

Milepost 2020: Climate Change Mitigation

In 2018, USTMA set forth a vision in which its members would strive to manufacture tires that reduce greenhouse gas emissions throughout a tire's life cycle. After soliciting stakeholder input, we have expanded that vision to reflect a more holistic view of climate change mitigation, encompassing the full scope of member operations and supply chains.

USTMA members are committed to:

- Manufacturing products that reduce CO₂ emissions, a primary contributor to greenhouse gas;
- Research and development of materials with lower carbon footprints;
- Proactive measures to reduce greenhouse gas emissions from our manufacturing facilities; and
- Advancing the circular economy for scrap tires.

PROGRESS THROUGH OUR PRODUCTS

The greatest opportunity for USTMA members to reduce CO₂ emissions is through the performance of their products on the road. More than 80 percent of tire-related CO₂ emissions are linked to vehicle fuel consumption; reduced fuel consumption translates to reduced CO₂ emissions. USTMA has long worked with the federal government to promote fuel-efficient tires and its members are offering an ever-wider selection of products with **improved rolling efficiency** so that less energy is required to propel a vehicle down the road.

RENEWABLE AND RECYCLED FEED-STOCKS HELP REDUCE LIFE CYCLE CO₂

Bridgestone, Continental, Cooper, Goodyear, Hankook, Kumho, Michelin, Nokian, Pirelli and Yokohama are among the USTMA member companies actively researching and utilizing feedstocks such as carbon black and micronized rubber powder recycled from end-of-life tires. These recycled materials avoid the CO₂ emissions associated with producing virgin feedstocks and advance a sustainable and circular scrap tire value chain. Manufacturing retreaded tires reduces CO₂ emissions and fosters the circular economy.

Guayule, a shrub native to American deserts, holds potential as a source of natural rubber



Renewable plant-based replacements for natural rubber, grown closer to manufacturing facilities, have the potential to significantly reduce transportation-related CO₂ emissions. For example, Nokian is investigating different varieties of guayule, a perennial shrub that thrives in desert environments, for their

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Seizing Opportunities for Improvement across the Value Chain

USTMA members are taking action to reduce their carbon footprints and mitigate climate change impacts in all aspects of their operations. Examples of this multi-dimensional approach include:

- Bridgestone's facility in Aiken County, South Carolina, installed an 8-acre array of solar energy panels, averting 1,400 metric tons of CO₂ annually.
- Continental installed LED lighting, improved insulation around presses to reduce heat loss, and enhanced its energy monitoring system.
- Cooper has implemented upgrades to energy efficient LED lighting, utilizing new energy sources and infrastructure improvements.

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VISION:

USTMA members strive to reduce greenhouse gas emissions throughout a tire's life cycle.

SNAPSHOT:

- Total U.S. tire industry CO₂ emissions decreased 6% from 2017-2019.
- CO₂ intensity decreased 7% over the same period.
- More than half of USTMA members have now set numeric goals for improved rolling efficiency.



More than half of USTMA member companies have set numeric commitments for improved rolling efficiency*

A tire with improved rolling efficiency reduces vehicle fuel consumption, reducing CO₂ emissions.

*Bridgestone, Continental, Goodyear, Hankook, Michelin, Nokian and Pirelli

For more information on USTMA and member company actions on climate change mitigation, visit sustainability.ustires.org

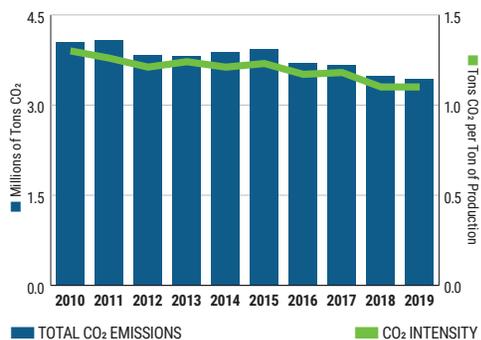
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potential as a commercially viable alternative to natural rubber imported from Southeast Asia. Working in partnership with DuPont, Goodyear has developed and patented a bio-based synthetic rubber — most synthetic rubbers are petroleum-based feedstock — that could help the company reduce its carbon footprint.

PROGRESS IN OUR FACILITIES

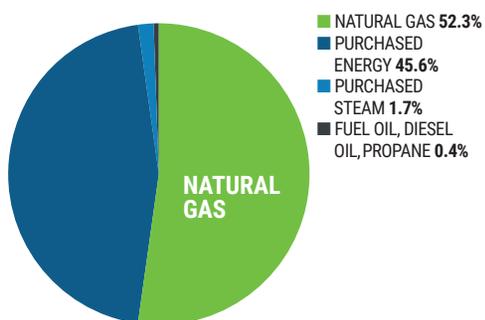
Total emissions of CO₂ related to tire manufacturing decreased 15% from 2010 to 2019.

CO₂ EMISSIONS BY U.S. TIRE MANUFACTURERS

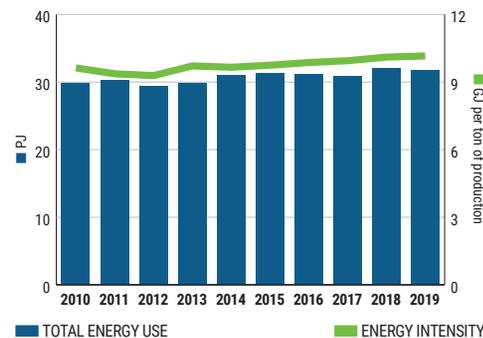


Much of this is due to improvements in the U.S. electricity grid, but tire manufacturers are also doing their part: More than half of the energy used at USTMA member facilities comes from natural gas. In addition, manufacturers are implementing a variety of strategies and technologies to improve the energy efficiency of their operations and reduce CO₂ emissions.

USTMA MEMBER FUEL MIX (2019)

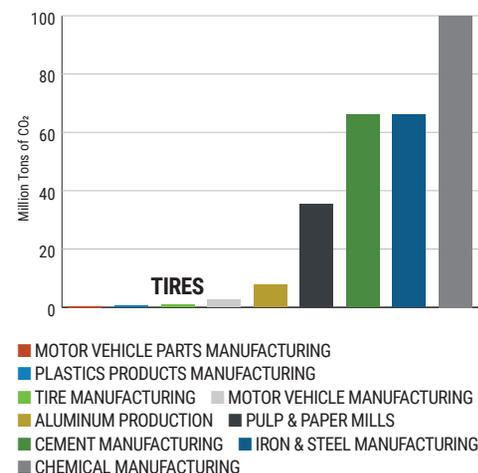


ENERGY USE BY U.S. TIRE MANUFACTURERS



Producing higher efficiency tires is relatively more energy intensive, but the front-end energy use is more than offset by the energy savings across the tire's entire life cycle. U.S. tire manufacturers' energy consumption increased 7% between 2010 and 2019 with the implementation of new technologies and the construction of new manufacturing capacity. However, because USTMA members are finding energy-saving opportunities in other aspects of their operations, total energy *intensity* — the amount of energy required to produce one ton of product — is growing more slowly than total energy use. Overall, U.S. Department of Energy data underscores that tire manufacturing remains a low energy-intensive industry.

ANNUAL CO₂ EMISSIONS BY INDUSTRY



SOURCE: U.S. Environmental Protection Agency

32% fewer CO₂ emissions

contributed over the lifetime of rubber-modified asphalt made with scrap tires versus traditional asphalt.



SOURCE: Bartolozzi et al. (2012)

MORE CIRCULARITY = LESS CO₂

USTMA members support sustainable and circular markets for scrap tires, including markets that reduce CO₂ emissions by reducing emissions compared to those associated with the manufacture and transport of virgin materials

- **Rubber modified asphalt** made with scrap tires, in addition to offering durability and maintenance advantages, has been shown to contribute lifecycle CO₂ emissions at least 32% lower than conventional pavement.¹
- Pyrolysis of scrap tires to yield **recycled carbon black** — used to reinforce and manage heat in a tire — produces 81% less CO₂ per ton compared to virgin carbon black.²
- In 2019, 36.8% of recovered scrap tires were used as **tire derived fuel (TDF)** by cement kilns, pulp and paper mills, and other industrial users. The U.S. Environmental Protection Agency has recognized the biogenic or natural rubber fraction in TDF as carbon neutral, reducing the CO₂ emissions profile of TDF and, therefore, the tire's life cycle. In cement kilns, TDF has an added circularity benefit because the steel belts replace the ferrous oxide that would otherwise need to be added to the cement mix.³

¹ Bartolozzi et al. (2012)

² Bridgestone Americas

³ Australian Tyre Recyclers Association

SPOTLIGHT: Renewable Materials and CO₂ Progress

- Healthy and abundant forests are essential to climate balance. In 2018, the Tire Industry Project — supported by 11 USTMA member companies — initiated the multi-stakeholder Global Platform for Sustainable Natural Rubber to lead improvements in the socioeconomic and environmental performance of the natural rubber value chain, including responsible forest management.
- Plant-based rubber alternatives that can be grown closer to manufacturing facilities, such as guayule and dandelions, could reduce the CO₂ emissions associated with the transport of natural rubber, which is typically produced in Southeast Asia.
- Using rice husks as a replacement for silica, where appropriate, reduces CO₂ emissions related to silica production, which traditionally depends on fossil fuels.
- Renewable additives such as soybean and orange-peel oils, already in limited use, could increase the biogenic fraction of end-of-life scrap tires used as tire-derived fuel, which is recognized in many jurisdictions as a carbon-neutral energy source and supporting a circular, low-carbon manufacturing economy.



Boosting Rolling Efficiency through High Tech and Best Practices

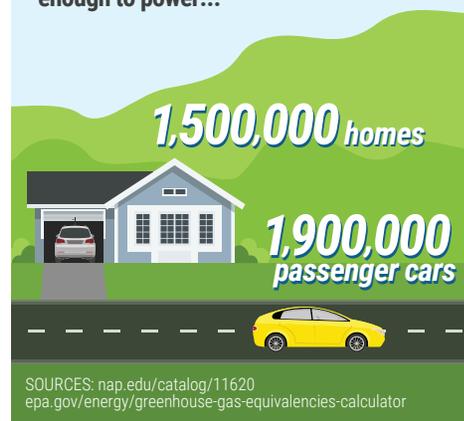
Tires are highly engineered products that must meet stringent safety and performance standards. Tire design is an exercise in balance and choice. Rolling efficiency, wet traction and tread wear are three of the key performance factors USTMA members must balance and, traditionally, favoring one attribute came at a cost to the other two, the sweet spot between them depending on the application. Today, thanks to innovative materials and manufacturing technologies, tires with improved rolling efficiency entail fewer performance tradeoffs.

PROPER INFLATION: A SIMPLE BUT EFFECTIVE SOLUTION

U.S. EPA estimates that maintaining proper tire inflation, which keeps the tire at its optimal rolling efficiency, can improve vehicle fuel mileage by an average of 0.6% — and up to 3% in some cases. USTMA and its members work constantly to educate the public on the importance of proper tire inflation in both driving and environmental performance.

Better Rolling Efficiency, Big Fuel Savings

A 1–2% increase in the fuel efficiency of light trucks and passenger cars thanks to improved rolling efficiency could save up to 2 billion gallons of fuel per year, enough to power...



Renewable energy sources are helping tire manufacturing-related CO₂ emissions

Opportunities *continued from p.1*

- Goodyear conducts energy loss assessments in its tire manufacturing facilities evaluating areas such as steam use, utility costs, heating, cooling, and electric efficiency. After the assessments, each plant identifies its greatest opportunity areas to reduce energy intensity.
- Hankook has committed to building a low-carbon management system, improving the efficiency of process energy use, expanding the use of renewable energy, and introducing innovative mitigation technology.
- Michelin's efforts include a focus on increasingly efficient transport, taking an intermodal approach. For example, some products are now shipped between Canada and the United States by boat instead of by road, reducing fuel consumption.
- Nokian has been actively reducing the CO₂ emissions of its factories by switching to lower-emission energy sources and making manufacturing processes and production facilities more energy efficient.
- Pirelli's Rome, Georgia facility hosts a third-party-owned solar array and is certified by the Forest Stewardship Council for its use of sustainably sourced natural rubber.
- Sumitomo's efforts to reduce its CO₂ emissions extend to its delivery chain by ensuring that manufacturing operations are located close to distribution infrastructure.

TDF
Tire Derived Fuel

The biogenic fraction of scrap tires (24%) is recognized as a carbon-neutral energy source in many jurisdictions. In 2019 alone, more than 100 million scrap tires were used to power cement kilns, paper mills and electric utility boilers.

SOURCE: tirederivedfuels.com