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PERFORMANCE & SPORTS MATERIALS



New nylons make an impact

Carbon-negative black pigments

Report reveals seven concerns about greenwashing

Dialogue: Jinro Nomura on 70 years of Pontetorto

THE INTERNATIONAL MAGAZINE FOR PERFORMANCE & SPORTS MATERIALS

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From its s/s 2022 collection: German outdoor brand Vaude features trekking pants made from a polyamide yarn derived from BASF's ChemCycling pyrolysis process.

IMAGE: VAUDE/ATTENBERGER

Editor
Stephen Tierney

Deputy editor
Clare Grainger

Consultant technical editor
Sophie Bramel

Assistant content developer
Charlotte Robson

Consultant editor
David Buirski

Publisher
Simon Yarwood

Design
Tim Button

Global sales manager
Jo Tait

Subscriptions manager
John Collins

Administration
Lisa Fabian-Smith

Editorial enquiries
stephen@worldtrades.co.uk

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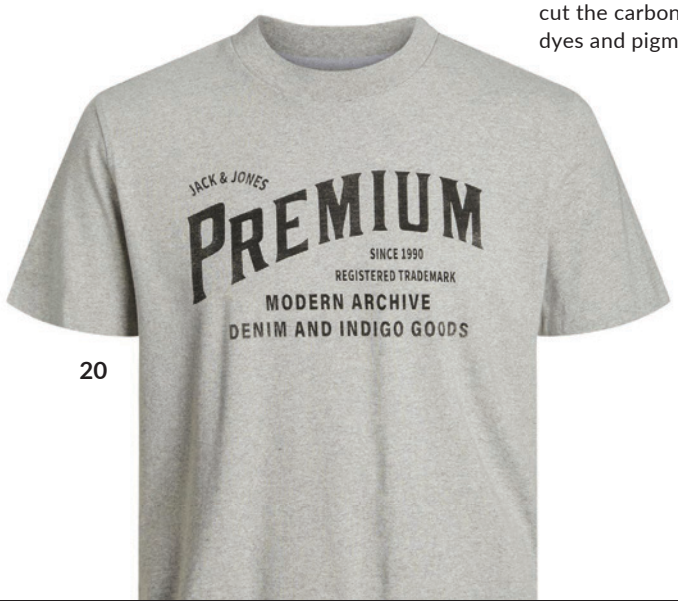
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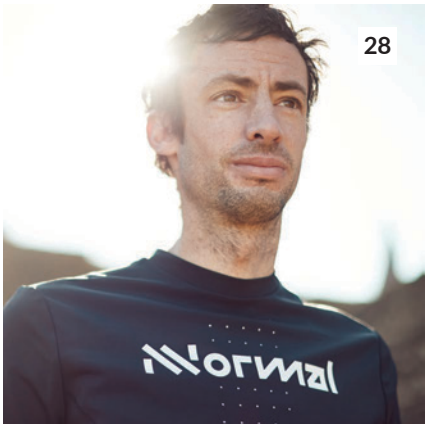


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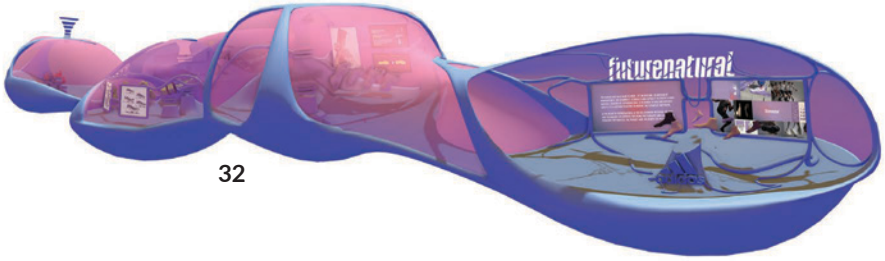
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Sales offices

Head office - World Trades Publishing

36 Crosby Road North,
Liverpool, L22 4QQ, UK.
Tel: +44 151 928 9288
Email: wsa@worldtrades.co.uk

Global sales manager

Jo Tait
Tel: +44 151 928 9288
Mobile: +44 74 1598 9103
Email: jo@worldtrades.co.uk

Pakistan sales

Abdul Rab Siddiqi
Email: arsidiqi@yahoo.com

@WTPwsa

linkedin.com/showcase/wtpwsa

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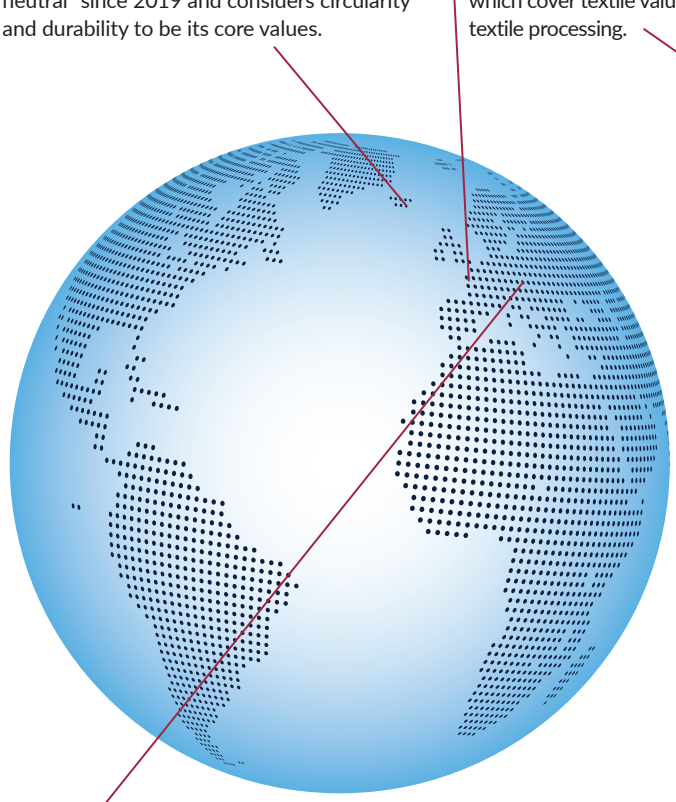
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Global news

France Biotech start-up Carbios has announced that the producer of polyethylene terephthalate (PET) it will partner with to help it scale up its C-ZYME enzymatic recycling technology will be Indorama Ventures. Together, Indorama and Carbios will now establish a manufacturing plant for fully bio-recycled PET. The factory will be in Longlaville in the east of France and will come on stream in 2025.

Iceland Outdoor brand 66°North, founded in 1926 in the Westfjords of Iceland, recently became its home country's first-ever certified B Corporation (B Corp). B Corps are legally bound by the requirement to analyse the impact of every business decision on all stakeholders, including workers, customers, communities and the environment. The Icelandic firm has described itself as "carbon neutral" since 2019 and considers circularity and durability to be its core values.

Germany Event organiser Messe Frankfurt has confirmed that its Techtextil and Texprocess events will take place in June, alongside a "summer special" edition of its Heimtextil show. The dates are June 21-24. After a hiatus imposed by the pandemic, Messe Frankfurt said exhibitors and visitors were looking forward to "personal interaction". It said "numerous innovations" would be on show at the events, which cover textile value chains and fibres and textile processing.



Czech Republic Fibre manufacturer Indorama Ventures has stated that it will acquire an 85% stake in UCY Polymers, a company based in the Czech Republic that specialises in recycling post-consumer PET into recycled polyethylene terephthalate flakes. UCY currently has the capacity to produce 40,000 tonnes of rPET flakes per year. Indorama said this acquisition was a strategic fit, describing it as part of a wider strategy to secure feedstock for its rPET footprint in Europe and across the world.

Austria Fibres manufacturer Lenzing has mapped out progress in 2021 in its first online sustainability report, with a focus on the circular economy. During the year, it achieved a reduction of "specific" greenhouse gas emissions and a 10% reduction in "specific" water consumption. In 2019, Lenzing set a target to reduce its carbon emissions by 50% by 2030 and to be net-zero by 2050.

Sweden Anti-odour and antimicrobial technology provider Polygiene has reported full-year sales revenues for 2021 of 181.6 million Swedish kronor, the equivalent at current prices of just under €17 million. This represents an increase of 116% compared to 2020. It has set itself the target of growing its net sales by more than five times to reach 1 billion Swedish kronor by 2026.



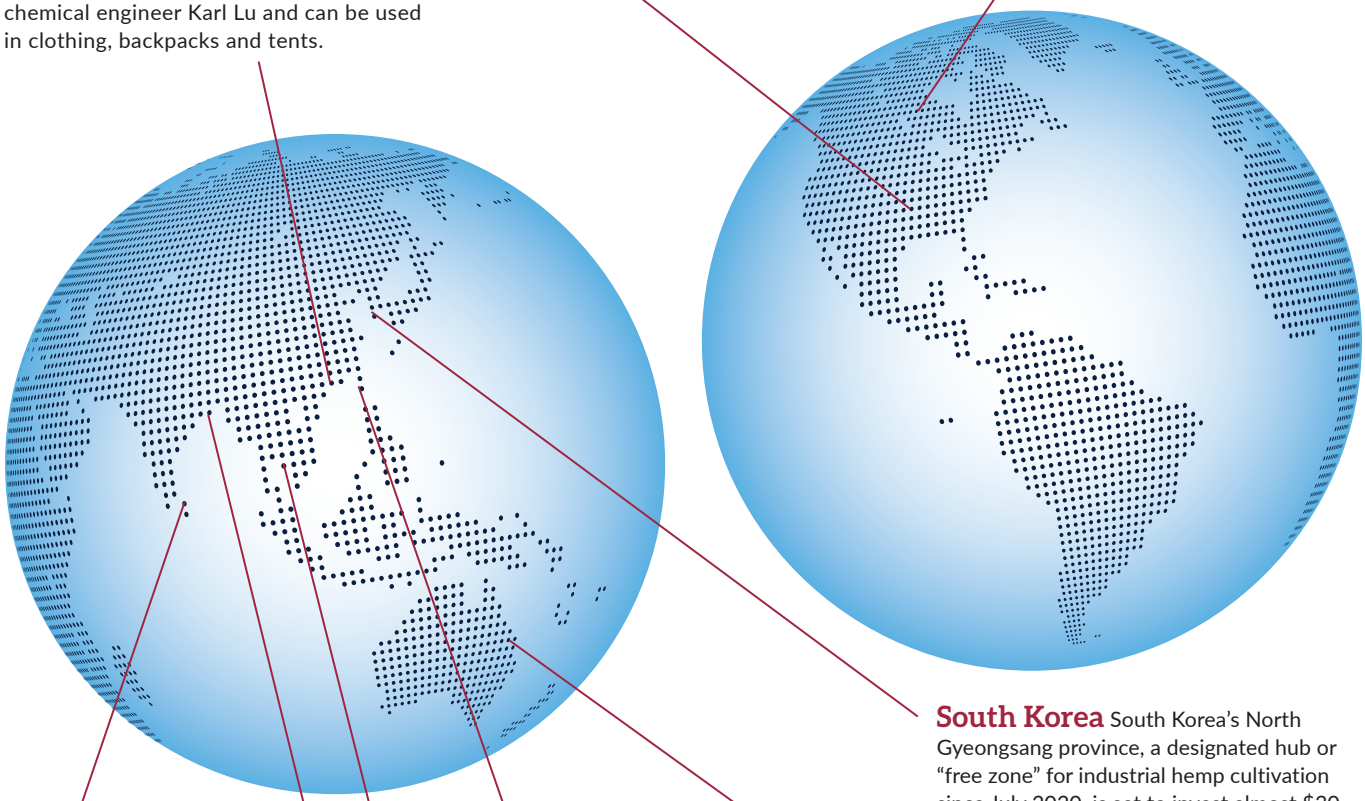
Kenya Heads of State, environment ministers and representatives from 175 nations agreed on a resolution to end plastic pollution and create a legal framework to uphold the future ban at the UN Environment Assembly in Nairobi, in February. The resolution signs into being a committee, the Intergovernmental Negotiating Committee (INC), which is tasked with drafting the clauses for a legal framework by the end of 2024.

Morocco As part of an EU-funded project, the United Nations Industrial Development Organization (UNIDO) has begun testing capacity for reusing pre-consumer textile waste in Morocco, presenting pilot projects at "Maroc in Mode" on March 31. The pilots demonstrated the business case for local manufacturing of yarns with recycled content and the investment opportunities in textile waste recycling technology.

Hong Kong Performance gear manufacturer Stealth is offering a seam welding process that uses sonic waves and high-frequency processes to 'weld' lightweight fabrics. It claims this results in stronger and lighter seams that are up to half the thickness of traditional stitched seams. The technology was engineered by outdoor adventurer Richard Strompf and chemical engineer Karl Lu and can be used in clothing, backpacks and tents.

US Athletic brand New Balance has opened a new sports footwear factory in Methuen, Massachusetts. It said the new factory signalled a strong commitment to manufacturing in the US and involved a significant investment in innovation and machinery, combined with the integration of lean manufacturing processes to enable what it called "a responsive US-made supply network".

Canada Vancouver-based activewear brand Lululemon has officially debuted its first ever footwear line online and in select stores across North America, mainland China and the UK, beginning with women's running shoes. Initially, the brand launched with Blissfeel, a running shoe which boasts "energy-filled" underfoot foam cushioning. Men's footwear is set to follow in 2023.



South Korea South Korea's North Gyeongsang province, a designated hub or "free zone" for industrial hemp cultivation since July 2020, is set to invest almost $30 million in the construction of a "bio industry complex" specific to hemp fibre production in its capital city, Andong, by the end of this year, local media have reported.

Taiwan Cooling yarn maker Brrr has developed a cationic dyed (CD) polyester yarn that can be single dyed or double dyed to achieve a heathered or solid look for increased flexibility in design. The yarn can be piece dyed or yarn dyed, is spun in Taiwan and can be used in knit or woven fabrics. The company says its patented technology offers a 'triple chill effect', the result of a combination of natural minerals, active wicking and rapid drying.

Australia The Woolmark Company has launched Sustainability and Wool, the first free-to-access online sustainability education course on its digital Learning Centre platform. Included in the course are modules on circular design, regenerative agriculture and reduced-impact manufacturing processes regarding the wool supply chain, all of which combine to present the creators' perspectives on sustainability's challenges and opportunities when it comes to textiles and fashion.

Sri Lanka Apparel and textile manufacturing group MAS Holdings has announced ambitious expansion. plans. The group has 41 apparel manufacturing facilities across the globe. It said an expansion drive across that network had already resulted in an increase in its global production capacity of 15% in the last year and a rise of more than 18,000 people in its global workforce. In total, the group employs more than 115,000 people.

Thailand Cellulosic fibre manufacturer Lenzing recently commenced production at what it described as the world's largest lyocell plant following two-and-a-half years of construction. Located within an industrial park in Prachinburi, 150 kilometres northeast of the Thai capital, Bangkok, the complex has the capacity to make 100,000 tonnes of lyocell per year.

Bangladesh Representatives from Bangladesh Garment Manufacturers and Exporters Association (BGMEA) travelled to the US recently to meet hemp processor Panda Biotech to accelerate the use of the fibre in the Asian country. BGMEA president, Faruque Hassan, said the clothing industry had made tremendous strides over the past years to integrate sustainability, and wishes to provide consumers with eco-friendly apparel. This could include a shift away from cotton, with hemp potentially being a good alternative.

People

Adidas hires Alasdhair Willis as chief creative officer



Adidas has appointed **Alasdhair Willis** as its new chief creative officer to define the creative direction of the brand. He has a connection to adidas that dates back to 2005, most notably through his role in the development of 'adidas by Stella McCartney', and has played a lead role in developing some of adidas' material innovations.

He was formerly creative director of British brand Hunter, transforming what was a wellington boot business into a multi-category fashion brand, and is the co-founder of *Wallpaper* magazine.

He said: "Stepping into a permanent role at adidas and evolving our partnership is a great privilege and feels like an incredibly exciting and natural next step."

Adidas has also announced that **Jason Thomas** has been replaced by **Adrian Siu** as the company's China chief.

The group described the Chinese market environment in 2021 as challenging, posting single-digit growth of 3% in Greater China for the period.

CREDIT: ADIDAS

Textile design process needs transforming, Sympatex CEO says

Membrane materials developer Sympatex called March 30, when the European Commission published a package of European Green Deal proposals, "an unforgettable date".

These proposals aim to put in place new rules to make "almost all physical goods in the EU market" more friendly to the environment, more circular, and energy-efficient. A textile-specific package called The EU Strategy for Sustainable and Circular Textiles is part of the wider announcement.

Sympatex's reaction was to say that the textile sector will be the first industry to shift fully from a linear to a circular economy, with products being designed to be more durable, reusable, repairable, recyclable and energy-efficient.

Chief executive, **Dr Rüdiger Fox**, said: "Until now, we have created products pretty much by ignoring our impact upstream and downstream. What we will have now is an eco-design process. The creative process of the product will need to take into account certain constraints, but the beauty is that these constraints will not limit innovation, but accelerate it."

He said the changes the European Commission is bringing in will lead companies to realise that "only certain materials are recycable". Once they realise this, Dr Fox continued, "people can focus on developing new solutions with those materials".

He estimated that the industry now has only three or four years in which to transform its design process.

Lenzing names new chief executive

Manufacturer of wood-based cellulosic fibres Lenzing has appointed **Stephan Sielaff** as chief executive officer. Effective April 1st, he moves up from the position of chief technology officer and chief operating officer, a position he held since March 2020.

A chemical engineer, Mr Sielaff worked formerly for Unilever and Archroma. Acting interim CEO, **Cord Prinzhorn**, will return to the company's supervisory board.

Return to Vans for brand president

Clothing and footwear group VF Corporation has named **Kevin Bailey** as the new global brand president of Vans, replacing **Doug Palladini**.

This marks a return to Vans for Mr Bailey, who was vice-president for retail at the footwear brand when VF acquired it in 2004. He was then brand president between 2009 and 2016 before holding a series of leadership roles elsewhere in the VF group, most recently as its president for the Asia-Pacific market.

Head of research

Campaign body The Microfibre Consortium (TMC), which works to encourage clothing brands and retailers to take steps to control fibre fragmentation and microfibre pollution, has announced **Dr Kelly Sheridan** as its head of research.

TMC has said the launch of its Microfibre 2030 Commitment, under which signatory companies have committed to work to tackle microfibre fragmentation, signalled a shift in its approach. As part of that shift, all signatories are now required to undertake material testing for three years and share the data on the group's portal.

Dr Sheridan, an academic at the UK's Northumbria University with a background in forensics, said she would work with the data generated from this testing to identify underlying trends and reach a better understanding of fibre fragmentation.

Homecoming at inov-8

UK-based running brand inov-8 has named a global category manager for cross training and head of footwear and apparel for Central and South America.

Chris Melton from Massachusetts, US, worked for inov-8 between 2011 and 2014, holding the position of general manager of the Americas and head of fitness and training. He said he felt like he was "coming home".

Senior appointment at Columbia

Sports and outdoor brand Columbia Sportswear has appointed **Pri Shumate** as the new chief marketing officer for its Columbia brand. She joins from Hurley.

On appointing Ms Shumate, brand president, **Joe Boyle**, described her as "a consumer-obsessed marketing leader".

Promotion at Eastman

Eastman Chemical Company announced that **Ruth Farrell** became general manager for its textiles business at the start of April. She has been the global marketing director of the group's textiles business since 2018.

Before joining Eastman, Ms Farrell worked for almost 13 years in senior communications and marketing roles at DuPont. She is based in Geneva.

President of fibres for Eastman, **Burt Capel**, said Ruth Farrell's "passion and tireless energy" for the group's cellulosic yarn brand, Naia, had led to growth, strong value chain partnerships and increased brand awareness.

New CEO arrives at Decathlon

Sports group Decathlon's new chief executive, **Barbara Martin Coppola**, took up her role in mid-March. Decathlon announced her appointment earlier in the year.

Ms Martin Coppola has joined the group from Ikea, where she was chief digital officer. Earlier in her career, she worked at Texas Instruments and Google.

She said Decathlon's values reflected her own and that she also identified closely with the challenges the group faces. She said the most important of these was to keep delivering high-quality products and services "to make sport accessible to the highest number of people possible and, through that, to improve people's health and wellbeing".

Sales appointment for Texon in Europe

Performance material solutions developer Texon has appointed a new regional sales director, with **Norbert Nieleck** joining to help it grow its business with footwear manufacturers in Europe, the Middle East and Africa.

Before moving to Texon, Mr Nieleck worked at labelling solutions developer Avery Dennison, eventually becoming its sales director for Germany, Austria and Switzerland. After this, he went to work at hook-and-loop materials developer Velcro, becoming its vice-president for sales and marketing in Europe, and, from there, to become global sales director of a German hook-and-loop producer, **Gottlieb Binder**. He will continue to be based in Germany.

Texon's sales director, **Bryan Whitfield**, said Europe is home to many of the company's key customers. He said Mr Nieleck would bring "a high level of strategy" to the company's efforts to work with those customers on projects that will improve the environmental footprint of their footwear collections.

Cotton Australia names grower of the year

Industry body Cotton Australia has named Quigley Farms from the Macquarie Valley in New South Wales as its cotton grower of the year for 2021.

Tony Quigley, a fourth-generation cotton producer, runs the farm with his wife, Sally, and sons, Tom, George and Richie.

Cotton Australia described Mr Quigley as a pioneer in water efficiency measures. He served as a director of an irrigation scheme in the area that campaigned successfully for government funding of more than $100 million.

This funding allowed farmers to rebuild a delivery channel that runs for more than 100 kilometres. They fitted it with a synthetic lining, new remote-control gates and metering systems. At Quigley Farms, this has resulted in an efficiency improvement of 20%.



Industry & Innovation



The Rieter Blowroom line.
CREDIT: RIETER

Traceability technology now built into spinning systems

DNA-based traceability technology provide Haelixa and textile machinery developer Rieter have teamed up to develop a system for marking fibres during yarn production.

They have said the idea addresses the increasing demand for reliable traceability data and will provide forensic evidence of the origin of textile materials.

The technology providers have said this traceability system will help manufacturers and brands see if their materials meet their requirements for, say, organic or recycled fibres.

Haelixa's technology provides a marker that users can apply directly to fibres. The marker is harmless, OekoTex-compliant and certified by the Global Organic Textile Standard (GOTS), yet strong enough to withstand industrial processing.

Tests to verify the origin or authenticity of material can be carried out on a finished garment or any intermediate product.

The two Swiss companies have completed joint in-house testing and validation of an idea to apply the Haelixa marker in liquid form as part of the automated processes built into Rieter's spinning systems.

Pinless spikes will save track athletes time and energy

Athletic footwear brand Asics has launched a new development in long-distance track spikes.

Its Metaspeed LD system combines midsole cushioning and outsole grip with a full-length carbon plate. It will help long-distance track runners to experiences "a more responsive rebound at toe-off", increase traction, save energy and take longer strides, Asics stated.

The company has given the name Hexa-Claw to the outsole. The spikes are carbon and use no pins so that, rather than piercing the track's surface, traction comes from claws in different shapes and sizes and positioned at different angles.

This also reduces contact time because, according to Asics, runners "glide across the track" instead of having spike pins penetrate the track and come back out again. This, in turn, will help them conserve energy between steps, the company claims.

"We studied the movement of mainly 5,000- and 10,000-metre competitons and athletes," explained Metaspeed LD project leader, Shuhei Takemura. "These competitions require athletes to keep up a high pace for a long period of time, and then show a burst of energy towards the end of the race. We focused on energy saving, so the athletes' strength can be showcased throughout the race, but also having the energy to showcase their speed at the end of the race."

Pangaia releases first 100% Infinna garment

Materials science brand Pangaia and Finnish textile technology company Infinited Fiber have together revealed the first commercial garments to be made entirely from the latter's Infinna fibre, made from regenerated textile waste.

Sold as the Infinite tee via Pangaia's materials innovation "lab" platform, the black t-shirts are available in both short- and long-sleeved versions for $75 and $85, respectively.

Key account director at Infinited Fiber, Kirsi Terho, commented: "We dream of a future where 'waste' is not wasted, but seen as the valuable resource it can be. We couldn't be happier that Pangaia's customers will be the first to experience wearing a shirt made out of 100% textile waste that has been cleaned up and broken down at the molecular level to be given a new life as brand-new textile fibre."

Seven new partners for Fashion For Good in Asia

Sustainability-focused hub Fashion for Good, which coordinates mentoring and funding for start-ups, has chosen seven new participants in its 2022 Asia Innovation Programme.

Candidate companies presented their ideas at an event in Mumbai and chose the seven of them to take part in the nine-month programme.

The new partners are AN Herbals, Fermentech Labs, Sodhani Biotech and UKHI Hemp Foundation from India, Picvisa from Spain, Gaiacel from the US and Vaayu from Germany.

This is the third programme of this type that Fashion For Good has set up. Its head of expansion in Asia, Priyanka Khanna, said it would provide the start-ups with a platform to learn and grow, and to connect with some of the leading industry players that support the hub's work.

The focus of the new partners includes dyeing, textile sorting for recycling and technology for carbon footprint reduction.

Global Change Award winners announced

Five projects for improving the textile and apparel sector's environmental impact will share prize money of €1 million as winners of the 2022 Global Change Award programme. This

EU presents strategy for sustainable and circular textiles

The European Commission presented a much-anticipated package of European Green Deal proposals on March 30. Its aim is to "make sustainable products the norm" in the European Union, boost circular business models and "empower consumers for the green transition".

These proposals aim to put in place new rules to make "almost all physical goods in the EU market" more friendly to the environment, more circular, and energy-efficient throughout their entire lifecycle, from the design phase to daily use, repurposing and end-of-life.

They insist that consumers be better informed about the environmental sustainability of products and better protected against greenwashing.

In parallel, and specific to textiles, the Commission has also presented a new strategy, The EU Strategy for Sustainable and Circular Textiles, to make textiles more durable, repairable, reusable and recyclable, to tackle fast fashion, textile waste and the destruction of unsold textiles, and ensure there is complete respect for social rights in the production of textiles and garments.

The strategy says that by 2030 textiles will have to be made as much as possible from recycled fibres, be free from hazardous substances and produced in keeping with commitments to respect social rights and the environment. It promises to tackle the release of microplastics from textiles in the second half of 2022 with "the promotion of innovative materials" one of the measures the European Commission will consider.

The strategy also pledges to ensure the accuracy of green claims. And to address fast fashion, it calls on companies to reduce the number of clothing collections they bring to market each year.

System for assessing polyester emissions in use at Teijin

Japanese group Teijin has announced a new proprietary system for calculating the carbon emissions generated by the polyester fibre production processes of its fibre division, Teijin Frontier.

It said it expects Teijin Frontier to use the system to carry out lifecycle assessments of its polyester fibre products in future.

The new system calculates CO_2 emissions based on data from the company's manufacturing bases. It also compares differences in emissions between petroleum-derived fibres and recycled fibres. The system will help clarify which processes need to be improved to further reduce environmental footprint.

Teijin Frontier has already begun using the system to evaluate emissions from polyester filament and staple fibres production, and will expand the scope to include woven and dyed textiles products. The company also plans to encourage partners to adopt the system.

Solvent systems for cellulose scoop award

The 2022 Marcus Wallenberg Prize – from the Swedish foundation that funds research projects of high scientific potential – has been awarded to Professor Ilkka Kilpeläinen and Professor Herbert Sixta for the development of novel ionic liquids to process wood biomass into high-performance textile fibres.

The pair from Aalto University and the University of Helsinki will receive the prize from the King of Sweden at a ceremony in Stockholm in October.

To produce manmade cellulose textile fibres, cellulose is solubilised using alkali and carbon disulfide and, in the yocell process, N-methylmorpholine-N-oxide (NMMO) is used to dissolve cellulose. The viscose process has, however, become environmentally controversial due to the use of toxic carbon disulfide as the main reagent. The lyocell process is hampered by the instability of the NMMO, according to the researchers.

These challenges have led to extensive research on different solvent systems for cellulose to produce regenerated cellulose fibres. Ionic liquids have gained interest as green alternatives for organic solvents in different processes. Ionic liquids are salts that can be melted below 100°C and have unique properties including low vapour pressure, high thermal stability, and high dissolving capability of different organic and inorganic substances.

is an initiative that the H&M Foundation set up in 2015.

Winners this year include an initiative to improve recycling of elastane and polyester blends, a development to create "planet-positive" viscose and lyocell from CO_2 emissions, and an alternative to goose down that derives from plants from regenerative agriculture projects.

The elastane-polyester project is the work of a Chinese company, Re:lastane, which uses a "mild process" to produce recyclable elastane and polyester blend fabrics. Planet-positive viscose and lyocell from CO_2 emissions is the work of US-based Rubi. The down alternative is BioPuff, developed by UK-based Saltyco.

Other winners are a laundry solution that aims to prolong garments' life, and an artificial intelligence platform for helping smallholder cotton farmers increase yield and income.

Carpet wool-to-clothing breakthrough for TMC

Performance fibre developer TMC, the owner of Nuyarn spinning technology, has launched a new product, Herculan, describing it as a sustainable, durable natural fibre.

New Zealand-based TMC (The Merino Company) acquired Nuyarn in 2013 and began using its specialised technology, centred on wrapping a superfine Merino wool yarn around a nylon core, to create lightweight, durable, stretchy fabrics. It has spent three years modifying Nuyarn spinning machines and has now been able to develop a patented technology to produce Herculan as a result.

The modifications it has made mean the Nuyarn machines can now accommodate strong wool, the coarsest and most durable grade of wool fibres, measuring more than 38 microns.

Historically, this type of fibre has gone into applications such as interior textiles, flooring and upholstery, and is often called 'carpet wool'. According to TMC, it has a low market value and in difficult economic periods is often deemed too costly to process, package and ship and much of the fibre goes to waste.

The International Wool Textile Organisation has estimated that between 40-50% of the global wool yield is fibre that falls into this category. TMC believes the changes it has made to Nuyarn will open the door for this type of wool to be used in apparel.

Backtrack

Limitations on space make it impossible for us to run more than a carefully selected sample of industry news in *WSA*. However, we publish hundreds more stories on www.sportstextiles.com, one of the most comprehensive archives of news anywhere on the web for textiles, apparel, footwear and equipment for sports and outdoor. Below are just some of the headlines that have appeared on the site in recent weeks.

12.04.2022

Extra cash will help Swedish sourcing platform limit waste

11.04.2022

Jilin's revenues surge despite rising covid cases

Spandex and polyester ahead of the pack in China

08.04.2022

TNF: recycled leather, merino and rPET intrigue 'MZ+eco' generation

07.04.2022

Textile students to have access to Archroma colour library

Footwear brands choose Canadian plant-based midsoles

06.04.2022

Merrell joins ReCircled for takeback programme

Infrastructure now in place for growth, OrganoClick says

Half of Nike's new design made with recycled materials

05.04.2022

Infinna certified as at least 99% PCR cellulose

04.04.2022

Rieter completes the acquisition of three Saurer businesses

Alpen opens biggest-ever flagship in Tokyo

01.04.2022

180% leap in Organic Cotton Accelerator farmers

GTT adds stain-protection version of Empel

31.03.2022

New format for NeoNyt

30.03.2022

Hyosung's xanadu in step with active commuters

Pangaia among investments for ambitious new fund

Catwalk showcase for Taiwan's performance textile makers

29.03.2022

Nike continues Kobe Bryant's legacy with fresh partnership

BASF invests in Oceanworks to accelerate plastics recycling

Renewcell sets sights on Japan and Asia

28.03.2022

Shirt brand shows appreciation for Australian Cotton

Low-carbon products now ready, BASF says

Calvin Klein pursues data-driven down jackets in China

Double-digit growth for all Anta brands

25.03.2022

Allied creates 'lab' to showcase novel down-based designs

GOTS certification for Sciessent anti-odour technology

Vollebak dreams of life on Mars with most advanced gear yet

24.03.2022

Despite controversy, OR will head back to Salt Lake City

Old football kits find new lease of life

23.03.2022

Ski boot brand to expand use of Celliant to 26 styles

Regenerative movement helps HD Wool globalise

Partners to test mycelium foam for fashion

Archroma develops 'safer' dyestuffs for sportswear

22.03.2022

ICAC creates more inclusive council for cotton

Nike's digital playbook pays off, but China losses weaken growth

Erem eyes growth with four appointments

21.03.2022

China and North America push On forward

Li-Ning: apparel, southern China dominated in 2021

18.03.2022

Keen demand for FibreTrace-verified cotton in Vietnam

Reebok's Nano X2 champions fitness as a lifestyle

17.03.2022

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Belgian start-up Noosa is developing a polylactic acid fibre that is currently available as a staple fibre and filament yarn. It can be blended with other fibres, but the company requests that a fabric contain a minimum of 50% Noosa.

CREDIT: NOOSA

Next generation biopolyesters

The polyester family includes a wide array of biopolymers that have long-standing uses in plastics and are being tested for their potential in apparel. In addition to being biosourced, they promise a new set of properties, including biodegradability, compostability, recyclability, in addition to the possibility of mitigating microfibre shedding.

For those who were banking on a biosourced future for polyester, the most common fibre in apparel with a market share of 52%, it is time to a take a new look, not at the standard PES polyester, but at its extended family. Meet PLA, PBS, PHA and PEF. These are the biopolymers vying for a position on the labels of the clothes we wear every day.

Polylactic acid (PLA) is the only one that the textile industry has already met. Under the brand name Ingeo, launched in textiles by NatureWorks in the early 2000s, it is made from dextrose and sucrose from corn starch or sugar cane. It is marketed by a number of companies, including Trevira in Germany, Radici in Italy and Far Eastern in Taiwan. A fibre with a low melting point, it is used mainly as a binder in thermal insulation for performance sportswear.

NatureWorks has just moved into new headquarters in Plymouth, Minnesota, where it has set up a new advanced biopolymer research facility to develop 'next-generation fermentation technology', new applications and functionalities. To address growing demand for sustainable biomaterials, the company is building a new manufacturing complex in Thailand that will have an annual capacity of 75,000 tonnes and could begin operations in 2024.

Noosa, a start-up based in Brussels, has also chosen PLA as the basis for its biosourced circular fibre concept. Company founders Luna Aslan and Hélène L'Ebrellec have designed it from the start as a closed-loop concept. They intend to collect waste and used clothing made from Noosa to

recycle them. Noocycle, their patented process, separates the PLA polymer from other compounds and converts it back to fibre form. To make the system work smoothly, "we test each product for its recyclability," says Luna Aslan. The company recommends that brands set up takeback systems so as to retrieve products at their end of life.

Noosa fibres are currently available as filament, staple fibre and spun yarn. They are produced in China, where the company's partner makes the biopolymer from non-GMO plants. "Our wish is to bring production to Europe, but there are no PLA polymer producers in Europe," says Ms Aslan. Noosa fibre can be blended with other fibres, such as cotton, lyocell or cashmere, "but we request that a fabric contain a minimum of 50% Noosa," she says.

With regards to the performance properties of PLA, Ms Aslan says that Noosa Fibre does not have the limitations of earlier versions of the biopolymer. It is technically biodegradable, but this is not an attribute the start-up seeks to promote.

Biodegradability appeals to some

International Fibres Group (IFG), a maker of specialty fibres based in Linz, Austria, has taken a strategic decision to pivot its product offering towards more sustainable, non-fossil fuel-based next-generation materials. Its biopolymers, grouped in its IFGBio portfolio, feature a recently launched polyamide 11 made from castor bean oil, along with PLA and PBS. These two polyester-family fibres are made from renewable non-GMO resources, and are certified industrially compostable.

"We see ourselves as leading the way by offering biobased substitutes for all the fossil fuel-based fibres we make," says Richard Barker-Poole, IFG Group sales and marketing director. "It is a journey, but we have a great amount of experience." The company is striving to address two main features, he says, sustainable sourcing that is not fossil fuel-based and end of life, through recycling or composting.



Brooklyn-based Kintra Fibers has completed resin, yarn and fabric trials on standard commercial polyester production equipment. Knit and woven fabric samples have been made in various constructions.

CREDIT: KINTRA FIBERS



San Francisco-based Mango Materials has begun production of specially formulated polyhydroxyalkanoate-based pellets that are tailored for fibre extrusion.

CREDIT: MANGO MATERIALS

The company launched its first biofibre, PLA, some 15 years ago, and has seen growing interest in the past five years. "PLA has natural UV qualities, and we can integrate additives to deliver other functions as required," he says. Tests on possible apparel applications are under way, and covered by NDAs or non-disclosure agreements.

IFG's polybutylene succinate (PBS) fibre is made from bio-succinic acid, derived from a plant-based renewable resource, and 1,4 butanediol (BDO). "This is currently a petrochemical raw material but bio-BDOs are becoming available on the market," he tells *WSA*. Possible apparel applications for PBS yarns include sewing threads and thermal insulation. Like PLA, PBS has a low melting point, but it has a higher resistance to abrasion, pilling and bursting, he says. IFG has developed staple yarns for weaving, knitting and nonwoven applications. Mr Barker-Poole expects a first product launch soon.

Chosen among the innovations Fashion for Good will be supporting in 2022, Brooklyn-based Kintra Fibers is working on the final stages of its fully biobased and biodegradable PBS fibre. "Conventional PBS is usually only 50% biobased, we have altered the chemistry so it is no longer technically a PBS; that is what makes it unique," says co-founder and COO Alissa Baier-Lentz. PBS fibres are said to have tenacity properties similar to those of polyester and polyamide, but with a natural fibre hand-feel. The start-up's mission is both to "get off petrochemicals" and to make the fibre part of a "natural biocycle". Engineered to decompose and maintain healthy soil, it will not contribute to microfibre pollution, it claims.

The company, which was founded in 2018, has completed resin, yarn and fabric trials on standard commercial equipment used for polyester production, Ms Baier-Lentz tells *WSA*. The final properties of the fibre have yet to be fully assessed, as the start-up is still in the pre-commercialisation phase. But it is working closely with brand partners to make its entry onto the market in luxury, athletic apparel, footwear and ready-to-wear. It can be expected that Pangaia, an investor in the company, will be an early user.

Methane-made

Mango Materials, based in San Francisco, has turned its attention to polyhydroxyalkanoate (PHA), a biopolymer that it says can be used to make a variety of eco-friendly plastics and can be a possible replacement for polyester in textile applications. The company founded in 2010 makes this biodegradable polymer from waste biogas, or methane, and can thus claim to be climate positive.

"PHA-based fibres can have properties similar to conventional PET-based fibres," says Molly Morse, company CEO and one of its three founders. It operates a fully-integrated launch facility installed at a wastewater treatment plant. "We have limited availability for our YOPP+ pellets that can be processed into fibres, but we will be building capacity over the next three years," she says. Mango Materials produces two types of pellets that it has named 'You Oust Polluting Plastics'. YOPP pellets are made from plant materials and YOPP+ from methane.

"We produce specially formulated polyhydroxyalkanoate-based pellets that are tailored for fibre extrusion," she says. Fibre grades are just one of the formulae it is working on, others being for injection moulding and films. "We love apparel as an application for our material as it is close to the consumer and can involve storytelling to help share the message of new materials," she says. Mango Materials was one of five companies to have won the 2022 Conservation X Labs' Microfibre Innovation Challenge which seeks to support innovations designed to reduce or prevent microfibre pollution. Its $525,000 prize is shared amongst the winners. They will be presenting their solutions at an event to be held at the headquarters of sportswear brand Under Armour in Baltimore later this year.

In the Netherlands, chemicals company Avantium is developing yet another polyester-type biopolymer, polyethylene furanoate (PEF). It is 100% plant-based, recyclable and biodegradable and can have multiple applications in packaging, textiles and films. "Our YXY technology catalytically converts plant-based sugar (fructose) into FDCA, the key building block for a wide range of plant-based chemicals and plastics, including polyethylene furanoate. PEF has great potential to replace fossil-based polyester yarns commonly used in textiles," says Caroline van Reedt Dortland, Avantium's communications director. The fibre is said to have high modulus and tenacity, a high glass transition temperature and low melting point which would make it a good candidate for spinning into textile yarns, the company says.

Avantium is seeking to shift away from fossil resources to manufacture chemical building blocks from plant-based sugars that are biodegradable. "If a textile made from PEF ends up in nature by mistake, it has faster degradation compared to fossil-based polyesters. We believe that PEF can be a potential solution to microplastics and microfibres," says Ms van Reedt Dortland.

The company is building its first plant to produce FDCA (furandicarboxylic acid) which is expected to begin operations at the end of 2023. It will have a capacity of 5,000 tonnes per year and will enable a commercial launch of PEF from 2024 onwards.

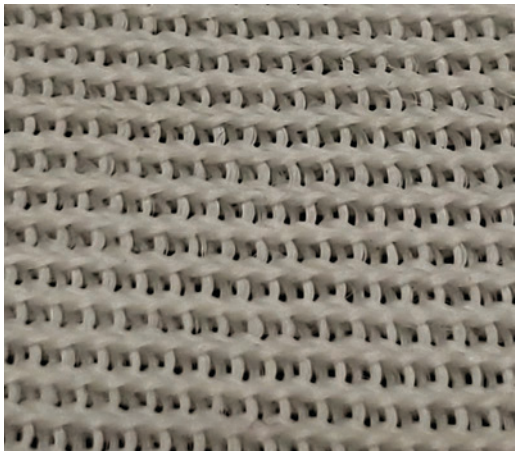


A sample of Kintra Fibers resin.

CREDIT: KINTRA FIBERS

> **"PHA-based fibres can have properties similar to conventional PET-based fibres"**
>
> MOLLY MORSE, MANGO MATERIALS

A whole new alphabet soup of polyester fibres is thus coming out of the ground, literally, carrying the promise of returning to the soil at some point. But this overview would not be complete without mentioning DuPont's partially biobased PTT fibre Sorona, yet another member of the polyester family. It is not biodegradable, but serves as a telling example of the challenge these new biopolymers face. Twenty years after its launch, Sorona has carved out a small niche in an industry bound to production processes developed in the mid-twentieth century and continually optimised since then. Admittedly, the industry is well aware that it needs to wean itself off finite fossil resources and develop suitable end-of-life solutions for the materials it makes. Today's radically different context could prove to be the incentive needed to bring these next-generation biofibres to the mainstream.



A knit fabric made from Mango Material's PHA fibre.

CREDIT: MANGO MATERIALS



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> **“We need more sustainable solutions right now, not in some distant future”**
>
> SAGEE ARAN, NILIT

Nylon in many shades of green

Recycled, biobased, biotech, made from cleaner processes or difficult-to-treat waste, the new nylon yarns that are in development cover an array of carbon footprint-reducing measures. This broad approach aligns well with a sector that believes polyamide is a premium fibre that delivers premium performance, aesthetics, longevity and sustainability.

Fishing nets, airbags, carpets. These are the materials that polyamide producers need to collect and treat to make recycled post-consumer nylon. It is a much tougher task than spinning beverage bottles back into polyester. For this reason, recycled nylon comes in limited supply, despite technologies that are already in operation. Aquafil’s ‘regeneration’ process comes to mind but all polyamide producers meticulously collect any production waste they have to meet growing demand for recycled content. Even when considering the possibility of recycling used clothing, the sector runs up against a tricky situation: nylon is often blended with elastane, which needs to be separated out.

But with sustainability high on the agenda of brands large and small, demand for recycled nylon is intense. Polyamide producers and spinners are taking measures to address this issue by reducing the carbon footprint of their production processes, which allows them to deliver the industrial quantities their customers request.

The latest developments focus on shifting away from fossil fuels, both to make nylon’s building blocks and to power factories. Israel-based Nilit’s new Sensil By Nature, a polyamide 6.6 yarn, replaces fossil feedstock with a biomass resource, or biogas, and can claim to be 100% biomass balance. The raw material is supplied by German chemicals company BASF that has developed a chemical manufacturing process powered by biomethane, generated by organic waste facilities or landfills. It applies a system known as Biomass Balance, or BMB, to this production line. “In a biomass balance system, inputs and outputs are monitored by a third party,” says Sagee Aran, Nilit’s head of innovation and sustainability. “Depending on the magnitude of non-fossil input, you can allocate a portion of the production as being biomass balance,” he says. This shift to cleaner energy, be it solar, wind or biogas, is an efficient way to be reduce impacts. “We need more sustainable solutions right now, not in some distant future,” he says, adding that BMB “encourages the shift away from fossil resources”. BASF supplies Nilit with a raw material having a 100% biomass balance stamp. “This certifies that our fibre emits less greenhouse gas, but there is otherwise no difference in performance or in consumer experience. Sensil By Nature has the same functionality as conventional nylon,” he says.

Italian polyamide producer Fulgar has also chosen BASF as the supplier of a raw material for its newest yarn, Q-Cycle, which is ‘recycled’ from used tyres. “Q-Cycle is the result of an innovative chemical recycling technology developed by BASF in its ChemCycling project, combined with Fulgar’s spinning technology,” says Alan Garosi, Fulgar’s head of strategic marketing. The raw material that BASF supplies to Fulgar is derived from the pyrolysis of difficult-to-recycle plastics, specifically tyres. “We have chosen this solution as tyres represent a huge quantity of pollutant elements that is difficult to dispose of. They are often abandoned in deserted areas across the planet and when they are incinerated, they emit significant amounts of CO_2,” he says. The advantage, again, is that Q-Cycle nylon 6.6 has the same functional and aesthetic benefits as conventional nylon.





In its Ecosustainable collection, Italian warp knitter Cifra features recycled nylon yarns such as Econyl by Aquafil, Renycle by Radici Group and Q-Nova by Fulgar.

CREDIT: CIFRA

Based in Zaragoza, Spain, polyamide producer Nurel is also launching a new yarn made from pyrolised post-consumer waste. This new fibre, a nylon 6, will supplement its recycled yarn offering. "Our production capacity for Reco Nylon, which is mechanically recycled from 100% post-industrial waste, is fully booked," says Nurel marketing manager, Leyre Quibus. Nurel has launched a vast company-wide programme to measure its carbon footprint across every product category, and from fibre to final garment, she says. "When we have finalised our research, we should be able to compare the impacts of nylon with those of polyester or cotton," she says, adding that it has chosen to apply the European Product Environmental Footprint (PEF) protocol. Nurel's parent company, Samca, operates in renewable energies and has installed what it says is the 'largest' solar panel facility for 'self-consumption' at its synthetic fibre facility.

Looking further ahead, Ms Quibus expects that there will be more textile waste to recycle when the mandatory separate collection of used textiles is implemented across Europe by 2025. This is part of the EU Green Deal and circularity directives. "This will be a major change. It will promote eco-design in textiles and clothing and may contribute to truly circular solutions," she says.

Cleaner energy

Pending the development of monomaterial designs, and improved collection and sorting of used clothing, this sector is busy rethinking and optimising its production processes. These can have a high impact on a material's eco-profile, and it is a core issue at Fibrant, a producer of caprolactam, which is the main ingredient for nylon 6. A former division of DSM, now owned by Chinese group HSCC, Fibrant has invested upwards of €40 million in the development of new technologies and in reducing its N_2O emissions. "This has enabled us to reduce the carbon footprint of our caprolactam by over 50%," says Giovanni Henssen, Fibrant's head of business development and sustainability. "These measures have brought the footprint of our Ecolactam down to 3.3 kg CO_2-eq per kg of caprolactam. It is the lowest in the industry, produced at industrial scale," he tells *WSA*. He says this rate is roughly 50% lower than the European average, based on data from PlasticEurope, and possibly 70% lower than the global average. Launched in 2021, this new EcoLactam can help achieve the industry's ambition to reduce its global footprint. "Our customers understand that it is the right way to go. In addition to increased use of recycled or biobased content, it is also important to explain the impact of a material that has a low carbon footprint, which is not an easy a story to pass on to consumers," he points out.

Fibrant also offers a biobased EcoLactam Bio made from tall oil, a by-product of the wood pulp industry, whose carbon footprint is even lower at around 1.5 kg CO_2-eq/kg. Mr Henssen says the company is looking into the possibility of recycling cooking oil as another biobased option. EcoLactam Circular, a third 'green' caprolactam, is based on recycled plastic waste.



In its s/s 2022 collection, German outdoor brand Vaude features trekking pants made from a polyamide yarn derived from BASF's ChemCycling pyrolysis process.

CREDIT: VAUDE / ATTENBERGER

> **"Recycling technologies for fishing nets have evolved and collecting and sorting processes have been improved upon"**
>
> MIKE SIMKO, HYOSUNG

Optimised processes

Nylon 6, which is made from a single raw material, caprolactam, can be considered 'easier' to recycle than nylon 6.6, which is made from two ingredients, hexamethylenediamine (HMD or HMDA) and adipic acid.

An early supplier of recycled nylon 6 made from fishing nets, Korean textile conglomerate Hyosung is planning a major relaunch of the mipan regen-branded nylon it first introduced in 2007. "Recycling technologies for fishing nets have evolved and collecting and sorting processes have been improved upon," says Mike Simko, the company's global marketing director for textiles. The company has entered into an agreement with fishermen in Busan, a major port on the south coast of the country, who will be supplying some 300 tonnes monthly of sorted nylon 6 nets. The new 100% recycled nylon yarn will be launched in the first quarter of 2023 and will be available in all of the company's specialty ranges including versions delivering added moisture management and odour control.

Like its creora-branded spandex, Xanadu stretch yarn and regen polyester, all recycled fibres at Hyosung are certified 100% recycled content. "This is the only way to make a real impact," says Mr Simko. The company has released LCAs for its recycled creora and polyester, and plans to publish an LCA for the new recycled nylon. "The first two LCAs have shown that our recycled yarns have a carbon footprint that is reduced by two-thirds compared with conventional yarns. The biggest gain in both cases, elastane and polyester, is the shift away from fossil fuels," he says; he expects the recycled nylon to have a similar profile.

Aquafil, headquartered in Arco, Italy, is gradually expanding its sources of post-consumer nylon waste to make its regenerated Econyl. It now operates two carpet recycling facilities in the US and has acquired a 32% stake in Nofir, a Norwegian company that has developed a high-tech system to collect and trace discarded nets. Earlier this year, Aquafil formed a partnership with Salmón de Chile, the Chilean Salmon Marketing Council, and Atando Cabos, a Chilean cleantech company, to collect and recycle used fishing nets.

From carpets to airbags

For polyamide 6.6 producers, airbags are a key source of possible waste material that can be mechanically recycled into new yarn. Quantities do, however, remain limited. US-based Invista has recently launched a recycled polyamide 6.6, branded Cordura re/cor, which is made mostly from material recycled from its own operations; it is a key supplier of airbag material. "As a major producer of nylon, we are constantly working on yield improvements that have resulted in a continuous reduction of downgraded material. However, the scale of our manufacturing facilities ensures that we have line of sight to deliver what the industry needs," said Cindy McNaull (see *WSA* issue 1, 2022). The new Cordura re/cor is certified 100% Global Recycled Standard (GRS). Invista says it has benchmarked its recycled nylon 6.6 fibre production process with its existing LCA for virgin polyamide 6.6 and found that the recycled version "leads to a decrease in greenhouse gas emissions of 83%. It reduces energy use by 82% and water by 57%. These are clear and quantifiable benefits," she says.

Spanish nylon specialist Nylstar also offers a mechanically recycled polyamide 6.6 in its Meryl range. It is made from 50% pre- and post-consumer waste blended with 50% virgin nylon 6.6. "We set the bar at 50% recycled content to ensure the same quality and performance as conventional polyamide 6.6," says Zuzana Vaskova, head of marketing for Nylstar, adding that it is GRS-certified. The company retrieves fibre and fabric waste from its own production and that of its direct customers. It also works with partner brands to recycle their

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A view of Fulgar's spinning facility.

CREDIT: FULGAR

unsold goods or used garments returned to them, as well as with collecting and recycling centres. "As demand for recycled nylon is high, we are investigating all possibilities," says Ms Vaskova. One of these is to promote the use of 100% Meryl Pure collections, which are made without elastane. "Our Meryl Hydrogen yarn has good natural stretch and is suitable for tops," she says. She adds that the company is also exploring the possibility of setting up a recycling centre in the US and working more closely with brands to encourage consumers to return used clothing in exchange for a discount on new purchases. The advantage of developing 100% Meryl Pure products is that the waste generated by Nylstar's partner mills in Portugal and Spain are pure nylon 6.6. "It is important to promote recyclability by avoiding blends. We believe it is better to focus on the infinite recyclability and circularity of Pure Meryl," she says.

Biobased and biotech nylons

A biobased nylon derived from castor beans, a polyamide 11, has been on the market since the 1950s, the result of technology developed by Arkema, a French specialty chemicals producer. The high price of this plant-based nylon has limited its use in apparel. Fulgar says its EVO yarn, a bio-based polyamide 10 made from castor oil, has been popular not only with high-end Italian fashion houses but also with fast fashion retailer H&M. This, it hopes, can "break the mould" and allow the product to expand its presence in the mass market.

Rhodia Brasil, a division of Belgian chemicals company Solvay, has recently launched Bio Amni, a new partially biobased nylon. This polyamide 5.6 is made from pentamethylenediamine (PMDA), instead of HMDA, and adipic acid. The PMD, which makes up 47% of its content, is derived from sugar cane, and the adipic acid accounts for 53% and is made from conventional fossil fuels. "The properties of nylon 5.6 are similar to those of nylon 6.6," says Eduardo Girote, the company's strategic marketing and business manager for polymers and fibres. It presents a number of processing advantages, including faster and lower-temperature dyeing (30°C), which increases productivity by some 30%, and wearer benefits such as high sweat-absorption and quick-drying properties. Bio Amni is part of Rhodia Brasil's efforts to reduce its overall impacts and says that sustainable textiles now account for 30% of Solvay's global polyamide portfolio. Its goal is to reach 50% in the next three years. The company also produces a biodegradable nylon, Amni Soul Eco, which is distributed in Europe by Fulgar.

Genomatica, a biotech company based in San Diego, California, has been working for years on developing biobased and bacteria-powered building blocks for the nylon industry. A biotech caprolactam is being tested by Aquafil. Thanks to in a partnership with German polymer producer Covestro, Genomatica has recently successfully developed a plant-based HMDA. Japanese textile conglomerate Asahi Kasei has announced it will be using it to make plastics for automotive and electronics applications, along with nylon yarns for airbags.

US-based pack brand Mystery Ranch has included Cordura re/cor 6.6 nylon in its autumn 2022 product line-up.

CREDIT: MYSTERY RANCH



Beyond the basics

A great deal of effort is being put into giving nylon a greener profile. These measures are mostly technical, behind the scenes, process-optimising and cleaner-power steps that, though laudable, do not have high marketing traction. For some of these innovative solutions, such as the biotech raw materials, it is not yet clear how much energy and resources they use and what their actual carbon footprint will be. What is very clear though, in the eyes of its producers, is that polyamide is a premium fibre that delivers premium properties.

Compared to other fibres, and with regard to microfibre shedding, nylon is mostly used as a filament yarn, less often in staple form, and is probably less susceptible to breaking down. It also has high abrasion resistance and tenacity properties, which probably reduce its ability to degrade in normal use. Nylon producers have also developed biodegradable versions of their fibres. Nylstar's Hydrogen Meryl is especially engineered to shed fewer microfibres. Nilit's BioCare is designed to decompose in marine environments, and has certified tests to back this claim. Nurel's Neride Bio has been proven to degrade in soil at the same rate as cellulose, and in landfill. The company is conducting research to assess its persistence in salt water.

For wearers, nylon producers willingly remind the sportswear industry that polyamide does not absorb odours as polyester does. A garment that feels good and looks good for longer will be kept longer, they contend. These properties could make nylon a more durable and more sustainable solution, they insist. But they are pushing for more. The next step that nylon producers are focusing on is promoting mono-component or monomaterial designs and products. They say that they can make a nylon yarn with enough elasticity to avoid the need for elastane. This would help increase the quantities of recycled yarns available, but beyond that, it would be a big step towards circularity and a deeper shade of green.



Rhodia Brasil launched a partially biobased polyamide 5.6 in response to growing demand for plant-based materials.

CREDIT: RHODIA SOLVAY GROUP





Alternative carbon blacks

The development of black inks and pigments that are derived from sources other than petroleum and are even proven to be carbon-negative could be a game-changer in the apparel industry and beyond. Enterprising companies are exploring biomass, waste and by-products, even soot itself, to make a greener version of a colour that fashion cannot live without.

It is a colour found in nearly every product under the sun, from the rubber of tyres and shoe soles to plastics, electronics, and beyond, including, yes, inks for printing on paper. In fashion, its presence is nearly as dominant, it is its absence that would really shake up the industry and make headlines. Speaking of which, how many articles begin with "X is the new black"?

In its traditional form, produced by the incomplete combustion of petroleum products (and agricultural waste), carbon black is considered "possibly carcinogenic to humans", a Group 2B substance, by the World Health Organisation's International Agency for Research on Cancer (IARC). Despite its hazardous nature, it is not banned.

Eco-conscious brands are beginning to take notice of how frequently black, from inks or pigments, are used to make their products, from textiles to hangtags to packaging, and are reaching out to innovative companies that are developing alternatives. Patagonia now prints all of its hangtags with Living Ink's Algae Ink, and it says tests are under way with six of the top ten sports brands. Hemp Black's eco6, a biomass black ink, is in trials at companies operating in nine different countries and in 13 different sectors, says Andrew Mark Sunderland, company founder and head of innovation and sustainability.

One of the research projects at Amsterdam-based sustainability organisation Fashion for Good is also looking into the potential of next-generation, biomass- or pollution-based carbon blacks as a possible solution for dope-dyeing. It has chosen three possible options, made by Living Ink, Nature Coatings and Graviky Labs. Birla Cellulose, in India, is working on a solution for manmade cellulosic (MMC) fibres, and Paradise Textiles, in Taiwan, on one for recycled polyester. Brand partners in the consortium include Bestseller, Kering and PVH. Thus far, the organisation says, all three alternative carbon blacks have mainly been used for printing. The project thus seeks to assist them in developing formulations for dope dyeing.

In the initial phase of the pilot, running in the first half of 2022, Birla Cellulose and Paradise Textiles will be producing the first dope-dyed MMC fibres and rPet yarns. "Participating Fashion for Good partners will have the opportunity to evaluate the performance, colour fastness,

British performance wear brand Vollebak introduced an Algae Ink by Living Ink T-shirt last year.

CREDIT: VOLLEBAK



Living Ink supplies its Algae Ink to Avery Dennison to print Patagonia's hangtags. The outdoor company also uses the carbon-negative algae pigments within ink for its publications.

CREDIT: PATAGONIA

wearability and impact of all solutions. Successful formulations will then go on to trial larger production runs with fabrics dyed using the innovations in phase two, which is scheduled to kick off in the second half of this year. The results of the project will be shared publicly with the industry at large at the end of phase two," says Katrin Ley, Fashion for Good managing director.

Dope-dyeing is "a very sustainable way of creating a coloured yarn," says Jane Palmer, CEO and founder of Nature Coatings. "It requires less water, less energy and less time too." Each type of yarn, she adds, requires a specific formulation.

Los Angeles-based company has been busy developing a water-based dispersion pigment that can be mixed with any paste or formulation at a mill. "We leap-frogged our technology and can now offer a dispersion product that is 100% plant-based, eliminating fossil fuels altogether," she tells *WSA*. A Life Cycle Assessment (LCA) is under way and initial results indicate that its pigment is carbon-negative. Nature Coatings has conducted extensive testing to demonstrate the safety of its solution. "It passes the EU standard for children's toys and has been included in the Oekotex Eco-passport and ZDHC MRSL 2.0 Gateway," she says.

Nature Coatings makes its black pigment from FSC-certified wood waste. A resource available in great quantities; 50 million tonnes are generated yearly in the US alone, says Ms Palmer. The company currently produces its pigment in the US and Europe and has plans to set up a plant in South-East Asia. "We want to be able to service our customers faster. This network will save money, time and shipping, in addition to further lowering the product's carbon footprint," she says.

In addition to the many tests under way with major sports brands — including Patagonia's hangtags, via global label specialist Avery Dennison, and its first commercial product with innovative British performance brand Vollebak last year — Living Ink is working on developments in many applications, including leather, Scott Fulbright, CEO and co-founder of the Colorado-based start-up, tells *WSA*. He adds that the Fashion for Good pilot programme is not only a great opportunity but also a key learning experience. "It enables us to tweak our process and iterate new formulations for the textile industry," he says.

Living Ink's Algae Ink is made from a by-product of an algae growing operation. As such it is considered a waste product, and because it "locks in" carbon into the ink forever, it is also a carbon-negative material. This is backed by an LCA conducted by researchers at the Colorado State University in Denver. "Carbon is locked in and won't be released back into the atmosphere. The ink does not biodegrade, but it is safe, inert, and can be composted. If a brand's priority is carbon, we are the solution," says Mr Fulbright.

Carbon is more or less present everywhere on earth, and of course in the carbon dioxide (CO_2) that modern society generates, but it is also found in high concentrations in particulate matter. "In India, particulate matter emissions can reach 1000 ppm during the winters every year when farmers burn crop residues. These are far more dangerous than carbon dioxide to human health and also contribute to global warming," says Graviky Labs CEO, Nikhil Kaushik. The MIT spin-off founded in 2016 and based in Boston and India sees itself not as an ink specialist but as a company that captures carbon and finds uses for it in everyday materials.

Graviky Labs has started making its black ink from soot, not CO_2. "Soot is made up of unburnt particles from combustion. It is very a carbon-rich substance that can have up to 98% carbon," says



Bestseller-owned brand Jack & Jones has released a range using Nature Coating's wood waste-based ink.

CREDIT: JACK & JONES



To better convey the carbon storage story to consumers, brands can print a QR code on their products, labels and packaging, says Living Ink CEO and co-founder Scott Fulbright.

CREDIT: AMERICAN EAGLE

Mr Kaushik. The company collects soot directly from factory smokestacks in India. It purifies this material, removing any unwanted substances such as heavy metals. It began by making inks for artists and has since developed formulations for screen printing and offset printing. In fashion, Graviky Labs' Air-Ink was used by Pangaia, before the company joined the Fashion for Good project.

Carbon-negative is good

Hemp Black, a company based in Georgetown, Kentucky, develops an entire suite of products from the plant, including an alternative carbon black it calls eco6. The patent-pending ink is made from the hurd (or stalk) of the hemp plant through pyrolysis to obtain biochar. This material is then ground into powder in varying qualities for different markets, from plastics to mascara.

"In the last six to eight months, we have been working specifically on developing eco6," says the founder, Mr Sunderland. Its biomass-derived carbon black is, as mentioned, being tested across 13 different product categories. "All results are proving to be one-for-one replacements for petroleum carbon black," he says. The company's eco6 technology is the first carbon black alternative to achieve Platinum Material Health certification from the Cradle to Cradle Innovation Institute.

Mr Sunderland holds seven patents for innovative hemp-based products covering a wide array of applications within Hemp Black's business portfolio. A derivative of CBD oil is integrated into yarns and used to make seamless performance clothing enhanced with the anti-odour and antibacterial properties of hemp. A specific strain of hemp is being tested for its potential as a hemp fibre for textile applications in southwest Texas. Hemp Black is part of Australian hemp specialist Ecofibre, which has extensive experience in hemp genetics and breeding.

Hemp Black's eco^6 is available as a pigment for plastics, foams and EVA, textile printing ink, and it has been used for solution dyeing and garment dyeing, says Mr Sunderland. The company currently operates one pyrolysis line whose future production capacity could reach 700 tonnes of eco^6 yearly.

Mr Sunderland's latest research has focused on measuring hemp's ability to sequester carbon when it grows, and assessing how much carbon is captured in its eco6 ink. As all plants do, hemp naturally transforms CO_2 into oxygen. Hemp pulls carbon dioxide from the air at a rate that can be three times that of trees, says Hemp Black, based on research by Darshil Shah at Cambridge University. Its cultivation also enriches and regenerates soil. "Hemp can be grown on fields during fallow periods," says Mr Sunderland. Furthermore, the carbon in the hemp hurd is permanently fixed into biochar. Petroleum carbon black also sequesters carbon, but its manufacture releases 2.4 kg of CO_2, according to a 2020 carbon footprint statement by Birla Carbon, a leading supplier of conventional carbon black. Research at Hemp Black shows that eco6 sequesters 6.8 kg of CO_2. "A few years back, we didn't know anything about hemp's ability to sequester carbon. Now we have the data, drawn directly from our own operations, and we can share it with brands," says Mr Sunderland.

Making carbon black from biomass, and especially from hemp biomass, is a natural fit, he insists. "Hemp is one of the few carbon-negative materials, and it is a whole economy," he likes to say.

The challenge remains to achieve the performance levels that the industry is used to with petroleum-based products, says Ms Palmer, at Nature Coatings. As brands increasingly seek to reduce their carbon footprint, choosing a colour that is not only capable of locking in carbon but also has a ubiquitous if not universal role, gives it a temptingly green twist.



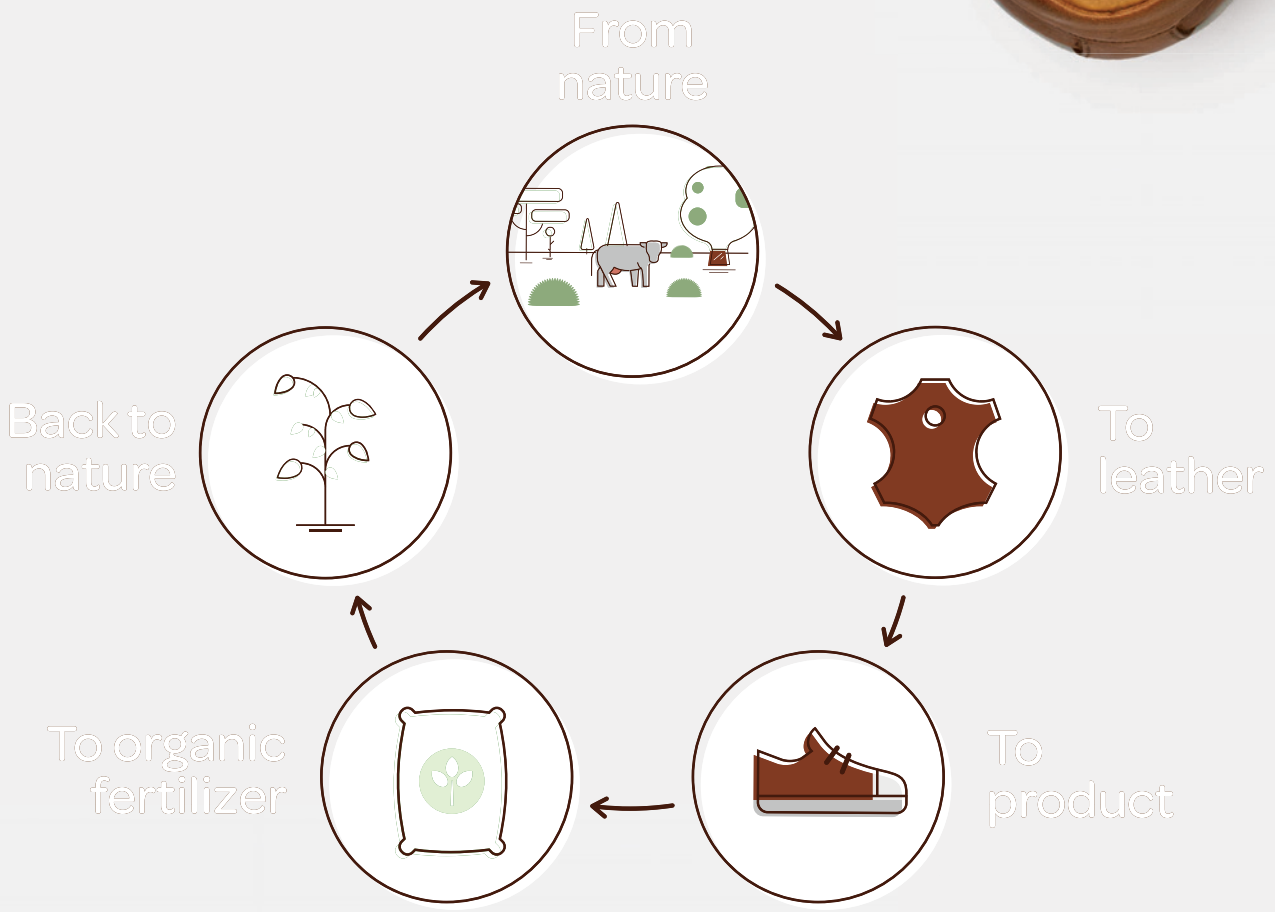
A growing number of sustainably-minded companies are adopting Living Ink's algae-based black pigment for their packaging.

CREDIT: ALLUVIAN

Ecotan

The first truly bio-circular leather with a proven path back to nature







Ecotan leather is free from metals, glutaraldehyde and other hazardous substances. **At the end of its life, it can be recycled into a fertilizer for organic agriculture.**

This tanning technology uses patent pending tannin based products and has been developed thanks to a partnership between Silvateam, Biofin, Fertilizzanti Certaldo and some of the world's best tanneries.

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Carving up territory

Terrex, an adidas division that specialises in athletic outdoor apparel and shoes, is set to release a limited-edition mid-layer hoodie, the HS1, online and in selected stores from July. The unisex garment is the first harvest from adidas' ongoing tie-up with Spinnova, after it became a cornerstone investor in the Finland-headquartered renewable fibre developer in 2021. Containing a minimum of 25% wood-based, mechanically ground Spinnova fibre, blended with organic cotton without the use of dyestuffs or chemical bleaching, the HS1 meshes well with the sports group's sustainability strategy. Specifically, its "made with nature" link, which stipulates the use of at least some natural ingredients in every article.

Renewable and sustainable

Launched as a spin-off from the VTT Technical Research Centre of Finland in 2014, Spinnova has worked steadily to develop its technology for making textile fibres out of natural microfibrils from renewable raw materials such as paper-grade wood pulp or waste from leather, textile and food production. It produces fibre without the use of harmful chemicals; its process is zero-waste, generates no microplastics, minimal carbon dioxide (CO_2) emissions and is low in water consumption, the Finnish company claims. Co-founder and chief executive, Janne Poranen, tells *WSA* that its flagship textile fibre should not only be celebrated for its sustainable and circular qualities, however, but also for its "distinctive" performance properties and "natural" hand-feel, which he describes as being similar to cotton or linen. On Spinnova's performance credentials, Mr Poranen singles out the fibre's capacity for moisture management and thermal insulation.

RISE TO THE CHALLENGE

Mapping new fibres and textile terrain would appear to come naturally to Finnish renewable fibre producer Spinnova. Testing its innovations commercially and at scale remains a task in hand, however. Outdoor brand adidas Terrex has sent a clear signal that it is ready to rise to the challenge.

In the case of the Terrex HS1 hoodie, the ratio of wood-based fibre used was in part influenced by the "still very limited" availability of its supply, the executive goes on to explain, although Spinnova fibre is typically blended with either cotton or wool as part of a process which involves tailoring the properties of the final fabric to best fit the desired application. As supply increases, the company plans to gradually expand its ratio to as much as 100% of a product's fibre composition in the future, he states. Currently, Spinnova fibre is produced at the firm's pilot factory in the university city of Jyväskylä in central Finland, and has been in operation since 2019. That this facility

Partnering with adidas means that Spinnova fibres will step out from Jyväskylä and into the world.

CREDIT: ADIDAS

was able to jointly develop and complete the HS1 project alongside adidas only eight months after the partners first announced their collaboration is an outstanding result, according to Mr Poranen, as well as a "very important" part of Spinnova's commercial journey.

For adidas, too, the HS1 hoodie represents a major step, says Terrex general manager, Carla Murphy. By allowing the brand to make "high-performance" gear with reduced CO_2 emissions, low water usage and less waste, compared to conventional fibre production, the garment offers a way forward. Especially considering adidas' very public ambition to create at least nine out of 10 articles through incorporating more sustainable technologies, materials, design or manufacturing processes by 2025. Though prior to the announcement of the HS1 in February, news from Terrex had been relatively muted since 2019, its clear alignment with the Finnish biomaterials developer underscores adidas' commitment to achieving these goals on all fronts.

Scaling new heights

Another joint venture, this time between Spinnova and Brazilian pulp supplier Suzano, a leading producer of eucalyptus pulp and one of Latin America's largest paper manufacturers, will be key to growing the former's wood-based fibre supply. Under construction in Jyväskylä since last year, the partners' commercial-scale Woodspin factory is expected to help Spinnova build an annual production capacity of one million tonnes of wood pulp-derived fibre for the textile industry by 2031, moving it closer to its goal of scaling to large volumes and providing a sustainable material that is competitively priced. The site, which is supported by local technology provider Valmet, is expected to be operational by the close of 2022.



Despite its soft, organic look and natural feel, Janne Poranen says that the Terrex HS1 has been engineered for performance.

CREDIT: ADIDAS



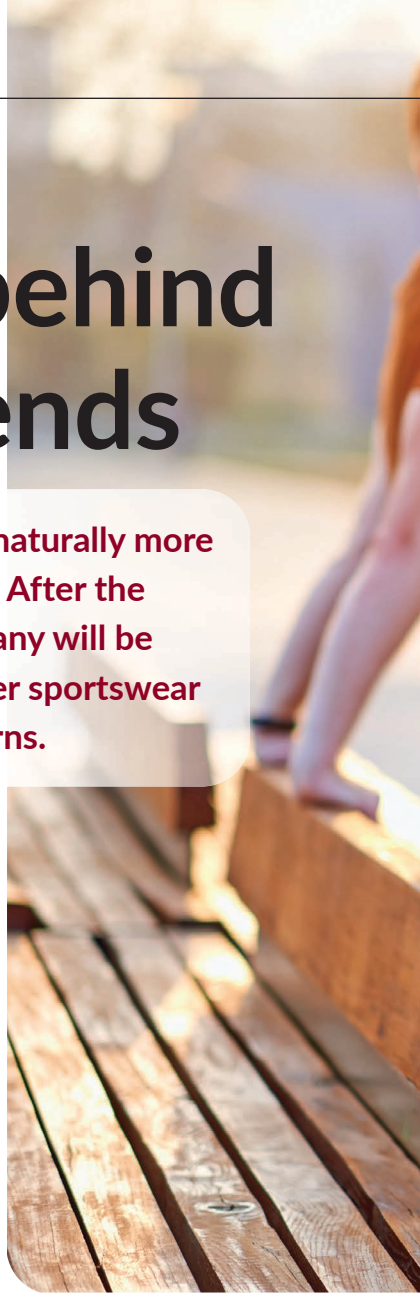
Spinnova may be just one Finnish enterprise carving out a niche in the forest of wood-based cellulosic fibres at present, but it is striking for its range: not only tree pulp, but also waste from leather, textile and food manufacturing can be spun into its eco-friendlier fibres.

CREDIT: SPINNOVA

Close-by, work will commence on an in-house yarn spinning facility which is scheduled for completion in the spring of 2023, Spinnova announced last month. It said at the time that this latest facility would enable "a fast turnaround of product development projects with multiple brand partners", offering them fibre, yarn or fabric, depending on their needs. Switzerland-based short-staple fibre spinning machinery maker Rieter will be the producer's main technology partner for the project. Meanwhile, pilot-scale production of another new material, Respin, created by Spinnova in collaboration with Swiss-based leather manufacturer KT Trading, began this past December. Respin uses wet blue shavings from tanneries to make a renewable yarn that can be woven or knitted into fabric for clothes, bags, shoes and other applications, with Danish footwear and leathergoods brand Ecco already set to be among the first to trial demo products made with the technology. Neither adidas nor Spinnova would be drawn on whether plans for their ongoing partnership currently include use of Respin.

Where all this will lead Spinnova (and adidas) is uncharted territory. Interest in the new materials market is intense, with agreements also in place with other high-profile activewear companies such as VF brands Icebreaker and The North Face, local sportswear firm Icepeak and international fashion groups H&M and Bestseller regarding supply of its wood-based fibre. Inspired by how spiders weave their webs and, to the company's knowledge, able to be recycled again and again, securing access to Spinnova fibre is now a competitive endeavour and, as adidas has shown, one considered worthy of strategic investment. How far the HS1 hoodie, as well as the adidas-Spinnova link-up, can go in the commercial sense will be tested for the first time this summer when the product launches, but its reach may be limited by the current supply situation.

Production knowhow behind Summer sportswear trends



Summer is a time when people are naturally more optimistic and focused on wellness. After the challenges of the past few years, many will be looking forward to choosing summer sportswear in uplifting colors and playful patterns.

Designers are embracing a vibrant color palette for the coming season, with bold color pairings lending a retro vibe. Geometric shapes, gingham checks, polka dots, florals and stripes are also making a splash with creatives at trend-setting fairs like Performance Days Munich.

Of course, sportswear has to be highly functional, too. "People buying sportswear nowadays want comfort and protection, whether on land or in the water. They expect their sports apparel to dry quickly, resist stains and odors, and offer breathability," says Martin Weber, Global Marketing Manager for Performance Apparel at Huntsman Textile Effects.

"Achieving this functionality with on-trend aesthetics can be a challenge, especially given the increasing focus on sustainability in the sportswear market. But solutions are available. The key to finding the ideal solution is to be clear about what design elements and performance attributes you want to achieve; and what undesired side effects must be avoided."

Let's consider a few scenarios relevant to spring-summer 2023.

Deep shades and bold contrasts without bleeding and fading

According to Mr Weber, it is technically difficult for mills to achieve deep shades and striking contrasts on the blends favored by sportswear and swimwear designers — specifically, polyester or cotton fibers, and synthetic or elastane blends, especially when using recycled polyester or polyamide.

"These blends tend to have limited wetfastness, and conventional dyes can bleed and fade, especially with increasing shade depth. But it is possible for brands to choose brilliant and deep shades and expect consistent shade reproducibility," he says.

Huntsman's **TERASIL® W/WW** disperse dyes deliver outstanding results, even for deep and very deep shades. With the best wetfastness performance available today for PES and its blends, they ensure that high-performance sportswear and athleisure garments will not bleed or stain during home laundering, or while in storage or transit, when temperatures can reach as high as 75°C. The new TERASIL® BLUE W further raises the washfastness benchmark and is robust during processing to heighten production efficiency and sustainability.

"Another option for nylon and nylon-elastane blends is the **ERIOFAST®** range, which brings greater design freedom to brands because intense deep shades can be combined in one garment for extreme color contrast—and even paired with white of the same substrate. This is an acid reactive dye range that provides excellent color blocking properties and no staining, along with outstanding washfastness so colors stay brilliant for the lifetime of the garment," Alessandro Larghi, Global Marketing Manager for Wool, Polyamide and Polyacrylic at Huntsman Textile Effects, explains.

ERIOFAST® achieves superior moisture management effects without any additional finishing steps. With no fixing agent, the fabric's very soft and smooth hand feel is also retained. The dyes are fully compliant with stringent brand and industry restricted substances requirements, as well as bluesign® approved and suitable for STANDARD 100 by OEKO-TEX®-certified textile products.

Water repellence without sacrificing fabric quality or production efficiency

Durable and sustainable water repellence is a key consideration for outdoor clothing. Mills have to have a high level of expertise to use non-fluorinated durable water repellents (DWRs) to achieve the desired repellency while maintaining fabric quality and production efficiency.

Kerim Oner, Global Marketing Manager for Finishing at Huntsman Textile Effects, says, "The right chemistry, recipe and application process is vital, and this is often best achieved with expert technical input from a partner like Huntsman Textile Effects."

When exceptional water repellent effects are required, sustainable **Zelan™ R3** is the chemistry of choice. Based on **Teflon EcoElite™** technology from Huntsman's long-time partner Chemours, this breakthrough product was the industry's first renewably sourced DWR treatment. It contains 63% renewably sourced content derived from a



variety of plant-based sources, carefully selected to be from non-genetically-modified (non-GMO) and non-food-source feedstock.

Furthermore, Zelan™ R3 is up to three times more durable than existing non-fluorinated DWRs, and it delivers consistent high-quality results on a variety of fabrics, including cotton, synthetics and blends. It is ideal for high-performance outdoor and outerwear fabrics, with an excellent water repellency spray rating after 20 washes.

Zelan® R3 is applied by padding at loading levels comparable or lower than other typical repellent finishes. It is engineered to help prevent build-up on rollers for uninterrupted production. It is also compatible with commonly used coating and lamination systems and can be combined with **PHOBOL® XAN Extender** to boost wash durability.

High-value intelligent performance without compromising sustainability

Consumers want their sportswear to deliver enhanced performance, comfort and protection, but they also increasingly expect brands to achieve this in an eco-friendly way—and to be transparent about their sustainability efforts.

Huntsman Textile Effects helps brands meet customer expectations through its **High IQ® quality assurance program**. Giving brands a way to communicate their products' quality and performance at point of sale, the High IQ® hangtag identifies products that deliver on-trend effects while also meeting the textile industry's strictest environmental standards.

For example, **High IQ® Cool Comfort** provides durable moisture management effects that allow garments to breathe. The unique technology transports water vapor away from the skin and spreads it over a wide area to accelerate evaporation, ensuring garments dry quickly. This quick-dry effect reduces post-exercise chill, leaving the wearer feeling cool and dry.

High IQ® Sun Protect, on the other hand, delivers built-in protection from damaging UV-A and UV-B rays, providing an Ultraviolet Protection Factor (UPF) of up to 50 and above. It is ideal for children's wear and summer sportswear. Tested against the highest industry standards, High IQ® Sun Protect offers maximum protection without impairing the natural aesthetics of the fabric. In addition, prolonged exposure to sunlight and multiple laundering will not degrade the protection or fade the colors.

The technology that drives the HIGH IQ® Cool Comfort and Sun Protect programs complies with the requirements of bluesign® for safe and sustainable textile production and is suitable for Standard 100 by OEKO-TEX®-certified fabrics.

"Consumers are increasingly holding sportswear brands to account for their sustainability efforts, but they still want garments that perform well and look good. That's entirely achievable today for brands and mills that take advantage of the latest dyes and effects technologies and the expertise of the innovators who create them," Mr Weber concludes.

> **We need a new way of thinking and of acting in relation to the environment**
>
> KÍLIAN JORNET

Out in the open

NEWCOMERS

Running and ski mountaineering star Kílian Jornet has launched a new footwear, clothing and accessories brand with Mallorca-based footwear group Camper.

Few people have the strength, fitness, determination and toughness to compete at the top level of competitive mountain running. Even fewer are able to combine winning medals in ultra-trail events all over the world with other demanding activities such as ski mountaineering and record-breaking fast times for the ascent and descent of major peaks, including Mont Blanc and the Matterhorn. Kílian Jornet, however, seems able to achieve all of this and still to have carved out time while preparing for the 2022 season of the global trail running World Series to launch a new sports footwear, clothing and accessories brand, NNormal.

This is a partnership the Catalan athlete has established with footwear brand Camper. This is more than a marketing initiative; Kílian Jornet will wear NNormal shoes and clothing to compete in this season's competitions, which means they will have to be able to withstand, and help him perform at, events involving distances of, sometimes, more than 100 kilometres and climbs of thousands of metres.

Country roots

It is not unusual for athletes and brands to describe their partnerships as something more than a commercial arrangement, and this certainly applies in the statements that have accompanied the announcement of the Camper-Kílian combo. In fairness, though, a number of elements support the 'meeting-of-minds' narrative here.

Camper is fiercely proud of its heritage, its links to the artisan footwear industry in Mallorca and its country roots. Its name does not derive from 'camping' as we understand it today; it simply means 'from the country', as opposed to 'from the town'. Its headquarters are in the town of Inca, in the north of the island, 35 kilometres from the nearest beach and the same distance in the other direction from the city of Palma.

It launched in 1975, but founder, Lorenzo Fluxà, had impeccable Mallorcan shoemaking credentials as the grandson of Antonio Fluxà, a footwear craftsman who, in 1877, became the





Kílian Jornet will wear NNormal shoes and apparel to compete in the 2022 international trail running World Series.

CREDIT: JAIME DE DIEGO



Made to last. Kílian Jornet in a Camper workshop in Mallorca. Both of NNormal's founding partners want to make long-lasting products and to discourage over-consumption.

CREDIT: JAIME DE DIEGO

first person to bring stitching machines to the shoe workshops of the island. Since 2012, a representative of the fourth generation of the family, Miguel Fluxà, has been running the company. It now employs more than 1,000 people and has shops in major cities all over the world, as well as a bit of a cult following among shoe fans.

On the subject of setting up a new brand now, Miguel Fluxà says it is always "an exciting adventure", but that having the chance to set up NNormal with Kílian Jornet was a one-off opportunity. He talks of a "perfect complementarity" between the two partners. "A union between performance and responsibility is totally written into our philosophy," he continues. "Kílian also has a unique vision of outdoor activity, as well as some solid expertise in product development, while we at Camper have been able to bring our entrepreneurship, our footwear-manufacturing expertise and our creative know-how to the table."

On top of the world

Kílian Jornet grew up in the Pyrenees, a dozen kilometres from the border between Spain and Andorra, at a large, popular mountain refuge called Cap del Rec, where his parents worked as mountain guides and winter sports instructors. Since 2016, his home has been in Rauma in the fjords of western Norway. The point is that he is no city boy either.

By his early 20s, he was winning world championships in trail-running and ski mountaineering. He entered the famous Ultra-Trail du Mont-Blanc mountain marathon for the first time in 2008, at the age of 20 and won, completing the 166-kilometre course in a record time of just under 20 hours and 57 minutes, almost an hour faster than the athlete who took second place, Sherpa Dachhiri-Dawa. He has since won the event on two other occasions.

He has won the Skyrunner World Series mountain-running championship six times and made films of his solo, unassisted ascents of the highest mountains in the world.

Saying and doing

"To talk and talk and talk and not to act adds up to nothing," NNormal's launch announcement states. "We know that it's what we do and not what we say that will define us." Nevertheless, as with the introduction of any new brand, what the partners have said about NNormal is all we have to go on for now.

The NNormal name came about, partly, through a combination of Norway and Mallorca. The products for its first collection, which will launch in Europe and North America this autumn, were designed at Camper's home in Mallorca and tested on its new partner's snow-covered home turf in Norway. The extra N is because what the brand partners seek to achieve in terms of product quality, sustainability and social responsibility is, they say, "not normal" today, but will be in the near future.

They describe their mission as being to inspire people to enjoy and respect nature. They commit to being "authentic", which is to say true to their passion for the outdoors, and at the same time "functional". This means they are determined to make products that outdoor enthusiasts will be able to wear while carrying out a series of different activities and still get lengthy service from them. These products will be repairable, reusable and recyclable, the partners insist.

They launched with a five-point manifesto, declaring that NNormal will blaze its own creative trail, which will push it "to contribute, for the good of people and the planet". The open air is the brand's home, the manifesto continues, because of its passion for outdoor sports and because, "on reaching the summit, we take with us our memories of the people who have accompanied us on our journey".

It also aims to "empower simplicity", it says. Simplicity for NNormal means being able to do

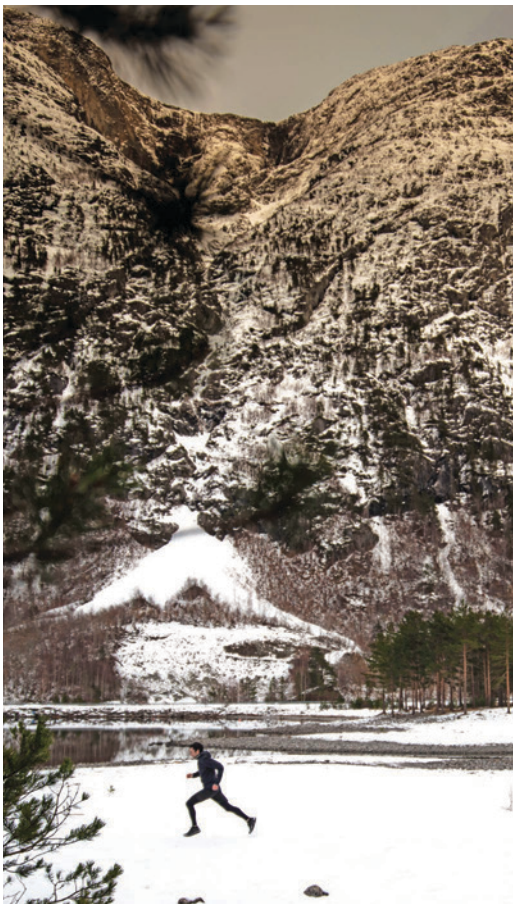
more with less, and a conviction that, sometimes, the simplest solution can be the most effective, "even if it's the most difficult solution to imagine". The fourth manifesto point extols teamwork and taking personal responsibility for our actions, and the fifth states that actions speak more loudly than words.

Transparency promise

Rounding off, for now, the words that have accompanied the introduction of NNormal, Kílian Jornet goes into more detail about what some of these manifesto pledges mean.

"We need a new way of thinking and of acting in relation to the environment and to outdoor activities," he says. He explains that this will, of necessity, mean being "very honest" about how NNormal products are made and the impact the brand has on society and the environment. "This has to translate into total transparency," he continues, "and into working to avoid excess consumption by creating products that are long-lasting."

With the aim of making sure NNormal shoes, garments and accessories have the lowest-possible environmental footprint, the mountain athlete explains, the brand will work with "different materials and different designs". He concludes: "It's going to be a long and difficult process, but that's what motivates us, the whole team and me, as we launch this project".



Designed in Mallorca and tested in Norway, the brand's first collection will go on sale in North America and Europe in autumn 2022.

CREDIT: BERNITZ/AASEN





> It has allowed me to have an immersive experience in the way we create products

ARNAU SANJUAN, ADIDAS

Out of this world

FOOTWEAR TECHNOLOGY

Adidas' director of footwear innovation, Arnau Sanjuan, tells *WSA* how software program Gravity Sketch is changing his approach to shoe design.

Creative people have a strong spatial intelligence, but the tools that are used to create digital 3D content are heavily based on logic, maths and linguistics, according to Howard Gardner's theory of multiple intelligences. This mismatch was something industrial designers Daniela Paredes and Oluwaseyi Sosanya wanted to tackle as part of their joint Master's project at Imperial College London in 2013 – surely it would make sense to make the design part more intuitive if your brain worked in a different way?

Their research coincided with being introduced to the then-nascent virtual reality (VR) programs that were beginning to emerge in gaming but were not prevalent in industrial design at the time. It seemed it could offer a way to create a 3D image that could better represent an object's final form. From this initial project, Gravity Sketch was launched. "The goal we set ourselves was to empower people to communicate and materialise their ideas in a quick and intuitive way, just as if you were pulling the thoughts from your head," Ms Paredes tells us. "It's about helping people bring their ideas out and being able to communicate them."

Following the course, she took a job in the innovations team at automotive group Jaguar, which cemented the realisation that there was a need for an easier way to create in 3D. Using a headset and moving from 2D sketch to 3D interpretation programs could save time and money. "The way that designers are working now is definitely changing," she says. "This change is bringing more voices into the beginning of the design process."

Globally connected

The onset of the global pandemic, which pushed many office-based jobs into people's homes, created the need for better communication with colleagues around the world. It was at this point, at the start of 2020, that sportswear brand adidas began to work with Gravity Sketch software. "There has been a change from the previous process, from before the pandemic, with the use of the new tools, such as virtual reality and Gravity Sketch," adidas' director of footwear innovation, Arnau Sanjuan, tells *WSA*. "It has allowed me and other people to have an immersive experience, something I had never experienced before, in the way we create products."

While there were similar programs in the market, many designers felt they weren't intuitive enough and did not really integrate into their way of doing things, he adds. "Gravity Sketch has the depth required to generate an object from the idea you have in your mind, making it flow easily. As soon as you try it, it's a no-brainer to integrate it into your workflow, especially when we focus on the ideation phase of product design."

Crucially, the programme offers the ability for more than one designer to contribute to the design



Co-founder Daniela Paredes demonstrates VR headsets using Gravity Sketch.

CREDIT: ADIDAS

at once. By wearing headsets, adidas designers across the US and Europe added their vision as the shoes were drawn and took shape.

Gravity Sketch has created a metaverse that is not consumer-facing but is an internal space for employees to collaborate on ideas. "Only a few people have the skills required to design in the metaverse and that's not good," says Ms Paredes. "Our goal is to democratise that. Ultimately, we're all creative and we know there are creative minds out there who are not able to sketch in perspective."

Simple to use

Using headsets and hand controls, Gravity Sketch software enables users to draw in 3D, and can interact with CAD and rendering software. It allows free-form sketching while creating CAD-ready data, and it is accessible through any device. It also enables users to import 2D sketches and images to trace over and to create a 3D wireframe. The companies say it only it takes a couple of hours to learn most of the tools, and full sketches are possible in only a few days. This simplicity means members of the team who are used to drawing only in 2D can quickly learn to design in 3D. It also means a design can be assessed by team members in a matter of hours, rather than waiting for a 3D model that could take up to three weeks.

"We need to build a bridge to allow people to go from an idea to a physical sample," adds Mr Sanjuan. "How to integrate that into our pipeline is something that I am focused on. You



Adidas protoytpes were designed around the 3D shape of the foot. The global design team collaborated on every detail of the shoe, virtually.

CREDIT: ADIDAS/GRAVITY SKETCH

can iterate more in the 3D space so the outcome is well thought-through and you are able to discuss everything before cutting any material or creating anything physical."

Being able to work collaboratively from the start could also help reduce problems later on, when it could be too late to make changes, adds Ms Paredes. "You end up with a process that involves a lot of compromises and with products that do not necessarily reflect completely the intent of that first sketch. The software enables people to speak the same language at the beginning of the process and to make the process richer."

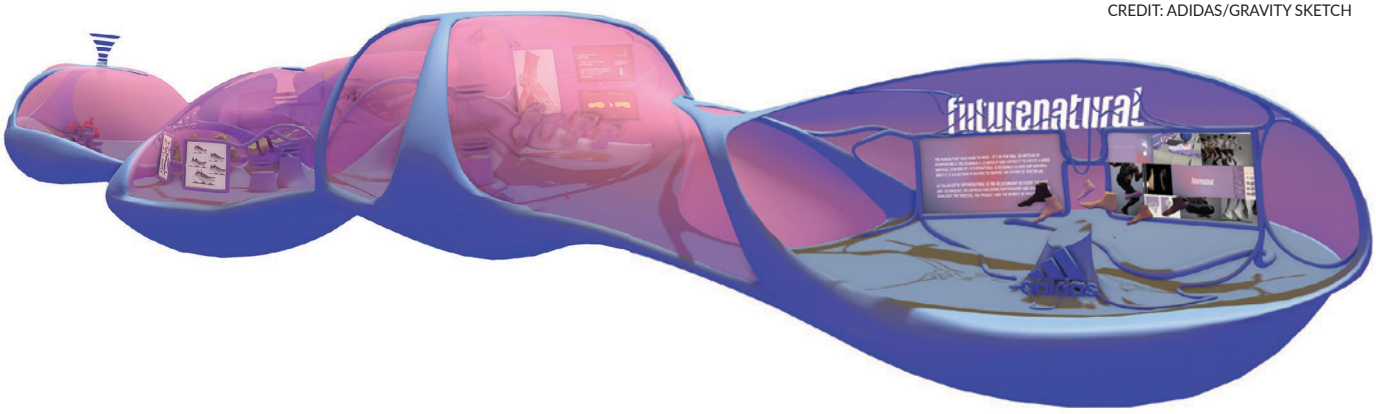
Time and cost savings

While it is not a tool that will affect the manufacturing side, at least not and is not in the near term, and not an engineering tool to make moulds, developers are looking at ways that samples and prototypes can be worked on across the supply chain. For instance, a factory in China could upload a 3D file of a prototype shoe into Gravity Sketch and this can then be refined by designers. They could all also be in the same virtual space having a real-time conversation around the 3D digital object. This reduces waste and would dramatically cut down on time as well as the CO_2 and cost associated with shipping samples.

Technology and software is constantly evolving, and Gravity Sketch asks for feedback from users to help with the development process, helping to add functionality or refine its tools. It suggests users share their experiences on social platforms and help generate wider professional adoption, which will lead to a more inclusive experience.

Adidas' first range of shoes designed inside a virtual museum shaped like a giant footprint, is the Futurenaturals family. These shoes mimic the shape of the foot and use a Primeknit upper. The program has also been embraced by footwear designers at Reebok and Anta, showing its potential in the athletic shoe sector, as well as at carmakers Ford and Nissan.

Both Mr Sanjuan and Ms Paredes see the demand for the technology growing in every sector that uses sketches. "You can generate things you were not able to generate before because you did not have that fully immersive experience," says Mr Sanjaun. "Designers will see a new way of working and will want to embrace it. I think it will soon be standard."



The adidas Advanced Concepts team's Futurenatural World. The design philosophy and journey fit inside a virtual museum, shaped like a giant footprint.

CREDIT: ADIDAS/GRAVITY SKETCH

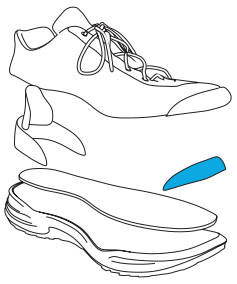
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Seven concerns about sustainability

SUSTAINABILITY

A report from Eco-Age raises serious questions about the way brands and campaign groups in the textile and clothing industry present sustainability claims at the moment. The call for change is loud.

Advocacy group Eco-Age has worked with the Geneva Center for Business and Human Rights to publish a report called The Great Green Washing Machine. Eco-Age founder, cinema producer Livia Firth, instigated the report. The director of the Geneva Center for Business and Human Rights, Professor Dorothee Baumann-Pauly, joined forces with London-based sustainability consultant and former World Bank economist Veronica Bates Kassatly to write it.

It has taken the form of two white papers. The first appeared last September, the second in mid-March this year. Together, these white papers raise seven specific concerns about the way companies in the textile and apparel sector measure their environmental performance and share information about sustainability. They draw the conclusion that current sustainability assessments in the industry are "broadly incorrect".

The Great Green Washing Machine says there are two reasons for reaching this conclusion, both of which are familiar already to readers of *WSA*. One is that the most frequent way of measuring the impact of textiles and garments is cradle-to-gate, rather than cradle-to-grave, which ignores outcomes of the products' use and disposal at end of life. The second is that the current measurement methods assess impact by kilo of material. What really matters, the authors say, is impact per wear. "Clothes are not Kleenex," they explain. "We are supposed to wear them multiple times."

They suggest there is a link between the likelihood that consumers will be able and willing to wear a garment lots of times and the fabric

It's an uphill struggle, but clearer, fairer sustainability reporting is in everyone's interest.

CREDIT: NORRØNA

garments are made from. "This should be included in sustainability calculations," the authors say. If a dress costs '12' dollars or environmental impact points or whatever, and a consumer wears it once before throwing it away, the cost is 12 per wear. Another dress may cost '1,200', and if its owner wears it 100 times, its cost is also 12 per wear. Equal? The main difference, they point out, is that at the end of the second dress's 100-wears lifespan, there would be one dress to dispose of. Wearing dresses of the first kind each day over the same timeframe would leave you with 100 dresses to dispose of. The two scenarios, therefore, are not equal at all.

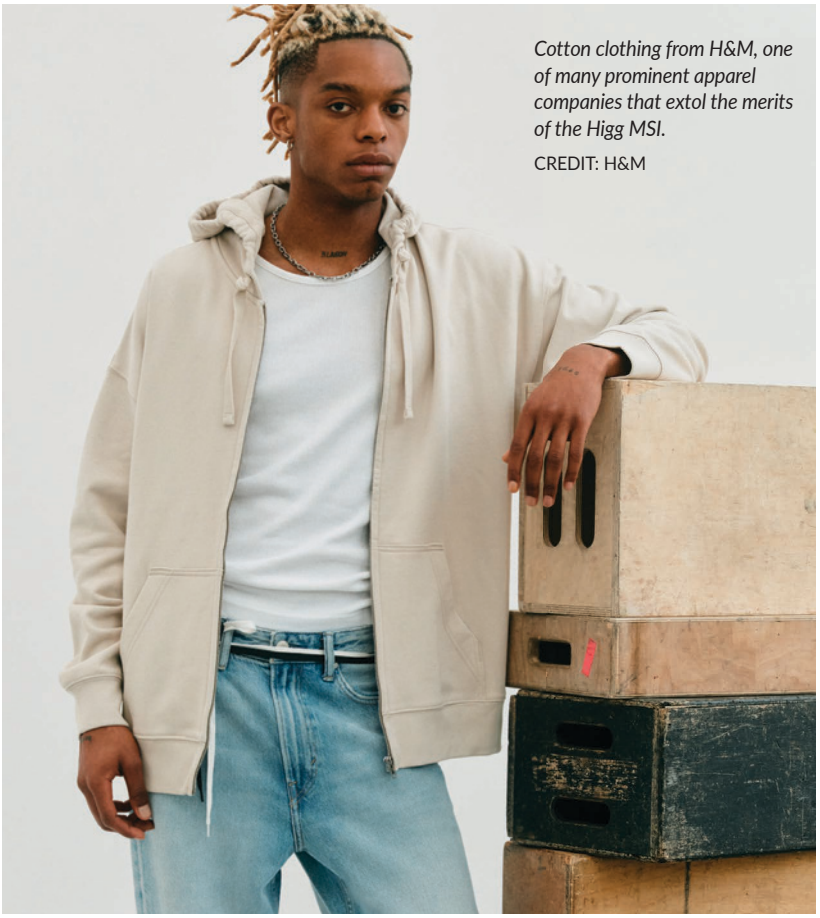
Raw deal

The first of the seven concerns the two white papers raise is to do with the influence on sustainability perceptions of programmes run or controlled by brands. Initiatives such as Germany's Green Button certification and the European Commission's efforts to create rules for calculating the product environmental footprint (PEF) of almost all physical goods on sale to consumers in the European Union mean well, but may depend too much on brand-led data and analysis that lack objectivity.

This brings up the Sustainable Apparel Coalition (SAC) and the Higg Materials Sustainability Index (MSI) for the first time in the report. The authors' main criticism of this multi-stakeholder alliance and its sustainability measurement tools is that they lack "public oversight". This makes it difficult to hold the SAC to account for the comparisons it makes concerning different materials and their sustainability credentials.

To support this assertion, the authors look more closely at the plight of two fibres, silk and alpaca wool, both of which score badly in the Higg MSI. The authors report that alpaca wool exports were worth $219 million to the economy of Peru in 2018, but only $120 million in 2020. Fashion group Kering spent €670,000 on alpaca fibre in 2018, but reduced this to €350,000 in 2019. In parallel, global annual silk production fell from 200,000 tonnes in 2015, to just over 90,000 tonnes in 2020. Industry bodies representing silk and alpaca told the authors of The Great Green Washing Machine that they had received no request for information from the SAC and were unaware of having been presented in a poor light in the Higg MSI, even though they have clearly felt the consequences.

"They were unaware that their fibres were being almost universally reviled for their allegedly poor sustainability," the report says. "The fibre sectors concerned appear to have been unable to obtain any form of redress from either the SAC or the fashion behemoths who use it. Corporations such as H&M and Zalando are rolling out consumer-facing programmes extolling the merits of the Higg without, as far as we are aware, having made any attempt to contact either the alpaca or silk sectors."



Cotton clothing from H&M, one of many prominent apparel companies that extol the merits of the Higg MSI.

CREDIT: H&M

> **"Current sustainability reporting is artificially favourable to polyester on its environmental impact."** THE GREAT GREEN WASHING MACHINE

Beyond the minimum

The report's second concern is that, in most programmes, the only area of focus appears to be environmental impact. Almost without exception, it says, brands and initiatives conflate sustainability with environmental impact. "None make any attempt to measure sustainability in terms of meeting the needs of the world's poor," it claims.

A starting point for the authors is that the definition of sustainability underpinning the United Nations' 17 Sustainable Development Goals (SDGs) is that overriding priority must be given to meeting the needs of the world's poor. They argue that it cannot come as a surprise to any brand, consumer or government in the most developed economies that this is so; they have all voiced loud commitments to helping the United Nations meet the SDGs. "The poor in the global fashion chain are fibre farmers and wage earners, primarily in manufacturing. The interests of both groups must be front and centre in any sustainability claims."

They warn that this goes beyond insisting that workers who grow fibres, spin yarn, weave fabric and construct garments for people in wealthy countries to buy and sell receive the minimum

wage. They say the statutory minimum wage in the largest garment-producing countries is less than 50% of what is necessary to secure a decent life.

Fairer for farmers

This leads them to concern number three: fairness for farmers. According to the report, even initiatives that have a focus on farmers do not include benefits to the farmers themselves in their impact calculations. For the authors, organic cotton's place in the debate about textile sustainability illustrates this well. They point to two major programmes, Better Cotton Initiative (BCI) and Textile Exchange (TE), that present organic cotton as more sustainable than conventional cotton. In spite of this, the authors say, neither BCI nor TE has ever provided any "robust, independent studies" that show that embracing organic farming will generate higher income for farmers. This flags up once again the lack of focus on people, especially the poor in the global South, in the textile sector's sustainability thinking, even though "ending poverty in all its forms" is the starting point for the SDGs.

Both the programmes that the report mentions in the context of concern number three parade their support for the SDGs. TE says using the SDGs as "a common vocabulary and reporting framework" is one of the five principles underpinning its own work. For its part, BCI says its work to make 'better cotton' a mainstream, sustainable commodity is "intrinsically aligned to the SDGs" and that the organisation "embraces the SDGs holistically".

In practice, though, according to The Great Green Washing Machine, there is no evidence that organic cotton farmers fare better, financially, than their conventional neighbours, even though growing the fibre organically takes more work, entails higher risk and gives lower yields.

Spell it out

Analysis explaining the last four concerns appears in the second of the two white papers. **The fourth in the list is the concern** that the scope of sustainability assessments is too limited, too narrow. Repeating the point that sustainability reporting from major apparel brands based on the Higg MSI focuses only on impact up to the factory gate, the authors say here that this can lead to "absurd results".

Cradle-to-gate measures the environmental footprint of the material extraction and production phases. It does not take into account any impact beyond manufacturing; the use of a garment and the disposal of it at end of life make no impression on these sustainability scores. In contrast, a cradle-to-grave approach measures all impacts across the complete lifecycle of the product.

Longevity and multiple use are the best sustainability metrics. The authors suggest that clothing companies that are serious about sustainability should start spelling this message out to consumers with forthright messages on garment labels. These could say, for example: 'If you wear this garment fewer than X times, your purchase is unsustainable and may increase global warming.' Another example would be: 'Consumers are advised to avoid purchasing any garment that they expect to wear less than Y times.'

They acknowledge that "further robust studies" are necessary if brands are to substitute X and Y here with an accurate number, but this takes nothing away from the core message: we should buy good products, own them for a long time and wear them frequently.



Cotton Australia launched an initiative in 2021 to return cotton textile waste to make the soil more fertile. It describes Australian cotton as "naturally the world's best", even though none of it is certified organic.

CREDIT: COTTON AUSTRALIA

Complex cotton questions

Concern number five returns to the issues around cotton farming, this time focusing on the complexities involved in comparing organic and conventional methods of producing the fibre. Comparative analysis in sustainable fashion, the authors insist, "continues to demonise conventional cotton".

They describe contemporary consumers' love of organic produce as an understandable reaction to excessive use of synthetic fertilisers and synthetic pesticides in the early twentieth century. Many organic practices represent a return to more traditional methods, such as crop rotation, encouraging the presence of beneficial 'pests' and the use of manure as a natural fertiliser. However, The Great Green Washing Machine argues that the reintroduction of many traditional methods, whose resurgence began with the organic movement, has happened in conventional farming as well now.

Australia is a leading global producer of organic crops, accounting for almost 50% by hectare in 2018, according to figures that TE has quoted. Australia is also a major global producer of cotton, but not organic cotton. Promotional body Cotton Australia has said: "It has been proven to be uneconomical to grow organic cotton in Australia." Nevertheless, The Great Green Washing Machine describes Australian cotton farmers as employing "arguably the world's most environmentally friendly and efficient production methods" and



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this tallies with Cotton Australia's presentation of the fibres that its 1,200 cotton-farming families produce in New South Wales, Queensland, Western Australia and Victoria as "carefully grown and naturally the world's best".

In terms of water consumption, for example, The Great Green Washing Machine says only one lifecycle assessment (LCA), a study that Sphera carried out in 2018 for the Laudes Foundation, has examined the issue in detail, comparing figures for organic cotton, conventional cotton and cotton that meets the requirements of BCI's 'Better Cotton'. The study concluded that organic cotton consumed 10% more water per tonne of seed cotton than conventional production. And of the three types of cotton analysed, conventional cotton had the lowest consumption of blue water, that is water from surface or groundwater sources.

The report takes clothing brands Norrøna and H&M to task for posting statements on their websites saying that they favour organic cotton in their collections on the basis that organic cotton uses almost 90% less water than conventional cotton. Expressing no surprise, it says the source of this information is the Higg MSI.

Deep dive

In concern number six, the report digs more deeply into existing sustainability studies. LCAs are, perhaps, the best known of these. It is less common to draw a distinction in reports from brands, campaign groups and other organisations between attributional LCAs and consequential LCAs, but that is what the report's authors do here.

Attributional LCAs measure the average impact of the production concerned. All current sustainability claims in the textile and apparel sector are based on comparing attributional LCAs, the report says. In contrast, consequential LCAs also take into account the effect that falling demand for a fibre or material would have on producers, asking what the impact might be if they turn to production of other, more in-demand fabrics instead. This would give a much clearer picture of what the net impacts of fibre swapping are likely to be, the authors say, before adding that they can find no evidence of the existence of any consequential LCAs in sustainable fashion.

They give this example. If consumers are persuaded to scorn conventional cotton and turn to garments made from viscose or polyester instead, demand for cotton will go down, prices will drop and farmers will suffer, especially in regions such as sub-Saharan Africa. In parallel, demand for the synthetic fibres will go up, leading, they say, to an increased threat of deforestation and the loss of biodiversity from viscose production and increased carbon emissions from polyester.

Polyester problems

This leads neatly to the seventh and last of the concerns on the authors' list: the overlooked impacts of polyester and microfibres.

Prices are particularly volatile in spring 2022, but on publishing the second white paper in March, the authors said that, at existing levels of demand, cotton was double the price of polyester, while silk costs 67 times more. Without cheap polyester, they insist, the fast fashion phenomenon would have died before it took off. The over-production and over-consumption of garments that have arisen from fast fashion have led to the mass dumping of unwanted clothes. "The industry is not surprisingly, unwilling to acknowledge, let alone address, potential problems with polyester production and consumption," the authors claim.



Polyester fibre. The Great Green Washing Machine Report says that, without cheap polyester, the fast fashion phenomenon could not have happened.

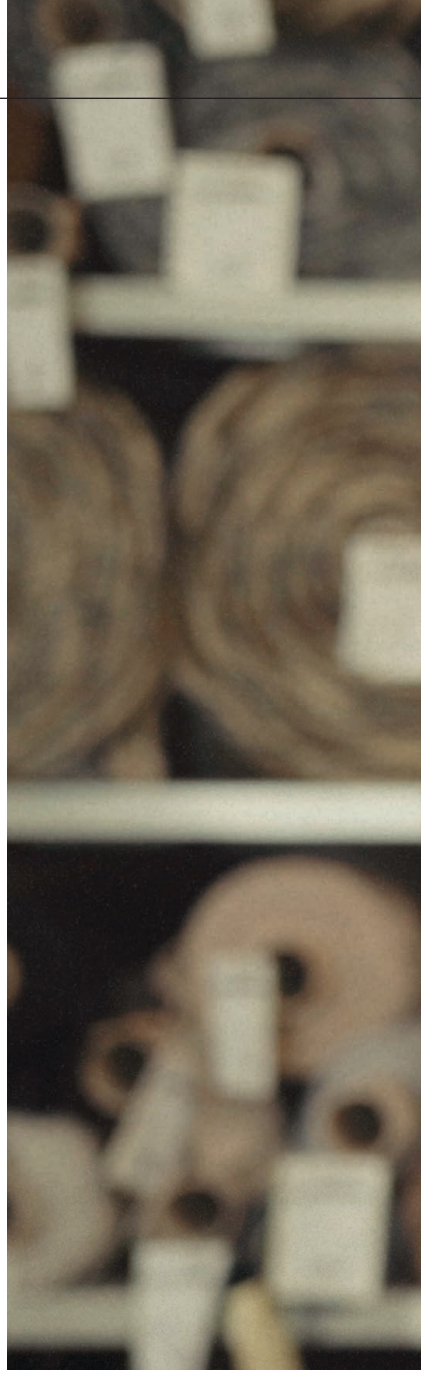
CREDIT: SHUTTERSTOCK

They point out that current sustainability reporting is "artificially favourable" to polyester on its environmental impact. Fibre-to-fibre polyester recycling is nearer the beginning than the end of its sustainability journey and clothes made from polyester do not degrade in the environment. Finally, they bemoan the lack of a global LCA for polyester.

Other details they flag up include the pervasiveness and harmfulness of microfibres from these fibres and the toxicity of antimony, which, in around 90% of cases, is used as a catalyst in polyester production around the world.

Virgin polyester is too cheap for there to be any real economic incentive to research and fund textile-to-textile recycling, the authors say, adding that, before "recommending recycled fibre as the solution to every problem", the apparel industry needs to evaluate the quality and durability of the fabrics it can make from those fibres.

Brands have a long way to go, they conclude. At present, companies can make sustainability claims based on what they call "pay for play, paper-based certifications, and using unsubstantiated generic averages". These are all, potentially, "seriously misleading". What will make the situation better will be for the public sector to step in. Rules should come into force demanding that accurate data accompany environmental claims and if brands need to fund studies that the authorities can accept as independent, so be it. The current system needs to change.



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>
> JINRO NOMURA, PONTETORTO

Proud heritage

Specialist fabric manufacturer Pontetorto is celebrating its seventieth anniversary this year. The Prato-based company had a long-established reputation in the fashion industry when, in 1985, it became the first mill in Europe to produce fleece fabrics for outdoor brands. From this, it has developed a division of the business devoted to sports. Japanese textile group Daidoh acquired Pontetorto from the founding family in 2016 and Jinro Nomura moved to Italy to take up the role of chief executive.

What are the most important differences between Pontetorto in 2022 and the company that the Banci family launched 70 years ago?

One of the important differences is that the company has moved from being a family-run company to become a public company. I am a newcomer but my colleagues on the board of directors, commercial manager Roberto DeMatteis, and chief technician and research and development director, Marco Toccafondi, have each worked in the company for more than 20 years. We have not changed things since the Banci family handed over the running of Pontetorto to Daidoh in 2016 and I do not have any concerns about the management of the company. We are grateful to all the clients, partners and employees who have supported the company throughout these 70 years. We are proud of having such an excellent heritage. We do not know exactly what the scenario was in 1952, but probably, just after World War II, the founders had a great entrepreneurial spirit, and I believe that spirit is still alive inside the company and in the hearts of our colleagues and employees. We spend almost all of our time, inside or outside the company, with colleagues. This means the company is like home and the people in the company are just like family.

DIALOGUE

Jinro Nomura, chief executive of Pontetorto

A number of companies involved in developing sports and outdoor clothing have spoken of this part of the apparel industry coming through the years of the pandemic relatively well because, for example, people who had been confined to their homes for long weeks and months wanted to walk or run a bit more than before when they were able to go out. In what ways did this phenomenon affect demand for Pontetorto fabrics?

This is a paradigm shift in people's lifestyles, caused by the pandemic. Yes, it has affected our sports lines very positively. We have worked very well with outdoor and sports brands. It's a trend that began in the last year or so and we think it will be strong for years to come.



Chief executive of Pontetorto, Jinro Nomura.

CREDIT: PONTETORTO

Linked to this, we know that some producers of fabrics with a high level of technical performance have become concerned about suggestions that many outdoor clothing products have been over-specified for most consumers. Are highly technical fabrics worth using in the garments ordinary consumers wear to play with their children in the park or take their dogs for a walk?

We have technical fabrics and we work with athleisure brands that make products for people to wear in their free time and at weekends. The main characteristic of our textile products is comfort and that is why they can meet any demand or any use. We have to have a two-way approach to this. If the technical properties we apply to fabrics represent danger in any way, we limit the technology's use as much as possible, but there are some very high-tech performance properties that we can add just to increase comfort. People do not perceive the technology, they only perceive comfort. That is our target, to keep the technology simple enough for it to work in normal-use applications.

You have said in recent comments that one of the reasons Daidoh decided to invest in Pontetorto in 2016 was because of its strong commitment to research and innovation. Why does this commitment remain important to you today?

Daidoh has consistently prioritised the customer in pursuit of quality, since its foundation in 1879. Pontetorto had and still has a similar policy. We want to enrich the quality of people's lives through the products and services we supply to our clients. It should be indispensable to be sensitive to new technologies and standards and bring them into our research and innovation in order to improve quality. I feel that this is important, not only in terms of the material or physical aspects such as design, colour and feel, but important in terms of how we spend our time of every day; I mean life itself. Daidoh chose Pontetorto because it offered creativity supported by a strong technological background. In Italy there are many creative companies, but they are not always supported by a high level of technical competence. We try to combine the two and so far it is proving to be effective.



Pontetorto's sports division noted a positive effect as interest in running and walking increased during the covid-19 pandemic.

CREDIT: PONTETORTO

We have seen several references to Pontetorto's desire to bring young people into the company and train them to be a new generation of technical textile innovators. Please explain why this is important and tell us how you will achieve it.

The company must continue, and young people who have fresh and flexible ideas should start to work with experienced colleagues in order to learn from their experiences, develop the same spirit of craftsmanship and a little of their sense of entrepreneurship. We are in contact with several schools to help us find this new talent. We like to have a mix of people; an inter-generational approach is part of our vision.

Which of Pontetorto's products is the most sustainable?

We have so many sustainable products it is difficult to say which is the best one. We can talk about sustainable products, of course, biofibres, special constructions and so on, but what is really sustainable is more than a single item. It's about the concept behind our manufacturing. We follow specifications in chemical use, energy use, discharge and so on and we are pursuing a circular approach. One of the most sustainable approaches is to produce fabric of good quality that will have a long lifespan. If you can supply a product that will last 40 years, it's definitely a product that is more sustainable than a product that will go to waste in three months.

If the global clothing industry consumes more than 40 million tonnes of fibre each year, it seems likely that options such as organic cotton, merino wool or recycled synthetic fibres will continue to account for only a small proportion of the total for years to come. What would you do to make change happen faster?

> **"Our target is to keep the technology simple enough for it to work in normal-use applications."**

We have already started some circular-economy trials with our customers, for example by making fabric cuttings that previously went to waste into parts of garments. To make change faster at a global level, there needs to be some public, governmental structure to connect consumers, brands, suppliers and government agencies, I think. We are part of the Associazione Tessile Riciclato Italiana (ASTRI), the Italian association of recycled textiles. Through this framework, we have access to research on how to recycle textiles and new ways of recycling are emerging from this. We believe that you cannot work alone, that you have to have a network involving customers and suppliers. Then there is European legislation coming in 2025 that will help encourage recycling, for example by imposing taxes on virgin materials. This will be a real step forward. A lot of brands are becoming aware of this now and are asking for our co-operation in creating circular-economy projects, with more and more material being recycled and reducing the huge amount going to waste now. There is progress, even if it is slow. We are optimistic that the 2025 legislation will help this become a reality.

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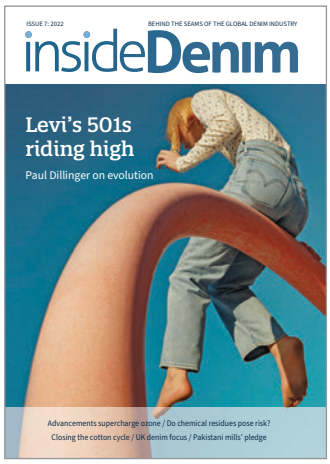
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