Technical TEXTILES international

Winter 2022
Volume 31, Number 4

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A focus on sustainability at the *Dornbirn Global Fiber Congress*

Graphene-based inks enhance the performance of sportswear

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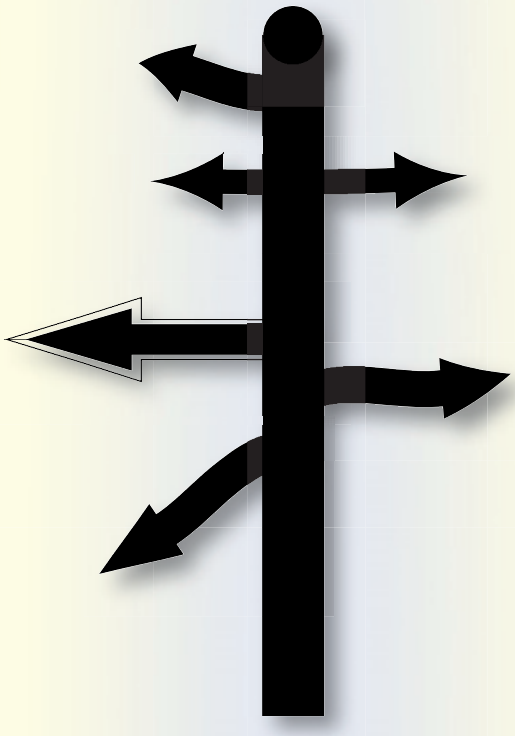

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Technical TEXTILES international

Winter 2022
(Volume 31, Number 4)

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Published by:
Boughton Technical Media Ltd,
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WR15 8XN, UK.

Subscription enquiries, orders and payments:
Boughton Technical Media Ltd,
PO Box 54,
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Tel: +44 (3301) 335079
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Annual subscription (four issues): includes free access to publications and back issues online: £300/$459/€390.

(Payments in other currencies are subject to our prevailing exchange rate). Prices are valid to the end of 2022, and include airmail delivery in Europe and air-speeded delivery elsewhere.

In the Editor's opinion

What it is to live in interesting times. While the worst of the human coronavirus (covid-19) pandemic may be behind us, the global energy crisis has served as a grim backdrop to the majority of 2022. The price of natural gas, for instance, has increased almost five-fold since the summer of 2020. China's demand for energy has always been a key driver of global market prices, but in 2021, its post-covid economic ramp-up coincided with an increase in demand across the rest of Asia and Europe too. As economies began to recover from the fallout of the pandemic, countries across the northern hemisphere, which experienced a long, cold winter in 2020-21 that depleted levels of stored gas, were left scrabbling to secure supplies. This unfortunate situation was compounded by Russia's invasion of Ukraine in February 2022. A major supplier of natural gas, Russia has cut supplies to countries in the European Union by over 80% because of their opposition to the invasion, and this has led to a bidding war for supplies of gas across the world.

The effect that this situation has had on the technical textiles industry cannot be overstated. Indeed, the European Apparel and Textile Confederation (EURATEX), of Brussels, Belgium, believes that the wider European textiles industry is facing something of an existential crisis. It says that, owing to global competition, companies operating in the textile and clothing industry on the continent are unable to pass their increasing costs on to their customers. This has already led to capacity reductions and production gaps at numerous companies and, if the situation persists, EURATEX says that many companies could relocate outside Europe.

The ongoing energy crisis creates a great deal of uncertainty, which is the enemy of investment. This is unfortunate, as the technical textiles industry – like all industries – will have to invest to reduce its impact on the environment. At the *27th Conference of the Parties to the United Nations Framework Convention on Climate Change*, commonly known as *COP27*, the United Nations (UN) Secretary General, António Guterres told world leaders that humanity is on a "highway to climate hell". He said: "We are in the fight of our lives and we are losing... and our planet is fast approaching tipping points that will make climate chaos irreversible."

The technical textiles industry appears to be committed to reducing its impact on the environment. The topic dominated discussions at the *Dornbirn Global Fiber Congress* (see also, page 11) held in the Austrian town on 14–16 September 2022. As was made clear at the conference, however, the complexities involved in putting the environment first when designing new products, including their production, marketing, sale, transportation and end-of-life, are staggering. One route to solving the problem could be to make products that last; this approach is touched upon in our other two features, which concern the use of graphene in the production of sportswear (see also, page 17) and an antibacterial finish for cotton fabrics (see also, page 21).

I am typically wary of making predictions, but here are two for 2023. First, the technical textiles industry's boundless capacity for innovation will be driven principally by the looming climate crisis. Second, this work will be fascinating to observe and take part in. Entering its 32nd year of publication, *Technical Textiles International,* together with its sister website technical-textiles.net, will be here to keep you informed.

Technical TEXTILES international

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On the cover:

The Generation 2.0 Fibre Bottle was just one of the many technologies developed with sustainability in mind to be presented at the Dornbirn Global Fiber Congress. Adrian Wilson's report starts on page 11

Versarien says that its graphene-based inks can increase the wicking rate, drying rate and the thermal transmittance of sportswear. James Bakewell spoke to the company's Chief Executive Officer, to find-out more (page 17)

Technical TEXTILES international

Further information at https://www.technical-textiles.net

Bio-based finish developed by HeiQ to offer relief to allergy sufferers

HeiQ of Schlieren, Switzerland, has introduced a textile finish (HeiQ Allergen Tech) to help alleviate the problems caused by allergens.

Intended for home textiles and fabrics used on public transportation, the company says HeiQ Allergen Tech is made using only bio-based materials. The finish reduces the unwanted effects of inanimate allergens, such as matter shed by dust mites and pets, and is applied readily during the finishing stage. Its application provides an invisible protective layer that in testing withstood at least 20 wash cycles.

Testing has also shown that, compared with untreated textiles, the application of HeiQ Allergen Tech reduces the levels of: matter from house dust mites by 96.6%; allergens from dog hair by 76.5%; allergens from cat hair by 83.6%. Sidcup-based Allergy UK has assessed and certified the finish, adds HeiQ.

The finish is a development based on the company's proprietary ingredient called Synbio, acquired when HeiQ purchased the Belgian company Chrisal NV of Lommel[(1)]. According to the microbiologist Dr Robin Temmerman, also Chief Executive Officer (CEO) of the renamed acquisition, HeiQ Chrisal: It's exciting to combine my two decades of research on synbiotics with HeiQ's innovation capability to come-up with the world's first 100% bio-based anti-allergen technology for textiles."

This technology becomes even more helpful when applied to furniture textiles such as sofas and public transportation seats, which are more difficult to wash or sanitise.

Allergies are one of the most prevalent health problems in the world, estimated to affect about 40% of the global population, according to an article in the International Archives of Allergy and Immunology. One of the environments where these allergens are most prevalent is the bedroom, mainly through the accumulation of shed matter in bedding items. During sleep and when we make our beds, we inadvertently launch these allergens into the air and breathe in a high number of them, potentially leading to respiratory, skin and ocular problems, according to an article in the Iranian Journal of Public Health. Even just sleeping means that our body and airways are exposed between six and eight hours each night.

See also: [(1)]*HeiQ launches antimicrobial filtration media*, https://www.technical-textiles.net/node/76154

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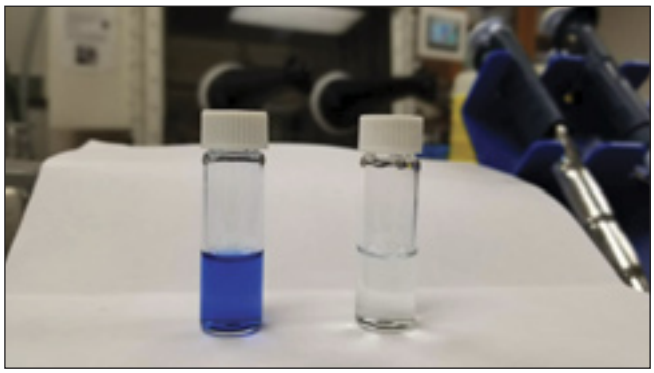
US researchers demonstrate that polymer removes dyes from wastewater



The left vial shows dye solution in water (blue) and the right vial shows clear water after the dye was removed from the solution by the polymer.

A polymer called polycarbodiimide can remove certain dyes from water, and can be recovered and re-used, according to researchers at North Carolina State University (NCSU) in Raleigh, USA, who say that it could be used to clean wastewater generated by the textiles industry.

In a paper published in *ACS Applied Polymer Materials*[(1)], the researchers report how they first created a polycarbodiimide and then dissolved it in a solvent, before introducing the resulting solution into samples of water contaminated with a series of 20 anionic, or acid, dyes. They then assessed how well the polymer removed the dyes from the samples using visual tests and ultraviolet (UV)–visible spectroscopy.

An Assistant Professor of Textile Engineering, Chemistry and Science at NCSU, Januka Budhathoki-Uprety, says: "We mixed the polymer solution and dye-contaminated water so the polymer in the solution can grab onto the dye. This is a two-phase solution, just like oil and water. The polymer part of the solution grabs onto the dyes. Then we were able to easily separate the clean water from the contaminated solution mixture by draining it out, similar to separation of water from a mixture of oil and water."

The polymer solution removed all but four of the 20 acid dyes tested from water. The researchers say that the pH of the solution and the topological polar surface area of the dyes contribute to whether the polymer works or not. They now plan to develop a library of polymers that would have the potential to work with more types of dyes. Further, they want to develop a more practical mechanism for using polycarbodiimide to clean wastewater.

Budhathoki-Uprety concludes: "We are working to develop materials that can do the same work without having to use the polymer in the solution phase. If you have dye spill, you do not want to have to use a flammable solution, you want a solid material that is easier to handle."

See also: [(1)]*ACS Applied Polymer Materials*, *Polycarbodiimide for textile dye removal from contaminated water*, https://doi.org/10.1021/acsapm.2c00959

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Digital technology holds potential for the finishing of workwear

The use of an energy-efficient, high-throughput digital finishing technology for the application of a water- and stain-repellent finish to a fabric for workwear has been tested by its developer, Alchemie Technology, which reports promising results.

The company, of Cambridge, UK, used its Novara machine to apply Barrier HM-C6 water- and stain-repellent (from HeiQ, of Zurich, Switzerland) to a 280-g.m^{-2} poly-cotton twill workwear fabric. It claims that the process consumed 52% less water and 46% less energy than a traditional padding method for finishing the fabric. By enabling a lower wet add-on of 31% (compared with 65% for padding) and a higher concentration of finish to be applied, Alchemie Technology says the process is more environmentally sustainable and cost-effective than padding. External laboratory tests verified that the finish continued to perform well after 20 washes.

Novara enables one- and two-sided functional coatings to be applied to numerous substrates, including polyester (PES), polyamide (PA), cotton, wool and blends with basis weights of 50–1000 g.m^{-2}, at pattern resolutions of 500 µm, or 50 dots per inch (dpi), only where they are needed—reducing consumption of chemicals. Using the technology, anti-microbial finishes, for instance, can be applied to specific areas of a textile.

For an average European textile finisher, Alchemie Technology estimates that replacing a traditional padder with a Novara machine would create an annual cost saving of around €1 million a year[1].

The Founder of Alchemie Technology, Alan Hudd,says: "With demand for workwear increasing every year[2], it is important to address the use of energy and water in the finishing process. We have the technology to provide workwear manufacturers with huge energy, water and costs savings". The Head of HeiQ's Textiles business unit, Mike Mordente, adds: "We are pleased to further our partnership with Alchemie Technology[3] to prove that the Novara system works with our chemistry to produce high-quality workwear finishes."

See also: [1]*Digital finishing technology cuts energy consumption*, https://www.technical-textiles.net/node/76635

[2]https://www.grandviewresearch.com/industry-analysis/workwear-market

[3]*Alchemie Technology and HeiQ partner on digital finishing technology*, https://www.technical-textiles.net/node/76271

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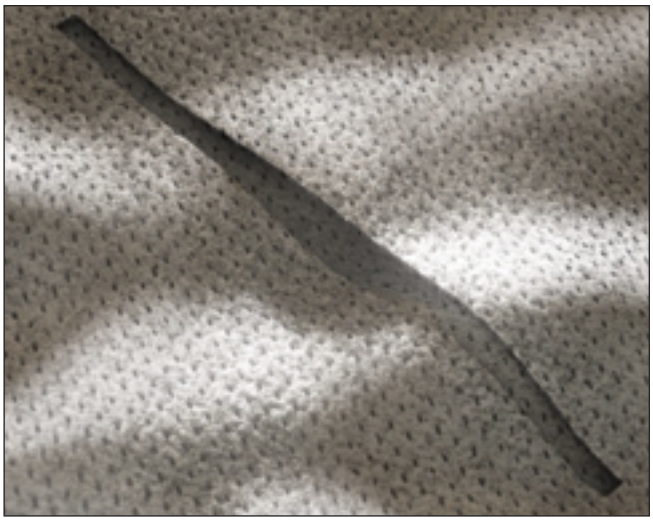
Nike adopts needlepunching process for the production of garments

A hooded fleece sweatshirt is being made using a needlepunching process by Nike, of Eugene, Oregon, USA, which claims that the technology is its most significant innovation in 30 years.

Nike says that by using the needle-punching process, which is the result of over five years of research and development, it can reduce the number of steps needed to create a garment—cutting the costs and environmental impact of production compared with the manufacture of such as traditional knitted garments. Further, the resulting nonwoven – called Nike Forward – has a lower density than traditional knitted fleece and contains 70% recycled content by weight.

A grey hooded sweatshirt made by Nike from a needlepunched fabric.

Nike's Vice President of Global Apparel Product Merch-andising, Aaron Heiser, says: "We believe this platform has the potential to reset the way we think about material and apparel."



The sweatshirt features raw-cut pockets, making it easier for the garments to be recycled.

Nike Forward will be used initially in the production of a grey hooded sweatshirt that is made without zippers, aglets or extra trims (it features raw-cut pockets) making it easier for the garments to be recycled. Nike says that no dyes or water are used in the production of the garment. Nike Forward can be made from a diverse range of layers, including those produced from industrial and post-consumer waste, and can be tailored for various applications.

The standard needlepuching process has been in use of for over 150 years; the first patent for a needlepunch machine was awarded in the UK in 1859.

Nike.
https://about.nike.com

Freudenberg wins contract to supply gas-diffusion layers for fuel-cells

Following the signing of a contract, Freudenberg Performance Materials (see also, pages 33–38) is to supply high-performance gas-diffusion layers for the stacks forming the cores of fuel-cell systems produced by a global automotive tier-one supplier.

The fuel cells will be installed in mid-sized and heavy commercial vehicles, and buses. Freudenberg says that it already has more than 20 years of experience in the development and production of gas-diffusion layers for fuel cells in the mobility sector, and for porous transport layers used in electrolysers.

The Chief Executive Officer (CEO) of Freudenberg Performance Materials[(1)], Frank Heislitz, adds: "This high-volume, multi-year industrial-scale order is confirmation that the long-term investment in our technologies and the close cooperation with our customers are paying off. As a result, fuel-cell technology will become an increasingly important pillar of our business activities going forward."

Freudenberg is currently expanding its capacity for the production of gas-diffusion layers at its headquarters in Weinheim, Germany, through the installation of additional lines.

The company is also on the verge of making further investments in its production capacity.

A fuel cell converts the chemical energy of hydrogen and atmospheric oxygen into electricity. Functionally optimised gas-diffusion layers made from carbon fibre-based nonwovens are installed on both sides of a catalyst-coated membrane, where they distribute hydrogen and oxygen evenly to the membrane and remove the electricity, heat and water generated by the chemical reaction. They also protect the sensitive membrane. A fuel-cell stack is made-up of several individual fuel cells.

See also: [(1)]*Technical Textiles International,* Autumn 2022, *Freudenberg Performance Materials gains strength through diversity*, page 23; https://www.technical-textiles.net/node/76828

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Recycling waste from the production of strong polypropylene nonwovens

Waste generated by TenCate Geosynthetics during the production of high-strength polypropylene (PP) nonwovens for civil engineering applications is now being recycled by the company using a line supplied by PureLoop.

PureLoop, of Ansfelden, Austria, says that the line – which comprises a combination of a shredder and an extruder and is called Pure Loop ISEC Evo – produces such high-quality granulates that TenCate Geosynthetics can re-use them in the production of new high-strength PP nonwovens. Recycled granulates can account for up to 10% of the raw materials used to produce these nonwovens.

Edge trimmings and production rejects generated at TenCate Geosynthetics' site in Linz, Austria, used to be recycled, but were not fed back into the company's own production processes. Head of Marketing (Europe/Middle-East/Africa) at TenCate Geosynthetics, Jürgen Gruber, says: "It was not an issue at the time, because the recyclate was sold, but in the meantime, it has become clear that reselling our valuable production waste is not an ideal solution, especially in view of the rising raw-material prices. That is why we investigated the market to see which recycling technology would make it possible to produce recylate that meets our production quality."

Project Manager at PureLoop, Patrick Wiesinger, says that developing a method for recycling the highly tear-resistant PP nonwovens proved challenging, but that the ISEC Evo line "conserves the quality of the production waste really well during recycling, so we were able to achieve the specified increase in quality for the recyclates."

Another advantage of the line, according to Wiesinger, is its ability to process scrap of a wide range of shapes. He continues: "At TenCate, one of the ways production scrap is delivered is on huge rolls [with] a width of up to 5 m. Our ifeed technology with a double feed-ram system and single-shaft shredder offers the ideal conditions for the direct processing of these large rolls."

Gruber adds that, using the line, "it is now possible to return the high-quality recyclates directly to production. It makes sense in terms of cost-effectiveness and it is an important step for us within the company in view of the circular economy that the industry is striving for."

Currently, production waste from TenCate Geosynthetics' site in Bezons, France, is being re-pelletised, while waste from its site in Hengelo, The Netherlands, is being processed at the plant in Linz for test purposes. Gruber concludes: "We produce many other special plastics in addition to this PP nonwoven. If we achieve the same high quality of recycled pellets, then we are open to using the PureLoop technology for other materials as well."

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Metal-enriched silkworm silk is significantly stronger than spider silk

Silkworm silks are not as durable as and are weaker than silk spun by spiders.

Researchers in China have found a way to make standard silkworm silk stronger than spider silk by bathing it with metal ions and then re-spinning it.

A researcher at Tianjin University, Lin Zhi, says: "Our finding reverses the previous perception that silkworm silk cannot compete with spider silks on mechanical performance."

Silkworm silks are not as durable as and are weaker than silk spun by spiders, particularly spider dragline silks, which behave well under high tension. Some have looked to solve this problem by, for instance, using transgenic silkworms to produce spider silk[1], but such approaches can be complex and costly.

Zhi and his colleagues strengthen silkworm silk by first dissolving it in either sodium carbonate or an enzyme derived from papaya, papain, and then re-spin it in a bath of sugar, ethanol, and zinc and iron ions.

Depending on how they have been dissolved, the resulting silks demonstrate mechanical properties that exceed those of natural silks. The average force that can be applied to the silks without causing them to stretch, up to 2 GPa, is 70% higher than the average value for natural spider silks (0.9–1.4 GPa). Further, at 43 GPa, their Young's modulus is higher than that of any natural silk

Zhi concludes: "We hope that this work opens-up a promising way to produce profitable high-performance artificial silks."

See also: [1]*Kraig Biocraft Laboratories' spider-silk technology detailed in Patents*, https://www.technical-textiles.net/node/76619

Matter, *Artificial superstrong silkworm silk surpasses natural spider silks*, https://doi.org/10.1016/j.matt.2022.08.028

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Partners to demonstrate the benefits of calcium carbonate in fibres

International Fibres Group (IFG, see also, pages 33–38) is working with Omya International AG to develop fibres that are modified with the latter's calcium carbonate, called Omyafiber.

The two companies will work together at IFG's Fibres Research Centre in Linz, Austria[1] to determine the performance and characteristics of fibres made from Omyafiber, and will explore applications for them, including in nonwovens. The partners have already incorporated masterbatches of Omyafiber into staple fibres made from polypropylene (PP) and polylactic acid (PLA) sucessfully, and now plan to trial the production of fibres made from other plastics on the pilot line in Linz.

The research and development team has discovered that the use of Omyafiber improves the haptics, opacity and whiteness of the staple fibres and believes that it could be used in place of the titanium dioxide typically used to impart whiteness to fibres. Importantly, the partners say that Omyafiber has a significantly lower carbon footprint (at 300 kg of carbon dioxide per tonne) than titanium dioxide.

Omyafiber can be used in recycled materials and is recyclable itself. It has a high thermal conductivity, which allows for products to be created with lower sealing/bonding temperatures. It is approved for use in food-contact applications, does not irritate the skin and is approved by the Oeko-Tex Association, of Zurich, Switzerland, for use in apparel.

Founded in 1884, Omya of Oftringen, Switzerland, has grown to be a global producer of industrial minerals, principally modifiers and pigments based on calcium carbonate and dolomite, an anhydrous form of calcium magnesium carbonate. It serves a variety of markets, notably technical polymers (including fibres and nonwovens)[2], construction, printing, packaging, food, personal and home care, pharmaceuticals, agriculture, forestry, water and energy. It makes its calcium carbonate powder by grinding marble in a special process. It says that by replacing the traditionally used and expensive polymer resins used to produce fibres, it can pass on substantial cost-savings to its customers. The powder also resists the build-up of static charges, which aids processing of fabrics and results in fabrics that are not prone to producing electric sparks in use.

The Head of Research and Development at Huddersfield, UK-based IFG, Simon Riepler, says: "The quality of [Omya's] calcium carbonate is excellent and we are looking forward to bringing this quality into fibres and providing a sustainable product for our customers."

IFG and Omya launched their partnership with a dedicated seminar at the *Dornbirn Global Fiber Congress*, which took place in Dornbirn, Austria, on 14–16 September 2022 (see also, page 11).

See also: [1]*International Fibres Group opens research and development centre*, https://www.technical-textiles.net/node/75137

[2]*Technical Textiles International*, Spring 2020, *Adding value and saving costs for nonwovens manufacturers*, page 41; https://www.technical-textiles.net/node/75443

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Mineral-enhanced recycled fibres will emit infra-red radiation

A fibre made entirely from recycled materials and embedded with minerals (Celliant) that convert body heat into infra-red (IR) radiation are to be launched by Unifi and Hologenix.

The two companies have signed an agreement to combine their technologies to create a fibre called Celliant with Repreve.

Unifi, of Greensboro, North Carolina, USA, uses material such as polyethylene terephthalate (PET) waste to produce Repreve, a fine-titre multifilament fibre that is available in a range of variants, each offering a consistent range of properties and tailored for specific applications, such as apparel, automotive textiles and home furnishings.

The company recently unveiled a certification system (U Trust[1]) that enables its customers to prove that Repreve is used in their fabrics. At any point in the supply chain and through the life of a product, Unifi can test its customers' fabrics and products to verify the presence, and quantity, of Repreve in them.

Hologenix of Santa Monica, California, USA, says that when Celliant is embedded in fibres used to manufacture garments worn close to the skin, the IR radiation from them is absorbed by the wearer's body tissue, boosting oxygen levels, improving athletic performance and quality of sleep, and reducing recovery times, as well as promoting general health and wellness[2].

In North America, Celliant with Repreve will be converted into fabrics for intimate apparel, activewear, outdoor products, mattresses and bedding, and automotive, industrial and medical applications, by circular knitter Beverly Knits of Gastonia, North Carolina. Beverly Knits also operates Creative Dyeing & Finishing LLC of Albemarle, North Carolina. As such, Celliant with Repreve will be produced, converted and finished within a 482-km^2 area.

See also: [1]*Unifi launches products at Outdoor Retailer's Winter Market,* https://www.technical-textiles.net/node/76579

[2]*Yarn blends emit infra-red radiation to boost athletic performance*, https://www.technical-textiles.net/node/52455

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Recycled polyamide fabrics are adopted for backpacks and anoraks

Mystery Ranch Backpacks is using fabrics made by Invista from pre-consumer recycled polyamide 66 to produce packs for its District Series.

Durable fabrics made from pre-consumer recycled polyamide (PA) by Invista's Cordura brand are now being used in the production of backpacks and anoraks.

Mystery Ranch Backpacks, of Bozeman, Montana, USA, is using Invista's recently launched PA 66 fabric[1], Cordura re/cor RN66, in its District Series of backpacks.

Invista, of Wichita, Kansas, USA, says that Cordura re/cor RN66 fabrics deliver similar levels of mechanical performance to conventional Cordura fabrics. The company adds that, compared with fabrics made from virgin PA 66, the production of Cordura re/cor RN66 generates 83% less greenhouse gas emissions, consumes 82% less energy and uses 57% less water. The pre-consumer recycled material from which the fabrics are produced is certified according to the Global Recycled Standard (GRS)[2] from Control Union Certifications. re/cor RN66 is available in 36 colours.

The President of Mystery Ranch, Alex Kutches, says: "With Cordura re/cor, we can remain committed to product quality and durability and introduce our first line of packs made from fully recycled materials."

Napapijri, of Aosta, Italy, is using Invista's recycled PA 6 fabric, Cordura re/cor RN6, to manufacture its Skidoo anorak. Invista says that Cordura re/cor RN6 is rugged, demonstrating good resistance to abrasion and scuffs, and is highly resistant to tearing. It can be supplied in any woven construction, typically plain, ripstop, basket and dobby.

Senior Material Manager at Napapijri, Paolo Pezzin, says: "With the use of Cordura re/cor RN6 , Napapijri can now offer products that are highly sustainable using responsibly recycled sources instead of virgin materials."

Earlier in 2022, Napapijri adopted Cordura UltraLite Fabric for the production of its Northfarer jacket. Inspired by the lightweight, durable fabrics used in parachutes and hot-air balloons, Cordura UltraLite fabrics are woven with high-tenacity PA 66 filament yarns and offer a good strength-to-weight ratio. They have a strong lustre and can be rendered water-repellent.

See also: [1]*Cordura launches fabrics made from recycled polyamide 66*, https://www.technical-textiles.net/node/76558

[2]https://certifications.controlunion.com/en/certification-programs/certification-programs/grs-global-recycle-standard

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Teijin develops process for the recycling of polyester fishing nets

Polyester (PES) resin recycled from fishing nets by Teijin is now being used to produce food trays for a restaurant chain in Japan.

Teijin, of Tokyo, Japan, is responsible for collecting and cleaning the fishing nets, and selling the products created through their recycling.

Fishing nets are made mainly from plastic fibres, such as polyamide (PA) and PES, to prevent them from rotting, to ensure their strength and to make them easy to maintain. Whereas common PA fishing nets are generally easy to recycle, the recycling of PES fishing nets has proved to be more difficult to achieve. In Japan, approximately 1.3 kt of discarded PES fishing nets are sent to landfill each year.

In April 2021, however, a solution to the problem of recycling PES nets was developed by Teijin and a number of partners specialising in the manufacture of fishing nets, plastic moulding, fibre processing and resin processing[1]. Under the new system, it is now possible to collect PES fishing nets and recycle them into a resin that can be used to make trays and stationery.

Initially, the partners faced two major problems. First, they needed to develop a method for cleaning the smelly, water-logged fishing nets and stripping them of coatings applied to improve their durability. Teijin and the other partners eventually identified organic solvents that can be used in an environmentally friendly cleaning process to produce virtually odourless resin that can be recycled repeatedly.

The second big challenge was profitability. Raw PES costs less than many other materials, so the partners knew that its resin would not be price-competitive if the costs of the cleaning and drying processes proved prohibitive. Their solution was to devise a method for manufacturing high-quality resin pellets containing a mixture of other recycled resins added to improve the durability and heat-resistance of the finished product.

Teijin aims to promote the new recycling system for the global production and sale of various products and hopes to be in a position to recycle 1 kt of PES fishing nets each year by 2030.

See also: [1]*Japanese partnership to recycle polyester textiles*, https://www.technical-textiles.net/node/76247

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The fibres industry gets its teeth into the problem of textile waste

Companies operating in every sector of the fibres, nonwovens and technical textiles industries must continue to innovate in order to make their products more environmentally sustainable. Adrian Wilson reports on the latest developments from the annual *Global Fiber Congress (GFC)*, held most recently on 13–15 September 2022 in Dornbirn, Austria.

There are 12.5 billion toothbrushes consumed worldwide every year, equating to around 1.6 for every person on the planet. This market should be much bigger; a change of toothbrush is advised by dentists every three months. If every person consumed four toothbrushes each year, demand would swell to 35 billion units. As such, the production and use of toothbrushes has a significant impact on the environment. In the USA alone, some one billion toothbrushes are thrown away each year. Most end-up in landfill, but many find their way into the world's seas and oceans. Rarely do consumers consider the environmental impact of simply brushing their teeth, but companies that produce toothbrushes increasingly are.

At the 61st edition of the *Dornbirn Global Fiber Congress (Dornbirn-GFC)*, held in Dornbirn, Austria, on 13–15 September 2022, the consequences and complications associated with the increasing focus of brands and retailers on the sustainability of even this very specific sector of the fast-moving consumer goods (FMCGs) market were made very apparent.

Technical filaments

Perlon – The Filament Co, is one of the largest manufacturers of technical filaments worldwide. It has five plants: three in Germany, in Affolterbach, Bobingen and Munderkingen; a Chinese plant near Shanghai; a US manufacturing plant in Lexington, South Carolina.

The Head of Research and Development, Pedex Range, at Perlon, Christian Fleschhut, told delegates about the vast array of products the company has developed for the bristles of toothbrushes, as it looks to meet the wildly varying sustainability agendas and preferences of its customers.

Producing approximately 23 kt of technical filaments each year, the company has 850 employees and generates annual revenues of around €160 million. Around 50% of its output is sold to manufacturers of paper machine clothing (PMC) belts, with its other major markets being filaments for abrasives, synthetic brushes and other technical filaments. It also supplies filaments for personal-care applications, largely toothbrush bristles for well-known brands, such as Germany's Bürstenfabrik Keller and Italy's Piave.

Speaking at the *Dornbirn-GFC*, the Head of Research and Development (R&D) for Perlon Pedex, Christian Fleschhut, outlined the vast array of products the company has developed for the bristles of toothbrushes, as it looks to meet the wildly varying sustainability agendas and preferences of its customers. Further, he pointed-out some of the issues – both commercial and environmental – that Perlon has experienced while trying to meet these needs.

GreenLine BB

First is the company's range of bio-based alternatives to polyamide (PA), called GreenLine BB. These can be made entirely from bio-based feedstocks, mainly oil made from castor beans (the cultivation of which does not compete with food production).

The availability of raw materials for the manufacture of such products, however, can be limited, with prices higher than those for standard PAs. These fibres can even, in some instances, have a larger carbon footprint than conventional PAs. Further, only a few of these materials are approved for food-contact applications in the USA and Europe, and the performance of the products can be poorer than that of conventional alternatives.

Perlon, however, makes variants of these filaments in PA 4.10, PA 5.10, PA 6.10, PA 10.10 and PA 11, all of which have their advantages and disadvantages.

GreenLine LC

The company's GreenLine LC range consists of filaments that are made from a number of polymers with inherently lower carbon footprints than conventional polymers, or are converted into filaments using a more sustainable manufacturing process powered substantially by renewable energy sources. They demonstrate the same performance as filaments produced from standard polymers, but, once again, availability can be extremely limited for certain products and prices are higher than for standard PAs.

GreenLine R

The GreenLine R range consists of filaments made from mechanically recycled materials and is produced via a simple and well-established process, with a wide range of polymers available. Fleschhut told delegates that

Face-to-face, once again

The 61st edition of the *Dornbirn Global Fiber Congress* attracted 557 delegates, representing 240 companies, from 32 countries around the world. In 2020 and 2021, the event was held online because of the human coronavirus (covid-19) pandemic. Opening the conference, the Managing Director of the Austrian Fibers Institute, Friedrich Weninger, told delegates that their attendance at the show indicates hunger for both traditional face-to-face events and global stability. He continued: "We have been overwhelmed by the successful support this year. To be able to attract such a high number of delegates as well as to present 112 in-person lectures and invite many new start-ups into our community is very satisfying. Our organisation showed agility in switching to digital and I think we are now being rewarded for keeping this spirit alive."

these products have very low carbon footprints and are competitively priced (although prices are rising). Their performance characteristics are, however, different from filaments made from virgin polymers and the availability of food-contact-approved polymers is limited. They can also be prone to impurities, especially from post-consumer waste, and are mostly dark in colour, making their use in blends largely necessary. The Perlon Group has its own recycling capabilities, mostly for in-house use, with some materials available for external sale.

GreenLine SL

GreenLine SL products are based on feedstocks from chemically recycled post-production or post -consumer waste. The recycling process involves the depolymerisation of the waste to monomers, or pyrolysis of the waste to pyrolysis oil. The products demonstrate the same or similar performance as filaments made from standard polymers and food-contact approval is possible. Fleschhut said that this offers perfect marketing opportunities for retailers, but current availability is limited and the price is higher than for standard polymers. He added: "It is a complicated and relatively new process and there are few European production facilities at present. The number of polymers that are available is also limited."

GreenLine BD

Not yet commercially available, the GreenLine BD range of products are based on polymers such as polylactic acid (PLA), thermoplastic starch (TPS), polybutylene adipate terephthalate (PBAT), polyhydroxyalkanoate (PHA) and cellulose acetate (CA), and are designed to biodegrade. Existing equipment and processes can be used for spinning these fibres, but Fleschhut said that, at present, biodegradation standards do not reflect reality.

Further, the fibres have low-to-very-low melting points and their performance is lower than standard polymers. Fleschhut added: "In addition, brushes consist of several materials, such as the handle and staple wires, in addition to the bristles, which all need to biodegrade in order to make sense. Added to this is the limited lifetime of the brush through degradation during shelf-time. PLA is the best known biodegradable polymer, but many German communities have banned PLA bags as they do not degrade at industrial composting temperatures and residence times."

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September 2023

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mayers@inda.org;
https://www.riseconf.net

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13–15 September 2023
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ISSN 0964-5993: Printed in the UK by Blackmore, Shaftesbury.

Technical Textiles International is published in four issues a year: Spring, Summer, Autumn and Winter, in one volume, by: Boughton Technical Media Ltd, PO Box 54, WR15 8XN, UK. The annual subscription in the USA is $459. Technical Textiles International is distributed by Blackmore Ltd, Longmead, Shaftesbury, Dorset, SP7 8PX, UK. Postmaster, please send address corrections to Boughton Technical Media Ltd, PO Box 54, WR15 8XN, UK.

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Listed below is a selection of some of the most important companies operating in the technical textiles industry. The listings include textile machinery manufacturers, fibre producers, yarn manufacturers, fabric knitters, nonwovens producers, dyers, finishers, chemical suppliers and other suppliers of goods and services, both to the industry and to end-users.

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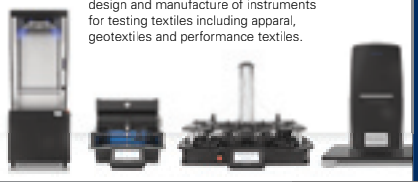

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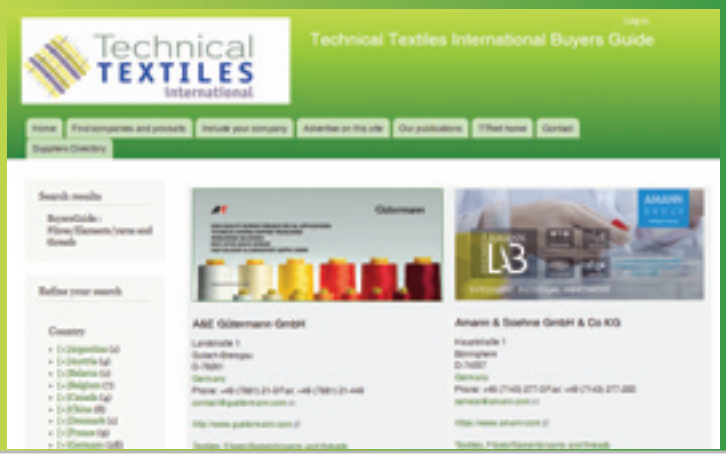

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Buyer's Guide for the Technical Textiles Industry—2023

The object of this *Buyer's Guide for the Technical Textiles Industry* is to put our readers in contact with new suppliers of products and services from around the world.

The *Buyer's Guide* is divided into two sections—an alphabetically arranged directory of the organisations, and an index of the products and services they offer. The directory, which starts on page 53, gives the organisation's full contact details (address, telephone and fax numbers), and email and Internet addresses.

The index is divided into several sections, according to the products and services offered. A full list of the sections and the pages on which they can be found is given to the right. To help readers locate suppliers local to their needs, the companies listed in each section of the index are sorted by country.

The *Buyer's Guide* will be updated and expanded for our Winter 2023 issue, as well as being available throughout 2023 on our website, see below). If you wish to add to or amend your organisation's listing, visit the website or contact the Editor: james@boughtonmedia.com

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Pegas Nonwovens sro, Znojmo, Czech Republic.
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Zeus Inc, Orangeburg, USA.

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EOC Group, Oudenaarde, Belgium.
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Stedfast Inc, Granby, Canada.
Guangdong Yilong Xincai Technology Co Ltd, Foshan, China.
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Tharreau Industries, Chemillé, France.
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ITW Dynatec, Mettmann, Germany.
Trans-Textil GmbH, Freilassing, Germany.
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Johns Manville, Bobingen, Germany.
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Techfab India, Mumbai, India.
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Hyosung Corp, Seoul, South Korea.
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Lineo NV, Meulebeke, Belgium.
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Fiberweb France SAS, Biesheim, France.
Tharreau Industries, Chemillé, France.
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Tenotex SpA, Terno d'Isola, Italy.
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Atlanta Nisseki Claf Inc, Kennesaw, USA.
First Quality, Lewistown, USA.
Conwed Plastics, Minneapolis, USA.
Fiberweb Inc, Old Hickory, USA.
FitesaFiberweb Washougal Inc, Washougal, USA.
ANCI Inc, Kennesaw, USA.

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Bekintex nv, Wetteren, Belgium.
Nano-Tex Inc, Maaseik, Belgium.
Régitex Inc, Saint-Joseph, Canada.
Eurtotex, Toronto, Canada.
Li Ning Co Ltd, Shanghai, China.
Tharreau Industries, Chemillé, France.
Christian Eschler Europe AG, Balingen, Germany.
Freudenberg Performance Materials, Weinheim, Germany.
Trans-Textil GmbH, Freilassing, Germany.
Supreme Nonwoven Industries Pvt Ltd, Bhilad, India.
Polycrest Innovations India Ltd, Chennai, India.
Supreme-Treves Pvt Ltd, Daman, India.
Alok Industries Ltd, Mumbai, India.
S. Kumar Unitex, Mumbai, India.
Supreme Nonwovens Pvt Ltd, Mumbai, India.
Geo&Tex 2000, San Nazario, Italy.
ICAP-SIRA, Parabiago, Italy.
KB Seiren Ltd, Osaka, Japan.
Unitika Fibers, Osaka, Japan.
Fiorima SA, Braga, Portugal.
Finetex EnE, Seoul, South Korea.
FOV Fabrics AB, Borås, Sweden.
Fritz Landolt AG, Näfels, Switzerland.
Rivertex Technical Fabrics Group, Culemborg, The Netherlands
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Fabric King Textile Co Ltd, Taipei, Taiwan.
Ho Yu, Taoyuan City, Taiwan.
Tex-Ray Industrial Co Ltd, Taipei, Taiwan.
Thai Acrylic Fiber Co Ltd, Bangkok, Thailand.
Salteks Tekstil Sanayi ve Ticaret AS, Istanbul, Turkey.
Teknik Ltd, Istanbul, Turkey.
Dunlop Coated Textiles, Manchester, UK.
Survival-One, Aberdeen, UK.
A. Rowe Ltd, Manchester, UK.
Heathcoat Fabrics, Tiverton, UK.
Draper Knitting, Canton, USA.
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Polartec LLC, Lawrence, USA.
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QIO Systems Inc, New York, USA.
FITS Sock Co, Niota, USA.
point6, Steamboat Springs, USA.
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Domestic/Textiles for the Home

Autex Pty Ltd, Melbourne, Australia.
Beaulieu Technical Textiles SA, Comines-Warneton, Belgium.
EOC Group, Oudenaarde, Belgium.
Xentrys, Gent, Belgium.
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Concordia Textiles Group, Waregem, Belgium.
Régitex Inc, Saint-Joseph, Canada.
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Pegas Nonwovens sro, Znojmo, Czech Republic.
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dorix GmbH, Selbitz/Bayern, Germany.
Sandler AG, Schwarzenbach/ Saale, Germany.
Trans-Textil GmbH, Freilassing, Germany.
Alok Industries Ltd, Mumbai, India.
Reliance Industries Ltd, Mumbai, India.
Geo&Tex 2000, San Nazario, Italy.
Gaetano Rossini Holding SpA, Costa Masnaga, Italy.
ICAP-SIRA, Parabiago, Italy.
Tessilbrenta Srl, Pove del Grappa, Italy.
Erhardt Nonwovens, Madrid, Spain.
MITSA, Tortella, Spain.
Tisca Tischhauser & Co AG, Bühler, Switzerland.
Fritz Landolt AG, Näfels, Switzerland.
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Teknik Ltd, Istanbul, Turkey.
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Don & Low Ltd, Forfar, UK.
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Scott & Fyfe, Tayport, UK.
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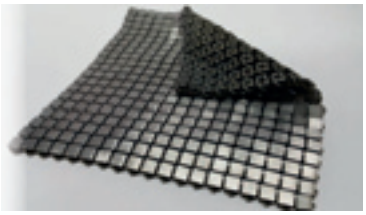
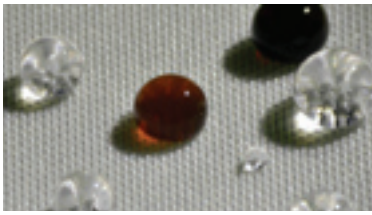

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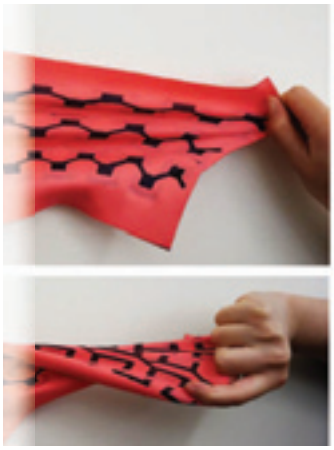



Advances in Textiles technology

February 2022

An international newsletter on textiles technology edited by: James Bakewell

Fibres, filaments and yarns

Artificial silk door-pulls feature on Mercedes-Benz concept car

Novel, sustainable door-pulls made from artificial silk fibre are being used by Mercedes-Benz of Stuttgart, Germany, in its latest concept car, the Vision EQXX.

The carmaker has designed Vision EQXX to highlight ways in which luxury vehicles can be produced using technologies that are more environmentally sustainable than conventional approaches.

The artificial silk fibre is called Biosteel and is produced by AMSilk of Planegg, Germany. The company says that the fibres are biodegradable and recyclable, and no waste is generated during their manufacture. It adds that Biosteel demonstrates mechanical properties

The door pulls for the Vision EQXX concept car from Mercedes-Benz are made from Biosteel artificial silk fibres.

Highlights this month: full contents listing on page 2...

Methods for determining the effects of strains and stresses on carbon nanotube fibres are being developed by researchers at Rice University 2

A single vented tumble dryer can discharge up to 120 million microfibres into the air each year, according to a pilot study 5

A range of durable fabrics made from pre-consumer recycled polyamide (PA) 66 fibres has been launched by Invista through its Cordura brand 3

A fibre-laying process that enables the efficient production of composite footplates and toe caps for use in footwear has been launched by Coats 7

A dual-action thermoregulating finish that reduces the temperature of surfaces to which it is applied by up to 3°C has been launched by HeiQ 4

A long, fibre-based lithium-ion battery that could be woven into fabrics is being developed by researchers at the Massachusetts Institute of Technology 10

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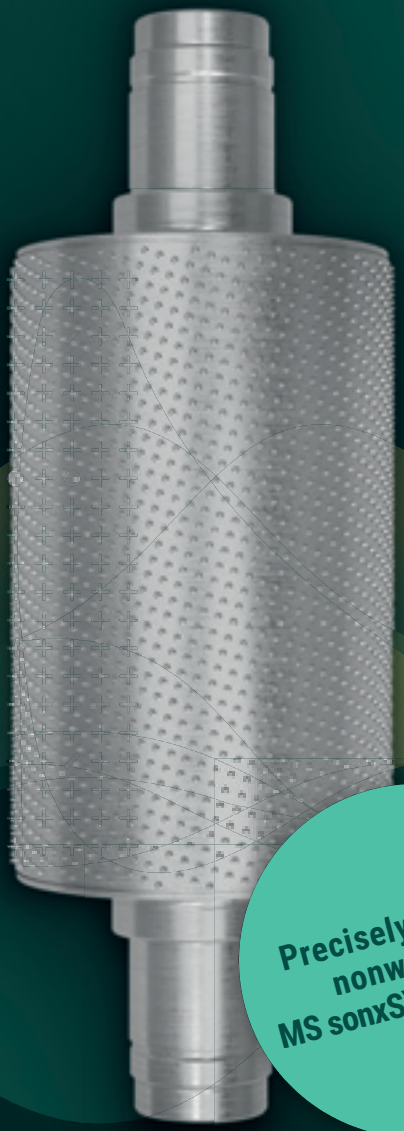

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