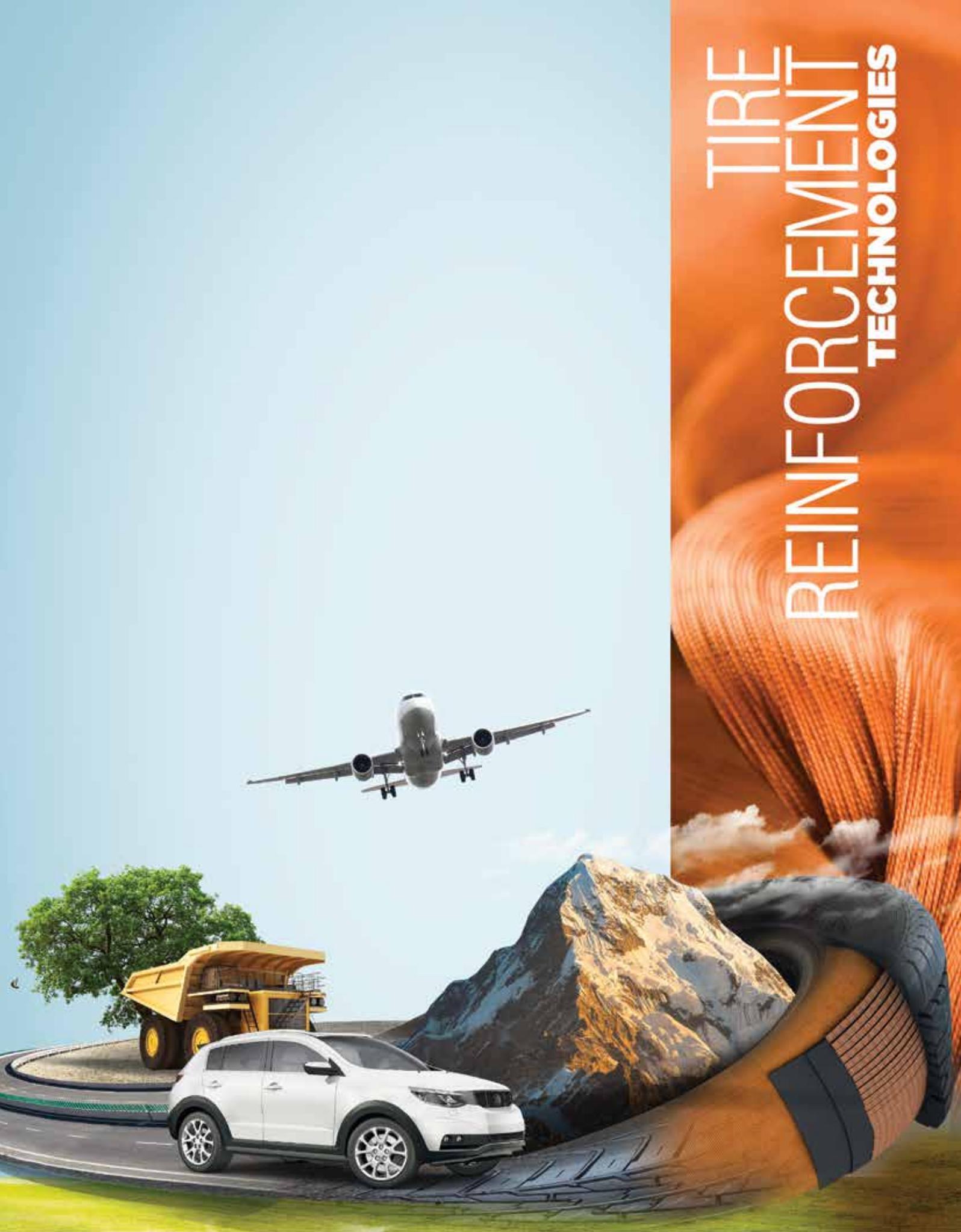


TIRE REINFORCEMENT TECHNOLOGIES



KORDSA
THE REINFORCER





We Reinforce Life

Kordsa's innovative technologies are very much integrated in everyday life to make it safer, more efficient, comfortable and convenient. Kordsa, the reinforcer of 1 out of every 3 automobile tires and 2 out of every 3 aircraft tires, strives for making life more sustainable by reducing the rolling resistance to decrease the fuel consumption with its tire reinforcement technologies as well as lightening the vehicles with its composite technologies and offering low carbon emission and long-lasting durability for successful and sustainable construction projects. With its value-added products, Kordsa not only improves the lives of individuals and families but also "reinforces the life".

Innovation Leader

Kordsa is the technology leader of the industry with its vast know-how, leading position in the market, intense R&D activities, open innovation culture, and strategic approach to the tire reinforcement industry. Operating in a wide geography from the U.S. to Asia Pacific, Kordsa aims to generate sustainable value for its customers, employees, stakeholders and the communities it operates in by offering them high value added and innovative reinforcement solutions.

Kordsa established its first R&D center in 2008 in Izmit. Besides the R&D center in Izmit, which also develops new products, processes and technologies for the tire and construction reinforcement markets, the R&D center at the Center of Excellence for

Composite Technologies, where R&D, innovation and production in composite technologies are under the same roof, approved as second R&D center by the ministry. Developing the reinforcement technologies of the future with a team nearly 110 people at R&D centers, Kordsa increased the number of its patent applications to a total 807 by the end of 2019. Kordsa has 190 inventions and 177 approved patents in total.



RAW MATERIAL



+



- POLYESTER CHIP
- NYLON POLYMER
- ADIPIC ACID
- HMD

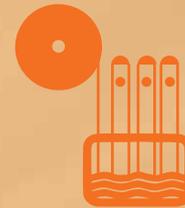
PRODUCTION



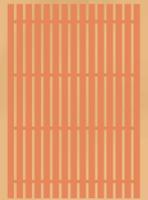
- NYLON 6.6 YARN



- POLYESTER YARN



- GREIGE FABRIC



- FABRIC

PRODUCTS

Nylon 6.6 Products

- Kordsa® T728
- Kordsa® T802
- Kordsa® T728 SEC
- Kordsa® SA164
- Technical Yarn
- Kordsa® SA147
- Airbag Yarn

PET HMLS Products

- Kordsa® 2G-HMLS
- Kordsa® 3G-HMLS
- Kordsa® 4G-HMVL
- AA&NAA

Kordsa® Specialty Products and Technologies



Global Footprint



NORTH AMERICA

NY6.6, TCF

SOUTH AMERICA

PET, SEC, TCF

EMEA

NY6.6, PET, SEC, TCF



ASIA PASIFIC

NY6.6, PET, TCF

Reinforcing Future of Mobility

Electric vehicles require lower RR tires to increase the mileage.

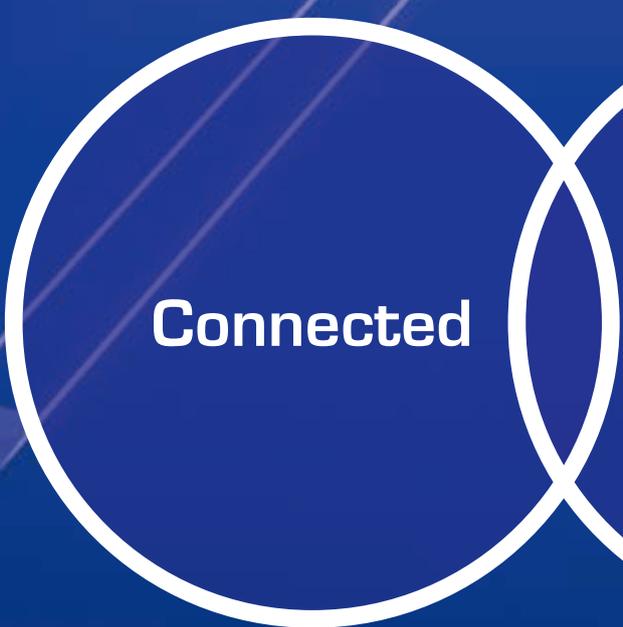
Demand of OE on Ultra-High Performance tires with large rim sizes is increasing with ensuring high speed, comfort and safety.

Since autonomous cars have no driver in case of a flat tire problem, run-on flat tires will be required for Extended Mobility.

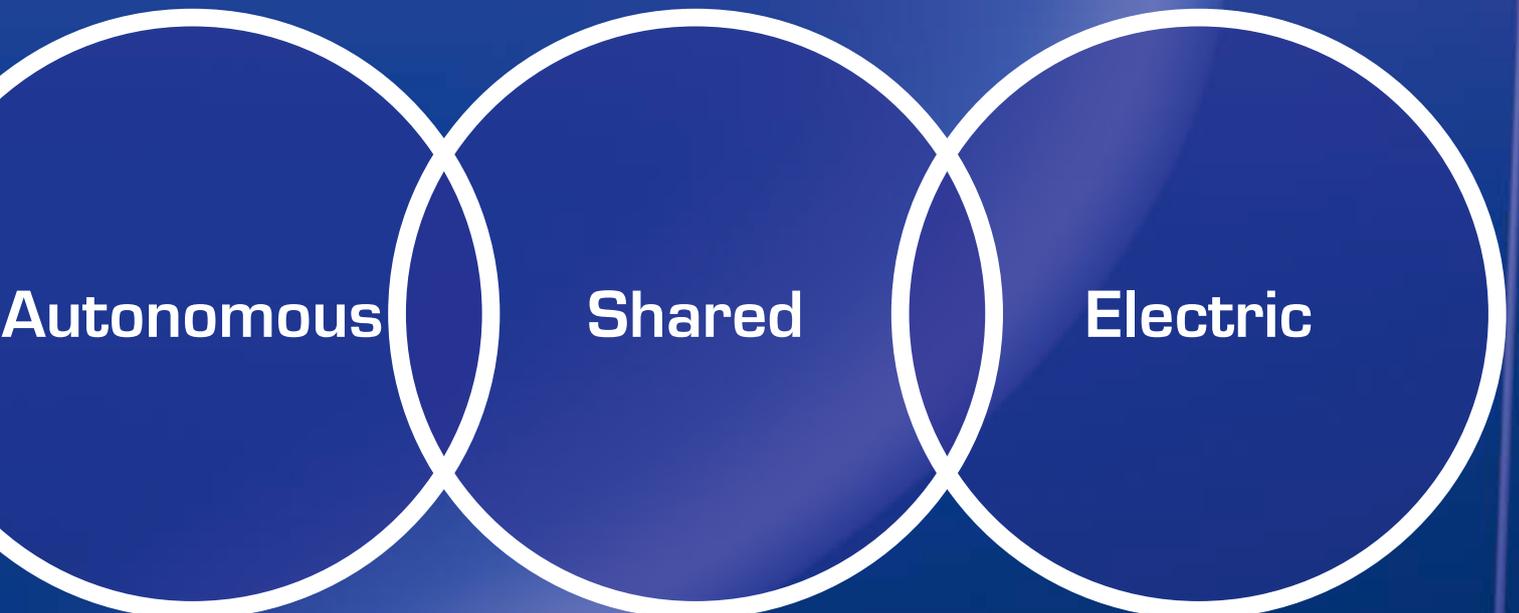
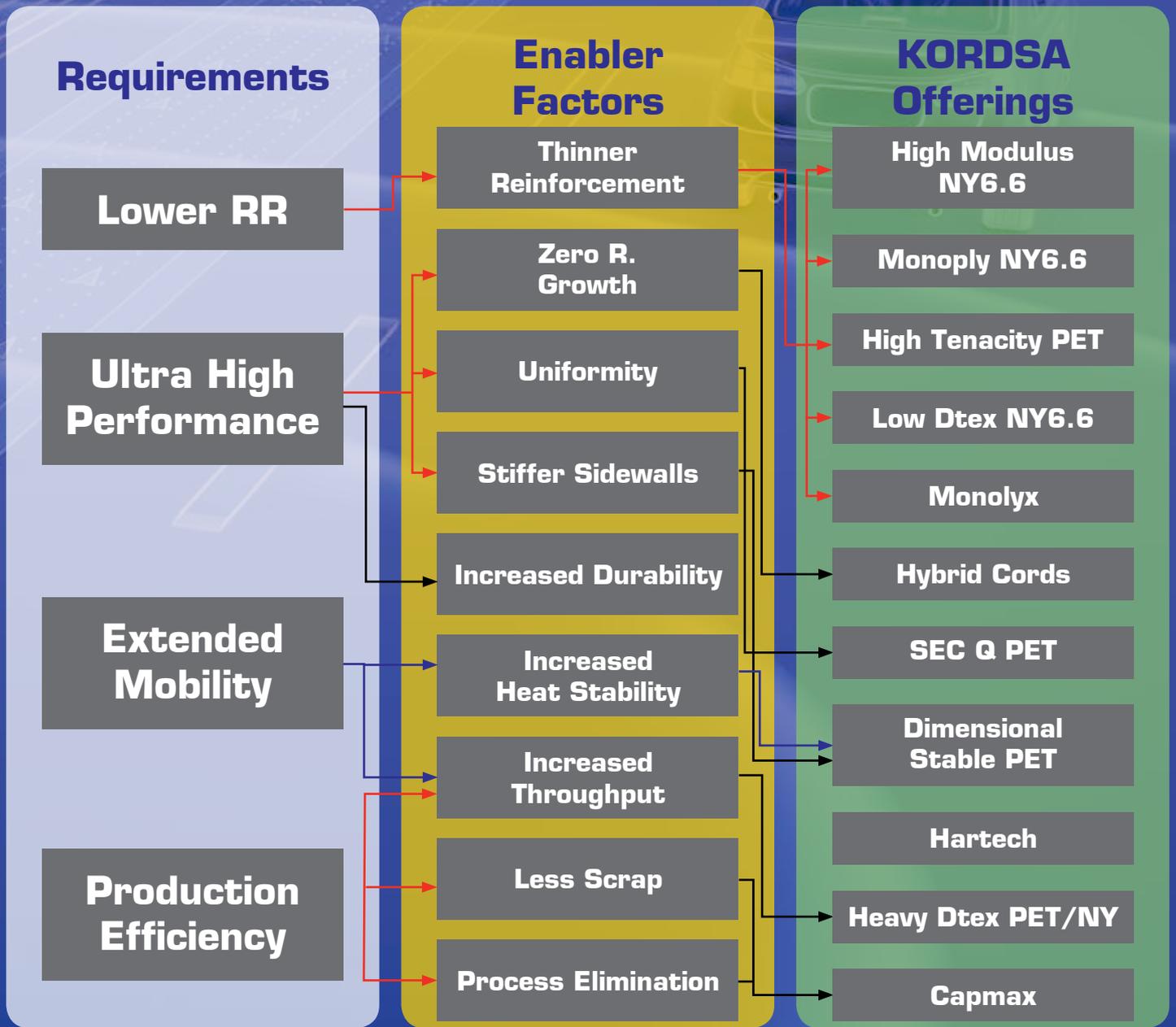
The Sharing economy may challenge Extended Mobility as well. Mobility as a service may require prolonged tire life and more durability if we think cars will be in service for 24h.

Production efficiency is all-time demand with opportunity of enabling sustainability and competitive advantage.

KORDSA product offerings will enable industry to match the requirements of Connected, Autonomous, Shared, Electric (CASE) vehicles.



Connected





Beyond Conventional

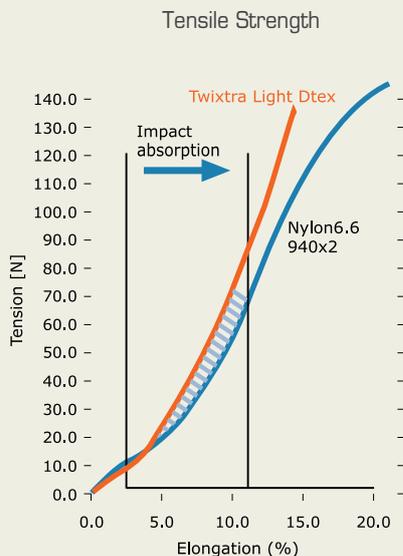
Extreme conditions require extreme performances Twixtra®, customized according to customers' reinforcement needs, is the solution for requirements that cannot be met by standard tire cord fabrics.

Twixtra® product range is the combination of different kinds of fibers in one cord to design a new set of properties, which is impossible to obtain from a single material.

Lighter Cords, Lighter tires

Twixtra® with light cord design reveals high modulus and high impact absorption capability. Compared to conventional cap ply material, Twixtra® LD will perform better.

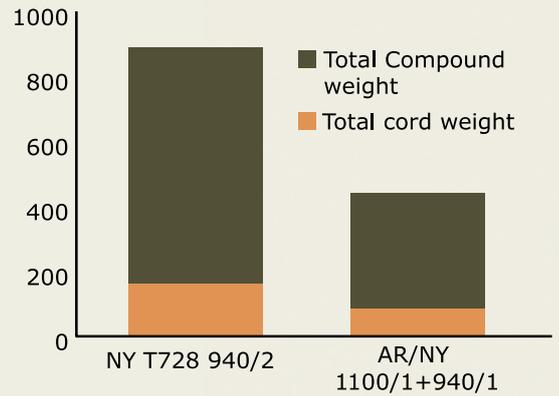
	Shrinkage @177°C [%]	Tenacity [cN/dtex]	Diameter [mm]
Nylon6.6 940x2	6.0	77	0.55
Twixtra LD Nylon6.6+Aramid	1.8	115	0.38



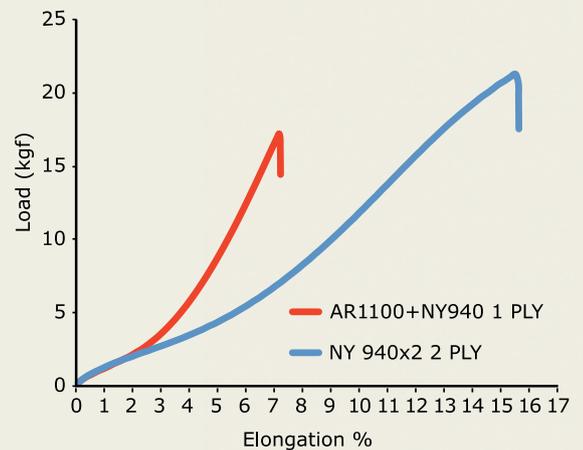
High Performance Cap Ply

AR/NY Hybrid cords deliver high modulus where you require dimensional stability Compared to conventional cap ply material, mono layer Twixtra cap ply is sufficient for UHP performance. Due to less material consumption, RR will be relatively lower.

Rubberized Ply Weight 245/45R18 96Y



Force & Elongation @ 70C



Tire protection

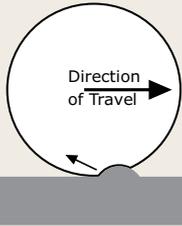
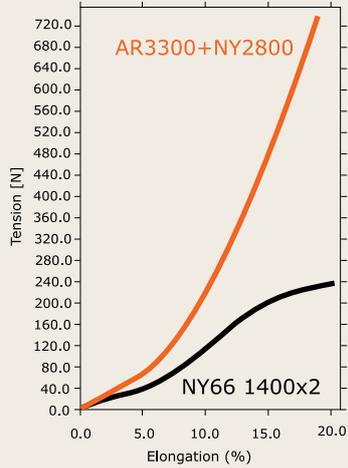
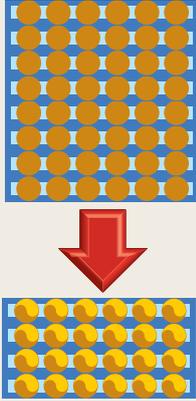
Twixtra® will enhance cut resistant property in AR/NY hybrid cords as aramid has higher cut resistance than multifilament Nylon6.6.



Bigger Tires, bigger cords!



Twixtra® with heavier cord constructions will enable layer reduction for various tire types.



High breaking strength cords design with high elongation at break, improves impact absorption capability of tires under challenging conditions.

	Performance	Lower Gauge	Cut Resistant	Low Weight	Cost Optimization
UHP & SUV	✓	✓		✓	✓
Aircraft Tires Belt			✓	✓	
Truck Bias Carcass			✓	✓	
Forestry & Agro Tires Belt & Carcass			✓	✓	✓
2/3 Wheelers	✓				✓

2-3% Rolling Resistance Improvement

Less fuel consumption, decrease in CO₂ emission by weight reduction



Up to 2% Cost Saving Per Tire*



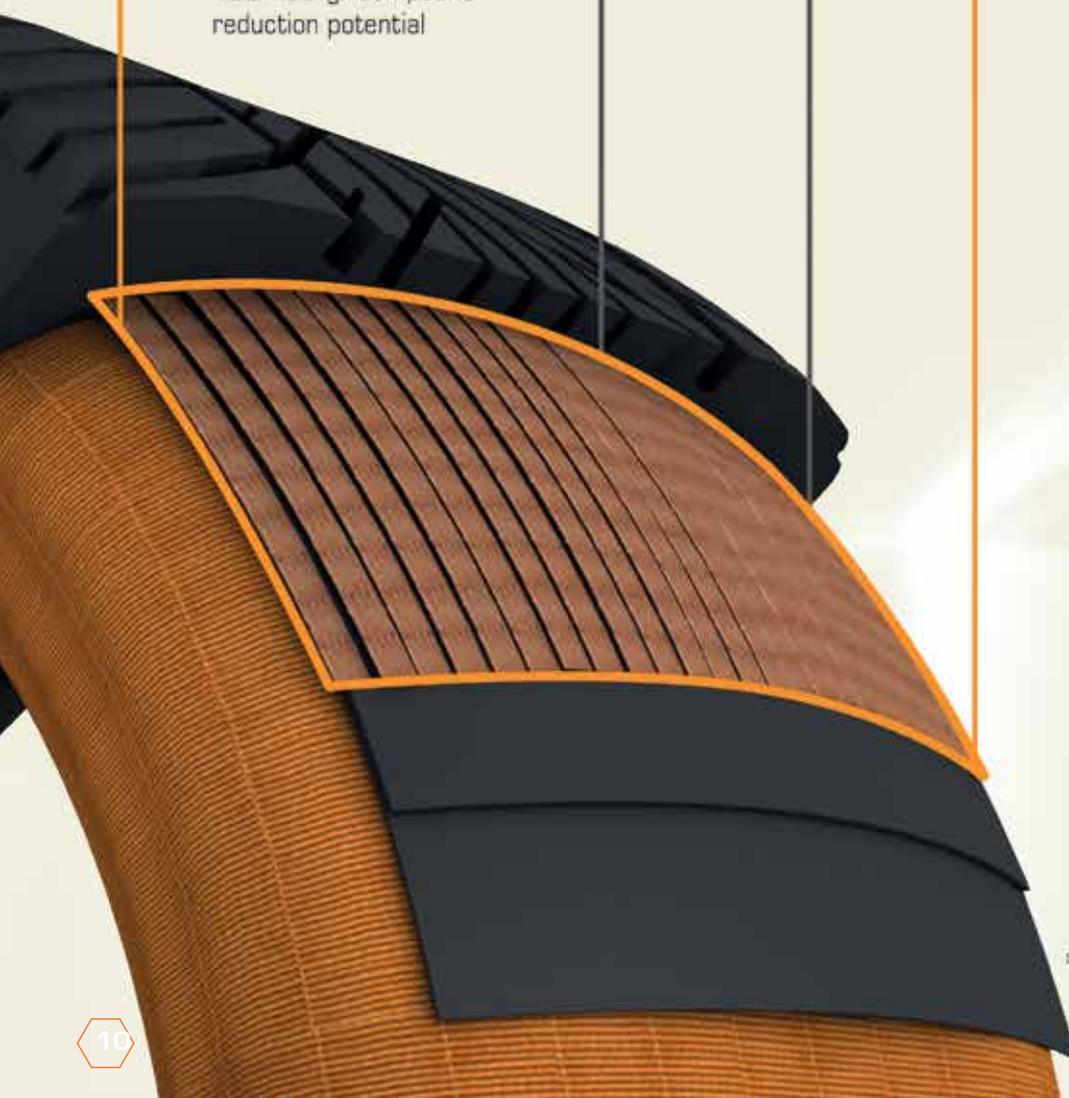
No Calendering Process

Reduce labor cost and scrap



1-4% Weight Reduction

100-400 gr compound reduction potential



*Capmax provides cost saving by reducing rubber and scrap as well as eliminating cutting and calendering processes.



At Max

Capmax® is engineered as a replacement for calendered tire cord fabric as the cap-ply material. Capmax® strips can be directly applied to the tire during the manufacturing stage, reducing the use of rubber in cap-ply as well as eliminating many stages in tire production. Capmax® greatly simplifies the manufacturing process, optimizes raw material usage and significantly reduces costs. Tires manufactured with Capmax® consume less resources, energy and raw materials contributing to reducing the carbon footprint of the tire.



Benefits:

- Direct load on cap strip service module in green tire building phase
- Elimination of compound mixing, calendering and slitting process for cap ply – utilized tire manufacturing process with waste reduction
- Minimized raw material expenses thru rubber saving
- Reduced energy consumption thru elimination of some process steps
- Less process and energy costs
- Reduced capital expenditure for the new investments and expansion projects (no extra slitting machines or calendering required)



Capmax®



Rubber preparation



Coating of fabric with rubber



Cutting coated fabric



Capmax®



Tire production



Monolyx® is a multi-ply monofilament cord for tire reinforcement that is made of synthetic monofilament fibres with 3-7 plies. Each ply has minimum 0.23 mm up to maximum 0.50 mm thickness, or minimum 460 dtex up to 2200 dtex and a round shaped cross-section. The properties of the cords are adjusted by changing the ply thickness and ply number combinations within the available product range. Different cord structures are offered within the boundaries of 0.23-0.50 mm ply thickness and with 3-7 plies.



Protective Tire Shield for TBR/OTR Damper Trucks

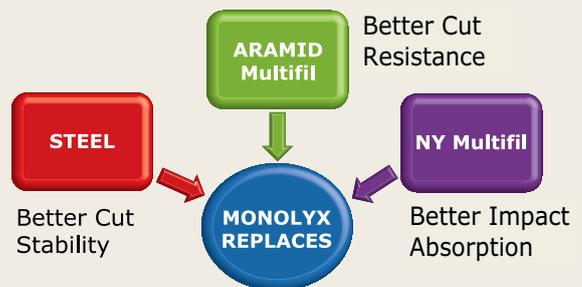
Proven cut through reduction during damper truck service by improved impact absorption.

4th Belt Layer replacement with Monolyx, thanks to better energy absorption and high bending stiffness, reinforcing steel belt layers are protected from cut throughs. In case of cuts corrosion is avoided due to polymeric material (NY66).

Protective Tire Shield for Heavy Duty Tires

Improved Safety and Service Durability for Aircraft, OTR, Forestry tires Monolyx as a breaker/ belt application creates perfect solution where you require light weight cut protection with impressive fatigue property.

	Nylon6.6	Aramid	Monolyx
Cut Resistance 1.0 mm cord gauge ISO; 13977:1999	24.9N	55.6N	73.5N



	Shrinkage @177 °C [%]	Tenacity [cN/dtex]	Diameter [mm]
Multifilament 940x2 dtex Nylon6.6	6.0	77	0.55
Monolyx 1400 dtex Nylon6.6	4.0	67	0.45

High Adhesion Retention Technology

Demanding tire service conditions of PCR tires such as high speed, high load or pressure loss may generate excess heat due to continuous deflection of tire. The larger size tires (like Agro, OTR) are exposed to longer curing cycles.

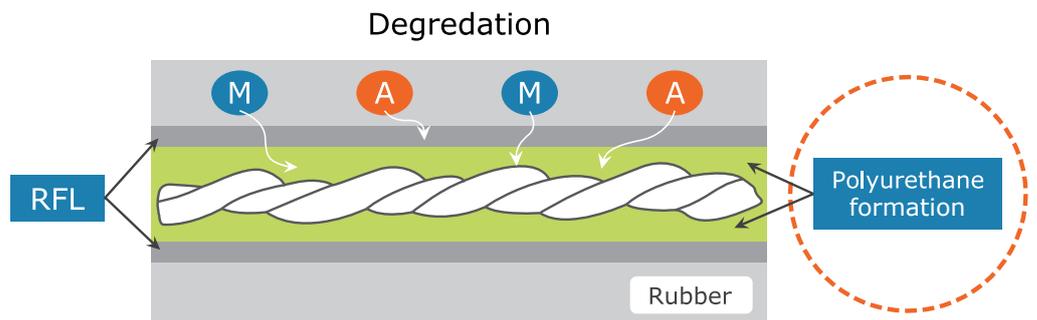
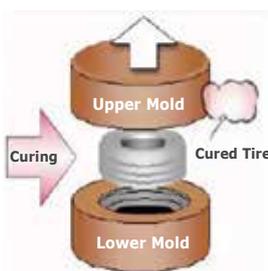
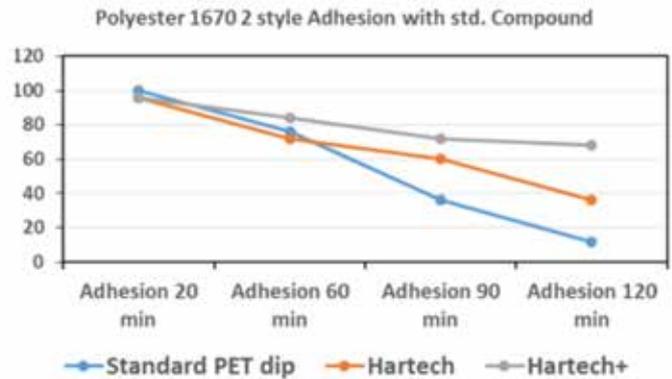
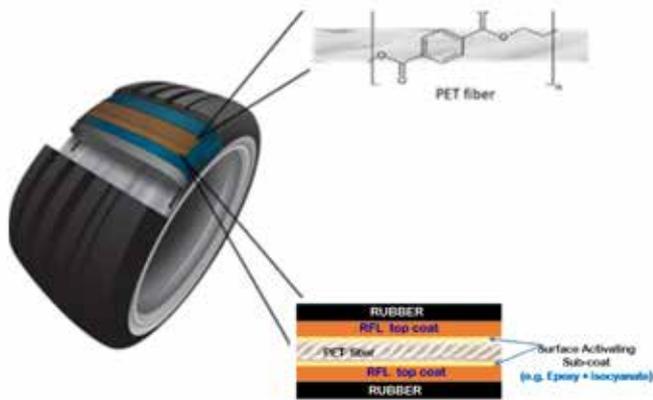
These two conditions may lead to adhesion degradation of PET reinforcement.

Hartech has better adhesion performance over regular PET dipping. Hartech+ has superior adhesion retention for more demanding conditions.



Hartech Plus

Hartech Plus is a new dipping formulation that generates high adhesion and retain at least 80% of the adhesion force even after curing the sample for over 2-3 hours (overcure)



Nylon 6.6

Kordsa® T728

Yarn Type: T728 Polymer: PA66

Yarn Count (dtex)	940	1400	1880	2100	2800
Breaking Strength (KG)	8.30	12.56	16.50	18.32	25.08
Tenacity (cN/tex)	86.2	87.1	85.2	84.4	86.6
Elongation @ 4.5 KG (%)	9.6	7.9	6.9	6.8	5.6
Elongation @ break (%)	18.6	18.8	19.5	20.2	21.0
Shrinkage @ 177 C, 2 MIN (%)	6.6	6.3	6.2	5.7	6.2

General specifications are given, all properties are adjusted to customer specifications.

Kordsa® T802

T802 cord fabric is a dominant material used in **aircraft tire reinforcement**.
Kordsa Global is the market leader in aircraft tire cord reinforcement market.

T802 has superior tensile strength properties offering:

- Weight reduction
- Longer life
- Higher load capacity
- Better processibility
- Improved safety

Yarn Type: T802 Polymer: PA66

Yarn Count (dtex)	940	1400	1880	2100	2800
Breaking Strength (KG)	8.82	13.46	17.53	19.67	26.1
Tenacity (cN/tex)	91.7	93.3	90.5	90.7	90.2
Elongation @ 4.5 KG (%)	9.2	8.1	7.4	6.7	5.7
Elongation @ break (%)	17.5	18.2	20.0	19.4	20.0
Shrinkage @ 177 C, 2 MIN (%)	7.4	6.6	6.5	6.3	6.4

General specifications are given, all properties are adjusted to customer specifications.

Dipped Cord Properties

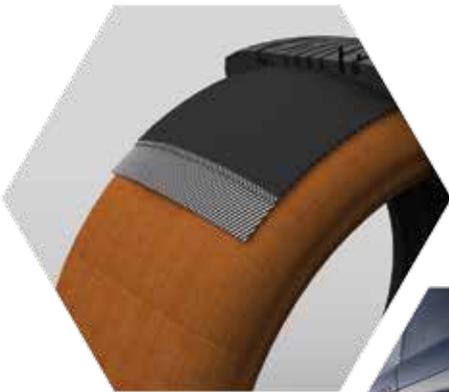
Construction		940X1X2	1400x1	1400X1X2	1880X1X2	2100X1X2	2800X1X2
Physical Properties (*)	UNIT						
Breaking strength	Kgf	13.5 min	10.5	20.5 min	28		43.0
Breaking strength, average	Kgf	14.5 ave	12.00	22.50	29.50		44.0
3,4 kg EASL	%		6,8 +- ±0.8				
4.5 kg EASL	%	9.0 ±0.8					
6.8 kg EASL	%			9.0 ±0.8			
9.1 kg EASL	%				9.0 ±0.8		
10.2 kg EASL	%					9.0 ±0.8	
13.5 kg EASL	%						9.0 ±0.8
Shrinkage at 177 C, 2 min 0.05 gr/dtex	%	5.0 ±0.8	5.0 ±0.8	5.0 ±0.8	5.0 ±0.9	5.0 ±0.10	5.0 ±0.11
H adhesion	kg/10 mm	10 .0 min	5.5min	15.0 min	16.5 min	17.0 min	18.0 min
Dip Pick up	%	5.0 ±1.0	5.0 ±1.0	5.0 ±1.0	5.0 ±1.0	4.5 ±1.0	5.0 ±1.0
Cord Thickness	mm	0.54 ±0.04	0,43 %0,05	0.65 ±0.05	0.75 ±0.05	0.8 ±0.05	0.90 ±0.05
Ply Twist, Z	tpm	470 ±15	200 ±15	390 ±15	335 ±15	315 ±15	220 ±15
Cable Twist, S	tpm	470 ±15		390 ±15	335 ±15	315 ±15	220 ±15

(*) all tensile properties are tested after conditioning 24 Hrs in lab conditions.

(*) General specifications are given, all properties are adjusted to customer specification.

Applications: Tire Reinforcement

Cap Ply Material : For passenger and light commercial vehicles
Carcass/Breaker Material : Bias tire applications



We Reinforce Life

