



Tires today, tomorrow, together

Materializing ambitions

TEIJIN ARAMID

Contents

Materializing ambitions	3
Reinforcing high-performance tires with Twaron®	4
Applications of Twaron® aramid fiber	12
Moving toward more sustainable tires	16
Partnering beyond materials	22
Get in touch	23



Materializing ambitions

The tire industry is evolving. Electrification, connectivity, energy efficiency, and sustainability are redefining what it means to excel on the road. While these shifts reshape expectations for the future, one principle remains constant: good design is eternal.

At the heart of this transformation is the shared ambition to create tires that deliver both exceptional performance and sustainable design. Twaron® plays a key role in helping manufacturers achieve this balance, offering the strength and reliability needed for UHP tires while supporting long-term environmental goals. By collaborating

closely with our partners, we're not just solving today's challenges, we're materializing ambitions for a safer, more efficient, and thrilling driving experience. Together, we're shaping the future of high-performance design – today, tomorrow, and beyond.



“By pairing advanced reinforcement with lasting value, we’re creating tires that not only meet today’s demands but also stand the test of time.”

Reinforcing high-performance tires with **Twaron®**

Twaron® is a high-performance para-aramid fiber that redefines the standards of strength, heat resistance, and dimensional stability in tire manufacturing. Its strength-to-weight ratio enables lighter, more efficient designs without sacrificing endurance.



Lightweight

5x stronger than steel, reducing tire weight and improving energy efficiency.



Superior performance

Provides superior handling, high dimensional stability, effective torque transfer and excellent load carrying capacity.



Improved durability

Corrosion-free reinforcement and high thermal stability for stable long-lasting performance.

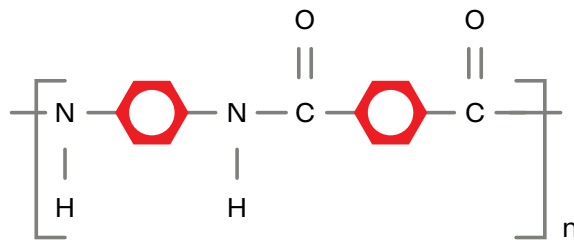


Sustainable choice

Reduces material consumption, with the lowest carbon footprint and lower use-phase emissions.

What is Twaron®?

Twaron® para-aramid yarn is designed for demanding environments, offering reliability in applications ranging from ballistic protection to heat and cut resistance. Its exceptional performance comes from its 100% paracrystalline structure, with molecules precisely aligned along the filament axis to deliver strength and durability where it's needed most.



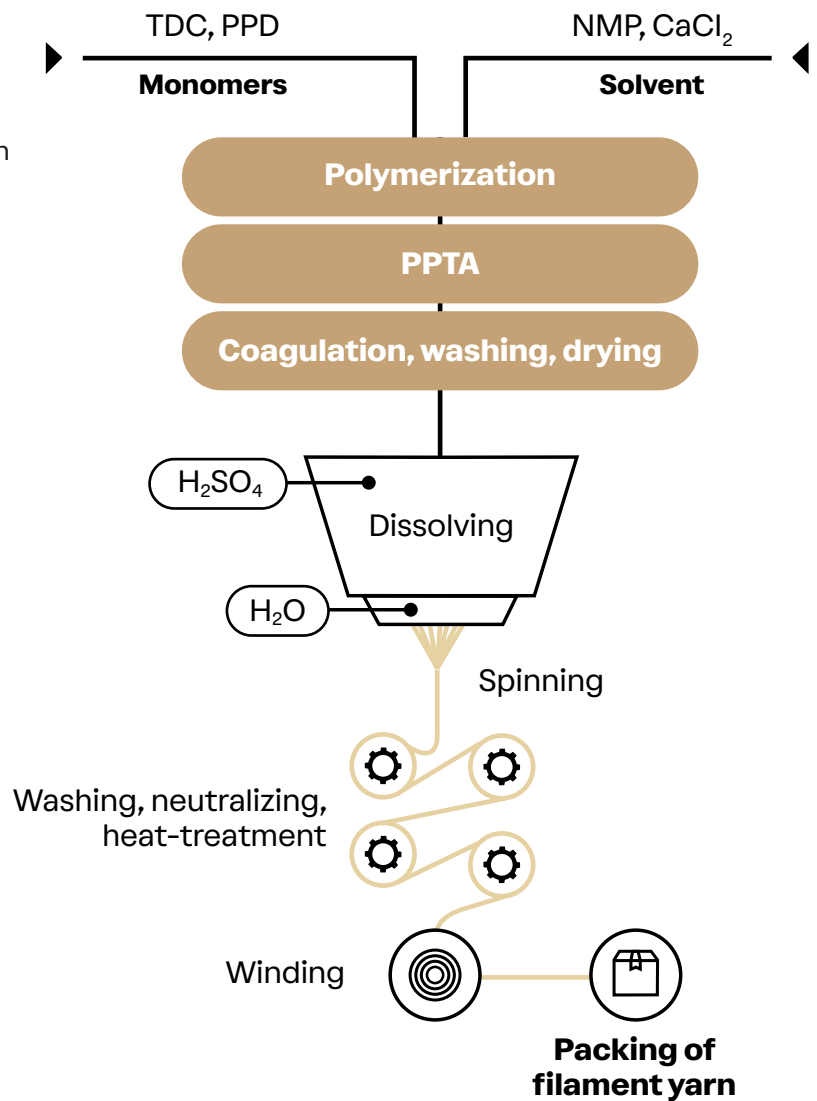
Polyparaphenylene terephthalamide (PPTA)



Production of Twaron® filament yarn

It all starts with the Twaron® production process. Our unique manufacturing process enables a material structure that offers an extraordinary set of chemical and physical properties.

Specifically, Twaron® outperforms other commonly used tire reinforcement materials such as rayon, polyester, polyamide 66, and steel on strength and modulus when compared by weight.



Twaron® is available in a range of product types, each designed to meet specific performance requirements in tire reinforcement. Our team brings deep expertise to help you identify the most suitable solution for your application, ensuring optimal results.

Product	Category
Twaron® 1000 / 1008	Standard p-aramid yarn
Twaron® 1014	Adhesion-activated p-aramid yarn. Excellent rubber adhesion, with single bath RFL dipping.
Twaron® 2200	High modulus p-aramid yarn
Twaron® 2300	High tenacity p-aramid yarn
Twaron® 2100	High elongation p-aramid yarn
Twaron® 1588, 1589	Dipped chopped fibers
Twaron® 3500	Aramid pulp masterbatch with 40% aramid content
Twaron® 3515	Compounding ingredient for hysteresis improvement

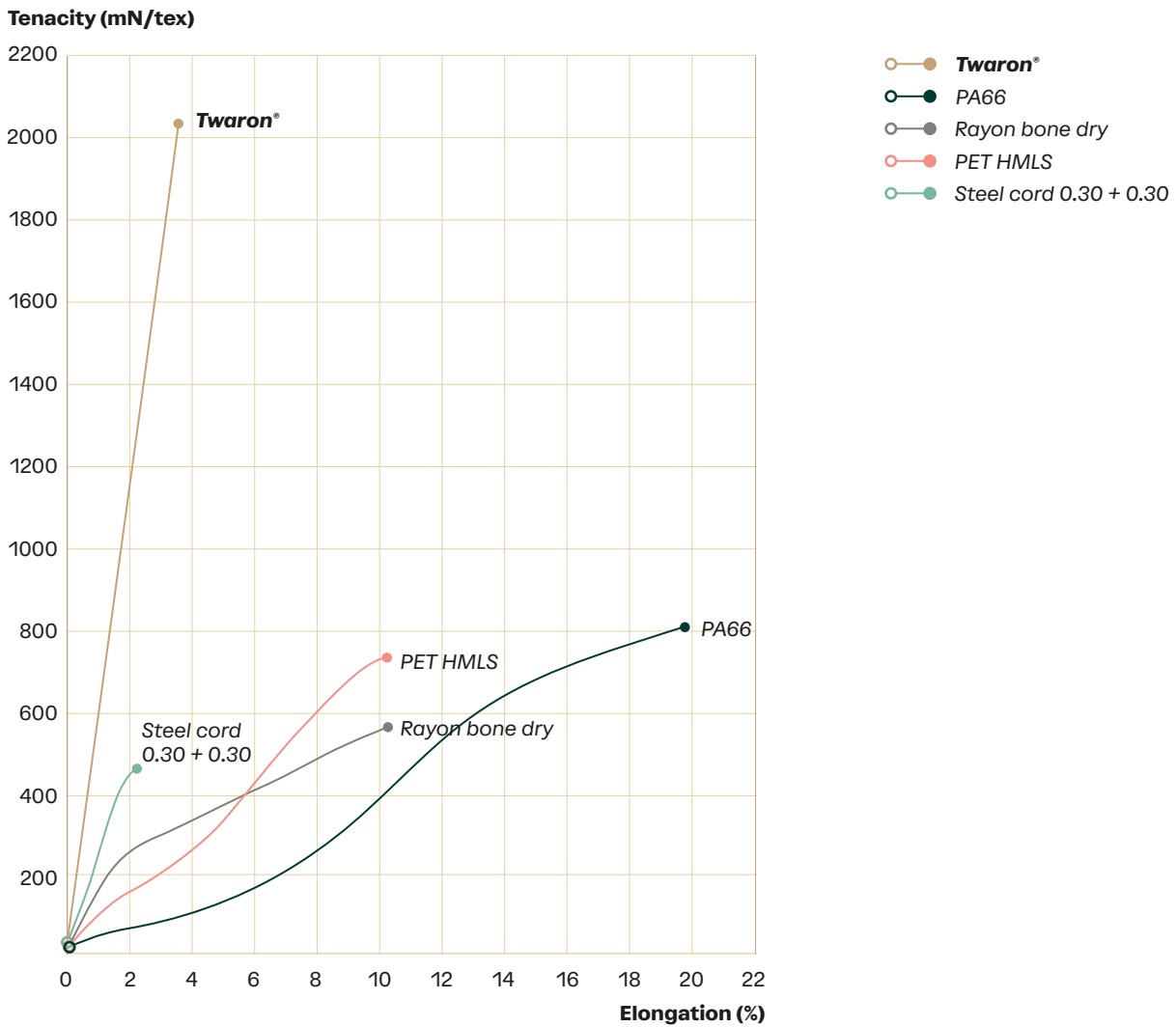
Twaron® product portfolio for tire applications



How does Twaron® compare to other materials?

The comparative properties illustrate how Twaron® enables the design of tires that require less reinforcement material – whether for carcass, belt, or cap ply – while still delivering exceptional performance under high stress and in all road conditions, even at extremely high speeds. No matter how hard drivers push their cars, Twaron® will perform when it counts.

Comparative Tenacity- Elongation Twaron® yarn



Tenacity/elongation curves of various tire reinforcement materials

Comparative properties of Twaron®

Property	Unit	Twaron® 1000 yarn	Polyamide 6.6 yarn	Polyester HMLS yarn	Rayon bone dry yarn	Steel cord 0.3+0.3
Density	kg/m ³	1440	1140	1400	1520	7750
Linear Density	dtex	1680	1400	1670	1840	11000
Number of Filaments	-	1000	290	250	1000	2
Moisture	%	6	3	-	11	-
Breaking Force	N	353	115	123	101	492
Breaking Tenacity	mN/tex	2044	805	726	543	447
Tensile Strength	GPa	2.94	0.92	1.03	0.83	3.46
Elongation at Break	%	3.5	19.7	10.3	10.1	2.2
Chord Modulus	GPa	73				167
FASE 1%	N	89	6	16	26	257
TASE 1%	mN/tex	514	42	94	142	234
Hot air shrinkage 180°C - 5 mN/tex	%	0.1	4.7	7.7	0.1	-

Uses of Twaron® in tires

Twaron® is used as a single-end cord (SEC) or tire cord fabric (TCF), tailored to specific reinforcement needs. The yarn undergoes twisting and dipping to achieve optimal properties, offering a wide range of design possibilities. For cap ply applications, Twaron® is often twisted with polyamide to create hybrid cords. This unique combination balances processability during manufacturing (tire lift) with the end-use performance (high modulus), meeting the specific demands of the cap ply layer.

Twaron® is used as a compounding ingredient in the form of dipped chopped fibers and pulp masterbatch, offering tailored solutions for enhancing rubber compound stiffness in specific applications. These include reinforcing bead apex compounds and improving cut resistance in sidewalls.

Dipped chopped fibers are available in various lengths and feature a dip treatment that facilitates easier incorporation into rubber during mixing. Twaron® pulp masterbatch, on the other hand, consists of pre-dispersed Twaron® pulp in a polyolefinic matrix, ensuring uniform distribution and improvement in low elongation modulus.



Twaron® dipped chopped fiber (DCF)



Applications of Twaron® aramid fiber



Twaron® is a trusted reinforcement material, relied upon by leading tire brands worldwide for over 30 years. It has been applied in a wide range of tire designs, including:

Off-the-road (OTR) tires

Twaron® reinforcement in OTR tires offers lightweight, corrosion-resistant durability for demanding off-road conditions. Its high-strength aramid properties allow for fewer plies, which contributes to weight reduction and cool-running performance in high-speed OTR applications.



Racing tires

Twaron® is primarily used for belt reinforcement, offering a lightweight design that enhances handling and performance on the track.



Aircraft tires

Twaron® is incorporated into aircraft tire belts, delivering exceptional durability and re-treadability to meet the rigorous demands of aviation applications.

Motorcycle tires

Twaron® serves as a zero-degree belt in motorcycle tires, improving cornering and handling behavior for a more responsive ride.



Bicycle tires

Twaron® is used in foldable beads and as an anti-puncture fabric layer beneath the tread, ensuring durability and flexibility.

PCR (Passenger Car Radial) tires

Twaron® provides stability in the cap ply with high-modulus properties that resist deformation caused by centrifugal forces at high speeds. This ensures structural integrity and precise performance under demanding conditions. By maintaining an even footprint at all speeds, it helps promote uniform tread wear. Twaron®-based cap ply solutions are less sensitive to flat spotting.

For ultra-high-performance (UHP) tires, Twaron® improves handling, cornering stability and braking reliability, giving drivers the confidence to perform safely.



Premium SUV & Electric Vehicle tires

The rise of electric vehicles (EVs) and heavier SUVs is reshaping tire design requirements, introducing new challenges for manufacturers. Tires need to be more energy-efficient while supporting significantly heavier loads. This calls for reinforcements that combine exceptional strength and durability with reduced weight.

Carcass

Typical carcass reinforcement materials have low strength characteristics (rayon) and low modulus (polyester). More frequently, this leads to multiple layers of carcass plies in heavier tire designs thereby negatively influencing the energy efficiency of the tire. Twaron® takes carcass reinforcement to a new level, offering unmatched tire performance in an energy-

efficient design. Its high tensile strength and high modulus properties allow manufacturers to reduce material layers, significantly lowering tire weight while maintaining structural integrity. This also helps in reducing one layer of rubber compound. This weight reduction improves rolling resistance, directly enhancing vehicle fuel efficiency for internal combustion engines and extending the range for electric vehicles (EVs).

By reducing the tire weight, Twaron® also contributes to improved driving dynamics, enhanced handling, braking, and acceleration responsiveness for a smoother, safer ride.



Belt

In the belt layer, Twaron® provides the stiffness and dimensional stability required to handle dynamic forces like the high torque acceleration and braking demands of electric vehicles (EVs). In premium ICE cars and heavy SUVs, CO₂ emissions during the use phase must be reduced due to regulatory obligations. Twaron® offers a lightweight alternative to traditional steel belts, reducing rolling resistance and optimizing fuel economy. For EV tires, this weight reduction is especially significant, enabling extended battery range and lower energy consumption. Beyond efficiency, its resistance to material fatigue enhances the durability of the belt layer, ensuring consistent performance across the tire's lifecycle.

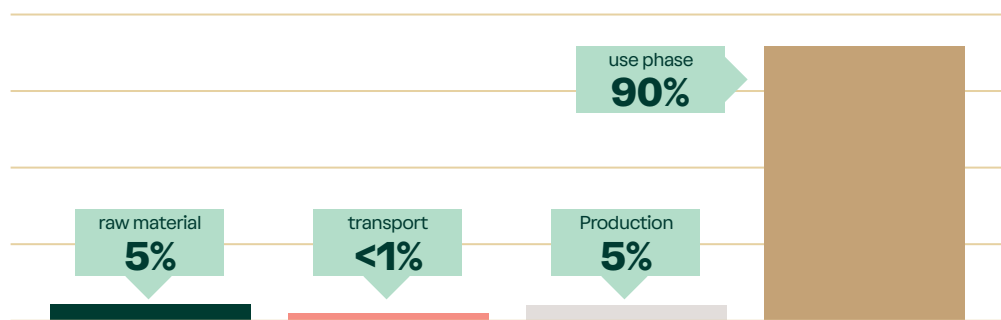
“Carcass and belt reinforcement with Twaron® provides value for both performance and sustainability-conscious customers.”



Moving toward more sustainable tires

Improving tire efficiency

Twaron® reduces rolling resistance, allowing tires to perform more efficiently and consume less energy during use. This results in lower fuel consumption for internal combustion vehicles and extended range for electric vehicles. By directly addressing emissions challenges in the critical use phase, Twaron® helps manufacturers comply with evolving regulations while delivering solutions that meet consumer expectations for cleaner driving.



CO₂ emissions during the lifetime of a tire.

By enabling manufacturers to use fewer reinforcement layers compared to traditional materials, Twaron® lowers material consumption and simplifies production processes. This reduction in complexity supports more efficient manufacturing, aligns with the tire industry's goals to reduce resource consumption, and helps manufacturers meet demands for sustainability while maintaining the high standards of performance that drivers rely on.

Making informed decisions with the CBM

Our TÜV-certified Customer Benefit Model (CBM) provides clear insights into the financial and environmental impacts of using Twaron®. By analyzing metrics such as CO₂ reduction, lifecycle costs, and energy savings, the CBM helps manufacturers quantify the value of integrating Twaron® into their designs. This data-driven tool helps to balance sustainability goals with economic performance, ensuring that material choices align with long-term business strategies, driving value across the supply chain. CBM model calculations in a 275 45R19 108Y tire for steel belt replacement and for 2-layer rayon carcass replacement by single layer Twaron® are provided on the next page.

By replacing steel in the belt and rayon in the carcass with Twaron®, manufacturers can significantly reduce tire weight, lowering CO₂ emissions and fuel or energy consumption.

Combined, these improvements deliver 2 g/km CO₂ savings per car, translating into substantial lifetime reductions in emissions, and cost savings for manufacturers and end-users alike. With millions of vehicles produced annually, adopting this approach offers a powerful solution to meet regulatory targets and sustainability goals.

Calculations based on a TUV certified Teijin Aramid Customer Benefit Model for a 275 45 R19 108Y tire with an average lifetime of 60,000 km.

Tire: 275 45R19 108Y	Unit	Rayon	Twaron®
Tire weight	kg / tire	14.6	13.5
Tire weight savings	% / tire		7.5
CO ₂ savings of the car	g / km / car		1.1
Total CO ₂ savings	kg / car (tire lifetime)		66
CO ₂ penalty	€ / excess g / km / car		95
Penalty savings	€ / car		105

CBM calculation: Twaron® vs Rayon carcass

Tire: 275 45R19 108Y	Unit	Steel	Twaron®
Tire weight	kg / tire	14.6	13.7
Tire weight savings	% / tire		6.1
CO ₂ savings of the car	g / km / car		0.9
Total CO ₂ savings	kg / car (tire lifetime)		55
CO ₂ penalty	€ / excess g / km / car		95
Penalty savings	€ / car		87

CBM calculation: Twaron® vs. steel belt

Reducing CO₂ footprint with Twaron®

Among aramids, Twaron® offers the lowest CO₂ footprint at 8.7 kg CO₂-eq per kilogram. This calculation, based on the cradle-to-factory-gate approach, adheres to ISO 14040/44 standards and has been independently peer-reviewed. The carbon footprint data is also publicly available through an officially published eco-data sheet.

Our commitment to sustainability is further demonstrated by an EcoVadis Gold Medal, placing us among the top 5% of businesses globally and the top 3% of man-made fiber manufacturers worldwide.

Twaron® carbon footprint

Product	Average CO ₂ -eq/kg
Twaron® yarn (filament)	8.7
Twaron® staple fiber	8.7
Twaron® pulp	8.8

Advancing the circular economy

Twaron® supports a circular economy by extending material lifecycles through innovative recycling processes. Our mechanical, physical, and chemical recycling methods ensure that post-consumer and post-industrial Twaron® fibers are reused, reducing waste and reliance on virgin resources. These advancements allow tire manufacturers to transition to a closed-loop production cycle, delivering on both eco-performance and industry expectations for sustainable practices.



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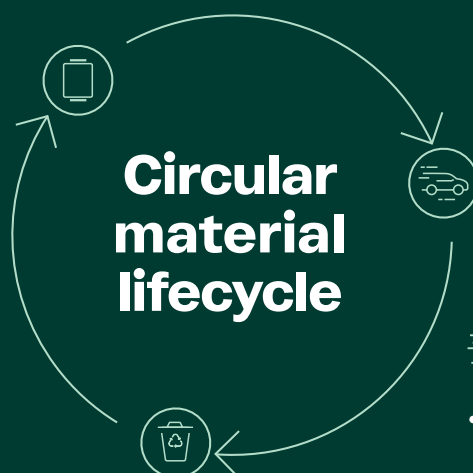
Pioneering material circularity


We are leading the way in advancing circularity for Twaron®. Through innovative processes, we have demonstrated that industrial aramid waste can be transformed into new feedstock and re-spun into high-quality fibers. Importantly, this is achieved without compromising the performance or properties that make Twaron® exceptional.

 **Material production**
Aramids based on renewable carbon

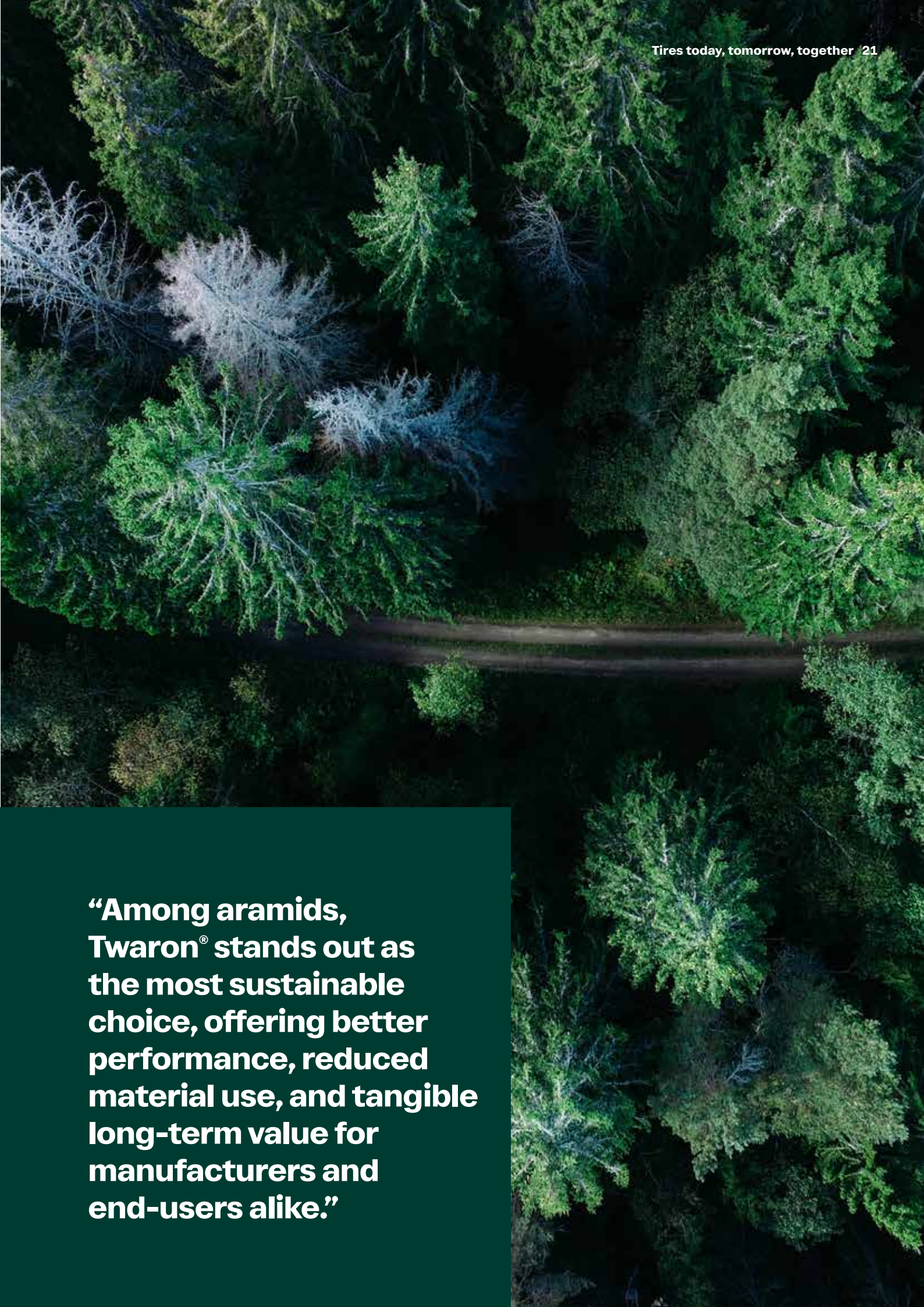
 **Material end of life**

- Take back used product
- Deconstruct & clean products
- Prepare aramids as recycled content for material production



 **Material use**

- Help reduce emissions along the value chain
- Maximize product lifetime
- Reducing product carbon footprint

An aerial photograph of a dense forest. A dirt road or path runs horizontally across the middle of the image. The trees are mostly evergreens, with some bare, greyish trees on the left side. The lighting is bright, creating high contrast between the green foliage and the dark shadows.

**“Among aramids,
Twaron® stands out as
the most sustainable
choice, offering better
performance, reduced
material use, and tangible
long-term value for
manufacturers and
end-users alike.”**

Partnering beyond materials

As the tire industry evolves, so do the standards for high-performance, energy-efficient materials. We do more than simply supply Twaron® – we collaborate with manufacturers, offering tailored support and innovative tools beyond the material itself.

Comprehensive support and services

Our advanced facilities are designed to help you innovate. From tire analysis and fatigue testing to twisting, dipping, adhesion, and compounding expertise, we provide the technical support needed to refine your designs and validate performance. Whether it's optimizing durability or ensuring compliance with industry standards, our services are built to support your success.

Expertise you can rely on

With decades of experience in tire and rubber reinforcement, our specialists bring deep technical knowledge and hands-on insights to every project. From material application to custom testing methodologies, we work alongside your team to solve challenges and deliver results that matter.

Data-based decisions

Our TÜV-certified Customer Benefit Model (CBM) helps you quantify the advantages of integrating Twaron® in your designs. From weight reduction and improved performance to measurable environmental and financial benefits, the CBM provides clear, actionable data to support your decision-making.

Shaping the future together

Working with us means more than accessing a high-performance material – it's a partnership to redefine what tires can achieve. Together, we're enhancing safety, advancing sustainability, and reaching next levels in performance. Every tire developed with Twaron® represents a step toward a more durable, efficient, and innovative future.

Get in touch

We have decades of expertise in applying aramid to improve projects. Our skilled R&D team, regional account team, and global business management team work together to address your unique challenges.

Whether optimizing existing solutions or exploring how our materials can contribute to a more sustainable end product, we are here to support your goals. Your ambition, our technology.

Contact us today: automotive@teijinaramid.com



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