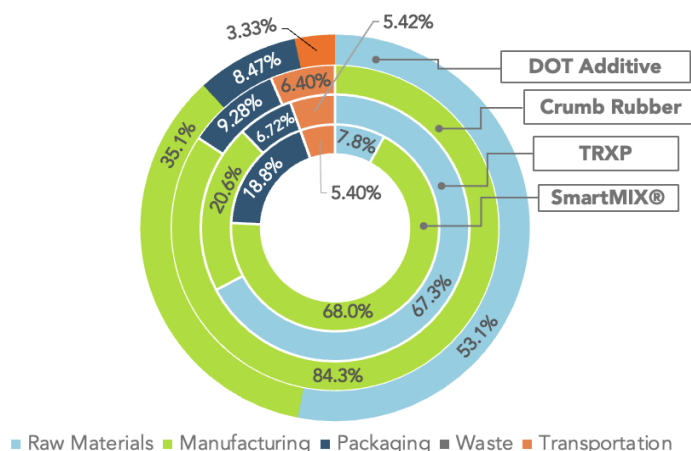


Responsible Consumption and Production



Life on Land

Liberty Tire Recycling GHG Footprint*



*GHG Footprint reflects a cradle-to-gate boundary. Percentages represent gross emissions, without avoided emissions. Categories contributing <1% may not be visible.

Boundless Analysis

- ▶ This report evaluates the cradle-to-gate GHG Footprints of four Liberty Tire Recycling products—crumb rubber, SmartMIX®, DOT Additive, and TRXP—using a functional unit (FU) of one pound (lb) of product.
- ▶ Results are presented across three United States electricity grid regions to capture regional variation in energy-related emissions.
- ▶ Crumb rubber has an estimated GHG Footprint of 0.0435 kg carbon dioxide equivalent (CO₂e) per lb and -0.543 kg CO₂e per lb, without and with avoided emissions, respectively.
- ▶ SmartMIX® has an estimated GHG Footprint of 0.0605 and -0.565 kg CO₂e per lb, without and with avoided emissions, respectively.
- ▶ DOT Additive has an estimated GHG Footprint of 0.134 and -0.492 kg CO₂e per lb, without and with avoided emissions, respectively.
- ▶ TRXP has an estimated GHG Footprint of 0.0950 and -0.470 kg CO₂e per lb, without and with avoided emissions, respectively.

Management Team

- ▶ **Thomas Womble, Chief Executive Officer:** Mr. Womble has 25 years of experience consolidating, integrating, and optimizing solid waste companies. This experience spans various industries, including solid waste hauling, landfill development and operations, portable toilets, and tire recycling. Mr. Womble was an original investor in Liberty Tire Recycling, LLC. He returned to the company in 2013 as the Chief Operating Officer and was named CEO in 2017. Mr. Womble received a B.S. in business administration from the University of North Carolina Wilmington.
- ▶ **Patrick Ryan, Chief Financial Officer:** Mr. Ryan joined Liberty Tire Recycling in June 2023. He previously served as the Chief Financial Officer of Resources Environmental Solutions (RES), a middle market environmental services business backed by Onex and KKR. Prior to joining RES, he worked as an investment professional in the Americas Private Equity division of KKR and began his career in the investment banking division of Tudor, Pickering, Holt & Co. (now a part of Perella Weinberg Partners). Mr. Ryan holds a B.A. in Economics & Global Studies from the University of North Carolina at Chapel Hill where he was a Morehead-Cain Scholar.
- ▶ **Chase Helon, Chief Operating Officer:** Mr. Helon joined Liberty Tire Recycling in 2011 and has served in a variety of progressive finance and commercial operating roles. He has more than 15 years of experience in finance and, prior to his time at Liberty, worked for Deloitte. Mr. Helon has a B.S. in business administration from Bucknell University and is also a certified public accountant.
- ▶ **Amy Brackin, Sr. Vice President, Sales & Sustainability:** Ms. Brackin joined Liberty Tire Recycling in 2012 and held several roles in business and market development before being promoted to lead the company's sales and sustainability initiatives. Ms. Brackin has a B.A. in political science at the University of Delaware and has completed coursework in sustainability management from Duke University and Yale's Executive Education program.

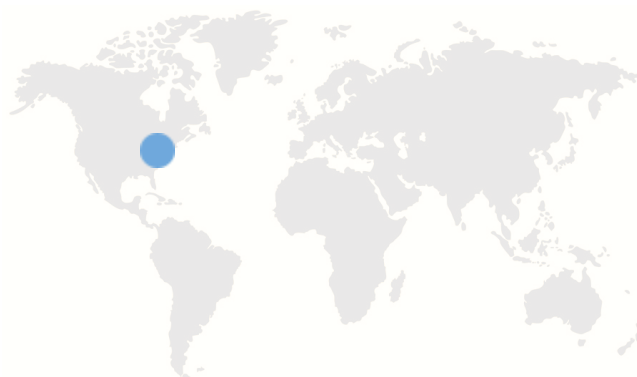
Technology

- ▶ Liberty Tire Recycling recovers end-of-life tires and processes them into engineered rubber materials through shredding, grinding, and blending operations.
- ▶ Recycled tire rubber is formulated into application-specific products designed to meet performance requirements for infrastructure, construction, and industrial uses.

Operations and Milestones

- ▶ Liberty Tire Recycling is headquartered in Pittsburgh, PA, with production locations across North America.
- ▶ Liberty Tire Recycling was established in 2000 and is celebrating its 26th anniversary this year.
- ▶ Recently acquired by I Squared Capital, Liberty Tire is the leading tire collection and recycling business in the United States and Canada, collecting and processing more than 215 million tires each year.

Current Operations



Environmental Highlights

Summarized below are the most relevant impact categories and codes that refer to the UN [SDGs](#). This section highlights the most important factors that explain how this technology impacts the environment and society.

Resilient Materials & Infrastructure



UN SDG 9 emphasizes building resilient infrastructure and promoting sustainable industrialization. Liberty Tire Recycling's products are derived from end-of-life tires and are designed for use in infrastructure, construction, and engineered material applications. By converting a consistent and widely available waste stream into durable secondary materials, Liberty's production process is resilient to fluctuations in virgin raw material supply chains and commodity markets. Unlike products that are dependent on the extraction of new raw materials, Liberty's crumb rubber, SmartMIX®, DOT Additive, and TRXP rely on recovered tire rubber, supporting long-term material availability while enhancing the performance and durability of infrastructure systems. This approach contributes to resilient infrastructure development while reducing dependence on resource-intensive virgin materials.

Relevant code: [SDG 9](#), Industry, Innovation and Infrastructure.

Waste Diversion & Circular Material Use



Globally, millions of end-of-life tires are generated each year, and without effective recycling pathways, these materials are often landfilled, stockpiled, or illegally dumped, creating long-term environmental and public health risks. Liberty Tire Recycling directly addresses this challenge by diverting discarded tires from disposal and reintroducing them into productive use. By processing recycled tire rubber into crumb rubber, SmartMIX®, DOT Additive, and TRXP, Liberty advances circular material flows and reduces waste across the tire life cycle. This approach minimizes the need for virgin materials, lowers disposal burdens, and supports more responsible patterns of production and consumption within infrastructure and industrial markets.

Relevant code: [SDG 12](#), Responsible Consumption and Production.

Environmental Protection & Land Systems



Improper tire disposal can negatively affect terrestrial ecosystems through land use impacts, fire risk, and the release of contaminants into soil and groundwater. Liberty Tire Recycling mitigates these risks by providing a controlled, industrial pathway for tire recovery and reuse, reducing the environmental pressures associated with unmanaged tire waste. While this report does not quantify broader ecological impacts, it can be reasonably inferred that diverting tires from landfills and stockpiles helps protect land-based ecosystems and reduces environmental degradation. By transforming waste into functional materials for infrastructure and construction, Liberty supports more sustainable land use and reduced environmental risk.

Relevant code: [SDG 15](#), Life on Land.

Environmental Key Performance Indicators

This section presents the Environmental Key Performance Indicators (EKPIs) for four Liberty Tire Recycling products: crumb rubber, SmartMIX®, DOT Additive, and TRXP. The assessment evaluates the cradle-to-gate environmental performance of each product across three major United States electricity grid regions, capturing regional variation in electricity-related impacts.

Environmental performance results reflect contributions from raw material inputs, transportation of materials to Liberty Tire facilities, manufacturing operations, waste management, and recycling credits applied through system expansion. Results are reported per unit of product and are presented graphically using bar charts to illustrate variation across grid regions. The Reliability First Corporation (RFC) region (Mid-Atlantic and Midwest) has a mixed generation profile with coal, natural gas, nuclear, and growing renewables, reflecting a transitional emissions intensity. The SERC Reliability Corporation (SERC) region (Southeastern US) relies heavily on natural gas and nuclear with remaining coal and expanding solar, while the Western Electricity Coordinating Council (WECC) region (Western US) generally exhibits lower average emissions due to a larger share of hydroelectric and other renewable generation, though impacts vary by subregion.

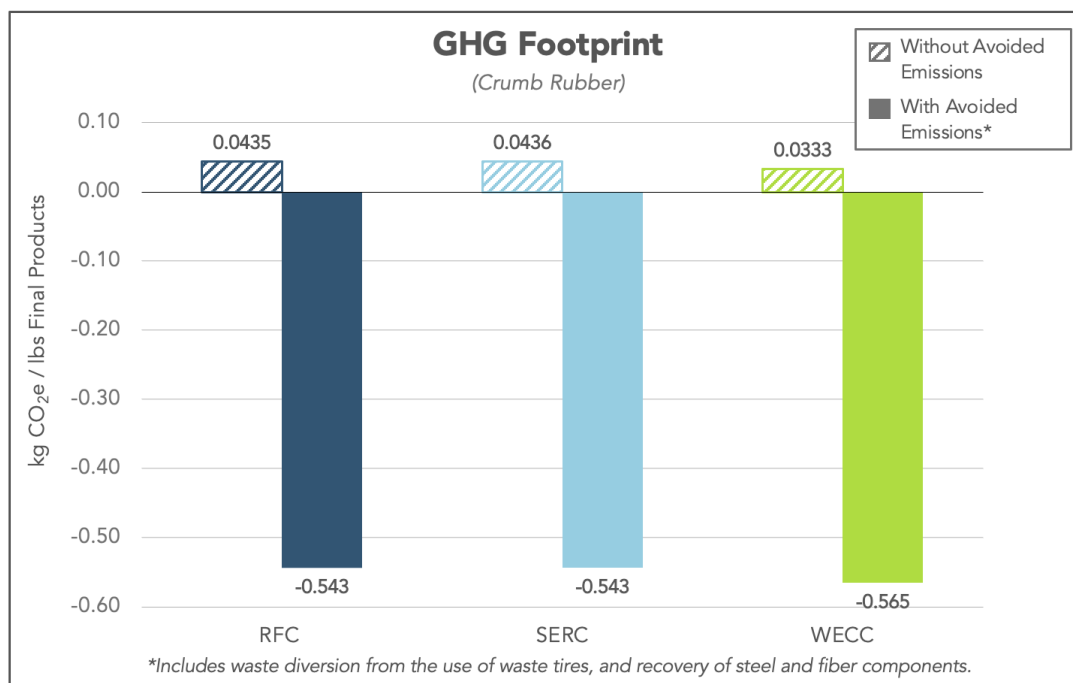
Where applicable, system expansion is used to account for avoided upstream emissions associated with steel and fiber recovery, displacement of virgin materials and fuels, and avoided tire landfilling. A detailed breakdown of allocation methodology and GHG Footprint contributions by life cycle stage for each product is provided in the appendix to support transparency and interpretation of results.

Greenhouse Gas Footprint

Crumb Rubber

GHG Footprint is a measure of the cradle-to-gate GHG emissions resulting from the production of 1 lb of crumb rubber; it is reported in kg CO₂e per lb of product. GHG Footprint accounts for all raw materials, energy, and water inputs. All crumb rubber GHG Footprints include credits applied through system expansion to reflect avoided upstream emissions. These credits account for the recovery of steel from waste tires, which displaces the production of virgin steel in the market, as well as the recovery of tire-derived fiber used as a substitute fuel source in cement kilns. In addition, crumb rubber receives a credit for the use of waste tires as a feedstock, reflecting avoided emissions associated with tire landfilling, as estimated using the US Environmental Protection Agency's (EPA's) [Waste Reduction Model](#) (WARM). Together, these system expansion credits materially reduce the net cradle-to-gate GHG Footprint and are consistently applied across all regional electricity scenarios.

- ▶ Across all US electricity regions evaluated, crumb rubber production exhibits a net negative cradle-to-gate GHG Footprint, ranging from approximately -0.543 to -0.565 kg CO₂e per lb of final product, depending on grid mix.
 - Regional variation in results is driven primarily by differences in electricity grid carbon intensity, with WECC showing the most negative GHG Footprint due to lower-carbon electricity supply.
 - Without accounting for the offsets from waste diversion and steel/fiber recycling, crumb rubber has a GHG Footprint of 0.0435, 0.0436, and 0.0333 kg CO₂e/lb for the RFC, SERC, and WECC regions, respectively.
- ▶ Even in regions with relatively higher grid emissions (e.g., RFC and SERC), the overall GHG Footprint of crumb rubber production remains consistently net negative, indicating robust performance across geographies.
- ▶ The spread between the lowest and highest regional results is modest, suggesting that electricity mix influences the magnitude, but not the direction, of climate impact.
- ▶ These results demonstrate that crumb rubber production delivers net GHG benefits across all modeled US grids, supporting scalability without materially compromising climate performance.

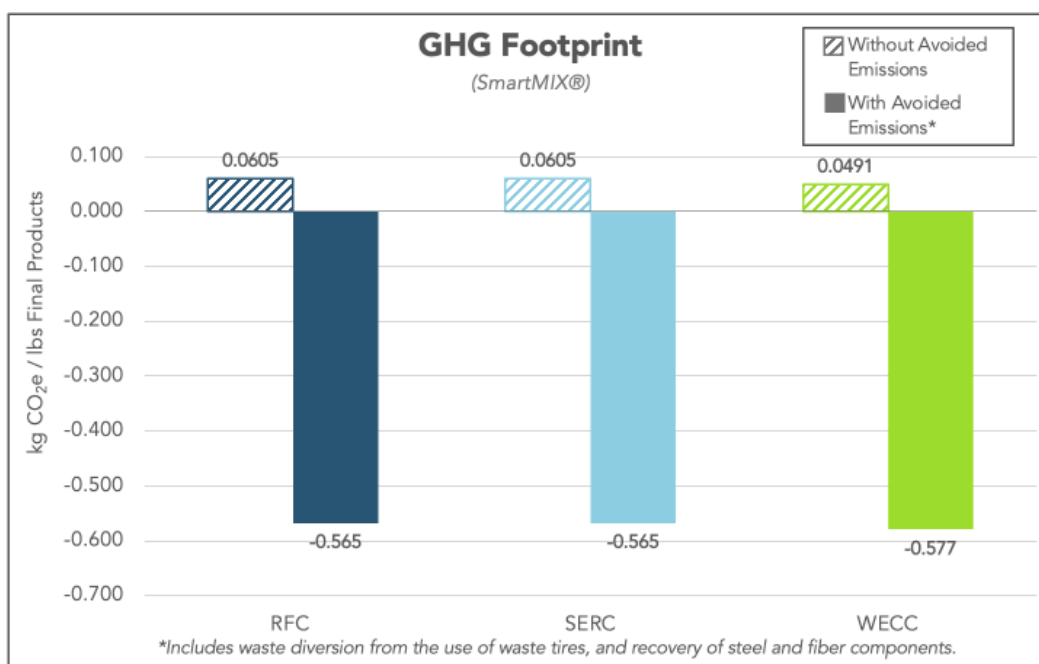


Greenhouse Gas Footprint

SmartMIX®

GHG Footprint is a measure of the cradle-to-gate GHG emissions resulting from the production of 1 lb of SmartMIX® Product; it is reported in kg CO₂e per lb of product. GHG Footprint accounts for all raw materials, energy, and water inputs. All SmartMIX® GHG Footprints include credits applied through system expansion to reflect avoided upstream emissions. These credits account for the recovery of steel from waste tires, which displaces the production of virgin steel in the market, as well as the recovery of tire-derived fiber used as a substitute fuel source in cement kilns. In addition, SmartMIX® receives a credit for the use of waste tires as a feedstock, reflecting avoided emissions associated with tire landfilling, as estimated using the US EPA's WARM. Together, these system expansion credits materially reduce the net cradle-to-gate GHG Footprint and are consistently applied across all regional electricity scenarios.

- ▶ As shown in the figure, the cradle-to-gate GHG Footprint of SmartMIX® production is negative across all electricity regions evaluated, ranging from approximately -0.565 to -0.577 kg CO₂e per lb of final product.
 - Results vary by region in line with differences in electricity grid carbon intensity. WECC exhibits the lowest footprint (-0.577 kg CO₂e/lb), reflecting its lower-carbon electricity mix, while RFC and SERC show higher but similar values.
 - Without accounting for the offsets from waste diversion and steel/fiber recycling, SmartMIX® has a GHG Footprint of 0.0605, 0.0605, and 0.0491 kg CO₂e/lb for the RFC, SERC, and WECC regions, respectively.
- ▶ The spread between the lowest and highest regional results is modest, suggesting that, while electricity mix influences the magnitude of emissions, it does not dramatically alter overall performance.
- ▶ Overall, the graphic demonstrates that SmartMIX® production maintains a relatively low GHG Footprint across diverse US grid regions, supporting its applicability across geographies without large variation in climate performance.

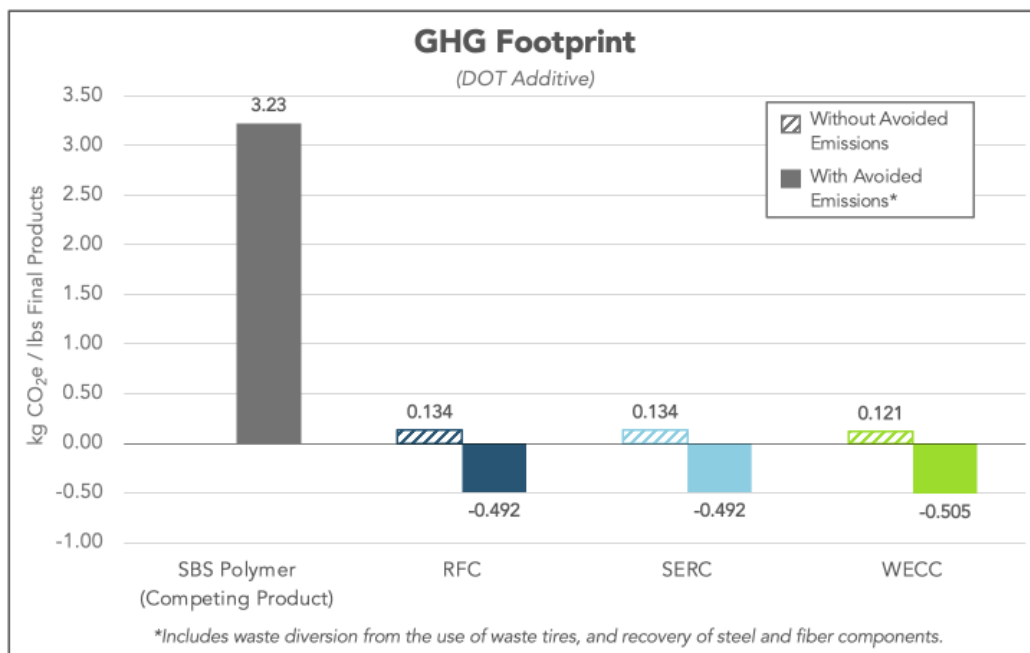


Greenhouse Gas Footprint

DOT Additive

GHG Footprint is a measure of the cradle-to-gate GHG emissions resulting from the production of 1 lb of DOT Additive product; it is reported in kg CO₂e per lb of product. GHG Footprint accounts for all raw materials, energy, and water inputs. All DOT Additive GHG Footprints include credits applied through system expansion to reflect avoided upstream emissions. These credits account for the recovery of steel from waste tires, which displaces the production of virgin steel in the market, as well as the recovery of tire-derived fiber used as a substitute fuel source in cement kilns. In addition, DOT Additive receives a credit for the use of waste tires as a feedstock, reflecting avoided emissions associated with tire landfilling, as estimated using the US EPA's WARM. Together, these system expansion credits materially reduce the net cradle-to-gate GHG Footprint and are consistently applied across all regional electricity scenarios.

- ▶ As shown in the figure, the cradle-to-gate GHG Footprint of the DOT Additive ranges from approximately -0.492 to -0.505 kg CO₂e per lb of final product across the electricity regions evaluated.
 - WECC exhibits the lowest GHG Footprint (-0.505 kg CO₂e/lb), reflecting its relatively lower-carbon electricity mix compared with the other regions shown.
 - Without accounting for the offsets from waste diversion and steel/fiber recycling, DOT Additive has a GHG Footprint of 0.134, 0.134, and 0.121 kg CO₂e/lb for the RFC, SERC, and WECC regions, respectively.
- ▶ The difference between the lowest and highest regional results is modest, suggesting that, while electricity mix affects the magnitude of emissions, overall performance remains relatively consistent across regions.
- ▶ Overall, the graphic demonstrates that the DOT Additive maintains a stable cradle-to-gate GHG Footprint across different US electricity regions, with regional variation driven primarily by electricity grid composition rather than process differences.
- ▶ The image below compares Liberty Tire's DOT Additive product to an industry average for SBS (styrene-butadiene-styrene) Polymers including: generic SBS Polymers, 2.80% SBS modified polymers, and 7.50% SBS modified polymers.
 - Liberty Tire's DOT Additive GHG Footprint is more than 100% lower than the benchmarked competitor.
 - SBS Polymers are a direct competitor to Liberty Tire's DOT Additive product.

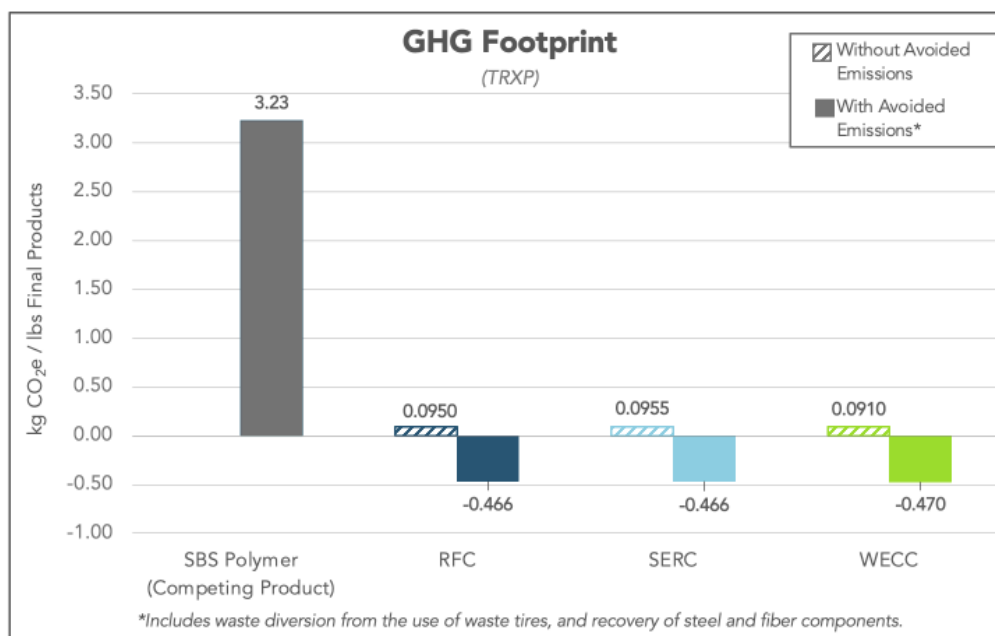


Greenhouse Gas Footprint

TRXP

GHG Footprint is a measure of the cradle-to-gate GHG emissions resulting from the production of 1 lb of TRXP Product; it is reported in kg CO₂e per lb of product. The TRXP product is produced by combining micronized rubber powder (MRP) and the Rheopave® additive through mixing. GHG Footprint accounts for all raw materials, energy, and water inputs. All TRXP GHG Footprints include credits applied through system expansion to reflect avoided upstream emissions. These credits account for the recovery of steel from waste tires, which displaces the production of virgin steel in the market, as well as the recovery of tire-derived fiber used as a substitute fuel source in cement kilns. In addition, TRXP receives a credit for the use of waste tires as a feedstock, reflecting avoided emissions associated with tire landfilling, as estimated using the US EPA's WARM. Together, these system expansion credits materially reduce the net cradle-to-gate GHG Footprint and are consistently applied across all regional electricity scenarios.

- ▶ As shown in the figure, the cradle-to-gate GHG Footprint of TRXP production is net negative across all electricity regions evaluated, ranging from approximately -0.466 to -0.470 kg CO₂e per lb of final product.
 - Results vary by region in line with differences in electricity grid carbon intensity. WECC exhibits the lowest footprint (-0.470 kg CO₂e/lb), reflecting its lower-carbon electricity mix, while RFC and SERC show higher but similar values.
 - Without accounting for the offsets from waste diversion and steel/fiber recycling, TRXP has a GHG Footprint of 0.0950, 0.0955, and 0.0910 kg CO₂e/lb for the RFC, SERC, and WECC regions, respectively.
- ▶ The spread between the lowest and highest regional results is modest, suggesting that, while electricity mix influences the magnitude of emissions, it does not dramatically alter overall performance.
- ▶ Overall, the graphic demonstrates that TRXP production maintains a relatively low GHG Footprint across diverse US grid regions, supporting its applicability across geographies without large variation in climate performance.
- ▶ The image below compares Liberty Tire's TRXP product to an industry average for SBS Polymers including: generic SBS Polymers, 2.80% SBS modified polymers, and 7.50% SBS modified polymers.
 - Liberty Tire's TRXP GHG Footprint is more than 100% lower than the benchmarked competitor.
 - SBS Polymers are a direct competitor to Liberty Tire's TRXP product.

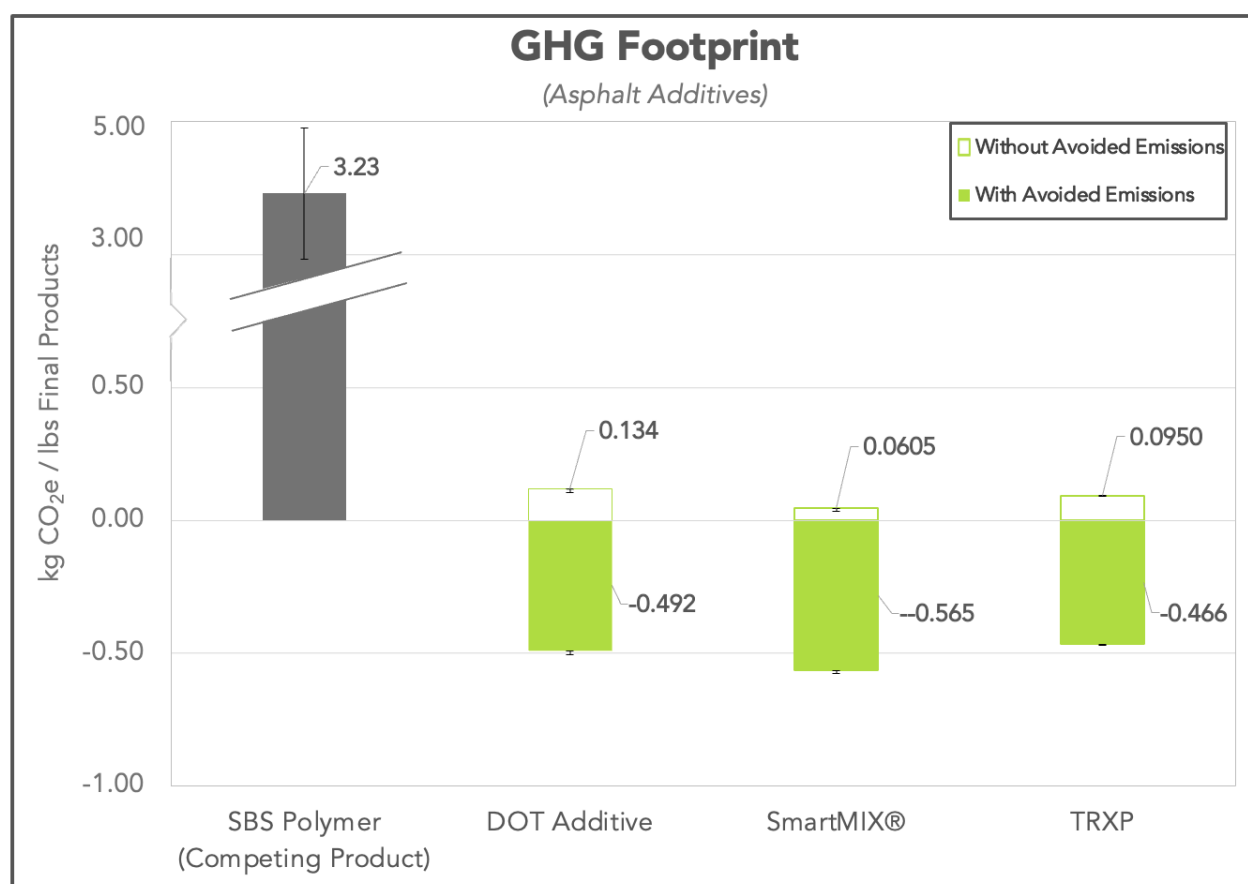


Greenhouse Gas Footprint

Asphalt Additive Products

As shown in the chart below, the estimated cradle-to-gate GHG Footprint of Liberty Tire Recycling's asphalt additive production is -0.492 kg CO₂e per lb of product for DOT Additive, -0.565 kg CO₂e per lb of product for SmartMIX®, and -0.466 kg CO₂e per lb of product for TRXP. These values reflect the RFC grid, with the error bars representing the SERC grid (upper end) and the WECC grid (lower end). All three products outperform SBS Polymer with respect to GHG Footprint.

These results reflect avoided emissions from utilizing waste tires as a feedstock that would otherwise be landfilled, recovering steel wire from the waste tires that is assumed to replace virgin steel production, and using fiber from the waste tires as an alternative fuel. Without accounting for avoided emissions on the RFC grid, Liberty Tire Recycling's DOT Additive, SmartMIX®, and TRXP products have GHG Footprints of 0.134, 0.0605, and 0.0950 kg CO₂e per lb of product, respectively.



About Boundless Impact Research & Analytics

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