

THE REINFORCER

KORDSA GLOBAL | BULLETIN | N.02 | JANUARY 2015 TURKEY

Determined to Create Value

KORDSA GLOBAL





MISSION

Deliver high value added reinforcement solutions globally.

VISION

Agile Kordsa Global in high value businesses for sustainable growth.

THE REINFORCER

N. 02 January 2015, The Reinforcer is a bi-annual publication by Kordsa Global
thereinforcer@kordsaglobal.com - www.kordsaglobal.com

Published by

Kordsa Global

Creative Director

Turgut Erentürk

Graphic Design

Dilay Sevim

Director

Nevra Aydođan Gürsoy

Content Coordinator

Sinan Seven

Editorial Office

dgT Agency

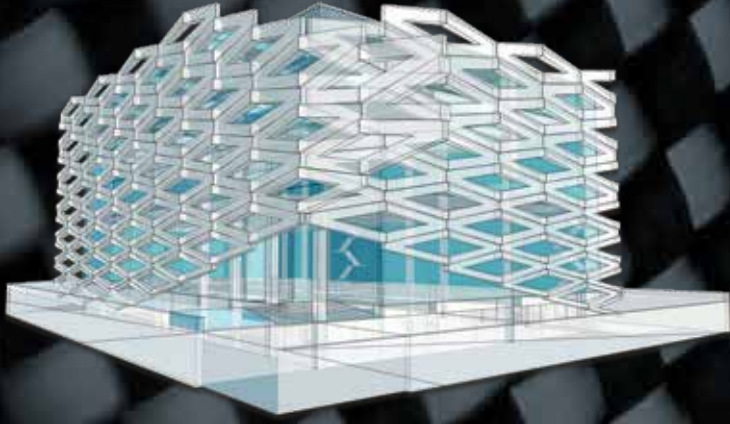
Marketing Office

Sibel Raif

Contents



04 / 05	How We Reinforce
06 / 07	Foreword <i>Cenk Alper</i>
10 / 13	Kordsa Global Quarter 4, 2014
14 / 15	Why Bother With A Sophisticated Market Segmentation <i>Bülent Araslı</i>
16 / 17	Commitment To Growth In Asia Pacific Market By The Opening Of 2Nd Facility In Indonesia
18 / 19	Back To The Future <i>İbrahim Yıldırım</i>
20 / 21	"-Less" Innovation, More Value <i>Burak İlğün</i>
22 / 23	Potential Developments In Tire Reinforcements <i>Sadettin Fidan</i>
24 / 25	Secret Behind New Products <i>M. Burak Akçael</i>



In Kordsa Global, future technologies are created with new business models.

Turkey's new and authentic "Industry-University Collaboration" is forming under the same roof at Teknopark İstanbul, aerospace and aviation Silicon Valley of Turkey, for high value-added technologies.

Composite Technologies Excellence Center, the joint project of Kordsa Global and Sabancı University will create a breakthrough ecosystem consisting of research, learning and production thus enabling a working environment for students, academicians, researchers, engineers, entrepreneurs and designers towards common goals.

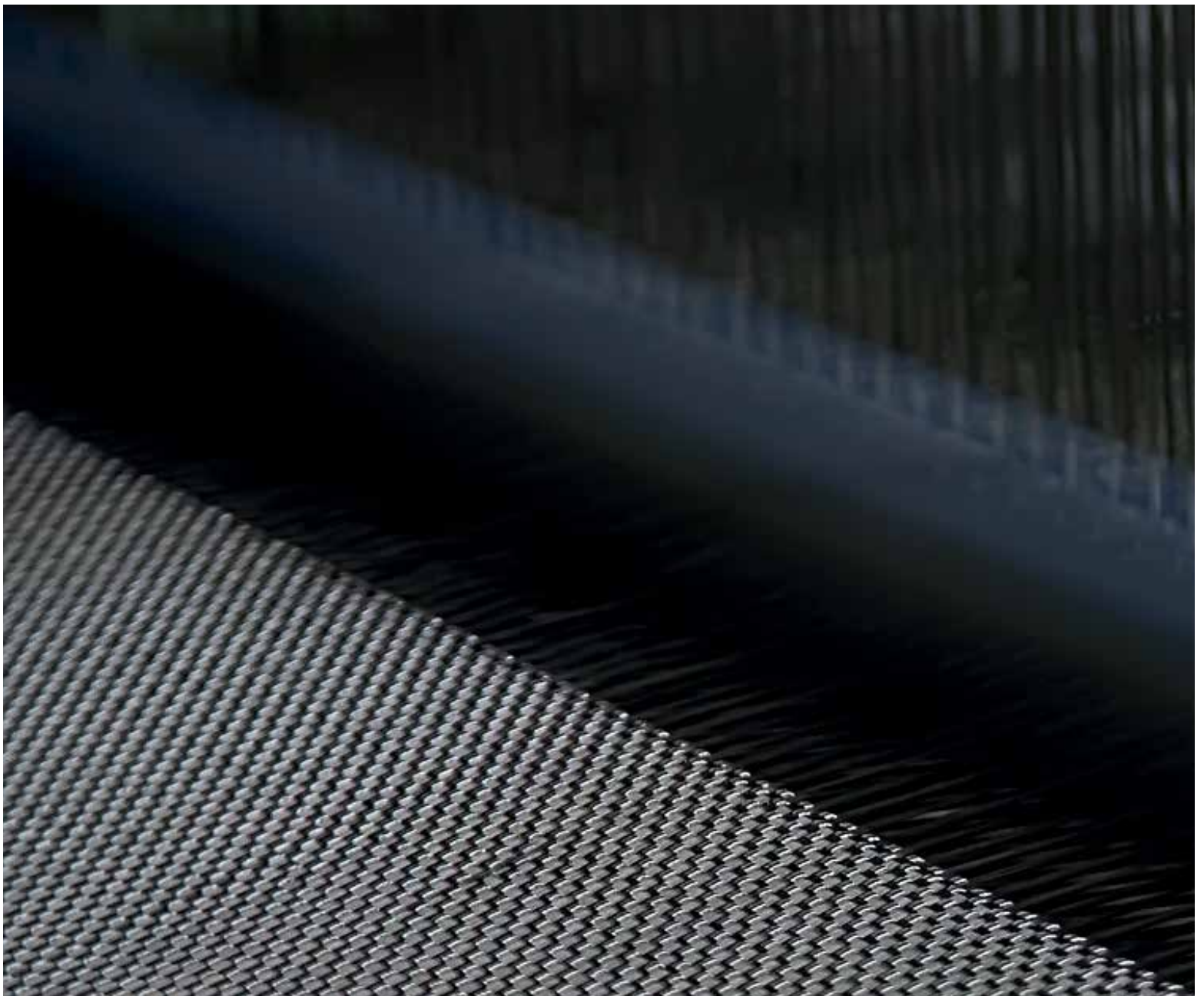
The center will be the home for graduate education, basic research, applied research, product development, incubation center and commercialization activities.

Composite materials are used in industries utilizing advanced technologies from aerospace, aviation, marine, automotive to medicine, energy, construction, electronics, musical instruments and sports equipment.



**Reinforced
by Kordsa**

There is only one condition of survival:
Creating higher value to
all stakeholders by managing today's
competitive pressures and
growth ambitions simultaneously.



Carbon Fiber Woven Fabric



CEO
CENK ALPER

Our New Corporate Identity “The Reinforcer” is becoming reality with our strong moves

We have completed another challenging year with commercial, operational and financial success, but more important we have taken important steps to realize our long term vision of “Agile Kordsa Global in High Value Business for Sustainable Growth”.

World economies are becoming more and more stressed. Growth rates have slowed down all over the world. Crude oil prices are at their lowest levels and that has caused growth and profitability challenges for all industries, mainly commodities. Growth rates in our value chain of automotive, tire and tire reinforcement materials have been revised down, yet capacity expansions are continuing and creating extra competitive challenges to all industry players.

There is only one condition of survival: creating higher value to all stakeholders by managing today’s competitive pressures and growth ambitions simultaneously.

On our core business of tire reinforcement materials, we have taken very important steps toward repositioning our manufacturing footprint. We have successfully exited from Argentina by managing supply chain continuity seamlessly.

We have completed our 2nd Tire Cord Fabric Plant and 2nd Polyester Yarn Plant investments in Indonesia to “Reinforce Asia”. The total investment is reaching 100 mm\$ and showing our strong commitment to Asia Pacific markets. The state of the art process and equipment technologies used in these investments guarantees higher quality reinforcement materials with competitive prices.

On the other hand, our technology and commercial teams have continued to strive for new innovations. While continuing to develop new tire reinforcement solutions, we have focused on service innovations to become your true solutions partner.

Growing in adjacent markets mainly in Composite and

Construction reinforcements is part of our new positioning for “The Reinforcer”.

2014 was a very important year toward realizing this ambition. Turkish Prime Minister Mr. Ahmet Davutoğlu participated in the groundbreaking ceremony of the Composite Technologies Excellence Center. The Composite Technologies Excellence Center is a joint initiative of Sabanci University and Kordsa Global making a new Business Model reality. For the first time, researchers from academia and industry will work under the same roof, and we will incorporate basic research, product development, incubation, and manufacturing processes of Carbon Fiber Reinforced Composites in the same building.

Our efforts to get into Construction Reinforcements with our new product line “Kratos” have been continuing. We have completed the investment of Kratos Macro Line in İzmit. Kratos Micro Line investment will be finalized in the first quarter of 2015. On the other hand, commercial activities in construction reinforcements continue in full speed ahead.

While striving in a highly competitive environment, we are proud to see our efforts are being crowned by many awards. For the second year in a row, we have been selected as the Best R&D Center in the Textile Sector. We have received Istanbul Chamber of Commerce Sustainability Award, Peryön’s Best Human Resources Process Award, Ethica 2014 Award and Kalder’s Best Quality Circle Award five years in a row are some of the examples of our efforts showing that the hearts of over 4000 Kordsa Global employees all around the world are beating continuously for our core values.

We are happy to share the latest developments and successes in our business with you in “The Reinforcer”. We still have a long journey ahead and we would like to unite, develop and prosper together.

Happy reading,

Reinforced by Kordsa

Kordsa Global is a leading enterprise that serves the rubber, composite and construction markets by providing reinforcement products.



KORDSA GLOBAL

Quarter 4, 2014



INVESTMENTS

Kordsa Global and Sabancı University will develop technologies of the future together.

Composite Technologies Excellence Center, created in collaboration with Kordsa Global and Sabancı University, has been opened at Teknopark İstanbul, aerospace and aviation Silicon Valley of Turkey, with a ceremony by the attendance of Prime Minister Ahmet Davutoğlu. Center will operate in the field of advanced composite materials integrated with nanotechnology that are used in broad range of industries varying from aerospace to automotive to sporting goods and yachting.

From Idea Development to Production, all-in-one ecosystem!

65 Million TL investment will come to life in the center where postgraduate education basic research, applied research, product development, manufacturing, incubation services and commercialization activities will be provided all under one roof in the field of composite materials technology; doctoral students and postdoctoral researchers, faculty, incubator companies, researchers, engineers will come together at Composite Technologies Excellence Center.

The facility consists of 10 thousand square meters of closed area and 3 thousand square meters of laboratory infrastructure where Kordsa Global and Sabancı University together will create a groundbreaking ecosystem by doing research, learning and production simultaneously.

Both Kordsa Global and Sabancı University technology and innovation in their respective disciplines

Kordsa Global has received awards by the Ministry of Science, Industry and Technology as the top R&D Center among the textile companies

for 2 consecutive years since 2013. Among all industries, Kordsa Global has ranked second in 2013 and fourth in 2014 underlining its exceptional technology and innovation capability. Similarly, Sabancı University ranks in the top league since 2012 in Entrepreneurial and Innovative University Index.

Kordsa Global and Tire Sector

The world's leading producer of nylon 6.6 and polyester industrial yarn, cord fabric and single end cord, Kordsa's success story began in 1973 with the cord fabric factory investment in İzmit-Turkey.

The Company that is one of the leading organizations of the Turkish economy and Sabancı Holding's shareholder at the rate of 91.1%, with its ever-growing global production structure maintaining its pioneer position in the industry and continuing its activities by adapting quickly to changing market dynamics and seeking new markets.

The Company strengthens its R&D investments and gets attention from the composite and construction sectors with doing innovation by high-performance "Green Products" and the reinforcing solutions that it developed.

Sabancı University

In 1994, Sabancı Group has created a new and unique university design by deciding to establish a "world university" under the leadership of Sabancı Foundation.

Sabancı University went into action in 1999 and has brought an innovative view of higher education in Turkey by being Turkey's first unsectional university with unique educational system.



Chairman of Sabancı Holding Güler Sabancı and Prime Minister Ahmet Davutoğlu at Teknopark İstanbul opening ceremony.

Sabancı University respects to differentiated participants and in a libertarian corporate culture that is responsive to the needs of all our stakeholders, innovative with an interdisciplinary educational infrastructure which enables the creation and spread of original information, leads to the leadership and aims to become an international reference point for the creativity in research and education.

In accordance with this goal; in 2012 October, Sabancı University was ranked at the top of the list of "Inter-university Entrepreneurship and Innovation Index" prepared by Ministry of Science, Industry and Technology prepared for the first time. At the same ranking, Sabancı University also managed to be Turkey's most entrepreneurial and innovative foundation university in 2013 and 2014.

In Times Higher Education (THE) ranking of the world's best universities, Sabancı University took place at 182. rank. It is the Turkish university that entered so successfully for the first time and is the only foundation university that can take place at top 200. Also, it achieved great success in entering to the list of Year 2014 Emerging Economies from the 15th rank published by Times Higher Education.

When Sabancı University entered QS World University Rankings for the first time, it was among the top 500 universities in 2014. At the same time, it was among 20 QS University of Emerging Europe and Central Asia Universities. Sabancı University entered the list that 10 universities of Turkey took place for the first time and by taking 17th rank it has added a new one to its international success.



Mehmet N. Pekarun Industry Group President of Sabancı Holding and Kordsa Chairman of the Board of Directors / **Hakan Öker** Vice President, Human Resources and Information Technologies / **Ali Çalışkan** Vice President, Operations / **Cenk Alper** Kordsa Global CEO

Kratos Macro Line has been opened

Through its advanced technologies Kordsa Global offers added value, high reinforcement solutions. It is now transforming this experience and sophistication to the construction industry with its reinforcement products developed specifically for concrete reinforcement.

Kratos Macro production line has been opened on 30th December 2014 with a ceremony. Sabancı Holding Industry Group Leader Mehmet Pekarun, Kordsa Global CEO Cenk Alper and Kordsa Global Construction Reinforcement Business Unit Leader Hakan Öker attended the ceremony. Kratos Macro production line has an annual production capacity of 2 kton. Additional investment and effort is underway to start the production of Kratos Micro.

Increasing Experience in Construction Sector

Mehmet Pekarun gave a speech at the opening ceremony and said: "Kratos Macro production line is significant for us. Kordsa Global will increase its experience in composite and construction industry as it did in the tire sector. This investment is one of the important steps that we took in construction industry."

Kordsa Global CEO Cenk Alper emphasized that they aim to add more strength to construction industry through Kratos that is developed for reinforcing concrete. He also added, "In October, we presented Kratos to the attention of the industry in Construction Fair and we received positive feedbacks. Kordsa Global is a world leader company in tire reinforcement materials. We want to transfer our experience, expertise and technological know-how to new industries."

Bringing Kordsa Global Quality to the Construction Sector

Kordsa Global Construction Reinforcement Business Unit Leader Hakan Öker gave information about Kratos' technical specifications and said, "Kratos is providing outstanding toughness, having 417k pieces on one cubic meter concrete, in other words, nearly 24 kilometers fiber." Öker mentioned that Kratos can blend easily in concrete matrix and it gives an advantage in terms of work safety. He added, "Kratos is doing effective crack control in concrete by its micro internal curing effect and 3D homogenous distribution."

Kratos Macro and Micro synthetic fibers are reinforcing materials which is in EN-14889-2 polymer fibers for concrete. Kratos Macro fibers are in EN-14889-2 Class II standard and have over 0,30 mm diameter. Kratos macro fibers are for the structural use which increase the residual flexural strength of the concrete and replacing steel mesh and steel fibers in concrete and shotcrete applications. Kratos Micro fibers are in EN-14889-2 Class I and have under 0,30 mm diameter. Kratos Micro fibers prevent the shrinkage cracks in concrete, grout and mortar.

Kratos Macro is reinforcing concrete without needing steel mesh nor steel wire. By easy and quick implementation, Kratos is providing time and cost saving and it will bring Kordsa Global quality to the construction sector.

AWARDS

Kordsa Global R&D Center Awarded by the Ministry of Science, Industry and Technology

Kordsa Global is reaping the fruits of the investments made in R&D, an important pillar of our strategy to provide value-added products in order to strengthen our market leadership and increase our profitability.

Most Successful R&D Center Award

The Company has outdistanced many giant technology companies in Turkey, ranking second in all industries after Aselsan and first in textile industry having won the “Most Successful R&D Center Award” among 142 Turkish R&D Centers in the R&D Centers Performance Evaluation carried out by the Ministry of Science, Industry and Technology. The award is presented by Minister Fikri Işık in a ceremony held in Kocaeli.

Championship Award of Textile Sector

Nor is this all, Kordsa Global came in first among the private sector R&D centers by showing the best performance in textile sector. According to 2013 R&D Centers Performance Index, Kordsa Global won the first prize of textile sector at the 3rd Private Sector R&D Centers Summit. Fikri Işık, presented the awards to their owners at the ceremony held in Ankara and said, “First of all, we must abandon the idea that R&D is an inefficient investment and the allocated resources of R&D will be a waste.” Işık also visited Kordsa Global’s stand and received detailed information about the technology and products that Kordsa Global presented from İzmit to the world. Kordsa Global CEO Cenk Alper evaluated the award and mentioned the role of the government incentives on R&D progress and said, “As Minister has stated, the allocated resources of R&D is not a waste but an investment for future. Kordsa Global reached to technology producing structure by this vision. To deliver our R&D strength much further is among our main strategy.”

These awards represent recognition of the success of our effective and efficient technology investments. We will continue to work decisively to reach our goal and to add new ones to these awards won as a result of the intense efforts by the Technology Team led by Kordsa Global CTO İbrahim Yıldırım and make Kordsa Global the technology leader in the industry.



17th Quality Chamber KalDer Awards

At the ceremony made within the scope of “17th Quality Chambers Sharing Conference” held in Ankara on 30 September 2014, our team was awarded in the Quality Chambers branch. To the process arranged every year by Turkey Quality Association (KalDer), 13 different teams were applied, field visits were made to 11 of these and 10 of them became finalists. 4 teams from 3 corporations were deemed worthy of the award: Kordsa Global, Türk Traktör and Hemsia Endüstri. In the last 6 years of this competition, as Kordsa Global, our teams went on to the finals 6 times and received awards 5 years.



PERYÖN's "People Management Leadership" award goes to Kordsa Global



This year, People Management Association of Turkey (PERYÖN) organized the seventh of "People Management Awards" ceremony and Kordsa Global won the first prize in the "People Management Leadership" category. Kordsa Global CEO Cenk Alper stated that successful human resource management is an important factor that strengthens leadership qualities.

"PERYÖN People Management Awards" gala night, considered to be Turkey's most prestigious awards in Human Resources, was held in İstanbul at The Marmara Hotel. PERYÖN managers, People Management Association World Federation (WFPMA) President Pieter Haen and leading guests from the business world attended.

In 2013, Kordsa Global won the "Achievement Award" in the Training and Development category and won the "Finalists" Prize in the Talent Management and Recognition & Rewarding processes.

In the "Human Management Leadership" category (which can only be attended by previous winners), Kordsa Global applied this year for the first time and won the championship award. Taking the first prize confirms it is successfully moving forward in the field of human resources.

While Kordsa Global CEO Cenk Alper was evaluating the award, he noted that the management of human resources should be leadership-oriented and said, "In today's era, companies that can produce leaders are at a successful position in terms of human resources management. For us, to improve leader qualifications is an integral part of our understanding of human resources."

Kordsa Global received "Energy Efficiency in Industries Award"

Kordsa Global was awarded at the "6th Energy Efficiency Forum and Exhibition (EVF) during the "34th Energy Efficiency Week" started on 14th January by the Ministry of Energy and Natural Resources for "Improving Energy Efficiency in Industry" Project (IEEIP).

The 15th Energy Efficiency Competition (EEPC -15)" where Kordsa Global was selected 3rd with the project: "Improvement in Compressed Air Dryer System in Polyester Manufacturing Silo" aims to increase the awareness of energy efficiency among industrial corporations encouraging development of new and similar applications through information exchange.

Kordsa Global Vice President Ali Çalışkan received the award from Erdal Çalikoğlu, the Assistant Manager of Directorate General of Renewable Energy.



“Today, Kordsa Global’s sophisticated market segmentation process takes into account several factors aiming to better tailor its value propositions to each segment to create valuable, differentiated and substantiated values for each customer.”





WHY BOTHER WITH A SOPHISTICATED MARKET SEGMENTATION

BÜLENT ARASLI
Vice President, Sales

Aligning the sales, marketing and product mix with the customers' buying processes inarguably strongly motivates the customers to prefer our product and services instead of other available alternatives in the industry.

A sophisticated market segmentation process is a very useful tool to provide deep insights into the needs of the customers across a wide range of dimensions which let us better understand how our customers want to be served and define the right strategies how we have to serve them in the most efficient and effective way.

We can simply define the market segmentation as the approach that distances itself from "one size fits all" solutions. Market segmentation looks deep into the needs of the market with an effort to provide differentiated products and solutions based on the needs of different market sub-clusters.

Increasing volatility in the world economies and prevailing overcapacities have made the competition tougher and tougher in our industry year over year. As our markets were getting more and more competitive every day, the parties that we were dealing with (the customers, the competitors, the suppliers, the contractors, the governmental bodies etc.) have been in a continuous change mode to differentiate themselves from others as much as they can, to improve or sustain their businesses. The purpose was same; to be more competitive and attractive to their target markets.

In such a challenging environment, we could hardly talk about a massive product and service strategy to appeal the entire market, to respond the needs of all customers. It is a clear fact that our customers are not any more a homogenous group as in the past.

They have different needs, different preferences, different behaviours, etc. and most importantly their willingness to pay to the similar products and services are also highly differentiated. While some of our customers are willingly paying premium to superior product properties (and also value the new product research and development activities) and extra services that we are rendering them to make their purchasing and further processes more efficient and effective, some customers on the contrary are simply demanding just highly standardized products and services with very little or no price premium at all.

About six months ago, as part of our commercial excellence project, we completed a sophisticated market segmentation study. Huge number of variables and data were analyzed to provide in depth quantification and understanding of market and customer needs.

This advanced tool will let us:

- Better serve the wishes and needs of our customers
- Improve our production efficiency, effectiveness and profitability
- Better standardize our products and services
- Provide customized premium value added product and services, upon request
- Create more opportunities to grow our businesses
- Have more targeted communication with the customers
- Stimulate innovation more
- Have more sustainable customer relationships

I think soon we will witness a significant increase in value perception similarities between the values that we are proposing to our customers and expected value by the customer.

To be competitive and attractive to target markets in today's competitive markets, the parties that Kordsa deals with are continuously differentiating themselves to improve their businesses.

COMMITMENT TO GROWTH IN ASIA PACIFIC MARKET BY THE OPENING OF 2ND FACILITY IN INDONESIA

Kordsa Global, has opened its second tire cord fabric and polyester yarn facility. Since 2007, operating under the title of IndoKordsa, Kordsa Global has become the biggest player in the Asia-Pacific region with its new investment

Kordsa Global has increased its global capacity by investing additional \$100 million in brand new facilities in South East Asia region. With the additional investment, Indonesia plant has now added 2 new facilities to its campus: An 18 kton Tire Cord Fabric Plant and a 14 kton 3rd and 4th Generation Polyester HMLS yarn plant. There will be over 200 people employed within these two new facilities.

Güler Sabancı, Chairman of Sabancı Holding, Mehmet Pekarun, Industry Group President of Sabancı Holding and Kordsa Chairman of the Board of Directors, Cenk Alper, Kordsa Global CEO, Indonesia government officials and local administrators have all joined the inauguration of the new facility in Bogor-Citeureup located on the west part of Java Island. Speaking in the opening ceremony Güler Sabancı said: "This occasion has become even more significant because our core commitment of "being where our customers are" has reached a new milestone; this is the true story of Kordsa Global. For a sustainable and profitable leadership, we closely monitor our existing and potential tire manufacturer customers and want to be present where production growth is stronger. By all means, standing along side the manufacturer is the key to our success. Kordsa Global is a global force to be reckoning with, we have 9 manufacturing facilities in 8 countries spread over 5 continents. For this we are proud."

Ms Güler Sabancı said that with the new investment in Indonesia, Kordsa Global would include Indonesia a new flagship as well as Turkey. Güler Sabancı also said: "The global economic scene is continuously changing. Production intensity has shifted from West to East, increasingly more Asian companies have entered the market so we have focused on differentiating ourselves from the new competition. Effective cost management and technology are two main principles of our strategy. Innovation is a main factor in differentiating ourselves in our promises, products, quality and service.

We have a simple yet strong company vision: Operational excellence, no-compromise on product and service quality and competitive costs. Indonesia, with its vast natural resources, is more than a geographic base to grow in Asia. The young, entrepreneurial workforce



striving to do achieve is a major driving force. Over seven successful years in Indonesia have helped us to decide on the new investment decision we have made there. The pro-investment climate and improving infrastructure has made the region utmost attractive for investments. Our Indonesian workforces outstanding success sets an example to be copied all over our sites and facilities. Starting from day one, this site has embraced our global vision, our values and raised the mark for further improvement. This facility deserves investment more than anywhere else. Being a Turkish company, Turkey has been our natural flagship with strong emphasis on the potential of Indonesia. Now, with our new investment here, it is more than appropriate to say that we have two flagships: Turkey and Indonesia. This investment is not our final destination, but the next phase in our journey. We are now taking the next step for a demanding, more sophisticated and growing global market where we have to be alert and are very excited about exploring new horizons.

Leap Forward

Mehmet Pekarun, Industry Group President of Sabancı Holding and Kordsa Chairman of the Board of Directors said that the second investment in Indonesia is the biggest investment in capacity for Kordsa Global outside Turkey and this investment has become the landmark within the last 42 years for Kordsa becoming a leading global player. Mehmet Pekarun also said that in the long term growth strategy this investment is a milestone for Kordsa Global and said: "Our customers now, are demanding the best in quality, the latest in new technology, to realize their global ambitions. I can clearly say that this region is rapidly becoming the most competitive market in all perspectives. Hence "success in Asia" is "the new definition of global competitiveness".



Mehmet N. Pekarun *Industry Group President of Sabancı Holding and Kordsa Chairman of the Board of Directors*
Mrs Nurhayanti *Bogor Regent* / **Saleh Husin** *Minister of Industry* / **Güler Sabancı** *Chairman of Sabancı Holding*
Cenk Alper *Kordsa Global CEO* / **Mr. Ievan Daniar Sumampow** *Member of the Board of Commissioner*
Nuri Düzgören *Operations Director Indo Kordsa*

Our customers' position in the market will be strengthened

Cenk Alper, Kordsa Global CEO, said that the investment made by Kordsa Global demonstrated the trust that the company have in the tire industry and with it, not only Kordsa Global would entrench its' position in the Asia Pacific region but the customers would too. Since the company started its investments in 2007 in Asia Pacific, the local and global teams have continued to strive for creating more value for the stakeholders, by bringing Kordsa Global standards to the region, by improving the quality, cost and service levels. Mr Alper added: "With these brand new facilities, we are going to offer added value by designing special solutions to our regional and local customers. By increased capacity and perfection, high quality standards and workforce that have embraced Kordsa Global's core values, we are going to provide continuously for our customers needs."

We have brought Kordsa standards to the region

"Since 2007, from the first moment that we have invested in Asia Pacific, our local and global teams have continued to strive for creating more value to our stakeholders, by bringing Kordsa Global standards to the region, by improving our quality, cost and service levels."

We are reinforcement specialists

Talking about the growth strategy and investment details in Indonesia Mr Alper also said: "With all respect to their strategy and position, we strongly believe that as Kordsa Global we can successfully compete with them via our innovative total cost of ownership solutions. If you consider the total product and service package we are customizing for our customers, we believe that we are the champion in value per unit of cost. The new polyester and tire cord fabric plants in Indonesia are very good example of this principle.

Our new polyester plant is an extension of generation 3rd and generation 4th HMLS polyesters, where the tire cord market demand is still increasing despite the overcapacity in the HMLS world. Our new TCF facility is the new design of our process and engineering teams targeting for environmental friendly and cost efficient products and processes. The energy requirement of our new dipping line is much lower than a traditional line and we can also produce our new product families like high adhesion retention technologies, and RF Free (recorcynol formaldehyde free) dipping technologies. The process quality and monitoring improvements in our new weaving and dipping lines guarantee defect free fabric quality."



Güler Sabancı *Chairman of Sabancı Holding*

Kordsa Global is working harder on its expertise areas and new technologies during this transformation era and what Kordsa Global is doing today is being a part of our kids' future.





BACK TO THE FUTURE

İBRAHİM YILDIRIM

Chief Technology Officer

Do you remember the famous film series "Back to the future"? Imagine you are very lucky and the time machine is invented when you are living. What would you see if you visit year 2115?

Even it seems like fortunetelling, actually it is not. Nothing happens in a short time and there are today's and yesterday's trends and events signaling us about what will happen.

Now, let's take a closer look at them.

Increased Environmental Concerns

Increased environmental concern is the first trend. Fossil fuels are limited and global energy demand is increasing as population grows. Today high CO₂ emissions damage our world through global warming. Now sustainability is not just a fancy word but a real concern. Many governments, institutions and companies are working more on green technologies. Energy efficiency and recyclability are other major manufacturing issues. This is an energy game with strong implications on political and economic stability.

Urbanization Driven By Globalization

Second trend is urbanization driven by globalization, especially at emerging countries. The number of mega cities are increasing thus forming more service driven businesses are due to increased number of middle class people seeking personalized goods and services. Growth driver for the next decades will be those cities through demand shifting to the East.

Internet Of Things

Third major trend is the internet of things. Internet has already changed and unified the world and this will continue until everything in the world is tied together. Information is more accessible than ever and even conventional education is under question. Customer is a "knowledgeable" king now demanding the "best" immediately and continuously.

And more; there are technological trends: Increased use of robotics driven by the improved sensor technologies, nanomaterials and nano manufacturing through better characterization and modelling and finally 3D printing which is a real breakthrough for all manufacturing industry.

In 2115, our grandkids will be using a different clean energy source, most probably solar based. Internet will be everywhere; on wearables, tools, houses...Dangerous tasks will be performed by robots. We will be producing our cars at our garage with our 3D printers. There will be new materials programmable to change shape and physical properties. All those new materials will be recyclable. Our grandkids will also live longer lives with the advances in medicine and gene therapies. Sounds good?

Kordsa Global and Composites

What's Kordsa Global doing today to be a part of our grandkids' future? We are working harder for new composite technologies to fulfill the mega need for lighter, stronger and more durable materials. Today, composite structures reinforced by high strength-high modulus fibers are being used more and more compared with the last 30 years.

Tire is a good example of dynamic composites, beginning with cotton followed by nylon, rayon, polyester, steel and aramid. Similar story is the airplanes evolution from wood to steel, aluminum and glass to carbon fiber reinforced plastics. Automotive industry is also very active for thermoplastic composites in hybrid and electrical technologies with nameplates like BMW i3, i8, Tesla and Strati.

We are experts on reinforcing rubber through polymerization, spinning, textile and coating with a strong fit of our competencies in the adjacent area named "Composite Reinforcement". We established our new "Composite Reinforcement Business Unit" in April 2014 and already began production of carbon fiber fabrics through our new weaving loom.

Thermoset prepregs (impregnated Carbon Fiber fabrics) production will also commence in 2015 for particular industries like aerospace, sports & leisure and automotive. Kordsa Global will differentiate with her "high precision processes knowledge", "resin recipe development capability" and "product design competencies" gained with extensive R&D efforts.

Kordsa Global Composite Technologies Excellence Center

We covered an important milestone with the groundbreaking of "Composite Technologies Excellence Center" at Teknopark İstanbul in December 2014. Kordsa Global and Sabancı University collaboration created a unique business

model enabling the participation of Sabancı University graduate programs of composite research, joint material and processing labs for composites, Kordsa Global R&D Center and the production plant for thermoset and thermoplastic prepregs altogether under the same roof.

We are preparing Kordsa Global for the future. As Peter Drucker said: "The best way to predict the future is to create it."

- SPECIALTY TIRE SOLUTIONS -

Twixtra[®] and Monolyx[®]

“Kordsa Global reinforces the tire industry with new and innovative products to create more value with less material consumption.”





“-LESS” INNOVATION, MORE VALUE

BURAK İLGÜN
Product Leader

“Driver-less” car concepts are being challenged not only by category leaders i.e. Mercedes, Ford, Audi; but also with Google as being a technology leader. So, this concept requires integration of complex competencies to create accident free, uninterrupted mobility of connected vehicles. Although driver-less car concept will take more years to penetrate due to infrastructure deficiencies; studies done so far and dedication give us the feeling that, it is the next big thing.

Availability of alternative energy sources and awareness on “green world” trend, challenging the combustion engines that today's cars are using. Electrical cars that have electrical engines with high efficiency are penetrating to industry day by day. Still these vehicles have short distance issue due to battery technologies. Tesla's Sedans with high powered engines, gives us freedom to think that electrical vehicles should not be only considered as small city cars for economy.

Tires, as the final component of mobility... Since tires are the key and very final components that create mobility, TPMS, run flat tires are the products that contribute to “improved mobility” through recent years. Energy efficient tires became a category to deliver improved mileage with “less fuel” consumption. Run Flat tires have stiffer sidewalls to support tire without air pressure. This gives an opportunity of improved mobility to driver within 80kms to find a secure place to replace the damaged tire.

Elimination of “air” from tires will permanently avoid the “blown” tire or air leakage that results in loss of hours to repair. Especially for commercial tires this is an issue. A recent commercialization of a known concept, “air-less tire”, X-Tweel by Michelin, is a disruptive product that challenges the tire industry about future concepts. X-Tweel eliminates the tire design about containing air pressures and avoids failures due to air leakage or tire burst. Mainly, all these developments are targeting to expand the mobility experience of drivers/passengers without any interruption.

Kordsa Global contributes to tire industry with Twixtra and Monolyx, enhances “-less” innovation concepts

Twixtra is the cord combination of mainly high modulus and high fatigue materials to deliver high performance with “less” amount of materials. Combining two materials with opposite characteristic materials is not a new concept. Having the core competency of designing cords based on customer needs, Kordsa Global delivers newer cord constructions with optimized parameters. So, any hybrid cord designed by Kordsa, promises the lowest amount of material with maximum performance. So, innovation behind Twixtra is capturing more value with less material consumption. Twixtra hybrid cords could be applied as Cap Ply to improve handling, cornering and uniformity performance of UHP tires under challenging conditions.

When Twixtra is applied in commercial tires, it might function as a carcass to increase production efficiency and reduce number of plies or as belt layer to stabilize tire crown area. Low gauge and/or low weight cords will consume “less” amount of rubber compound while enhancing tire performance at the same time.

Monolyx is the protective tire shield composed of twisted monofilament Nylon 66 cords. Monolyx combines the adhesion and fatigue property of Nylon66 with the “cut resistance” and “bending stiffness” of monofilament cords. Tires that Monolyx applied as belt layer, have improved mobility due to either protection of “steel belts” by better absorption and avoiding corrosion.

These unique properties are served in a single material that enhances the concept of “less material” to be effective on many functions.

4th belt of radial truck tires, rear farm tire belts, aircraft belts, motorcycle tire belts are the main application of Monolyx to create more value with less material consumption.

Innovation is an alternative to our daily life with “less” of something that has lower/no value. Kordsa Global reinforces the tire industry with new and innovative products to create more value with less material consumption.

POTENTIAL DEVELOPMENTS IN TIRE REINFORCEMENTS

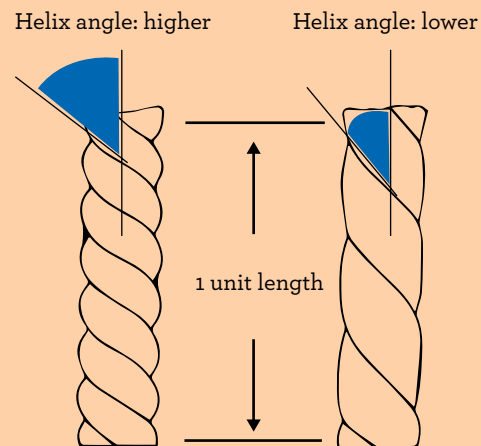


SADETTİN FİDAN
Technology Manager, Tire Technologies

Structurally, a pneumatic tire can be defined as a high-performance composite, comprising polymeric and metallic reinforcements in rubber matrix with functions of load carrying, steering stability, force transmission, impact absorption and comfort, minimum power consumption, endurance and safety.

The helix structure or twisted form of the cord reinforcements optimizes breaking strength, modulus and fatigue resistance properties having vital importance on tire performance.

But, when we take a look at the history of the reinforcement developments within last fifty years, although there have been several hundreds of patents on tire reinforcements, we do not see a breakthrough application revolutionizing the tire reinforcement concepts. That is, at least until Kordsa Global started to focus on innovative and revolutionary tire reinforcement concepts recently.



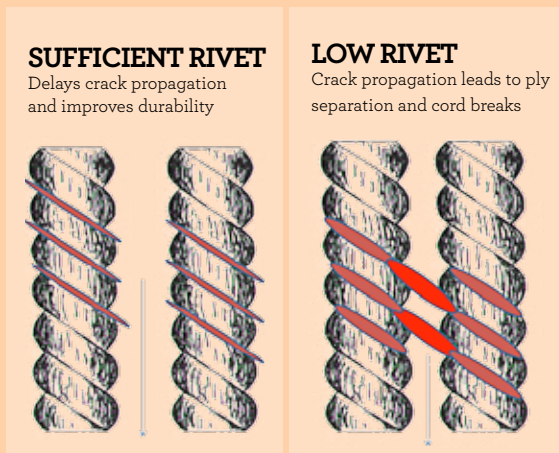
LOW TWIST - HIGH FATIGUE RESISTANT PET CORDS OFFER NEW DESIGN PARAMETERS TO TIRE MANUFACTURERS

The first of the potential products about to be developed during 2015 is High-TMF cords. High-TMF cords refers to High Tenacity, High Modulus, High Fatigue Resistance Cords and these revolutionary tire reinforcement concepts are in progress in Kordsa Global.

While smaller helix angle enhances braking strength and modulus, the special dip system penetrating through the individual filaments improves the tension, compression and flexural fatigue resistance.

Increased breaking strength due to lower twist makes it possible to use thinner cords which leads to rubber saving and rolling resistance reduction. Or by using lower epdm, the increased cord-to-cord distance (rivet) improves tire durability. In terms of High Fatigue resistant cords especially PET Cord as carcass, some potential applications are; High-TMF PET Cord as carcass in radial PC and LT tires, High-TMF NYLON as cap ply in radial PC tires and HIGH-TMF NYLON as carcass and breaker in bias tires.

Also, High-TMF PET Cord can replace rayon carcass in UHP tires (similar trend existed in 2014). Kordsa Global is working diligently to deliver trial samples at the end of 2015.



THE TIRE TECHNOLOGIES SHOULD DISCOVER THE UNUSED, BUT POWERFUL PROPERTIES OF NYLON 6.6

The second innovative and revolutionary tire reinforcement concept is SUPER HIGH MODULUS NYLON 6.6.

Actually, nylon cord is a bi-elastic or dual-modulus reinforcement within a very wide range of twist, having low initial modulus and high final modulus after a wide transition zone.

Especially in cap ply applications, only low modulus and some parts of the transition zone can be used by almost all of the tire technologies. In order to minimize or prevent the tire growth under high speed conditions, it would have been preferable to use high modulus part of stress-strain curve, enabling a sufficient restraining force together with high thermal shrinkforce with less material. That's why, in order to offer this hidden and not-used nylon property for tire applications, Kordsa Global is working to narrow the transition zone between low and high modulus zones of the nylon in stress-strain curve.

This new High Modulus Nylon will have more pronounced bi-elastic behavior like hybrid cords, having nylon like initial modulus and PET like secondary modulus which will be much more effective as cap ply than conventional nylon applications. In Capmax form, super high modulus nylon will not show any cutting effect due to texturized weft's stress distribution effect on belt layer.

The third innovative and revolutionary tire reinforcement concept is INTELLIGENT (ADAPTIVE) CAP PLY.

The Intelligent (adaptive) cap ply reinforcement controls the restraining force as a function of tire speed and, by preventing tire growth, it improves high speed durability. Its response range and profile is controlled by glass transition temperature and polymer morphology. Temperature dependent shrinkforce intensity and modulus change can be tailored by fibers having different Glass Transition Temperatures. Kordsa aims to provide Lab samples for customers within this year.

And the last of the innovative and revolutionary tire reinforcement concepts is ULTRA HIGH MODULUS POLYMERIC REINFORCEMENT.

It seems that, the only way for drastic weight reduction and fuel saving is to replace high density metal reinforcements with low density ultra high modulus fibers as composite strips or as stiff, but flexible, cords.

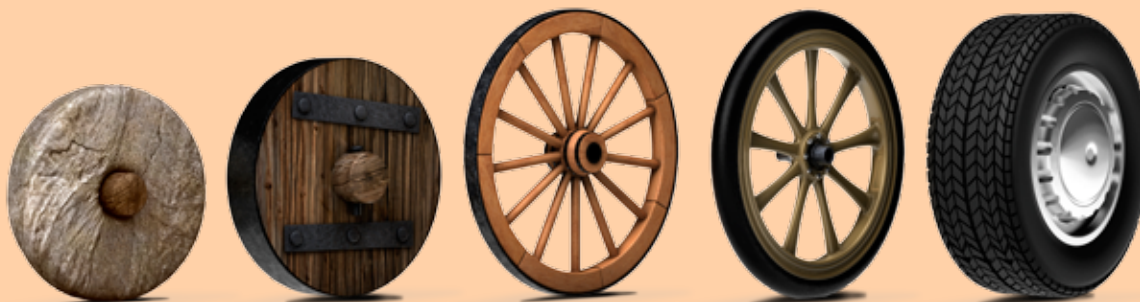
Several tire companies have already tried to find the alternatives and patented them, but most of them were not mature enough to overcome integrity (fiber-fiber separations resistance) and fatigue (e.g., compression induced cracks) problems under dynamic conditions in tire.

Obviously, a belt package made of UHM polymeric cords might require a strong cap ply for a sufficient plunger energy. UHM cords provide sufficient breaking strength and modulus as bead core, but 3 to 5% breaking elongation and radial (tranverse) toughness is also needed for tire mounting and demounting.

Steel cord and textile combinations which are able to increase their stiffness as a function speed and temperature could find application as belt package in passenger car tires in future (intelligent belt layers).

Kordsa Global aims to provide trial samples for tire companies within this year.

Kordsa Global continues to make developments for creating value added products according to the trends in tire industry.



"Thanks to having tailor-made production practices for more than 41 years and a state-of-art R&D Center, Kordsa Global is continuously developing new reinforcement solutions for almost each segment of technical textile industries."





SECRET BEHIND NEW PRODUCTS

M. BURAK AKÇAEL

Marketing Manager

Technical textile markets are now much more demanding for new products. Price-performance ratio is being calculated for every single penny. If not satisfactory, even with its superior properties, the product fails.

Today, consumers and suppliers are coming together to analyze market needs and create tailor-made solutions. By this mutual effort, companies can bring high-value added products to markets.

Thanks to having tailor-made production practices for more than 41 years and a state-of-art R&D Center, Kordsa Global is continuously developing new reinforcement solutions for almost each segment of Technical Textile Industries.

Here are some examples of the recent developments:

Airbag Yarn (For Mobiltech)

Yarns, used in airbags, are special and need high production technology to achieve high safety standards. When compared with other material options, Nylon 66 is still far beyond due to its high tenacity, toughness, high heat resistance and aging stability properties.

Kordsa has recently introduced its 350, 470, 580 and 700 decitex T-147 yarns into the market. This yarn is specially engineered to get perfect mechanical quality and eventually zero broken filaments in filament yarn.

To bring high-value added products to markets, Kordsa Global is continuing to make tailor-made production practices

Monofilament (For Indutech)

Nylon 66 monofilaments have been preferred by many Indutech applications for years due to their special features like high tenacity, flexibility, high stretch, high shock absorption strength, abrasion resistance, temperature resistance and good appearance. Nylon 66 monofilaments are preferred for many industries such as Carpet, Marine and Filter manufacturing.

By transforming its existing Nylon 66 multifilament yarn production technologies, Kordsa managed to produce Nylon 66 monofilaments with higher tenacity levels than other alternatives in the market. Patents have already been applied on this special production technology.

High tenacity Nylon 66 monofilaments are now available in Kordsa Global product portfolio.

Technical Nylon (For Protech)

High abrasion resistance, resistance to chemicals and stability under high temperature conditions are some of the critical material properties while manufacturing of protective clothes in many outdoor applications including army uniforms.

By using existing high tenacity Nylon 66 yarn product portfolio and hybrid formulation know-how, Kordsa provides new and tailor-made solutions for high-end fabric designers.

High tenacity T-164 flat and textured yarns, Hybrid cords (like Nylon-PET; Nylon-Aramide) are some of the examples in this product group.

Reinforced by Kordsa

Tunnel
Segmental Linings

Macro
Synthetic Fiber
Reinforcement
for Concrete

macro
KraTos[™]

- Eliminates Steel Mesh Laborship
- Saves Construction Time up to 30%
- Non-corrosive, Builds Long Term Durablity in Structures
- Non-conductive, Electrical Safety in Railways and Subways
- High Melting Point, Keeps the Structural Integrity of the Lining After Fire Situation

For more information:
construction@kordsaglobal.com
kordsaglobal.com

Slab Track



Shotcrete &
Final Linings

Concrete Roadway

Shrinkage
Control

micro
KraTos™



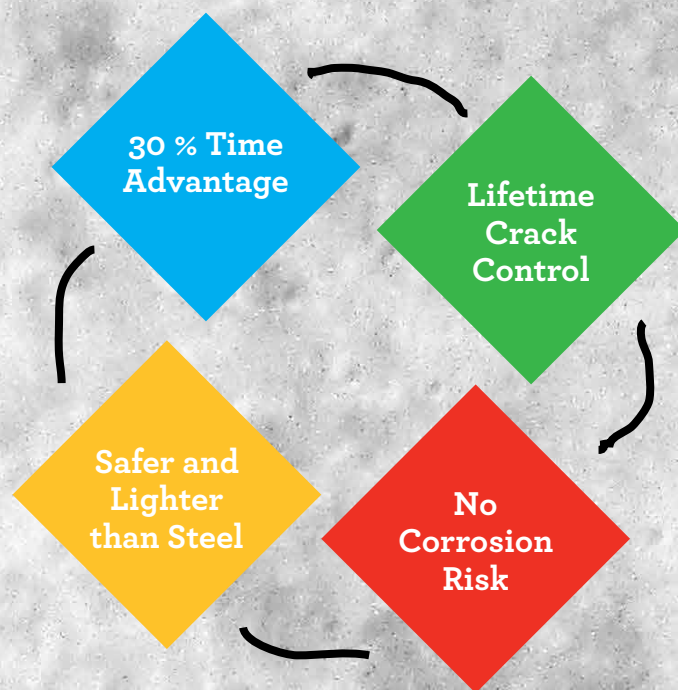
KRATOS OFFERS BREAKTHROUGH IMPROVEMENTS FOR CONCRETE REINFORCEMENT WORLD

For decades, conventional methods to reinforce concrete have been mainly with steel.

Although steel reinforcements are able to support concrete sections to bear tensile forces, its behavior is weak in crack control, especially under loads derived from plastic shrinkage in concrete, since steel reinforcements are only laid in 2 dimensions in concrete.

Kratos Nylon 6.6 high-strength high modulus fibers differ with its 3-dimensional dispersion in concrete mix, which controls crack formation both under service loading and shrinkage, in each interface of concrete.

Since cracking is a common vulnerability in all applications of concrete, Kratos is a smart solution in variable applications; from industrial floors to port ground supported slabs, screed concrete, shotcrete applications in tunnels, track slabs, precast segments, pipes and panels, concrete roadways.



Sustainable Structures with Higher Durability

Another bottleneck with steel mesh is corrosion. It naturally affects durability and lifetime performance of concrete. Kratos Macro is one of the most resistant fiber reinforcements when exposed to the high alkalinity of portland cement and has no decomposition risk under corrosive effects of water content or alkali environment. It brings in long term concrete durability, by the exclusive coating which provides better physical adhesion and gives fiber its stiffness for homogeneous distribution. This technology in the coating formula is an invention of Kordsa Global's R&D Center.

Less Laborship, More Time & Cost Advantage

On the other side, contractors desire to accelerate the operational periods on site in today's fast-growing construction world. Steel reinforcement must be cut, bent, spliced and placed to the project substrate. This process is very time-consuming, costly and labor intensive.

Kratos Macro fibers serve as an end product, application only needs dosing the fibers into concrete mixer, mixing and pumping through concrete forms. The simple process eliminates steel laborship, reduces total construction time and total cost of ownership.

When comparing the other macro-synthetic fibers, substitutes for steel mesh reinforcement such as polypropylen, superiority of Kratos can be seen in many points.

Nylon 6.6 fibers with density of 1,14 gr/cm³, do not float in concrete mix; therefore finishing in concrete does not suffer from "hairy surface". Hence, no costly time and labor delays for removing fibers protruding from the surface. Contrary to Nylon 6.6 fibers, this is the weakness of polypropylene synthetics with density about 0,9 gr/cm³, which is less than that of water.

In the future, Kratos Micro is the most efficient micro synthetic fiber to control cracking by shrinkage in early age concrete.

KRATOS micro fibers are naturally hydrophilic and absorb moisture in concrete up to 5% within dehydration in critical setting period. Then, they start to cure concrete internally by redirecting them from the 7 th day on and reduce shrinkage down to 50% until 28 th day, on which concrete shows main cracking behavior by dehydration and gains 70% of its strength.

By this feature, fibers mitigate cracking by shrinkage more successfully with less dosage than polypropylene or basalt fibers.

Since cracking is a common vulnerability in all applications of concrete, Kratos is a smart solution in variable applications; from industrial floors to port ground supported slabs, screed concrete, shotcrete applications in tunnels, track slabs, precast segments, pipes, panels and concrete roadways.

Product type	Macrosynthetic Fiber
Polymer	%100 Virgin
PA 6.6	
Dipping	Exclusive*
Density (gr/cm3)	1,14
Color	Yellow
Length (mm)	40; 45; 50 ; 54
Diameter (mm)	0.55; 0.80
Tensile Strength (MPa)	900
Elastic Modulus (GPa)	10,5
Melting Point	256 °C
Ignition Point	900 °C
Alkali Resistance	☺
Corrosion Resistance	☺

Product Type	Microsynthetic Fiber
Polymer	%100 Nylon 6.6
Density (gr/cm3)	1,14
Color	Light Grey
Length (mm)	3; 6; 12; 18
Diameter (mm)	0,020- 0,024
Tensile Strength (MPa)	900
Elastic Modulus (GPa)	10,5
Melting Point	256 °C
Ignition Point	900 °C
Alkali Resistance	☺
Corrosion Resistance	☺

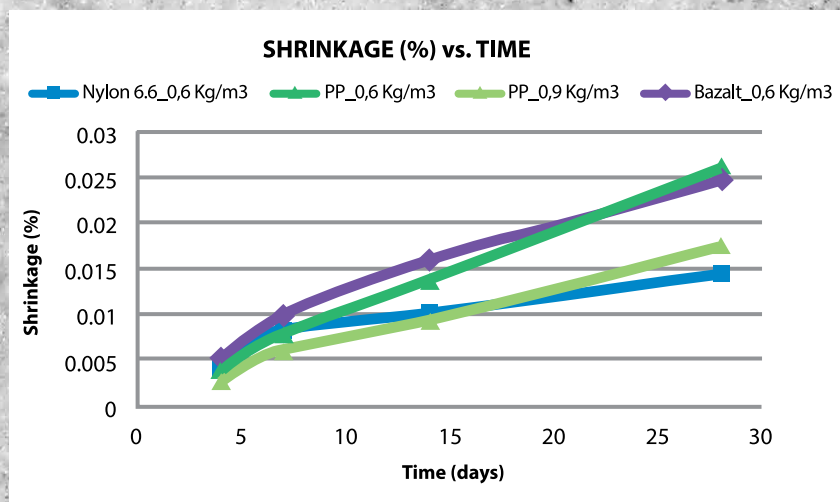


Figure A: Plastic shrinkage mitigation in microfiber reinforced concrete within 28 days.

* "Nylon" 6.6. refers to Kratos Micro.

** "PP" refers to polypropylene microfibers.

* Tests performed according to TS 332 2 (ASTM C157) standards.



KORDSA

Nylon6.6 PET HMLS InterPlast® InterCord®

CapmaX

Twixtra
hybrid solutions

MONOLYX

KraTos

HARtech

The New Resorcinol & Formaldehyde Free Dipping Technology

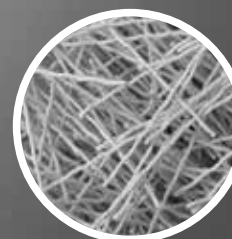
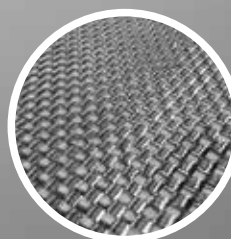
For a Greener World





THE REINFORCER

Kordsa Global is a leading enterprise that serves the tire, composite and construction markets by providing reinforcement solutions.



Products of Kordsa

KORDSA

Nylon 6.6 PET HMLS CapmaX Twixtra MONOLIX InterPlast InterCord Kratos HARtech

KORDSA GLOBAL

