Technical TEXTILES international

Spring 2023
Volume 32, Number 1

Informing the industry worldwide

## Functional and sustainable contract fabrics on show at *Heimtextil*

## Hydrogen-storage to boost demand for carbon fibre

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Durable solar cells can be applied to fabrics

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Spring 2023
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# In the Editor's opinion

It looks set to be a very busy year of events for the technical textiles industry. At the beginning of 2022, the world tentatively started to open-up after over 18 months of lockdowns and disruption caused by the human coronavirus (covid-19) pandemic. At the beginning of 2023, it looks like we are back to business as usual.

*Domotex* (12–13 January; Hannover, Germany) and *Filtech* (14–16 February; Cologne, Germany) have both been held successfully. On 10–14 January, *Heimtextil* returned as a stand-alone event to Frankfurt, Germany, for the first time since 2020 (the 2022 show was co-located with *Techtextil* and *Texprocess* on 21–24 June). With 44 000 visitors and 2 400 exhibitors from 129 nations, organiser Messe Frankfurt describes the show as a great success. As Nonwovens Editor Adrian Wilson reports (see also, page 17), while many home textiles are chosen principally for their aesthetics and tactile properties, the event proved that, for the contract fabrics market, functionality and environmental sustainability are of equal importance.

The second quarter of the year promises to be equally hectic. On 18–21 April, Palexpo in Geneva, Switzerland, will welcome 550 exhibitors (see, for instance, page 7) for the triennial nonwovens exhibition *INDEX* (see also, page 15). The following week, on 25–27 April, the Paris Nord Villepinte exhibition centre in France will host approximately 1200 exhibitors and more than 36 000 visitors for composites exhibition *JEC World*. For clues to the key themes at this year's show, Editor James Bakewell, looks at one of the dominant topics at last year's show, starting on page 26. Then, on 10–12 May, *Techtextil* and *Texprocess North America* return to Atlanta, Georgia, USA. Ahead of the shows, US Correspondent John McCurry spoke with one of the exhibitors, Claros Technologies, about its ambitious plans for its durable zinc nanoparticle-based treatments that can be used to make antimicrobial, odour-resistant and ultraviolet (UV) radiation-shielding textiles (see also, page 23).

The *Technical Textiles International* team will be present at all three events and will bring you the latest news from them in the pages of the next issue of this magazine and on our sister website, Technical-Textiles.Net.

The main event of 2023 for machinery manufacturers will be *ITMA 2023*, which takes place in Milan, Italy, on 8–14 June (see also, page 13). The owner of the machinery show, the European Committee of Textile Machinery Manufacturers (CEMATEX) reports that exhibition space, comprising 220 000 $m^2$ of the Fiera Milano Rho exhibition centre in Italy, has sold-out. Over 1600 exhibitors from 44 countries will be present at the show. According to the President of CEMATEX, Ernesto Maurer, the exhibitors will focus on demonstrating the environmental sustainability of their technologies. He continues: "During the pandemic, many of our members channelled their resources into [research and development] R&D activities. *ITMA 2023* is perfectly timed to offer our exhibitors an opportunity to showcase these new products and cutting-edge technology."

The Summer issue of *Technical Textiles International* will feature an extensive preview of *ITMA 2023*. If you would likeyour company to be included, please email james@boughtonmedia.com before the end of March.

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***The Textile Matters display at Heimtextil addressed the concept of the circular economy over four enclosed display areas. Starting on page 17, Adrian Wilson reports on this and other exhibits at the show.***

***One of the many high-pressure gas-storage vessels on show at JEC World 2022. There will likely be many more at JEC World 2023, reports James Bakewell, starting on page 26.***

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

# Autoneum launches easy-to-recycle automotive carpet systems

*Autoneum's multilayered tufted and needlepunched carpet systems such as this are made entirely from polyester, making them easier to recycle than multimaterial systems.*

Multi-layered tufted and needlepunched carpet systems made entirely from polyester (PES), making them easier to recycle than multimaterial systems, are being developed for automotive applications by Autoneum of Winterthur, Switzerland.

The systems are based on Autoneum's existing technologies; the surface of the carpets, for example, can be made of the tufted nonwoven, Di-Light, while Hybrid-Acoustics PET can be used for the decoupler layer.

The company claims that Di-Light is more resilient and lighter in weight than its rivals. One of the most frequently made observations concerning needlepunched automotive carpets is that they are not as durable and abrasion-resistant as tufted carpets. However, for a given weight, Di-Light offers a higher abrasion-resistance compared with previous carpets, while providing a homogeneous appearance and texture. These improvements result from Autoneum's development of specialised polyethylene terephthalate (PET) fibres.

Moreover, depending on the specific product, Di-Light carpets can consist of up to 97% recycled PET, reducing the impact of their manufacture on the environment[1].

Lightweight and porous, Hybrid Acoustics materials are based on nonwoven felts or combinations of such felts and foams. By controlling the properties of the felt, Taylor says it is possible to tailor parts to give different acoustic properties appropriate to their location. Autoneum recently introduced a version of the material (Hybrid Acoustics PET) containing a significant proportion (up to 50%) of recycled fibres – cotton or PET.

Hybrid Acoustics PET could be used to enclose electric motors, reducing the noise heard from them and, in particular, attenuating the high-frequency sounds emitted by electric drive units.

Autoneum says that parts made from Hybrid-Acoustics PET are recyclable and, when compared with conventional acoustic insulators, are up to 40% lighter in weight[2].

Further, Autoneum has developed a back-coating (ABC) process that employs a thermoplastic adhesive rather than latex, meaning that the production of the needlepunched and tufted carpet systems consumes significantly less energy and no water at all.

While the interiors of end-of-life vehicles with internal combustion engines are usually shredded together with the rest of the body, making the reclamation of textile products such as carpets practically impossible, end-of-life electric vehicles (EVs) are often treated differently.

Since their batteries have to be removed in order to be recycled or disposed of properly, Autoneum says that demand for easy-to-dismantle products, especially carpets, for the interior of EVs is increasing. Such easily removable components not only facilitate access to the battery, but they can also be recycled individually.

Autoneum is currently developing a PES carpet system for an EV that will be available in Europe and Asia from a German original equipment manufacturer (OEM).

**See also:** [1]*Winning material combinations revealed during Index 17*, https://www.technical-textiles.net/node/73456

[2]*Autoneum expands range of acoustic insulation for electric vehicles*, https://www.technical-textiles.net/node/76794

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# Ahlstrom launches high-performance plasterboard

A range of plasterboards that are made from a combination of glass, and synthetic and natural fibres has been launched by Ahlstrom, which says that they demonstrate a number of useful properties, including good dimensional stability and durability.

According to the Helsinki, Finland-based company's Vice President, Nonwovens, Pierre Mary, plasterboards in the FibRoc Plasterboard range are resistant to fire and moisture, limiting the spread of flame and, in wet and humid environments, the proliferation of mould. They can also be made without formaldehyde and fluorocarbons, reducing their environmental impact.

The plasterboards will be manufactured at Ahlstrom's main Fibroc plants in Karhula, Finland, and Brignoud, France, as well as in Malmedy, Belgium, and Ställdalen, Sweden. Further, a new line for the manufacture of plasterboards will be started-up at Ahlstrom's plant in Madisonville, Kentucky, USA, within the next three-to-four months.

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# Microfilament fabric protects parts from electrostatic discharge

A microfilament fabric that protects automotive and industrial parts with electronic components from electrostatic discharge (ESD) and surface scratches during transport has been launched by Freudenberg Performance Materials (see also, page 11).

The company, of Weinheim, Germany, says that the fabric, called Evolon ESD, provides permanent protection to parts, such as trim lines, dashboards, mirrors and steering wheels, from electrostatic charging and discharging caused by movement and friction, and that its surface resistivity can be customised. Since damage to parts from ESD cannot be detected with the naked eye, the fabric could prevent failures that are only noticed after the final product is assembled and released. Manufacturers that use the textile should therefore get fewer complaints and will reduce their warranty costs.

Using Freudenberg's process for producing Evolon fabrics, bicomponent filaments are spun before being split to generate microfilaments and then hydroentangled using high-pressure water jets. Unlike staple fibres, filaments cannot release fibres or lint because they are virtually endless. At the same time, extremely fine microfilaments do not create micro-scratches on sensitive parts.

Evolon fabrics have a highly durable, soft and smooth surface that is scratch-resistant, breathable and completely lint-free, preventing damage to moulded plastic parts, delicate paint-work and highly complex components. Further, up to 85% of the polyethylene terephthalate (PET) from which the fabrics are made can be sourced from recycled material.

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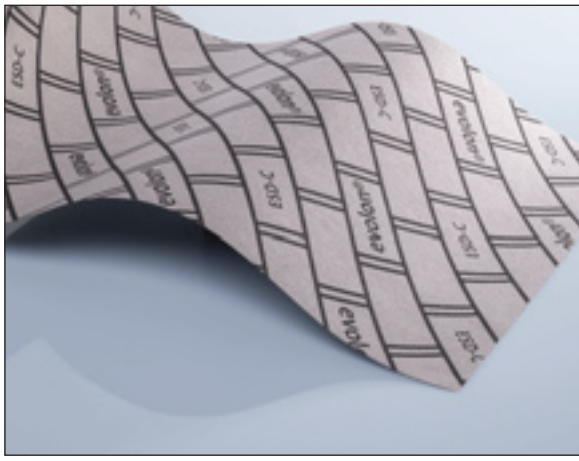


*Evolon ESD protects parts from both electrostatic discharge and surface-scratching during transit.*

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# Avgol highlights algae-based dyes for nonwovens at *Filtech*

Polyolefin-based fibres and meltblown fabrics dyed using products developed by Algaeing were showcased by Avgol at *Filtech* in Cologne, Germany, on 14–16 February 2023.

Algaeing, of Berlin, Germany, and Beit Yizhak, Israel, has developed an algae-based dye formulation that it says can be applied to fibres and fabrics, and is completely biodegradable. The company is able to produce a wide range of colours, many of which replicate those currently used for nonwovens, and adds that the dyes are skin-friendly and that their use reduces the consumption of water and fertilisers significantly compared with the use of conventional dyes.

Algaeing and Avgol, of Tel Aviv, Israel, have been working together since 2020[1] and have demonstrated the suitability of the dyes for application to fibres and nonwovens through proof-of-concept and prototyping programmes.

Avgol's Chief Executive Officer (CEO), Tommi Bjornman, says: "Following an extensive development path, the fibres both absorb and retain a range of colours – such as vibrant greens and blues – and that we can even deliver a 'heathered' appearance for a more natural-looking material, all without affecting the filtration, barrier-quality or feel of the final product."

Bjornman adds that the use of Algaeing's technology assists his company in its aim to produce materials that are more readily recyclable and biodegradable than conventional alternatives. He concludes: "Having an organic colourant that is fully biodegradable and has no negative impact when released into the environment if undergoing biodegradation, supports polyolefins as future-proof resins."

**See also:** [1]*Avgol and Algaeing to develop algae-based dyes for nonwovens*, https://www.technical-textiles.net/node/76229

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# Nonwovens Innovation & Research Institute upgrades spray-bonding equipment

The Nonwovens Innovation & Research Institute (NIRI) has upgraded its equipment for the application of bio-based binders to nonwovens as its customers look for ways to reduce or eliminate the presence of plastics in their products.

The company, of Leeds, UK, says that the equipment is specifically designed for the application of binders to both high- and low-loft fabrics, and features a dedicated spraying rig for both pilot-scale and continuous operation.

NIRI adds that the European Union (EU)'s Single Use Plastic Directive (SUPD) continues to have a significant impact on producers of nonwovens[1], particularly those in sectors such as: wipes, and sanitary and feminine hygiene products; general medical supplies and devices; packaging for such as the food and beverage industry. It believes that, as companies look to replace their single-use plastic products with plastic-free versions, the use of bio-based binders can help to bridge any gaps in performance that might arise. Such binders can: reduce linting and thereby improve the quality of products; increase softness and comfort; impart greater structural integrity and processability; improve aesthetic appearance; create better surface-functionality. NIRI adds that products developed using bio-based binder technology can be completely biodegradable and, potentially, entirely compostable.

NIRI's facilities allow for the pilot-scale application of binders by spraying, which enables the impregnation of the nonwoven to be controlled. This produces a uniform end-sample, meaning better quality-control and greater certainty of the feasibility of a prototype or end-product. A controlled spray-rate, together with flexibility of application-distance and dwell-time, allows for the optimisation of the impregnation/ bonding process.

The new equipment is designed to apply the binders through microdosing, using spray jet-streams running over a conveyor system. A transport conveyor supports and carries a substrate or medium, while a microdosing unit comprising up to three flat spray nozzles sits above the conveyor. A suction slot, in-line with the spray nozzles, runs under the conveyor. Thus, samples are belt-fed through the spraying rig where the spray-applicators apply the binder formulation to the unbonded web.

Once sprayed, the web is then fed into a through-air oven to consolidate the fabric, and additives can also be used to impart specific functional properties to the final fabric.

Compared with alternative processes, such as submerging or padding, NIRI says that the spray-bonding technique has several benefits, not least improved product-performance and greater environmental sustainability. The technique consumes lower quantities of binder and water, and less energy is needed during heating and drying.

NIRI's Chief Commercial Officer (CCO), Ross Ward, concludes: "While single-use plastic is high-profile as an issue to be addressed - albeit a complex one that may not be solved overnight - more durable products will, undoubtedly, come under increased scrutiny. We are already working with clients who are using our upgraded spray-bonding facilities to develop novel products, and this can only be good for the commercially and environmentally viable future of product development across a wide range of sectors."

**See also:** [1]*Technical Textiles International*, Spring 2022, *The challenge of going plastic-free in the midst of a pandemic*, page 11; https://www.technical-textiles.net/node/76653

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# Hydroentanglement technologies from Autefa Solutions at *INDEX*

*Autefa Solutions' Futura card and V-Jet injector.*

Autefa Solutions is to showcase its latest technologies for the forming and hydroentanglement of fibrous webs, and the drying of the resultant nonwovens, at *INDEX* in Geneva, Switzerland, on 18–21 April 2023.

The company, of Friedberg, Germany, will tell visitors to its stand that its injection card enables the formation of webs at very high speeds, while minimising the stresses applied to the constituent fibres. Autefa's Crosslapper Topliner CL4006 SL, meanwhile, ensures the homogeneity of the webs.

Autefa Solutions will also show a card (Futura) for high-speed production. The card is mounted on high-precision linear bearings to ensure that all its rollers return to the same position after opening. The different parts of the card – feeding group, first main cylinder, transfer group and doffers – are each placed on separate carriages connected to one another by a single screw on each side. This design allows for easy and full access during cleaning and maintenance.

Autefa Solutions' injector (V-Jet) for hydroentanglement processes will also be shown. The V-Jet injector has had the distance between the nozzle and the injector bottom reduced from the conventional 15–25 mm to 0.5 mm, decreasing energy losses generated by friction with the air, air turbulence and jet expansion. This enables a 20% reduction in the water pressure needed to produce a fabric demonstrating a given tensile strength—yielding overall energy savings of 30%.

Autefa Solution's Square Drum Dryer SQV, which, according to the company, demonstrates the efficiency of a horizontal belt dryer and the small footprint of a drum dryer, will also be highlighted. The company adds that the dryer consumes 30% less energy than conventional systems used to dry hydroentangled webs.

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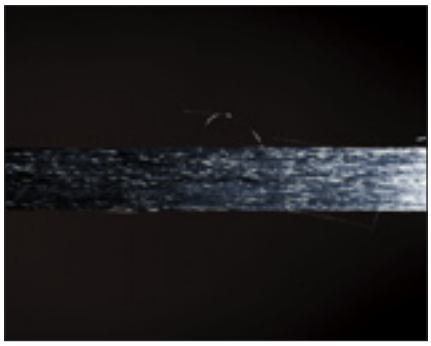
# Stretch-broken carbon fibres enable highly formable composites



*A stretch-broken tow of carbon fibre.*

An efficient method for making stretch-broken tows of carbon fibre that enable the production of more formable composites is being developed by researchers at Montana State University (MSU) in Bozeman, USA.

The tows are stretch-broken by feeding them through differentially driven rollers, which "stretch" their constituent fibres until they fail at flaws in them. While composites made from conventional carbon fibres can be difficult to form into complex moulds owing to their in-plane strength and brittleness, those made from stretch-broken tows conform to deep-drawn shapes and sharp radii more readily, as the broken fibres are able to slide past one another in the matrix as heat and pressure is applied. This means that simpler equipment can be used to manufacture composites made using stretch-broken tows.

According to MSU Professor of Mechanical and Industrial Engineering, Douglas Cairns, the composites being created by his team are about eight times more formable than conventional alternatives, while demonstrating roughly the same strength. He adds: "Because it is so much easier to form, we are conservatively estimating that we can lower the manufacturing costs by a factor of four". The work has been ongoing for the past four years and is being funded through contracts from the US Army worth US$25.8 million.

The idea of stretch-breaking tows is not new; US companies Hexcel, of Stamford, Connecticut, and DuPont, of Wilmington, Delaware, have conducted extensive research into the technology since the 1980s. Both companies have ceased this work, however, because limitations in manufacturing technology made the production of consistent stretch-broken tows very difficult.

Working with nearly two-dozen Montana companies to help with design and machining, the MSU team developed a stretch-breaking tool called the Bobcat Head. As tows are passed through a series of rollers, a precise force is applied to break the fibres where there are nicks and other imperfections. Only about 2% of the fibres are broken across a given area, Cairns notes.

The next step, according to Cairns, is to scale-up the stretch-breaking machine for a pilot demonstration of how it could be used in manufacturing, which would pave the way for licensing the technology to companies that produce both military and civilian aircraft.

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# Funding for demonstration plant for production of bio-based acrylonitrile

The developer of a process for the production of bio-based acrylonitrile (ACN), Trillium Renewable Chemicals, has secured funding from investors and the US Department of Energy (DoE)'s Advanced Manufacturing Office to commercialise its technology.

ACN is a precursor for carbon fibre and is typically made from petroleum-based feedstocks, such as propylene, before being polymerised into polyacrylonitrile (PAN) and spun. Trillium, of Knoxville, Tennessee, USA, has developed methods for the production of ACN from such as xylose, glucose and glycerol harvested from wood-based biomass.

Trillium and its development partner, Mid-Atlantic Technology, Research and Innovation Center (MATRIC), are currently operating a pilot plant in Charleston, West Virginia, USA. The US$2.5 million that Trillium has received from the Advanced Manufacturing Office, together with the US$10.6 million received from investors through a round of Series-A financing, will allow it and MATRIC to design, build and operate a market-demonstration unit. Trillium will provide the resulting product to Solvay, of Brussels, Belgium, for validation[1]. Solvay will also conduct a lifecycle analysis on Trillium's product.

Trillium was established in April 2021 to commercialise technology developed at the Southern Research Institute, of Birmingham, Alabama, by Amit Goyal and colleagues[2]. A Patent protecting the technology was issued in 2017[3].

Trillium says that its process has numerous advantages over conventional approaches for the production of ACN. The production of ACN from propylene emits significant amounts of heat and produces large quantities of hydrogen cyanide. The company claims that its process, by contrast, generates one-third of the heat and no hydrogen cyanide. It adds that, unlike propylene feedstocks, the raw materials that it uses are widely available around the world and their prices are much less volatile. The use of such feedstocks opens-up markets and allows production to be based in locations that are 100% reliant on imports. Finally, the six-million tonnes of ACN produced each year from fossil fuels create 12 Mt of greenhouse gas emissions; Trillium claims that the carbon footprint of its process is 75% smaller.

**See also:** [1]*Partnership to develop bio-based carbon fibre*, https://www.technical-textiles.net/node/76562

[2]*Funding boost in search for biobased precursors for carbon fibre*, https://www.technical-textiles.net/node/52387

[3]US Patent US9708249B1, *Compositions and methods related to the production of acrylonitrile;* Applicant: Southern Research Institute; Inventors: Amit Goyal and Jadid Samad.

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# Tool for cutting dry-fibre thermoplastic materials wins award

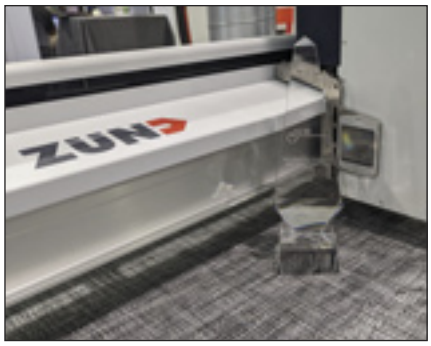
A tool developed by Zünd, of Altstätten, Switzerland, that facilitates the processing and handling of dry-fibre materials with thermoplastic content has been recognised with an award at the *Composites and Advanced Materials Expo (CAMX)*.

Zünd says that its launch of the tool, called the Heat Sealing Module (HSM), is its response to increasing demand in the composites industry for technologies that make reinforced thermoplastics easier to process.

During cutting, dry-fibre materials are prone to fraying along their edges. When mounted on a Zünd digital cutter, the HSM uses hot air to heat-seal the perimeter of a part prior to cutting. Zünd software directs the module over the dry-fibre material, sealing the fibres around the part edges. A high-performance power rotary tool (PRT) then cuts the material in full, without leaving uncut or loose fibres behind.

The HSM helps create clean, sealed edges when cutting fibre-reinforced thermoplastic. Zünd says that this not only makes the cutting process more efficient, but also the other production processes downstream. It maintains a clean cutting surface and reduces contamination of the production environment. At the same time, it ensures that cut parts maintain their shape and this increased stability makes them much easier to handle, especially in fully automated production workflows.

At *CAMX 2022*, which took place in Anaheim, California, USA, on 17–20 October, the American Composites Manufacturing Association (ACMA) proclaimed the HSM the winner of the *ACE Award for Unsurpassed Innovation in the Manufacturing: Equipment and Tooling* category. This award is presented annually to developers of equipment, tooling, a production aid or software designed to improve the production, environmental sustainability or quality and performance of composites.




*Zünd's Heat Sealing Module, which uses hot air to heat-seal the cutting path of a reinforced thermoplastic part prior to cutting.*

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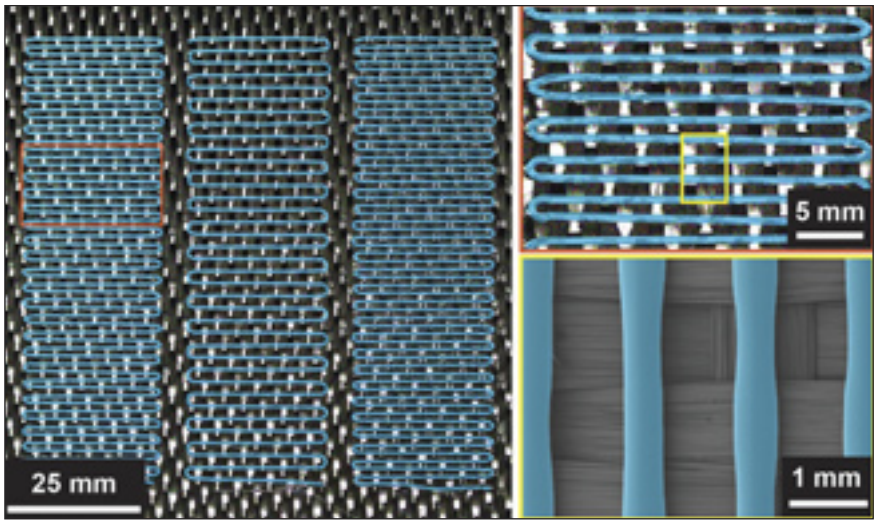
# Technology overcomes challenges to making self-healing composites




*A pattern of thermoplastic healing agent three-dimensionally printed onto a carbon-fibre composite. When melted, the agent enables the composite to repair itself in situ.*

Composites that can repair themselves *in situ* are being developed by researchers at North Carolina State University (NCSU), in Raleigh, USA, who say that the technology could extend significantly the lifespan of structural components such as wind-turbine blades and aeroplane wings.

According to the researchers, the technology they have developed solves two practical problems with existing self-repairing composites. First, they often need to be removed from service to be, for instance, heated in an oven, which is impractical if the part in question is large or is in use. Second, many self-repairing composites only work for a limited period of time. An Assistant Professor of Civil, Construction and Environmental Engineering at NCSU, Jason Patrick, explains: "For example, the material might be able to heal a few times, after which its self-repairing properties would significantly diminish. We have come-up with an approach that addresses both of those challenges in a meaningful way, while retaining the strength and other performance characteristics of structural fibre [reinforced]-composites."

The technology developed by the researchers is designed to prevent composites from delaminating. The researchers three-dimensionally (3D) print a pattern of thermoplastic healing agent (polyethylene-co-methacrylic acid) onto the fabrics reinforcing the composite and embed thin "heater" layers in the composite. The heater layers comprise a network of conductive carbon whiskers (of approximately 10 µm in diameter) suspended within an adhesive layer and sandwiched between layers of dielectric glass fibre. When an electrical current is applied, the heater layers warm-up. This, in turn, melts the healing agent, which flows into any cracks or microfractures within the composite and repairs them. Patrick says: "We have found that this process can be repeated at least 100 times while maintaining the effectiveness of the self-healing. We do not know what the upper limit is, if there is one."

The researchers also claim that the printed thermoplastic enhances inherent resistance of a composite to fracture by up to 500%, meaning it requires more energy to cause delamination in the first place. Further, the healing agent and heater layers are all made of readily available materials, and are relatively inexpensive. Patrick adds: "While making composites that incorporate our design would be marginally more expensive, the cost would be more than offset by significantly extending the lifespan of the material."

Another advantage of the new technology is that, if incorporated into aircraft wings, the internal heating elements would allow airlines to stop using chemical agents to remove ice from wings when aircraft are on the ground, and also to de-ice them in flight.

Patrick concludes: "We have demonstrated that this multi-functional technology works. We are now looking for government and industry partners to help us tailor these polymer-based composites for use in specific applications."

**See also:** *Nature Communications, Prolonged in situ self-healing in structural composites via thermo-reversible entanglement*, https://doi.org/10.1038/s41467-022-33936-z

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# Recycler of carbon fibre secures €34 million in funding

The developer of what it describes as a "virtuous" process for recycling carbon fibre-reinforced plastics (CFRPs), Fairmat of Paris, France, has secured €34 million in funding.

Through an oversubscribed Series-A funding round, the company has won financial backing from a range of institutional and private investors. Typically, companies that have gone through seed- and Series-A funding rounds have already developed substantial user bases and have proved to investors that they are prepared for success on a larger scale.

The company will use the funds to accelerate developments at its new automated sorting plant, which will house over one-hundred robots and be able to process up to 3.5 kt of scrap each year. Further, the company will be expanding internationally, starting with in the USA in 2023, and Spain and Germany soon after. As part of this expansion, Fairmat will also increase its global team from 80 people in 2022 to 400 people by 2025.

***Alexandra Pelissero, Communications, Fairmat.***
***Email: alexandra@fairmat.tech;***
***https://www.fairmat.tech***

# Freudenberg Performance Materials to showcase products at *JEC World*

Surfacing veils and core materials for the manufacture of lightweight fibre-reinforced plastic (FRP) parts will be presented by Freudenberg Performance Materials (see also, page 5) at *JEC World*. The company, of Weinheim, Germany, will also be showing flow media and spacers (parts of its Enka Solutions range) for efficient vacuum-infusion, resin-transfer and foam-injection moulding processes.

Freudenberg produces a variety of glass, polyacrylonitrile (PAN) and polyethylene terephthalate (PET) nonwoven surfacing veils that improve the resistance of composite parts to abrasion and corrosion, impart smooth surfaces to them and increase their mechanical strength. The resulting parts could be used, for instance, as anti-corrosion coatings for pipes and tanks, and smooth, ultraviolet (UV) radiation-resistant surfaces for façade panels.

Products in the Enka Solutions range, meanwhile, are characterised by their three-dimensional (3D) entangled polymer-filament structures. This structure makes them suitable for use as flow media and spacers for the production of composite parts using vacuum-assisted resin-transfer moulding (VARTM), structural reaction injection-moulding (SRIM) and foam-moulding processes. The media enable the high-speed and reliable flow of resins and foams through the composite part. When used as a spacer in foam injection-moulding processes, for instance, the media push the reinforcement matting and the composite skin against the mould and hold them in place during the process, allowing for the glass fibre and skin to be fully wetted-out.

*JEC World* takes place in Paris, France, on 25–27 April 2023.

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*Enka Solutions products are suitable for use as flow media and spacers for the production of composite parts using vacuum-assisted resin-transfer moulding.*

***Katrin Böttcher, Manager Global Communications, Freudenberg Performance Materials.***
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# Partners use flax-fibre reinforcements to produce racing yacht


*Crosscall won the Class40 World Championships in June 2022.*

Fibres, fabrics, epoxy resins and adhesives from Sicomin have been used by Grand Largue Composites (GLC) to construct the first Class40 racing yacht to feature a significant quantity of flax-fibre reinforcements.

The yacht, called Crosscall, won the Class40 World Championships in June 2022 and is a prototype of the new Lift V2 design by naval architect Marc Lombard.

Class40 is one of the most competitive fleets in yacht racing. The hulls of Class40 yachts must be light in weight, strong and stiff, and durable in the most extreme of conditions. Further, to keep costs down, they cannot be reinforced with carbon fibres. The quality and reliability of the resins used for the infusion and lamination of the hulls are therefore of paramount importance.

Owner of Crosscall, Aurelien Ducroz, was keen to use as much flax as possible in the construction of the yacht, but Lombard – who had to certify and warranty the structure of the boat for use in ocean racing – was more cautious. A compromise therefore had to be reached.

Crosscall's cockpit was designed to be effectively non-structural, with the mainsheet, which can generate huge shock loads, supported separately. This would allow the cockpit to be made from a hybrid biaxial fabric comprising 50% flax fibres. Other parts of the boat that incorporate flax fibre include the tunnel, the engine cover, the ballast tanks and the cap. The rest of the boat is reinforced with glass-fibre fabrics.

To help it realise this ambitious design, GLC, of Mondeville, France, turned to its long-time material supplier and compatriot, Sicomin, of Chateauneuf les Martigues.

The hull was moulded and infused in one piece and the deck – including the hybrid flax-fibre cockpit – was also infused as a single part. The internal structure was then laminated into the hull by hand before the hull and deck were finally bonded together.

The infusion resin was Sicomin's SR 1710, a high-modulus structural epoxy. Designed specifically for use in infusion and injection processes, it has a low viscosity and its low-reactivity hardener makes it suitable for the production of large parts.

Sicomin says that composite components made from SR 1710 possess high inter-laminar shear-strength and the resin retains its mechanical properties in wet environments.

Sicomin's low-toxicity SR 8200 was used to laminate the internal structures onto the skin of the hull. Suitable for hand-laminating, this system includes a choice of hardeners with a wide range of reactivities, which means that it can be used for making large or small parts.

The hull and deck were joined together using Sicomin's Isobond SR 7100, which demonstrates high fatigue-strength and is resistant to microcracking, according to the company.

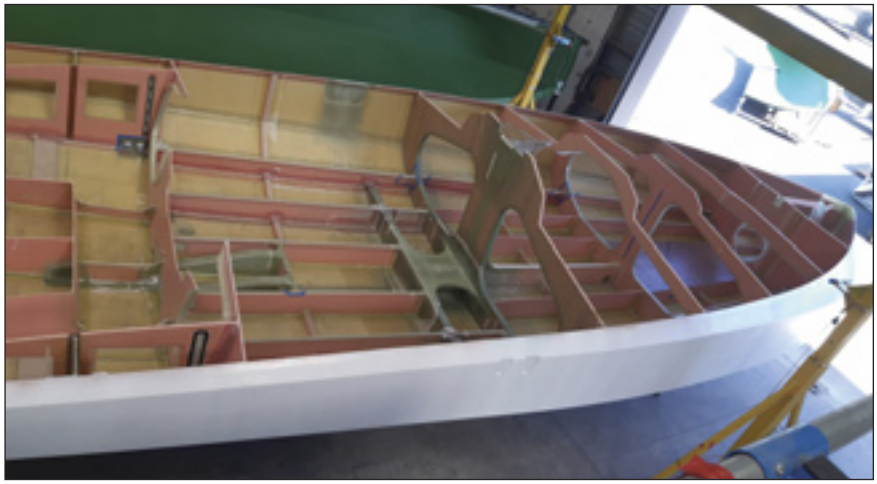
An epoxy bonding primer – called Undercoat EP 215 HB+ and supplied by Sicomin's sister company, Map Yachting, of La Ciotat, France – was applied to the moulds first to make demoulding easier.

The primer also serves as an undercoat in the polyurethane (PU) exterior paint system that is used instead of gelcoat to protect the epoxy hull from UV damage.

Since the launch of Crosscall, GLC has started building a second Lift V2 Class40 and a third one is now planned, for both of which Sicomin will supply the materials.

***Grand Largue Composites. https://www.linkedin.com/company/grand-largue-composites***

***Marc Denjean, Export Manager, Sicomin. Tel: +33 (4) 4242-3020. Email: marc.denjean@sicomin.com; http://www.sicomin.com***



*Crosscall's hull was moulded and infused in one piece, and the deck – including the hybrid flax-fibre cockpit – was also infused as a single part. The internal structure was then laminated into the hull by hand before the hull and deck were finally bonded together.*

# Asahi Kasei develops technology for recycling continuous carbon fibre

A method for reclaiming continuous carbon fibres from end-of-life composites is being developed by Asahi Kasei and its partners in Japan.

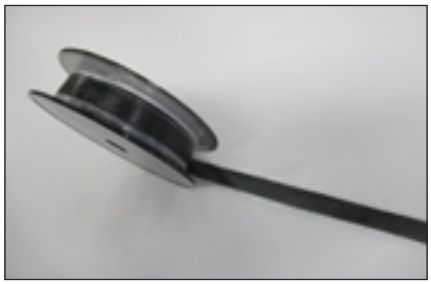
The company, of Tokyo, says that conventional methods for recycling carbon fibre-reinforced plastics (CFRPs) yield chopped carbon fibres, the mechanical performance of which is poorer than that of the original, continuous carbon fibres. By contrast, the technology being developed by Asaha Kasei through the Circular economy program for the automotive carbon fiber project will enable the creation of a closed-loop recycling system, where recovered fibres maintain the properties of their virgin counterparts. The other partners on the project are the National Institute of Technology in Tokyo, Kitakyushu College in Kyushu and the Tokyo University of Science.

The electrolysed-sulfuric-acid method being developed through the project exploits oxidative active species generated by electrolysing sulfuric acid to decompose the resin elements of CFRPs in order to extract the carbon fibre reinforcements. Asaha Kasei claims that the process can decompose any kind of resin and does not affect the strength of the recovered continuous carbon fibres.

The partners on the project have tested the process by recycling CFRP gas cylinders used in scuba diving. The fibres recovered did not exhibit any twisting or fluffing, and could be used in the filament-winding of new gas cylinders.

Asahi Kasei is also developing a tape made from its polyamide (PA, Leona) reinforced with the recycled, continuous carbon fibres, which it says could be useful in the production of structural and non-structural parts for cars.

The company plans to commercialise the process in around 2030.



*A tape made by Asaha Kasei from its Leona polyamide and recycled continuous carbon fibres.*

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***http://www.asahi-kasei.co.jp***

# Hyosung Advanced Materials develops ultra-strong carbon fibre

An ultra-high-tensile-strength carbon fibre has been developed by Hyosung Advanced Materials, of Seoul, South Korea.

Called H3065 (T-1000), the fibre demonstrates a tensile strength of at least 6.4 GPa and a Young's (tensile) modulus of 295 GPa. Chairman of the Hyosung Group, Cho Hyun-joon, says that the development of the fibre "has made Korea the third country to develop ultra-high-tensile[-strength] carbon fibre after the USA and Japan, and it will contribute greatly to the development of the country's carbon fibre industry."

Hyosung Advanced Materials is now working to commercialise H3065 as it looks to capitalise on the growing market for carbon fibre. According to the Fuji Economic Research Institute of Japan, the global market for polyacrylonitrile (PAN)-based carbon fibre will grow by 10% a year on average until 2035, from 85.7 kt in 2021 to 327.4 kt. In 2021, the majority of carbon fibre was used in wind-turbine blades (39%), followed by applications in aerospace (15%), sports and leisure (12%) and transportation (7%).

Hyosung Advanced Materials became the first company to produce carbon fibre in South Korea when its plant in JeonJu was started-up in May 2013. The company is in the process of investing KRW1 trillion (approximately €752 million) in the construction of the world's largest factory for the production of carbon fibre in JeonJu[(1)]. With the investment, the company will increase the annual production capacity for the strong, stiff and lightweight fibre at JeonJu from 2 kt (on one line) to 24 kt (on ten lines). At present, it is carrying-out phase 3 of this expansion, from 6.5 kt to 9 kt a year. Hyosung plans to install the balance of the new lines by 2028.

**See also:** [(1)]*Largest carbon fibre plant in the world to be built by Hyosung*, https://www.technical-textiles.net/node/75089

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***http://www.hyosungadvancedmaterials.com***

# Factories to recycle composite turbine blades

A Denmark-based company is planning to build six industrial-scale factories for the recycling of wind-turbine blades, the first of which will be in Esbjerg, Denmark, and will be operational by the end of 2024.

Continuum, which is backed by investments from the Danish venture capital firm Climentum Capital, of Copenhagen, and a grant from the UK's Offshore Wind Growth Partnership (OWGP), says that its second factory will be opened in the UK. The company plans to open further factories in France, Germany, Spain and Turkey by 2030. Each factory will have the capacity to recycle a minimum of 36 kt of end-of-life turbine blades per year and will be powered only by renewable energy.

Continuum plans to organise the transport of end-of-life composites products and manufacturing waste to its factory according to its clients' needs. Using a number of processes, it will then mechanically transform and separate the waste into their constituent materials.

The factories will have optical systems to sort-out carbon-fibre materials. All ferrous and non-ferrous metals, as well as any pollutants, will be separated and sent for further recycling. Among other materials, the processes yield glass and carbon fibres of under 20 mm in length.

The company says it will be in a position to start collecting end-of-life turbine blades by the end of 2023, preventing them from being sent to landfill or recycled via co-processing in cement factories.

The resulting material will be turned into composite panels for the construction industry and use in the manufacture of day-to-day products such as facades, industrial doors and kitchen countertops. The Chief Executive Officer (CEO) of Continuum, Nicolas Derrien, says: "As a society, we are rightly focused on renewable energy production, but what to do with wind-turbine blades at end-of-life has not been effectively addressed. We are changing that by offering a recycling solution for the blades and a construction product that will outperform most other existing construction materials and be infinitely recyclable."

**See also:** *Technical Textiles International*, Spring 2021, *The race to develop methods for recycling wind-turbine blades,* page 11; https://www.technical-textiles.net/node/76118

***Continuum.***
***Email: hello@continuum.earth;***
***https://www.continuum.earth***

## Automated system detects defects in carbon fibre

A camera system and related software that automatically detects defects in carbon fibres as they are being produced is being developed by a researcher at the Institute for Textile Technology (ITA) at RWTH Aachen University in Germany. ITA says that the system eliminates the need to inspect carbon fibres for defects manually and could therefore reduce costs associated with their manufacture.

During the production of carbon fibres, up to 300 individual filaments have to be monitored simultaneously. If carbon fibres break, it costs time and money to remove them. A bachelor's graduate at ITA, Deniz Sinan Yesilyurt, is working to solve this problem by fitting a carbon-fibre line with a camera that takes pictures of various fibre defects during production and stores them in a database. Software built into the camera evaluates the defects by assigning the images it has collected to predefined reference defects. By doing so, it can recognise various fibre defects with an accuracy of 99%.

***Christoph Greb, Scientific Director, Institute for Textile Technology, RWTH Aachen University.***
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***https://www.ita.rwth-aachen.de***

# Elastic superabsorbent material unveiled by Freudenberg at *Compamed*

An elastic, flexible superabsorbant material for the production of comfortable, long-lasting wound dressings was shown for the first time at *Compamed* by Freudenberg Performance Materials.

Freudenberg, of Weinheim, Germany, says that, unlike its competitors, it does not need to perforate or slit the superabsorbent material in order to make it elastic, meaning that the elasticity it demonstrates is highly consistent. Further, it says that the super-absorbent fibres that make-up the material are more uniformly bonded, ensuring its integrity.

*Compamed* took place in Düsseldorf, Germany, on 14–17 November 2022. Freudenberg used the exhibition to show a number of products, including a bio-based wound pad (M 1714), polyurethane (PU) foams with directly applied silicone adhesives and an innovative hydrophilic debridement foam.

Its M 1714 material is for the production of plasters for application to challenging wounds, demonstrates high absorption, comprises a mixture of bio-based fibres and features a smooth wound-contact layer. It is biodegradable when tested according to European Standard EN 13432[(1)].

Freudenberg's silicone-coated foams, which it claims demonstrate all the advantages of pure foam dressings without a silicone layer, such as free swelling and the prevention of exudate pooling in the wound bed, while eliminating the disadvantages of solutions that have standard silicone adhesive layers. They are simpler to produce, for instance—reducing waste, saving energy and streamlining the supply chain. The company will show prototype bordered dressings featuring this technology, and a variant with an extra-strong silicone border that enables it to be worn for longer time, thus reducing waste.

Finally, the hydrophilic debridement foam, owing to its softness and flexibility, is suitable for cleaning deep and hard-to-reach wounds. Owing to its large pores, the foam also easily picks-up fibrin coatings and dried exudate, and does not shed fibres in the wound. Finally, it can be applied at lower pressures than conventional alternatives, making it more comfortable for the patient.

**See also:** [(1)]EN 13432, *Requirements for packaging recoverable through composting and biodegradation - Test scheme and evaluation criteria for the final acceptance of packaging*, https://www.en-standard.eu

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# Events diary

## March 2023

### Introduction to Textiles
21–23 March 2023
Manchester, UK
Robyn Ingham, Events Coordinator, The Textiles Institute;
Tel: +44 (161) 237-1188
ringham@textileinst.org.uk;
https://www.textileinstitute.org

### Intertextile Shanghai Apparel Fabrics
28–30 March 2023
Shanghai, China
Rita Li, Messe Frankfurt (HK) Ltd;
Tel: +852 223-9966;
Fax: +852 2598-8771;
rita.li@hongkong.messefrankfurt.com;
https://intertextilehome.hk.messefrankfurt.com/china/en.html

### Intertextile Shanghai Home Textiles Spring Edition
28–30 March 2023
Shanghai, China
Rita Li, Messe Frankfurt (HK) Ltd;
Tel: +852 223-9966;
Fax: +852 2598-8771;
rita.li@hongkong.messefrankfurt.com;
https://intertextilehome.hk.messefrankfurt.com/china/en.html

### Yarn Expo
28–30 March 2023
Shanghai, China
Rita Li, Messe Frankfurt (HK) Ltd;
Tel: +852 223-9966;
Fax: +852 2598-8771;
rita.li@hongkong.messefrankfurt.com;
https://intertextilehome.hk.messefrankfurt.com/china/en.html

## April 2023

### INDEX 23
**18–21 April 2023**
**Geneva, Switzerland**
**Magali Fakhry Dufresne, Palexpo SA;**
**Tel: +41 (22) 761-1061**
**index@palexpo.ch;**
**https://www.indexnonwovens.com**
**See also, page 15**

### JEC World
25–27 April 2023
Paris, France and online
Farah Boudjemia, JEC Composites;
Tel: +33 (1) 5836-4399;
Fax: +33 (1) 5836-1513;
boudjemia@jeccomposites.com;
http://www.jeccomposites.com

## May 2023

### Absorbent Hygiene Products
3–4 May 2023
Brussels, Belgium
Anaëlle Schütz, EDANA;
Tel: +32 (2) 740-1811
anaelle.schutz@edana.org;
https://www.edana.org/trainings/online-nonwoven-training/online-absorbent-hygiene-training-course

### Inkjet Development Conference 2023
10–11 May 2023
Hamburg, Germany
Tim Phillips, Managing Director, IMI Europe Ltd;
Tel: +44 (1223) 236920
tim@imieurope.com;
https://imieurope.com/events/2023/5/10/inkjet-development-conference-2023

### Techtextil North America
10–13 May 2023
Atlanta, Georgia, USA
Kristy Meade, Show Director, Messe Frankfurt Inc;
Tel: +1 (770) 984-8016, x 2428;
Fax: +1 (770) 984-8023;
kristy.meade@usa.messefrankfurt.com;
https://techtextil-north-america.us.messefrankfurt.com

### Texprocess Americas
10–13 May 2023
Atlanta, Georgia, USA
Kristy Meade, Show Director, Messe Frankfurt Inc;
Tel: +1 (770) 984-8016, x 2428;
Fax: +1 (770) 984-8023;
kristy.meade@usa.messefrankfurt.com;
https://texprocess-americas.us.messefrankfurt.com/atlanta/en.html

### FESPA Global Print Expo
23–26 May 2023
Munich, Germany
Leighona Aris, FESPA;
Tel: +44 (1737) 228160
Leighona.Aris@Fespa.com;
www.fespa.com

### GO Carbon Fibre
30–31 May 2023
Hamburg, Germany
Ellie Baker, Smithers;
Tel: +44 (1372) 802291
ebaker@smithers.com;
https://www.gocarbonfibre.com

## June 2023

### Outdoor by ISPO
4–6 June 2023
Munich, Germany
Sabine Wagner, ISPO;
Tel: +49 (89) 949-20802
sabine.wagner@messe-muenchen.de;
https://www.ispo.com

### Aircraft Interiors Expo
6–8 June 2023
Hamburg, Germany
Polly Magraw, Reed Exhibitions Ltd;
Tel: +44 (20) 8271-2174
polly.magraw@rxglobal.com;
https://www.aircraftinteriorsexpo.com

### GO Wipes Europe
7 June 2023
Online
Ellie Baker, Smithers;
Tel: +44 (1372) 802291
ebaker@smithers.com;
https://www.go-wipes.com

### ITMA
**8–14 June 2023**
**Milan, Italy**
**ITMA Services;**
**Tel: +65 6849-9368**
**info@itma.com;**
**https://itma.com**
**See also, page 13**

### The Global Digital Textile Conference
10 June 2023
Milan, Italy
World Textile Information Network;
Tel: +44 (113) 819-8155
info@wtin.com;
https://gdtc.wtin.com

## July 2023

### Nanotexnology
1–8 July 2023
Thessaloniki, Greece
Stergios Logothetidis, Chair, Nanotexnology;
Tel: +30 (231) 099-8174
info@nanotexnology.com;
https://www.nanotexnology.com

### The Textile Institute World Conference
3–6 July 2023
Huddersfield, UK
Robyn Ingham,Events Coordinator, The Textiles Institute;
Tel: +44 (161) 237-118
ringham@textileinst.org.uk;
https//www.textileinstitute.org

### World of Wipes
17–20 July 2023
Atlanta, Georgia, USA
MIsty Ayers, Marketing Coordinator, INDA (Association of the Nonwoven Fabrics Industry);
Tel: +1 (919) 459-3712
mayers@inda.org;
https://www.worldofwipes.org

### International Conference on Composite Materials (ICCM)
30 July–4 August 2023
Belfast, UK
Kristen Scully, Administrative Assistant,

University of Delaware Center for Composite Materials;
Tel: +1 (302) 831-8149;
Fax: +1 (302) 831-8525;
Kscully@udel.edu;
https://iccm23.org

## August 2023

### Intertextile Shanghai Home Textiles
16–18 August 2023
Shanghai, China
Rita Li, Messe Frankfurt (HK) Ltd;
Tel: +852 223-9966;
Fax: +852 2598-8771;
rita.li@hongkong.messefrankfurt.com;
https://intertextilehome.hk.messefrankfurt.com/china/en.html

### FESPA Mexico
17–19 August 2023
Mexico City, Mexico
Leighona Aris, FESPA;
Tel: +44 (1737) 228160
Leighona.Aris@Fespa.com;
https://www.fespa.com

## September 2023

### International Composites Summit
6–7 September 2023
Milton Keynes, UK
Composites UK;
Tel: +44 (1442) 817502
info@fpcc-conference.com;
https://compositesuk.co.uk/events/international-composites-summit

### Research, Innovation and Science for Engineered Fabrics (RISE) 2023
12–13 September 2023
Raleigh, North Calrolina, USA
MIsty Ayers, Marketing Coordinator, INDA (Association of the Nonwoven Fabrics Industry);
Tel: +1 (919) 459-3712
mayers@inda.org;
https://www.riseconf.net

### Textile Discovery Summit
12–14 September 2023
Greenville, South Carolina, USA
Kim Nicholson, AATCC;
Tel: +1 (919) 549-8141
education-dept@aatcc.org;
https://aatcc.org/events

### Dornbirn Global Fiber Congress
13–15 September 2023
Dornbirn, Austria
Dornbirn Global Fiber Congress Office;
Tel: +43 (1) 319-2909-41;
Fax: +43 (1) 319-2909-31;
office@dornbirn-gfc.com;
http://www.dornbirn-gfc.com

### The Emergency Services Show
19–20 September 2022
Birmingham, UK
David Brown, Event Director, Nineteen Group;
Tel: +44 (20) 8947-9177
dbrown@nineteengroup.com;
https://www.emergencyuk.com

### CINTE Techtextil China
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Jason Taylor, Messe Frankfurt (HK) Ltd;
Tel: +852 2230-9296;
Fax: +852 2598-7919;
jason.taylor@hongkong.messefrankfurt.com;
https://cinte-techtextil-china.hk.messefrankfurt.com/shanghai/en.html

## October 2023

### Performance Days
4–5 October 2023
Munich, Germany
Design and Development GmbH Textile Consult;
Tel: +49 (89) 9394-6060
info@performancedays.com;
https://www.performancedays.com

### FiltXPO
10–12 October 2023
Chicago, Illinois, USA
Lori Reynolds, Director of Events, INDA (Association of the Nonwoven Fabrics Industry);
Tel: +1 (919) 459-3716;
Fax: +1 (919) 459-3701;
lori@filtxpo.com;
https://www.filtxpo.com

### Outlook
18–20 October 2023
Algarve, Portugal
Delphine Rens, Marketing and Communications Coordinator, EDANA;
Tel: +32 (2) 740-1822;
Fax: +32 (2) 733-3518;
delphine.rens@edana.org;
https://www.edana.org/events/outlook/outlook-2022

## November 2023

### Advanced Engineering
1–2 November 2023
Birmingham, UK
Alison Willis, Divisional Director, Easy Fairs;
Tel: +44 (20) 3196-4303
alison.willis@easyfairs.com;
https://www.advancedengineeringuk.com

### Advanced Textiles Expo
1–3 November 2023
Orlando, Florida, USA
Amy Collins, Advanced Textiles Association;
Tel: +1 651 225 6970
amy.collins@textiles.org;
https://www.textiles.org/event/ifai-expo-2023

### PCIAW Summit
7–9 November 2023
Porto, Portugal
Yvette Ashby, Chief Executive Officer, Professional Clothing Industry Association Worldwide;
Tel: +44 (1908) 411415
yvette@pciaw.org;
https://pciaw.org/summit

### Hygienix
13–16 November 2023
New Orleans, Louisiana, USA
Tracie Leatham, INDA (Association of the Nonwoven Fabrics Industry);
Tel: +1 (919) 459-3726
tleatham@inda.org;
https://www.hygienix.org

### Milipol Paris
14–17 November 2023
Paris, France
Comexposium;
sales@milipol.com;
https://en.milipol.com

### ITMA Asia + CITME
19–23 November 2023
Shanghai, China
Daphne Poon, ITMA Services;
Tel: +65 9478-9543
daphnepoon@itma.com;
https://www.itmaasia.com

### 26th Annual Carbon Fiber Conference
28–30 November 2023
Salt Lake City, Utah, USA
Tara Grogan, Conference Manager, Gardner Business Media, Inc;
tgrogan@gardnerweb.com;
https://www.carbonfiberevent.com

### ISPO Munich
28–30 November 2023
Munich, Germany
Sabine Wagner, ISPO;
Tel: +49 (89) 949-20802
sabine.wagner@messe-muenchen.de;
https://www.ispo.com/en/munich

### Aachen-Dresden-Denkendorf International Textile Conference
30 November–1 December 2023
Aachen, Germany
Sabine Keller, Deutsche Institute für Textil- und Faserforschung Denkendorf (DITF);
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add-itc-2020@ditf.de;
https://www.aachen-dresden-denkendorf.de/en/itc

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# Advances in Textiles technology

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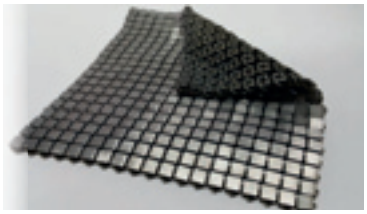
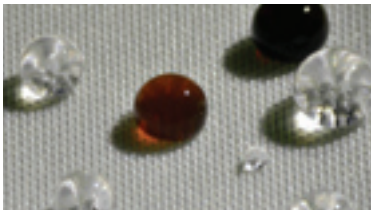

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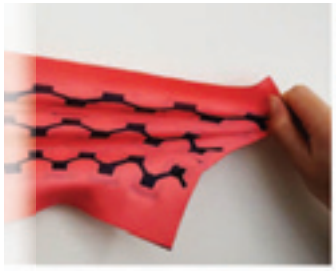


Advances in Textiles technology

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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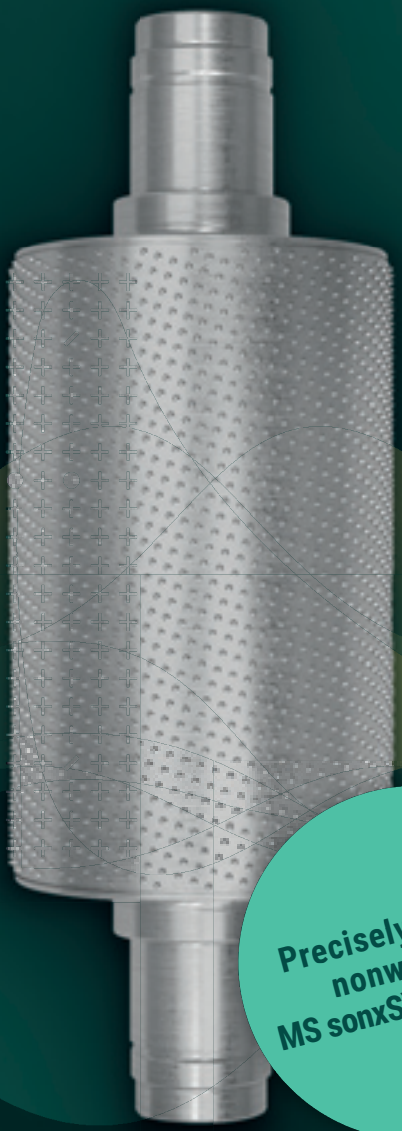

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