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BEHIND THE SEAMS OF THE GLOBAL DENIM INDUSTRY

insideDenim

Time for a step change

The promise of print / Innovation on show at ITMA / Kontoor's circular mindset

BluConnection / Halit Gümüser

Contents

Cover Carhartt WIP's denim collection editorial for FW 2023 was shot in Berlin by Julien Barbès.

PHOTO: JULIEN BARBÈS FOR CARHARTT WIP

DENIM IN-DEPTH

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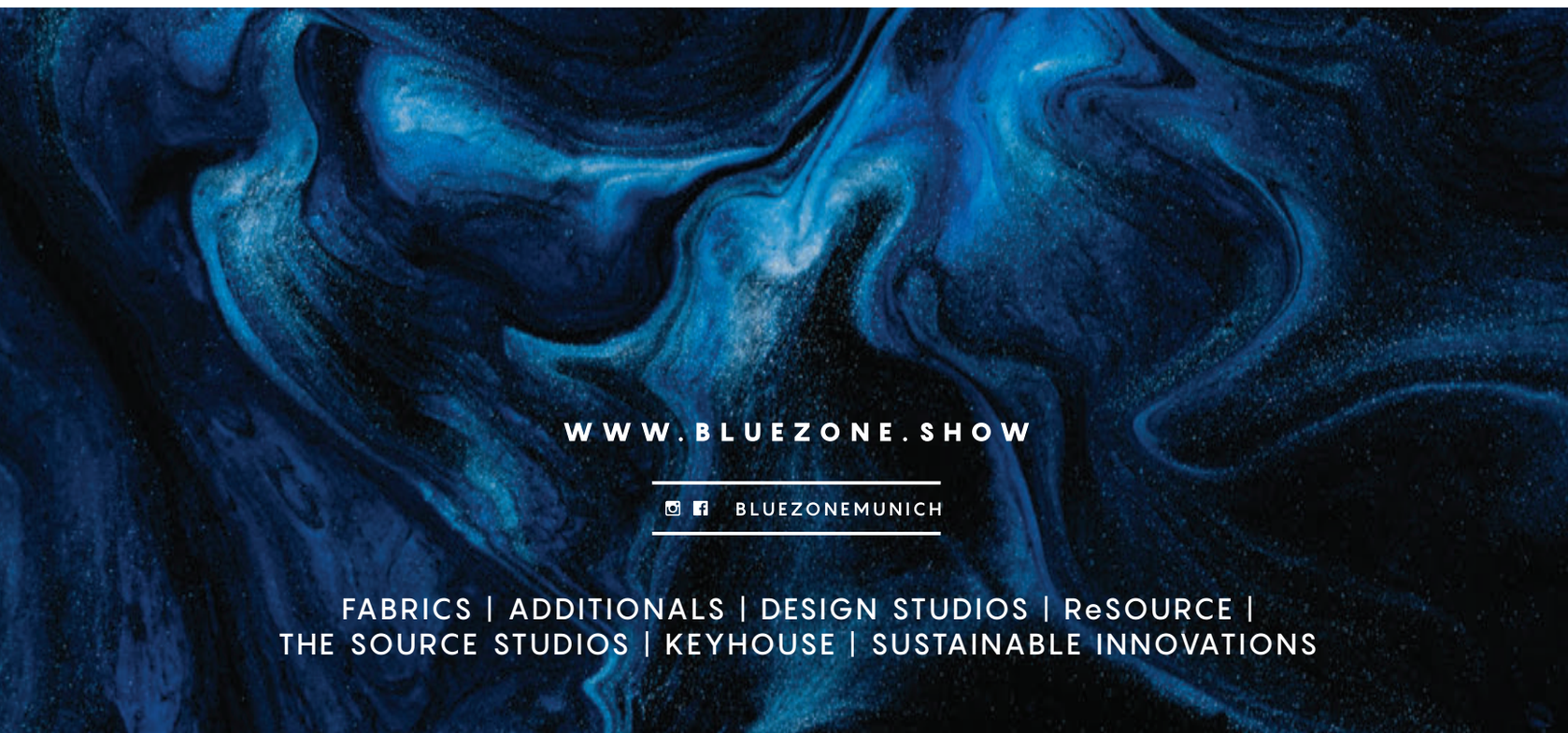

Changing mindsets

Talk is easy. It is the doing, or the walking, as the saying goes, that is not so easy. As several of the industry insiders we interview in this issue stress, if we really want to change our ways, we need to change our mindset.

It is the key point that this issue's Guest Comment, Dr Sarif Patwary, senior sustainability analyst at Kontoor Brands, makes in his overview of the sustainability measures the group is taking to reduce its water consumption, greenhouse gas emissions and to set up a more circular business model. Alexander Bock, who walks us through the new BluConnection factory, insists that it is neither difficult nor costly to shift to cleaner production methods, but more a matter of altering mindsets. This will then lead to the effort needed to instigate change, he says.

True progress can only be made if the industry collaborates more closely, says Halit Gümüser in this issue's Dialogue. He practises what he preaches, having worked closely with Säntis and two other companies to fine-tune the inner workings of the RCO100, a cotton recycling and spinning technology officially presented at ITMA. Our Jean Genie for this issue, Wojciech Beyger, similarly applauds the chemicals suppliers that work hand in hand with machinery makers to develop products that achieve their full benefits and potential when perfectly aligned with specific equipment.

New technologies are a major part of this edition, many were on display at ITMA 2023, and many denim industry managers made the trip to Milan. Tonello introduced its new ultrasound garment washing machine, the result of a partnership with Sonovia. NTX showed off the first samples of printed denims featuring all desired fadings in one go, a process co-developed with Stella Blu. Soko presented a new Hydrogel finish, the result of a complete rethink of finishing processes, says Luca Braschi. Jeanologia's booth featured a device designed to remove microfibre fluff from garments before they are put up for sale, made possible by support from Inditex.

We also highlight how technology is being harnessed in new ways, using satellites and infrared sensors to better monitor organic cotton farming, and possibly expand its production by identifying plots of land suited to this type of crop. Fully automated denim fabric production is something that Kaihara Denim, in Japan, has intriguingly adopted, as Tilmann Wröbel tells us in his regular *Inside Denim* feature. Also hailing from Japan, Spiber's Brewed Protein is now weaving its way into denim, introducing a new regenerative solution, in addition to one of the world's few biotech fibres.

All these new solutions seek to improve upon conventional practices, and all they need, basically, is a genuine commitment to invest and support the transition to more sustainable processes from the brands and retailers that rule over the market. They monitor their efforts in ESG reports, admittedly, but these are often just talk – with goals set in a more or less distant future – and rarely include actions that concern companies operating in the depths of their tiers 3 or 4 suppliers. These (shouldn't they be called partners?), have a fundamental role to play in making the denim industry ecosystem more sustainable.

The creation of a sustainable ecosystem in which companies work together in a non-competitive mode was one of the buzzwords of ITMA 2023. This could be the new mindset that is needed for the denim industry to make a bigger dent in its environmental impact.

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"A mindset shift is crucial, an alternative model is imperative"

GUEST COMMENT

As senior sustainability analyst at Kontoor Brands since 2022, **Dr Sarif Patwary** develops evidence-based recommendations for improving sustainability for the group's two iconic consumer brands: Wrangler and Lee.

The fashion industry's take-make-waste model, fuelled by resource extraction and disposal, wreaks havoc on our environment. Production of synthetic textiles alone depletes 98 million tonnes of non-renewable resources annually, while skyrocketing greenhouse gas emissions outpace two millennia of human history. Every second, we send one garbage truck filled with unwanted clothing to landfills or incinerators.

Upon deeper reflection, it's clear that a mindset shift is crucial, and an alternative model is imperative. The emerging circular business model provides this transformation. Rooted in the belief that nature generates no waste, it operates through closed-loop systems, involving biological (renewable) and technical (man-made) cycles. The technical cycle maintains product and material circulation via reuse, repair, remanufacture, and recycling, while the biological cycle returns nutrients from biodegradable materials to regenerate the Earth.

At Kontoor, circularity starts early in the design phase, aligned with our Global Design Standards. Guided by these standards, we focus on reducing energy consumption and emissions in manufacturing, where over 90% of our impact occurs. For instance, an analysis by consultancy Quantis shows that replacing 50% of our ring spun volume with an open-end process could potentially cut 6% of scope 3 emissions. Additionally, we are committed to powering all owned Kontoor facilities with renewable electricity by 2025, reinforcing our commitment to sustainability.

In line with Kontoor's circular material innovation, Wrangler collaborated with Infinited Fiber Company, based in Finland, and Spanish textile mill Tejidos Royo to develop a denim fabric made from a chemically recycled fibre combined with an eco-friendly Indigood foam dyeing method for yarn dyeing, reducing toxic chemical usage. Launched in 2021, the Infinited Blue FW21 collection featuring Infinna, Wrangler's Indigood, and e-flow earned recognition in Fast Company's 2021 Design Innovation Awards. Likewise, YKK and Wrangler and Lee started a brass (from zipper) recycling initiative in 2008. Since its inception, the programme has recycled 1.5 million pounds of brass scrap. Based on an average brass alloy of 67% copper and 33% zinc, the brass scrap equates to 2,793 tonnes of CO_2 saved from mining and processing of raw materials[1].

Kontoor's water-saving goal, to save 10 billion litres by 2025 compared to a 2008 baseline, was achieved three years early, thanks to tremendous efforts made through the Indigood programme. It encourages water reduction and recycling in denim production and earned accolades like the 2022 SEAL Award and 2023 Edison Awards second place.

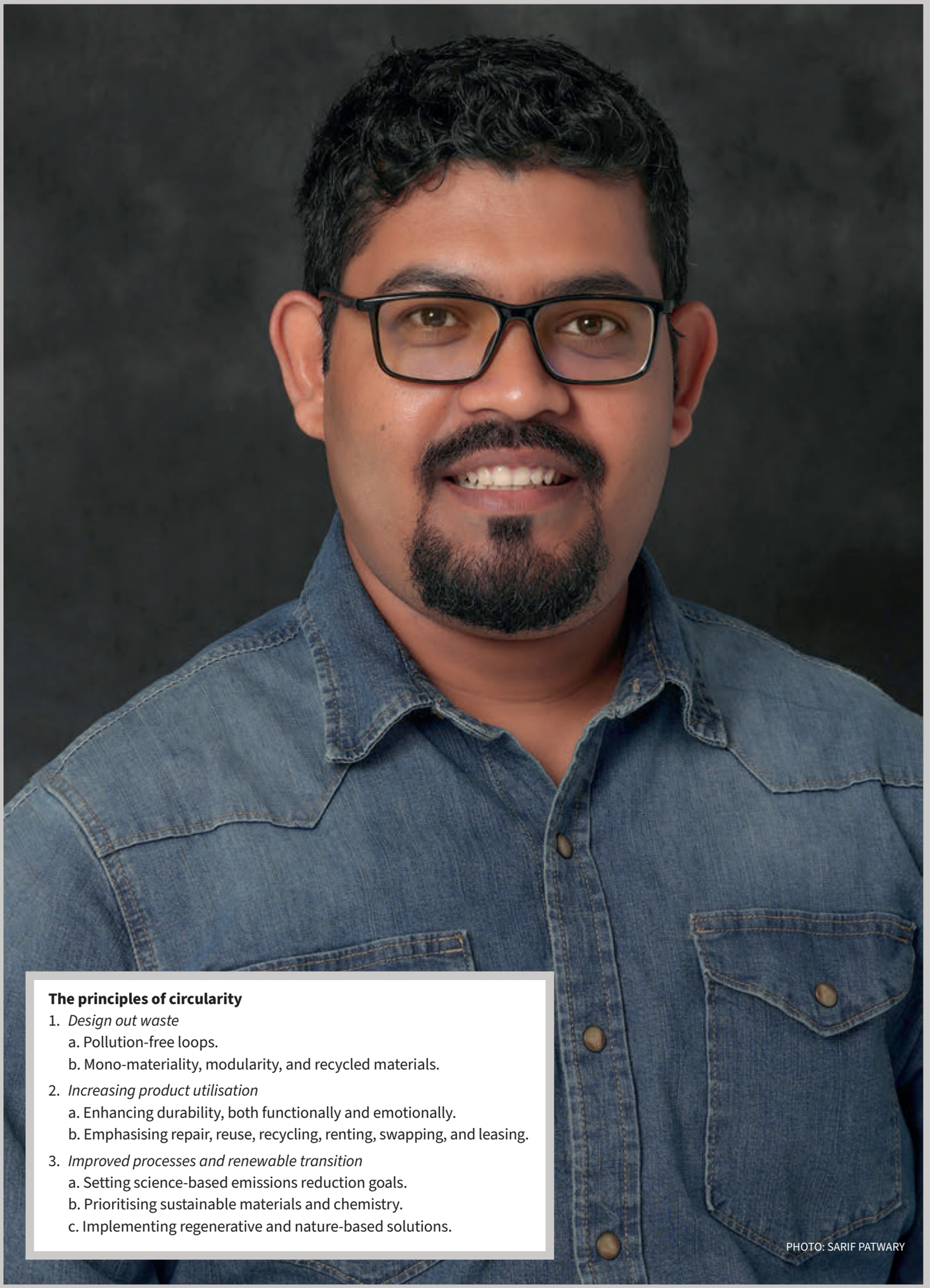
Kontoor partnered with Ellen MacArthur Foundation's Jeans Redesign initiative and the Cradle to Cradle (C2C) Product Innovation Institute. In 2021, the Lee Aureola jeans achieved C2C Gold certification and Nymph styles are C2C Bronze, in a partnership with Pakistan-based Artistic Milliners. Kontoor has also set up consumer resale initiatives such as Wrangler Reborn and Lee Archives. We are currently examining the possibility of upcycling fabric scraps from old denim to create new products.

Building upon these innovations and targets, Kontoor commits to reduce absolute scope 1 and 2 GHG emissions by 46.2% by 2030 from a 2019 base year. It also seeks to reduce absolute scope 3 GHG emissions from purchased goods and services, fuel and energy related activities, upstream transportation and distribution, and downstream transportation and distribution by 46.2% within the same timeframe. These targets are in line with a 1.5°C climate trajectory and validated by Science Based Targets Initiatives (SBTi).

While the circular fashion model embodies sustainability ideals, its full realisation remains a work in progress. The urgency of our time demands swift and concerted action to reduce greenhouse gas emissions by half before 2030, a goal that hinges on comprehensive engagement with the circularity principles outlined above. As the fashion industry evolves and critical technologies become more available, a systemic transition to circularity holds the potential to rejuvenate the industry. We must act together, and we must act now to address these pressing issues and pave the way for a more sustainable future.

Reference:

1. *IEA (2021), The Role of Critical Minerals in Clean Energy Transitions, IEA, Paris https://www.iea.org/reports/the-role-of-critical-minerals-in-clean-energy-transitions, License: CC BY 4.0*



The principles of circularity

1. *Design out waste*
   a. Pollution-free loops.
   b. Mono-materiality, modularity, and recycled materials.
2. *Increasing product utilisation*
   a. Enhancing durability, both functionally and emotionally.
   b. Emphasising repair, reuse, recycling, renting, swapping, and leasing.
3. *Improved processes and renewable transition*
   a. Setting science-based emissions reduction goals.
   b. Prioritising sustainable materials and chemistry.
   c. Implementing regenerative and nature-based solutions.

PHOTO: SARIF PATWARY

Industry News

Mud and HMS to enlighten consumers on washing

PHOTO: MUD/HMS

HMS Stone-maker Baytech has launched a lighter version of its pumice alternative and plans to launch a consumer-focused marketing campaign with Dutch brand Mud Jeans.

The Turkish company uses upcycled pumice dust bound by a ZDHC-certified (Zero Discharge of Hazardous Chemicals) organic binder for its stones. The result is a 50 times more durable, hydrophobic stone that lasts up to 100 washes, according to the company, and eliminates the sludge byproduct associated with pumice.

"One of our most sought-after services is the customisation of our HMS," Beyza Beykan, managing director at Baytech, tells *Inside Denim*. "We deal with the compatibility of our stones with our customers' specific fabrics so they don't have to. Ever since the start, we have created different sizes, shapes and colours to adjust to our customers' needs."

However, the increase in recycled fabrics and blends meant they wanted to offer a dedicated product tailored to more delicate material. HMS Light is a lower-density version of HMS Original, launched after a year of research and development. "This product works wonders on sensitive/recycled/thinner fabrics. While Original is better and more effective for rigid, thicker garments, we have seen HMS Light perform better and faster when used on thinner ones," adds Ms Beykan.

Mud Jeans is the latest to switch to HMS Stone for its washing, after it was introduced through its supplier Yousstex International, a Tunisia-based manufacturer. The two companies discovered "shared values of transparency, circularity and innovation" and plan to launch a joint marketing campaign this autumn.

A spokesperson for Mud explained the campaign will run over its social media channels, in a dedicated newsletter and other press. "We have to be very careful as, for the end consumer, washing is something they do to clean their jeans – we will have to explain what it means in the industrial sense," she said. "But overall, it is important to share all the details in creating jeans; improving them to create a better planet."

Archroma claims cleaner dyes can 'rewrite' black denim

Spanish textiles maker Textil Santanderina has launched an Advanced Black denim collection in collaboration with Archroma, using the chemical company's new Diresul Evolution Black Liq dyestuff.

The dyestuff "delivers an overall impact reduction to 57%, measuring its effect on human health, ecosystems and resources", compared with standard Sulfur Black 1 liquid, according to Archroma.

Unlike traditional synthesis processes, it does not produce any ammonia, sodium salts waste or liquid effluents, and water consumption in the synthesis process is reduced by 73%, it added.

Bluesign unveils denims scheme

Madewell has become the first US denim company to become a Bluesign System Partner brand as the assessment body launches a denim-focused initiative. Bluesign Denim represents a commitment to minimising the industry's impact through eliminating harmful chemicals and ensuring sustainable manufacturing processes, it said. The concept covers fabric and garment production steps that meet Bluesign criteria. Madewell's collaboration with Bluesign launched in October last year and the first denim style under the partnership was crafted using ISKO fabrics.

New owners for G-Star

Following its acquisition of Bonobos in May, Brand management firm WHP Global has bought a majority stake in G-Star Raw. CEO Rob Schilder said G-Star had become "an online first company" and that the investment would help strengthen its presence in the US and tap into new geographies and new product categories.

Sustainability success for Dystar

Singapore-based chemicals manufacturer DyStar has reduced greenhouse gas emissions intensity by 45% compared with a baseline year of 2011, including a 9% reduction during 2022. The figures were included in its new Sustainability Report, in which it also shows a 52% reduction in wastewater production intensity, and a 24% reduction from 2021. In 2022, its top purchased raw materials included indigo granules and its intermediates.

Azgard9's gel-dyeing technique

Lahore-based denim supplier Azgard9 has debuted a "revolutionary" gel dye process that requires "zero" water and no temperature adjustments, according to the company. Traverse falls under its 9.0 Green Laundry umbrella, introduced last November. The team also expanded on the concept with Fraction, which it calls an "exacting methodology" for assessing both garment care and ecological impact.

Montega updates offerings

Textile finishing effects developer Montega Chemical Solutions has updated its signature products, including Croco Surface, which enables a special cracked surface on garments. The Italian company developed a special binder that also allows the finish to be combined with its Montedel Natural Dye range.

The new dyestuff, when adopted with the full Archroma coloration system, delivers a black colour with on-tone wash-down effect and cleaner effluent at the mill.

Sulfur dyes are the most commonly used dyes for coloured denim, but some are being phased out due to the toxicity of the dyeing process and wastewater contamination.

Umberto De Vita, a director of denim at Archroma, said: "For more than a century, the traditional Sulfur Black 1 synthesis process consumed substantial water and energy resources and produced unwanted effluents and residues. With the Diresul Evolution Black Liq, Archroma is rewriting the future of denim for market leaders like Textil Santanderina that want to produce more sustainable collections with high-value aesthetics and top fabric quality."

The new product is manufactured in Spain at a production facility near Barcelona, where Archroma produces sulfur dyestuffs for mills and brands in Europe and global markets.

Goldschmied's relaunch includes Rajby partnership

Adriano Goldschmied, known as the "Godfather of Denim," has relaunched his company, House of Gold, with new partner Filippo Donati, and together they struck an agreement with Rajby Textiles to be the Pakistan denim mill's US sales agency.

House of Gold will operate as an independent entity, led by Donati and Goldschmied. The company's mission is to bring business to the US market focused on innovation, technology and circular sustainability.

Goldschmied has been an integral figure in the denim industry for 50 years, working with brands such as Hugo Boss, Tom Ford, Chloe, Edwin, Sixty and OVS.

He recently relaunched Daily Blue, a fashion-focused denim brand he first introduced in 1974, about which he told *Inside Denim* earlier this year.

Donati is the founder of Dona Trading, which specialises in elevated fabric sourcing and development from Italian mills such as Eurojersey and Lanificio Cangioli. The company, established in 1998, is based in New York with a showroom in Los Angeles.

The denim mill's commitment to sustainability, including its Cradle-to Cradle certifications, impressed Donati and Goldschmied, who plan to collaborate on the strategic direction of products, marketing and customer communication.

"The denim industry has changed over the course of my career and evolved into one that is cleaner, safer and more responsible than when I started," Mr Goldschmied said. "Our business' future is circular and it was important for me to partner with a company that is as much an advocate for sustainability as I am. I look forward to showing the denim community what Rajby Textiles is working on."

At the beginning of the year, Rajby Textiles split from garment manufacturer Rajby Industries to become an independent denim mill, with its own in-house weaving, dyeing and finishing capabilities. With a capacity of 3.2 million metres per month, Rajby Textiles employs nearly 1,500 people in the company's facility in Karachi, which houses state-of-the-art machinery from companies such as Picanol, Karl Mayer, HTP, Mahlo, Efi and Monforts.

"Adriano and I share a love of premium fabrics," Donati says. "We were both impressed by the quality of the denim produced by Rajby and are enthusiastic to introduce the mill to the US market."

Candiani launches premium brand anchored by Coreva

Italian mill Candiani Denim has launched a consumer brand anchored around Coreva, its biodegradable denim, the world's first using a natural rubber for stretch.

Coreva Design launched during Milan Fashion Week, and will offer four capsule collections, including denim, leisure and ready-to-wear.

The use of natural rubber instead of synthetic stretch fibres means Coreva degrades in less than four months in the right conditions at end of life, instead of 200 or more years, according to the company.

Candiani president Alberto Candiani said: "The time has come for Coreva technology to definitively transform itself into a brand to demonstrate the possibility of a complete and scalable circularity. This is how the Coreva Design brand was born, where the word 'design' is added to describe the process behind the creation of a durable and quality product, designed to respond to the problem of its own 'end of life'." He added that the garments can be recycled or even eventually potentially used as compost.

From this month, a selection of garments can be previewed at Italian retailer Banner, Candiani Denim Store in Milan and corevadesign.com. The collections will then be available at select retailers globally.

Cooltrans, an engineered printing technology developed by NTX, has been adapted to apply ultra-high definition patterns on cotton and cotton blend grounds. These will then go from printer to automated laser cutting, and to sewing.

PHOTO: NTX / STELLA BLU

The fine print

Open up a pair of good-looking vintage jeans. Lay flat. Scan. Transfer the file to the printer. Press go. Laser cut. Sew. Done. This is the promise of digital age jeans fully printed with authentic-looking fading. No laundering, no need for an indigo warp-dyed fabric. It could be a game-changing technology for 'deepfake' jeans.

The digital printing of textiles has been a break-through technology. Offering on-demand flexibility, a high level of process automation, and releasing no discharge, it is considered efficient, economical and eco-responsible. It is not the only new digital tool the industry now uses widely, 3D fashion design software and laser machines have also profoundly changed how products are conceived and manufactured in today's modern Industry 4.0 factories. It was arguably just a matter of time before the denim industry took a look at the possibility of printing its jeans.

Singapore-based NTX introduced one such solution at ITMA this June in its patented Cooltrans 'textile colouration' technology. It developed the process with Stella Blu, a division of China-based Prosperity Textiles, and the two companies have now formed a joint-venture. They believe they have a solution that reproduces strikingly authentic-looking fading on jeans, front and back, in a single pass. Cooltrans, as Jeffrey Hsu, chief innovation and marketing officer, describes it, "is a ridiculously precise colour-dosing technology." Extreme precision is what he sees as one of the technology's differentiation points. "Our application precision can go up to 3200 dpi," he says of the on-demand, fully digital, AI-driven process that uses standard dyes and is discharge free.

First developed for manmade cellulosic and synthetic fabrics, Cooltrans can now print on cotton grounds. The technology developed by NTX is said to be neither inkjet, nor sublimation, nor screen printing, but rather a modified transfer print. Mr Hsu tells *Inside Denim* that the face of the fabric is printed using a transfer film and the back is a direct to fabric print. It removes the need for conventional wet processing in denim fabric manufacturing and garment laundering and finishing, making it a waterless and low energy solution.

"We are just starting on the journey to printed denims," says Marco Stefanelli, head of marketing and business development for Stella Blu. "We are quite positive, but this is not traditional denim, it is an addition to the world of denim. This is a product that an eco-aware consumer will appreciate for its savings in water, chemicals and energy." He also sees it as a game-changer for product development and lead times. "It usually takes 60 to 120 days to go from idea to finished product. This system brings these down to 60 days. It makes the traditional methods of obtaining aged effects obsolete." He notes that it does not rule out all rinsing and washing, which may be needed to achieve the right hand feel. Among its many promises, Mr Hsu adds that "it can reduce MOQs to a single piece."

NTX has also taken an innovative approach to the commercialisation of Cooltrans. "In our business model, we don't sell the machines, but rather partner with companies by creating a joint venture in which NTX is the majority shareholder," says Mr Hsu. The company has already formed six such joint ventures, including one with Stella Blu who is now a system partner for the production of denim, piece-dye and pattern prints on cotton and cotton blend fabrics. The jointly owned enterprises then become part of a same network or ecosystem. They all work together, share information on processing, debugging, and can even allocate machine time to each other if needed, he says.

Companies specialising in denim have been investigating the technology for years, as has Gonser Group, based in Tunisia, with headquarters in Germany. Originally a denim laundry, it has evolved to become a vertically integrated denim and jeans manufacturer. The development of its patented Mimikry technology is now up and running at its Gonser Denim Revolution facility, in Tunisia. "Mimikry has been made possible by the evolution of digital printing machines, which no longer create a plastic hand feel, and by the high quality and resolution of our library of effects," says Alvise Alcaro, the company's head of communication and development. He insists on the extreme sustainability of the process, which uses GOTS-approved water-based inks, as it eliminates "hours of finishing and laundering stages".

With Mimikry, its patented digital printing process, vertically integrated denim producer Gonser Group seeks to offer radically more sustainable jeans.
PHOTOS: GONSER GROUP

In development for several years, Mr Alcaro says the company has made significant progress in improving the technology, thanks in part to the creation of a dedicated department covering all processes, from file design and pattern-making to printing. Technical details have also been ironed out. "By tweaking various parameters, such as pre-treatment, colour profiles and ink drops dimension, we are now able to obtain the best rendition on different fabrics," he says.

Manufacturers of digital printers are also looking to develop solutions for the denim industry. Headquartered in Israel, Kornit Digital specialises in printing systems for the fashion and textile industry. Its technologies can print on any ground, from cotton to silk and to leather, and on fabrics that have raised textures, such as denim, with a wide array of possibilities including three-dimensional embroidery-like motifs. The company makes machines that can print a roll of fabric or a finished garment, and they can also be used to print markings or fadings in resolutions that can go up to 1,200 dpi. For more authentic looks, Dafna Ratzon, marketing manager, says that a white printing technology was recently introduced. "We know we can print a worn-in denim look and achieve a great hand feel that perfectly emulates true jeans," she tells *Inside Denim*. The company is in talks with brands, she says, and testing various options to reach the best results.

Global digital printing expert Kornit Digital is expanding from the possibility of printing motifs to patterns that emulate actual jeans.
PHOTOS: KORNIT DIGITAL

Testing, testing, testing

Turkey-based Ereks Blue Matters has indepth experience with a similar technology based on lasering fadings on a denim fabric before sewing (see *Inside Denim* issue 9). As part of its dedication to sustainable, on-demand, no waste manufacturing, the company is currently curious about the possibility of printing jeans. "Printing can be a very sustainable solution as it saves water, chemicals and energy in fabric production and in industrial laundry processes," says board member and partner Romain Narcy. But especially, "it opens the door to customised jeans production similar to what we are already doing with our Digital Denim Production process using lasering technology from Seilaser."

In the samples Mr Narcy has seen, he says that "washing effects look good" but he was less impressed by the hand feel. He also wonders how the jeans will fade after home washing. "We will have to test and assess how they react to domestic laundering," he says. While he believes that printing may help reduce lead times and be suitable for on-demand manufacturing, "we have yet to see what the capacity of this technology is and if it can replace bulk production or is more adapted to smaller batches."

The devil is in the details

Denim consultant Rowan Hunt has been keeping a close eye on the technology for years, and says that he has seen products that, from afar, can look very good. But he notes that emulating indigo using printing cannot be an easy task. "The more dye you apply, the more difficult to achieve varying shades of blue," he tells *Inside Denim*. "What makes indigo special is that the blue will shimmer with a red or a green cast. I'm not sure you can get that even with the most sophisticated printer." Fading is another issue where printed denims may fall short of the real thing. "True jeans wear down with wearing and washing, and as they do, they become more comfortable to wear and that's why we love them. If printed jeans do not wear down well, will people keep them for a long time?" On the plus side, he notes that it is very difficult to control fading in traditional laundry processes. The highly reproducible nature of digital printing could solve this problem. He also conjectures that it could be useful for fabrics made from Tencel, as they will not fade like cotton. "Printing could be a way to make jeans with Tencel look as if they had faded naturally."

NTX has partnered with Stella Blu, a division of Prosperity Textiles, to develop its novel high-tech process that can print front and back in a single pass.
PHOTOS: NTX / STELLA BLU

Achieving the aesthetics of a genuine pair of old and worn-in jeans, and reproducing indigo's tendency to fade into myriad shades of blue is one of the main challenges that digital printer makers face. At Gonser, Alvise Alcaro says that darker indigo tones are more difficult to mimic. "Indigo blue is really hard to print, but this is a limit that any printing technique will have. We have been able to obtain impressive results when recreating mid-heavy washes and these are also the most requested as they can be enriched with infinite details that, with a traditional wash, would require a specific fabric structure along with many laundry and manual stages," he says.

"Detail, detail, detail. The devil is always in the details," agrees Jeffrey Hsu, at NTX, when asked about the key challenges the Cooltrans technology faces in denim. "I would argue that what we showed at ITMA was ~95% there. We are now able to create more consistently the exact same [aesthetic] as denim." He adds that the results are, to the general mass, already indistinguishable from the real thing, even when told so, but the ultra diehard denim guru will notice that the jeans are printed. He says the company is working with brand designers to "hash out those final details".

While insisting that Kornit Digital's system can emulate everything, and reproduce blues in an infinite variety of shades, Dafna Ratzon admits that obtaining the effect of traditional bleached or hand scraped fadings that abrade indigo dye, is far from easy. "Our printers apply an ink to a fabric and it is not easy to achieve that same look and feel." The solution, she says, is to apply just the right amount of ink to get the right shade or colouring.

Is printing scalable?

The second key challenge that printing technologies must overcome is the critical matter of scale. At the current relatively small volumes NTX is producing, which are under 500 metres, there will be no problem, says Mr Hsu. "When we go to larger scales – above 100k metres, 500k metres, and to 1M metres – that is when those pesky details that are not visible or noticeable at small runs will begin to amplify." Given the company's experience in the sports and outdoor industry with full commercial production in excess of 1 million metres, he trusts that NTX's Cooltrans will in time reach a scale suitable for large denim brands. But, he notes, "it would be wishful thinking to assume we have a plug-and-play solution that generates zero problems." Even in conventional processes, he points out, "there are many, many problems that require careful attention and dialogue. What we offer is a technical scientific solution, not magic." This, he insists, requires open, clear and honest communication.

In potential water, chemicals and energy savings, printing is beyond question a more sustainable solution. For Mr Hsu, water savings are in excess of 90%, as it rules out laundering, and brands may also be happy to see their carbon footprint lower by 66% at the very least, he says. Kornit estimates that its processes save up to 95% of water usage and 85% of energy compared to a full range of traditional jeans finishing processes. "Digital printing is a very sustainable solution. Our inks are GOTS, bluesign and Oekotex approved. Surveys show that young consumers give a lot of value to sustainability, which is a big driver of demand for these technologies," says Dafna Ratzon.

She adds that the Kornit's systems allow new opportunities for customisation and that they are designed to be easy to use. "This is a good technology to test the market (with 500 ex for instance), or to produce mid-season runs. It gives brands and retailers more flexibility. Our system can connect directly to an e-commerce site, and print only what is needed, thus reducing excess stock."

An innovative & creative tool

Digital printing syncs perfectly with the development of computer design software. "This is photographic denim, it is quite cool from a design point of view, and it makes sense to combine this technology with virtual design tools," says Rowan Hunt. Going from photo to 3D rendition to printing and sewing, a pair of jeans could be made in just a few hours, he speculates.

While all types of fadings can be reproduced, Gonser says the most convincing are the mid-heavy washes.
PHOTOS: GONSER GROUP

A nearly one-step process, printing no doubt makes it easier to offer customised designs and limited editions. "Mimikry can contribute to faster sampling but it can also help young designers develop their own products; ultimately it makes jeans making more democratic," says Mr Arcaro. "I see the adoption of digital printing as not necessarily driven by the aim to replace current washing but mainly as a new creative option. We never get tired of denim but we are always genuinely thrilled to see something new. A printed garment has no comparison in terms of reduced environmental impact, but what is most relevant is the infinite possibilities for unseen products."

For boutique denim labels, the technology could thus open new design possibilities and simplify the production of small runs. It is probably a long way from offering mass market brands a solution that can replace current practices (and the industry knows how hard it is to change these). It could, however, find its place in the market, with the creation of an entirely new product category. Something like deepfake jeans or jeans-like tops and bottoms with fadings and markings that a traditional laundry might not even be able to reproduce.

ITMA, the epitome of work in progress

Anticipation was high when industry shopping mecca ITMA opened its doors at Fiera Milano Rho this June. Visitors, numbering more than 100,000, flocked from all corners of the world looking for faster, smarter and more efficient equipment and supplies to power the next generations of denims and jeans.

Humming aisles, busy booths, lively discussions, the 1,717 exhibitors at the latest International Textile Machinery Association (ITMA) exhibition have good reason to be satisfied with this edition, the first one to take place after the pandemic. Shaping a more sustainable industry was the key message expressed by the machinery, fibre and chemicals suppliers that called Milan home for a full week. Italy, not unexpectedly, topped the podium both in the cohort of exhibitors (30%) and visitors (29%). The turnout was due in no small part to the efforts of Alex Zucchi, president of the Association of Italian Textile Machinery Manufacturers (ACIMIT), and to the creative engineering skills of the Italian textile and fashion industry. The country's green, white and red flag colours could be seen throughout the show's six huge halls, across booths, machines and displays of products proudly made in Italy. Germany came second in the exhibitor count, with 198 companies booking 15% of the floor space, followed by Turkey, with 191 exhibitors occupying 12% of the halls. Chinese (7%) and Indian (6%) companies also made a strong showing.

Held every four years, ITMA is the place where exhibitors showcase truly innovative machinery and processes. Suppliers to the denim industry came en masse to display their new devices and solutions for all stages of manufacturing, from spinning to finishing and from garment-making to recycling. A telling sign of the importance of denim, Candiani picked up ITMA's sustainable innovation award for the micro factory housed in its Milan boutique. This is the second time its commitment to innovation has been honoured by the textile industry show. In 2019, its circular denim Re-Gen concept, made from 50% Tencel x Refibra Lyocell and 50% post-industrial recycled cotton fibres, garnered an Industry Excellence Award.

Innovation in dyeing

Dyeing processes, a field of constant innovation, was prominently featured at the show. Italian technology provider Tonello proudly displayed a new ultrasound garment dyeing machine. The use of high frequency sound waves is emerging as a promising solution to dye yarns, fabrics, and even finished garments, as seen here, with the promise of reducing energy, dyestuff and chemicals usage. "This is an industry first, as ultrasound has never been applied in a washing machine," Alberto Lucchin, Tonello marketing and sustainability manager, tells *Inside Denim*. The Italian company partnered with Israel-based ultrasound specialist Sonovia to develop the new device. "Ultrasounds have many advantages: they increase the penetration of dyes which makes it possible to reduce chemicals and allows processing at lower temperatures," he says, adding that it also improves the light fastness of natural dyes, which the company offers in its Wake range. Tonello's new DyeMate technology was also prominently featured. This new garment-dyeing machine for vat, sulfur and indigo dyes does away with the need for hydrosulfite. "The reducing agent we use is nitrogen, and oxygen is pumped in to oxidise the dyestuff," explains Mr Lucchin.

Officina39, based in Biella, Italy, showcased a new version of its pigments made from recycled textiles, Recycrom Ready To Dye. Its palette of 15 colours is made from a minimum of 65% pre- and post-consumer textiles, and can be used to dye cotton, wool, nylon or any cellulosic and natural fibre or blend. "Recycrom Ready To Dye is available on stock and the pigments can be mixed to create any dark or bright shade. This makes it easier for brands to adopt the concept," says Andrea Venier, adding that "it will also help our clients increase the recycled content of their products."

Exhibiting in the new Start-up Valley section of the show, Colourizd, a company based in the United States and Hong Kong, featured its latest indigo warp dyeing device it is calling QuantumCOLOUR Denim Machine. Using the company's 'direct colour application method', it is said to deliver high consistency, reduce energy use by 50% and radically cut down water consumption (by 98%), to the point of generating zero effluent. The company has seen high interest for the technology, particularly from mills based in water stressed regions, such as Uzbekistan, whose president was part of a national delegation that made the trip to Milan.

Smarter chemicals & processes

The new product on show at Soko Chimica, a chemicals company based in Florence, Italy, claims to require less water than many so-called waterless processes. In development for the past two years, Hydrogel is the result of a complete rethink of finishing processes, Luca Braschi, denim laundry expert and consultant for Soko, tells *Inside Denim.* "Laundries usually look to optimise machinery, washing machine drums, replace chemicals, and so on, but no one is thinking to change the medium itself: water. In essence, we jellify water." The new concept, he adds, combines the fluidity of water with the viscosity of hydrogel to envelop the fibres and protect the yarns in a bubble of gel. "This completely changes the behaviour of both the water and the products added on. Now, for the first time, it is possible to use the same bath of water from raw to bleach. The result gives a balanced look, avoiding excess crack marks typical of standard waterless enzyme processes, and the flat look of conventional enzyme finishes, while saving a lot of water. That is the magic of the Hydrogel process," he says. Soko will be presenting another innovative and production-friendly process at the Kingpins show.

Sustainable processes were, as can be expected, a major focus of the new products and devices on display at ITMA 2023. Yilmak, a laundry machine maker based in Istanbul, has a long history of breaking new ground in the field and made the trip to Milan to introduce its latest machines that integrate a technology developed by British laundry equipment supplier Xeros. Yilmak has upgraded its EcoGreen range, which features a pumpless, and therefore energy-saving water circulation system, with Xeros' XDrum and XOrbs delivering-and-harvesting technology. The XOrb polymer beads are presented as an alternative to pumice stones. "XOrbs can be reused for 10 years, they last much longer than pumice, and are much safer for workers. They also reduce friction between garments which speeds up cleaning and reduces wear," says Xeros licensing director for commercial products Jamie Harrison. The patented technology fits well into our line-up, notes Yilmak general manager for sales and marketing Furkan Civelek, adding that the company is "always looking for bright ideas." Yilmak's Eco-friendly 2020 HNS tumbler dryers feature another instance of smart engineering: their energy-saving closed-circuit system is designed to keep steam in circulation while fresh air is added. "Instead of needing to heat water from 0 to 90°C, we only need to heat it from 40° to 90°C, which basically cuts steam use by half," says Mr Civelek.

Top: Italian denim processing machine maker Tonello displayed a lab-scale ultrasound garment-dyeing machine on its booth.
PHOTOS: WTP

Below: Recycrom Ready-to-Dye is the latest range of dyes to be developed by Officina39 from textile waste. It comes in a palette of 15 shades, ex-stock, and has a minimum recycled content of 65%, with the remainder being conventional dyestuffs.
PHOTOS: OFFICINA39

Higher quality recycled cotton

One highly anticipated new machine designed to optimise cotton recycling was on display at the booth of Temsan. The Turkey-based textile air conditioning equipment supplier revealed the latest version of a cotton recycling line co-developed with Säntis Textiles, a Swiss engineering company headquartered in Singapore, Turkish denim mill Kipas and Swinsol, a Swiss company that specialises in mechanical compact spinning processes. The new RCO100 recycling line, designed to convert pre- and post-consumer cotton into 100% recycled cotton yarns, is an evolution of an earlier machine first launched in 2016 with PVH and installed at Kipas in Kahramanmaraş. This first-generation line produces from 300 to 350 tonnes of recycled cotton bales per month. Addressing the challenge of obtaining high quality fibres from recycled content, the new and improved version is designed to shred and process waste as gently as possible so as to maintain maximum fibre length and strength. This is due in part to a system that recirculates unopened yarn and fabric material as many times as needed. This is said to be crucial to achieve the highest possible fibre lengths. The new machine, says Säntis, can process up to 450 tonnes per month, or some 10 to 12 tonnes daily.

New and improved mechanical recycling solutions were a key focus at the booths of spinning specialists Andritz, from Austria, and Trützschler and Rieter, based in Switzerland. Demand for yarns made from recycled content is high, but achieving decent yarn quality is a challenge that Rieter believes its new Com4recycling spinning system solves. It is said to enable customers to produce fine, high-quality ring and compact yarns from challenging raw material. This holds true even with a relatively high proportion of mechanically recycled cotton fibres, the company says. “We have focused on addressing the issue of shorter fibres that have a lot of neps after the shredding process,” Sathyanarayanan Subramanian, technology and process analytics manager for Rieter’s machines and systems business group, tells *Inside Denim*. In ring spun yarns, he says that recycled content can rarely go higher than 15-20% of a yarn. “Our technology can now handle 50% recycled content and maintain the performances of a non-recycled ring spun yarn.” A collaborative project between Polopiqué, Recover and Rieter was featured on the spinning machine maker’s booth.

Cotton waste can also be transformed into new fibres, as seen at Finnish company Infinited Fiber, one of the few fibre producers to exhibit at ITMA. Its booth highlighted the need to build up post-consumer garment recycling facilities to address demand for cotton-like recycled fibres, estimated to be 4.5 million tonnes/year. This number is based on the volume of garments discarded in Europe and the likelihood of future legislation imposing a proportion of recycled content in products, chief marketing manager Tanja Karila tells *Inside Denim*. Infinited Fiber turns cotton-rich textile waste into Infinna fibre using a urea-based viscose production process, which is cleaner and safer than conventional viscose production, she says. The company is currently operating a pilot facility that produces 150 tonnes of Infinna yearly, and it is fully sold out, she notes. A flagship factory will begin operating in 2026 at a scale of 30,000 tonnes per year. “But this would still be far from addressing future needs. If we had four large-scale factories we could produce 0.5 million tonnes yearly,” she posits, but that would still only cover a portion of demand. Ms Karila said that the company made the trip to Milan looking for partners and investors.

Exhibiting in a four-year cycle, ITMA allows machinery makers and suppliers to the textile industry time to explore novel technologies and engineer next-generation solutions that are truly innovative. The 2023 show was in that sense a banner edition, paving the way to a cleaner and more responsible industry.

Turkey-based Yilmak presented its newest denim processing machine outfitted with the XDrum and XOrbs technology developed and patented by British company Xeros.
PHOTOS: XEROS

Italian chemicals specialist Soko featured its new truly waterless hydrogel-based finishing.
PHOTOS: WTP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The presence of microplastic particles has been scientifically established in the air, the oceans, freshwater, soil and rainfall. Textiles are believed to be responsible for 30% of the tiny fibres that blanket our planet. Research into this pervasive phenomenon is ongoing, as are solutions to capture the fluff in factories. No quick fix for fibre fragmentation, however.

Stemming the flow of microfibre fluff

In an industry that makes its goods primarily from cotton and manmade cellulosic fibres, adding in only a small proportion of elastane or a polyester-based stretch yarn, the release of microfibres into the environment may not be seen as an issue of concern. Cotton and other cellulose-based fibres are believed to be biodegradable, and it is expected that they will eventually decompose and disappear. Or so it is said, and tests tend to confirm.

But does this hypothesis hold up when a pair of miner's pants in a fairly good condition is recovered from a shipwreck that had spent over a century under water? The button-fly trousers appear to have been as new, the auction house Holabird Western Americana Collections noted in its catalogue. They fetched $114,000 last February.

The miner's pants were conceivably originally white, and the presence of synthetic dyestuffs can be ruled out as they were found in a ship that sank back in 1857. The auction house believes the black and brown markings are fugitive stains from the trunk and its other contents. Aside from that, its surprisingly solid state remains a mystery. It shows that a garment made from cotton will not always biodegrade in salt water as expected.

Tests to assess a material's biodegradability are done in controlled conditions that do not replicate real-life situations, as seen. They are designed to accelerate the process of digestion by microorganisms but provide no guarantee that a textile will biodegrade in any random environment. Biodegradability is a complex topic, as is the related, and relatively new issue of microfibres escaping into nature from our clothes. The phenomenon was first identified in 2011, and research into its sources and possible solutions are slowly coming forward.

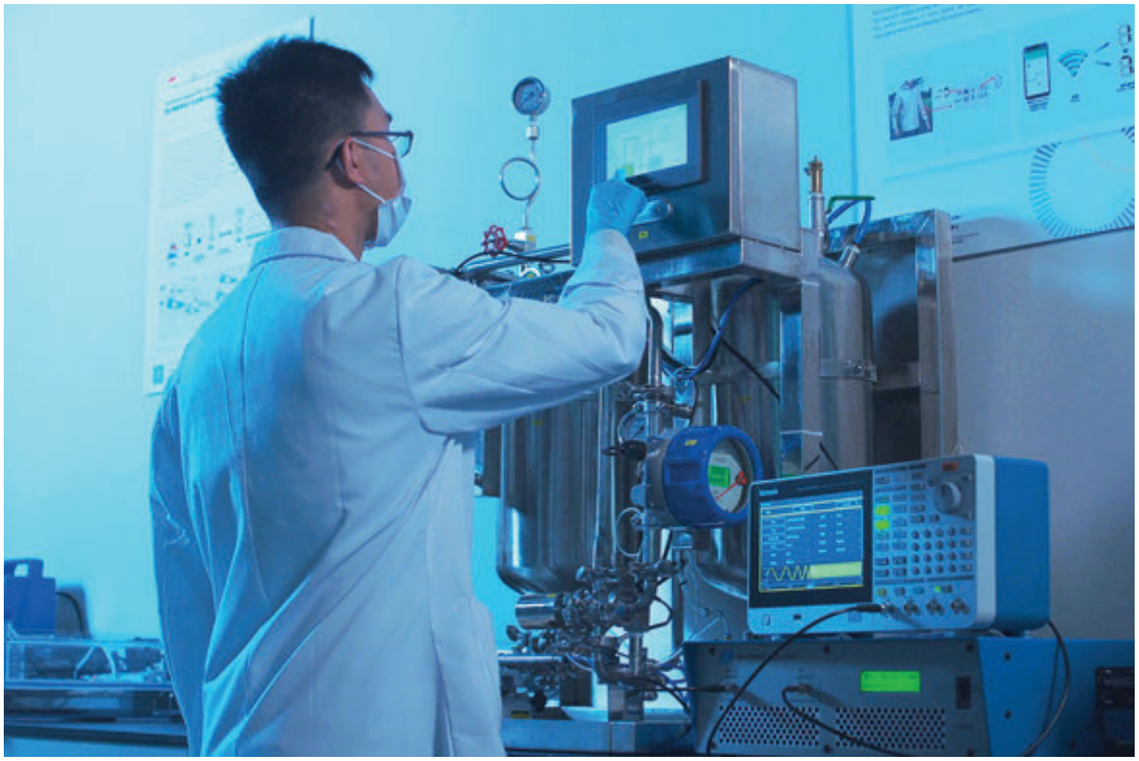
The Microfibre Consortium (TMC), a science-oriented research organisation based in the UK, is looking for answers. It recently released a report comparing fibre fragmentation from virgin polyester and recycled polyester fabrics. It tested 251 different textiles and found that mechanically recycled polyester does not have a more detrimental effect when compared to virgin polyester. There goes another commonly held belief.

Along with new insights into the issue of fibre leakage, a consensus on the use of terms is also emerging. 'Fibre fragmentation' is now considered preferable to 'microfibre', a word already in use in the textile industry, and to 'microplastics', which could lead to believe that cellulosic and natural fibres are not part of the problem.

Another positive development is that authorities, in the EU particularly, now distinguish between microplastics that are *intentionally* added to a product, such as those found in cosmetics, with those that are *unintentionally* released into the environment, which is the case in textiles. This indicates that future legislation may make the same distinction. As yet, few binding measures have been taken, with the exception of the mandatory equipment of microfibre filters on domestic washing machines from January 2025 in France.

No sign of biodegradation after 166 years. The steamer S.S. Central America sank during a hurricane on its way from Panama to New York City in 1857. It was found in 1988 off the coast of North Carolina. In addition to the thousands of pounds of gold the ship was transporting, there were many items of clothing and, particularly of interest, a pair of men's work pants.

PHOTO: HOLABIRD WESTERN AMERICANA COLLECTIONS



Hong Kong-based textiles research centre HKRITA is in the process of scaling up a new filter-free device known as Acousweep that uses sound waves to separate out microfibres from wastewater.
PHOTOS: HKRITA

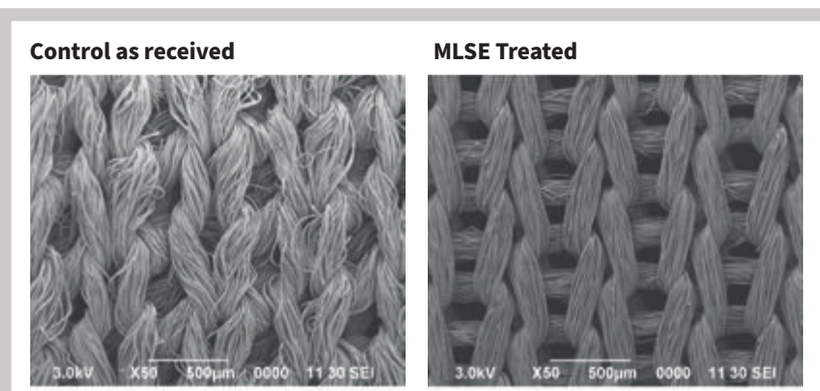
Clothes shed fragments of fibres when worn and washed. If properly handled, adding filters to washing machines will no doubt help reduce this insidious form of pollution. But while home laundering is of concern, industrial laundering is arguably a greater source of fugitive fibres. Textile mills and denim laundries are presumably a source of unintentional leakage, but new solutions and guidelines to stem the flow early in the apparel making supply chain are in the works. The ZDHC Foundation, a Microfibre Consortium partner, has said that it will introduce specific recommendations for microfibres in the next iteration of its wastewater guidelines.

HKRITA, a textiles research centre based in Hong Kong, has developed a system to separate and remove tiny textile slivers from wastewater using sound waves in a project known as Acousweep, which received support from the H&M Foundation. Designed to connect to an existing sewage outlet, the device is said to be more effective than membrane-type filters that require regular replacement as the minuscule fibres tend to block their pores. A lab scale system that can treat 20 litres of water per hour has been built. A larger sized model is expected to be able to handle 5,000 to 10,000 litres of water per hour.

New solutions for finishing

Textile technology providers are also developing solutions to mitigate fibre loss during fabric manufacturing and garment finishing. The Multiplexed Laser Surface Enhancement (MLSE) system, by MTIX Limited, combines laser with plasma and various algorithms to remove microfibre fluff from the surface of a fabric after weaving.

The patented machine was one of the award winners of the Conservation X Labs' Microfibre Challenge, a competition the British company entered with lifestyle brand Pangaia in 2022. "Our technology can remove up to 55% of microfibres in one pass," Phil Mansour, chief executive of MTIX International, the owner of MTIX Limited, tells *Inside Denim*. The near waterless and chemical-free solution can also be used to prepare a textile for dyeing or to apply a water-repellent, fire-retardant or antibacterial finish. A specific algorithm needs to be created for each function and type of fabric, he says. The innovative technology also comes with a novel business model as MTIX installs the machine for free in a factory and charges a fee by metre processed. Mr Mansour points out that treating a fabric at the mill before dyeing would stem fibre migration further down the line and lift the load off consumers' home laundering.



The multipurpose Multiplexed Laser Surface Enhancement (MLSE) machine developed by MTIX Limited combines laser and plasma technologies to remove microfibre fluff from a fabric.
PHOTOS: MTIX Limited

Jeanologia's new Air Fiber Washer is said to dislodge 60% of loose fibres from finished garments.
PHOTO: JEANOLOGIA

UK-based technology provider Xeros, a maker of laundry machines, has been developing special microfibre filters for domestic and industrial washing machines. "We are developing a range of filtration solutions based on our core technology that addresses microfibre pollution across all wet processes in the textile industry," says Dr Paul Servin, company CSO. Xeros has recently partnered with the University of Surrey to explore the possibility of recycling the captured microfluff to make a new 'carbon material'.

Jeanologia has also taken the issue to heart and developed a solution with the Air Fiber Washer. Officially launched at ITMA, it uses air, as its name implies, to force out loose microfibres from a garment before it is put for sale. It is designed to be installed in cut-and-sew facilities and received funding from Spanish fast fashion retailer Inditex. "The first wash is the one that releases the most microfibres. During manufacturing, loose fibres tend to stay in a fabric or garment, and these will only come out when the item is washed," says Begoña Garcia, project manager at Jeanologia. The patented device sends air through a specially designed polyhedric drum and is said to dislodge up to 60% of the loose microfibres.

As opposed to makers of fleece knits, denim manufacturers may have not yet felt pressed to address this issue, but legislation and growing awareness among brands and consumers may tip the balance. Some 83 companies have joined TMC's Microfibre 2030 Commitment, and these include denim industry names such as PVH, Gap Inc., Isko, Bestseller, C&A and H&M. It is a sign that they feel some concern and are looking to address unintentional microfibre release. Treating fabrics upstream would no doubt be a useful solution to capture the minuscule loose ends that we, like all living species, breathe in and ingest unintentionally every day.

British technology provider Xeros has developed microfibre filters for domestic and industrial washing machines.
PHOTO: XEROS

Testing & comparing

With the development of standardised tests, the industry can now assess fibre fragmentation, and this may help better understand which of the countless parameters in a textile's make – fibre composition, yarn or fabric construction – contribute the most to fibre shedding. Three protocols, developed by The Microfibre Consortium (TMC), the American Association of Textile Chemists and Colorists (AATCC), and the Hohenstein Institute, are now available. A fourth one, a certified CEN/ISO (EU) standard, is in the works.

Counting the nano-sized fibrils that escape from a yarn, fabric or garment is incredibly tricky. The development of a test protocol for assessing microfibre shedding has been a long process, from the preparation of the specimen samples to creating lab conditions that will not contaminate the results. The methods available are an evolution of laundering and colour fastness tests. Basically, they involve measuring the increase of mass in a filter, expressed as a percentage of the mass of the original specimen or in absolute weight.

The Microfibre Consortium Test Method was released in 2021. The samples tested using its protocol feed a database and knowledge hub that currently has more than 6,000 data points. Fiber Fragment Release During Home Laundering, the test developed by the AATCC, is nearly identical to TMC's, and is based on an accelerated laundering procedure, says AATCC executive vicepresident Diana Wyman. It is important to note, she adds, that "it is a relative measure that should be used to compare two fabrics made with different yarns, two vendor options or two generations of a same reference."

PHOTO: ALICE DAVIES AT UOL

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PHOTO: EUROPEAN SPACE AGENCY

Eye in the sky

Being able to spot the difference between organic and non-organic fields of cotton would be a challenge for most people outside the agricultural sector – particularly from a distance of 700km. But this is exactly where the European Space Agency (ESA) and German software company Marple started when they embarked on a project to test if they could use satellite data to identify different field usage from space. They harnessed machine learning and artificial intelligence to highlight cotton fields versus wheat or maize or other uses, with satisfyingly accurate results. "They discovered the software was able to differentiate cotton versus other crops to a degree of 98% accuracy, as well as whether or not it was likely to be organic or non-organic," Jeffrey Thimm, project manager at Global Organic Textile Standard (GOTS), tells *Inside Denim*.

GOTS – a standard for the post-harvest processing of textiles made with certified organic fibres – realised the project had considerable potential to support the organic cotton sector and chose to invest. From the initial pilot mapping of fields in Uzbekistan, it has now been widened to look at India, the world's most important organic cotton producer, training artificial intelligence to use satellite data and "ground truth" data to classify fields automatically. "The satellite images are not just photographs, they use infrared and far-infrared sensors that are able to pick up on differentials that you and I can't see," explains Mr Thimm.

The software operates using various metrics, including the Normalised Difference Vegetation Index (NDVI), which measures vegetation health, and the Normalised Difference Water Index (NDWI), which evaluates the water content in vegetation and soil. The team discovered nuances in organic cotton fields, such as how long the plants took to grow, what they looked like and the water content.

The data will be used for three main aims: to help estimate volumes, to combat fraud and to identify farms that could easily be converted to organic practices. It is important to have a reliable estimation of volumes, partly so buyers know how much they can expect to purchase in the coming seasons, but also for fraud prevention. "If we don't really know how much organic cotton is actually available then it really opens up the doors for fraudulent behaviour, which of course then hurts everybody," says Mr Thimm.

Gaps in volume

GOTS supplies information to the US-based Textile Exchange (TE) to help it with its publications, including the widely used Organic Cotton Market Report. Last November, TE published Strengthening Integrity in Organic Cotton, in which it noted the gap in the volume of organic cotton reported to be used by brands and retailers and the estimates of the volume of organic cotton actually produced. "Most organic cotton farmers don't have access to good-quality non-GMO cotton seeds, don't have secure buyer relations, and often don't receive a price differential that offsets their efforts," it stated. "Without fair remuneration, there's greater pressure on farmers to increase their yields and reduce their costs, which increases the risk of fraud. This may come through the use of GMO seeds, or the use of pesticides to prevent disease or losses from insect pressure as well." It concluded that organisations must proactively map suppliers and invest in new tools to boost the integrity of supply.

Part of the GOTS certification involves adhering to working and social conditions. These must be met by all processors, manufacturers and traders.
PHOTO: GOTS

Organic cotton supply is still very low – around 1.4% of the global cotton volume. In the most recent Organic Cotton Market Review, published last October, TE conceded its data confidence from India was low. The body was only able to obtain data from India's Agricultural and Processed Food Products Export Development Authority, but this combines organic and in-conversion production into a single figure. In the past, TE was able to use data provided by producers and certification bodies to determine the breakdown between organic and in-conversion but this year had to apply modelling and assumptions to arrive at an estimation.

Tight supplies push prices up – and also increase the temptation for fraud. In 2020, GOTS found evidence of fake Raw Cotton Transaction Certificates (TC) in India, which had been created by fraudsters using government templates with fake QR codes, leading to a cloned website to pretend the TCs were authentic. The announcement hit the sector, with questions over authenticity, transparency and governance, pushing prices even higher.

While GOTS had measures in place to combat fraud, it has since doubled down on efforts to police the supply chain. From December 2022, it has put in place "a double safety net" of traceability of all TC data back to the original farm source, as well as cotton gins certified to the Organic Cotton Standard. "We have been looking at many different tools to reduce the possibility of fraud, so in India we've introduced a farm-to-gin registry so that we have better clarity on exactly where gins are getting their cotton from, and we've made it harder for traders just to move cotton around on paper. When we learned about this AI opportunity with satellites, we thought this is one of a basket of tools that could really help."

Watchful presence

The project is funded by both the ESA and GOTS. Through its Business Applications Space Solutions, ESA aims to show how satellite applications and space technology can be beneficial to business. It has previously worked with Schoeller Textil and the Hohenstein Institute to evaluate performance textiles in space, and with Sympatex on a project to design functional fabrics for astronauts.

As a non-profit, GOTS believes investing in the project could "reduce the running costs of sustainability", and could also help to identify more farms whose land is suitable for conversion to organic, boosting the network. "This is a way for us to help find those farmers who are already on board in terms of methodology or almost growing the cotton with organic principles and just need a little bit of extra support to get certified, whether it's organisational or financial, being part of the group, connecting to the supply chain," adds Mr Thimm. More brands are now accepting 'in-conversion' cotton, as it typically takes three years to become certified organic, which is also helping to address the demand gap while helping growers financially during the transition.

Potential deterrent

Farmers and supply chain partners have mainly reacted with "intrigue" to the project. "There have been some concerns about data privacy – how the field data is going to be used – but we're in compliance with the EU's GDPR regulations," says Mr Thimm. "The only negative response has been from the fraudsters. People behave differently when they know there's a camera looking and an eye in the sky should reduce the amount of attempted fraud. We already catch a lot of fraud going on and prevent that cotton from getting into the market, but we prefer less of that to happen to begin with, and so we are hoping that as technology is deployed the risks will be too high for that type of behaviour to continue."

The team expects results from India by the end of this year. Following that, the scope could be global. "Once we conclude in India, we could look at another region, perhaps East Africa. We might also look at other fibre crops," adds Mr Thimm. "This is just the initial stages of this technology and it is quite an exciting time for us."

Wojciech Beyger, senior quality manager for 7 For All Mankind, has travelled the world as a standards and laundry specialist, creating new recipes, monitoring back-end processes and passing on his extensive knowledge to those he oversees.

Blending chemistry and curiosity

Q What do you like most about your job?

A I like that I can use my chemist nature. Even as a child, I loved experimenting – I remember my mother being upset when I burned a hole in the carpet with chemicals! In this job, you can develop yourself by continually experimenting. I'm Polish but my family name is German and I think I have a somewhat German nature: I like innovations but everything has to be methodical and well organised. In this job, every day is different – you never know what it will bring!

I also like working with people. My parents taught me to respect everybody throughout the company, from the cleaners to the CEO. I apply this approach everywhere I go, even in places that might not be used to it. From the beginning, I always wanted to help and educate. When you manage and train lots of people, you end up forming close bonds and many former colleagues are still in contact.

I like to change my environment. I really enjoyed my time in Mauritius – it is a very mixed and multicultural place – some of the workers from Bangladesh and Madagascar wouldn't see their families for months or even years. When I organised daily production meetings, staff would share personal stories, thoughts and opinions. In these sorts of environments, you cannot separate your job from your personality; in some ways you feel like a leader and a boss, a technical guide, but in other ways you feel like a father figure, especially for the younger workers. You teach not only the job principles but also life principles and life philosophy, in a way.

What does it take to be a good denim technician?

I have produced and developed thousands of recipes. I believe to do this well you need to have both education and experience. Unfortunately, many people just rely on experience and they don't have the basic background knowledge. I tend to hire technical people who have the correct education so they have a scientific and engineering understanding of what they are doing and what they are seeing as an outcome.

How do you create great recipes?

We need to understand not only what is happening but why. This is my principle. When I was working at VF, I bought raw materials like enzymes and blended them to be used in the laundry; we also developed our own softener formulas with high anti-yellowing features and extremely good softness. The knowledge and recipes need to be registered, shared and followed up, using the correct software, databases and archives. These practical solutions, clear and simple recipe registration with cost analysis, was always important for me.

I favour a very professional way of testing and comparing products, not just 1kg versus 1kg but also in terms of money; comparing the costs of various products and the outcomes. I also developed my own products, such as anti-backstaining agents. Whenever I moved companies, I brought that knowledge, and people appreciated that they were getting support.

How do you integrate 'sustainable' products into the workplace?

The word sustainability can be overused, maybe some people don't understand it deeply enough. For instance, when bleaching with hypochlorite, if you process it properly and correctly neutralise, you only end up with salt, water and oxygen. Another example: some of the chemicals that tried to replace permanganate in spray ended up being more harmful for workers. We also suffered tensile problems on those garments, even though the chemicals were advertised as "green".

In about 2000, a benzoyl peroxide was developed as an "eco" bleaching product, but it could be more harmful, and also created the risk of explosions if handled incorrectly. There's a similar story for pumice stones replacements, including trials to use thick synthetic rope knots, or synthetic stones. We need to select wisely, understanding the origin of the material: does it create microplastic pollution? Is it really less harmful to the planet? I am not against these tests but emphasise the need for non-emotional and non-political research first.

Polish national Wojciech Beyger is a chemist by nature: he graduated as a chemical engineer and applies his analytical mind to help designers produce beautiful effects and sustainably washed garments. His job roles have taken him all over the world, including 16 years at VF, where he managed laundry and R&D labs in Poland, Malta and Turkey, among others. He worked as a consultant before moving to Mauritius to manage departments for REAL Garments and Denim De l'ile (DDI), where he oversaw 300 staff. He is currently a senior quality manager for 7 for All Mankind, working across various locations to monitor quality requirements and ensure all processes conform to strict standards. He is based in Switzerland and has three children.

PHOTO: WOJCIECH BEYGER

Even ozone can become harmful for operators, if it's not handled correctly or the machine is not securely deactivated and the ozone disposed of. Maintenance is not always the strongest point in some countries. Laser is a really good tool but it consumes quite a lot of energy, and you need to have good exhaust ventilation because otherwise the fumes could harm the operators. So, in some cases, traditional scraping can be less harmful, especially if using pneumatic scraping tools.

There have been various trials over the years to replace old methods – touted as 'unsustainable' – with new ones that sometimes turned out to be riskier in other aspects. It reminds me of the saying, "Only the dose makes the poison".

My point is that sustainability in chemistry is not as simple as replacing the chemicals, but a wise combination of new and old methods, correct utilisation and correct safety rules and protection. Always ask yourself questions before you introduce solutions. This way, you work in a way that doesn't harm anybody – the final consumer, your workers and the environment. This, for me, is sustainability.

How does your knowledge of machinery help?

In the past, chemicals and machinery were considered as separate business areas. Today, we should understand the symbiosis of both. There are many products that need to have the correct equipment to work properly and efficiently. Innovative chemical companies, such as Nearchimica and Soko, cooperate closely with machinery companies; they develop products that require certain equipment to give the full benefits. Soko's Stardust and Lumia processes, or alternatively Nearchimica's Nearstone Zero and Nearbooster Fade, in combination with ozone and nebulisation by Tonello's Core system are good examples of this. Another good example can be low temperature biopolishing or enzymatic abrasion treatment in the nearly waterless Core machine.

“In the past, chemicals and machinery were considered separate business areas. Today, we need to understand the symbiosis of both.”

I remember the days when suppliers visited with bottles of chemicals and asked us to try them. Then they started to bring some garments, showing the effects of their chemicals. Nowadays, really good companies offer a professional service lab – like a small advanced professional laundry with the latest lasers and advanced washing machines (core, jet, ozone) – so we can test and develop new finishes together.

Garmon, Nearchimica and CHT were some of the first to invite their clients for sample processing. I have visited various chemical companies recently and have been impressed with the equipment and professionalism. I am also a fan of the latest Tonello innovations and Jeanologia laser developments. I know they are competitors but both are simply the best in their areas.

For those that work in the laundries, it's important to understand both the chemicals and the machinery, and always work with an open approach. And do not forget the human factor. I used to talk to Bangladeshi operators who couldn’t read or write, but they were able to explain what was happening and we learnt from each other.

What are the priorities in the laundries?

One of my best bosses, Marc Belon at VF, used to laugh and say, “People in the laundry answer everything with ‘It depends’.” And, here I answer as well … it depends. The priorities depend on where you are based and what type of products you are producing. Some brands produce garments in countries with water scarcity issues, for instance close to Dubai, so using methods with reduced water is important there. In Mauritius, we focused on water usage and avoiding pollution in general. In other countries, the priority might be the cost. But it should always be a balance.

In terms of my priorities, the first is people: the safety of the workers and the final consumer. This is crucial for me, as I have seen examples – either with my own eyes or when people have told me – of workers suffering. Second, we need to work in a way that is safe for water, the atmosphere and the Earth in general, in terms of pollution. My third priority is energy consumption – I might not be creating pollution where we produce directly, but if I use a product or machinery that requires a lot of electricity, I’m creating pollution somewhere else.

What are you most proud of?

I know I have been able to produce consistently good garments with extremely difficult washes, using marble methods, special jet dyeing, rags or stones alternatives. I could be proud that I know these recipes, but I’m prouder of the people I’ve trained to have the same philosophy of managing people, treating their co-workers and team building as I do: organised and precise, focusing on details.

For example, in Mauritius a young man was hired almost directly from Monash University and I taught him this job from zero. By the time I left, he was able to run the dry and wet processing plant section, working with brands like Armani, Diesel and Guess. There’s a similar story with a very skilled young Mauritian lady. I could give more examples from Turkey, Malta, Tunisia and Poland. Every case is a separate story, a piece of my life. This is satisfaction for me – many people who were my “students”, I can now call my friends. We support each other, no matter what companies we work for. I know I can count on them and they can count on me. This I am proud of.

What did you see at ITMA that caught your eye?

I was impressed with Soko’s Lumia and Stardust, which create abrasion and bleaching looks almost without water. They use a technique that has been around a long time but they have developed it in a new way. Another revolutionary product is N-ICE of Nearchimica – reactive dye by nebulisation (Core System), without salt and without heating, with only drops of water. This is real sustainability; no pollutants, clean effluent. Here you really see how important the harmony of the right machinery and the right products is.

This drive to have the right synergy between chemicals and equipment at ITMA impressed me. I also visited Tonello and Jeanologia, who I’ve had the pleasure of working with. Let me say again: in this industry, people are very important; people who are striving to do things well and who work in an ethical way. I am happy the company I work for now has this philosophy, too: working with correct fabrics, vendors, product developments, designs and high-quality requirements. ■

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Japan's reputation for trends acceleration makes it a hotbed for textile and fashion innovation. How this meshes with the archipelago's cultural heritage, particularly its emphasis on living in harmony with the natural environment, often produces strikingly novel results. Biotech firm Spiber is making the best of both worlds as it steps into new territory: the country's denim scene.

Brewing a new blue

The buzz around Japanese biotechnology company Spiber has been brewing somewhat organically since its founding just over 15 years ago in 2007. However, it was not until 2021 that the Yamagata prefecture-based company began exploring how to create denim fabrics with its proprietary Brewed Protein fibres, as marketing and communications specialist Ayana Nakajima tells *Inside Denim*. It subsequently unveiled a denim trucker jacket and jeans set with Goldwin 0, the experimental arm of domestic apparel group and long-term partner Goldwin, in March 2022. Both pieces went to retail this March.

Nutrient-dense threads

Spiber primarily turns plant-derived biomass into polymeric films and filaments via an in-house fermentation or "brewing" process, which remains unchanged whether the resulting Brewed Protein staple fibres and spun yarns are destined for denim products or not, Ms Nakajima explains. Its novel protein-rich fibres can be fine-tuned and tweaked to produce a range of textures, suitable for various end uses. The blending percentage with more conventional materials can vary, depending on a brand's desired hand feel, she adds. Trials undertaken alongside Goldwin 0 during research and development involved comparative surface property tests between denims woven from 50% Brewed Protein fibre in the weft versus 100% cotton versions. These tests yielded "relatively favourable" results, with increased slippiness and smoothness attributed to the blended fabric, as would be expected.

Goldwin 0's spin on a 'Canadian tuxedo' for Spiber's denim debut in March.

PHOTO: GOLDWIN

The company next plans to continue moving forward with more fibre blends, especially those engineered for enhanced comfort and softness, gradually upping their Brewed Protein ratio as it goes. Now that its Thai facility is operational, there is much more leeway for working with spinners and manufacturers to develop denim fabrics with a higher percentage of Brewed Protein content. The material can later be broken back down into nutrients, which Spiber expects to be able to reuse as feedstock for fresh polymers, films and filaments. On denim's suitability for its "biosphere circulation" project, introduced alongside brand partners Pangaia and Goldwin back in June, clothing and textiles made from the fabric may be included, the marketer confirms, so long as they are microbially digestible. The business has already been in touch with several mills and brands to discuss this, Ms Nakajima says.

It is hoped that the two brands will begin supplying Spiber with their surplus fabrics for Brewed Protein fermentation feedstock, along with other "end-of-use nutrients" such as agricultural by-products. Spiber has been collaborating with Goldwin's teams since 2015, when the biomaterials developer signed an exclusive operational partnership to provide its designers with synthetic spider silks for sportswear. Tokyo-listed Goldwin, founded as a knitwear manufacturer in 1950, made its denim debut with Cordura and Kaihara in spring 2020. Its sustainability targets include dedicating a 10% share of its overall materials mix to the Brewed Protein polymer by 2030.

Recipe for innovation

According to Ms Nakajima, an especially popular fabric option among buyers in more recent times has been Spiber's charcoal-dyed denim, produced at Nihon Menpu's factory in Ibara, Okayama prefecture. The textile is woven from 100% organic cotton yarns in the warp, with 10% Brewed Protein fibre and 90% organic cotton for the weft, naturally dyed with traditional Japanese charcoal or binchotan, upon the manufacturer's recommendation. First used by artisans during the Edo period (1603-1868), charcoal was selected as the "most reasonable" dye choice among those available at the time, she states, primarily due to internal testing and time considerations. The other candidates were natural indigo and persimmon tannin. Trials are currently underway at another factory, with the objective to increase the proportion of Brewed Protein in the denim fabric blend ratio. "If all goes well, we expect to be able to unveil new products at upcoming trade shows in Europe," Ms Nakajima tells us, noting that several US and European premium and luxury brands have already registered keen interest in Spiber's charcoal denims.

Spiber's charcoal denims have proven popular at recent trade fairs.

PHOTO: SPIBER

Japanese contemporary fashion label Yoke also included a lightly washed, matching jean jacket and trouser set in its spring-summer 2024 collection, which will be distributed locally as well as through overseas retailers. Each article contains 4% and 5% Spiber-made Brewed Protein fibre respectively, the rest being cotton. After viewing the garments up close at Première Vision Paris in July, *Inside Denim's* Sophie Bramel was pleased to report that the fabric "felt just like regular denim". As progress continues to be made with scaling up the technology, from production capacity down to tailor-made fibre blends, Spiber appears to be treading a path that few can navigate. In other words, how to consistently balance materials innovation, fashion and heritage techniques, all at the same time.

Although cotton has dominated brands' denim fabric blends thus far, the opening of Spiber's Thai production site means there is now more room to experiment with upping the Brewed Protein fibre ratio.

PHOTO: YOKE

Armedangels became the latest European fashion brand to join the still-exclusive 100% recycled denim jeans club back in July.

Angel's advocate

This summer's collections saw German eco-denim label Armedangels debut its very first pair of 100% recycled cotton jeans, sold under the brand's low-impact line, Detox Denim. The range is produced from 100% certified organic cotton fibres, no "unnecessary chemicals" are used, no toxic heavy metals, chlorine or potassium permanganate, Armedangels' impact and innovation director, Katya Kruk tells *Inside Denim.* Accordingly, 99.62% of the product line-up was made from natural fibres or recycled materials, without any virgin plastic-based content in the fabric, for a reduced carbon footprint. Its 100% recycled Mairaa Mom Fit denims are cut in fabrics made from 80% pre-consumer and 20% post-consumer cotton waste. Design lead, Sara Maier, said on launch that the jeans were Armedangels' first to have been manufactured with recycled fibres exclusively.

Design mechanics

The brand sources its yarns from Calik Denim in Istanbul, which purchases its cotton from fellow Turkish recycler Gama. It generally prefers to work with mechanically recycled fibre, especially when it comes to natural materials such as cotton, linen or wool, and at times extends this to selected synthetics, too. The brand is keeping an eye on developments in chemical recycling, and has experimented with Lenzing's Refibra technology, which results in Tencel-branded lyocell made from roughly one third pulped cotton scrap and two thirds wood pulp. Early phase pilot tests on other chemically recycled manmade cellulosic fibres are also underway. In the past, the company has incorporated its own shredded production off-cuts into pre-consumer waste yarns.

The brand's Mairaa Mom Fit style is its first-ever pair of 100% recycled cotton jeans.

ALL PHOTOS: ARMEDANGELS

Close collaboration with the Calik team was essential to achieve a denim fabric made from fully recycled cotton, says Ms Kruk. To maintain quality, one of its key sustainability tenets, and never not a core concern, it chose a cotton blend having 80% pre-consumer recycled cotton, owing to inherent purity issues in post-consumer textile waste. The final fabric met in-house quality standards following "extensive testing", despite requiring "completely different" treatment to the label's other denims, due to the comparative shortness of the recycled fibre. Tunisian jeans maker Denim Authority was therefore asked to use an eco-friendlier softener in finishing, as well as chemicals that align better with Armedangels' own strict chemical management standards, themselves inspired by Global Organic Textile Standard (GOTS) principles. An emerising finish was applied to enhance fabric softness and wearer comfort. Importantly, the finished articles are of the same quality as the company's other jeanswear, "but might have a slightly stiffer hand feel after washing and occasional shading differences".

Future-forward prepping

To take its designs to the next level, Armedangels will work to increase the percentage of recycled fibre content in denims, forging ahead with its goal to "set new paradigms in the industry" through not only achieving, but also exceeding prevailing sustainability standards, the business shares. All while continuing to create contemporary styles that balance innovation and aesthetics, it adds, and ramping up supply chain traceability. A pilot is already underway to help translate the brand's carbon emissions data into more accessible and easily digestible information for shoppers, in partnership with fashion life-cycle assessment platform Carbonfact. This carbon calculation-turned-communications tool is currently being introduced across the label's entire autumn-winter Detox Denim range, as a complement to the embedded Aware end-to-end physical tracer. Resulting insights are subsequently expected to help shape product development in other categories, beyond jeanswear.

Armedangels was notably ranked among the 54 companies (out of a total 424) that achieved level four or "leading" status for its strategy, expansion, and growth in use of preferred materials, harmony with global ecological goals and actioning circularity agendas in Textile Exchange's most recent Material Change Insights report, based on 2021 figures. All very much in keeping with its wider eco-minded objectives and storytelling. Brand co-founder and chief executive, Martin Höfeler, perhaps captured its ethos best: "We need to radically rethink fashion. If we don't, we'll [just] go down perfectly styled."

Left: Exactly 99.62% of this summer's Detox Denim range was made using natural fibres or recycled materials, and zero virgin plastic.

Right: The high-waisted denims are available for purchase in 16 different washes.

Halit Gümüşer, the director of Kipas, believes in collaborative approaches to innovation, partnering multiple companies to create new products, with a particular focus on recycled content. The Turkish mill is one of the driving forces behind the Sustainability Talks Istanbul, which takes place in November. It will unite industry players, pass on best practice and create opportunities for start-ups and investors.

"It's vital to invest in new ideas"

Q: Why are the Sustainability Talks Istanbul important and what are your goals?

A: We know that sustainable manufacturing is essential to create a better world, which is why we joined forces with Orbit Consulting to create the Sustainability Talks Istanbul. Orbit collaborates with umbrella organisations, governmental institutions and NGOs to help drive sustainable practice in the Turkish textile industry. We wanted to share our learnings and our practices to make a change for everyone. There are lots of events on sustainability, especially about textiles, however, we think the content can be quite similar or repetitive. This year, we wanted to take a different approach.

One of our topics will be the benefit of artificial intelligence for sustainability. We will highlight new water usage and green systems, and discuss brands' strategies in terms of carbon footprint. We will analyse legislation – for instance, the incoming European Union laws concerning textiles and circularity. DuPont will present the recycling of protective apparel, and regenerative and organic cotton projects in Turkey will also be discussed.

Kipas managing director Halit Gümüşer believes change is driven by collaboration.

PHOTO: KIPAS

How will the approach be different to previous events?
The event itself will be different because associations such as Dornbirn Global Fibre Congress (GFC), Textile Exchange and International Textile Manufacturers Federation (ITMF) will present their annual outlooks. We're collaborating with these important partners who can share their vision with our audience.

Additionally, we will have a start-up and scale-up investment session. We are inviting companies in collaboration with Fashion for Good. Orbit Consulting has brought on board Turkish businesses and textile companies that are interested in investing in start-ups. We know that with existing manufacturing methods, is not possible to be completely sustainable - the processes, the technology and the system itself consumes so many natural resources, we need lots of innovation to make textiles more sustainable. We think it's very important to invest in these new ideas.

If I was a buyer or company thinking of attending the event, what could I expect?
Turkey is one of the main manufacturing hubs, most global brands have offices in the country and are participating in our conference. Our event is unique because many sustainability conferences are not focused on the actual business and manufacturing side. We are only inviting speakers and companies that are already commercialised, so it is a solid business-oriented event.

Also, Istanbul itself is a nice place to spend some time and meet with an excellent textile network. For the international guests who are visiting us, we are setting up networking sessions and platforms. Business-wise, people can meet their producers and manufacturers and their business friends.

What other highlights can you tell us about?
Finland and Holland will be our country sponsors. This is very important because both countries are doing a great job in terms of sustainability. They are inviting their innovative companies to make presentations and introduce their products.

Recycling has been a major focus at Kipas and you have been one of the forward thinkers in terms of innovation. Can you briefly tell us about the 100% recycled cotton project, RC0100, that you worked on with Säntis, Swinsol and Temsan? How did the launch at machinery fair ITMA go?
Mechanical recycling technology was invented almost 100 years ago and the technology has not changed significantly since. Recycled textiles were not used for sophisticated business segments before. The expectation today is using recycled materials for high quality products. So, we need better fibre properties from the waste we collect.

"Chemically recycled technologies are not yet mature, but I think this will become the main solution for circularity."

Säntis designed a shredding system for Kipas three years ago. The fibre quality from this machinery is quite advanced but the machinery itself was missing some technological properties. Thus, we decided to redesign and improve the device using Swiss engineering with Swinsol and the equipment production expertise of Temsan.

RCO100 is unique because we combined our expertise in both recycling waste material with high quality spinning. We are offering 100% recycled OE (open end) yarns between 6/1-20/1 and ring spun yarn between 6/1-30/1. For some of the yarn counts we produce, Kipas is the only globally certified company. Besides offering yarn we also make 100% recycled denim and non-denim fabrics. One of the best examples is the project we worked on with PVH – a 100% recycled denim.

The launch at ITMA was successful, with an impressive number of visits. Many companies and brands came to our booth and made solid enquiries and orders for the machine. At the conference, there will be a session that will explain more. Santis will be on a panel, sharing the process.

Where do you see the market going in terms of demand for the recycled fibres? Is it the mills driving it, the brands or the consumers?
The demand from brand side is increasing because of legislation. In the next few years, brands will need to use some recycled content in their products, so they have to have a solution. Both mechanically recycled and chemically recycled fibres will be important.

At Kipas, we have already invested in mechanically recycled fibres but we have also recently invested in the chemical recycling of PET bottles to produce recycled polyester. Chemically recycled technologies are still not very mature, but I think they will become the main solution for circularity as it is difficult to mechanically recycle post-consumer waste successfully, particularly with all the blends. We must support.

Innovation costs money; how easy is it to spread the costs or increase the prices for these types of solutions?
Obviously, there are costs associated and it increases the product price, however there are tools that make the cost more reasonable, such as good management of the raw material, because it is the key. When it is sorted into good quality waste, it is much easier to work with and the cost is lower. But when you have to source it from the market, it becomes more expensive. And if it's not sorted, it can cost even more. So, there are several parameters to costs.

In terms of chemically recycled fibres, the cost of the fibre is quite high, and you can't use it in high percentages; availability and process costs make the product quite expensive. But as the technology grows and the companies increase volumes, the price will go down.

You have collaborated with partners such as Infinited Fiber Company on the New Cotton Project, which involves scaling up and testing its manmade cellulosic fibre, Infinna. This is due to end soon, why did you want to take part?
Mechanical recycling has its limits, particularly in terms of recycling post-consumer waste, so we are following chemical recycling projects as well. The New Cotton Project is very important because it enables us to have cellulosic fibre from 100% post-consumer waste.

You have previously talked about Kipas' goals to become carbon neutral, helped by the planting of thousands of trees. Can you tell us about any progress in this regard?
Our goal is to become carbon neutral by 2030. Even though we have a huge manufacturing capacity, we have been able to move to totally green energy. We checked our excess capacity in terms of CO_2 emissions and it was more or less equivalent to 500,000 trees. We know that it is not a valid way to neutralise our carbon footprint but we started to plant 100,000 trees every year to reach our goal. This year we are going to plant the fourth portion of this target.

The Sustainability Talks Istanbul, organised by Kipas Textiles and Orbit Consulting, will be held on November 28, 2023, at Hilton Istanbul Bomonti Conference Center. Turkish-English/English-Turkish translation will be available.

PHOTO: SHUTTERSTOCK.COM

What is Turkey's role in the denim industry? How are you recovering from the devastating earthquake?
Turkey is an important denim manufacturer for fashion brands. High quality, reasonable prices, vertical manufacturing and easy access to raw materials are some of the advantages. Reducing carbon footprint is also a vital aspect and Turkey is a reliable option for the Euro-Med zone.

After the devastating earthquake, the denim industry in Turkey was seriously affected because almost 80% of the denim manufacturing companies are located in the region where the earthquake happened. We are grateful to our dedicated workforce who sacrificed a lot to recover the sector, even thought they had so many problems of their own.

What's going to be some of the most important themes that the denim industry will be tackling in the next few years?
In terms of denim, water consumption and water treatment topics are very important. Denim is a polluting industry and you have to tightly control your wastewater and your input. It's critical to use the right dyestuff and treatment methods to reduce the footprint of denim products.

Recycled content topics will continue to be important, as will the designing of denim products to help recycling, maybe fewer blends or more responsibly used accessories – these kinds of design tools will be important.

Our vision is always based on sharing knowledge and growing knowledge. We must all help each other to make the industry more sustainable, as it is not easy to find solutions to the problems, but we are all working towards the same goals. Let's help each other to make this happen.

PREMIÈREVISION

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Mexico-based fabric producer Global Denim has said work it had already done to digitally present its collections paid off in a big way when the covid-19 pandemic hit, and has continued to develop in the post-covid environment.

Denim mill's digital diligence pays off

As its name suggests, Global Denim, a family-run company with its headquarters in Mexico City, a denim mill in Puebla and a sales office in Los Angeles, has attempted to take a global view of its business since its launch in 1994. It is proud of its verticality and self-sufficiency, working from fibre to finished fabric, with its own fibre-washing, carding, spinning, dyeing, weaving and finishing operations. It prefers to keep these processes in-house, it explains. It regards each of the links in the chain as important and prefers not to depend on external partners for any of them.

In the same way, the company has come to view digital connections to customers as a natural progression from the physical ties it has spent years building up, creative director, Anatt Finkler, said at the Trippin' Blue seminar this September. "They go hand in hand," she says. "We now talk about a fusion between what is real and what is virtual."

This has led to the development of an advanced digital showroom in which customers can pore over the Mexican company's entire range of fabrics and make choices for the jeans, jackets and other products they want to make. "This came out of the pandemic," Ms Finkler continues. "Our lives changed completely during that time and we became used to searching online for everything we needed, whether for entertainment, education or even personal connections. This situation changed all businesses, including in the textile industry and in our world of denim."

Fabric assessment

She explains that with everyone "immersing ourselves in that virtual world", people became much more willing to assess fabric digitally, making business decisions more efficient, faster and with less waste and fewer samples flying back and forth. Advanced software has made it possible for Global Denim to showcase its entire library of fabrics, giving customers quick access to information about the fibres, colours and finishes available. "This is making it easier for our customers to do business with us," the creative director says.

> *"We are helping our customers understand our fabrics more clearly."* VANESSA TROICE, GLOBAL DENIM

A new project that Global Denim has embarked on with technology provider Bandicoot Imaging and the organisers of Trippin' Blue is taking this further forward. It has a new tool that allows customers to see 3D versions of finished garments, jeans, jackets or shorts, in the fabrics they have chosen, zooming in to get a close-up view of the material and changing the angle to be able to make decisions about design, pattern-making, construction and even about fluidity of movement in garments. The system makes it possible for customers to make one-click requests to receive samples, swatches or the 3D files for the choices they have made for them to use in their own design systems.

Communication channel

"This has become an important communications channel for us," says Global Denim's sustainability director, Vanessa Troice. "It's true, of course, that we don't make the final product, the product that reaches the consumer, but we think it's a good thing that our customers, the companies that make the finished garments, can take some inspiration from us. Perhaps there are people who see less clearly in their imagination what it is possible to do with the fabrics we are developing. We are helping our customers understand our fabrics more clearly."

For Anatt Finkler, all of this constitutes an important contribution to the emergence of Latin America as a near-shoring hub from which brands in important markets such as the US and Canada can source denim garments. She says she knows that the virtual world is never going to take the place of the physical world, which is good news for clothing companies. All Global Denim wants to do is provide a tool that will make selection processes faster.

Too many choices

In any case, her colleague Ms Troice says there are too many choices in the company's fabric library to be able to send clients samples of all of them. "This is a way for clients to look at what we have and start to make their selections remotely," she explains. "Another benefit is that it gives us good insight into the way our clients are thinking and the direction they are moving in before we sit down to have a meeting with them." And when the time does come to sit down and talk to customers face to face, the customer, too, will know more about Global Denim and its product range.

According to the host of the Trippin' Blue event, Ana Paula Alves, Global Denim's approach is about offering the highest level of service it can and she says she has been delighted to see this develop at the Mexican company. "The service levels are so high that the company is selling its fabrics by osmosis," she comments.

Mexican fabric producer Global Denim works from fibre to finished fabric and is proud of its verticality and self-sufficiency.

PHOTO: GLOBAL DENIM

A greener shade of blue

The butterfly wall has been designed to attract 36 species, with 50 types of plants. The factory is surrounded by multi-tiered vegetation and ponds.

ALL PHOTOS: BLUCONNECTION

As it marks its first anniversary this October, the 30-metre butterfly wall at BluConnection's new facility in Singapore welcomes its latest insect guests, homing in on the tailored array of pollinating plant species. The wall is a small reflection of the 'green' planning that went into the factory conversion, one whose execution is such that the chemicals maker believes it could be used as a blueprint for similar Singaporean factory upgrades.

The decision to relocate was to offer purified pre-reduced indigo with the lowest aniline content possible from a state-of-the-art indigo hydrogenation facility, with added flexibility and an increased capacity. Founders Peter Zinser, Alexander Bock and Andreas Mendel took the opportunity to build in carbon and waste reduction and efficiency from the ground up. There are solar panels on the roof, rainwater is recovered and the facility is embedded into a garden with pond and gazebo, contributing to a positive working environment as well as the microclimate. "The footprint we leave in this world is becoming more and more important, and in Europe, new regulations will make it a focus for the entire supply chain," explains Alexander Bock. "What is our contribution? We have a minimum-to-no carbon footprint. We have zero discharge. At this point in time, we are pretty confident that this facility is as good as it can be."

FACTORY TALK: BLUCONNECTION

A year on from the inauguration of BluConnection's new indigo facility, we find out about how clean production and plant-based auxiliaries can help companies 'walk the talk' with a lighter footprint.

Reducing the load

BluConnection's sole focus is pre-reduced synthetic indigo and its auxiliaries for the denim sector, having launched in 2009 with a 30% pre-reduced indigo, DenimBlu30, as its key product. Although synthetic indigos have been in the market for more than 125 years – being first commercialised by Germany's BASF at the end of the 19th century – the pre-reduced versions were not introduced until 1993. The global market for indigo for denim is made up of around 30% pre-reduced and 70% powder/granules, according to estimates, although this rises to about 60% pre-reduced if China is discounted.

Indigo's appeal is still unrivalled, says Mr Bock – being the only synthetic colour that uses an identical molecular structure to its natural form and the only one that is sold by the number of molecules. "It has an unmatched tinctorial strength, it's a copy of nature and it's been proven safe for many years," he adds.

However, only the reduced form of indigo can bind to the cotton fibre; it needs to go through a chemical reduction using caustic soda and a reducing agent, the most common of which is hydrosulfite. By buying indigo in a pre-reduced state – which is achieved by processing it with hydrogen – the dyehouses or mills lessen the amount of hydrosulfite needed. For instance, DenimBlu30 allows a saving of 40-70% sodium hydrosulfite and a 35-60% saving of caustic soda, according to BluConnection.

"There is nothing better than pre-reduced indigo in the market as far as performance and environmental footprint is concerned," says Mr Bock. "When this was invented, it was a big step forward. The hydrogen gas is completely absorbed in the process, it leaves no other byproduct. It allows denim mills to have more control, and to have less colour and a lower pH in the wastewater, making it is easier to treat."

Turning to nature

The chemicals industry had been looking for alternatives to the difficult-to-dispose-of hydrosulfite, or at least reduce its levels, for many years. "There have been multiple attempts to change the chemistry with other products which didn't work, because they were not commercially feasible or not technically feasible, or they didn't produce the right denim shade, the reproducibility was poor, and so on. No alternative to hydrosulfite worked."

Looking to nature to clean up the process felt like a "logical next step" and three years ago BluConnection teamed up with a European university to study a raw material option derived from the food industry. It found the resulting product, BluWit, delivered impressive results. In production trials at denim mills using BluWit as a reducing agent led to 95% sulfite-free effluent with 60% less salt, and it reduced chemical oxygen demand (COD) by 5%. In wastewater, total dissolved solids were around 60% lower than normal. The plant-based reducing agent is said to be odourless, biodegradable and easy to handle. "This is the first time there's an alternative that produces authentic denim," says Mr Bock. "You can make a dark shade and have a progressive wash tone, and it's reproducible. This is a breakthrough in the concept of dyeing indigo."

Supply chain cohesion

At Kingpins Amsterdam 2022, Italian chemicals maker Officina39 expanded its Aqualess mission with 'Just One Step Process', which, in collaboration with BluConnection and denim mill Naveena, combined several solutions to save time, energy and water. It claimed the combination of products made it possible to place a raw garment in the machine and produce a vintage effect, ready to be dried. Using DenimBlu30 and BluWit – which was officially launched in April 2022 – boosted the efficiency, making it easier to neutralise the garment, reducing time and water consumption by 50%, they said. "We are constantly working on reducing the number of processes and washes that are traditionally applied in garment finishing," Andrea Venier, Officina's CEO, told *Inside Denim* at the fair.

The new facility is built to be clean and efficient. The company estimates if all denim was dyed with DenimBlu and BluWit, a minimum of 70,000 tons/year of hydrosulfite could be replaced by a natural product.

Working alongside supply chain partners like Officina39 is something that happens often but, like many downstream suppliers, BluConnection is not often namechecked, says Mr Bock. "We are regularly collaborating with our suppliers, partners and customers, for instance Tonello, Candiani or Naveena. It was the combination of our products that made the difference for Just One Step, and Andrea wanted to credit us," he explains.

QR code traceability

The European Commission is forging ahead with its circular and green ambitions, with the introduction of various rules and legislation by 2030 that will mean brands and fashion companies will be required not only to look at the circularity of their products but also take more responsibility for their supply chain and be transparent in their decision making. Underpinned by the European Green Deal, the Strategy for Sustainable and Circular Textiles, the Extended Producer Responsibility Scheme, Ecodesign for Sustainable Products Regulation and Digital Product Passports are set to shake up the sector.

Even before these regulations were announced, BluConnection launched a hangtag and QR system that details the composition of its products, energy and water consumption as well as any impurities generated. This can be combined with Eco Passports and test results, offering a route to transparency. Adding the new factory's footprint means the carbon and water credentials are further improved. "We can do a full disclosure of everything – where our raw materials come from, what went into our products, how much water, how much energy. With the new regulations coming up, brands will be forced to look into this and make a conscious choice about who they work with," adds Mr Bock.

He believes it is not difficult or costly to adopt these tools, nor to swap to plant-based reducing agents and it is more a question of trying to alter mindsets and the effort needed to instigate the changes. When asked what brands demand of suppliers, Mr Bock counters, "We want them to walk their talk. They ask for sustainable solutions. We have the products, we have the expertise and we are here to support. With our new facility we are set for the future. With our commitment to achieve net zero in 2030 we are contributing to the society in Singapore and the indigo world."

Skeins of hand-dyed indigo yarns at Sakamoto Denim.
PHOTO: TILMAN AT WRÖBEL

Selvedge denim by Kaihara.
PHOTO: KAIHARA DENIM

Into the future with Kaihara

The name Kaihara should no doubt be familiar. It manufactures denim and selvedge denim fabrics that are surprisingly cost-competitive for goods made in Japan. Its accessible prices have made Kaihara one of Uniqlo's global partners. The Japanese retailer has very successfully and astutely marketed them. You might have seen, fitted or even own a pair of Uniqlo jeans cut in a Kaihara selvedge denim fabric, for they are sold at incredibly tempting prices.

Kaihara's fabrics are also chosen by many premium denim brands across the world, including Nudie Jeans and Edwin. Brands are mostly, and noticeably, quite happy to highlight the origin of the fabric they use to make their jeans from, all the more so if they can proudly proclaim that the fabric is "made in Japan, by Kaihara Denim". Few mills have achieved such a level of desirability amongst a broad following of denim lovers.

It is said that Kaihara has a domestic market share of 50%. This means that every second pair of jeans sold and worn in Japan is made from a denim fabric made by the mill. Simply amazing. With this in mind, you can begin to imagine the size of Kaihara Denim's factories, as there are more than one.

FACTORY TALK: KAIHARA DENIM

When it comes to denim mills, it is common enough to think that experienced human eyes and hands are involved in the making of great denim fabrics. Can you imagine a mill without any humans? Your fabrics made by robots? If not, read on, and join me on a trip to Kaihara Denim.

But first let's catch up on our history lessons. Businesses in Japan are often family affairs, and so it is with Kaihara. The Hiroshima-based company began selling indigo "bingo-kasuri" cloth in 1893. If you are not familiar with bingo-kasuri, it is a soft, ancient and traditional Japanese fabric that is woven so as to store air inside its weave, which makes it cool to wear in summer and warm in winter. The fabric is woven on very slow wooden shuttle-looms, and often has an ikat texture. Kaihara became famous for its indigo bingo-kasuri fabrics.

The company began manufacturing denim fabrics in the 1960s. The fully integrated mill covers all operations from spinning to finishing. It sources its cotton from the United States, Australia and Brazil. Today the company sells its denim fabrics to more than 30 countries. These are made in one of the four different plants it operates in Japan.

Not so long ago I had the chance to meet Yoshi Kaihara personally. I was introduced to him in a typical old-fashioned hot-pot restaurant in Hiroshima. He said to me, “tomorrow I will show you something surprisingly new”. The next day, I was extremely eager to see what Mr Kaihara says is “surprisingly new”. It was a cold winter day in the city, and considering my jetlag, not easy to wake up early. When I first saw the factory, it resembled what I thought was a huge trade-fair ground with massive exhibition halls. Very clean and very grey. Mr Kaihara was waiting for us, excited like a kid, wearing his US-style five-panel denim cap. This is when he told me he had built a plant with fully 100% robotised spinning, weaving and finishing units.

Only six people manage the robots that manufacture denim fabrics in the hundreds of thousands of yards per month (or so, this number may not be fully accurate, as I said, it was damn cold, very early and my jetlag was no help). Suffice it to say that the factory is huge, and the stock of denim fabrics in the warehouse more than massive. I immediately took out my camera, but Mr Kaihara gently told me, “no images at all”. This will be the first Factory Talk I write for *Inside Denim* with no photos to show the inside of the plant.

But let me tell you: when I entered the operational area, I felt like I was “beamed up” into a Star Trek episode. The floor was clean and shiny, nicely painted. No dust, no waste, no sign of any work in progress. At first glance, there was no one around. Not a single worker. Bright lights, spick and span cleanliness. Automated vehicles were driving around with orange flashing lights. Dr Spock, where are you?

The famed label of the family-owned mill founded in 1893. PHOTO: KAIHARA DENIM

View of the factory based in Hiroshima.
PHOTO: KAIHARA DENIM

Yoshi Kaihara.
PHOTO: TILMANN WRÖBEL

As we walked around, the flashing automated vehicles would stop and wait until we moved away or crossed their tracks, and then continue with their tasks. The smaller vehicles would transport bobbins of cotton yarns, the heavier ones bolts of fabrics. And when I say, “heavier ones” think “truck-size”. Robots transport cotton bobbins to the spinning unit, install them on the machine while other vehicles could be seen transporting huge rolls of indigo warps. Big robot arms install these directly on the rapier weaving machines. I was impressed.

Normally a hall of rapier weaving machines is very noisy. But here, it felt soft and nearly quiet, all in perfect harmony. The six engineers could be seen walking discreetly around the units, checking the robots to make sure everything was going smoothly.

This is the future. A future without my friends, my fellow human beings. I felt I had stepped into a time tunnel. It is difficult to imagine what this factory will look like the next time I visit it. This is the future of denim. You have my full respect, Mr Kaihara. ■

Tilmann Wröbel is the founder of Monsieur-T, the ‘denim lifestyle’ studio. He started his career as a haute couture designer before moving into streetwear and denim. He has worked as a designer and consultant for some of the world’s top brands. He is based in Dusseldorf, Germany, and Biarritz, France.

MONSIEUR_T_OFFICIAL/PHOTO: CHRISTIAN GEYR

Solomon Russell's passion for denim, its history and culture is infectious. He started his business, Left Hand Twill, in 2014, selling carefully curated vintage items online and through hubs in Colorado and vintage markets around the US. He also designs limited edition denim ranges, teaming up with mills such as Bossa and Soorty.

ALL PHOTOS: LEFT HAND TWILL

CLOCKING ON...

With music as a backdrop, Left Hand Twill's Solomon Russell finds inspiration in the classics, curating his archives and catching up on denim's latest developments.

Vintage advantage

6.30am

I'm a creature of habit so I tend to wake up around the same time. I put my coffee on and scroll social media. It's kind of a brain-dead way to get my day started but I think more of us are in that boat than not.

7.30am

I hop in the shower, afterwards I do my daily stretching routine. The older I get the more important that has become; I can't afford to be stiff as a board. I check my email, have a Zoom call on occasion. I like to read what's going on within the industry. There's always something new and cutting edge to read about and *Inside Denim* keeps me updated. LinkedIn is a reliable resource but if I have a deep question, I'll reach out to industry friends, who are always happy to help.

8.00am

I put some music on, typically music with no lyrics. I can get carried away and tend to sing or rap along to whatever I'm listening to. I go over some of my conceptual designs, add to my mood board and try to bring some inspiration in for new design ideas. Creatively, I work best in the morning. Back when L.H.T. was working with Soorty on our "Own Your Denim" collaboration, most work was done in the morning and that worked out for me being in Colorado because of the time difference between Pakistan, Turkey and New York.

9.30am

I finally get around to eating breakfast. I typically keep it light and have yogurt, granola, fruit and a bagel. It sounds like a bad continental breakfast at a hotel but it works for me.

2.00pm

I head down to Circa Vintage, which is a shop located in Old Colorado City, where I have a few of my vintage items up for sale. I check my inventory, swap new pieces in and hang out for a couple of hours. Vintage denim has always been at the forefront for Left Hand Twill and serves as a daily source of inspiration. Being able to touch the fabric and see the fade patterns, the patina on the rivets and buttons not only helps create new looks for the design aspect of my business but also helps create stories around these new ideas.

Left Hand Twill's collaboration with Pakistan-based mill Soorty was inspired by vintage pieces but updated using sustainable fabrics and processes.

6.30pm

I begin making dinner. I usually put more music on, right now Notes & Tones by DJ Muggs is my go-to album while cooking. My knives seem to be sharpest while listening to the sweet sounds of the Soul Assassins, I could filet a whole fish if the music is right.

8.00pm

By now I'm usually settled in for the night. On some occasions I might have a creative thought or idea that I'll work out but for the most part I try to turn my brain off. I'll catch up on some shows, drink ginger tea, have a snack and chill out.

11.30pm

My eyes are heavy like 20oz denim, the yawning is continuous and my body knows it's time for some sleep. My eyelids close only for me to dream about all the different washes, selvedges and the indigo that has brought us all here today.

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