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Nick Butler

Nick Butler – Editorial Director

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Technical TEXTILES international

Autumn 2021
Volume 30, Number 3

Informing the industry worldwide

Electric vehicles present wealth of opportunities for textile suppliers

Industry urgently seeks sustainable raw materials

INSIDE:

What to expect on the show floor at *Index 2020*

Textiles that harvest energy from radio waves

Nonwoven pads ensure safety and reliability of batteries

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Experts from the following companies will present their latest technologies to the INDEX™ audience in Geneva:

Fibroline ▪ NIRI ▪ Norafin ▪ RISE Research Institutes ▪ Indian Institute of Technology

The session will be chaired by experienced industry specialist, Adrian Wilson. In addition, there will be an Innovation Lab where visitors can view products relating to the presentations given during the seminar. This display area is outside the seminar room.

SEMINAR PROGRAMME

- **Dry powder impregnation solutions** - Jérôme Ville, *CEO*, Fibroline SA (France)
- **Adsorbent Technology for High-performance Nonwoven Applications** - Ross Ward, *New Business Development Manager*, Nonwovens Innovation & Research Institute Ltd (NIRI) (UK)
- **Innovation in Technical Nonwovens – Evolving USP** - Marc Jolly, *Head of Research & Development*, Norafin Industries (Germany) GmbH
- **Opportunities for production of nonwoven bio-based electronics**, Hjalmar Granberg, *Senior Research Associate*, RISE Research Institutes of Sweden
- **High-performance applications for nonwovens - an overview**, Adrian Wilson, *Seminar Chair*, Technical Textiles International (UK)
- **Out-of-plane auxetic nonwoven as a designer metamaterial**, Amit Rawal, *Professor*, Indian Institute of Technology (India)

The seminar will provide a taste of the kind of high-quality, insightful and informative presentations that feature in our conference series, Nonwovens for High-Performance Applications (NHPA)

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Technical TEXTILES international

Autumn 2021
(Volume 30, Number 3)

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In the Editor's opinion

A return to normality or more chaos? Why we need to proceed cautiously

In June, the industry witnessed the first staging of a major exhibition since the pandemic struck—*ITMA Asia + CITME* was held in Shanghai, China, on 12–16 June 2021. It was quickly followed by *CINTE Techtextil China* and *Asia Nonwovens Exhibition and Conference (ANEX)/Shanghai International Nonwovens Exhibition (SINCE)*, held in the same city on 22–24 June and 22–24 July, respectively.

Emboldened by vaccination programmes, more parts of the industrialised world are now relaxing restrictions on gatherings and the following months promise to be extremely hectic, with many important meetings scheduled to follow between now and the end of the year—in August: *Techtextil North America*; in September: *Techtextil Russia*; in October: *FESPA Global Print Expo*, *Index* (see also, page 10, *Milipol* and *A+A*; in November: *IFAI Expo* and *Techtextil India* (see also, page 55).

There is a clear appetite among many to meet face-to-face at live events, not just for all the usual business-related reasons, but also to satisfy the very human needs for personal contact and affirmation that we are returning to a more familiar world—one similar, if not the same, as the one we knew before those of us outside of microbiology laboratories had heard of coronaviruses.

However, many remain more cautious, and with good reason. A headlong rush back to so-called "normality" could damage the fragile control we are beginning to grasp on this pandemic, resulting in the need to re-introduce restrictions on our freedoms.

Evidence for the continued need for caution came on 4 August, when, as a result of outbreaks of covid-19 in China, Messe Frankfurt announced that it was postponing major textile exhibitions for the apparel and domestic markets (*Shanghai Apparel Fabrics*, *Intertextile Shanghai Home Textiles* and *Yarn Expo*) all due to be held in Shanghai.

The postponements are only for a few weeks – originally due to take place at the end of August, the shows are now scheduled for October – but the disruption will be significant and it is highly symbolic that this is affecting the very city that had seemed to be a beacon of a return towards business as usual just a few weeks before.

In addition, where they are able, some major events, such as the *Dornbirn Global Fiber Congress* (taking place on 15–17 September), have chosen to be wholly online meetings. Others among those listed above, such as *Index* and *Techtextil India*, have contingency plans for some of their programmes at least to be online—recognition that even if events can go ahead as planned, not everyone from our international community will be able (or want) to travel just yet.

In summary, there are optimistic signs, but we need to proceed cautiously if we are not to jeopardise the return to normality we crave.

Technical TEXTILES international

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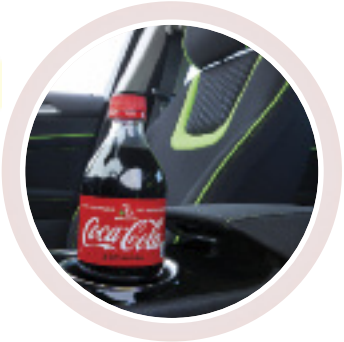
Autumn 2021

On the cover:

Autoneum has developed a back-coating process for its range of automotive carpets that makes them easier to recycle. Adrian Wilson describes further textile technologies for use in future vehicles, starting on page 17



Consumer disapproval and pending legislation are piling pressure on the synthetic fibres industry to change its ways. Ford, for instance, has worked with Coca-Cola to produce interior fabrics using PlantBottle technology. Turn to page 24 to find out more

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

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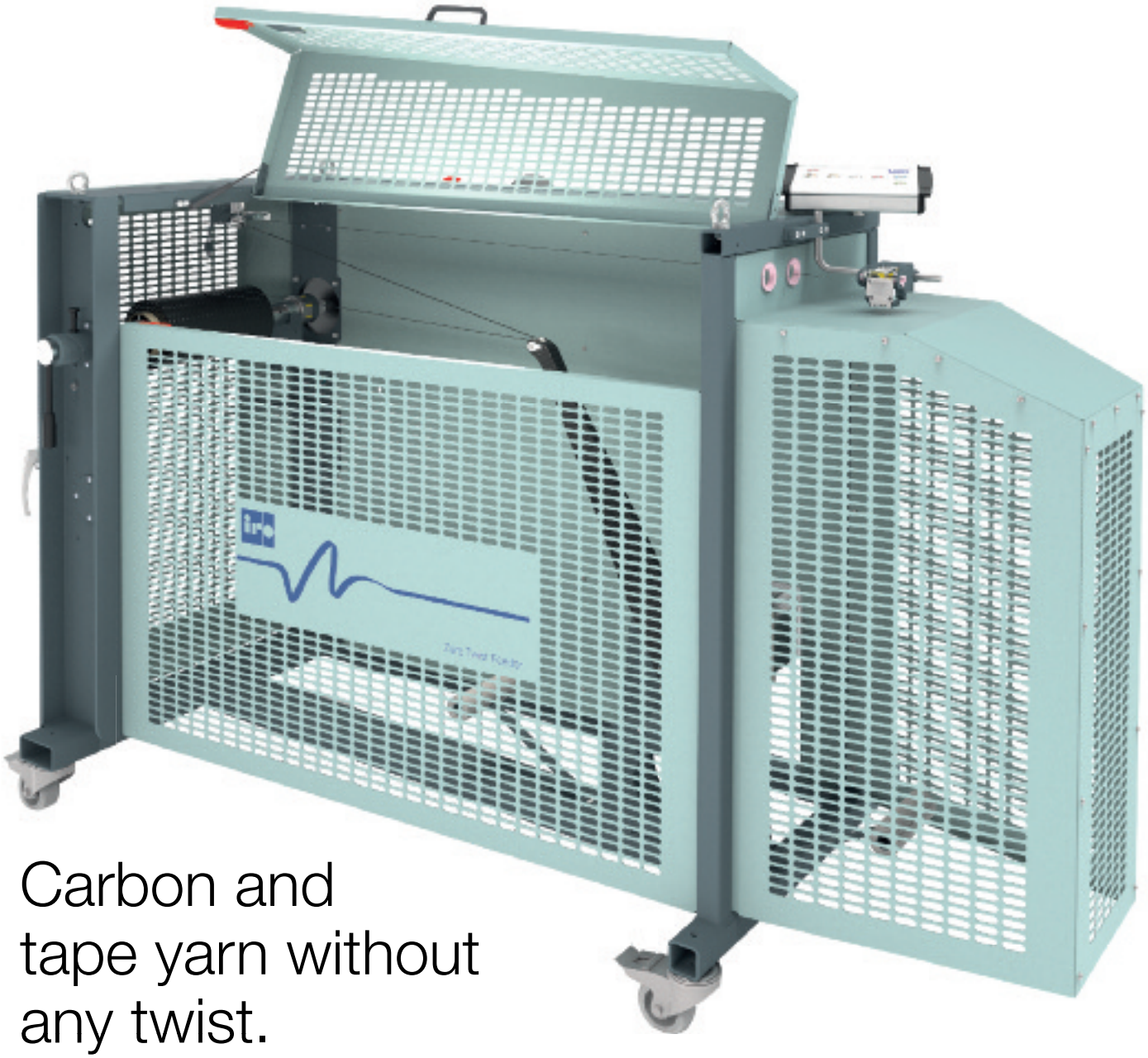

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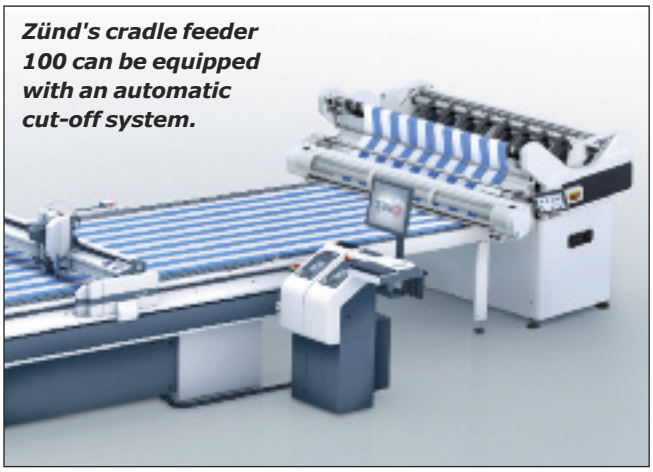
Zünd launches updated cradle feeder

A cradle feeder that is capable of removing stretch fabrics from rolls without generating any tension that might create distortions and can be fitted with an integrated cut-off system has been launched by Zünd Systemtechnik AG of Altstätten, Switzerland (see also, page 17).



Zünd's cradle feeder 100 can be equipped with an automatic cut-off system.

Called the cradle feeder 100, the machine has an unwind-control system that continuously monitors the rate at which it feeds material to a cutter and manages that process with greater precision than its previous iteration, says Zünd. The optional integrated cut-off feature, meanwhile, slices through the material at the end of a marker while the cutter is still operating, making it possible for rolls to be switched without interrupting the production process. Especially for users who frequently need to process short markers, this reduces preparation and set-up times. The cut-off function can be initiated manually by the user or can be set in the cutter software to occur automatically.

To make the loading process easier, one side of the cradle feeder 100 can be lowered. A dancer roller continuously registers fluctuations in web tension and, if necessary, the cradle feeder automatically synchronises its feed speed with the cutter, which further minimises stretch and distortion in the material. The cradle feeder not only unwinds material from rolls, but can also rewind them. When a job is completed, this feature can be used to rewind uncut fabric back onto the roll.

The cradle feeder 100 is available immediately for Zünd's S3, G3 and D3 cutters.

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http://www.zund.com

AATCC revises and introduces standards in supplement

The American Association of Textile Chemists and Colorists (AATCC) of Research Triangle Park, North Carolina, USA, has published the mid-year supplement to its *Manual of International Test Methods and Procedures*.

The 2021 *AATCC Mid-Year Supplement*[1] includes four revised, one editorially revised and two new standards. Of particular interest to developers and manufacturers of technical textiles will be a method that provides a quantifiable means of evaluating the reduction of odour from textiles treated with antibacterial finishes, which is laid-out in one of the new standards, TM211-2021 (*Test method for the reduction of bacterial odor on antibacterial-treated textiles*). EP13-2021 (*Evaluation procedure for electrical resistance of electronically integrated textiles*), meanwhile, has been revised to allow for measurements using a four-point probe. Finally, TM35-2018e2 (*Test method for water resistance: rain*) has been updated to clarify its reference images and align its history section with the AATCC's style guide.

See also:
[1]https://members.aatcc.org/store/mid2021/3479

Erika Simmons, Technical Director, The American Association of Textile Chemists and Colorists.
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Email: simmonse@aatcc.org;
https://aatcc.org

Pulcra Chemicals buys Devan Chemicals

Belgian private equity fund Pentahold has sold Devan Chemicals to Pulcra Chemicals of Geretsried, Germany.

Established in 1977, Devan Chemicals has its headquarters in Ronse, Belgium, and has offices in: Ambergate, UK; Moreira Da Maia, Portugal; Greenville, South Carolina, USA. It also has a team in Shanghai, China.

The company is focusing increasingly on the development of sustainable alternatives to its conventional products for the finishing of textiles.

Since 2019, Devan has launched a softener and a finish that improves the sweat-wicking performance of fabrics, both derived from vegetable oils[1], a bio-based flame-retardant[2], a natural antimicrobial[3] and a range of plant-based fragrances[4].

The Chief Executive Officer (CEO) of Pulcra Chemicals, Ümit Yaldiz, says that the purchase of Devan Chemicals will position his company better to supply the textiles market. The terms of the acquisition will not be disclosed.

See also:
[1]*Devan launches bio-based softener and moisture-management finish*, https://www.technical-textiles.net/node/76225

[2]*Devan unveils bio-based finish for textiles*, https://www.technical-textiles.net/node/74866

[3]*Devan reveals bio-based finishes for bedding at Heimtextil*, https://www.technical-textiles.net/node/75351

[4]*Technical Textiles International*, Summer 2021, *Devan launches range of bio-based fragrances for textiles*, page 24; https://www.technical-textiles.net/node/76124

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Unifrax signs agreement to buy Lydall Inc

Manufacturer of fibres and inorganic materials, Unifrax, has signed a definitive agreement to acquire producer of materials for thermal and acoustic management, and filtration and separation applications, Lydall Inc.

Unifrax of Tonawanda, New York, USA, says that its compatriot Lydall, of Manchester, Connecticut, has numerous technologies and 23 manufacturing facilities around the world, meaning that it is well-positioned to capitalise on growth in demand for materials for use in clean air-filtration applications and electric vehicles, among many others.

Under the terms of the agreement, Lydall's shareholders will receive US$62.10 in cash for each share outstanding, implying a total enterprise value of approximately US$1.3 billion. The transaction, which has been approved by the boards of directors of both companies, is expected to close in the second half of 2021, subject to the receipt of the required regulatory approvals, the approval of Lydall's shareholders and other customary closing conditions.

In September 2020, Lydall announced plans for the installation of a production line for the manufacture of fine-fibre meltblown filtration media for face masks and high-efficiency air-filtration systems at its facility in Saint-Rivalain, France[1].

See also:
[1]*Lydall invests in meltblowing line to support European face-mask production*, https://www.technical-textiles.net/node/75838

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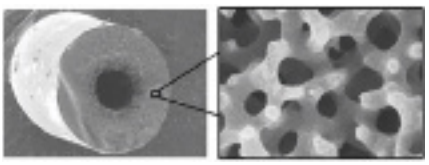
http://www.lydall.com

Toray unveils gas-separation membrane



Toray's thin, flexible and chemically stable carbon fibre has a nanoscale continuous pore structure.

A durable all-carbon separation membrane that can remove carbon dioxide from gasses is being developed by Toray of Tokyo, Japan. The hollow fibre membrane comprises an inner layer made from a thin, flexible and chemically stable carbon fibre with a diameter of less than 300 µm and a nanoscale continuous pore structure[1], and an outer separation layer also made from carbon with a thickness of a few micrometres.

Conventional absorption- and adsorption-based facilities for greenhouse-gas separation and hydrogen production are large, consume a lot of energy and emit a great deal of carbon dioxide. Gas-separation methods based on the use of membranes have thus attracted considerable attention, but until now, a membrane that demonstrates satisfactory gas-separation performance and durability has not been developed.

Toray says that its membrane is flexible and thin, and – as it is in the form of a fibre – can be produced using a continuous process. Its permeability to carbon dioxide can be five times greater than that of conventional inorganic separation membranes with the same volume. Further, it can be tailored for use in the separation of other gasses.

Toray is to continue the development of such gas-separation membranes at its research and development (R&D) Innovation Centre for the Future at its Shiga plant in Japan.

See also:
[1]*Toray creates carbon fibre with continuous pore structure*, https://www.technical-textiles.net/node/75268

Soichiro Koda, Corporate Communications Department, Toray.
Email: soichiro.koda.ox@mail.toray;
http://www.toray.com

Porvair expands range of microfiltration products

Porvair Filtration Group of Fareham, UK, has added two products to its Tekfil range of polypropylene (PP) depth filter cartridges.

The Tekfil SW range of precision-wound filter cartridges are available in a variety of media types and with either PP or steel cores, ensuring their compatibility with a wide range of chemicals. The use of glass fibre on a steel core enables them to operate at temperatures of up to 400°C in the presence of a broad spectrum of solvents. The cartridges are suitable for numerous applications, such as in the manufacture of food and beverages, fine chemicals and solvents, coatings and photographic chemicals, and in metal-finishing and water-treatment processes.

Tekfil CR, meanwhile, is a PP depth filter cartridge optimised for the removal of Cryptosporidium oocysts from such as mineral water. It is made from fine fibres that remove more than 99.9993% of live *Cryptosporidium* oocysts without compromising flow rate, pressure drop or dirt-holding capacity of the cartridge.

Porvair Filtration Group Ltd.
Tel: +44 (1489) 864330.
Fax: +44 (1489) 864399.
https://www.porvairfiltration.com

Neenah Gessner launches filter media

A range of high-quality filter media for use in the filter elements of heating, ventilation and air-conditioning (HVAC) systems and air-purifiers has been launched by Neenah Gessner GmbH of Feldkirchen-Westerham, Germany.

Called NeenahPure, the range features media that demonstrate filtration efficiencies from ePM10 50% to ePM1 80% (according to the 16890 standard from the International Organization for Standardization (ISO) of Geneva, Switzerland) and M5-F9 (according to European standard EN 779:2012). The electrostatically charged NeenahPure meltblown media can reach filtration efficiencies of up to 99.9% for particles of 0.3 µm and above in size.

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Let's grow together

Long-awaited chance for nonwovens industry to meet in Geneva

Following two postponements, *Index 2020* is finally set to take place in Geneva, Switzerland, and online on 19–22 October 2021. Editor Nick Butler rounds-up some of the highlights to expect at the exhibition.

On Stand 2010, Dilo Group will discuss its ability to provide complete lines for all technologies for nonwovens made from staple fibres.

Machinery and equipment

The **Andritz Group**'s stand (2114; see also, page 7) will be home to the companies:

- **Andritz Asselin-Thibeau** of Elbeuf-sur-Seine, France, which designs, builds and supplies turnkey lines for needlpunched, and thermo- and chemically bonded fabrics;
- Collecorvino, Italy-based **Andritz Diatec**, which develops and manufactures machinery and technology for the hygiene industry. As well as machines for making disposable sanitary products, the company can now supply lamination machinery, spool winders and equipment for manufacturers of medical nonwovens;
- **Andritz Küsters** GmbH of Krefeld, Germany, specialising in individual parts and complete lines for wetlaid, hydroentangled and spunbond nonwovens, as well as a line combining wetlaid and hydro-entangled processes (called Wetlace). Lines include wire systems, calenders, rolls and finishing equipment (both inline and offline);
- **Andritz Perfojet**, with headquarters in Montbonnot, France, where it develops and supplies lines (neXline) for hydroentangled fabrics. A complete line includes a carding system, a hydroentanglement unit (Jetlace), a de-watering unit, a through-air dryer and a twin embossing calender. The company also supplies through-air bonding lines for high-throughput manufacture of hygiene products.

In Shanghai, China at the latest *ANEX/SINCE* exhibition (held on 22–24 July 2021), Andritz concentrated on its needlepunch technology for durable applications and the production of wipes made from biodegradable materials.

Brückner Group (see also, page 19) of Leonberg, Germany, specialises in supplying finishing and coating lines for textiles and nonwovens. The company has already begun to meet with customers face-to-face by exhibiting at *ITMA Asia*, held in Shanghai on 12–16 June 2021. Visitors to stand 1580 in Geneva can expect to learn about the latest developments relating to automation and data-exchange between manufacturing technologies, so-called "Industry 4.0".

One recent development, for instance, is an intelligent assistance system that gives the machine operator tips on setting the individual machine parameters to achieve goals, such as saving on consumption of energy while maintaining levels of productivity. Another is a maintenance manager that monitors all processes in the background and supports the operating personnel in planning maintenance and cleaning work, as well as the timely re-ordering of parts as they wear.

Specifically for nonwovens, Brückner has developed ovens to dry and consolidate fabrics.

Eberbach, Germany-based **Dilo** Group (see also, *Technical Textiles International*, Summer 2021, page 5) can be found on Stand 2010 where it will provide information about its ability to provide complete lines for all technologies for nonwovens made from staple fibres. Fabrics made on the Group's machinery are used for durable and disposable technical applications such as automotive, filtration, geotextiles, insulation, roofing materials and medical.

Erhardt+Leimer (see also, page 14) of Stadtbergen, Germany, will use stand 4443 to exhibit products that it

Trützschler's exhibit will include details about the company's latest condenser wires.

designs, makes and supplies for automated measurement and control technologies for nonwovens and textiles, as well as plastics, paper and tyres. These products include cutters, spreaders, guides, devices to measure tension and control webs, and monitors to check printed images. In Shanghai, the company introduced its latest metal detector, for instance, the Elmeta MDA1005/1006, which it claims can detect small metal particles across the width of a web running at between 2 and 500 m.min^{-1}.

Fibroline of Limonest, France, has developed and patented an impregnation method for dry powders[1]. Using alternating electric fields, the company's D-Preg, S-Preg and T-Preg technologies can permanently embed various additives into porous structures, including nonwovens up to 10 cm in width, on lines running continuously at 10–300 m.min^{-1}. Visitors to Geneva can learn more on Stand 1383, or by listening to Chief Executive Officer (CEO) Jerôme Ville's presentation at the *Smart Nonwovens* seminar taking place during the exhibition (see also, Inside front cover).

The German machinery builder **Reifenhäuser Reicofil** (see also, page 1) is a leading supplier of meltblown and composite lines for polypropylene (PP) and polyethylene terephthalate (PET) fabrics. On its stand (2531), the Troisdorf-based company will explain that these nonwovens are used in such as the medical, agricultural and filtration markets. It will also explain that, in addition to lines for high-volume production[2], it can now deliver machines designed for economical entry into small markets and for making soft, bulky materials.

At *ANEX/SINCE*, Reifenhäuser Reicofil focused on nonwovens made using sustainable materials.

Reifenhäuser's subsidiary, **Enka Tecnica** of Heinsberg, Germany, will exhibit from its own stand (2638), displaying its spinnerets, spin packs, distributor and perforated plates, coat hangers, die tips, spinning beams and jet strips for melt-, and wet- and dry-spinning. The company will also introduce its Refresh Service for restoring customers' spinnerets.

From complete production lines to single components, Egelsbach, Germany-based **Trützschler Nonwovens & Man-made Fibers** (see also, page 13) supplies machines for opening and blending fibres, forming and bonding (hydroentangling, and thermally and chemically bonding), drying, finishing and winding webs. At its Egelsbach headquarters, customers can perform process trials at an industrial scale, visitors will learn. Products to be highlighted on stand 2327 will include:

- the company's range of carding machines, specific cards and crosslappers designed to allow customers to process numerous fibre types to create unique nonwovens;
- lines combining wet-laying and hydroentanglement to create flushable wipes[3], which were developed in partnership with Voith Paper of Heidenheim, Germany. The exhibitor will also show such wipes made using pulp- and lyocell-based materials with sufficient strengths to compete with those made using polyester (PES)/viscose blends;
- complete production lines for making nonwovens using sustainable materials including cotton, natural fibres, viscose and wood pulp. The resulting fabrics can be used for biodegradable, single-use products such as medical textiles, face masks, wipes (wet and dry) and feminine care items.

Sharing stand 2327 will be fellow group member **Trützschler Card Clothing** of Neubulach, Germany, a specialist in high-performance clothing for cards and roller cards. In Geneva, the company will introduce its latest clothing product (Supertip).

Weko – Weitmann & Konrad GmbH & Co KG (see also, *Technical Textiles International*, Summer 2021, page 9) is a specialist in the selection and integration of non-contacting systems for the application of small amounts of functional additives/finishes during production. Based in Leinfelden-Echterdingen, Germany, the company offers test services at its technical centre.

A highlight of its exhibit on Stand 4171 will be the Weko-ProTec system for applying functional fluids for the finishing of webs. The company will say the system applies the finishes reliably and reproducibly. It also has an encapsulated unit allowing users to handle safely substances that should not be exposed to the working environment.

Fibres and fabrics

One of the world's largest suppliers of nonwovens, **Berry Global** of Evansville, Illinois, USA, will highlight a number of product launches on its exhibit, Stand 2631. For technical applications, these include:

- a viral barrier that satisfies the level-4 breathability requirements stipulated by the Association for the Advancement of Medical Instrumentation (AAMI) of Arlington, Virginia, USA;
- polyethylene (PE) spunbonds (Berotex PE) derived from sugar cane-based raw materials, and used as thermobonding layers between textiles and the support media for roofing products;
- biodegradable and compostable food wipes;
- bicomponent PP/PE spunbonds (Melfab) with high strengths in the machine and cross-machine directions, and rigidity for use as pleat supports.

FiberVisions from Varde, Denmark, is a specialist in manufacturing polyolefin staple fibres for nonwovens. On Stand 2119, the company will highlight its monocomponent PP fibre (HY-AffiniT) for hydroentangled fabrics, claiming it has a high degree of hydrophilicity and a softness similar to that of a bicomponent.

Meanwhile, **ES FiberVisions**, its joint venture with JNC Corp of Tokyo, Japan, is a supplier of bicomponent fibres.

FiberVisions is part of **Indorama Ventures** of Bangkok, Thailand, which encourages all its group members and affiliates to cooperate to serve better various markets, such as hygiene, automotive and construction. FiberVisions and ES FiberVisions, for instance, cooperate to supply blends of their fibres.

Indorama, also to be found on Stand 2119, will launch its iCare staple fibres, which consist of monocomponent PET and bicomponent PET/PE versions, both claimed to be free from heavy-metal contaminants.

International Fibres Group (IFG; see also, page 11) is based in Bradford, UK, and specialises in the global supply of polyolefin staple fibres, as well as polyamide (PA), biopolymer and recycled fibres. The exhibitor will say it focuses on research and development (R&D) in order to create innovative fibres that meet the exact demands of its customers. Technical textile markets for the fibres include automotive, geotextiles, sports and leisure, filtration and construction. The Group includes three European fibre companies:

- IFG Drake of Bradford;
- IFG Asota of Linz, Austria;
- IFG Exelto of Zwijnaarde, Belgium.

There are also two other members: IFG Cresco, a weaver of technical textiles in Lokeren, Belgium; Drake Extrusion, a supplier of PP fibres and yarns from Martinsville, Virginia, USA.

Kelheim Fibres GmbH is a supplier of specialist viscose fibres made entirely from wood pulp. On Stand 2415, the company from Kelheim, Germany, will tell visitors the fibres are fully biodegradable while offering properties at least comparable with those made using petroleum-based chemicals. In Geneva, the company will introduce its Galaxy fibre, developed for use in the transfer layer of sanitary pads and tampons.

Sandler AG of Schwarzenbach/Saale, Germany, will be exhibiting on Stand 2431, offering information about its nonwoven roll-goods for: personal care (including wipes, diapers, and feminine care and adult incontinence products); medical textiles; filtration; construction and transportation. The company's fabrics are made using many different nonwoven technologies, including parallel carding, crosslapping, hydroentangling, thermobonding, air-through bonding, meltblowing and needlepunching. Visitors will also be told about the numerous different fibres Sandler uses, such as PP, PET, copolymerised polyethylene terephthalate (coPET); PPcoPP, PA, polylactic acid (PLA), bicomponents, viscose and cotton. The manufacturer can also apply a variety of finishes and coatings to the fabrics, and emboss and laminate them. The company reported it had a highly successful year in 2020, despite the economic impact of the pandemic, generating sales of €328 million and hiring 60 new

members of staff[4]. During this period, it provided its expertise to efforts to make materials for face masks[5], particularly for Germany's Bavarian region.

Technical Absorbents Ltd (see also, Outside back cover) is based in Grimsby, UK, where it developed a unique technology called SAF for making superabsorbent fibres[6]. Visitors can learn about the fibres' properties, which include an ability to absorb up to 200 times their own weight in water or 60 times their own weight in saline solution. The company will also describe the fibres' applications, such as medical textiles, protection for cables, food packaging and filtration. More recently, Technical Absorbents has introduced a range of fabrics made from the fibre[7] and its most recent development, fabrics made from a SAF fibre with a high gel-strength (HGS), will be the focus of the exhibit on stand 1118.

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Full programme including seminars:
https://www.indexnonwovens.com/en/pages/programme-3#sector-section
(See also, Inside front cover)

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Electric vehicles present new opportunities for textile suppliers

With or without an internal combustion engine, future vehicles will need tailored packages for noise, vibration and temperature control. As a result, major suppliers of textiles and nonwovens to the automotive industry remain optimistic, reports Adrian Wilson.

For businesses that are currently grappling with unprecedented change, as well as enduring an extremely turbulent 2020, key manufacturers of technical textiles for automotive thermal and acoustic insulation components are decidedly upbeat about the future. Having enjoyed many years of rapid growth, as well as developing numerous innovations, stimulated by the needs of automobile manufacturers to reduce the weight of vehicles, the industry now faces fresh challenges.

Over two decades or more, the desire to reduce a car's weight has been the automotive industry's response to consumer demands and increasingly stringent legislation to lower the fuel consumption and carbon dioxide (CO_2) emissions of their internal combustion

Global production of cars and light vehicles in 2020 was just 77.6 million, down 21% on 2019.

In a single step, Adler-Pelzer's hot-moulding process can make a floor carpet (HMPtex) with either a velour or tufted surface and an integrated backing for acoustic insulation.

engines (ICEs). Now, regulators and automobile manufacturers are looking to do away with the ICE completely, switching to cleaner propulsion such as offered by battery-powered electric vehicles (BEVs).

Many countries have already set targets for ending the sale of new petrol- and diesel-fuelled vehicles between 2030 and 2040, while Norway will end sales of them in 2025. As a result of these pressures, according to EVvolumes.com of Trollhättan, Sweden, quoted in a report in the *Guardian* newspaper[1], global sales of BEVs and plug-in hybrid vehicles are growing, amounting to 3.24 million in 2020, up 43% on 2019 (2.26 million). Moreover, this rise took place in a period that saw the total production of cars and light vehicles globally fall by 21% to 77.6 million (2020), compared with 98.1 million (2019).

If the growth of electric vehicle production maintains such momentum, they could potentially become the dominant force in all car and light-vehicle production very quickly.

How could this affect textiles and nonwovens?

Automotive parts providing thermal and acoustic insulation include carpets, headliners, engine encapsulation, bonnet (hood) and boot (trunk) liners, and underbodies. Such products exploit a wide range of materials such as glass-fibre composites and aluminium, as well as textiles and nonwovens.

The use of fabrics in the European automotive industry alone grew by 11.3% a year on average between 2010 and 2015, according to Brussels, Belgium-based industry body EDANA. Similar growth was recorded for the use of polyurethane (PU) foam, according to the European association representing this industry, Europur of Brussels, Belgium[2]. These growths were achieved despite the fact that the production of cars and light vehicles in Europe grew by only an average of 1.3% a year in the same period.

Even before the decline in automobile production in 2020, these growths were slowing, but the figures underline the degree to which nonwovens and PU foams have already been incorporated into the lightweight designs of vehicle manufacturers. A good deal of material substitution – particularly of hard plastics, dense foams and in certain cases metals – has already occurred.

However, given the first and most obvious thing most drivers and passengers notice when travelling in any kind of electric vehicle for the first time is how quiet it is without an ICE, perhaps there will be a substantial reduction in the materials required for insulation.

Happily, Adler Pelzer Group of Hagen, Germany, and Autoneum of Winterthur, Switzerland, two leading suppliers of such materials, say this is not the case.

Why do suppliers remain confident?

Autoneum points-out that in the absence of noise from an ICE, sounds that were previously drowned-out (such as those from fans and pumps, and noise generated by the movement of the vehicle over the road surface, so-called "rolling noise") become more discernible and have to be suppressed. These are joined by new sources, including the high-frequency noise from the electric motor. These irritants need to be silenced by acoustic components. At the same time, the requirement for lightweight parts remains, as the driving range on a fully charged battery falls as the car gets heavier.

Temperature-control is just as critical. Beyond passenger comfort, particularly low or high temperatures have a negative impact on the battery's performance, such as the driving range.

Adler Pelzer Group

With a network of manufacturing plants, and research and design facilities at 80 locations worldwide, Adler Pelzer has more than 11 000 employees. It experienced a challenging

first six months in 2020, seeing its revenues for the period fall to €472 million, but, after a general economic recovery during the second half, saw sales climb by 48.7% to €702 million—a total of €1.17 billion for the year.

According to the Group, the automotive industry is going through substantial change, principally as a result of the desire to develop connected, autonomous, shared and electrically powered vehicles, a future scenario sometimes referred to by the acronym CASE.

In addition, Adler Pelzer believes electric vehicles will claim a market share of 20–30% by 2030 and is excited about the opportunities these shifts represent. Chief Executive Officer (CEO), Pietro Lardini says: "We decided to embrace these disruptive changes a long time ago and have already been active in developing solutions for more than 50 new-energy vehicle (NEV) platforms."

So far in 2021, for instance, Adler Pelzer has:

- acquired the Acoustic and Soft Trims business of Nanterre, France-based Faurecia (Faurecia AST);

Contoured and precisely cut insulation components are availible from Adler-Pelzer.

- established its own plastics division for hard trim, following its acquisition of a controlling interest in STS Group, which has its headquarters in Munich, Germany, from the previous owner, Mutares SE & Co KGaA of Munich, Germany.

The acquisition of Faurecia AST includes a research and development (R&D) centre in Mouzon, France, and

Autoneum has developed an alternative back-coating process for its range of automotive carpets, which eliminates the need to use latex and so makes easier the recycling of the product at the end of its use.

manufacturing plants in: Mouzon, as well as Marckolsheim, Saint-Quentin, and Mornac, France; Eselborn, Luxembourg; Washington, UK; Olmedo, Spain; Legnica, Poland. With 2019 sales of €385 million, Faurecia AST has approximately 1820 employees.

Meanwhile, STS Group employs more than 1600 people worldwide and generated sales of €235 million in 2020.

According to Lardini, at least 70% of all vehicles in the next ten years will still have an ICE; however, this period will see developments in electric vehicles and corresponding innovations in engine insulation too. "There has already been a much-needed shift, with a focus on reducing emissions and environmental impacts, but the noise levels of conventional vehicles with [ICEs] still needs to come down." Noise levels experienced by those inside and outside the vehicles need to reduced.

Adler Pelzer's parts are generally based on PU foams and natural- or recycled-fibre nonwovens formed by compound-injection or hot-moulding processes.

During 2018, the Group introduced a range of tailored packages (EVO) specifically developed for NEVs. EVO products are based on the simplification or removal of certain parts, such as damping sheets[3] and mass barriers[4], the optimisation of other parts, such as bonnet (hood) liners, and the introduction of entirely new parts, including those for the encapsulation of the electric motor and its accessories, together with specific seals. The parts are tailored to mask different sounds and frequencies, as well as to meet the demands of different temperatures.

The Group has also developed a simulation tool (Genome), which allows engineers to track noises from their sources through to the cabin. Using so-called "morphing" simulation technology, the tool can help users explore the effects on the design of substituting a conventional engine with an electric motor.

Customers already using the company's packages for full-system engineering and noise, vibration and harshness (NVH) designs include Tesla Inc, a specialist in electric vehicles based in Palo Also, California, USA.

Autoneum

Autoneum employs 12 093 people across its global operations (as reported on 30 June 2021). Like Adler Pelzer, the company saw its 2020 sales fall, in this case by 18.7% to CHF1740.6 million. However, it too reports it is now experiencing a significant recovery. Announcing its results for the first-half of the year on 29 July 2021, the company said 29.2% more light vehicles were produced worldwide than in the corresponding six-month period for 2020, despite the negative impact of a continuing shortage of semiconductor chips. As a result, Autoneum's revenue for the first-half of 2021 rose to CHF890.3 million, 24.3% higher than that in the corresponding period for 2020.

Nevertheless, the company adds that production of light vehicles in the second half of 2021 is uncertain owing to the semiconductor shortage. Although there is a high demand in all regions, it can be assumed that the shortage of chips will continue to impact the automotive industry for some time.

Key products made by Autoneum are chiefly for engine bays and interior floors, as well as underbodies.

Theta-FiberCell, for instance, has been a leading nonwoven product for engine encapsulation since 2012. In addition to suppressing noise, it can withstand temperatures of up to 200°C and enables heat to be retained for long periods after a vehicle has been parked, thereby allowing the engine to re-start more efficiently than if left to cool. Importantly, compared with traditional solid plastic engine covers, Theta-FiberCell components are 60% lighter-weight.

Meanwhile, Theta-Cell is a proprietary PU foam able to withstand a peak temperature of up to 180°C. Its applications include bonnet liners, dashboard liners, tunnel insulators and battery covers.

Interior applications

With Autoneum's Hybrid-Acoustics products for car interiors (such as dashboard liners and floor insulation), the thickness and density of the materials used can be tailored by adjusting the deposition of the fibrous top layers. Together with three-dimensional (3D) calculations and statistical energy analysis, this allows Autoneum to vary the insulation and absorption capacity with a resolution of one centimetre.

In addition, Hybrid-Acoustics products contain a high proportion (up to 50%) of recycled fibres – cotton or polyethylene terephthalate (PET) – and are as much as 50% lighter-weight than conventional insulation made from heavy layered foams. Each of the two types of material – cotton felts embedded in a thermoplastic or specially layered PET fibres – can be pressed to form numerous different shapes and sizes.

Underbodies

Fibre-based underbodies have had a considerable impact on the goal of making vehicles lighter-weight and have contributed significantly to the growth in the use of nonwovens in the automotive market. Autoneum's Ultra Silent is a technology based on using lightweight PET nonwovens for under-floor panels and under-engine shields. Despite their low weight, the products provide good acoustic absorption. Being 100% PET, the nonwovens are fully recyclable, Autoneum claims.

Materials for electric vehicles

In 2019, Autoneum announced it was extending the range of its Ultra Silent materials by adding products that meet the specific requirements for acoustic and thermal management of battery undercovers in electric vehicles. These requirements include improving the battery's performance by protecting its cells from heating and cooling, and reducing rolling noise.

Autoneum also now offers Ultra Silent materials for the liners of front boots (trunks), so-called "frunks", which it claims save on average 3 kg in weight when manufacturers substitute them for pre-existing products, lowering the vehicle's energy consumption and so extending its driving range.

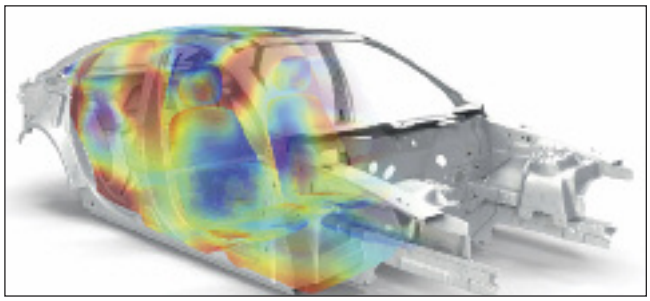
In another adaptation of the company's products for electric vehicles, Hybrid-Acoustics PET is being used to: encapsulate electric motors as a way to insulate high-frequency sounds at source; line inner wheelhouses, to reduce tyre noise.

Dashboard liners and floor insulation specifically for electric vehicles have also been developed based on the company's Prime-Light range of compounds, which are made from cotton felts embedded in a thermoplastic. Once more, depending on the application-specific composition, these contain up to 50% of recycled materials.

Autoneum is also introducing an alternative back-coating process to its range of automotive carpets, replacing commonly used latex with a thermoplastic material, with the goal of significantly improving recyclability at the end of the product's life. In addition, the company says the new manufacturing process for applying the back-coating greatly reduces water and energy consumption compared with existing techniques.

The thermoplastic adhesives can be heated and melted-down together with the carpet components made of pure PET at the end of the product's life. Further, the thermoplastic mono-materials are easier to remove from the vehicle (latex tends to bond to the metal over time as a result of incidental heating) and easier to take apart, making the materials simple to

Tufted carpet production at Autoneum's plant in Ghent, Belgium.



With its Belgian partner Free Field Technologies, Autoneum is developing computer-aided engineering software for the design of components to suppress noise and vibration in electric vehicles.

reclaim. These thermoplastic adhesives, developed in-house, will open-up new possibilities for adapting back-coatings to the individual needs of vehicle manufacturers, in terms of their acoustic performance, stiffness and abrasion-resistance.

Car models from various customers in Europe and North America are already equipped with latex-free needlepunched carpets from Autoneum and soon back-coatings with thermoplastic adhesives will also be available as part of the company's tufted-carpet range.

Computer-aided engineering

As the demand for electric vehicles grows, both the development time of new models and their time-to-market is decreasing, Autoneum reports. At the same time, the new powertrains of these cars are creating new requirements for acoustic management.

In response, in June 2021, Autoneum announced that it will share its long-standing experience of acoustic-simulation technologies with Free Field Technologies (FFT) of Mont-Saint-Guibert, Belgium, the developer of advanced modelling software for acoustics and vibration (Actran). The partners' aim is to set new standards in the computer-aided engineering (CAE) design of NVH materials, as well as in data exchange. In doing so, they hope to help shorten the development process times further for manufacturers, as well as helping to reduce noise in their vehicles.

Reasons to be cheerful

With this wealth of developments, it is clear why major suppliers of thermal and acoustic insulation remain optimistic about the automotive market, with or without the ICE.

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(3)Sheets of material used to dampen the noise from an engine.

(4)Loosely bound material, such as shoddy or loose non-wovens, used to fill empty volumes so as to hold other parts in place.

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- reducing the carbon footprint of the textile finishing industry

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Photos courtesy of Fibroline, Huafeng & Schoeller

CONFERENCE PROGRAMME TO DATE

KEYNOTE

• **Phil Patterson, Colour Connections, UK:** ***On a knife edge - making quality textiles responsibly***

INTRODUCTION AND OVERVIEW

• **Adrian Wilson, Technical Textiles International, UK:** ***Emerging technologies and processes - can they truly provide sustainable manufacturing?***

SUSTAINABLE CHEMISTRY

• **Lance Li, Microban International Inc, USA:** ***Sustainable alternatives for odour control on garments***
• **Elisabete Silva, Mehler Engineered Products GmbH, Germany:** ***An innovative, bio-based adhesive for mechanical rubber goods***
• **Theo Verweerden, Lamoral Coatings BV, The Netherlands:** ***Sustainable, durable water-repellent treatments***

KEYNOTE

• **Catherine Tubb, Planet Tracker, UK:** ***A view from Planet Tracker***

INNOVATIVE TECHNOLOGIES AND PROCESSES

• **Rick Stanford, Baldwin Technology, USA:** ***Revolutionizing and applying real sustainability to the Textile Finishing Department***
• **Kushtrim Daci, Weber Ultrasonics AG, Germany:** ***Ultrasound processing - cutting operating costs and resource consumption by around one-third***
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KEYNOTE

• **Tricia Carey, Lenzing, USA / Günther Widler, DyStar, Germany / Alex Penadés, Jeanologia, Spain:** ***Collaborations for change from fibre to finish - how innovation can impact resource savings***

DENIM, DYEING AND COLOURING

• **Mary Ankeny, Cotton Inc, USA:** ***Reduction of resources (water, energy and chemicals) during cotton dyeing***
• **Kasper Nossent, DyeCoo Textile Systems BV, The Netherlands:** ***Waterless dyeing technology***

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Register now at www.technical-textiles.online/WCTC

Industry urgently needs to develop supplies of sustainable raw materials

Consumer disapproval and pending legislation are piling pressure on the synthetic fibres industry to change its ways, according to Adrian Wilson.

US automobile manufacturer Ford collaborated with Coca-Cola to produce automotive carpets made using some of the technology employed for PlantBottle eight years ago [1].

Global drinks manufacturer Coca-Cola is to end its use of virgin polyethylene terephthalate (PET) in its on-the-go bottles made in the UK in September 2021. All bottles under 500 ml across its entire portfolio (Coca-Cola, Diet Coke, Fanta, Sprite, Dr Pepper and Lilt) – will now be made from recycled PET, which the company estimates will save 29 kt of virgin plastic each year.

Coca-Cola's is one of many initiatives underway as the plastics industry responds to tightening legislation, especially in Europe, designed to reduce plastic waste (another by Coca-Cola itself, PlantBottle, is described in detail below). Regardless of the best intentions of these programmes however, they could result in supply problems for the textiles industry, where recycled PET is currently used as a raw material to make fibres for a broad range of applications. In addition to the pressure of regulation, bottle-to-bottle recycling of PET is a circular process, with the potential of many such iterations, in contrast to bottle-to-fibre products, which enter the waste stream rapidly.

Virgin-quality recycled polymer

As an alternative to PET-to-PET recycling, a Canadian company has patented a depolymerisation technology that transforms such post-consumer polymer waste into its monomers—monoethylene glycol (MEG) and paraxylene (PX). Loop Industries, which has its headquarters in Montreal, Quebec, says these reclaimed monomers meet the established purity criteria needed for the production of virgin-quality PET. importantly to the textiles industry, the process can accommodate feedstocks of clothing, carpets and even mattresses, as well as bottles.

It should be noted that this development has received two recent setbacks:

- in October 2020, the US financial analyst Hindenburg Research questioned the claims for the process, leading to a damaging impact on Loop's share price;
- a joint venture with Indorama Ventures of Bangkok, Thailand, to build a depolymerisation plant in the USA in 2020, was shelved as a result of the covid-19 pandemic.

Rapid turn of fortune

Subsequently however, a not-for-profit research centre specialising in environmental chemistry, Kemitek of Thetford Mines, Quebec, has fully endorsed the depolymerisation process and Loop has won the backing of Seoul, South Korea-based SK Group, one of Asia's largest conglomerates.

A strategic joint venture with SK's subsidiary SK Global Chemical (SKGC) of Seoul, aims to commercialise the process throughout Asia. In addition to a 49% stake in the venture, Loop will receive annually a percentage of revenue from each facility using its technology. SKGC has also paid US$56.5 million for almost five million shares in Loop (US$12 per share), with options to buy more.

SKGC aims to build the first facility in South Korea in the first half of 2022 and to complete three others in

as-yet unspecified Asian locations by 2030, with a projected combined consumption of 400 kt of PET waste a year.

Founder and Chief Executive Officer (CEO) of Loop Industries Daniel Solomita says: "Our team has been extremely impressed by the thoroughness and extent of SKGC's technical due-diligence on Loop, including an on-site verification of the technology at our demonstration facility."

Share of bio-based materials

Bio-based materials currently represent less than 1% of all plastics and synthetic fibres produced each year. In 2019, 368 Mt of plastic and 80 Mt of synthetic fibres were produced globally, according to the latest data, respectively from Plastics Europe and the European Man-Made Fibres Association (CIRFS), both based in Brussels, Belgium. Bio-plastics production in 2020 was 2.111 Mt, according to European Bioplastics, which also has it headquarters in Brussels.

Plastics that can be made from bio-based raw materials as direct replacements for their fossil fuel-based counterparts, without any changes to manufacturing processes or equipment, so-called "drop-in" solutions, exist for PET and polyamide (PA). Production capacity for these bio-based drop-in plastics is currently around 1 Mt (or 48% of the total for all bio-based plastics). No data is available on the proportion of this amount used for synthetic fibres.

At present however, such products – a notable example being Coca-Cola's PlantBottle – only contain a part (around 30%) of bio-based content at present, which somewhat distorts the overall figures for bio-based plastics production. Nevertheless, since the 2009 introduction of PlantBottle, Coca-Cola has distributed more than 40 billion of them, which it calculates has saved the equivalent of more than 365 kt of carbon dioxide emissions a year. PlantBottle now accounts for 29% of Coca-Cola's packaging volume in North America and 8% globally, making the brand the world's largest consumer of bioplastics.

A tale of two monomers

So far, it is the MEG monomer that has been successfully replaced in PET for PlantBottle production,

Chief Executive Officer (CEO) and Founder of Loop Industries, Daniel Solomita (left) and CEO of SK Global Chemical, Na Kyung-soo, signed their strategic investment agreement on 23 June 2021.

while a bio-based PX component has proved much trickier to achieve.

In July 2015, Coca Cola announced the production of a fully recyclable PET plastic bottle made of 100% bio-MEG and bio-PX and showcased it at the *World Expo* in Milan, Italy (held on 1 May–31 October 2015)[2], but little has been heard of it since and obviously there remains more work to be done to reach the ultimate goal of commercialising a 100% renewable, responsibly sourced bottle.

In recognition of this, in 2019, Coca Cola announced that it was making PlantBottle technology freely available for other industries to explore, even making it available to its competitors[3].

Polyamide

The key attributes of PA, its toughness and abrasion, resistance, ensure it is the synthetic fibre of choice for textiles requiring enhanced durability, such as workwear, military uniforms, parachutes and floorcoverings.

Since 2013, Aquafil has pioneered the production of 100% regenerated PA 6 from PA waste. The company, which has its headquarters in Trento, Italy, claims its Econyl-branded products offer the same quality and performance as conventional PA 6 but with many environmental benefits. A portion of the PA Aquafil recovers to make Econyl products is from the oceans, as

part of the *Healthy Seas* initiative[4], in which divers recover abandoned fishing nets from the coastal regions of the Mediterranean. Much more comes from the massive quantities of discarded carpeting that Aquafil is now recycling at its two purpose-built facilities in: Phoenix, Arizona, USA; Chula Vista, California, USA.

A portion of the polyamide that Aquafil recovers for its Econyl products is from the oceans via the Healthy Seas initiative.

Bio-based precursor

In November 2020, Aquafil announced a new partnership with Genomatica of San Diego, California, USA, with the goals of first building a demonstration facility for 100% renewable bio-based PA 6 and then scaling-up to commercial production within five years. The two companies first teamed-up in January 2020 to produce the world's first bio-PA 6 precursor, initially making one tonne.

Already, however, the partners are moving to a larger-than-typical demonstration pilot plant to support initial commercial applications by committed brand partners.

The target now is to produce 50 t of bio-PA for pre-commercial use by Genomatica's brand partners, with showpieces to be unveiled in 2022, followed by limited-edition collections and then full commercial production within five years. Initial volumes of the bio-PA ingredients will be available before the end of 2021.

The Wesseling complex in Germany is LyondellBasell's largest manufacturing facility in Europe.

Genomatica CEO, Christophe Schilling believes this is a sector where the partners can make an important contribution, reducing the impacts on the environment and revamping parts of the textiles, carpet and flooring industries. Brands are increasingly realising that sustainable manufacturing is a winning strategy, he adds.

Aquafil will be responsible for the downstream operations, converting Genomatica's bio-based precursors to commercial-quality PA 6 yarns, films and engineered plastics at its facility in Slovenia.

Polypropylene

Polypropylene (PP) remains the most widely used fibre in nonwovens production, but attempts to produce a viable bio-based version have until recently been unsuccessful.

However, in the past two years, two of the major European PP manufacturers – LyondellBasell, which has its headquarters in Rotterdam, The Netherlands, and Vienna, Austria-based Borealis – have each announced progress with a technology for producing bio-based PP from agricultural waste.

Both projects are joint ventures with Neste of Espoo, Finland, which produces bio-based alternatives to conventional fossil fuel-based feedstocks for the production of polymers and chemicals. Neste claims its proprietary technology can use nearly any bio-based

oil or fat as a raw material, including lower-quality waste and residues, to produce various premium-quality renewable products.

LyondellBasell and Neste

Using Neste's renewable hydrocarbons, for instance, in June 2019, LyondellBasell announced the first parallel production of bio-based PP and bio-based low-density polyethylene (LDPE) at a commercial scale.

Subsequently, LyondellBasell introduced a new Neste RE renewable feedstock to its site in Wesseling, Germany, which it converts directly into bio-based polyethylene (PE) and PP. Independent testing using carbon tracers by International Sustainability and Carbon Certification (ISCC) of Cologne, Germany, confirmed these materials contained more than 30% renewable content.

In April 2021, LyondellBasell launched the Circulen family of products:

- The CirculenRenew range consists of polymers based on renewable feedstocks;
- polymers made from mechanically recycled materials are marketed under the brand name CirculenRecover;
- polymers called CirculenRevive are produced using a technology that recycles at the molecular scale.

In June 2021, LyondellBasell announced a long-term commercial agreement with Neste to source the Neste RE feedstock.

Borealis and Neste

Borealis announced a strategic co-operation with Neste for the production of renewable PP in October 2019, a deal that enables Borealis to use Neste's 100% renewable propane as a feedstock at its facilities in Kallo and Beringen, Belgium.

Borealis has used Neste's renewable propane, which is produced in Rotterdam, to create an entire portfolio (Bornewables) of renewable PPs, which was launched in March 2020.

This is the first time that Borealis has used bio-based feedstock partially to replace fossil feedstock in the commercial production of PP and the first time ever that renewable propane dehydrogenation has been carried-out on an industrial scale. The company claims Bornewables polymers offer the same properties as conventional PP and are fully recyclable.

To verify that the feedstock is renewable, sustainably produced and traceable to its point of origin, ISCC has independently certified the manufacturing process.

Bio-based strong Dyneema

Recently, DSM of Heerlen, The Netherlands, has announced a number of initiatives for its ultra-high molecular weight polyethylene (UHMWPE) fibre (Dyneema)[5].

Circular ethylene

In July 2021, for instance, DSM announced a collaboration with SABIC of Riyadh, Saudi Arabia, to create Dyneema products made using materials from SABIC's certified circular portfolio (Trucircle). In a pilot project, DSM will produce Dyneema made with certified circular PE for both a sailing rope and an open-sea trawl net.

To make the PE, SABIC uses mixed plastic waste, including hard-to-recycle plastics that would otherwise go to landfill or be destined for incineration, as feedstock. The company's process breaks-down this feedstock to leave basic building blocks that it then

Canadian shoe brand norda has just launched the first seamless trail running shoe made with DSM's bio-based Dyneema fibre.

uses to recreate high-performance polymers akin to virgin materials.

Wood feedstocks

In March 2020, DSM and SABIC, together with UPM Biofuels of Helsinki, Finland, announced they had succeeded in producing a bio-based version of Dyneema using residues from the pulping of wood taken from sustainably managed forests[6]. As a result, partially bio-based Dyneema has been available since April 2020.

Legislation and consumer demand

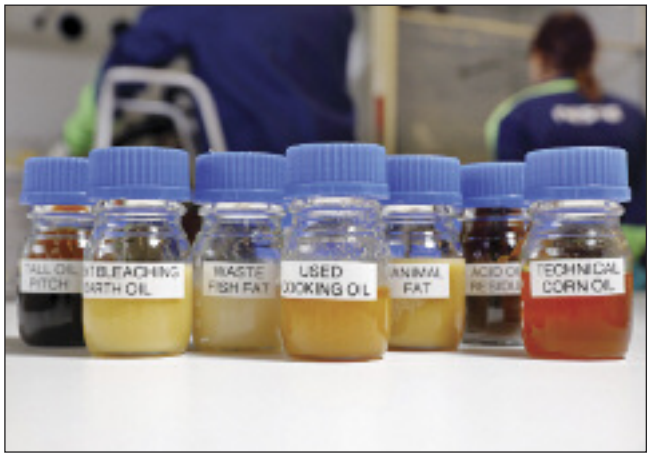
According to Alexander A. Koukoulas of A2K Consultants, based in Savannah, Georgia, USA, new legislation aimed at banning single-use plastics, together with a growing consumer demand for more environmentally friendly materials will drive significant demand for bio-based plastics: "the market for bioplastics could easily double in the next five years."

However, the textiles sector will face stiff competition for any bioplastic capacity in the next decade from industries such as plastic packaging, which is hungry for alternative raw materials.

Other pending legislation is likely to see much more done to recycle textile waste and successfully regenerate synthetic fibres from it. One prime example will be the need to find ways to deal with the waste clothing that the European Union (EU) has mandated must be collected from 2025.

In fact, so-called "extended producer responsibility" for this waste stream has already been introduced in France and other countries within the EU are following this approach, so the onus is on the textile industry to find solutions, and fast.

The latest developments in technologies for the sustainable finishing of textiles will be discussed at the *World Congress on Textile Coating* special edition: *Conference on Sustainable Finishing of Textiles*, which will be held online on 30 September–1 October and 7–8 October, 2021 (see also, page 23).



Neste claims it can use nearly any bio-based oil or fat as a raw material, including lower-quality waste and residue oils, to produce various premium-quality renewable products.

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Further information

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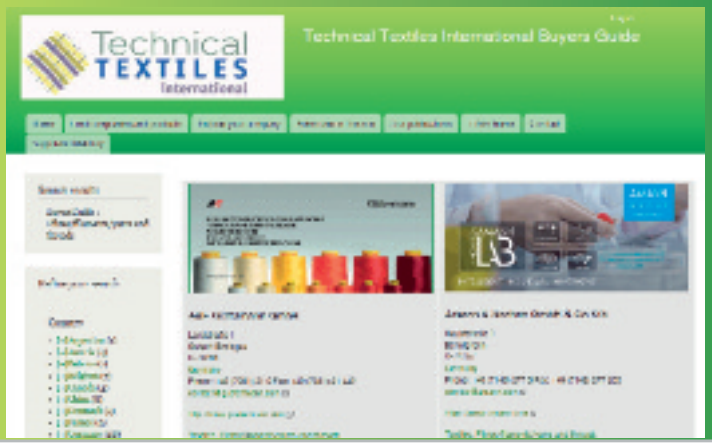

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Stretchable, washable textiles can harvest energy from radio waves

Stretchable, washable silk-based coils that, when sewn into clothing, can harvest energy from radio waves and power wearable electronics wirelessly are being developed by researchers at Purdue University in West Lafayette, Indiana, USA.

Described in a paper in *Nano Energy*[1], the coils are made from microfibres of a novel silk–nanocarbon composite that demonstrates the stretchability of silk fibroin and the high electrical conductivity of multi-walled carbon nanotubes (MWCNTs) and chitin carbon nanoflakes. The coils can be sewn into clothing using standard techniques and their surfaces rendered omniphobic — both hydrophobic and oleophobic — using a spray-based silanisation method, which imbues the resulting smart textile with waterproof and stain-repellent properties without compromising its flexibility, elasticity and breathability. The coils can withstand up to 50 standard laundering cycles without affecting their performance.

The senior author of the paper, Assistant Professor at Purdue University's School of Industrial Engineering, Ramses Martinez[2], says: "By spray-coating smart clothes with highly hydrophobic molecules, we are able to render them repellent to water, oil and mud. These smart clothes are almost impossible to stain and can be washed in conventional washing machines without damaging the electronic components sewn onto their surface."

The rigidity of typical waterproof garments and their low breathability can make them uncomfortable if worn for more than a few hours at a time. Martinez adds: "Thanks to their ultra-thin coating, our smart clothes remain as flexible, stretchable and breathable as conventional cotton T-shirts."

The coils can harvest energy from wireless Internet (Wi-Fi) and other radio waves for use in powering other devices sewn onto the textile. One example demonstrated by the researchers is a battery-free glove

The flexible silk-based coil is shown here sewn into a textile, and is capable of harvesting energy from wireless internet and other radio waves present in its surrounding environment.

featuring a coil sewn into the palm area that powers a light-emitting diode (LED) incorporated into one of the fingertips. When the wearer of the glove is near a live electrical cable, the LED lights-up, providing warning of the possibility of an electric shock. Another example is a miniaturised cardiac monitoring system sewn onto a washable sweatband. Significantly, owing to the use of the omniphobic coating, these devices can work while under water.

"Such wearable devices, powered by ubiquitous Wi-Fi signals, will make us not only think of clothing as just garments that keep us warm, but also as wearable tools designed to help us in our daily life, monitor our health and protect us from accidents", Martinez concludes.

See also:

[1]*Nano Energy,* Volume 87, September 2021, 106155, *Washable, breathable, and stretchable e-textiles wirelessly powered by omniphobic silk-based coils*, https://doi.org/10.1016/j.nanoen.2021.106155

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A foldable, rollable, musical keyboard

A knitted musical keyboard that can be easily folded or rolled-up and packed in a bag, much like an item of clothing, is being developed by researchers at the Massachusetts Institute of Technology (MIT) in Cambridge, USA.

Called KnittedKeyboard II, the seamless, piano-patterned textile is produced using intarsia and interlock patterning techniques from electrically conductive and polyester (PES) fibres. Both individually and in combination, the keys on the textile can respond to touch, as well as continuous proximity, stretch and pressure. Users can play the keyboard using conventional keystrokes and, by waving their hands near it, activation of non-contact theremin-inspired proximity sensors.

Each knitted key acts as an electrode and is sequentially charged and discharged. This creates an electromagnetic field that can be disrupted by the hand's approach, enabling the key to detect not only direct touch, but also non-contact gestures. It can also detect the velocity at which it is struck. Piezoresistive layers underneath can measure pressure exerted on the knitted keyboard and the amount by which it stretches in response. All of the data from these sensors is converted into musical instrument digital interface (MIDI) messages, which will correspond to certain timbral, dynamic and temporal variations, as well as pitch-bend, by a central microprocessor. Audio sequencing and generation software map these MIDI messages to their corresponding channels, controls, notes and effects.

The researchers says that the technology could also be exploited in wearables and smart objects.

See also:

https://player.vimeo.com/video/562885935?color=ffffff&title=0&byline=0"/

Irmandy Wicaksono, Research Assistant, Responsive Environments, Media Laboratory, Massachusetts Institute of Technology. Email: irmandy@mit.edu; https://www.media.mit.edu/people/irmandy/overview

Inkjet printing shows promise for the production of electronic textiles

A simple and effective inkjet-printing process that enables layers of electrically conductive ink to be deposited on a polyester (PES) fabric is being developed by researchers at North Carolina State University (NCSU) in Raleigh, USA.

The process – described in a paper in ACS *Applied Materials & Interfaces*[1] – can be carried-out at room temperature and in normal atmospheric conditions using a Dimatix inkjet printer from Fujifilm of Tokyo, Japan, and the researchers say that its development suggests techniques commonly used in the flexible-electronics industry could be applied to the manufacture of smart textiles.

Professor of Textile Engineering, Chemistry and Science at NCSU, and the corresponding author of the paper, Jesse S. Jur, says: "Inkjet printing is a rapidly advancing new technology that is used in flexible electronics to make films used in cellular [mobile] telephone displays and other devices. We think this printing method, which uses materials and processes that are common in both the electronics and textiles industries, also shows promise for making electronic textiles for wearable devices."

Part of the challenge faced by the researchers was in ensuring that the liquid ink would not seep through the porous surface of the textile on which it was being deposited and thereby lose its ability to conduct electricity. Former graduate student at NCSU and the first author of the paper, Inhwan Kim, adds: "We wanted to build a structure layer by layer, which has not been done on a textile layer with inkjet printing. It was a big struggle for us to find the right material composition."

The researchers demonstrated their process by printing a capacitor – comprising layers of electrically conductive silver ink sandwiching insulating layers of two liquid materials, urethane-acrylate (UA) and poly(4-vinylphenol) (PVP) – on the surface of a woven PES fabric. Observing the resulting structure through a microscope, they found that the chemical properties of the insulating materials, as well as of the textile yarns, are important in ensuring that the liquid-silver ink is able to conduct electricity, and in preventing it from penetrating the porous fabric.

"We wanted a robust insulation layer in the middle, but we wanted to keep it as thin as possible to have the entire structure thin, and have the electric performance as high as possible," Kim says. "Also, if they are too bulky, people will not want to wear them."

The electrical performance of the textile capacitor remains constant after 100 bending cycles.

In future work, they want to improve the materials' electrical performance compared with that of electronic textiles created using methods that require special facilities and atmospheric conditions, and to increase its breathability. Eventually, they want to use the printing method to create a textile that could be used in wearable electronics, such as biomedical devices that could track heart rate, or be used as a battery to store power for electronic devices.

Kim concludes: "We are able to coat the ink on the fabric in a multilayer material that is both durable and flexible. The beauty of this is, we did everything with an inkjet printer—we did not use any lamination or other methodologies."

See also:

[1] *ACS Applied Materials & Interfaces*, 2021, Volume 13, Issue 20, pp 24081–24094, *Microstructures in all-inkjet-printed textile capacitors with bilayer interfaces of polymer dielectrics and metal–organic decomposition silver electrodes*, https://doi.org/10.1021/acsami.1c01827

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Thread features molecular tag for supply-chain security

A range of sewing threads that are made entirely from recycled polyester (PES) and, through the use of a molecular tag, can be tracked and traced has been launched by American & Efird (A&E) of Mount Holly, North Carolina, USA.

The company says that the range, called Integrity ECO100, provides an economical means for companies to authenticate and validate their products anywhere along their supply chains by way of a common component—sewing thread. The threads are tagged using A&E's Integrity technology, which employs the CertainT molecular identifier and Beacon encrypted fluorescence technology developed by Applied DNA Sciences of Stony Brook, New York, USA. Once a product is marked, it can be identified in the field using Applied DNA Sciences' simple Beacon activator (which chemically decrypts the Beacon) and a source of ultraviolet (UV) radiation or, if needed, through a quantitative polymerase chain reaction (qPCR) test.

Australian designer, Sara Caverley, will use A&E's ECO100 thread products in her range of footwear, called Caverley. She says: "It is essential that Caverley [footwear is] produced with sustainable components that can be traced throughout their supply chain while ensuring we are delivering the very best to our customers. A&E's ECO100 recycled sewing threads provide tangible proof of the one-of-a-kind leather and luxury trimmings used in our products."

The Executive Vice President of A&E, Chris Alt, says: "Our customers are hyper-aware of the detrimental effects of counterfeit products, from lost sales to the potential loss of brand equity. It is a real and global threat."

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Improving the power output of textile-based triboelectric nanogenerators

Textile-based triboelectric nanogenerators (TENGs) that, when integrated into clothing, could harvest energy from movement are being developed by researchers in the UK and the Republic of Ireland.

TENGs use the cyclic contact of two suitable surfaces to convert mechanical energy to electrical energy. One of the researchers on the project, funded by the UK Engineering and Physical Sciences Research Council and called *Next generation energy autonomous textile fabrics based on triboelectric nanogenerators (NextGenT-TENG)*, is Heriot-Watt University Professor George Stylios.

He says: "Our biggest challenge is increasing our power output in order to make this a viable option. For example, textile TENGs currently produce power in the microwatt-to-milliwatt range. We need to drastically increase the level of friction in order to achieve an output of hundreds of milliwatts, which is required to power most mobile devices."

Stylios and his colleagues plan to overcome this challenge by experimenting with the materials used to produce textile-based TENGs, their fibre architectures and surface topographies. Specifically, they will employ metal oxide-coated fibres that will generate an electrostatic charge when brought into contact with conventional textile fibres, such as those made from polyester (PES) and polypropylene (PP), and will design a fibre architecture that maximises the contact area between these fibres, which will be further enhanced through the creation of branching nanofilaments or nanopillars on the surfaces of the fibres.

Stylios says that the TENGS would be incorporated into areas of clothing that come into contact with one another frequently, such as in the sides and elbows. He continues: "Once we have generated and stored this energy, the question is how do we transfer this into mobile devices? We have a couple of ways for doing this. Firstly, we can store the electricity in a small polymer battery on the clothing itself, but my preference is the second option of directly transferring the electricity wirelessly, by simply carrying our phone in our pocket."

Further to Heriot-Watt University, of Edinburgh, UK, the partners on *NextGenT-TENG* are:

- the University of Glasgow in the UK;
- Pireta of Teddington, UK, which has devised a manufacturing process that can apply a thin, durable metallic layer to fibres, providing them with excellent electrical conductivity without impacting on the performance of the textile[1];
- University College Cork in Ireland;
- smart textiles specialist, Kymira Ltd of Reading, UK;
- the Institute of Technology - Sligo, in Ireland.

See also:

[1] *Technical Textiles International*, December 2019, *Military funding continues to be a big boost for innovation*, page 11; https://www.technical-textiles.net/node/75255

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Smart textile-based monitoring used in space exploration

Further smart textile-based systems for monitoring the vital signs of astronauts have been dispatched to the International Space Station (ISS), and they will also be used on a Virgin Galactic test flight.

Called Astroskin and developed by Hexoskin of Montreal, Quebec, Canada, the system comprises smart garments and related software that can be used to record the vital signs, quality of sleep and levels of activity undertaken by astronauts during their missions. The system is designed to operate continuously, recording heart and breathing rates, the electrical activity of the heart (electrocardiogram), blood pressure, breathing volume, skin temperature, physical activity and the level of oxygen in the bloodstream, without obstructing the astronaut.

Space is a harsh environment and, while the scientific community now has some awareness, there is still much to discover of the impact it can have on an astronaut. Astroskin can be used to determine biological effects of launch, weightlessness, re-entry and landing on spaceflight participants.

On 3 June 2021, the eighth payload of Astroskin systems was launched on a SpaceX rocket from the Kennedy Space Center in Florida, USA, to the ISS. Astronauts aboard the ISS have been using Astroskin since January 2019.

International Institute of Astronautical Sciences (IIAS) researcher Kellie Gerardi, meanwhile, will conduct experiments using Astroskin during a test flight of Virgin Galactic's spaceflight system. The purpose of this mission is to demonstrate the benefits to scientific research that Virgin Galactic's spaceflights will provide. It will also illustrate the potential of conducting human research in suborbital flight, building on the knowledge gained through a number of Kellie's reduced-gravity flights performed on Earth, including with the National Research Council of Canada (NRC) and the Canadian Space Agency (CSA).

During the test flight, following the shutdown of the rocket motor, Kellie will – during several minutes of weightlessness – unbuckle from her seat and undertake the actions necessary to complete each experiment. The Chief Executive Officer (CEO) and Co-Founder of Hexoskin, Pierre-Alexandre Fournier, says: "This historic flight will demonstrate the role private space companies can play to advance our knowledge of human physiology in space, to prepare for future missions to the Moon and beyond."

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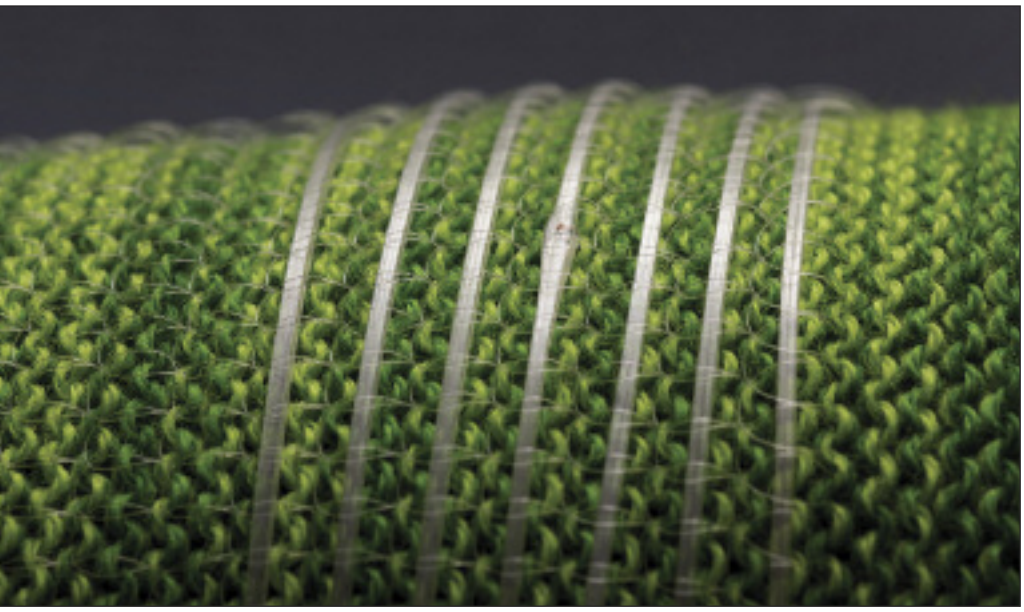
Massachusetts Institute of Technology engineers create digital fibre



The fibre, developed at the Massachusetts Institute of Technology and shown here on a green fabric, can collect and store data on body temperature over several days, and enables the type of activity its wearer is undertaking to be inferred in real time with a high degree of accuracy.

A method that enables the production of tens-of-metres of flexible fibre containing hundreds of interspersed digital temperature sensors and memory devices has been developed by researchers at the Massachusetts Institute of Technology (MIT) in Cambridge, USA.

When incorporated into a shirt, the fibre can collect and store data on body temperature over several days and enables the type of activity its wearer is undertaking to be inferred in real time with a high degree of accuracy.

Until now, electronic fibres have been analogue — capable of carrying a continuous electrical signal — rather than digital, where discrete bits of information can be encoded and processed in 0s and 1s. The senior author of a paper[1] describing the work, Professor in MIT's departments of Materials Science and Engineering, and Electrical Engineering and Computer Science, Yoel Fink, says: "This work presents the first realisation of a fabric with the ability to store and process data digitally, adding a new information-content dimension to textiles and allowing fabrics to be programmed literally."

The fibre is thin and flexible and can be passed through a needle, sewn into fabrics and washed at least ten times without breaking-down. MIT PhD student Gabriel Loke adds: "When you put it into a shirt, you cannot feel it at all. You would not know it was there."

To construct the fibre, hundreds of square silicon microscale digital chips, each with four corner-positioned contact pads, are first placed into slots within a polymeric preform. Each chip is placed at an angle of 26.56° with respect to the fibre axis and the slots in the preform are milled to the exact dimensions of the chips. This specific angle ensures the individual connection of four coplanar and coaxial tungsten wires to the four individual power and signal ports on each chip. The preform is then thermally drawn at a specific tension, during which process, the four 25-µm-diameter tungsten wires are fed into it—creating electrical contacts with the silicon chips within it.

The process enables individual chips within the fibre to be controlled from one point at the fibre's end. Loke says: "You can think of our fibre as a corridor, and the [chips] are like rooms, and they each have their own unique digital room numbers". The research team has devised a digital addressing method that allows them to switch-on one chip without turning-on all others.

The digital fibre can store information. The researchers were able to write, store and read information on the fibre, including a 767-kb full-colour short movie file and a 0.48-MB music file. The files can be stored for two months without power.

The researchers have also been able to incorporate, within the fibre memory, a neural network of 1650 connections. After sewing it around the armpit area of a shirt, the researchers have used the fibre to collect 270 minutes of surface-body temperature data from a person wearing the shirt, and to determine how this data corresponded to different physical activities. Trained using this data, the fibre was able to determine with 96% accuracy the activity its wearer was engaging in.

Fabrics with digital components can collect a lot of information across the body over time, and this so-called "lush data" is perfect for machine-learning algorithms, Loke says. He adds: "This type of fabric could give quantity and quality open-source data for extracting new body patterns that we did not know about before."

With this analytic power, the fibres in future could sense and alert people in real time to health changes such as a respiratory decline or an irregular heartbeat, or deliver muscle activation data or heart-rate data to athletes during training.

The fibre is controlled by a small external device, so the researchers now plan to design a microcontroller that can be incorporated into the fibre itself.

See also:

[1] *Nature Communications*, 12, 3317 (2021), *Digital electronics in fibres enable fabric-based machine-learning inference*, https://doi.org/10.1038/s41467-021-23628-5

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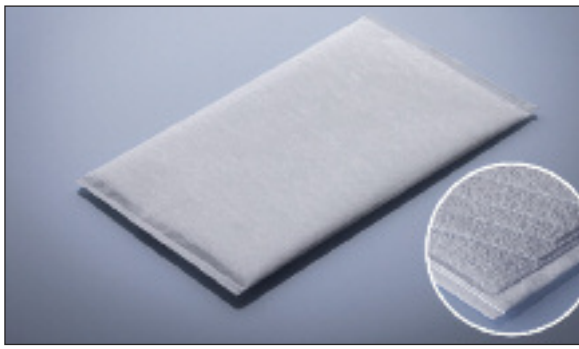
Absorbent nonwoven pads ensure safety and reliability of batteries

Nonwoven pads that, when fitted inside battery packs, can absorb fluids that would otherwise shorten the lifespan and hinder the performance of lithium-ion batteries have been launched by Freudenberg Performance Materials of Weinheim, Germany.

Liquid carried in air can condense inside battery packs and coolants can leak from the systems used to maintain their temperatures. In both cases, Freudenberg Performance Materials says that its Battery Pack Liquid Absorbers can capture and retain these liquids quickly and reliably. The pads comprise cover layers of a thermally bonded polyester (PES) nonwoven sandwiching layers of a hydrophilic nonwoven covered in a highly absorbent coating. The pads have a liquid-absorption capacity of 30 $l.m^{-2}$, are resistant to temperatures of up to 230°C in the short term and 110°C in the long term, and have achieved an HB rating when tested according to the UL 94 standard from Underwriters Laboratories (UL) of Northbrook, Illinois, USA.

Freudenberg Performance Materials adds that the modular design of the pads allows for their absorption capacity to be scaled-up easily—limited only by the space available. Further, the size and the shape of the pads can be tailored to the specific needs of a given application. The General Manager of the company, Thomas Petzel, says: "As liquid-cooling systems are prevailing to deliver efficient thermal management for high-power batteries, we believe that our Battery Pack Liquid Absorbers will become a must-have safety component of future high-voltage systems."



A Battery Pack Liquid Absorber and, inset, its multilayered structure.

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Andritz receives repeat order for hydroentanglement line

Less than nine months after ordering its first hydroentanglement line for the production of nonwoven roll goods from Andritz Group (see also, page 7), Zhejiang Saintyear Textile Co Ltd has placed an order for a second.

Andritz of Graz, Austria, says that this second line, which will be dedicated to the manufacture of wipes, is scheduled for start-up in the third quarter of 2022 and will have a production capacity of up to 2.8 tonnes an hour. The line will include opening and blending machinery from Cours, France-based Laroche – which was acquired by Andritz in early 2021[1] – two inline TT cards, a JetlaceEssentiel hydroentanglement unit and a neXdry through-air dryer.

Zhejiang Saintyear Textile Co Ltd, which is based in Hangzhou, China, says that the first hydroentaglement line it ordered from Andritz will start operating in the middle of 2022.

See also:
[1]*Andritz to buy Laroche*, https://www.technical-textiles.net/node/75971

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Avgol to invest in Russian production facility

Avgol is to make a three-tier investment at its facility in Uzlovaya, Russia, that it says will enhance its ability to supply existing markets for its nonwovens and will help it expand into new areas.

The largest element of the investment will be the addition of a high-speed, high-capacity RF5 production line[1] from Reifenhäuser Reicofil (see also, page 1) of Troisdorf, Germany, which will boost production capacity for high-loft nonwovens and will support the development of new technologies, according the Chief Executive Officer (CEO) of Avgol – of Tel Aviv, Israel – Tommi Bjornman. He continues: "Serving the growing baby diaper, adult incontinence and feminine hygiene markets along with satisfying sustained demand for meltblown filtration and medical materials, this investment enables Avgol to deliver an improved degree of service while consolidating and strengthening our existing position."

Further, Avgol will install a meltblowing line and a laminating line at the facility. Bjornman continues: "The RF5 line, meltblown line and lamination capabilities will provide us with a powerful set of platforms as a base from which to provide high-value products for our customers."

Avgol's facility in Uzlovaya, Russia.

This investment will make the Uzlovaya facility Avgol's second-largest after its site in Mocksville, North Carolina, USA.

See also:
[1]*Technical Textiles International*, May 2017, *Reifenhäuser reinvents its industry-standard line for nonwovens*, page 76; https://www.technical-textiles.net/node/73283

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Ahlstrom-Munksjö unveils nonwovens for use in ceiling construction

A range of nonwoven backing and facing materials for use in the construction of ceilings has been launched by Ahlstrom-Munksjö of Helsinki, Finland.

Called FibRoc Ceiling, the range comprises nonwovens made using wet-laid and foam-forming processes from: glass and cellulose–glass blends for mineral wool- and wet felt-based ceilings[1]; glass, cellulose–glass blends and cellulose–polyester (PES) blends for plasterboard ceilings[2]; glass and cellulose–glass blends for perforated wood and metal ceilings[3].

Ahlstrom-Munksjö's Vice President, Nonwovens, Pierre Mary, says that these nonwovens help to ensure that the acoustics of a given room are comfortable and that they can be treated to be flame-retardant. Further, they can be manufactured using formaldehyde-free binders and can be tailored to the individual needs of a customer.

The company adds that the range will evolve over time as new products are added. The nonwovens are manufactured at its plants in: Karhula, Finland; Tver, Russia; Brignoud, France; Stalldalen, Sweden.

See also:
[1]https://www.ahlstrom-munksjo.com/globalassets/products/construction-and-furniture-materials/performance-materials-for-durable-construction/fibroc_ceiling_sell_sheets_mineral_wool_web.pdf

[2]https://www.ahlstrom-munksjo.com/globalassets/products/construction-and-furniture-materials/performance-materials-for-durable-construction/fibroc_ceiling_sell_sheets_plasterboard_web.pdf

[3]https://www.ahlstrom-munksjo.com/globalassets/products/construction-and-furniture-materials/performance-materials-for-durable-construction/fibroc_ceiling_sell_sheets_metal_wood_web.pdf

Ahlstrom-Munksjö completes line re-build in China; https://www.technical-textiles.net/node/76237; and: *Ahlstrom-Munksjö to invest in US line for glass-fibre nonwovens*; https://www.technical-textiles.net/node/76226; and: *Ahlstrom-Munksjö works to increase production capacity at plant in Belgium*; https://www.technical-textiles.net/node/76294

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Nonwoven Innovation & Research Institute invests in pilot meltblowing line

The meltblowing line will be used to develop such as new items of personal protective equipment and medical devices.

A pilot line for the development of meltblown nonwovens has been installed at the Nonwoven Innovation & Research Institute (NIRI) in Leeds, UK, where it will be used for sampling, prototyping and proof-of-concept testing.

Supplied by Fibre Extrusion Technology (FET) Ltd, also of Leeds, the laboratory and pilot line is capable of processing such as engineering polymers, high-temperature polymers, corrosive and aggressive polymers, as well as sustainable and biomedical polymers. The Chief Executive Officer (CEO) of NIRI, Matthew Tipper, says: "We were mindful when specifying the new equipment that we wanted to invest in the most flexible and adaptable technology available, to enable the development of a wide range of nonwoven structures—with the potential to develop unique filament and mechanical properties to further facilitate our clients' [research and development] R&D and prototyping."

The line features a computerised control system that enables process parameters, such as temperature, pressure, speed and recipe, to be monitored and managed. It enables the quality of the output of a given process to be verified, generates a wide range of reports, and displays data, sounds alarms and logs events so the cause and effect of parameter changes can be determined.

NIRI's clients will use the system to develop such as new items of personal protective equipment (PPE) and medical devices for use in the fight against the human coronavirus (covid-19) pandemic.

NIRI's New Business Development Manager, Ross Ward, adds: "We are keenly interested in exploring the wider opportunities for meltblown nonwovens, such as developing products from bio-derived polymers, chemically recycled polymers and novel masterbatches with enhanced functionality. This latest investment will help us facilitate the rapid development of innovative and commercially viable products for our customers."

Ward will speak at *Smart Nonwovens (High-performance Applications of Nonwovens)*, which will be held during *INDEX* in Geneva, Switzerland (and online) on 20 October 2021 (see also, Inside front cover).

See also:
https://www.youtube.com/watch?v=TqyTUlpdQwo&feature=emb_logo

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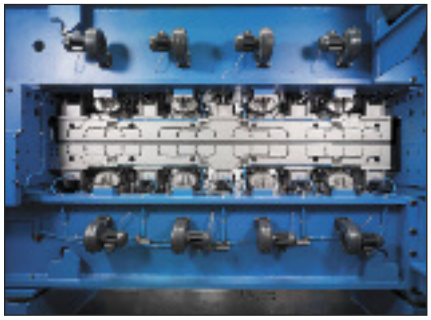
DiloGroup to supply web-forming and needling line for automotive parts



The infeed side of Dilo's double needleloom with blowing nozzles at the stitching plates.

DiloGroup is to supply a second web-forming and needling line to Zhejiang Huajiang Science and Technology Co Ltd of Hangzhou, China, for the processing of blends of glass and polypropylene (PP) fibres—used in the manufacture of glass fibre-reinforced thermobonded parts for automotive interiors.

DiloGroup, of Eberbach, Germany, says that the line comprises systems for fibre preparation, web-forming, carding and crosslapping, and needling. The fibre-preparation system from DiloTemafa is adapted to ensure that glass and PP fibre are blended homogeneously, while the Baltromix blending system features precise weighing pans and provides accurately dosed fibre material to the collecting apron. The fibre material is opened and blended in a carding willow.

DiloGroup says that it can also provide equipment for the recycling of waste fibres generated during the production process. These fibres can be collected from the stations in the fibre preparation and web-forming systems.

The company adds that the efficiency of a glass fibre-processing line depends largely on ensuring that dust is removed from its component systems, and that, as a general contractor, DiloSystems can carry-out this task. At the double-doffer card, a fancy roller enables webs to be formed without excess fibre being left within the card clothing wire. Blowing nozzles can be installed in the needleloom to clean the perforated plates, stripper and bed plates, while the dust exhaust is separated at a filter station. Using air lines, recycled fibres can be re-introduced at the beginning of the line.

See also:
Manufacturer of artificial leather orders three lines from DiloGroup;
https://www.technical-textiles.net/node/76296

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Ahlstrom-Munksjö launches filtration media for electric vehicles

A range of filtration media for use in electric vehicles (EVs) has been launched by Ahlstrom-Munksjö of Helsinki, Finland.

Called FiltEV, the range features media for the cabin air, transmission and battery-cooling systems of EVs. FiltEV Particulate Cabin comprises particulate filters for the removal of coarse, fine and ultrafine particles – including bacteria and viruses – from cabin air, and multilayer carbon media that can both filter particles and remove gases[1]. FiltEV Cooling features air-filtration media for use in battery cooling systems and three-layer wetlaid media for filtering oil[2]. Finally, FiltEV Transmission features glass microfibre media with optional protective scrims and synthetic three-layer media for filtering particles from transmission fluids[3].

According to the Head of Business Development for Ahlstrom-Munksjö's Industrial Filtration and New Vehicles business, Cedric Vallet, the company plans to launch filter media for use in the air-intake systems of fuel cells in the next few months.

Ahlstrom-Munksjö estimates that all-electric vehicles will account for 25% of light-vehicle production in 2030. It adds that demand for filtration media for use in EVs is expected to grow by around 35% per year up until 2030, when it will be worth approximately €100 million.

Ahlstrom-Munksjö estimates that all-electric vehicles will account for 25% of light-vehicle production in 2030.

See also:
[1] https://www.ahlstrom-munksjo.com/globalassets/products/filter-media/fitev_cabin_air_sell_sheet_a4_web.pdf

[2] https://www.ahlstrom-munksjo.com/globalassets/products/filter-media/filtev_cooling_sell_sheet_a4_web.pdf

[3] https://www.ahlstrom-munksjo.com/globalassets/products/filter-media/filtev_transmission_sell_sheet_a4_web.pdf

This issue, *Electric vehicles present new opportunities for textile suppliers*, page 17.

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Nonwoven for protective clothing is proven to reduce heat-stress

A highly breathable fabric developed by Toray Industries for the production of disposable personal protective clothing has been proven in testing to reduce the chance of its wearer suffering from heat-stress in comparison with conventional fabrics.

Livmoa 3000 comprises an electrostatically charged nonwoven (called TorayMicron) meltblown from fine polypropylene (PP) fibres, which is sandwiched between two layers of spunbond fabric.

Under supervision from Associate Professor of Advanced Textile and Kansei Engineering at Shinshu University (in Nagano Prefecture, Japan), Tomonori Sakoi, Toray of Tokyo, Japan, conducted evaporative thermal-resistance testing on Livmoa 3000.

Evaporative thermal-resistance testing is used to determine the ease with which perspiration evaporates through a fabric and indicates the impact this has on generating heat stress. It is carried-out by laying moist fabric on a heating plate set to 20°C. The sample fabric is then placed on top of the moist fabric and a weak flow of air is applied across its surface. By determining the level of heat evaporation through the sample, its evaporative thermal-resistance can be calculated.

The test found that that in wet bulb globe temperature (WBGT) testing – which is used to measure the heat-stress experienced by a person in direct sunlight and takes into account: temperature, humidity, wind speed, sun angle and cloud cover (solar radiation) – clothing made from Livmo 3000 could be assigned a correction value of 0°C, meaning that has no more effect on heat-stress than regular work clothes and would reduce heat-stress experienced by its wearer in comparison with general-purpose protective clothing.

Further, it was found that Livmoa 3000 is significantly more permeable to air than commercially available single-layer and spunbond–meltblown–spunbond (SMS) nonwoven fabrics with equivalent dust-protection capabilities used to produce protective clothing.

A protective suit made from Livmoa 3000.

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Tomonori Sakoi, Associate Professor, Department of Advanced Textile and Kansei Engineering, Shinshu University.
http://soar-rd.shinshu-u.ac.jp/profile/en.uVAUjFkV.html

DuPont launches para-aramid nanofibre for battery separators

A para-aramid nanofibre (called Kevlar MicroCore) for the production of separators for lithium-ion batteries has been launched by DuPont of Wilmington, Delaware, USA.

The company says that, unlike other materials currently used for the manufacture of battery separators (that allow for the passage of charged ions between the anode and cathode at the same time as preventing electrical short circuits between them), those made from Kevlar MicroCore are inherently non-flammable and will not shrink—even at temperatures of up to 300°C.

Global Market Manager for DuPont Automotive, Carlo Fiorella, says: "When used in battery separators, Kevlar MicroCore can help prevent the biggest safety issue for [electric vehicle] EV batteries—thermal runaway. Testing has shown that it may also enable EV batteries to charge faster and deliver higher acceleration power, addressing two key performance concerns for both consumers and EV manufacturers."

DuPont is working with separator manufacturer Nippon Kodoshi (NKK) Corp of Tokyo, Japan, to commercialise the nanofibre. Kevlar MicroCore will be used to produce NKK's TopNove separators for lithium-ion batteries.

Preliminary results of independent research undertaken at Yamagata University in Japan suggest that, in certain conditions, TopNove separators made from the nanofibre perform better than incumbent separators, such as those made from ceramic-coated microporous films.

DuPont says that Kevlar MicroCore could also be used for the production of separators for batteries in the aerospace, defence, medical and utilities industries.

See also:
This issue, *Electric vehicles present new opportunities for textile suppliers*, page 17

Jennifer McMahon, Marketing Communications Lead, DuPont Automotive.
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Nonwovenn positions itself for post-pandemic growth

Over the last 12 months, technical fabric manufacturer Nonwovenn reports that, it has invested £7 million in its head-quarters and production facility in Bridgwater, UK.

The company has purchased the freehold of the site where it has operated since 2003, securing its future, and has invested in a new 1-kt-a-year chemical bonding line with which it can increase its production capacity and manufacture new fabrics for the packaging and industrial sectors.

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Tyre reinforcements produced from recycled plastic bottles

Two companies in Clermont-Ferrand, France, have demonstrated that a high-tenacity polyethylene terephthalate (PET) fibre produced from recycled bottles could be used to reinforce tyres.

The fibres were produced by the developer of an enzymatic process for the recycling of PET, Carbios, and have been validated by tyre producer Michelin. With some 1.6 billion car tyres sold worldwide every year by tyre manufacturers, the production of fibres for tyre reinforcement consumes 800 kt of PET each year, according to Carbios. Meeting that demand using the company's technology would enable the recycling of nearly three-billion plastic bottles annually.

Carbios notes that conventional thermomechanical processes for the recycling of plastics do not yield raw materials suitable for the production of plastics for high-performance applications. The monomers produced from its process, however, once repolymerised into PET, meet Michelin's requirements for use in its tyres—demonstrating high breakage-resistance, toughness and thermal stability.

Carbios has been working since 2015 to develop a process that combines enzymes and plastics to transform waste PET back into two purified monomers—terephthalic acid (PTA) and monoethylene glycol (MEG). These monomers can then be repolymerized into PET with virgin-like properties.

Carbios is currently operating at pilot scale, and counts the quantities it produces in cubic metres, but by September 2021, the company says it will start a demonstration plant in Clermont-Ferrand and, by early 2025, plans to be ready to open an industrial-scale plant with an annual production capacity of somewhere between 35 and 75 kt.

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Lyocell fibre produced using citrus-fruit waste

A lyocell fibre is being manufactured using pulp sourced from wood and by-products of the processing of citrus fruit by Lenzing Group and Orange Fiber.

Called Tencel Limited Edition x Orange Fiber, the fibres are produced using the same closed-loop process used for the manufacture of Lenzing's standard Tencel fibres. Lenzing, of Lenzing, Austria, and Orange Fiber, of Catania, Italy, are currently using the fibres to create a collection of fabrics, which the latter will unveil in October 2021.

Collections produced from Tencel Limited Edition x Orange Fiber will have dedicated marketing materials, such as co-branded swing tags, which will provide consumers with information regarding the process and materials used for their manufacture.

Vice President of Global Research and Development at the Lenzing Group, Gert Kroner, says: "By upcycling waste materials such as orange peels in our products, we are taking proactive steps towards a more sustainable future and minimising the environmental impact of waste.

Tencel Limited Edition x Orange Fiber is manufactured from wood pulp and by-products of the processing of citrus fruit.

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http://orangefiber.it

Superabsorbent polymers from bio-based acrylic acid

Bio-based feedstocks are being used by Nippon Shokubai Europe (NSE) NV of Antwerp, Belgium, to produce a superabsorbent polymer (SAP).

The company, a subsidiary of Nippon Shokubai of Osaka and Tokyo, Japan, has been awarded an ISCC Plus sustainability certificate from ISCC System GmbH of Cologne, Germany, for the manufacture of a SAP using acrylic acid derived from biomass-derived propylene and conventional propylene. The amount of bio-based content in the SAP is quantified using a mass-balancing approach, which allows for the volume of a feedstock to be tracked through a production system so that the amounts used in the final product can be accounted for accurately. NSE adds that the quality of the bio-based SAP is equivalent to that of products manufactured entirely from petroleum-derived feedstocks. NSE produces both acrylic acid and SAP.

Nippon Shokubai is in the process of developing technologies for the recycling of SAPs from used disposable diapers[1].

See also:
[1] *Recycling superabsorbent polymers from used disposable diapers*, https://www.technical-textiles.net/node/75924

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In addition to the news reported on these pages, the latest developments in technologies for the sustainable finishing of textiles will be discussed at the *World Congress on Textile Coating special edition: Conference on Sustainable Finishing of Textiles*, which will be held online on 30 September–1 October and 7–8 October, 2021 (see also, page 23).

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YKK to use sustainable finishing technology

As it looks to limit the environmental impact of its operations, global fastenings manufacturer YKK is to use a perfluorinated compound (PFC)-free finish to make its zip-fasteners water-repellent, after signing a licensing agreement with the developer of the technology, Green Theme Technologies (GTT).

GTT, of Rio Rancho, New Mexico, USA, says that no water is required to apply the finish, called Empel, to fabrics. By contrast, it adds that traditional finishes are applied using water baths, generating trillions of litres of polluted water each year that regularly get discharged into streams and oceans around the world. Fabrics treated with Empel are highly water-repellent and – as the finish bonds uniformly to the fibres from which they are made – they remain supple and breathable. Category Manager, YKK Global Marketing Group, Mike Maekawa, says: "The Empel technology will allow us to create a new generation of water-protective zippers that perform better, have better flexibility and are more sustainable."

The process for the application of the Empel treatment starts with a hydrocarbon monomer base, which can be rolled onto the face of a fabric using conventional textile-coating machinery. Rolls of coated fabrics are then placed into curing pods where they are pressurised to ensure that every fibre is coated evenly with the finish. Finally, recirculated steam is used to heat the pressurised rolls of fabric, converting the monomers in the base into polymers that bond molecularly to the fibres. Once this process is complete, no further washing is required, and it generates no hazardous discharge or waste, and is non-toxic.

YKK has its headquarters in Tokyo, Japan.

See also:
Technical Textiles International, Winter 2020, *Saving every last drop—dyers innovate to save precious resources*, page 15; https://www.technical-textiles.net/node/76002

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Solvay launches partially bio-based polyamide yarn

A partially bio-based polyamide (PA) 5,6 yarn has been launched by Solvay of Brussels, Belgium. Called Bio Amni and produced at the company's textile industrial unit in Brazil, the development of the yarn forms part of Solvay's response to demands from the textile industry for more sustainable products.

With the launch of Bio Amni, sustainable products will now account for 30% of Solvay's global PA portfolio, a figure which the group plans to increase to 50% in the next three years.

Solvay has launched several PA products for the textiles industry in recent years. In 2020, in response to the outbreak of the human coronavirus (covid-19) pandemic, the company unveiled an antiviral and antibacterial PA, called Amni Virus-Bac OFF[1].

See also:
[1]*Antiviral and antibacterial polyamide yarn*, https://www.technical-textiles.net/node/75914

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Cleaning granulates support the development of bio-based fibres

Cleaning granulates from Dreychem are being used by IFG Asota[1] to clean its extrusion equipment to help ensure that it produces high-quality fibres from biopolymers.

IFG Asota of Linz, Austria, is a research and development (R&D) centre operated by Industrial Fibres Group (IFG; see also, page 11, which has its headquarters in Danderyd, Sweden, and manufactures meltspun staple fibres from polypropylene (PP), polyethylene (PE) and polyamide (PA).

The products manufactured on the pilot plant installed at IFG Asota change often, meaning that the extruders need to be cleaned frequently between production runs. R&D Manager at IFG Asota, Andreas Weinberger, says: "With the fibre diameters down to less than 20 µm, even the tiniest contaminants in the melt can cause production problems. Especially when the machine has been idle for a certain time, rinsing with the usual polymer is not enough to reliably remove all the deposits and agglomerates". He adds that this is particularly the case if biopolymers, such as polylactic acid (PLA), are being processed, as they tend to degrade rapidly at elevated temperatures. Weinberger uses Dreyclean LT cleaning granulates from Dreychem of Moormerland, Germany, for the task. He says that they have proved to be so efficient that, "since we started using them, we have had significantly fewer problems such as fibre breakages. Apart from that, our experience shows that, following their use, processing temperatures in the extruder of up to 20°C lower are sufficient for achieving the same throughput. This improves the quality of the bio-based fibres and lowers the energy consumption."

Another benefit of using Dreyclean LT, says Weinberger, is a reduction in wastage when starting production of a new fibre. He explains: "Biobased plastics such as PLA are very much more expensive than conventional thermoplastics used for melt spinning. This, plus our overall shorter running times per batch, make the material losses until a stable process is reached a significant economic factor.."

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

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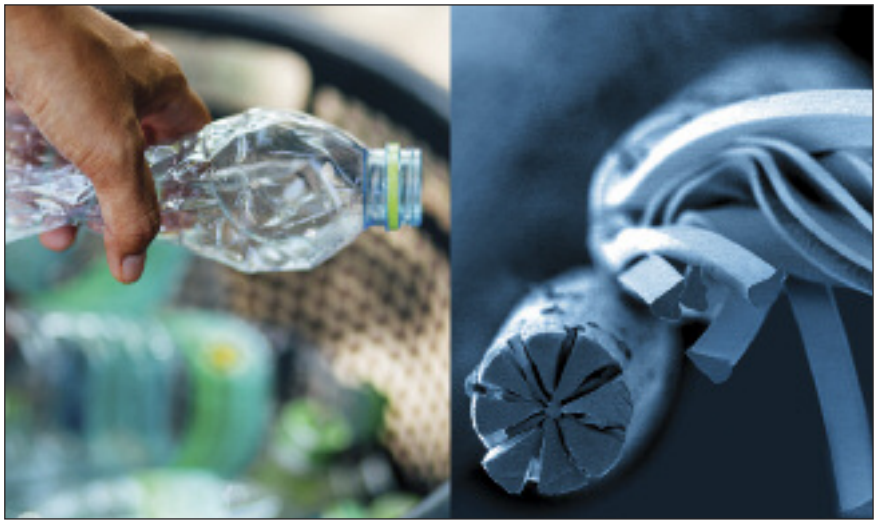
Microfilament fabrics made using post-consumer recycled polyester

Freudenberg Performance Materials has launched a version of its hydroentangled microfilament fabric (Evolon) that is produced substantially from recycled materials.

The company, of Weinheim, Germany, reports that the fabric (Evolon RE) is manufactured from an average of 70% recycled polyester (PES), which it sources from post-consumer polyethylene terephthalate (PET) bottles. It adds that the fabric, which is available in basis weights of 80–300 g.m^{-2}, demonstrates the same mechanical properties as standard Evolon fabrics, making it suitable for the production of such as durable, washable wipes and technical packaging.



Freudenberg is using polyester sourced from post-consumer recycled plastic bottles (left) to produce Evolon microfilament textiles (right).

Freudenberg Performance Materials says that, since Evolon was launched in 1999, it has worked continuously to make the product, and the process used for its manufacture, more sustainable. No solvents or chemical binders are used during the manufacture of Evolon, for instance, and in 2003, the company set-up a system for reprocessing the water used in the hydroentanglement process.

To produce Evolon fabrics, bicomponent filaments are spun and then hydro-entangled using high-pressure water jets, before being split to generate micro-filaments. Unlike nonwovens based on staple fibres, these fabrics do not release fibres or lint, because of the integrity of the long filaments.

Further, the microfilaments ensure the fabrics are strong, mechanically stable and isotropic, as well as forming a structure that can hold impregnated liquids well.

See also:
Fabrics made from recycled polyester for sportswear;
https://www.technical-textiles.net/node/76222

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Producing elastic fibres from polylactic acid blends

Methods for increasing the elasticity of polylactic acid (PLA) fibres, which could enable them to be used in place of elastane in the production of clothing, are being developed by researchers at the Transfer Center for Plastics Technology (TCKT) GmbH in Wels, Austria.

Through the BioModFiber project, the researchers blended PLA with materials of higher elasticity, such as polybutylene succinate (PBS) and thermoplastic polyurethane (TPU), and various peroxides and chain-extenders were added to the blends using a reactive extrusion process. Fibres were then produced from these blends via melt spinning, after which they were characterised through tensile testing.

Fibres made from a 60/40 blend of PLA and PBS, and modified with the additive Joncryl (from BASF of Ludwigshafen, Germany), demonstrated an elongation-at-fracture of 107%—almost double that of fibres made from an unmodified 60/40 PLA/PBS blend.

Fibres made from a 90/10 blend of PLA and TPU, and modified with a peroxide crosslinker and a stabiliser demonstrated an elongation-at-fracture of 193%—again, almost double that of fibres made from an unmodified blend.

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Apply Carbon to establish carbon-fibre recycling facility

Apply Carbon is to establish a facility to recycle carbon fibres following its acquisition of ELG Carbon Fibre's short-fibre business in May 2021[(1).]

Apply Carbon – which is based in Languidic, France, and is part of Procotex Corp of Dottignies – has a 15 600-m^2 production facility in Plouay, France, with an extra 90 000 m^2 of space in which to expand. Equipment and stocks of carbon fibre are currently being transferred to this facility from ELG Carbon Fibre's former headquarters in Coseley, UK.

Procotex Corp aims to make high-quality recycled fibres, including carbon, aramid, polyphenylene sulphide (PPS) and uni-directional (UD) flax and other natural fibres. In 2011, it acquired Apply Carbon, a company with expertise in milling and cutting technical fibres.

See also:
[(1)]*ELG Carbon Fibre becomes Gen 2 Carbon*,
https://www.technical-textiles.net/node/76227

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Additive enables thermoregulating fibres to biodegrade in landfills

Cocona Labs' 37.5 thermoregulating fibres and yarns have been used in the production of such as waterproof jackets for mountain runners.

Cocona Labs reports that it can incorporate an additive into its thermoregulating fibres and yarns (called 37.5) that enables them to biodegrade in landfills.

In testing undertaken according to the D5511 standard(1) published by ASTM International of West Conshohocken, Pennsylvania, USA, 37.5 polyethylene terephthalate (PET) staple fibres embedded with the additive biodegraded by 78% after 726 days in an accelerated landfill environment. Cocona Labs, of Boulder, Colorado, USA, says that this data indicates that the fibres will break-down by 50–80% over the productive lifetime of the average US landfill site (80-100 years).

It caveats these findings by adding that the stated rate and extent of degradation will vary by landfill and fabric type, and the material might not continue to degrade after this time. Conventional PET does not biodegrade.

The additive is embedded into the fibres, enhancing the ability of microorganisms already present in landfills to bind to them and break them down. Unlike other products on the market, the additive does not cause the fibres to fracture into smaller pieces of microplastic that then remain unchanged. The fibres are converted into by-products at the molecular level, some of which could be captured and re-purposed in modern landfills.

37.5 technology comprises active carbon particles that are permanently embedded in fibres and help the body's natural cooling mechanism, sweating, by removing the moisture vapour from the microclimate next to the skin.

The addition of the particles increases the fibre's surface area by up to 800%, and their presence accelerates the conversion of sweat to vapour and the rate of removal of the vapour, significantly increasing the rate of drying, Cocona Labs claims. Moreover, the hotter the wearer gets, the greater the driving force removing the moisture from the microclimate.

By working to keep the microclimate at the optimum relative humidity, 37.5 helps to keep the core temperature close to an ideal of 37.5°C, leaving the wearer more comfortable and able to exercise for longer. Cocona says fabrics using 37.5 technology dry up to five-times faster than untreated ones and, because the additives are derived from natural materials, the treatment does not cause skin irritation. In addition, the additives never wash out from the yarn and their performance does not degrade over time.

See also:
(1)ASTM D5511, *Standard test method for determining anaerobic biodegradation of plastic materials under high-solids anaerobic-digestion conditions*, https://www.astm.org/Standards/D5511.htm

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Avgol and Algaeing to develop algae-based dyes for nonwovens

Nonwovens manufacturer, Avgol, and developer of algae-based dyes and fibres, Algaeing, are to develop algae-based products for the dyeing of polyolefin based spunbond and meltblown fabrics.

Algaeing, of Berlin, Germany, and Beit Yizhak, Israel, has developed an algae-based dye formulation that it says can be applied to all types of 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 and have demonstrated the suitability of the dyes for application to nonwovens through proof-of-concept and proto-typing programmes.

The companies, which are now preparing for the next steps to commercialise the technology, say that they will concentrate initially on nonwovens for use in the hygiene, medical and personal protective equipment (PPE) markets—specifically, body-liner materials for absorbent hygiene products (AHPs) and components for face masks and face coverings.

The Chief Executive Officer (CEO) of Avgol, Shachar Rachim, says that the use of Algaeing's technology supports his company's efforts to use materials that are more readily recyclable and biodegradable. He adds: "Having an organic colorant that can be removed during the recycling process and has no negative impact when released into the environment if undergoing biodegradation, supports polyolefins as future-proof resins."

Avgol recently entered into a partnership with Polymateria Global of London, UK, and Indorama Ventures of Bangkok, Thailand, to produce nonwovens from biodegradable polyolefins(1).

See also:
(1)*Technical Textiles International*, Summer 2021, *Partners to develop biodegradable synthetic fibres and nonwovens*, page 35; https://www.technical-textiles.net/node/76193

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Rollable camouflage sheet can make soldiers nearly undetectable

Developed by Polaris Solutions, the Kit 300 sheet is made from a thermal/visual concealment material and can be carried as a small roll.

A camouflage sheet renders soldiers virtually invisible to the naked eye and thermal imaging equipment, claims its developer, Polaris Solutions of Givat Haim, Israel.

Developed in partnership with Israel's Ministry of Defense (MoD), the Kit 300 sheet is made from a thermal visual concealment (TVC) material that, according to Polaris Solutions, comprises "metals, polymers and microfibres". The sheet weighs around 500 g and can be carried as a small roll. Soldiers can wrap it around themselves when on the move and can join their sheets together to build a barrier that resembles rock when they set-up a position.

It can also be used as a stretcher; a far lighter solution than the current set-up where a member of an infantry squad has to carry a dedicated stretcher weighing several kilogrammes.

The Head of the MoD Directorate for Defense Research and Development (DDR&D)'s Detectors and Imaging Technology Branch, Gal Harari, told *Janes*[1] that there had been little investment in infantry camouflage in recent years, while the functionality of night-vision systems has improved and their use has proliferated. Indeed, their use by the Lebanese group Hizbullah during the 2006 war led to the founding of Polaris Solutions to find a countermeasure.

See also:

[1]https://www.janes.com/defence-news/news-detail/new-israeli-camouflage-sheet-unveiled

Technical Textiles International, December 2019, *Military funding continues to be a big boost for innovation*, page 11; https://www.technical-textiles.net/node/75255

Technical Textiles International, October 2018, *Textile innovations continue to help keep military personnel safe*, page 41; https://www.technical-textiles.net/node/74369

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Award for developers of electromagnetic radiation-attenuating yarn

The Chief Executive Officer of FibreCoat, Robert Brüll (left), and the Managing Director of Deutsche Basalt Fiber GmbH, Georgi Gogoladze.

The developers of an aluminium-coated multifilament basalt yarn that, when used to produce fabrics, could shield parts in cars, mobile telephones and buildings from electromagnetic interference (EMI), have been presented with an award for their achievement.

Fabrics produced from the yarn, called AluCoat, are cheaper and easier to produce than the metal-fibre fabrics currently used for EMI shielding, according to FibreCoat of Aachen and Deutsche Basalt Faser GmbH of Sangerhausen, both in Germany. The partners were awarded the overall prize at the *17th IQ Innovationspreises Mitteldeutschland*, an online event broadcast from Leipzig, Germany, on 24 June 2021.

The partners say that, in comparison with the production of metal yarns, 1500 m of AluCoat can be produced per minute, instead of five metres, and that the energy required for the production of AluCoat is 90% lower. As a result, AluCoat costs around twenty times less to produce than metal yarns.

AluCoat was launched commercially on 1 January 2021 in a range of titers[1] and can also be used to manufacture heat sinks for batteries and electric diverters in filters, as conductive elements in smart textiles and as a reinforcement for cast aluminium. AluCoat is also available in fabric and nonwoven forms in a wide range of areal weights.

FibreCoat says that the yarn has an electrical conductivity of 100 Ω.m and can be used in working temperatures of up to 400°C. It is highly thermally conductive. Further, it delivers 80–120 dB of attenuation to high and low frequencies of electromagnetic radiation.

See also:

[1]*Aluminium-coated yarn attenuates electromagnetic radiation*, https://www.technical-textiles.net/node/75954

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Durable, inherently flame-retardant fabric

Extreme X provides a high arc-protection rating for workers in such as power stations.

A durable, stretchable and inherently flame-retardant (FR) fabric for the production of protective clothing for workers in such as electric power stations has been launched by Daletec of Dalekvam, Norway.

Called Extreme X, the fabric lasts three-times longer than standard modacrylic–cotton blend FR fabrics in standard abrasion testing, owing to the use of polyamide (PA) fibres (Cordura) from Invista of Wichita, Kansas, USA. Further, Daletec says that the fabric:

- maintains its FR performance even after extensive washing (at 75°C and above);
- grants freedom of movement owing to its stretchability;
- provides a high arc-protection rating (9 cal.cm^{-2}), as certified according to a broad range of European norms;
- is dimensionally stable and possesses high tear-strength;
- is comfortable, owing to its high air-permeability and soft handle.

Brand Manager for Daletec FR Fabrics, Erlend Hesjedal-Johannessen, says: "Ultimately, Daletec Extreme X has been engineered for comfort, for protection and to last. It is designed to stand-up to the hazards workers face, as well as resist tearing and abrasion. The longer a fabric lasts, the longer the wearer has protection in the work environment and the longer the garment can remain in use."

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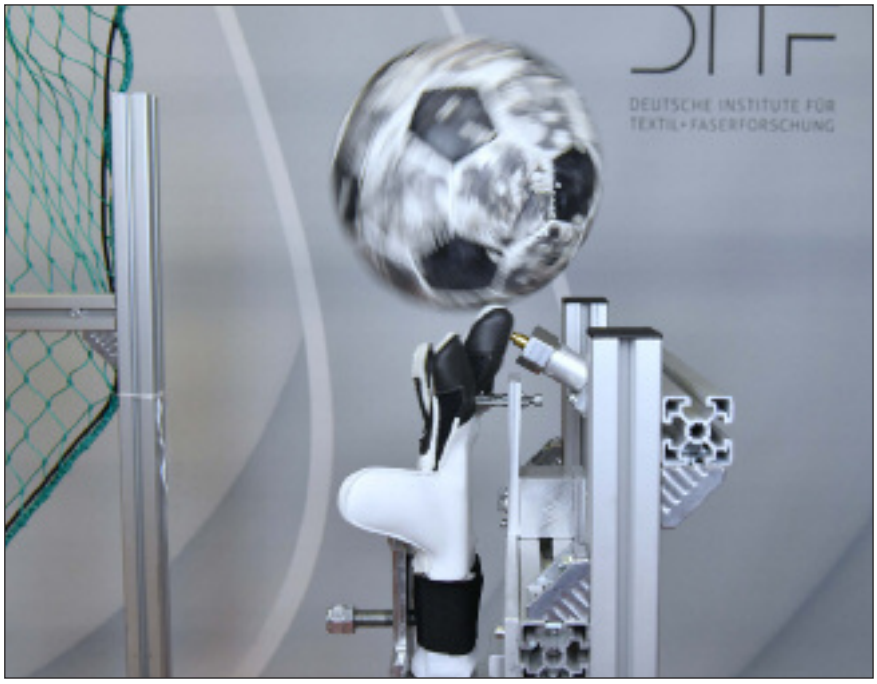
Gloves protect goalkeepers from finger injuries



The gloves have been tested on a rig comprising a ball-cannon and a dummy hand on which the glove can be placed.

Gloves designed to prevent goalkeepers in association football from overstretching – and thereby injuring – their fingers when making saves are being developed by researchers at the Institute of Textile Technology and Process Engineering (DITF) in Denkendorf, Germany.

According to a researcher at the Technology Center Knitting Technologies at the DITF, Hans-Helge Böttcher, the glove needs to protect the goalkeeper's fingers from large mechanical forces while remaining flexible enough not to affect their sensory perception. Conventional gloves worn by goalkeepers can be fitted with plastic splints or so-called finger frames, but these are not always effective and can affect flexibility, and thereby the athlete's control of the ball.

The glove developed at the DITF features textile structures with specific force-elongation properties that absorb force applied at the fingertips and transfer it to the wrist cuff. These structures are sewn onto the glove from the finger end-joint of the outer hand to the finger end-joint of the inner hand and their lengths can be adjusted to the size of the wearer's hand. An appropriate amount of tension can also be set for each individual finger. The wrist is enclosed by a cuff made of a strong, elastic material and, with the help of load-bearing textile structures, transfers tensile forces to the forearm via channels in the palm.

To test the efficacy of the gloves, a rig comprising a ball-cannon and a dummy hand on which the glove can be placed was set-up at the DITF. The cannon shoots balls from different angles at speeds of 20–120 km.h^{-1} and a pressure cell installed behind the glove is used to determine the residual impact force of the ball striking the hand. The testing indicates that the glove prevents the fingers of its wearer from over-extending.

The research project will be completed in September 2021 and the researchers believe the technology could be commonplace at the *2022 FIFA World Cup*, which will be held in Qatar on 21 November–18 December 2022.

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Senate passage of *Innovation and Competition Act* is welcomed

The US Senate's passage of the *Innovation and Competition Act (USICA)*[1], which includes measures to help build a domestic supply chain for the manufacture of personal protective equipment (PPE), has been welcomed by the US National Council of Textile Organizations (NCTO) of Washington, District of Columbia. The industry association has, however, expressed concerns about some aspects of the act.

Designed to help address the rising military, geopolitical and economic competition that the USA experiences from China, the act will enable hundreds of billions-of-dollars to be spent on science and technology projects by a range of US government agencies. It includes the *Make PPE in America Act*[2], which will require the US Departments of Homeland Security, Health and Human Services and Veterans Affairs to issue long-term contracts to US manufacturers of PPE for the supply of these goods.

Sponsored by US Senators Rob Portman (Republican) and Gary Peters (Democrat), the *Make PPE in America Act* is designed to ensure that the US has all the PPE it requires, for the present and for any future pandemic, while creating domestic manufacturing jobs.

Senator Portman says that the human coronavirus (covid-19) pandemic has made it evident that the USA should not rely on foreign countries for the supply PPE. He adds that long-term contracts "give producers the certainty to know that their investment in the USA will be worth it because the government will be there to buy the PPE they produce."

The NCTO led an industry and labour coalition supporting the inclusion of the *Make PPE in America Act* in the *USICA*. It is, however, unhappy with a provision added to the *USICA* just before it was passed that would see normal tariffs and penalties assessed on imports of PPE suspended for two years.

The President and Chief Executive Officer (CEO) of the NCTO, Kim Glas, says: "Doing so would allow China to maintain its stranglehold on the US PPE market, while working at cross-purposes with other provisions of the bill designed to incentivise much-needed investment in domestic PPE manufacturing. US manufacturers retooled production and have significant idle capacity."

Glas adds that the Biden Administration needs to keep these tariffs in place to "support US businesses and workers who abide by higher labour, environmental and production standards... This provision is the absolute wrong message to send to American manufacturers and its workforce."

The Biden Administration recently awarded a pair of contracts for the manufacture of over 17 million re-usable face masks, for use in community health centres, food banks and soup kitchens across the USA, to US companies, Parkdale Mills and Ferrara Manufacturing Inc[3].

See also:

[1]https://www.rpc.senate.gov/legislative-notices/s1260_the-united-states-innovation-and-competition-act

[2]https://www.congress.gov/bill/116th-congress/senate-bill/4578?r=6&s=1

[3]*Technical Textiles International*, Summer 2021, *Biden Administration purchases over 17 million US-made face masks*, page 8; https://www.technical-textiles.net/node/76167

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DSM partners with mills for production of Dyneema fabrics

Royal DSM of Heerlen, The Netherlands, has entered into partnerships with seven mills that will manufacture fabrics using its ultra-high molecular weight polyethylene (UHMWPE), Dyneema.

The mills, which DSM refers to as its premium manufacturing partners (PMPs), are: Hwa Sung International of Busan, South Korea; IBQ Fabrics of Barcelona, Spain; Naveena Denim of Lahore, Pakistan; Feinjersey Group of Götzis, Austria; VDS Weaving of Oudenaarde, Belgium; Fuchshuber Techno-Tex in Lichtenstein, Germany; Gayon of Haining City, China. DSM says that each of the mills has met specific criteria regarding their ability to develop and manufacture high-quality fabrics using Dyneema. It adds that the PMPs will enable the quicker development and production of a wider range of fabrics, than would otherwise be possible.

The Global Business Director, Consumer & Professional Protection, at DSM Protective Materials, Marcio Manique, says: "We are confident that our partnership will ensure the continuous growth of our Dyneema offerings for various end-use markets worldwide and look forward to exploring additional opportunities, including the introduction of more sustainable alternatives with bio-based Dyneema fibre[1]."

See also:

[1]*DSM to launch partially bio-based ultra-high molecular weight polyethylene*, https://www.technical-textiles.net/node/75499
This issue, *Industry urgently needs to develop supplies of sustainable raw materials*, page 24.

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Klopman launches products through virtual showroom

More than twelve new fabrics for the production of workwear have been unveiled in a virtual showroom that is being hosted online by Klopman of Frosinone, Italy.

It has supplemented the flame-retardant (FR) fabrics in its K-Flame range with a series of high-performance products. The company's Greenwear range has been expanded with two high-visibility protective fabrics, made using recycled polyester (PES) and cellulosic fibre, respectively. It has also launched a range of four-way stretch fabrics. Klopman's virtual showroom can be accessed at: https://virtualshowroom.klopman.com

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Electrospun wound dressing indicates infection by glowing

An electrospun dressing that fluoresces when the wound to which it is applied is not healing properly is being developed by researchers at RMIT University in Melbourne, Victoria, Australia.

Integrated into the nanofibres of the dressing are nanosheets of antibacterial and antifungal magnesium hydroxide that glow brightly when exposed to a source of ultraviolet (UV) radiation, such as a UV light. Crucially, the fluorescence of the nanosheets alters in response to changes in the pH of the environment to which they are exposed. This means that they could be used to determine whether a wound is acidic, indicating that it is in the process of healing, or alkaline, suggesting that infection is setting in. Further, the researchers claim that the dressing is cheaper to produce than typical silver-based antimicrobial dressings, but is as effective at fighting bacteria and fungi for up to a week after its application.

A Vice Chancellor's Postdoctoral Fellow at RMIT and one of the authors of a paper describing the work[1], Vi Khanh Truong, says that, currently, in order to check how a wound is healing, its dressing must be removed, which can be painful and can create a vector for pathogens. He continues: "The smart dressings we have developed not only fight bacteria and reduce inflammation to help promote healing, [but they also] have glowing sensors to track and monitor for infection. Being able to easily see if something is going wrong would reduce the need for frequent dressing changes and help to keep wounds better protected."

The fluorescence of the bandage under ultraviolet light changes in response to the pH of the wound to which it is applied, enabling it to be used as a tool to track healing.

The researchers claim that magnesium hydroxide nanosheets can be integrated easily into any biocompatible nanofibre, which means they can be incorporated into standard cotton bandages. Laboratory tests showed the nanosheets were non-toxic to human cells, while destroying emerging pathogens such as drug-resistant *Staphylococcus aureus* and *Candida auris*. Further, Truong says that the process used to make the fluorescent nanosheets would be simple to scale-up for mass production.

He adds: "Normally, antimicrobial wound dressings start to lose their performance after a few days, but our studies show these new dressings could last up to seven days, and because magnesium is so abundant compared with silver, our advanced dressings could be up to 20 times cheaper."

The research team is keen to work with clinicians to develop the technology further through such as pre-clinical and clinical trials.

See also:

[1]*ACS Applied Materials & Interfaces*, 2021, Volume 13, Issue 24, pp 27904–27919, *Fluorescent magnesium hydroxide nanosheet bandages with tailored properties for biocompatible antimicrobial wound dressings and pH monitoring*, https://doi.org/10.1021/acsami.1c05908

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Antimicrobial knitted face masks can withstand 100 washes

A three-dimensionally (3D) knitted antimicrobial face mask that can filter particles of 3 µm and above in size from the air has been launched by SP Science Ltd of Bury, UK.

Called the Silver Life Face Covering, the general-purpose mask is knitted from a blend of cotton and polyester (PES) yarns. Antimicrobial silver particles are incorporated into the fibres of the PES yarn as they are extruded, enabling the mask to retain its antimicrobial effects after 100 washes by machine at temperatures of up to 40°C using biological or non-biological washing powder, or by hand in warm water using a suitable washing solution. The mask cannot, however, be tumble-dried.

The antimicrobial efficacy of the mask has been tested according to several standards, including the 18184:2019 standard[1] published by the International Organization for Standardization (ISO) of Geneva, Switzerland, the 30 standard[2] from the American Association of Textile Chemists and Colorists (AATCC) of Research Triangle, North Carolina, USA, and Japanese Industrial Standard (JIS) L 1902[3] published by the Japanese Standards Association of Tokyo.

SP Science guarantees Silver Life Face Coverings for up to 100 washes or two years of use and says that they reduce the environmental burden associated with use of single-use face masks.

See also:

[1]ISO 18184:2019, *Textiles — Determination of antiviral activity of textile products*, https://www.iso.org/standard/71292

[2]AATCC 30, *Antifungal activity, assessment on textile materials: Mildew and rot resistance of textile materials*, https://members.aatcc.org/store/tm30/491/

[3]JIS L 1902, *Textiles-Determination of antibacterial activity and efficacy of textile products*, https://global.ihs.com/doc_detail.cfm?document_name=JIS%20L%201902&item_...

SP Science Ltd.
Email: enquiries@spscience.co.uk;
https://www.silverlifemasks.com

Face masks feature biosensors that can detect *SARS Cov-2* virus

The wearable freeze-dried cell-free sensor can be integrated into any standard face mask. The wearer pushes a button on the mask to release a small amount of water into the system, which provides results within 90 minutes.

Wearable biosensors that can be customised to detect the presence of pathogens – such as the *SARS Cov-2* virus responsible for the human coronavirus (covid 19) pandemic – and toxins, and alert their wearer, have been developed by researchers in the USA.

In a recent paper[1], the researchers – at the Wyss Institute for Biologically Inspired Engineering at Harvard University and the Massachusetts Institute of Technology, both in Cambridge – report that they have incorporated the biosensors into standard face masks so that they can be used to detect the presence of the *SARS Cov-2* virus in the wearer's breath. The button-activated biosensors give results within 90 minutes of exposure and to degrees of accuracy comparable with standard nucleic acid-based diagnostic tests, such as polymerase chain reactions (PCR). A Research Scientist at the Wyss Institute and the co-first author of the paper, Peter Nguyen, says that the cost and speed of the biosensor are similar to those of cheap antigen tests. He continues: "In addition to face masks, our programmable biosensors can be integrated into other garments to provide on-the-go detection of dangerous substances including viruses, bacteria, toxins and chemical agents."

The wearable sensors are based on technology created several years ago in the laboratory of Wyss Core Faculty member and senior author Jim Collins. In 2014, he showed that proteins and nucleic acids needed to create synthetic gene networks that react to specific target molecules could be embedded into paper, and he used this approach to create paper-based diagnostics for the *Ebola* and *Zika* viruses. In 2017, Collins developed another cell-free sensor system, known as SHERLOCK, which allows for the detection of nucleic acids. These cell-free sensors are freeze-dried and remain stable for many months, until they are rehydrated. When activated by water, these sensors can interact with their target – which can be any ribonucleic acid (RNA) or deoxyribonucleic acid (DNA) sequence, as well as other molecules – and produce a signal such as a change in colour.

More recently, Collins and his colleagues began working on incorporating these sensors into synthetic textiles, with the goal of creating a laboratory coat for healthcare workers or others who might be exposed to pathogens. The researchers embedded their freeze-dried components into a small section of this synthetic fabric and surrounded them with a ring of silicone elastomer to prevent them from evaporating or diffusing away from the sensor. To demonstrate the technology, the researchers created a jacket embedded with about 30 of these sensors. They showed that a small splash of liquid containing viral particles, mimicking exposure to an infected patient, can hydrate the freeze-dried cell components and activate the sensor. The sensors can be designed to produce different types of signals, including a colour change that can be seen with the naked eye, or a fluorescent or luminescent signal, which can be read with a handheld spectrometer. The researchers also designed a wearable spectrometer that could be integrated into the fabric, where it can read the results and wirelessly transmit them to a mobile device.

Then, the covid-19 pandemic struck. Postdoctoral Fellow at the Wyss Institute and co-first author, Luis Soenksen, says: "We wanted to contribute to the global effort to fight the virus, and we came-up with the idea of integrating [sensors] into face masks to detect *SARS Cov-2*. The entire project was done under quarantine or strict social distancing, starting in May 2020."

To researchers embedded freeze-dried SHERLOCK sensors into a face mask. As with the wearable sensors, the freeze-dried components are surrounded by silicone elastomer. In this case, the sensors are placed on the inside of the mask, so they can detect viral particles in the breath of the person wearing the mask. The mask also includes a small reservoir of water that is released at the push of a button when the wearer is ready to perform a test. This hydrates the freeze-dried components of the *SARS Cov-2* sensor, which analyses accumulated breath droplets on the inside of the mask and produces a result within 90 minutes.

The researchers can also swap-in sensors for the detection of other pathogens, including influenza, *Ebola* and *Zika*, or sensors they have developed to detect organophosphate nerve agents.

In the paper, the researchers demonstrate that a network of fibre-optic cables can be integrated into the sensors to detect fluorescent light generated by the biological reactions, indicating the detection of the target molecule with a high level of accuracy. This digital signal can be sent to a smartphone application that allows the wearer to monitor their exposure to a vast array of substances.

The team is searching for partners to enable the mass production of the face-mask diagnostic for use during the covid-19 pandemic, as well as for detecting other biological and environmental hazards.

See also:

[1]*Nature Biotechnology*, 2021, *Wearable materials with embedded synthetic biology sensors for biomolecule detection*, https://doi.org/10.1038/s41587-021-00950-3

https://player.vimeo.com/video/529526393

James J. Collins, Founding Core Faculty and Lead, Living Cellular Devices, Wyss Institute for Biologically Inspired Engineering, Harvard University, and Termeer Professor of Medical Engineering and Science and Professor, Department of Biological Engineering, Massachusetts Institute of Technology. Email: jimjc@mit.edu; https://www.collinslab.mit.edu

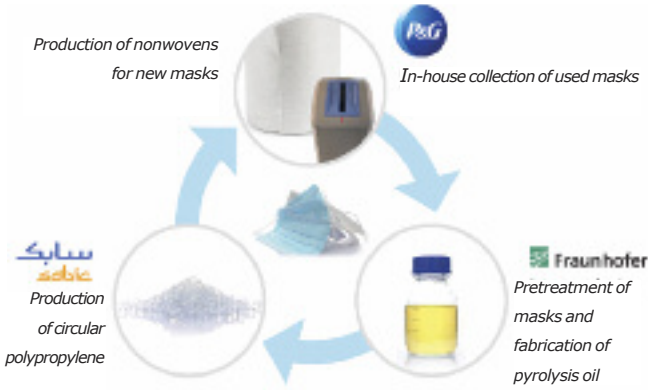
System developed for the closed-loop recycling of single-use face masks

A pilot project to demonstrate the feasibility of a closed-loop system for the recycling of single-use face masks has been undertaken by the Fraunhofer Institute for Environmental, Safety, and Energy Technology (UMSICHT), SABIC and Procter & Gamble (P&G).

Billions of disposable face masks have been used throughout the human coronavirus (covid-19) pandemic and those that are not disposed of thoughtlessly in public spaces are currently sent to landfill or incinerated. They could, however, represent a valuable feedstock for new materials if a suitable recycling process was developed and the necessary infrastructure for their collection was put in place.

As part of the pilot project, P&G of Cincinnati, Ohio, USA, collected used face masks worn by employees or given to visitors at its manufacturing and research sites in Germany. Although those masks are always disposed of responsibly, there was no route in place to recycle them efficiently. To help demonstrate how this problem could be solved, special collection bins were set-up, and the collected used masks were sent to Fraunhofer UMSICHT in Oberhausen, Germany, for further processing in a dedicated research-scale pyrolysis plant.

The Head of the Recycling Management Department at Fraunhofer UMSICHT, Alexander Hofmann, says: "The masks were first automatically shredded and then thermochemically converted to pyrolysis oil. Pyrolysis breaks the plastic down into molecular fragments under pressure and heat, which will also destroy any residual pollutants or pathogens, such as the coronavirus [*SARS-Cov-2*]."



A closed-loop system for the recycling of single-use face masks has been developed by the Fraunhofer Institute for Environmental, Safety, and Energy Technology, SABIC and Procter & Gamble.

The pyrolysis oil was then sent to SABIC of Riyadh, Saudi Arabia, where it was used as feedstock for the production of polypropylene (PP) resin. The resins were produced using the mass-balance approach, which allows for the volume of a feedstock to be tracked through a production system, so that the amounts used in the final product can be accounted for accurately.

Finally, the PP was supplied to P&G, where it was used to produce nonwovens. P&G Senior Director Open Innovation, Hansjörg Reick, says: "This pilot project has helped us to assess if the closed-loop approach could work for hygiene- and medical-grade plastics. Of course, further work is needed, but the results so far have been very encouraging."

The entire pilot project was developed and implemented within only seven months and the potential of transferring the principles established through it to the recycling of other feedstocks and chemical products is being evaluated through the Fraunhofer Cluster Circular Plastics Economy (CCPE), a partnership between six of the Fraunhofer institutes and led by UMSICHT.

The latest developments in technologies for the sustainable finishing of textiles will be discussed at the *World Congress on Textile Coating special edition: Conference on Sustainable Finishing of Textile*s, which will be held online on 30 September–1 October and 7–8 October, 2021 (see also, page 23).

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Antimicrobial additive can be applied through laundering

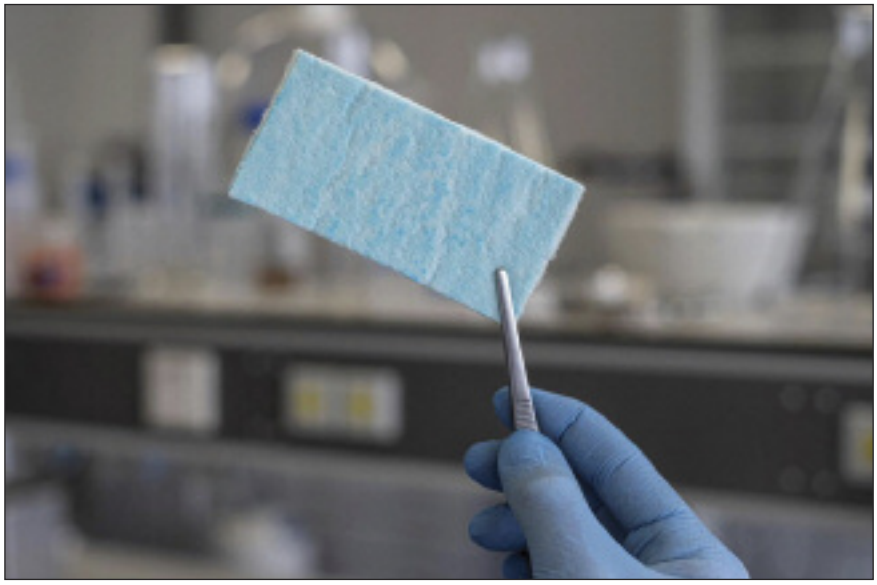
An antimicrobial additive that has been proven effective against the 229E strain of human coronavirus (a surrogate for *SARS-Cov-2*, which is responsible for the human coronavirus (covid-19) pandemic) and can be applied to fabrics during laundering has been launched by Cosmo Speciality Chemicals of New Delhi, India.

Called Cosmotex AVB, the biodegradable, silver-free additive inactivated 99.9% of the virus when tested according to the ISO 18184:2019 standard (from the International Organization for Standardization (ISO) of Geneva, Switzerland)[1] by Biotech Testing Services of Mumbai, India. It inhibits the growth of bacteria, mould and mildew, and algae. Further, Cosmo says that the additive retains this efficacy after 50 laundering cycles, is compatible with detergents and does not hamper the colour-fastness of fabrics. It is suitable for application to such as garments, home furnishings and bed linen.

See also:
[1]ISO 18184:2019, *Textiles — Determination of antiviral activity of textile products*, https://www.iso.org/standard/71292.html

Cosmo Speciality Chemicals.
Email: enquiry@cosmochem.in;
https://www.cosmochem.in

Impregnated textile patch used to stem bleeding during surgery



GATT-Patch is a fibrous gelatin sheet impregnated with particles of synthetic activated polymer, which has been used to stem bleeding in a patient undergoing liver surgery.

Liver-surgery patients could soon be protected from heavy bleeding by a haemostatic patch made using an advanced textile-impregnation technology.

GATT Technologies BV of Nijmegen, The Netherlands, says that its GATT-Patch has been used for the first time to treat bleeding in a patient undergoing liver resection surgery as part of a study led by Radboud University Medical Center (UMC), also in Nijmegen. GATT-Patch is a flexible, fibrous gelatin sheet, impregnated with particles of synthetic activated polyoxazoline polymer using a process developed by Fibroline of Lyon, France.

Fibroline's patented process uses alternating electrical fields to drive dry powders into substrates and, because no heat is required, is suitable for use with materials that might otherwise be thermally degraded.

Chief Executive Officer (CEO) of Fibroline, Jérôme Ville described the news as "a milestone", being the first time a medical product treated using the company's technologies has been implanted in a human. "Our technology portfolio has been optimised over the last year to meet medical technology standards."

Nancy Hummel, who is responsible for medical textile developments at Fibroline, adds: "We are able to guarantee a very clean powder processing and avoid any cross-contamination between different formulations, while obtaining the desired powder distribution into the porous media. This allows us to work with progressively more challenging customers in many areas of medical and hygiene use."

Fibroline is working with a separate strategic partner to develop another medical product, which is scheduled for a US launch in late 2022.

- Fibroline's Chief Technology Officer (CTO) Joric Marduel gave a presentation about the company's technology at the *World Congress on Textile Coating* held online in February 2021 and now available on demand (see also, Inside back cover);
- Jérôme Ville will present the very latest developments using the technology at *Smart Nonwovens — High-performance Nonwovens Seminar* on 20 October 2021 in Geneva, Switzerland (see also, Inside front cover).

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Geert van Gansewinkel, Chief Executive Officer (CEO), GATT Technologies BV. Tel: +31 (24) 378-1536. Email: g.vangansewinkel@gatt-tech.com; https://www.gatt-tech.com/gatt-patch

Professor Dr Hans de Wilt, Radboud University Medical Center (UMC). https://www.radboudumc.nl/patientenzorg

Antimicrobial spray can be applied to textiles

An antimicrobial spray that can be applied to textile products such as face masks has been launched by Bio-Gate AG of Nuremberg and Bremen, Germany.

Containing silver microparticles that remain as a coating after its liquid component has evaporated, the spray has been shown to inactivate enveloped viruses, such as *SARS Cov-2* (responsible for the human coronavirus (covid-19) pandemic), *MERS Cov* and influenza. Its use helps, for instance, to reduce the spread of viruses while putting on and taking off masks.

The spray is available in Germany under the brand name Vitalia and is sold by Bio-Gate's customer Dr. Kleine Pharma GmbH of Bielefeld.

The spray is also sold under the brand BioEpiderm in online pharmacies and in retail pharmacy stores in Germany. In North America, the product is sold as PurLif.

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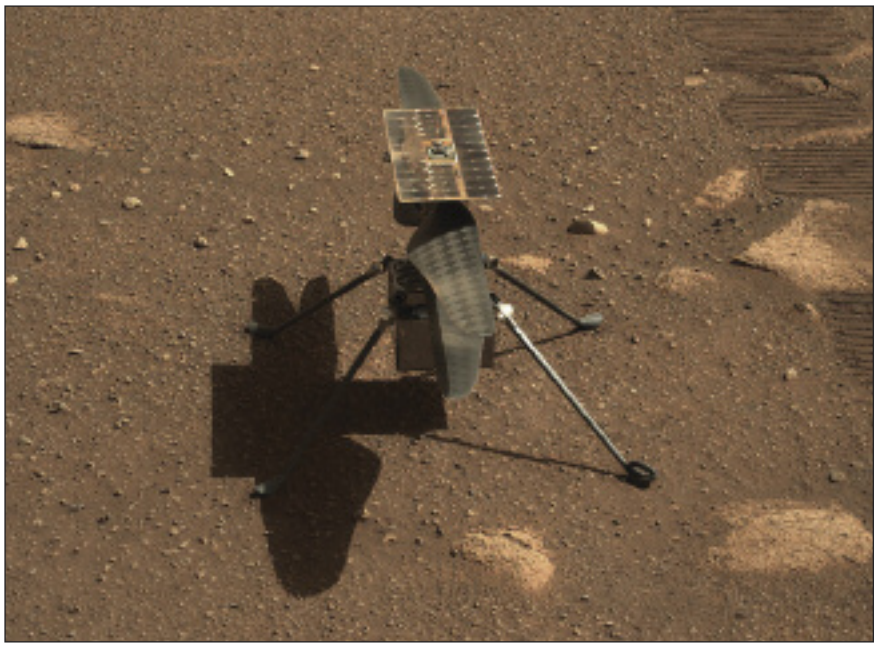
Karl Richter, RFH BioTek Inc (Bio-Gate AG's North American representative). Tel: +1 (416) 407-6120. Email: rfh@rfhBioTek.com

Spread-tow fabrics contribute to success of Ingenuity Mars helicopter

The National Aeronautics and Space Administration (NASA)'s Ingenuity Mars helicopter, which features carbon fibre-reinforced plastic (CFRP) rotor blades, has now completed ten flights over the Martian surface.

Ingenuity was transported to Mars on the underside of the Perseverance rover and its blades – together with the substrate for its solar panel and parts of the box on its bottom – are made using spread-tow carbon fibre reinforcements (TeXtreme) from Oxeon of Borås, Sweden.

Founded in 2003, Oxeon has developed and patented a method of weaving tapes that can range in widths in both warp and weft directions. The weaving process is gentle and flexible, and enables the conversion of many types of fibrous tapes, including glass, aramid, carbon and even brittle materials such as boron and ceramic, into customised fabrics.

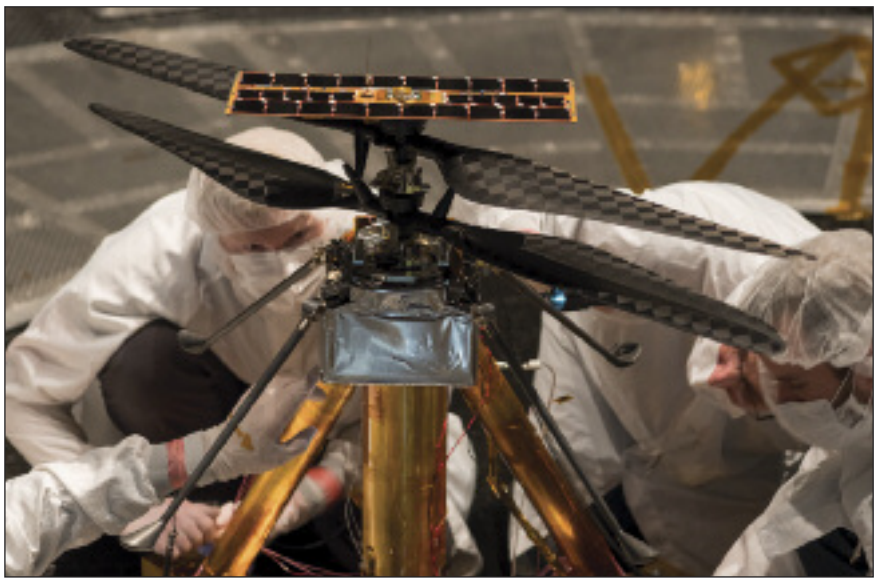


NASA's Ingenuity Mars helicopter is seen here in a close-up taken by Mastcam-Z, a pair of zoomable cameras aboard the Perseverance rover.

The tape-weaving technology can be used to produce spread tows of carbon fibre that have a thin profile. As a result, says Oxeon, composites manufacturers can pack more fibre into a given volume, or use fewer fibres (resulting in components that are up to 20–30% lighter in weight), than they would using yarns to achieve the same mechanical properties.

Further, the company says that TeXtreme-reinforced composites have smoother surfaces than conventional composites as a result of the greatly reduced number of interlacing points, increased fibre floats and a reduction in crimp. TeXtreme also allows the reinforcement of complex geometries. In many cases, one ply of such a material can be used instead of two cross-plied unidirectional (UD) sheets and the stable structure makes the material easy to handle.

Oxeon says that, in the case of Ingenuity, the use of TeXtreme enables the production of thinner and lighter-weight components, and plays a major role in suppressing any microcracking that might occur as a result of the parts being exposed to the extremes of temperature experienced on Mars—thereby preventing their subsequent failure.



Members of the NASA Mars Helicopter team inspect the flight model of the Ingenuity Mars helicopter prior to the mission. The distinctive chequerboard surface finish of TeXtreme can be clearly seen on the helicopter's blades.

Technical textiles have been a key enabler of NASA's Mars 2020 mission. A high-performance textile developed by Heathcoat Fabrics of Tiverton, UK, for the production of parachutes, for instance, enabled the Perseverance rover to land safely on Mars[1].

See also:

[1] *Technical Textiles International*, Spring 2021, *High-performance fabric delivers a soft landing on Mars*, page 22; https://www.technical-textiles.net/node/76094

https://www.youtube.com/embed/kNx9hcrUpww

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NCC unveils automated fibre-placement, automated tape-laying machine

A cell for automated fibre-placement and automated tape-laying processes installed at the UK's National Composites Centre.

A cell that can be used for both automated fibre-placement (AFP) and automated tape-laying (ATL) processes has been installed at the UK's National Composites Centre (NCC) in Bristol.

The cell, created in partnership with Electroimpact of Deeside, UK, can be used to carry-out ATL and AFP processes individually or together to create large structures with complicated geometries, and is intended for medium-to-large-scale manufacturing. It is the final machine to be installed as part of an 18-month, £36.7-million programme to fit ten automated systems for the manufacture of composite parts at the NCC. Funding for the programme was provided by the Aerospace Technology Institute (ATI) of Cranfield, UK, and the West of England Combined Authority (WECA) Local Enterprise Partnerships of Bristol.

The AFP process head can work with eight tows, each measuring 12.7 mm in width, and can be equipped with either an infrared (IR) heater with which to tack layers of thermoset composites together, or humm3 flash technology, which has been developed by Heraeus Noblelight Ltd of Cambridge, UK, and has been used at the NCC to tack thermosets at low temperatures (30-60°C), high-temperature thermoplastics and bindered dry fibres. The ATL head, meanwhile, can deposit tapes of the same materials of 75, 200 or 300 mm in width and employs the same heating systems as the AFP head.

Vertical and horizontal rotators allow for complex tools to be used to create such as convex and concave panels, large-diameter pipes, spars and barrel/tower structures. The rotators enable components of up to 4.6 m in diameter, and 7 m in length, to be manufactured.

The cell's flat tables also allow for the production of parts at smaller scales, for such as material-testing samples and prototypes. The modular design of the cell will enable new components, such as heads, to be added to it as and when they are developed.

The Head of Technology - Structures, Manufacturing and Materials at the ATI, Alex Hickson, says: "This advanced combined AFP–ATL automation equipment offers a means to develop a broad selection of future products for aircraft structures and engine applications."

The ten automated composite-manufacturing systems installed at the NCC also include:

- an ultra-high-rate deposition cell that can produce parts of 5 m in width by 20 m in length and features a 20-m-long, multi-zoned oven and a verification system;
- Europe's largest multiaxial braiding machine;
- An overmoulding system that will be particularly useful for the high-volume manufacture of parts for such as the automotive industry.

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Heraeus Noblelight.
https://www.heraeus.com/en/hng/home_hng/home_noblelight.html

Aerospace Technology Institute.
https://www.ati.org.uk

ELG Carbon Fibre becomes Gen 2 Carbon

ELG Carbon Fibre Ltd of Coseley, UK, has divested its business for the recycling and sale of short carbon fibres to Procotex Corp SA, while the balance of the company – which primarily sells nonwovens made from long carbon fibres and thermoplastics – has been purchased by its management and will now be known as Gen 2 Carbon.

Founded in 2003 as Milled Carbon, ELG Carbon Fibre Ltd started with a pilot plant based on a continuous pyrolysis process it had developed for the recycling of carbon fibre. Once the concept was proved, Recycled Carbon Fibre Ltd was set-up in 2008 to commercialise this technology. Recycled Carbon Fibre Ltd then became ELG Carbon Fibre Ltd after its acquisition by ELG Haniel of Duisberg, Germany, in late 2011.

In early 2020, the business strategy of ELG Haniel was reviewed by its parent company, Franz Haniel & Cie GmbH of Duisberg, which decided that ELG Haniel should focus on its core business of recycling metals and has since sold the company to Luxembourg-based Aperam SA. After considering a number of options, ELG Carbon Fibre sold its short-fibre business to Procotex Corp SA of Dottignies, Belgium. Customers of this business will not experience any interruptions to their services. Gen 2 Carbon, meanwhile, will build on the business for long carbon fibres and carbon fibre/thermoplastic nonwovens developed under the stewardship of ELG Haniel and Mitsubishi Corp.

ELG's Managing Director, Frazer Barnes, has become the Chairman and Chief Technology Officer (CTO) of Gen 2 Carbon.

Kate Davison, Communications, Gen 2 Carbon.
Email: kate@hybridpr.co.uk;
http://www.gen2carbon.com

Procotex Corp SA.
https://en.procotex.com

ELG Haniel GmbH.
https://www.elg.de

Zoltek to increase production capacity for carbon fibre

Manufacturer of low-cost carbon fibre, Zoltek Co Inc of St Louis, Missouri, USA, is to expand production capacity at its facility in Guadalajara, Mexico.

Following the expansion, the facility will be able to produce 13 kt of 50-k PX35 carbon fibre each year—taking Zoltek's total production capacity for the fibre to 28 kt a year.

PX35 is also produced in Nyergesujfalu, Hungary, and is suitable for use in wind-energy and automotive applications. Executive Vice President of Sales for Zoltek, David Purcell, says: "As wind turbines continue to increase their efficiencies with longer, lighter-weight blades, we continue to see an increase in demand for our carbon fibre. We also see developing applications in automotive and energy storage. So there are several favourable macro trends that we expect will continue to support our rapid growth."

David Purcell, Executive Vice President for Composite Intermediates and Oxidized PAN Fibre, Zoltek.
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Fibre Extrusion Technology breaks ground on research and development centre

Fibre Extrusion Technology (FET) Ltd has started to build a two-storey research and development (R&D) centre adjacent to its headquarters in Leeds, UK.

The company says that its customers frequently spend several days on-site participating in development trials and technical sales meetings, so the R&D centre will have a visitor centre that will make their stay more efficient and comfortable, and a process development laboratory in which testing and product development activities can be carried out.

Sales, administration and design departments will also be housed at the new facility.

The building of the R&D centre will free-up space in FET's existing facilities, which will enable it to increase its production capacity by more than 50%.

The refurbishment of the existing facilities will be completed by the end of 2021, while the R&D centre will be opened in the first quarter of 2022.

FET says that the construction work has been driven by substantial growth in its revenues – its current order book is worth more than £10 million – and it is taking the opportunity to ensure it has the necessary infrastructure for future growth.

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Teijin establishes carbon-fibre products facility in Vietnam

A subsidiary of Teijin of Tokyo, Japan, has started to produce carbon-fibre materials – including prepregs – commercially at a facility in Ha Nam, Vietnam.

Initially, Teijin Carbon Vietnam Co Ltd (TCV) will manufacture these materials for use in sports and outdoor applications, including fishing, golf, bicycle and ice hockey equipment, for markets in Southeast and South Asia, and the Asia-Pacific region. The sale of the materials will be handled by TCV and sales affiliates of Teijin operating in these markets. Teijin says that its affiliates in Singapore, Shanghai, China, and Taipei, Taiwan, work to identify applications for its materials and to service its customers in Asia. Partnerships between these companies and TCV will strengthen Teijin's presence in these regions.

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Informtion correct at the time this issue went to press

August 2021

Techtextil North America
23–25 August 2021
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https://techtextil-north-america.us.messefrankfurt.com

September 2021

Emergency Services Show
7–8 September 2021
Birmingham, UK
David Brown, Event Director, Broden Media Ltd;
Tel: +44 (20) 8947-9177
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http://www.emergencyuk.com

Istanbul Textile Machinery Fair
8–11 September 2021
Istanbul, Turkey
Yusuf Akbolat, ECR Fuarcılık Ltd Sti;
Tel: +90 (212) 573-0662
yusuf@ecrfuar.com.tr;
https://www.tmeexhibition.com/en/homepage

Aircraft Interiors Expo
14–16 September 2021
Online
Polly Magraw, Event Director, Reed Exhibitions;
Tel: +44 (20) 8439-5138
aixoperations@reedexpo.co.uk;
https://www.aircraftinteriorsexpo.com

Heimtextil Russia
14–16 September 2021
Moscow, Russia
Ekaterina Tydykova, Messe Frankfurt RUS;
Tel: +7 (495) 649-8775, x. 116
ekaterina.tydykova@russia.messefrankfurt.com;
https://heimtextil-russia.ru.messefrankfurt.com

Techtextil Russia
14–16 September 2021
Moscow, Russia
Oksana Anikeeva, Director Techtextil Russia, Messe Frankfurt RUS;
Tel: +7 (495) 649-8775, x. 125;
Oksana.Anikeeva@russia.messefrankfurt.com;
https://techtextil-russia.ru.messefrankfurt.com

Dornbirn Global Fiber Congress
15–17 September 2021
Online
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

FESPA Mexico
23–25 September 2021
Mexico City, Mexico
Lynda Sutton, Marketing Manager, Federation of European Screenprinters Associations (FESPA);
Tel: +44 (1737) 228350
lynda.sutton@fespa.com;
https://mexico.fespa.com

Automotive Interiors
27–28 September 2021
Aachen, Germany
Andreas Wibowo, Director of Business Development, Red Cabin;
Tel: +49 (3099) 40489-11
andreas.wibowo@redcabin.de;
https://automotiveinteriorandintuitivevehicles.redcabin.de

Med-Tech Innovation Expo
28–29 September 2021
Birmingham, UK
Magda Brzegowy, Rapid News;
Tel: +44 (1244) 680222 x 518
magda@rapidnews.com;
https://med-techexpo.com

Research, Innovation & Science for Engineered Fabrics (RISE)
28–30 September 2021
Online
Tracie Leatham, INDA (Association of the Nonwoven Fabrics Industry);
Tel: +1 (919) 459-3726
tleatham@inda.org;
https://www.riseconf.net

Cleaning Products US
29–30 September 2021
Washington, DC, USA and online
Brittany Norton, Marketing, Smithers;
Tel: +1 (330) 762 7441
bnorton@smithers.com;
https://www.cleaningproductsconference.com/cleaning-products-us

Circular Nonwovens Forum
30 September 2021
Brussels, Belgium
Christelle Tuncki, EDANA;
Tel: +32 (2) 740-1820;
christelle.tuncki@edana.org;
https://www.edana.org/events

Impact of the Pandemic on the FutureDevelopment and Use of Technical Textiles
30 September 2021
Online
Stefan Schmidt, IVGT eV;
Tel: +49 (69) 2556-1723;
Fax: +49 (69) 2556-1725;
stefan.schmidt@ivgt.de;
https://eutt.net/5-agenda-09-2021

World Congress on Textile Coating special edition: Conference on Sustainable Finishing of Textiles
30 September–1 October 2021 and 7–8 October 2021
Online
Jill Gwinnutt, Marketing Manager, International Newsletters Ltd;
Tel: +44 (3301) 335450
jill.gwinnutt@intnews.com;
https://www.technical-textiles.online/STF
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October 2021

Outdoor by ISPO
5–7 October 2021
Munich, Germany and online
Aleksandra Solda-Zaccaro, Messe München GmbH;
Tel: +49 (89) 949-20730
aleksandra.solda-zaccaro@messe-muenchen.de;
https://www.ispo.com/en/outdoor

FESPA Global Print Expo/ European Sign Expo/ Sportswear Pro
12–15 October 2021
Amsterdam, The Netherlands
Lynda Sutton, Marketing Manager, Federation of European Screenprinters Associations (FESPA);
Tel: +44 (1737) 228350
lynda.sutton@fespa.com;
http://www.fespa.com

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Geneva, Switzerland and online
Delphine Rens, Marketing and Communications Coordinator, EDANA;
Tel: +32 (2) 740-1822;
delphine.rens@edana.org;
http://www.edana.org

Milipol
19–22 October 2021
Paris, France
Comexposium;
Tel: +33 (1) 7677-1329
Vanessa.galvez@comexposium.com;
https://en.milipol.com

Smart Nonwovens (High-performance Applications of Nonwovens)
20 October 2021
Geneva, Switzerland and online
Jill Gwinnutt, Marketing Manager, International Newsletters Ltd;
Tel: +44 (3301) 335450
jill.gwinnutt@intnews.com;
https://www.technical-textiles.online/NHPA
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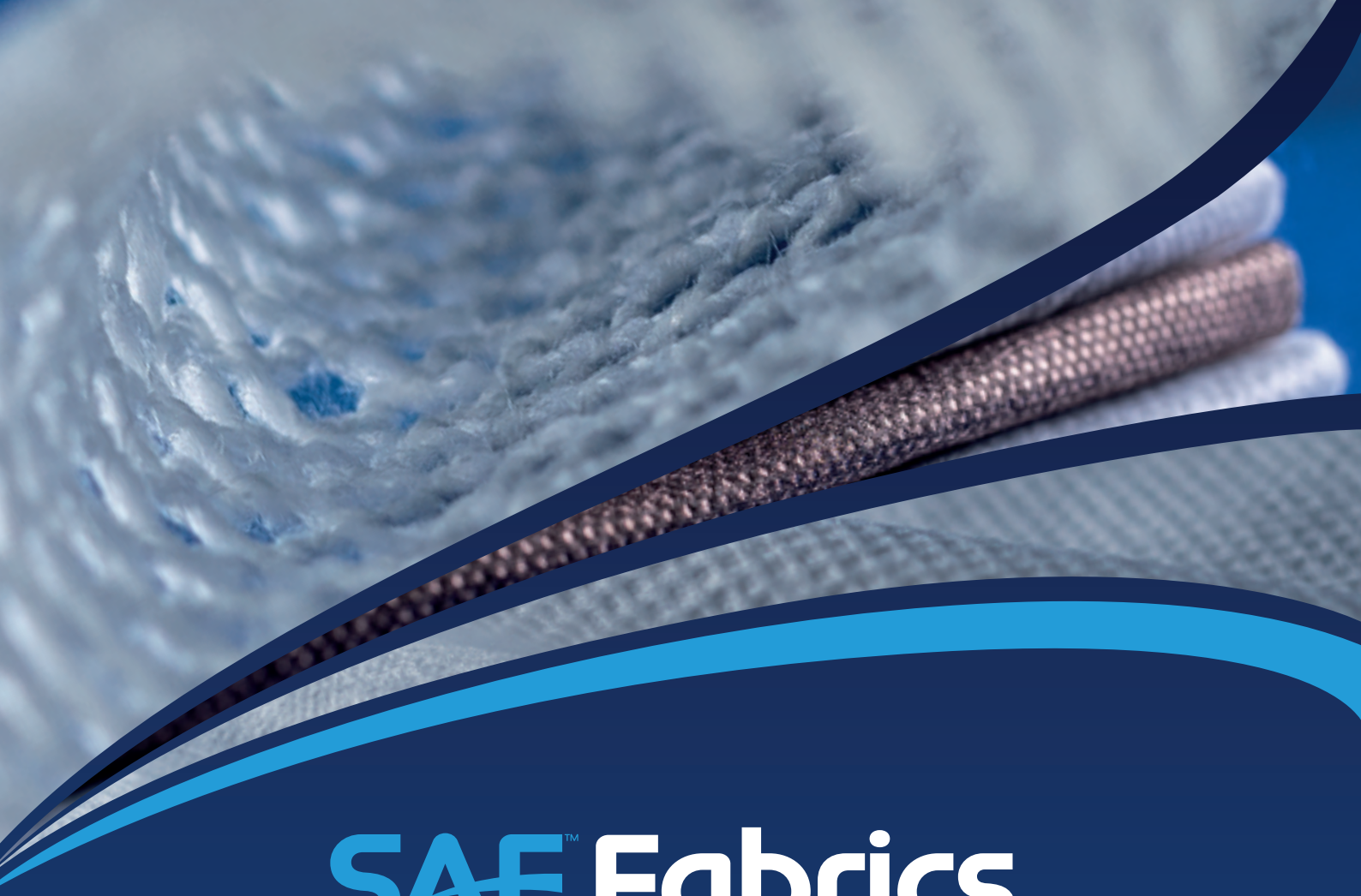

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