

# 2017 Activities Report



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STRENGTH. SUPPORT. SOLUTIONS.





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## Executive Letter

Dear customers, colleagues and friends,

2017 proved to be another interesting year for the METYX team. We faced some new challenges and quickly learnt how to adapt and manage significant changes within the company as we continue to strengthen and grow our business to remain in good shape for the future.

### Further Expansion of Manisa

After successfully acquiring adjacent land and buildings in 2016 which almost doubled the available space for production and warehousing on the Manisa site to a total of 23,000 sqm, a second adjacent site was acquired during 2017. This latest land purchase has provided an additional 4,500 sqm of open space, taking the Manisa site to a total of 27,500 sqm. There is now sufficient space to double again the current production capacity and to install additional warehousing for raw materials, finished goods and logistics as needed to remain aligned with demands.

In 2017 the existing building on the Manisa site was also extended, adding 1,700 sqm of factory space in which a brand new 'state-of-the-art' direct warper line has been installed, able to produce homogeneous tension stitch yarns for glass and carbon technical fabrics used in the most demanding applications, along with a new powder coating line for manufacturing preformable fabrics.

We will continue to work closely with existing and new customers, especially the wind turbine blade manufacturers in the local Aegean region, to ensure that quality products and a high level of supply chain customer service continue to be provided.

### Hungary Facility Upgrade

In 2017 METYX Composites made further major investments in its Hungarian production facilities in Kaposvar. In the latter part of the year, construction work started to build a new, purpose built 5,000 sqm warehouse and logistics centre, which will have 3,000 sqm of enclosed warehouse space including covered loading areas, along with 2,000 sqm of open storage space. A larger, more efficient warehousing and logistics operation is vital to ensure that METYX Hungary can meet growing demand and further improve service levels, especially for EU customers.

### An International METYX Family

2017 was also a year of international expansion and major changes within our business. To help ensure the success of future growth plans more globally, METYX Composites is delighted to have secured the services of external consultants Marc Schrief, Dr. Christian Kissinger and Andy Williams, who have joined the METYX team as Advisory Board Members. Each is a renowned industry professional with many years of experience. Their diverse backgrounds, skills, knowledge and expertise will be of great benefit to support the continued strategic growth of METYX to better serve our growing customer base around the world.

### We Care

In addition to our business activities, we also make time to support students and the local communities where we live and work, to give something back and especially to help develop young people. A significant proportion of our annual donations go towards sponsoring university engineering projects, which we believe will make a positive difference for the future of the composite industry.

For many years METYX has supported young, local swimmers through the Manisa Water Sports Club. In 2017 we also started supporting aspiring young sportsmen and women in Kaposvar, Hungary, which included sponsoring a local youth football tournament.

We care and are committed to continue to provide this support in the coming years.

### Going Forward Together

As always, we are driven by the needs and demands of you, our customers. As a team, we constantly strive to support your businesses to the best of our abilities, delivering exceptional results that improve the quality and efficiency of your manufacturing activities.

We thank you, our valued partners, for your loyalty and support in 2017 and look forward to working together in 2018.



**Uğur Üstünel**  
Managing Partner  
METYX Composites



**Tunç Şerif Üstünel**  
Managing Partner  
METYX Composites





METYX Composites headquarters, Kozyatağı

## METYX Composites Moved to New Headquarters

METYX Composites relocated its headquarters team in 2017 to new more central offices in Kozyatağı which is in the heart of Istanbul. Since 2003, when METYX Composites first started, the headquarters had been located with the parent company Telateks A.S. at the Group headquarters and factories in the Tuzla industrial area, over 35 minutes by car south of Istanbul. Telateks A.S. was originally established in Levent by Erol Üstünel in 1978, before moving to Tuzla in the 1990s.

The move to new headquarters office space was needed to accommodate both the existing and future numbers of people in sales, purchasing, finance, accounting and management departments, which have all grown as the METYX Composites business has rapidly expanded from one to three factories, adding new technical textile products and added value services. The METYX Group has corporate ambitions to double the business by 2025 and now there is sufficient space for the additional head office staff that will be needed in the foreseeable future as the business continues to expand globally.

Ugur Üstünel, Co-Director, METYX Composites stated; "This move to our own headquarters marks an important milestone in our company's history and signals our commitment to future investment and growth objectives." The more central office location, close to the city's public transport networks, is much more convenient, being closer and so quicker to get to for staff, as well as visiting suppliers and customers who come to Istanbul.

To better serve its customers and suppliers, as part of the upgrading of the METYX Composites HQ operations, the new offices have the latest telecommunications using the same phone and fax numbers as before, along with new integrated IT hardware and software which uses secure 'Cloud' based systems which can rapidly process and back up data for the business. ■

"This move to our own headquarters marks an important milestone in our company's history and signals our commitment to future investment and growth objectives."



## Factory Expansion in Manisa Continues

METYX Composites acquired land and buildings adjacent to the existing factory in the Manisa Industrial Zone in 2016 which doubled the space for production and warehousing to 23,000 sqm. To support expected future demand and business growth, in 2017 an additional 4,500 sqm of adjacent land was acquired, which combined has taken the Manisa site to a total of 27,500 sqm.

The expanded factory site has provided METYX with sufficient extra space to double the existing weaving capacity at Manisa for glass and carbon fibre multiaxial fabrics, as well as to further grow the existing composite tool making facilities and increase the kitting service capacity. From both Manisa and the Kaposvár, Hungary factory a full kitting service is provided, supplying customers with 'make to order' kits for cores, glass and carbon fibre reinforcements, supplied not only for wind energy, but also for marine, automotive, and other industrial applications.

Along with this latest site expansion investment, in 2017 the existing building on the Manisa site was also extended, adding 1,700 sq. m of factory space in which a brand new 'state-of-the-art' direct warper line has been installed, able to produce homogeneous tension stitch yarns for glass and carbon technical fabrics used in the most demanding applications, along with a new powder coating line for manufacturing preformable fabrics.

Additional new warehousing facilities for both raw materials and finished goods are also being constructed at Manisa to further improve stockholding and distribution services from this main production site, which not only serves customers. ■





## New METYX Team Members

We are delighted to welcome five new members to the METYX Composites team. Each is a renowned industry professional with many years of experience. Their diverse backgrounds, skills, knowledge and expertise will be of great benefit to support the continued strategic growth of METYX to better serve our customers across the globe.

### New Advisory Board Members



#### Marc Schrief

Immediately after his studies Marc Schrief joined J. H. Ziegler, a subsidiary of the Paul Hartman Group, as Sales Manager for Northern Europe. For one year his focus was to open up the market for nonwovens in the automotive and furniture industries of Northern Europe.

In 1998 Marc joined the SAERTEX Group, Saerbeck, Germany, then a small privately owned Company, venturing into the advanced technical textiles business. In his 18 years he was responsible and significantly shaped the organizations development – from a regional family-owned company into a global player. Under Marc's continued leadership the SAERTEX Group took on major initiatives and with its transformation he was promoted and appointed to a Board member as the Global Sales & Marketing Director in 2004 with additional responsibilities including not only the strategic marketing efforts but also establishing the company's manufacturing presence across the globe.

In 2017 he founded SMACK to expand and grow a strong composite network by bringing the story of composites to the end user by connecting people, companies and solutions and sharing their knowledge.



#### Dr. Christian Kissinger

Dr. Christian Kissinger is a business leader with over 20 years' experience in operational management in a global environment from start-up to full production. He combines technical and manufacturing experience with an understanding of the cultural challenges of running a multinational organisation.

After working as a R&D project engineer at the Institute for Composite Materials (IVW) in Germany, he was appointed General Manager in 2001 for SAERTEX USA LLC, and established a new factory for producing multiaxial fabrics in Huntersville, North Carolina (NC). In 2008, Dr. Kissinger became Managing Director for SAERTEX USA. He set up and managed the opening of SAERTEX Brazil at the end of 2013, with a fully operational new multiaxial and special fabrics factory near São Paulo.

After 15 years with SAERTEX, Dr. Kissinger moved to Owens Corning as Director - New Ventures, a role focused on building start up incubators for innovative new business ventures to deliver composites solutions.

Today, Dr. Christian Kissinger is Founder & CEO of KISS LLC, a business he established in 2017 in Charlotte, NC and is now working closely with the METYX team to help drive strategic growth and deliver technical solutions in numerous projects on a global scale.



#### Andy Williams

Andy Williams has more than 25 years' technical and production development experience in coatings, recycling and composite materials. He began his career in 1988 as technical Manager for, a UK manufacturer of surface coating systems. In 1997 Andy changed Industry and moved to a privately owned UK waste recycling company, as General Manager; responsible for the day to day business operations of collection and recycling of industrial, commercial, and construction waste materials.

In 2000 Andy moved to the composites industry, starting in Production Development at Vestas Wind Systems Denmark, followed by a move to JSB Group, a Danish specialist in composite core material kits where he worked for 15 years in various international roles.

Andy started as Business Development Manager, primarily focusing on growing business with wind turbine blade manufacturers. He had key roles in the establishment and operation of production facilities in North America and Asia, with several years based in China as Managing Director, and Group Management roles as VP Global Supply Chain and Chief Technical Officer.

In 2017 Andy accepted a new role on the METYX Advisory Board and is now working with the new METYX consultancy team.

### New Advisory Consultancy Team



#### Evren Aykol

Evren Aykol is currently also based in Charlotte, NC, working as a Consultant to help with the startup of new METYX Business Operations in North America. Evren joined METYX in 2017 after spending 10 years working in Sales & Marketing, Country Sales Manager and Key Account Manager commercial roles with organisations in the composite industry focused on Renewable Energy.

Evren is a graduate of The University of Marmara in Istanbul, Turkey, where he received a BA in Business Administration. He has 18 years of international business experience gained in commercial roles in Turkey, Austria and the USA.

As well as helping to establish the new METYX operations in the USA, Evren will use his extensive commercial expertise and knowledge of the composite market to support METYX customers in North America.



#### Stefan Kanburoglu

Stefan Kanburoglu has been working in the machinery and textile business for more than 30 years. He lives in the USA but is originally from Switzerland. He started in 1980 with the weaving machine manufacturer Sulzer-Rüti, where he did his apprenticeship and worked as a Global Field Technician. In 1989 Stefan moved to American Dornier, another weaving machine manufacturer, where he spent nine years, first as a Field Technician before being promoted to Assistant Service Manager (North & South America). Then, in 1998 he moved to become Project Manager for Victor Innovatex Inc., a Canadian upholstery weaving company, and after only a year with them was given the opportunity to join the US scrim and composite fabric manufacturing company Textum Inc., based in North Carolina (NC), where he spent six years, with responsibility for all weaving production line operations, maintenance and repair. In 2005 he then joined Saertex USA in NC, where he worked for 10 years, first as Technical Manager and then as Special Projects Manager.

Since 2016 Stefan has been working as an independent consultant for Woven and Non Crimped Fabrics. He specializes in solving technical textile problems, developing new machinery and equipment, installing and relocating weaving lines and textile production equipment, and runs in-house training programs. Stefan is currently part of the technical consultancy team supporting the METYX Group globally.

### New Composites Team Appointments



#### Dr. Balazs Zsigmond

Dr. Balázs Zsigmond joined the METYX Composites technical team in 2017 as the Carbon Fabrics Specialist, based at the METYX Hungary production facilities in Kaposvár.

Dr. Zsigmond has a distinguished academic record. In 2002 he obtained an MSc in Mechanical Engineering from The Budapest University of Technology and Economics, going on to graduate from Miklós Zrínyi National Defense University with a BSc. degree in Radiation Protection. In 2005 he completed his PhD in Mechanical Engineering (Material Science), also gained from The Budapest University of Technology and Economics. His career started in 2002 while he was still a PhD student, which included working as an assistant in BUTE, Budapest University of Technology and Economics.

After completing his PhD, Dr. Zsigmond spent 12 months working as an independent researcher at the NASA Glenn Research Center in the USA, returning to Hungary at the end of 2006. He joined Zoltek in early 2007, initially as Head of Composite Development, then becoming R&D Director, Europe. He was appointed as Head of Global Technical Support Services for the Zoltak Group, then going on to become Head of Materials and Process Development in Zoltek's Hungarian and US facilities which he ran until the end of 2011.

He moved to Russia as Head of Product Development Engineering - Textile Structures and Technical Support. Then he returned to Hungary in 2016 and joined SKY Advanced Materials Ltd., where he was Technical & Quality Manager until he joined METYX in 2017. ■





## Naturally Green New Fibre Products

While high performance reinforcement fibres, such as glass and carbon, provide critical end use engineering solutions, there are many applications where more sustainable bio based composite options, such as natural fibre reinforcements are possible to use. Sustainable products are desirable for manufacturing companies, to enable them to responsibly address global environmental problems, responding to both social desires to be 'greener' and meet environmental legislation regarding emissions, fuel consumption and recycling.

The availability of natural fibre products with the required technical performance for some composite applications is now significantly better than in the past. Many alternatives are now commercially sold, such as flax, jute and hemp, both short and continuous natural fibres. In certain applications, when compared with the performance of glass and carbon fibres [see Table 1.] sufficient part strength and stiffness is achieved with the added end use application benefit of the composite part being significantly lighter due to natural fibre products being much lower density materials; around 40% lower density compared to E-glass fibres and 15% lower

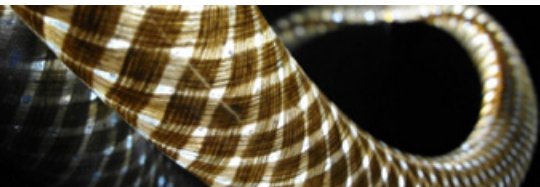
than carbon fibres. Natural fibres also provide additional application benefits, such as vibration and sound damping properties.

### Natural Fibre Applications

Successful bio-based composite applications are now globally established in the industry, with OEMs now using natural fibre preforms made from woven, non-crimped fabric, or non-woven fabric reinforcements. For some applications, bioresins are also used by producers in combination with natural fibres to further enhance the sustainability level of a finished composite component.

Examples of applications using natural fibre products include: lightweight automotive interior parts in door panels, seat backs, dashboards and trunk liners; sporting goods such as tennis rackets, bicycle frames and snowboards; building applications such as for interior acoustic panels and flooring, exterior garden decking and fencing; household consumer goods such as hi-fi speakers, laptop cases and modern furniture.

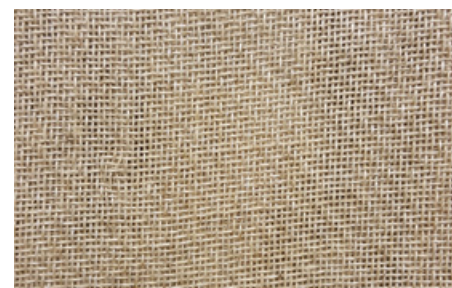
Product Images Made With Natural Fibres



Flax NCF non-crimp



Flax Uni-directional



Flax Woven

Table 1\*: Comparison of reinforcement fibres

Property	Carbon	E-glass	Flax	Hemp
Density, g/cm <sup>3</sup>	1.8	2.6	1.5-1.6	1.5-1.6
Stiffness, GPa	800	70	50-70	30-60
Strength, MPa	2.500	3.500	500-900	300-800

\*Source: JEC Composites. Technical Book Flax and Hemp fibres: a natural solution for the composite industry

### Technical Study-Lightweight flax fibre wind turbine blades

A number of technical studies have been carried out on the suitability of natural fibres for manufacturing lightweight wind turbine blades. In one study on flax fibres, the test data [see Table 2.] showed that while unidirectional E-glass composites have significantly better mechanical properties than unidirectional flax composites, the specific tensile stiffness of the composites and the effective tensile stiffness of the two fibres are

comparable; specific properties are properties that have been divided by the material density, so provides a stiffness to weight ratio performance indicator. Table 2 represents experimental values from a small wind turbine blade case study carried out which compared glass and flax fibres with a polyester matrix.

Table 2\*: Tensile and fatigue properties of unidirectional flax/polyester and E-glass/polyester composites.

	Property	Units	Flax	E-glass	Flax/E-glass
Physical	Fibre volume fraction	%	30.9	42.8	
	Density	g cm-3	1.31	1.79	0.732
Tensile	Composite stiffness	GPa	23.4	36.9	0.634
	Composite specific stiffness	GPa/g cm-3	17.9	20.6	0.869
	Effective fibre stiffness	GPa	67.6	81.6	0.828
	Composite strength	MPa	277	826	0.335
	Composite specific strength	MPa/g cm-3	213	461	0.462
	Effective fibre strength	MPa	883	1920	0.460
Physical	Fibre volume fraction	%	26.9	30.0	0.897
	Density	g cm-3	1.29	1.64	0.787
Fatigue (R=0.1)	Single cycle strength	MPa	236	567	0.416
	Fatigue strength at 10 <sup>6</sup> cycles	MPa	115	204	0.564

\*Source: Composites Part B: Engineering Volume 52, September 2013, Pages 172-181; Can flax replace E-glass in structural composites? A small wind turbine blade case study.

### New METYX Natural Fibre Textiles

In 2017 METYX created a new Environmental Products Group to develop new technical textile products based on natural fibres. The combined objective is to expand our product range to offer more eco-friendly material options, enabling both METYX and our customers to be more sustainable businesses and to help meet existing or future environmental regulations.

Following extensive R&D project work METYX has now developed a new range of natural fibre textile products for both thermoset and thermoplastic applications based on flax (linen) fibres; flax was chosen being the natural

fibre option with the highest mechanical strength, which is also easy to machine and a readily available raw material. While natural fibres can be processed using conventional infusion or RTM methods with a thermoset resin, to provide a totally recyclable moulded composite part, the new range of METYX natural fibre technical fabrics includes grades which have a thermoplastic resin polymer matrix, designed for hot compression moulding. Like our glass and carbon fibre ranges, the new natural fibre range includes non-crimp fabric, unidirectional (non-woven) and non-woven fabric product options.

### Custom Made Sustainable Products

In addition to standard unidirectional and multiaxial non-crimp natural fibre fabrics, METYX Composites can now also produce products in different forms in line with the specific needs, custom made to order. Our custom

manufacturing offering has now been expanded to include sustainable bio-composites, not only natural fibre textile materials, but now also alternative production methods and matrix materials, as required by a customer. ■

Flax nonwoven impregnated with acrylic resin







## A Growing global distributor network

We extended our global distributor network in early 2017, appointing GRP Solutions Ltd. as the exclusive distributor in Great Britain (GB) for METYX Composites high performance technical fabrics. This new distributor agreement has significantly improved the access, supply chain service and local technical support provided for composites moulders in England, Wales and Scotland.

GRP Solutions Ltd. stocks and provides technical support for the full range of METYCORE and METYCORE MAX RTM glass reinforcement fabrics, along with other products from the METYX Composites range including E-glass, carbon fibre and hybrid multiaxial and woven fabric reinforcements,

and non-woven surface veils. GB customers now also benefit from access to the added value core and fabric kitting and tool making services also offered by METYX Composites.

Dave Bancroft, Sales Director for GRP Solutions Ltd. commented about the appointment and the company, saying: "We have a lot of experience in closed moulding, particularly RTM, also providing solutions and selling a range of infusion resins, catalysts, processing and release agents, as well as cores and fabric reinforcements. The METYCORE RTM reinforcements range, along with the other excellent, high performance technical fabrics available from METYX Composites, fits perfectly with customer needs, enabling us

to deliver a total solutions package. Everyone in the GRP Solutions team is very excited to now be working with METYX Composites, which is known as a high quality reinforcement fabrics supplier which provides customers with innovative, added value moulding solutions."

GRP Solutions Ltd has a highly experienced team of dedicated people, who work with world class composite suppliers to deliver a world class service to customers. As a result, it has grown rapidly throughout the UK across all market sectors.

METYX Composites products are now distributed in more than 30 countries. Our expanded global network of independent distributor partners includes: ■



JEC EUROPE 2017

## Trade Show Activities 2017

METYX Composites exhibited at the following trade shows during 2017.

- |  |  |
|--|--|
| <p><b>JEC EUROPE 2017</b><br/>(Paris, France)<br/>March 14 - 16</p> <p><b>COMPOSITE EUROPE 2017</b><br/>(Messe Stuttgart, Germany)<br/>September 19 - 21</p> <p><b>IZMIR WIND SYMPOSIUM 2017</b><br/>(Izmir, Turkey)<br/>September 28 - 30</p> <p><b>TURK COMPOSITES 2017</b><br/>(Istanbul, Turkey)<br/>October 5 - 7</p> | <p><b>COMPOSITES MEETINGS 2017</b><br/>(Nantes, France)<br/>November 8 - 9</p> <p><b>METS 2017</b><br/>(Amsterdam, Netherlands)<br/>November 14 - 16</p> <p><b>CAMX 2017</b><br/>(Orlando, Florida, USA)<br/>December 12-14</p> <p><b>WIND TURBINE BLADE MANUFACTURE 2017</b><br/>(Düsseldorf, Germany)<br/>December 12 - 14</p> |
|--|--|

COMPOSITES EUROPE 2017



WIND TURBINE BLADE MANUFACTURE 2017



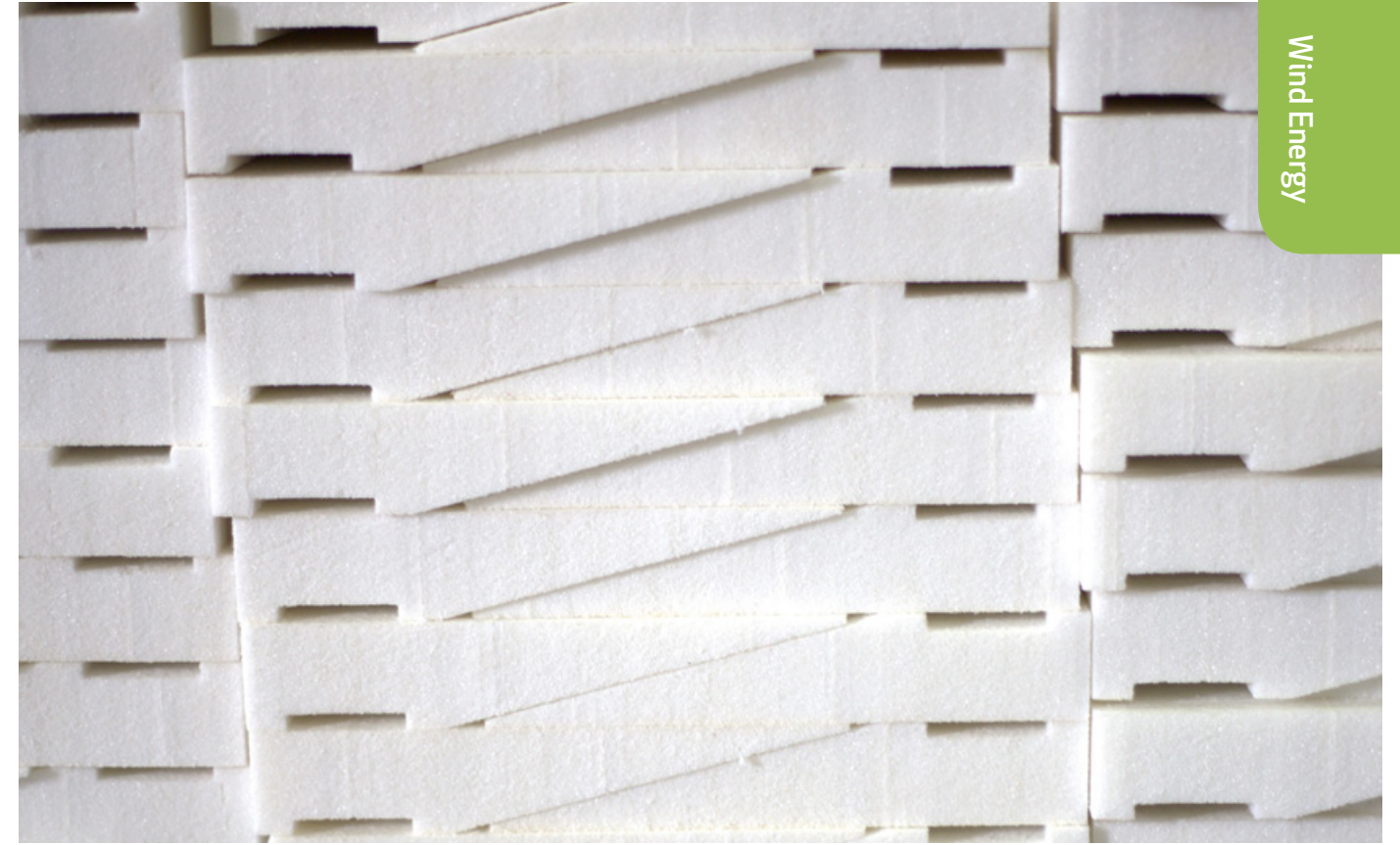
CAMX 2017



### Planned events for 2018

- |  |   |
|--|---|
| <p><b>JEC EUROPE 2018</b><br/>(Paris, France)<br/>March 6-8</p> <p><b>EUROASIA AIRSHOW 2018</b><br/>(Antalya, Turkey)<br/>April 25 - 29</p> <p><b>CAMX 2018</b><br/>(Dallas, Texas, USA)<br/>October 16 - 18</p> | <p><b>COMPOSITES EUROPE 2018</b><br/>(Stuttgart, Germany)<br/>November 6 - 8</p> <p><b>METS 2018</b><br/>(Amsterdam, Netherlands)<br/>November 13 - 15</p> <p><b>WIND TURBINE BLADE MANUFACTURE 2018</b><br/>(Düsseldorf, Germany)<br/>December 10 - 12</p> |
|--|---|





## Investing with a growing wind energy industry

METYX Composites has rapidly grown to become a well established, market leading supplier to the wind energy market, providing products and cost effective solutions for major OEM producers of composite blades for wind turbines.

To meet growing customer demand globally, METYX Composites has continued to expand its production facilities and extended the range of products and services offered, with a special focus on the needs of the growing wind energy industry in Turkey, across Europe and beyond.

In recent years, METYX Composites has developed new glass and carbon fibre reinforcements that are specifically designed for the manufacturing of wind turbine parts. The extension of production facilities at our factories in both Turkey and Hungary were mainly in response to the continued strong growth of the wind turbine industry to remain aligned with customer demands, to ensure that quality products and a high level of supply chain customer service continue to be provided.

High quality, E-glass, H-glass, carbon fibre standard and custom made multiaxial technical fabrics are manufactured by METYX Composites on dedicated production lines for weaving both glass and carbon fibre multiaxial fabrics in Turkey and Hungary.

The extensive range of products and services provided to wind energy customers includes:

- E-glass, H-glass and carbon fibre based UD, biaxial and triaxial multiaxial fabrics - both standard and custom fabrics.
- Kitting services for fabrics, cores (PVC, PET, PU, SAN, Balsa) and vacuum consumables (peel plies, breather fabric and flow mesh).
- Composite tooling design and fabrication (plugs and moulds).
- Engineering and production processing technical support.
- Prototyping and GL laboratory testing services.
- Bought-in products from approved suppliers of: continuous filament mats (CFM); vacuum leak detectors; vacuum bagging consumables; core materials; mold release agents and surface veils; adhesives; resins and gel coats; hardeners; sheet wax products.

### MEETING LONGER & LIGHTER WIND BLADE DESIGN NEEDS

To achieve the lightweight, high strength design needed for modern wind blades, many laminate designs now typically use a combination of cores, unidirectional (UD) and multiaxial fabrics, and UD tapes, with a growing trend for larger

blades towards the use of Automated Tape Layup (ATL) and Automated Fibre Placement (AFP) to reduce labour and improve quality. UD carbon fibre tapes and fabrics have been added to the METYX range to meet a growing demand, especially from OEMs looking to design and manufacture larger rotor blades over 60 metres long.

## The two METYX kitting centres also provide custom kits for key core materials including balsa wood and PET, SAN and PVC sandwich foams.

### KITTING SERVICE FOR CORES, FABRICS & VACUUM CONSUMABLES

A customized kit cutting service using 'state-of-the-art' 5-axis CNC processing centres is offered from both Turkey and Hungary for a wide range of cores, fabrics and vacuum consumables. The supply of kits has grown into a major added value service provided by

METYX Composites to many of its wind energy customers.

Both kitting centres are able to accurately cut the full range of multiaxial, RTM and woven technical fabric reinforcements manufactured from carbon, e-glass, aramid fibres, and hybrid fibre combination fabrics, as well as supplying kits with vacuum consumables such as: peel ply, flow mesh film, and breather fabrics.

For higher volume needs, the largest CNC fabric cutting machines are capable of handling fabric widths up to 350 centimetres (138 inches) in a very cost effective way, being one of the biggest fabric cutting machines currently operating in the industry, which minimizes off cut scrap and reduces material costs.

The two METYX kitting centres also provide custom kits for key core materials including balsa wood and PET, SAN and PVC sandwich foams. Core material finishing options or finish combinations as required include: grooved, perforated, scrim fabric applied, and single or double contoured.

### PLUG AND MOULD TOOLING SOLUTIONS

METYX also provides cost effective tooling solutions from the dedicated Tooling Business Unit at the Manisa factory in Turkey, which designs and manufactures custom made composite tooling cost effectively, which consistently produces high quality composite parts with a high level of confidence.

Our expert and highly experienced engineering and production team offers customers a complete 'end to end' composite tooling design and fabrication service for both master plugs (patterns) and fibreglass mould tools; single and multi-split FRP moulds are produced for hand lay, spray up, RTM, and infusion processes. Design engineering support includes 3D surface mapping and CAD-CAM.

Back in 2015, in response to several major wind sector customer inquiries at the time to provide heated tooling for moulding larger epoxy glassfibre rotor blades, METYX Composites set up an in-house engineering project team, which successfully developed the technical and manufacturing capabilities to produce heated epoxy tooling, available to tooling customers as an option on request.

The METYX Tooling Business Unit is able to cost effectively provide customers with a complete composite tooling solution from concept to delivery. ■







Courtesy photo of Northel



## First All Turkish MW wind turbine OEM supplied locally

Founded in 1993, Northel Elektromekanik A.Ş., based in Tuzla, İstanbul designs and manufactures a range of finished products for the defence industry, electrical power and renewable energy systems, including wind turbines. In 2017 Northel became the first Turkish large scale Megawatt (MW) wind turbine OEM, gaining TS EN 61400-1 and TS EN 61400-22 international certification for its POYRA P36/300 0.3 MW (300kW) wind turbine which, in terms of design, technology and raw materials, all of the 2500 parts used to construct the MW wind turbine are 100 percent Turkish.

The move into the wind energy sector by Northel started in 2003. The first R&D projects were focused on designing and producing a small scale wind turbine to supply 'off grid' wind energy power generator for companies and dwellings in Turkey. Northel succeeded in developing a commercial 3kW wind turbine generator; the first was installed in Söke, in the Aegean region of western Turkey, with Northel going on to complete more than 100 installation projects nationally.

Encouraged by this success and the wind technology knowledge gained, when regulation changes in 2005 occurred to allow them to design and build much larger scale wind turbines, Northel decided to develop 75kW and 100 kW generators. It was at this point that Northel and METYX Composites first met and subsequently started what has become a long standing partnership. This first meeting was recalled by Ahmet Cem Yalçın, the founder of Northel, saying: "Northel and METYX's paths crossed very soon after we decided to build large wind turbines. At such a critical point, a design and production company needs reliable and knowledgeable raw material suppliers and we found this with METYX from the start, which continues today." Yalçın also remarked that: "The METYX staff in the Manisa facility shared their extensive composites production know-how with us and supported us with our first applications. It has been beneficial to have all the glass fabrics, core materials and vacuum consumables needed for the production of blade and nacelle parts supplied locally from Manisa."

Tunç Şerif Üstünel, one of the managing partners of METYX, commented: "We are

very proud to serve this local, long established and highly successful company, which is now looking to grow and establish Northel as a global brand in the wind industry. METYX is investing to support Northel and other wind energy customers to achieve their future business goals."

Today, Northel produces two large scale MW wind turbine options: POYRA P36/300 a 0.3 MW (300kW) wind generator with 30m diameter epoxy-glassfibre rotor blades; ORSA DS75/1200, a 1.2 MW (1,200kW) turbine with 75m diameter epoxy-glassfibre rotor blades. Currently under development is a new 2.6MW (2,600kW) wind turbine generator, due to be launched in 2019. ■



Courtesy photo of Numarine

## An exceptional experience with Numarine 32XP

Numarine offers owners a world full of experiences to share in style

Numarine designs and builds high performance luxury motor yachts from 19 m (62ft) to 32.5 m (107 ft) at its purpose built 35,000 sq. metre shipyard in Kocaeli, Turkey. Its design team looks to blend style, space and interior designer luxury with latest materials weight saving technologies to deliver performance, economy and range requirements.

Numarine achieves this by extensively using vacuum infusion for moulding GRP parts, and regards the use of composite materials as an ideal way of minimizing vessel weight inside and out. This approach was applied to the new design used for the 32XP.

Launched in June 2017, the 32.5 m (107ft) Numarine 32XP luxury motor yacht has been described as "an exceptional blend of size and capability". The all-new design of the 32XP, with its 8.0 m (26ft) beam provides very generous onboard internal living spaces across four decks, with sleeping accommodation for eight guests in extreme comfort. The combination of a steel hull construction with a GRP superstructure and interior parts, allows Numarine to offer owners

the flexibility to create a personalized internal layout to suit individual needs and preferences and to customize the external spaces on the upper and sun decks.

All of the GRP structural areas of this beautiful super yacht were built using the vacuum infusion process, which is where METYX steps in. Having been a supplier of Numarine for over a decade,

METYX provides all of the vitally important manufacturing elements needed for the infusion process, such as glass and carbon multiaxial reinforcements, vacuum consumables, structural adhesives as well as the PVC core material from its Manisa facility.

Mr. Bahattin Şendogan, METYX Sales and Marketing Group Manager stated: "Our team at METYX Composites handles all Numarine's material needs for each production schedule with great care in terms of reinforcement and PVC core supply and customer service. Manufacturing of the 32XP super yacht is still going at full speed, with a strong order book, and METYX is very pleased to be an approved supply partner." ■



32 XP at Bosphorus





Courtesy photo of Bilgin Yachts

## ELADA (BILGIN 147) - Superyacht perfectionism made real

"Bilgin" in Turkish means "knowhow" and for over 100 years and five family generations, Bilgin Yachts has established and maintained a respected reputation as master craftsmen in leisure boat building. Today, Bilgin Yachts operates four shipyards covering almost 40,000 sq. metres, located in the greater Istanbul area. In more recent years, the company has attracted international attention with its fibreglass superyachts, now rated in the upper echelons of motor yacht builders globally.

Elada is one of the most futuristic looking of Bilgin's superyachts, designed by the acclaimed H2 Yacht Design Studio. It has a reversed-bow design and striking light-blue sections of the exterior upper decks in the transom sun deck and the expansive bridge deck terrace areas. This 'ultramodern' exterior design is contrasted by a classic interior, which uses composite sections combined with more traditional yacht material and designs, such as ribbed and scalloped woodwork.



'Elada' is a 146ft (45m) luxury tri-deck motor yacht, built with a fibreglass hull and decks and powered by twin CAT C 32 1915 BHP@2300 rpm diesels which give this semi-displacement vessel a 17 knots cruising speed and a top speed of 22 knots.

To attain the very high aesthetic finish standards and product performance needed for luxury superyachts, the Bilgin shipyard specified peel ply and biaxial fabric products from METYX Composites, which were used for moulding all of the visible epoxy glass fibre components. ■

"METYX products were chosen by Bilgin Yachts because of a combination of the outstanding technical product performance and the fast, high quality, reliable service provided."



## GRP pultruded structural profiles help keep things cool

The Besmaya 1,500 MW Combined Cycled Power Plant project in Iraq was implemented by the Ministry of Electricity for the city of Baghdad as part of essential reconstruction to its damaged infrastructure. The site selected for this prestigious new plant is located approximately 40km south east of Baghdad. Mass Group Holding Ltd. was contracted to build and operate the new Baghdad Power Plant to provide the state capital with reliable and sustainable electrical power, which will add 3,000 MW of power to the grid when fully operational. Phase 1 has been completed, with the second phase of the project expected to start commercial operations during 2018.

The Besmaya plant has been designed as a world-class power generation facility utilizing the latest 'combined cycle' technology in the market to reduce the carbon footprint and meet environmental mandates for cleaner, more efficient power generation. The finished plant will have two power blocks, which together will produce 1,500 MW of power at a 400 kV transmission level. Each block has been designed with two GE 9F series combustion turbine generators which may be operated in either an open cycle or combined cycle via the use of a bypass stack; in the combined cycle mode, the hot exhaust from the combustion turbines is not wasted but directed to Heat Recovery Steam Generators which provide the energy source to drive a steam turbine generator, generating additional electricity without any additional fuel consumption.

Some waste heat is still produced by the plant, which is handled using a combination of fin-fan coolers and wet cooling tower equipment. The GEA 14 cell water cooling tower was constructed on the site using pultruded GRP structural profiles produced to exacting specifications by Pul-tech FRP, located in Uşak, Turkey where it has a 26,000 sq. m factory site in the industrial zone. GEA is an international technology group focused on process technology and components for sophisticated production processes, globally used in a wide variety of industrial and end-user markets, including utilities.

year track record as a reliable supplier of high quality GRP composite profiles; all products are manufactured in accordance with ISO EN 13706 to the specifications and standards as required by its customers. The high degree of consistent product quality, combined with cost efficient productivity, is achieved due to investments by Pul-tech FRP in continuous, automated, manufacturing lines and having a team of highly experienced technical, engineering, production and quality personnel to ensure material qualification and product quality.

Pul-tech FRP pultruded, filament wound and moulded structural profiles are used for many structural engineering applications such as ladders, walkway gratings, structural beams, window frames, hand rails, seating, locking pins, and reinforcing concrete. The company's maintenance free GRP products are installed in a wide variety of industrial environments including: power generation cooling towers; waste and water treatment facilities; chemical plants; food and beverage production.

METYX Composites supplied its MTM225 stitched, unidirectional glassfibre combi mat fabric product, used by Pul-tech FRP for all of the GRP structural profiles required for this demanding project, supported with on-time deliveries. ■



GEA selected Pul-tech FRP to supply all the glassfibre reinforced (GRP) pultruded structural profiles for the Besmaya plant water cooling tower due to the company's outstanding 14



## METYX fabrics keep Sazcılar on the right track

In 1987 Sazcılar Otomotiv started manufacturing in Bursa, the fourth largest city in Turkey, which is located south of Istanbul on the other side of the Sea of Marmara. Today, Sazcılar has grown into a major manufacturer in Turkey, which has a workforce of around 700 people and operates four production plants (three in Bursa and one in Sakarya) covering approximately 25,000 sq. metres. Its factories have gained numerous approvals including ISO TS 16949, ISO 9001, ISO 14001, DIN 6701 A2, 15085-2 CL4 and IRIS (International Railway Industry Standard), which underpins the very high quality assurance standards of Sazcılar's products and manufacturing processes.

Sazcılar specialises in the production, finish painting and complete assembly of composite components primarily for the following industry sectors: automotive, rail, infrastructure and construction, agricultural machines and off highway vehicles, military and armoured security vehicles. Major OEM customers are supplied, such as Vanhool, Heuliez Bus, CAF, BMC, Terex, Siemens, Bombardier and Hyundai Rotem.

Sazcılar has extensive know-how in designing and manufacturing fibre reinforced and lightweight sandwich composite products using a variety of production technologies to suit customer needs including: hand lay-up, RTM and L-RTM, vacuum bagging infusion, BMC and SMC press moulding, and pDCPD RIM. The range of part manufacturing and finishing processes available enables Sazcılar to offer its customers tailored solutions using the latest developments in the composites industry.

For the last 10 years, composite rail parts manufactured by Sazcılar have been specified and supplied for a wide variety of rolling stock applications for Siemens, Bombardier and Hyundai Rotem. Examples of rail projects successfully delivered by Sazcılar are given below:

### 1. Bombardier Austria

*a. Project Flexity, Vienna Trams*  
Exterior FRP parts for carriage and cab units

The project is for 119 trams for Vienna, to be manufactured and supplied over 10 years.



For each tram 74 different FRP composite parts are manufactured by Sazcılar for all the exterior body panels of the tram carriages and cab units using a variety of METYX technical fabrics.

*b. Project Flexity, Innsbruck Trams*  
Interior & Exterior FRP parts for carriage & cab units.



The project was for 20 trams for Innsbruck.

For this project there were 10 different designs of exterior FRP parts, with 20 external parts supplied per tram. There were also 54 different shaped and sized interior FRP parts, with 160 interior parts supplied per tram, all again moulded using METYX fabrics.

### 2. Siemens AG, Austria

*a. Project Bangkok Green Line Trains*  
Interior & Exterior FRP parts for carriage & cab units



The projects was for 22 trains for the Mass Rapid Transit Authority of Thailand (MRTA) as part of the expansion of the existing Bangkok's Green Line, a two-way elevated rail line.

For this project, specific exterior FRP parts were moulded using FR rated quadraxial Q800 and L600E 10C unidirectional fabrics, made to order by METYX Composites.

The project required 9 different FRP reference parts for the exterior applications, with 18 parts per train, plus 17 different interior part designs with a total of 182 interior FRP parts needed per train.

*b. Project Bangkok Blue Line Trains - Interior and exterior FRP parts for carriage and cab units.*

This Siemens projects is for 35 three-car trains to update the existing fleet. Once again custom made METYX Composites quadraxial Q800 and L600E 10C unidirectional fabrics were used for the six individual exterior FRP parts per train specified. For the interior applications there were 37 different reference parts, with 280 interior FRP parts per train.

### 3. Hyundai Rotem, South Korea

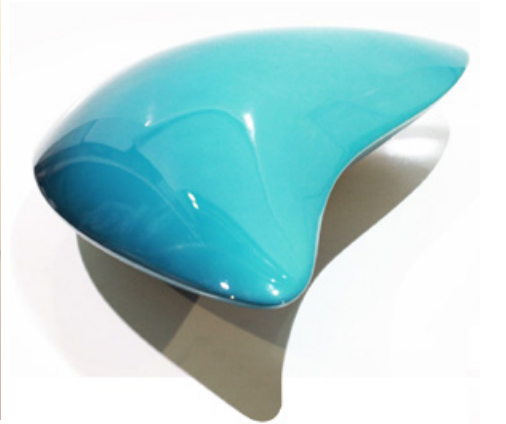
*Project M2 Yenikapı Metro, Istanbul*  
Interior & Exterior FRP parts for carriage & cab units



The project was for 17 new metro line trains for the M2 Yenikapı - Hacıosman rapid transit line in Istanbul.

This project, covering both interior and exterior applications, required 70 different FRP parts and a total of 550 parts being supplied per train. All FRP parts supplied for this project by Sazcılar were moulded using a variety of METYX technical fabrics, specified for their quality and proven performance capabilities.

Important properties that Sazcılar's FRP parts must provide for rolling stock applications include: tough, high impact resistance; long term mechanical strength and durability; high exterior performance in demanding environmental weather conditions. METYX's quadraxial and woven fabrics are used by Sazcılar with high confidence to achieve these goals for the project. ■



## Stunning Artistic Interpretation in Composites

Bülent Sancar, a contemporary Turkish artist of growing acclaim, creates his stunning, eye-catching, composite based statues at METYX Group's Manisa factory. Two of Sancar's beautiful sculptures made in 2017 were displayed in Italy at an international art show and contemporary art gallery in Venice.

These truly unique composite sculptures are designed and created by Sancar using METYX's Tool Centre production facilities. The creation of each sculpture follows very similar stages and techniques used for traditional composite tool making. The first stage is hand sculpting the two complex, curved, elliptically shaped mould patterns (plugs) from polystyrene block. The artist then directly applies the matrix resin and several layers of METYX's multiaxial E-glass fabrics, building up a sufficient laminate wall thickness to provide rigidity.

The next stage is to sand and overlay the GRP laminate with a matched tooling compound and then wet sanded to a very smooth surface finish prior to priming the outer surface. The final finishing stage to complete the sculpture is the application of acrylic paint to create the desired, colour and highly lustrous, flawless, surface finish.

"I knew as soon as I discovered composites that this was the right medium for me. The versatile way they can be moulded allows complete artistic freedom to create the desired shape and finish. I will definitely continue creating composite sculptures," said Bülent Sancar.

It is clear from the continued success Sancar is enjoying internationally with his modern sculptural art, that the use of composite materials will become increasingly popular in the art world. ■





YILDIZ UNIVERSITY  
AESK CLUB

## Supporting Future Engineering Talent

The company has been a strong supporter of university student projects for many years now. This support continued in 2017, with METYX Composites sponsoring more than 15 universities during the year, providing raw materials to help make their composite design ideas become a reality, as well providing technical advice and guidance.

The majority of the materials supplied for the wide variety of composite based design projects supported were to produce high performance lightweight FRP components, mostly vacuum infused using METYX carbon multiaxial and woven fabrics; PVC foam cores for sandwich panel laminate designs and vacuum consumables were also supplied.

METYX strongly believes that by supporting engineering student projects we will increase the opportunities to move composite technology forward for a better future for the industry. Each student involved in these new design engineering projects creates additional academic and applied knowledge and understanding in the use of composites. This valuable applied learning experience is of real value, not only to the project team members and university department, but for the wider design engineering community and ultimately for manufacturing industries nationally and globally after the students complete their studies. ■

### *Undergraduate & Postgraduate engineering student projects supported during 2017 included:*

- BOĞAZIÇI UNIVERSITY
- ÇUKUROVA UNIVERSITY - ISTIKBAL DRONE PROJECT
- ÇUKUROVA UNIVERSITY - ELECTROMOBILE TEAM
- DUMLUPINAR UNIVERSITY
- GEDİK UNIVERSITY
- ISTANBUL TECHNICAL UNIVERSITY - FACILIS RACING TEAM
- ISTANBUL TECHNICAL UNIVERSITY - HYDROS TEAM
- ISTANBUL TECHNICAL UNIVERSITY - ROVER TEAM
- ISTANBUL UNIVERSITY - MILAT 1453 ELECTROMOBILE TEAM
- KARABÜK UNIVERSITY - KARVOLT ELECTRIC CAR
- KARADENİZ TECHNICAL UNIVERSITY - K-TECH TEAM
- MARMARA UNIVERSITY - ELECTRIC CAR
- SABANCI UNIVERSITY
- SAKARYA UNIVERSITY
- ULUDAĞ UNIVERSITY
- UŞAK UNIVERSITY
- NEAR EAST UNIVERSITY
- PIRI REIS UNIVERSITY
- YILDIZ TECHNICAL UNIVERSITY - AESK TEAM
- YILDIZ TECHNICAL UNIVERSITY - WIND ENERGY TEAM
- UŞAK UNIVERSITY
- NEAR EAST UNIVERSITY
- YILDIZ TECHNICAL UNIVERSITY - AESK TEAM
- YILDIZ TECHNICAL UNIVERSITY - WIND ENERGY TEAM

İSTANBUL UNIVERSITY  
MILAT 1453 TEAMULUDAĞ UNIVERSITY  
MAKİNE TEAMKARADENİZ UNIVERSITY  
KTECH TEAMKARABÜK UNIVERSITY  
KARVOLT ELECTROMOBİLEÇUKUROVA UNIVERSITY  
ELECTROMOBİLE TEAMİSTANBUL TECHNICAL UNIVERSITY  
ROVER TEAM





## Committed to supporting local communities

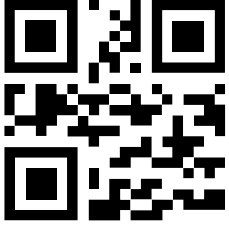
In addition to our business activities, we also make time to support the local communities where we live and work, to give something back and help deserving people, especially children. For many years METYX has supported young, local swimmers in Turkey through the Manisa Water Sports Club, giving both disabled and non-disabled teams opportunities to participate in regional and national swimming and water polo competitions.

In 2017 we also started supporting aspiring young sportsmen and women in Hungary, which included sponsoring a local Under 9s football tournament, held on January 21st, 2017 in Kaposvár, where METYX has its Central European production facilities. The event was a great success, attracting six teams and a total of 72 children who were part of the six squads participating in the competition. The tournament provided a great experience for the 8 year olds to strengthen their competitive team spirit and meet so many children of their own age.

At METYX, we care about the local communities close to our facilities and are committed to continue to provide support in the coming years.







Courtesy photo of Bilgin Yachts

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