

THE REINFORCER

KORDSA GLOBAL | BULLETIN | N.05 | 2016 | TURKEY

Determined to Create Value

KORDSA GLOBAL



ESTHETICALLY STRONG
COMPOSITE TECHNOLOGIES

*FREDERIQUE MUTEL
THE SAGA OF COMPOSITES*

*SADETTİN FİDAN
THE POTENTIAL APPLICATIONS OF
CARBON FIBER
IN TIRE TECHNOLOGY*

*UNIVERSITY PROJECTS
REINFORCED BY KORDSA GLOBAL*



*To lighten the world
with technology*

MISSION

Deliver high value added reinforcement solutions, globally.

VISION

Agile Kordsa Global in high value businesses for sustainable growth.

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“Safety, health and environment is among our top priorities, as our “Reinforcers” are Kordsa’s main asset. Our target to achieve accident-free working hours has been reached at our Chattanooga and Laurel Hill plants in the USA, as well as at our Thailand plant, thus contributing to the improvement of accident frequency on a global level.”





Foreword

CENK ALPER

CEO

Honored Partners,

I am very grateful to be back with you once again in the newest issue of The Reinforcer.

Our planet is facing difficult times. Security is becoming a major problem throughout the world, and the impact of this can be seen in the slowdown of world economies in different regions.

Despite all the negativity in the air, I am pleased to communicate that we at Kordsa Global continue to improve our safety, quality and financial performance year upon year, by meeting the expectations of our stakeholders and expanding our solution portfolio in our role as “The Reinforcer of the World”.

Safety, health and environment is among our top priorities, as our “Reinforcers” are Kordsa’s main asset. Our target to achieve accident-free working hours has been reached at our Chattanooga and Laurel Hill plants in the USA, as well as at our Thailand plant, thus contributing to the improvement of accident frequency on a global level.

To sustain our safety efforts, the second “Safety Training Center” has opened at our Izmit plant, following the center in Indonesia. Experience Centers increase safety awareness among all our employees with real time simulators of accident situations.

In recent years, we have further increased our efforts in the area of product and service quality, which we see as the main tool to improve Total Cost of Ownership for our partners. We have been using Blue Ocean Strategy tools and concepts for many years to identify the needs of our customers, and this has delivered many innovations in products and services.

“Behind the Borders” is a new Blue Ocean Strategy project, in which we spend time at our strategic partners’ plants, together with our tire and fabric experts, and identify opportunities to improve Total Cost

of Ownership, thus contributing to their success. We are now in a position where we are ready to launch this project with all of our partners.

I am proud to say that the yarn and tire-cord investments that we completed last year have been almost fully utilized. We have recently announced a wave of new-generation PET yarn investments in Turkey and Indonesia to support the growth of tire reinforcement markets.

Dear Partners,

I am proud to say also, Composite Technologies Center of Excellence has opened. Kordsa Global and Sabancı University have combined their forces under the same roof for this high technology hub. Center operates in the field of high-technology composite materials, a milestone for a wide range of industries from aviation to automotive. Kordsa Global’s production engineers and Sabancı University’s academic members and doctoral students are working together in the R&D and production processes of the composite at Composite Technologies Center of Excellence. This technology hub will be the new high-tech hub of Turkey driven by the collaborative research and production. The Centre operates as one of the most prominent test centers of the world, and composite producers of Europe.

As of July 1, 2016, Kordsa Global is listed in the Istanbul Stock Exchange 50 Index (BIST 50) thanks to an increased trading volume and investor interest in our improving share price.

On a final note, I am proud to announce that Kordsa Global has been recognized as a “Great Place to Work” in the Brazilian state of Bahia. This is the result of the high-standard HR practices that we implement globally with the aim of improving working conditions for all our Reinforcers.

Happy reading!

KORDSA GLOBAL

News Highlights

First Half of 2016

Composite Technologies Center of Excellence Opening Ceremony

Composite Technologies Center of Excellence has opened. Kordsa Global and Sabanci University have combined their forces under the same roof for this high technology hub.

The opening ceremony of Composite Technologies Center of Excellence was held with the participation of the Prime Minister of the Republic of Turkey Mr. Binali Yıldırım, Dr. Faruk Özlü, the Minister of Science, Industry and Technology, Mr. Lütfi Elvan, the Minister of Development, Mr. Ahmet Arslan, the Minister of Transportation, Maritime Affairs and Communication, Mr. Fikri Işık, the Minister of National Defense, Ms. Güler Sabancı, the Chairperson of Sabancı Holding, and founder and Chairperson of the Board of Trustees of Sabancı University, Prof. Nihat Berker, the President of Sabancı University.

Center will operate in the field of high-technology composite materials, a milestone for a wide range of industries from aviation to automotive. Kordsa Global's production engineers and Sabancı University's academic members and doctoral students are working together in the R&D and production processes of the composite at Composite Technologies Center of Excellence.

This technology hub will be the new high-tech hub of Turkey driven by the collaborative research and production. The Centre operates as one of the most prominent test centers of the world, and composite producers of Europe.

Ms. Güler Sabancı noted the following in her opening remarks:

"Today we are at Composites Technologies Center of Excellence Opening Ceremony, to introduce a new model that will set an example for our country. As Kordsa Global and Sabancı University,



we are taking a new initiative, in an area with crucial strategic importance for our country. We are embarking on a new journey to which our country can make a difference with advanced technology, and even become a global power, a major player in the big league. Today, we are not only investing for tomorrow, but for the next 10-20-30 years of Turkey."



Safety Training Center Opens



Kordsa Global has opened the new Safety Training Center in İzmit, based on Total Productive Maintenance, in order to reach our target of a 100% accident-free and safe work environment. The center is equipped with advanced accident technology simulators to allow Reinforcers to experience possible accidents in a safe environment. Each simulation module at the center is portable and replaceable for improvement, making the training center the ideal place for employees to develop experience on how to handle a potential hazard.

Three Safety Targets Reached in Chattanooga, Laurel Hill and Thailand

At Kordsa Global our most valuable achievements are our safety records. Aiming at reaching a 100% accident-free environment, we have now reached our second safety target, at the Kordsa Chattanooga plant with 800,000 injury - free hours, also met our first safety target at Thai Indo Kordsa, with 1,000,000 injury - free hours and also met our first safety target at Laurel Hill with 270,000 injury - free hours.



All Stars Award Ceremony



Organized by Kordsa Global since 2006, the All Stars Awards Ceremony is an award program designed to recognize outstanding projects and the employees who effectively contributed to them. Once again this year, Kordsa's "All Stars" Global Award program was held simultaneously in all plants on 26 February 2016. At the award ceremony, which was broadcasted live in all Kordsa plants, employees selected for the accolade were presented their awards by their company's board members. The All Stars Awards Ceremony came to its conclusion following the presentation of the factory awards, global synergy awards

Ali Çalışkan at KalDer Board



Ali Çalışkan, Kordsa Global's COO of EMEA, has been elected as board member of KalDer (Turkish Quality Association) at the 27th KalDer Ordinary General Assembly.

KalDer is a non-profit organization that aims to have a positive impact on contemporary life by promoting a culture of quality and excellence, to support sustainable development and to create competitive institutions.

Visit from Sabancı Holding Industry Group President



Mehmet Hacıkamiloğlu, Industry Group President of Sabancı Holding, visited Kordsa Global's Composite Technologies Center of Excellence and İzmit plant, as part of his visit he obtained information on-site about Industry 4.0 practices, examples of technological improvements and innovative investments for the reinforcement market, such as Project Minidip. At the end of the program, Industry Group President Hacıkamiloğlu expressed his pleasure at this informative visit.

Cenk Alper Speaks at the 10th European Nylon Symposium

Cenk Alper was the Key Industry Speaker at the 10th European Nylon Symposium, held in Frankfurt. In his speech he spoke of how Kordsa has grown into the leading PA66 yarn and fabric producer in the world, and highlighted important decisions/factors that led to this success.

PCI Nylon, part of the PCI Wood Mackenzie market research consultancy, focuses on the global nylon and polyamide industry and organizes two symposia per year with the aim of updating clients on developments in the global polyamide industry.

Innovative Reinforcement Ideas

In order to encourage innovation and new ideas within the company, Kordsa Global has once again implemented its Blue Ocean Strategy. The goal of the strategy is to develop innovative ideas for the composite and construction markets in order to enlarge the company's market share in these areas. In November, six teams were established, formed of Kordsa employees in various departments - from sales to production, R&D and communication - and began their fieldwork and literature reviews in order to identify customer needs and insights. The teams presented 17 projects to the Executive Leadership Team and BOS teams. Projects receiving the highest points from the panel will be implemented following a feasibility study.



Kordsa Global Reinforcement Truck on the Road



Reinforcement trailer trucks are taking Kordsa Global's products on the road to Europe. Trailer trucks transporting Kordsa Global products hit the European roads in May, featuring designs that reflect the "Reinforcer" brand identity. Making regular deliveries to Europe, the trucks will be the brand ambassador of Kordsa Global on European highways.

The Reinforcers' Journey of Excellence

Composite Technologies Center of Excellence based in Teknopark, Istanbul. The center was established together with Sabancı University, one of the most prominent universities of Turkey, in order to serve stakeholders throughout all different stages of production and innovation. The Composite Technologies Center of Excellence is set to become a technological base, serving customers according to

their needs throughout all stages of product development, starting with primary research, and continuing through prototyping to mass production.

The Composite Technologies Center of Excellence has been designed as a "Green Building" in accordance with the Reinforcers' sustainability targets.

Visit from Güler Sabancı the Chairperson of the Board of Directors of Sabancı Holding



Güler Sabancı, the Board Chairperson of Sabancı Holding, visited the Composite Technologies Center of Excellence conjointly established by Kordsa Global and Sabancı University. Inspecting the production facilities and R&D laboratories under the scope of visit, Güler Sabancı observed and received on site information about the composites production processes. Expressing her satisfaction about the business model established between Kordsa Global and Sabancı University, Güler Sabancı stated that university-industry collaborations should be increased and extended on a widespread basis.

Cenk Alper Explains “How to Be a Sustainable Brand” at the 14th Quality and Success Symposium

Cenk Alper shared Kordsa Global’s journey towards becoming a sustainable brand at the 14th edition of the Quality and Success Symposium, organized by KalDer on 15-16 April 2016 in Bursa with the theme “Sustainable Excellence”.

Cenk Alper, attended a session on “How to Be a Sustainable Brand”, moderated by Sami Erol, former Board Chair of KalDer BURSA and board member and Chairman of the Executive Board of Aktaş Holding. He spoke of the journey of the Kordsa Global brand towards becoming “The Reinforcer”, and shared the company’s milestones on this journey, from gaining market leadership in Turkey to becoming the global market leader in tire reinforcement industry, and then growing into the industry giant of tire, construction and composite reinforcement technologies.



“ Speaking of “How to Be a Sustainable Brand”, **Cenk Alper, CEO of Kordsa Global, said,**

Innovation and the use of technologies are crucial to Kordsa Global’s journey to becoming a sustainable brand. As market leader and champion of innovation in Turkey, our mission is to open up and share our technology with all. Today, we share our technology with our competitors in other countries and we believe that this ‘open innovation’ approach will transform the industry and the world. Being a sustainable brand is about efficiently and effectively using these resources and experience and about making the most of their benefits for customers and for the world. ”

Kordsa Global Composite Materials Tour the Balkans



Trakya University’s Pehlivan team toured the Balkans between 19 and 27 April with the Pehlivan Elektrak, a car produced with the platinum sponsorship of Kordsa Global. The Pehlivan Elektrak is an environmentally friendly electric car, whose body is composed solely of carbon fiber. Students set out from Edirne in their light but strong car on 19 April, ending their tour in Tirana.

"In a world where energy conservation and product recyclability are sought, composites seem well placed to be one of the best solutions, and not only for extreme applications, but also in consumer markets."





The Saga of Composites Where is the composite industry heading?

FREDERIQUE MUTEL

President & CEO of JEC Group

Every aspect of the development of composites offers a fascinating story, whether it is the study of the materials themselves and their gradual and continual process of transformation, the work with engineers who are always developing new applications for composites, the manufacturers who set out to conquer new markets, or the world's many different geographical regions that are adopting composites, often for very specific uses. Hindsight makes it relatively easy to retrace the sector's history. It is much more difficult, however, to map out the future, since so many factors (e.g. the world economy, lobbies, protectionism, resources) are beyond our control. But what we can do is analyse what is happening now.

From the days of pioneering to the industrial era

Composite materials as we know them first started to appear in the 1940s, and since then we have seen the sector develop into a veritable industry, particularly in recent years. It all started with carbon and glass fibre. Thanks to the creativity of early composite pioneers, the first composite products based on new materials emerged, bringing their share of advantages and positioning composites as serious rivals for existing materials.

First there were the aerospace, building, boating, sports and leisure, and military equipment industries; composites then spread to new sectors, such as the medical, electronics, electricity, consumer goods, and automotive industries. As for the materials themselves, the glass, carbon and aramid fibres used to make the composites were joined by basalt, natural plant-based, and then graphene fibres.

From the very beginning, material production was mainly an activity for large companies. For parts and product manufacturing, expertise was often located in small or medium-sized companies. In terms of the production of parts, there were at least a dozen different processes involved, depending on the item being manufactured and the sector for which that item was intended. For this reason, for a long time the processing operation was a complex and heterogeneous one.

Overall, the industry has progressed, in particular due to regulatory pressure. Europe has been a pioneer in that area, and is also well positioned in the formulation of raw materials and parts production. The need for large volumes and the production of large series has done the rest. This is particularly the case in the aerospace and automotive industries, which are being transformed by automation and robotization.

As it has developed over the decades, the composite industry has been able to address the many challenges it faced in the past century:

- Excessive raw material prices,
- Low level of standardization in general, particularly design standards, and of technical support from suppliers,
- Failure to take recycling into consideration,
- A persistently small market,
- A tendency to consider composites as a mere substitute for other materials rather than creating new applications,
- Insufficient communication on the part of companies to spread the word to user industries about the benefits of composites.

The future of composites

The global market for composites is estimated at around US\$73.9 billion (2015 figures). In terms of distribution, the markets in the United States/Canada and European regions are mature, accounting for 32% and 20% of global value respectively. The India/Asia/Pacific region accounts for the lion's share of the market at about 43%, while Latin America and Africa account for only 5%. The current relocation of production to certain geographical areas, such as the U.S., where energy has become less expensive, is worthy of note. Overall, the industry continues to develop in structure. During these past years, we have seen a large number of mergers and acquisitions throughout the value chain and between players in different regions of the world. At the same time, newcomers have arrived, either from the ancillary material sector or from downstream industries, and they know their markets very well. Some of these are aiming at vertical integration in order to give the end customers maximum benefit.

In a world where energy conservation and product recyclability are sought, composites seem well placed to be one of the best solutions, and not only for extreme applications, but also in consumer markets. This should have an impact on the size of the composites market in the very near future, and a large number of jobs should be created in this innovative industry. As Jules Verne said, "all that is impossible remains to be accomplished".

BIOGRAPHY

Mrs Frédérique Mutel

Frédérique Mutel, is the President & CEO of JEC Group, an industry organization dedicated to Composites. Frédérique Mutel joined JEC at the creation of the company (December 1996). She conducted a business model based on knowledge and networking. She opened offices in Asia and America. Within 15 years, she multiplied by 6 the services offered to the industry, the JEC revenues and the number of employees.

Before JEC, she acquired experience in international development, aerospace industry and Information Technologies:

She was involved in the United Nations Development Program in Niger and the Agency for International Development in the US Department of State. Then she entered the industry and had development responsibilities in the field of aircraft simulation, electronic publishing and 3D imagery at Sogitec (Dassault Aviation). Completed with senior positions in information technology companies (Accenture and Thales) and in the publishing sector (Blenheim).

AWARDS

Kordsa Global among the Best Employer Brands in Brazil!



According to a survey conducted by the "Great Place to Work Institute", among nearly 40 companies in Brazil's Bahia state, Kordsa Global outdistanced many competitors to take 7th place in the list of best companies to work for.

Speaking of the company's success in this area, Cenk Alper said,

“ This is the result of the high-standard HR management that we implement as an employee brand in our business operations on four continents. This award has strengthened our leading position in this field, as we were also selected as the winner in the 'Investment in People' category in the Golden Collar Awards organized by Sabancı Holding last month. ”

HOW IS THE EVALUATION MADE?

In the evaluation made by the Great Place to Work Institute, two-thirds of companies' scores of is based on employee surveys, with the remaining third based on comparative analyses of programs and applications established by the company in the field of human resources.

Export Star of the Year

The ceremony for the "Stars of Export - Export Encouragement Awards 2015" of the Turkish economy to improve their export performance and to support the sustainability of exports, was held in Istanbul on May 12 2016, organized by the Dünya newspaper.

At this year's 15th edition of the "Stars of Export - Export Encouragement Awards", a total of 19 companies received awards in nine categories, with Kordsa Global receiving the grand prize. A company that is extending its export activities by exporting technology globally, Kordsa Global was awarded the "Export Star Grand Prize" at the ceremony.



Investment in People Award

The 7th Sabancı Holding Golden Collar Awards were held at the Sabancı Center. The ceremony began with an opening speech by Ms Güler Sabancı, Chairman of Sabancı Holding, continuing with a welcome address by Mr Zafer Kurtul, CEO of Sabancı Holding. During the ceremony, Kordsa Global's Reinforcers received 3 championship awards and 1 honorable mention.

The Reinforcers' first award came in the "Investment in People" category, and was presented to Cenk Alper by Neriman Ülserver, Head of Human Resources at Sabancı Holding. The Composite Technologies team was presented with the "Innovation and Institutional Entrepreneurship" championship award by Zafer Kurtul, CEO of Sabancı Holding. The Kordsa Connect project received an honorable mention in the "Digitalization" category, presented by Ata Köseoğlu, Head of Strategy and Business Development at Sabancı Holding. Finally, the second award for the Composite Technologies team came in the "Synergy" category for the "Composite Component Bus Project", carried out together with Temsa Global; the award was presented by Barış Oran, CFO of Sabancı Holding.



Two Awards from the League of American Communications Professionals (LACP) for Kordsa Global's First Sustainability Report

Kordsa Global's first "Sustainability Report" on the company's economic, environmental and social performance for 2013-2014 received gold awards for both the chemicals and materials industries at the LACP Vision Awards Competition, organized by the League of American Communications Professionals. The report features among the Top 50 reports in LACP world rankings.

Reflecting Kordsa Global's socially and environmentally responsible mindset, and with the aim of measuring, monitoring and improving the economic, environmental and social impacts of Kordsa Global's everyday activities, the sustainability report presents the company's performance in every area of the world in which it operates. The sustainability report earned praise from the jury for its first



impression, cover, letter to shareholders, narrative, financials, creativity, message clarity and information accessibility, and received the gold award for two industries: chemicals and materials.

Kordsa Global received a total score of 98 points out of maximum 100, and was judged to be the 41st best report, featuring among the top 50 in the world rankings at the LACP Vision Awards Competition. One thousand entries were submitted to the competition, representing more than 20 countries. Speaking of the achievement, Kordsa Global's CEO Cenk Alper said,

“ We are extremely pleased and proud to have won the LACP Vision Awards for our very first sustainability report. The success of this report, in which we share our project to improve the management of the economic, environmental and social impacts of Kordsa Global's everyday activities, is down to the Sustainability Task Force as well as to all our senior executives, employees and customers who have offered their support and contributions. We offer our congratulations to the entire team involved in the work that went into this report. Such awards further encourage us to continue to generate value for all our stakeholders, and to develop environmentally friendly projects. ”

Corporate Awareness Award for 2nd Time

Kordsa Global has received its second "Corporate Awareness Award" from the Institute of Internal Auditing - Turkey (TIDE) at the Sixth Awareness Awards Ceremony. Kordsa Global received the award for its "Annual Report on Internal Audit Activities", prepared by the company for the first time. Reinforcers' first "Annual Report on Internal Audit Activities" was considered an indicator of the importance the company attaches to transparent communication with its stakeholders. The Reinforcer was previously been awarded the same accolade in 2015, making this the second time that Kordsa Global has received the "Corporate Awareness Award".



Kordsa Global Receives Award from the Turkish Textiles Innovations League



Kordsa Global was recognized as one of Turkey's "Top 12 Companies" by the Turkish Textile Innovations League. The awards ceremony took place as a part of the 8th edition of the "UTIB International R&D Brokerage Event in the Textile and Clothing Sector", organized by the Uludağ Textile Exporters' Association since 2009. Kordsa Global was presented the award by Mehmet Müezzinoğlu, Minister of Health and parliamentary representative for Bursa.

“Actually, a single neuron is not clever. They only have an ability to process the data according to their simple codes and to transmit the results through creating connections with other neurons. This is a very good example how simple parts can create something bigger than sum of them. This is how humanity has been evolved.”





Neural Innovation – Innovation ∞

İBRAHİM YILDIRIM

CTO and Composites Reinforcement

Business Unit Leader

There are always different trend topics in business. Each age has their own “zeitgeist” and innovative forces which create the trends of that specific age.

Nowadays we hear more about “Industry 4.0” as a trend. The name implies that industry followed a path by increasing complexity about the technologies used in industry, through steam power and mechanization (Industry 1.0 – 1800’s) to electrification and assembly lines (Industry 2.0 – 1900’s) to PLC and automation (Industry 3.0 – 1960’s) and cyber-physical systems and networking (Industry 4.0 – today). Each path is driven by the innovations of their age. Then, what will be the innovations to drive “Industry 5.0”? The answer might be in our brains, literally “our brains”.

Any simple action that a human being makes requires very complicated and long calculations that none of today’s supercomputers were able to accomplish to calculate until now. Our brain does it all in a very fast, accurate and efficient way in milliseconds by using an energy less than a light bulb. Most of our actions happen in a harmony with automatic piloting of our brain, beyond thinking even without noticing. Our reality is the stories created by our brains, most of them is created subconsciously. How could that be possible?

Our brain continuously renews and restructures itself. With each single experience, new codes are written by electrochemical reactions occurring in our brain cells by virtue of signals created by a perfect neural network.

Our body systems sense every small change in our environment and create small electrical signals to our nervous system. Those signals go directly to our brains as input data and a magnificent Nano process happens. Each single neuron reacts in a way to compute this data and communicates with another neuron through chemicals and neurotransmitters until a decision takes place. Our brain then sends

back orders about how to act to our body. Very fast Nano computers. Each data is recorded in our memory to be used for next processes, to create a perfect model for our actions. In a normal human brain, there are 86 billion neurons with approximately 50 trillion connections (synapses) (*). Location of those connections are changing flexibly when it is necessary, according to signals coming. This is called as “plasticity” of the brain.



Actually, a single neuron is not clever. They only have an ability to process the data according to their simple codes and to transmit the results through creating connections with other neurons. This is a very good example how simple parts can create something bigger than sum of them. This is how humanity has been evolved.

The critical thing here is “correctly arranged and seamless interactions” and afterwards “networking and collaborations” which creates perfection, agility and efficiency. Learning how brain works is the real organic model for the future.

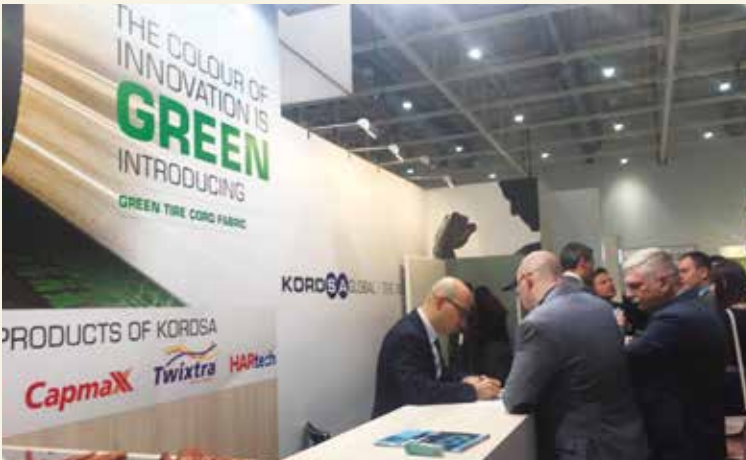
Inspired by all this knowledge about biological neural networks, I believe humanity will need a new kind of innovation for the future. Today, it is already started globally with “open innovation” efforts, but sooner or later further necessities will occur and will lead us to have a “neural innovation”.

Until that time comes, Kordsa Global will continue its “neuron tasks” to create new values for all stakeholders through open innovation and to reinforce its customers.

(*) The Brain: The Story of You, David Eagleman

EXHIBITIONS

Green Tire Cord Fabric at Tire Technology 2016



Kordsa Global attended Tire Technology 2016 Expo, the year's most exciting gathering of worldwide tire manufacturing experts and a leading event in the sector of tire production and design technology. Held in Hannover, Germany, the exhibition hosted various exhibitions and conferences. At the expo, Kordsa Global presented its new high-tech product, the environmentally friendly green tire cord fabric. By using a tire cord surface finishing process that does not require resorcinol and formaldehyde, Kordsa Global eliminates the emission of toxic substances that adversely affect the environment and human health. Furthermore as part of expo, İbrahim Yıldırım, CTO of Kordsa Global, gave a seminar in which he shared the company's experience in the tire reinforcement industry, and presented Kordsa Global's Nylon 6.6 and polyester tire cord fabric reinforcement products.

Kordsa Academy Training at Tire Technology 2016

The Kordsa Academy offered its support to the "Tire Reinforcement Materials" training program, organized as part of Tire Technology 2016. The day before the opening of Tire Technology Expo 2016, major actors in the tire industry gathered at one-day training workshops in which they discussed changes and developments in the

industry. Having been established to offer training sessions and share knowledge on various platforms with employees, customers and industry representatives, Kordsa Academy was involved in the gathering, with the academy's R&D experts offering a session on "Innovative Technologies Training".

Kordsa Global at JEC World in Paris with its Composite Products

Kordsa Global, attended JEC World 2016 in Paris. More than 100 countries were represented at the fair, and leading companies in the industry had the opportunity to share their innovative applications. Kordsa Global shared its customized fabric and prepreg solutions, its unique and innovative intermediate products, and its product applications, mainly in the aerospace and automotive industries, as well as in sports equipment, wind turbines and the maritime sector. Kordsa Global also introduced the Composite Technologies Center of Excellence, which is the first development facility in Turkey bringing university-industry collaboration together under the same roof.



Kordsa Global at the 13rd International Istanbul Yarn Fair



Kordsa Global participated in the 13rd International Istanbul Yarn Fair, which brings together major manufacturers in the yarn industry. At the fair, Kordsa Global presented its strong corrosion-resistant products, carpet yarn, as well as monofilament and industrial textile yarn. The unique features of Kordsa Global's carpet yarn and monofilament products, which have been developed through the company's years of experience in the reinforcement market, attracted great interest at the fair. The industrial yarn was distinguished by its superior elasticity and durability, while the monofilament products stood out for their dimensional stability and high resistance against corrosion in harsh conditions. Another product presented at the fair was Kordsa Global's carpet yarn, which drew considerable interest from the visitors for its color permanence and durability.

Kordsa Global at the 2nd Annual Innovative Passenger Tire Development Forum in Berlin and Innovative TBR Tire Development Forum in Amsterdam

Kordsa Global was among the main sponsors of the 2nd Annual Innovative Passenger Tire Development Forum and TBR Tire Development Forum. Both conferences brought together leading tire manufacturers and suppliers to discuss developments in the tire sector, the future of the sector and current needs. During each conference we gave two speeches in which emphasized the importance of cooperation, synergy and acceleration.



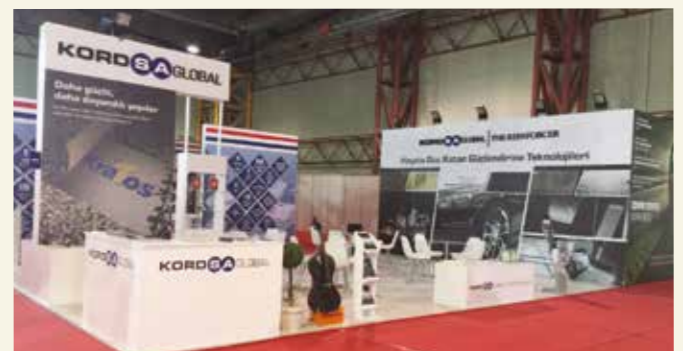
Kordsa Global at “Future Tire Conference”



Kordsa Global held a talk at the “Future Tire Conference”, organized by the European Rubber Journal and held for the first time as part of the international tire industry event REIFEN, which took place in Essen. Kordsa Global, the platinum sponsor of the “Future Tire Conference”, presented “New Materials for Tire Manufacturing” and discussed the trends that will shape the future of the tire industry.

Kordsa Global at Santek 2016

Kordsa Global attended the SANTEK 2016 3rd Eastern Marmara Industry and Technology Fair, presenting its composite technologies, construction and non-tire reinforcement technologies at this major industry event that was held in İzmit. Kordsa Global shared its market experience and innovative projects with participants and also introduced its innovative products at the fair. Kordsa Global showcased Kratos, the concrete reinforcement synthetic fiber for the construction industry as well as composite technologies that offer customized fabric and prepreg solutions. Kordsa Global also displayed non-tire products such as polyamide 66 granules and polyamide 66, which stand out for their mechanical strength, temperature resistance and dimensional stability.



UNIVERSITY PROJECTS REINFORCED BY KORDSA GLOBAL

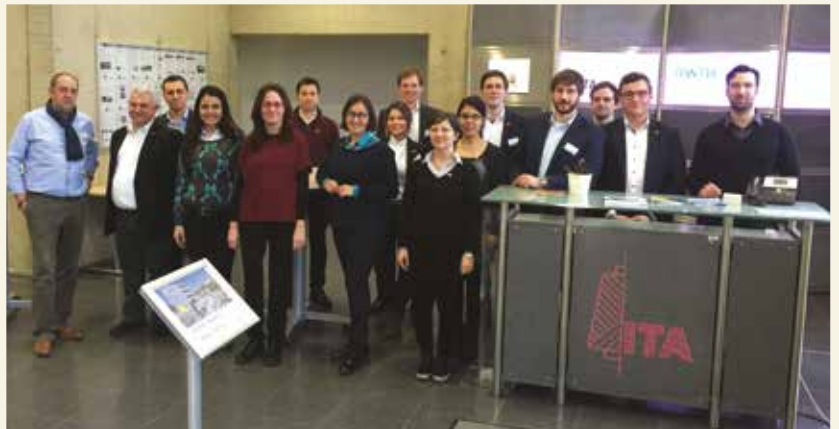
Reinforcers believe that, our future depends on the youths who are willing to integrate their academic knowledge with R&D and practice to create innovation.

In this line of thinking, Kordsa Global continuously supports innovative university projects through sponsorship and mentorship; and also attends university workshops, shares longlasting experience in reinforcement technologies with students to reinforce our future.

Here we would like to share the university projects and workshops we have reinforced:

Kordsa Global – RWTH Aachen University Workshop

Kordsa Global organized an innovation workshop with the biggest technical university of Germany, RWTH Aachen University on 11 – 12th February in Aachen. During the workshop, Kordsa Global R&D Team joined the brainstorm and shared their knowledge and experience to develop products, process and application innovations in the field of thermoplastic composites. Additionally, short-long term cooperation opportunities has been planned. Main focus of the workshop was automotive applications.



Yıldız Technical University - Wind Energy Club



Yıldız Technical University Wind Energy Club, working on composite reinforcement project to produce a wind-powered vehicle, is getting ready to compete in the “Racing Aeolus Den Helder”, the largest sustainability race in the world that takes place in the Netherlands. Kordsa Global Composite Technologies has provided carbon fiber support for use in the production of wind-powered car produced by Yıldız Technical University Wind Energy Club.

Kordsa Global Attends Yıldız Technical University Manufacturing Technologies Event

Kordsa Global, gave support to “Manufacturing Technologies Event” organized at Yıldız Technical University in İstanbul. During the event organized by YTU Machine Technologies Club, Kordsa made a presentation on “Composite Materials”. Students showed great attention to the composite materials’ specifications, production processes and the areas of usage during the Q&A.



Yıldız Technical University - YTU Racing Team

The YTU RACING Team was established to participate in Formula Student, the world's biggest annual student engineering competition, which helps students transform their theoretical knowledge into practical experience and knowhow. The YTU Racing team is formed of students from Yıldız Technical University, who have been continuing their studies under Kordsa Global sponsorship since 2015, with guidance provided by instructors from the university's Automotive Department, Ass. Prof. Alp Tekin ERGENC and Ass. Prof. Orkun OZENER. The YTU Racing Team was established by students from different university departments, who started to design and build a single-seat, open-wheel racing car in accordance with the concept of Formula Student. The most important point of the competition is "effective design and manufacturing"; and participating students design their car according to cost, manufacturability, maintainability and performance. The YTU team first participated in Formula Student UK with a car codenamed YTR-01, which they entered in the competition's Class 1 in July 2014. YTR-01 weighed 340kg, highlighting the importance of **weight reduction** to win the race.

The team decided to establish a composite department after seeing the monocoque chassis and other composite works - such as bodywork, aero package (wings), suspension arms, rims, intake manifolds - used in other teams' competition entries. YTR-01's chassis and body weighed nearly 80kg, whereas other Formula Student teams had managed to reduce this to 15-20 kg by using a monocoque chassis. This was an eye-opener for the team, and paved the way for their next models of racing car: the YTR-02 and YTR-03. After a four-month design period, the team manufactured the YTR-02, with which they ranked 57 among 135 teams at the design presentation in July 2015. The team was also selected for the "Most Effective Communication Strategy Award" from the Institution of Mechanical Engineers (IMEchE). As the lighter design of YTR-2 brought greater success, the team started working on YTR-03 in



August 2015 with the support of Kordsa Global. Following long and intensive design and production processes, the team produced the car's chassis, suspension arms, intake and exhaust manifolds, steering parts and seats. Thanks to their structural and flow analysis, the team managed to make YTR-03 lighter than other cars by using carbon fiber in the parts mentioned above and they launched their design at the Naval Museum of Command on 14 June. The team then set themselves a new goal:

“ Our next goal is to combine the steel chassis and carbon fiber body into one part to make a monocoque chassis. The monocoque structure has much greater design freedom and better packaging, and is five time more rigid and 80% lighter than a steel chassis. We certainly believe that we can reach that goal with the support of Kordsa Global. ”

Trakya University - Pehlivan Team

The Pehlivan Team was formed by students at Trakya University who continue their innovative studies under Kordsa Global platinum sponsorship.

The team produced two different cars: Pehlivan-02 and Pehlivan Elektrak. The first car produced by the team, the Pehlivan-02, is a solar-powered car that it earned the team third place in the Formula-G category of the Alternative Energy Vehicles Race, organized by the Scientific and Technological Research Council of Turkey (TÜBİTAK).

The second car produced by the Pehlivan Team is Pehlivan Elektrak. The Elektrak's most important characteristics are its unique design, domestic production, and performance. 85% of the car is designed and produced by the team members themselves.

The Pehlivan Elektrak's body is fully made from carbon fiber and is reinforced with a high-strength aluminum chassis. The car has a 3kWh battery pack developed by the team, which recharges itself in 45 minutes. When fully charged, Elektrak can run for 100km. The main reason for this outstanding performance is the car's aerodynamic design and minimal weight, thanks to use of carbon fiber. The Pehlivan Elektrak weighs just 240kg.



The Pehlivan Team toured around the Balkans in Pehlivan Elektrak between 19 and 27 April. They set out from Edirne on 19 April in their lightweight yet strong car, and ended their tour in Tirana.

Production Management Seminar at Marmara University

Our CEO Cenk Alper, visited Marmara University to participate in a seminar organized by the Sabancı Holding Human Resources Directorate. Cenk Alper shared his experience on Production Management through the composite production process with students of the Business Administration Faculty.



Kordsa Global's Inspirational "Reinforcement" Journey at Middle East Technical University

İbrahim Özgür Yıldırım, CTO and Composites Business Unit Leader of Kordsa Global, shared his experience with undergraduates of the Chemical Engineering Department of Middle East Technical University, his alma mater.

Yıldırım emphasized that Kordsa Global makes a difference in the



market through working with teams who work together to develop innovative, value-added technologies and solutions, and also explained the characteristics needed for success, while sharing his educational and business experiences with undergraduates. Yıldırım stated,

“ A chemical engineer is someone who knows enough physics and mechanics to confuse a chemist, enough chemistry to confuse a physicist or mechanical engineer and enough mathematics to confuse himself. ”

Istanbul Technical University - Fantastic Four Canoe Team

The National Intercollegiate Concrete Canoe Competition is organized by İTU Engineering Preparation Club at Ayazağa Campus in İTU Pond on May 15. During the competition, project presentation and canoe characteristics such as durability and speed for 2 people and 4 people categories were evaluated by the jury.

İTU Fantastic Four team has reinforced their concrete with Kordsa Global's KraTos Macro Synthetic Fibers to enhance structural strength and toughness to achieve a water-borne, fast, durable and light-weight concrete canoe. After all, the team has produced a 604 cm x 60 cm x 35 cm dimensioned, highly-durable concrete canoe weighing only 173 kg with 0,79 gr/cm³ light-weight concrete density.

İTU Fantastic Four Team became 1st and won the grand prize where Balıkesir University Canoe Team placed 2nd and BOUN Vikings team the jury. İTU Fantastic Four team has reinforced their concrete with Kordsa Global's KraTos Macro Synthetic Fibers to enhance structural strength and toughness to achieve a water-borne, fast, durable and light-weight concrete canoe.

İTU Fantastic Four Team became 1st and won the grand prize where Balıkesir University Canoe Team placed 2nd and BOUN Vikings team from Boğaziçi University became 3rd amongst 6 competing teams.



Kordsa Global Meets the Youth

Within the scope of the company's "Reinforcing the Future" theme, Kordsa Global CEO Cenk Alper met with students from Yaşar University, followed by members of the Manisa Young Business People Association. Cenk Alper shared with the young audience his experiences of working with different cultures, over a large geography that spreads from USA to Thailand, of being a global leader and of Kordsa's journey of excellence.



REINFORCING OUR HABITAT: CSR PROJECTS

As the Reinforcers of the world, we are aware that we hold a responsibility towards the societies in which we operate. Kordsa Global has a presence in many continents, and every single day we are at work we always aim to maximizing our positive impact and minimizing our negative impact. In other words, we do our best to bring our reinforcing mission to every aspect of life: reinforcing our society, reinforcing our environment, reinforcing our future.

Here we would like to share with you some of the social projects we carried out in the first half of 2016:

Donation to Women's Shelters

At the beginning of the year, Kordsa employees decided to collect donations for women who have been victims of violence and who are living in women's shelters as a protective measure. 34 boxes were collected by employees at our İzmit plant and the Sabancı Center. Items such as women's and children's clothes, sanitary pads and wet wipes were collected during the donation period and then sent to the women's shelters.

Freedom for Kids

As part of the Sabancı Volunteers program initiated by Sabancı Holding, Kordsa global established a team to run its own project focusing on children under six years of age who are living in prison with their mothers who have been incarcerated. The team worked together with the Youth Re-Autonomy Foundation of Turkey, the country's first NGO working in the field of the juvenile justice system defending children's rights.



In order to raise awareness about the issue and to collect donations, 16 Kordsa runners joined RunAnatolia, competing in three categories -10 km, 21 km and 42 km- on 6 March in Antalya. Kordsa employees had the chance to sponsor the runners in support of their goal.

Indo Kordsa 2016 CSR Projects

In April Kordsa Global initiated the 2016 period of the company's corporate social responsibility program in Indonesia with a ceremony attended by Bupati Bogor Ms. Hacah Nurhayanti.

After successfully completion of its 2015 projects, Kordsa Global will continue to reinforce the region through various corporate social responsibility projects throughout 2016. Kordsa Global aims at improving health, wealth, education and living standards through various CSR projects. These projects include land donation to meet the needs of the public sphere, the renovation of 25 inadequate

houses, the establishment of an internship program, support of local infant health care, scholarships for children, blood donation, safety training, medical check-ups for employees and employee candidates.



Indo Kordsa launched the new CSR-project period with a land donation to Sukahati Village, donating 1433 m2 of land to Sukahati Village to become a public street.

Reinforcers Visit a Village School in İzmit

Kordsa Global sees corporate social responsibility projects as a continuous process. As such, on 23 April National Sovereignty and Children's Day the Reinforcers visited a village school that was renovated by Kordsa Global during the Global Leadership Summit (GLS). During the GLS, the Reinforcers created a sleeping room for kindergarten children, painted the school façade, built a library and a computer laboratory, and cleaned the playground. On the latest Reinforcers' visit, pupils were celebrating National Sovereignty and Children's Day with poems and songs, while members of the Kordsa Global team, including upper management, served lunch to the children and presented books that had been donated by Kordsa Global employees.

Charity Rally for Baan Lumpheung School

Together with employees, Thai Indo Kordsa Co. Ltd organized a charity car rally to the Pung Waan Resort, Kanchanaburi province on 19-20 March 2016. 71 employees from Thai Indo Kordsa (TIK) participated in the trip and after the rally the team handed out gifts to children at the Baan Lumpheung School, which included basic necessities, clothing, toys and funds that had been collected as donations.



The entire TIK team attended a post-rally dinner, enjoying an evening of singing and dancing at the end of a wonderful day!

“Strands and strips could open new horizons in tire applications, if prepared under the proper conditions with tailor-made properties.”





The Potential Applications of Carbon Fiber in Tire Technology

SADETTİN FİDAN

**IP and Technology Manager,
Tire Technologies**

In tire technology, the principal property requirements for each of the main tire reinforcement components can be summarized as follows:

BEAD RING:

Ultra high modulus, high strength and high bending stiffness

BODY PLY:

High strength, dimensional stability and fatigue resistance

BELT PLY:

High strength, ultra-high tensile modulus and axial compression resistance

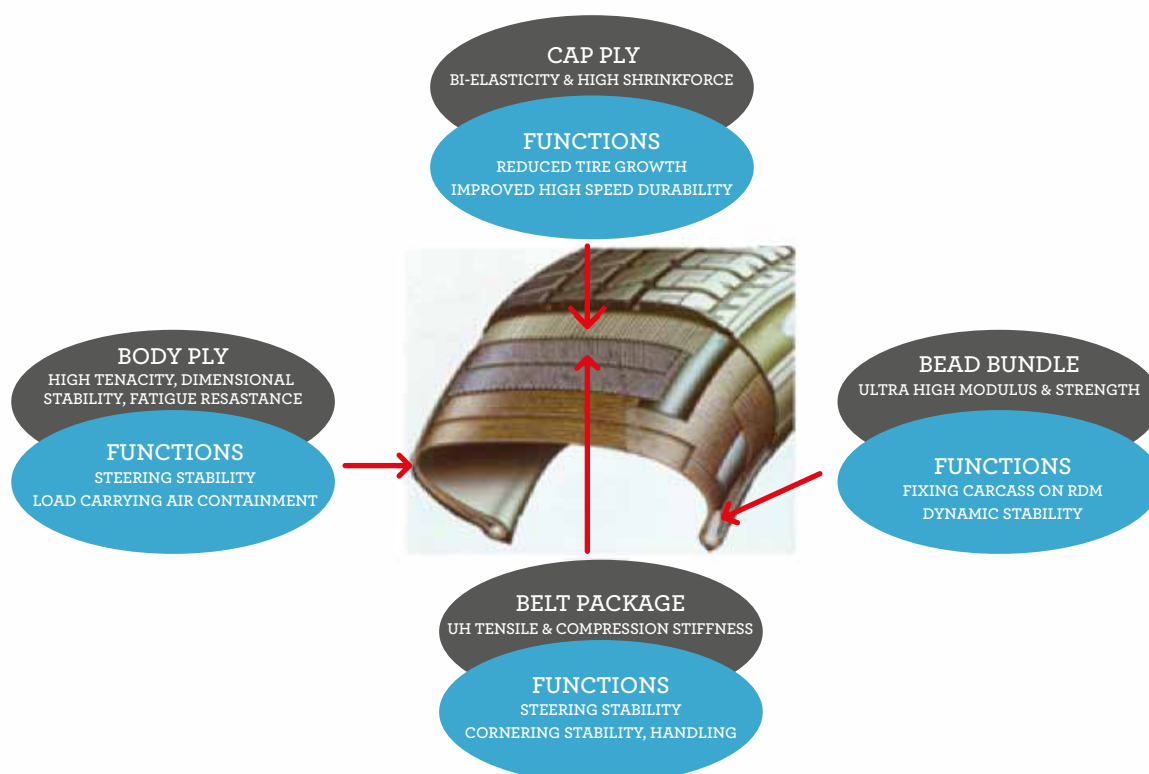
CAP PLY:

High modulus, medium heat-shrinkage, and high thermal contraction force

Carbon fiber (CF) has exceptional tensile modulus, strength and dimensional stability properties, but has certain shortcomings in soft rubber matrix of tire applications. The primary solution parameter to overcome this problem in soft matrix applications seems to be polymeric or resinous fillers, which improve stress-transfer uniformity and abrasion resistance between stiff carbon filaments.

The potential tire applications of CF-based reinforcements can be given as follows:

TIRE COMPONENTS, PROPERTIES & THEIR FUNCTIONS

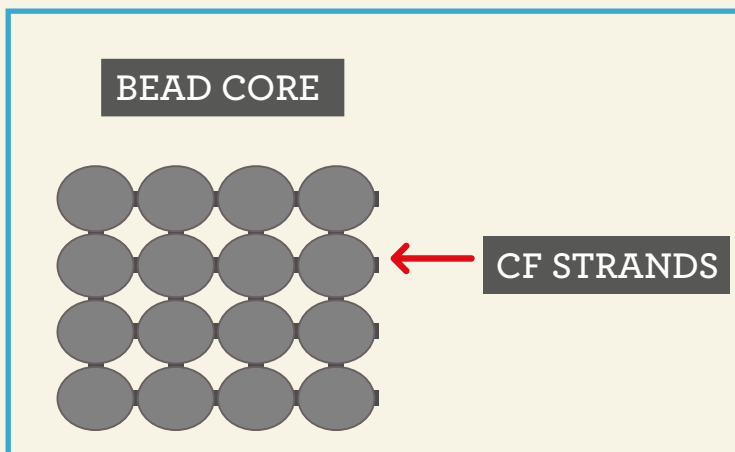


TREAD

As an ingredient in tread compound, either as powder or dipped chopped fiber (DCF), carbon fiber improves not only electrical conductivity to enable static electrical discharge from the tire to the road contact surface with the footprint, but also shortens the dry and wet braking distances by means of the spiking effect of the sharp ends of the fibers on the road surface. In order to reduce rolling resistance and heat build-up in the crown area, while the low carbon black and high silica content reduce tread conductivity, the carbon fiber, as a powder or DCF, also improves the electrical and thermal conductivity and additionally contributes to enhanced heat dissipation.

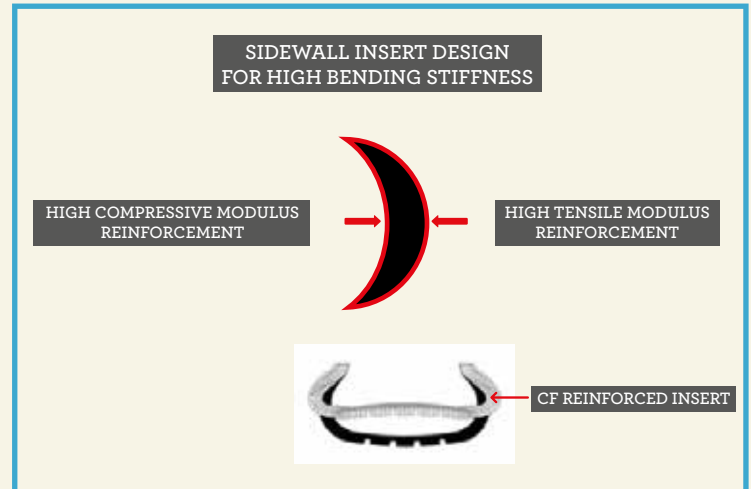
BEAD WIRE/CORE

High-strength, ultra-high modulus single-twisted CF strands can function as perfect bead wire due to the capability to maintain their original physical properties. The original modulus and strength can be maintained by controlling inter-filamentary stress transfer with polymers filling yarn-bundle interstices. The first potential candidates for such applications are racing and high speed tires. Different strength and stability levels can easily be obtained by adjusting the number of windings of 6K or 8K CF strands in the bead core. Polymeric or resinous fillers/matrices could increase the breaking elongation of up to 4-5% with some helix configurations. The most important motive for this application is weight reduction and fuel saving.



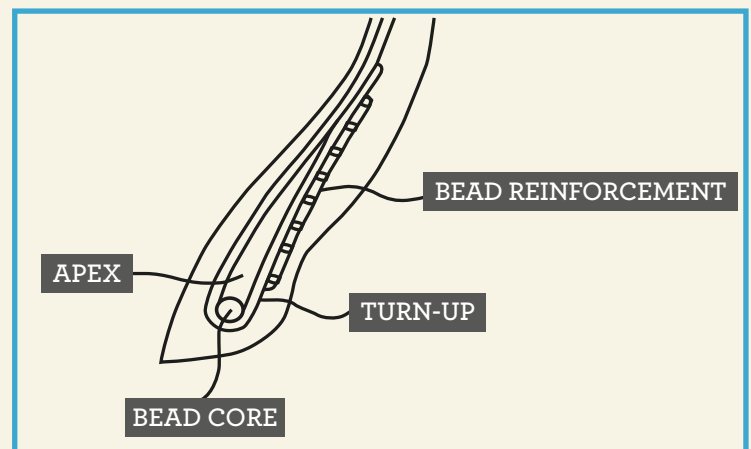
SIDEWALL INSERT & SIDEWALL REINFORCEMENT

In order to improve the run-flat performance and to decrease the heat build-up, CF cords can be applied as a sidewall reinforcement, or CF short fibers and powders can be applied as an ingredient in the sidewall insert rubber. Such measures can increase the radial stiffness and decrease sidewall deflection under reduced inflation pressure. Increased thermal conductivity also helps reduce the temperature rise, which improves run-flat driving performance.



BEAD REINFORCEMENT

With a tensile modulus higher than 15,000kg/mm², CF cords have been used as bead reinforcement in radial tires to improve high-speed steering stability and to provide comfort. Full RFL (or similar adhesive systems) penetration into filaments is a must for improved bending-fatigue resistance. Cord-twist optimization is necessary to hold the filaments tightly together, because of the negative effect of high twist on cord strength and modulus.



BELT PACKAGE

CF-cord reinforcement, as a folded belt package with or without cap ply, improves high-speed durability by preventing early belt-edge separation that leads to tire failure. While ultra-high modulus CF enhances the circumferential tensile stiffness, the out-of-plane flexibility of the belt layers provides reduced radial stiffness and more comfort compared to conventional tires with steel cords as a belt. Furthermore, with the low specific density of CF, tire weight and rolling resistance can be reduced.

In order to increase belt-cord integrity and its performance under dynamic conditions, full impregnation of the CF bundles in twisted or non-twisted form with thermoplastic, semi-thermoplastic or thermoset resins might be necessary. This treatment increases cord compression, bending and cut resistance. As a result of cord compactness, resistance against surface-filament separations under shear conditions is improved.

When compared with steel, aramid and glass, CF can generate less stress/strain concentration at the belt edge zone. Cornering stiffness can be controlled with cord compressibility, angle with the equatorial

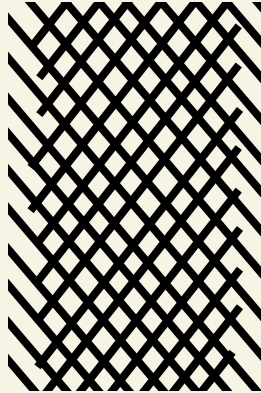
plane, end count and linear density.

Another potential application of stiff CF elements can be in the cut-end cross-angled belt package.

ULTRA LIGHT BELT MADE OF 2-LAYER CROSS-PLY CF CORD

KEY PROPERTIES:

- HIGH TENSILE & COMPRESSION MODULUS !



CROSS ANGLE: 15-25°
LAYERS WITH CUT-ENDS

FLEXIBLE, BUT COMPRESSION RESISTANT CF-CORDS

CAP PLY

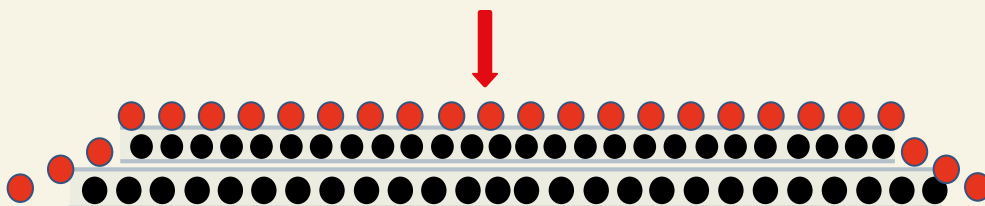
Theoretically, CF cords, with a breaking elongation of lower than 2.0%, can not be used as spirally wound cap ply due to the lifting of the belt package during the tire curing process, which could lead to the belt compound being penetrated by the CF cords and the friction between the CF cords and steel cords under high tension. Under such process conditions, low-extensible CF cords can be broken during lifting (tire expansion).

For these reasons, Kordsa Global is developing bi-elastic CF strips with a breaking elongation higher than 4% and with a

tenacity/strength at least three times higher than conventional CF cords by applying a special axial relaxation process. Such CF reinforcements as spirally wound cap ply strips on belt package prevent tire growth and pantographic belt-edge movements under high-speed conditions. Such bi-elastic CF strips also have exceptional cut-resistance against FOD (Foreign Object Damage).

SPECIAL ZERO DEGREE CAP PLY

PUNCTURE RESISTANT CAP PLY WITH HIGH TOUGHNESS



BELT PACKAGE

IN ORDER TO ENHANCE PUNCTURE RESISTANCE AND PLUNGER ENERGY

- THE CAP PLY MUST ALSO FUNCTION AS PROTECTION LAYER

In summary, CF-based reinforcing cords, strands and strips could open new horizons in tire applications, if prepared under the proper conditions with tailor-made properties.



Dr. Mehmet Yıldız

He received his PhD degree in 2005 in the Department of Mechanical Engineering at the University of Victoria, BC, Canada in the area of experimental and computational materials processing, and transport phenomena. He currently works at Sabancı University in the Faculty of Engineering and Natural Sciences with an affiliation to Materials Science and Nanoengineering, and Manufacturing Engineering programs. Dr. Yıldız is currently acting as the director of the Composite Technologies Center of Excellence and has been leading the effort from Sabancı University side as to the establishment of the center in the Technopark Istanbul.

Prof. Dr. Yusuf Menceoğlu

Prof. Dr. Yusuf Z. Menceoğlu received his Ph.D. degree in Chemistry at Istanbul Technical University in 1991 and after post-doctoral research at University of North Carolina in Chapel Hill. He is currently the Dean for Faculty of Engineering and Natural Sciences (FENS) at Sabancı University in Istanbul, pursues research area of nanosize material preparations, functional polymers synthesis, composite property structure relationship and reactions/processing in liquid/supercritical carbon dioxide.

Composite Technologies Center of Excellence: Building the Future of the Composite Research in Turkey

DR. MEHMET YILDIZ

Associate Professor at Sabancı University and Director of Composite Technologies Center of Excellence

Due to their strength-to-weight ratios, stiffness, corrosion resistance, and fatigue performance, and tailorable physical and functional properties, advanced composite structures offer many advantages over conventional engineering materials. Towards this end, advanced composites have been regarded as the materials of choice in key engineering disciplines, and therefore have been considered and utilized in a variety of primary and secondary load bearing structures in aerospace, automotive, wind turbine industries, among others. Engineers and scientists have been pushing the boundaries of innovative technologies to be able produce advanced composite materials with tailorable properties in accordance with the applications of interest. The composite materials considered here are fiber-reinforced polymer-matrix materials, which combine engineering performance and cost-effectiveness through near-net-shape manufacturing processes. Materials and processes vary widely depending upon the application. Of relevance are industrial grade composites such as glass fiber in polyester resins, through to high performance grade composites such as carbon fiber in epoxy resins; and innovative additives such as nanoparticles are also included.

Kordsa Global, industry giant of the world in tire, construction, and composite reinforcement technologies and Sabancı University, a top contender of the Most Entrepreneurial and Innovative Universities Index since 2012 have established “**Composite Technologies Center of Excellence**” in the Technopark Istanbul at the Asian side of Istanbul in the Marmara Region of Turkey, regarded as the locomotive of the Turkish industry particularly, engineering textile, marine, automotive, aerospace and defense industries which use composite materials increasingly in their production. Technopark Istanbul hosts more than hundreds high-tech companies in a spectrum of areas ranging from aviation, defense, automotive to

PROF. DR. YUSUF MENCEOĞLU

Dean of Faculty of Engineering and Natural Sciences at Sabancı University

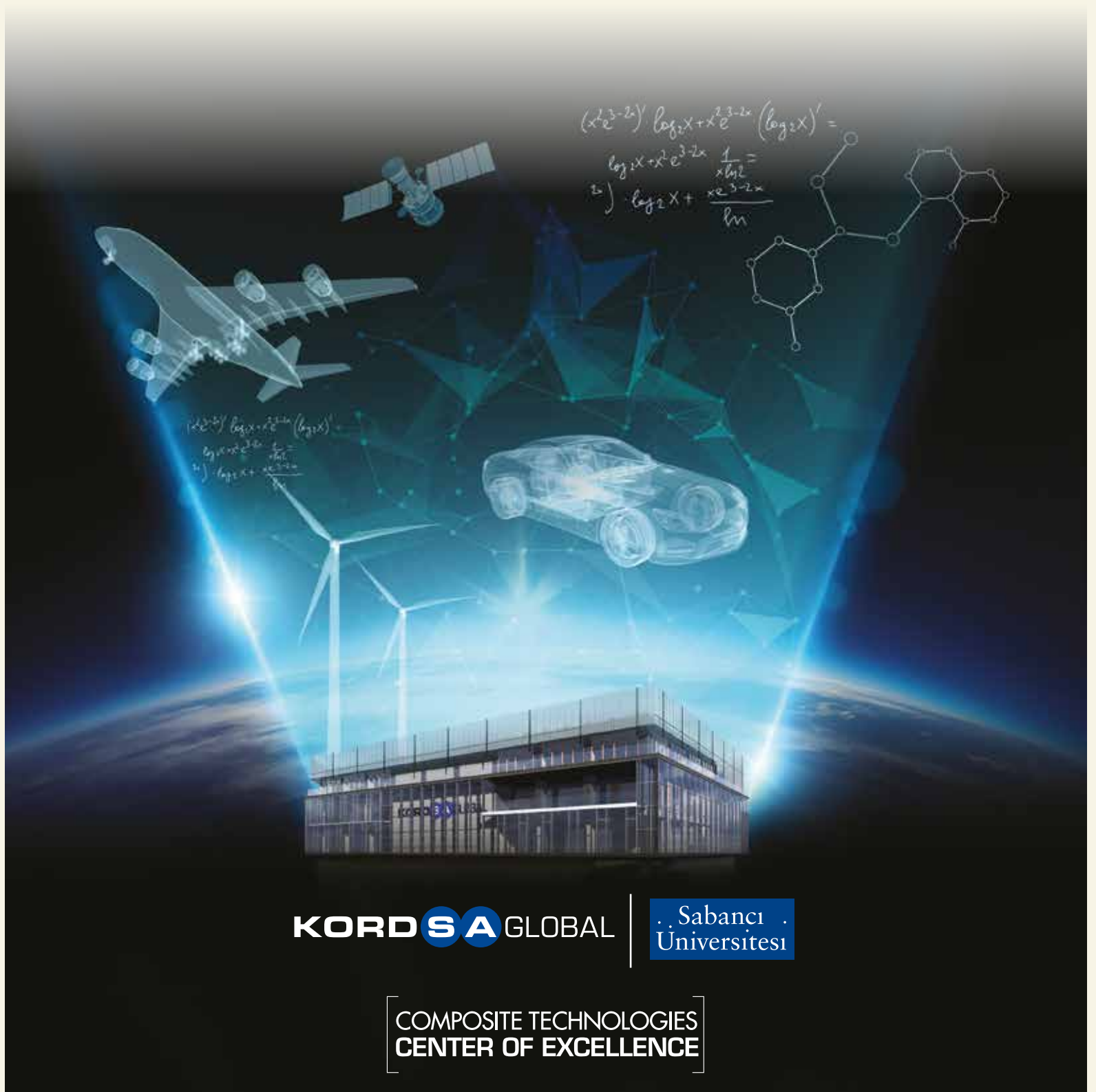
marine industry. Center represents the university-industry partnership model and will be home to industrial scale-research and technology development and production facility in the field of advanced composite materials, targeting products and methods with high technology readiness level for a wide range of application areas such as aerospace, automotive, sports & leisure, marine, wind and construction industries.

Recently built in 2016, **Composite Technologies Center of Excellence** aims to act as a bridge between university and industry to create groundbreaking leaps in the development of emerging science through innovative research and maturing them to a point where the industry can use it. Researchers, designers, engineers, managers and staff of the production process, PhD students, postdoctoral fellows, faculty members and entrepreneurs from incubators, i.e. all relevant players in this process co-exist in a dedicated 14,500 m² state-of-the-art building. The model brings different cultures (students, researchers, faculty members, entrepreneurs, engineers) together in the same ecosystem, allowing them to work in close cooperation, understanding their respective issues better, and creating better solutions more quickly by a common mind. They will share laboratories, work in the same environment, and run faster towards common goals – not in adjacent rooms but all together, at the same table, in the same lab. As being first in Turkey, the collaborative effort of Kordsa Global and Sabancı University will set an example for a novel and breakthrough university-industry ecosystem fueled by doing research, learning and producing together whereby the university becomes a greater part of the economy.

The center serves its stakeholders throughout the different stages of the production and R&D cycle considering their needs, starting with basic research, continuing with prototyping and ending in

production with the facilities including: Prepreg Production Lines, Composite Reinforcement R&D Center, Wet Chemistry Laboratory, Material Characterization Laboratory, Polymer Processing Laboratory, Micro Nano Manufacturing Laboratory, Advanced Composite Laboratory, Mechanical Characterization and Nondestructive Testing Laboratory, Clean Room and Autoclaves. The center provides the followings benefits to the composite industry: the production of engineered fiber reinforcement; an opportunity to stay at the forefront of technological development; reduce research and development costs; network and collaborate with other leading equipment manufacturers. Moreover, the center will guide SMEs towards more value added technological productions and applications through enabling them to access training and intense courses on composite technologies or manufacturing engineering MSc and PhD programs offered in the center.

One of the very important focuses of the center is to develop innovative and high-value added composite materials and processing technologies by integrating new generation advanced manufacturing technologies (i.e., the nano- and micro-technologies, additive and unconventional manufacturing technologies) into conventional composite manufacturing processes. Idea is to increase the functionality and the mechanical performance of composite materials and to develop innovatively integrated manufacturing technologies for composite materials. Considering the market share of composite materials and products in Turkey which is around €1.2 billion with an expected annual growth rate of 10%, the integration of nano-micro-technologies, additive manufacturing, among others into composite materials manufacturing will accelerate the growth rate of composite goods and products, thereby potentially leading to the creation of new market share.



"Baggage Lid is expected to have high cosmetic performance in terms of surface and visual quality, but at the same time is a moving part that is exposed to dynamic loads. Therefore, baggage lid should be strong and esthetical at the same time."





Strength of the Two: The Composite Component Bus Project

İBRAHİM ESERCE

Plant Director, Temsa Global

TEMSA Global's first encounter with composite materials dates back nearly 20 years, when composite (FRP) materials were first used for the interiors of buses and the front and rear panels of vehicles. Over the following 5-8 years, FRP parts in buses were replaced with ABS and polyurethane materials.

In terms of competitiveness, the topic of light and durable vehicles is a very crucial topic for all companies in the bus sector. A lighter vehicle means you can lower the fuel consumption, and offer more seats and a higher baggage capacity, thus making your mark on the sector and outstripping your competitors. Innovations and developments in this field resemble a race with no finish line; TEMSA Global has always taken part in this race, aiming to offer vehicles that are highly competitive and bring added value to the customer, through both their design as well as new material technologies.

As of December 2014, we have followed closely and with great interest the investments of Kordsa Global in the field of composite materials.

We met the Kordsa Global Composite Technologies team to discuss the activities, production, objectives and client expectations of our companies. As a result of this mutual sharing of information, we made a decision to create a joint project by bringing together the strategies and objectives of TEMSA Global and Kordsa Global.

Our teams prepared a report on our new Marathon vehicle, which we determined as the target vehicle for our project, regarding the possibilities in terms of converting metal to composite by evaluating parts with regard to weight, annual production numbers, costs and alternative production techniques. Composite materials were being

used in only a limited number of applications, such as bumpers, protective glass and fenders, and as a result of this report we established an objective to increase the use of composite parts in our vehicles. This was the beginning of "The Composite Component Bus Project".

The vehicle's "Baggage Lid" became our first project, and there were several reasons behind this choice. Baggage Lid is expected to have high cosmetic performance in terms of surface and visual quality, but at the same time is a moving part that is exposed to dynamic loads. Therefore, baggage lid should be strong and esthetical at the same time. For these reasons, our teams felt that producing a composite baggage lid would be a challenging and exciting target to reach. The objective in our "Baggage Lid" project was reducing the weight of the vehicle while also increasing durability, as well as reducing the risk of corrosion by replacing metal materials with composite.

Our design teams started by calculating the required endurance values (distortion and deflection solidities) through both computer aided engineering (CAE) as well as tests on the current door design, and we then based our lid design on to these values. At the same time, Kordsa Global developed a custom material for the baggage lid by working on resin and fiber compositions in line with our concept design. Composite materials release a certain amount of gas during use on the vehicle due to the solvent that they incorporate. Since the formula obtained during the selection of resins was solvent-free, the team has enabled the removal of these harmful gasses. As a result, our vehicles have become more environmentally friendly and more sensitive to human health. This has been a very important positive outcome of the project for both Temsa Global and Kordsa Global.

Material values were obtained by Kordsa Global through an analysis of the lid prepreg-material lamination, based on the requirements of the baggage lid. Prior to the lid production, these values were validated by the TEMSA Global CAE team in a computer environment using kinematic simulations. Over the course of the project, the CAE design teams gained competence in the analysis of composite materials. The door design entered the final stage with these values.

The prototype production was carried out according to the final door design with the support of a sub-contractor who was based at the firm. The ongoing prototype studies enabled the development of a local supplier who is able to carry out production with prepreg materials. Prototype production was carried out using

glass-fiber-based prepreg and glass-carbon-based prepreg. Users of composite materials often face problems caused by irregularities in the resin-fiber ratio of the part concerned. During the production phase of this prototype, the prepreg material was saturated with resin in advance, allowing full control of this aspect of the production process. This development brought TEMSA Global to a point that enabled the company to change its perspective on the use of composite materials.

Through tests (such as paint and adhesive tests) carried out on prepreg sheets and door samples obtained with Kordsa Global, we created material

libraries and material testing specifications for future projects.

The test stands for the produced baggage lids and road tests on the prototype vehicle continue to take place. In parallel with these tests, preparations for mass production have also commenced.

Finally, the crowning glory of our successful project with Kordsa Global was being awarded first place in the Synergy Category of the prestigious Sabancı Golden Collar Awards; we are all extremely proud of our achievements.



"Twixtra is the hybrid cord reinforcement solution to industry which is customizable in accordance with the needs of the customer. We observe tire maker's processes, to be able to have the necessary insight about exposed conditions of cord (tension and temperature memory) through calendaring, building and curing. "





Paradigm Shift in Asian Tire Makers

BURAK İLGÜN

Market Development, Manager /PCR

It is always better to review past events and experiences before idea generating about future of tire industry. When we take a look at the past decade, emerging tire makers in Asia penetrated to international markets either via greenfield investments or well establishing distribution network. They renovate their product portfolio by taking challenge of fast responding to industry trends. Many locally strong tire makers preferred to take position to protect their own market by utilizing their capacity effectively, therefore creating cost advantage for them versus Chinese competition.

Chinese tire makers were the first who lowered the prices and penetrated the market, again, they were the first who challenged the industry by their low priced high performance tires, run flat tires etc. Chinese tire makers were penetrating not only cost oriented 13"-14" rim sizes but also launching new products according to market trends and requirements. Many people had hard times realizing the paradigm shift created by Chinese tire industry and also giving a

response was not an easy task for the market considering the things that had happened in past 10 years.

Meanwhile, non-Chinese players in the market were searching for a way to compete with China. And obviously, "cost game" is not a right strategy to win, considering the Chinese competitive advantages. As it is easy to state that price reduction on any item will not bring sustainable growth, Asian tire makers started to focus on value added tires; instead of joining the price war.

Low Cost and UHP& RFT tires from China

Non-Chinese emerging tire makers are feeling squeezed due to imported "lower priced" and "differentiated tires.". As competing through lowering price is not an option for Non-Chinese players, a paradigm shift happened within the non-Chinese-emerging tire makers. Nowadays, all tire makers are focusing on "premium" tires with >17" rim sizes, Y speed rating and also run flat tires. Beyond that, many of them realized the importance of being an OE suppliers.

Since we are talking about tires, a complex composite product; it is obvious that it is not easy to replace or extend tire portfolio from day to night. In fact, high performance tires and niche applications are challenging the limits of current design, reinforcement, compound and production processes. The only way to implement change to the tires is proceeding "step by step" and proceeding "patiently" in order to affect the portfolio. One needs to observe the tire makers' process, in order to find the risk - free moment for change.

In this line of thinking, Kordsa offers Twixtra, the hybrid cord reinforcement solution, in order to enable tire makers produce ultra-high performance tires.

How it works?

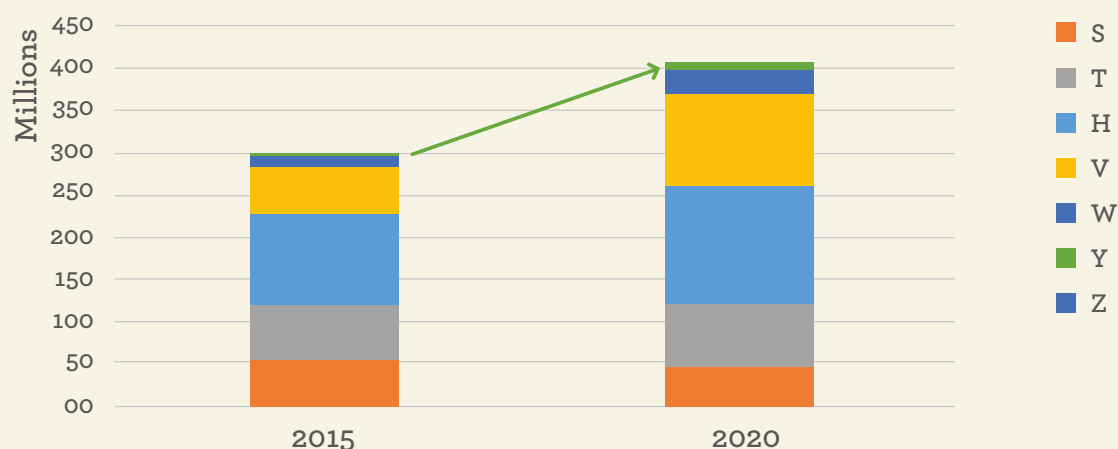
Twixtra is the hybrid cord reinforcement solution to industry which is customizable in accordance with the needs of the customer. We observe tire maker's processes, to be able to have the necessary insight about exposed conditions of cord (tension and temperature memory) through calendaring, building and curing. As a result of this observation process, final cord construction is developed by Twixtra team depending on tire speed rating and target market conditions; more importantly "in accordance with the specific customer needs."

Target application is mainly cap ply of UHP tires with Aramid and Nylon66 (AR/NY) hybrid cords. AR/NY hybrids cord properties are designed according to whole life cycle of the cords starting from calendaring to tire's drum tests. Not only cord design but also through implementation processes, team will jointly work with tire maker to ensure the performance of Twixtra.

Twixtra AR/NY hybrid cords deliver easy processing, high modulus during tire service. In return, production processes will be efficient, tire will have better uniformity, less flat spot and high speed endurance results.

Twixtra will enable the "paradigm shift" come true.

2015-2020 PCR Trend in China



“... development that meets the needs of the present without compromising the ability of future generations to meet their own needs.”





2015 SUSTAINABILITY PROJECTS

YOGA MARDIANSYAH

Global and İzmit SHE and Sustainability Manager

As a continuation of our 2014 Sustainability Report, our 2015 report is being prepared in line with GRI (Global Reporting Initiative) Guidelines and in compliance with the GRI G4 Core level, with the help of a multidisciplinary team.

As awareness of and the need for sustainable growth increases year on year, Kordsa would like to face this challenge with a positive attitude, as written in our Golden SHE Rules: "We believe that all occupational and environmental accidents can be prevented. Our target is to create a 100% accident-free and safe work environment and to produce 0% waste."

Three of our major sustainability directives, are from BORSA Istanbul, the BIST Sustainability Index and CDP, these three directives are consolidated and analyzed by the Global Sustainability Department: Economic Initiatives, Social Initiatives and Environmental Initiatives.

We will implement major changes through a sustainability strategy questionnaire, based on GRI Strategic Sustainability Index, conducted with the participation of the Kordsa Global Executive Leadership Team (ELT) and the Sustainability Task Force. New commitments regarding climate change, biodiversity and supply-chain management have been added to our sustainability goals. As we continue to increase the number of sites participating in the report, over the coming years environmental data on waste, energy and GHG calculation from all Kordsa Global sites will be included in the report.

Sites will, step by step, obtain Environmental Management System standards (ISO 14001), and we will achieve the sustainability goals aligned with our business model.

Promises are there to be kept, and so we fulfill our promise by achieving our 2014 sustainability targets and commitments.

Economic Initiatives

- In June 2016 we opened our Composite Technologies Center, in accordance with the sustainability plan.
- We have increased the amount of paper waste, nylon waste and wooden pallets recycled in 2015 compared to 2014.

Social Initiatives

- We have increased the number of employee training hours following the establishment of our Global Mentoring Program and through the use of the KEEP Online Training Platform.
- We continue to maintain our performance of ZERO cases of discrimination at all locations.
- We have continued to adopt and implement the principles of the Equality at Work Declaration.
- Machinery safety has been completed for Kordsa Turkey, while other sites continue to install the mechanical guarding step which is a barrier to protect worker from direct contact to hazardous machinery movement.
- 2015 saw the establishment of a Kordsa Safety Training Center based on TPM principles in Indo Kordsa, while a similar center was also established in Turkey in June 2016
- The Kordsa Chattanooga plant has achieved their second safety target with 800,000 injury-free working hours, while Thai Indo Kordsa hit the first target with 1,000,000 injury-free working hours.

Environmental Initiatives

- Kordsa Turkey water consumption has been reduced to 35,680m³ per year, thanks to improvements in the reverse osmosis project.
- We have ensured that all our emission rates are below the threshold limit allowed by the relevant national regulations.
- We have begun to calculate our CO₂ calculation for Kordsa Turkey, and plan to start 2015 calculations for Thailand Indo Kordsa and Indo Kordsa plants, followed by 2016 calculations for other sites.

Allow me to share with you a definition of sustainable growth from Brutland (1987):

"... development that meets the needs of the present without compromising the ability of future generations to meet their own needs."

These are unselfish, noble and ideal goals for a company, as it means we are fulfilling our duty to play a positive role, and to ensure the preservation of natural resources for future generations.

“We had two choices: greet him over the newspaper and say hello, or act as if we hadn’t seen him. Without much thought we chose the second option. It was clear that the situation we were in was not a normal one.”





A Negotiation Meeting with a Twist

BÜLENT ARASLI

Managing Director, Inter Kordsa

It was the 1990s... We were trying to deal with several challenging matters in a Middle Eastern country. Our customer, one of the largest tire manufacturers in the region, had invited us to discuss a series of technical and commercial subjects as well as possible new business opportunities. We took the first flight of the day, arriving early in the morning in the town where the customer's factory was located, about two hours from the capital city. I had the feeling that due to our busy schedule we would again not have much of an opportunity to wander around this city that is famous for its historical and natural beauties. We planned to return on the evening flight. As soon as we reached the factory the meeting started. By noon, and following some lively discussions, we had reached an agreement on the majority of the agenda items to the satisfaction of our customer and in line with our targets.

However, long discussions continued on one particular topic that had both technical and commercial aspects, and even before making this trip we knew that reaching an agreement on this critical subject might be difficult. Our Middle Eastern way of negotiations continued until late afternoon. The long day and complex discussion topics began to drain the energy of the purchasing manager with whom we had been negotiating since early morning. Our arguments were accepted one by one. Before official working hours were over, the moment we had been waiting for arrived... We came to a fair agreement, as we had planned. Both parties were happy. As people of a shared culture, we shook hands and embraced each other to celebrate the fruitful result.

As usual, we also agreed in writing and what we had discussed and agreed. We quickly drew up the minutes of the meeting – a one-page, hand-written document. The purchasing manager offered to make photocopies of the minutes before we all signed them, and he left the meeting room to make copies. We drank our last cups of tea. It was time to go to the airport. Although some 15-20 minutes had passed, there was still no sign of the purchasing manager. We decided to leave the meeting room to look for him. The building was almost silent. The working day was already over, only a few employees were left and they were getting ready to leave the office, too. Hoping one of them might have seen the purchasing manager, we approached an employee and, with a certain anxiety, asked him whether he had seen him or not. The answer came as a shock... The purchasing manager had already left the office. This was hard to believe. To be certain, we asked the same question to another person. We waited in the office for some time, just in case. Nothing changed.

It was an unbelievable situation and there was nothing we could do. We rushed to the airport and luckily we caught our plane. While we were looking for some free space in the overhead lockers for our hand luggage, a passenger in one of the back rows of the plane, who was trying to hide his face with a newspaper, caught our attention. The purchasing manager was sitting about 10 rows behind us. We had two choices: greet him over the newspaper and say hello, or act as if we hadn't seen him. Without much thought we chose the second option. It was clear that the situation we were in was not a normal one.

After a few days, and with the help of our representative, we learned the background of the story. After leaving the meeting room, the purchasing manager hadn't felt comfortable with the content of the agreement and decided to fax a copy to his boss in the company headquarters in the capital city. After seeing the agreement, his boss (a well-known personality in the industry for his hot temper) was furious and told him to find a way to correct it immediately. The purchasing manager, however, could find no other way to follow his boss's instructions than to simply disappear.

After a while, we set up another meeting. This time the purchasing manager's boss also joined us and we ended up negotiating exactly the same agreement as before.



Esthetically **Strong** | Technologically **Advanced**
COMPOSITE TECHNOLOGIES

We globally reinforce tire, composite and construction technologies.
As Innovation and R&D Champion of Turkey, we work for a sustainable future and direct our future with our technology leadership.

KORD  **GLOBAL** | THE REINFORCER

