

WORLD FOOTWEAR

ISSUE THREE 2021 • VOLUME 35 No.3

THE MAGAZINE FOR THE GLOBAL SHOE INDUSTRY



Foot scans are easier than ever
Dutch safety shoes come full circle
A penchant for old-style welting
Dr Martens: talent magnet


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Our cover image is from Bavarian outdoor footwear company Hanwag, which is celebrating its centenary in 2021.

Image: Hanwag

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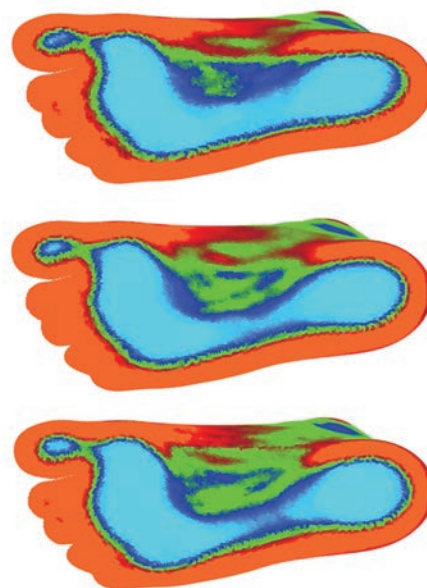
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World Footwear is published 4 times per year by World Trades Publishing, 36 Crosby Road North, Liverpool L22 4QQ, England. Price UK £80, ROW £135 per year (four issues). Credit cards will be charged in GB Pounds converted at the daily bank rate. Your credit card company may charge you for this service. Graphic origination by WTP. Print by Bishops Printers, Walton Road, Portsmouth, Hampshire PO6 1TR, England. All rights reserved. ISSN 0894-3079.

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News

SWITZERLAND Sporting goods retail group Intersport has sold 100% of specialty footwear chain The Athlete's Foot (TAF) to Arklyz Group for an undisclosed amount. The transaction is set to be completed by the end of July. Intersport chief executive, Steve Evers, said other parties had been interested in acquiring TAF but he insisted that Arklyz was "a strong investor" and would help TAF continue to grow "rapidly and successfully".

FRANCE Designer Alber Elbaz, long-time creative director of Lanvin, has died. Mr Elbaz died in Paris at the end of April from covid-19. He was 59. Mr Elbaz was born in Morocco but grew up in Israel. He began his career in fashion in New York but had been based in Paris for 25 years. He had spells at Guy Laroche and Saint Laurent before joining Lanvin in 2001. He became the brand's creative director and worked there until 2015.

GERMANY The European Sporting Goods Industry Federation (FESI) has announced its former president and a longstanding Puma executive has died aged 80. Horst Widmann was president of FESI for 10 years from 2004 and worked at Puma for 27 years. Neil Narriman, FESI president and Puma general counsel, said: "No one really believed he would ever retire, which he only did when he was nearly 77 years old. Internally he was often referred to as Mister Africa since his contacts in Eastern Europe and especially in Africa had been very useful in bringing football teams and players to Puma, enriching our diverse company culture."

ITALY Industry association Assomac has said its Simac-Tanning Tech event, which is scheduled to take place in Milan from September 22 to 24, will offer footwear machinery manufacturers the chance to restart their businesses after the pandemic. Simac-Tanning Tech will run alongside Micam, Lineapelle and Mipel. Assomac said it was hopeful of seeing representatives of all parts of the international leather industry in person in Milan for the events. President Maria Vittoria Brustia said she thought having leather industry people gather again in Milan could be "a decisive moment" in the sector's revival.



SPAIN Events organiser Ifema Madrid has announced the return of its Momad event in September. It will run in the Spanish capital from September 17-19 and will include footwear among its components. Momad last took place in February 2020. Footwear's inclusion in Momad has had a patchy recent history. Madrid used to have a dedicated footwear exhibition called Modacalzado (a combination of the words for 'fashion' and 'footwear'). It was subsumed into the wider Momad fashion event in 2013.

NIGERIA Nigeria's vice-president, Yemi Osinbajo, said the country's leather sector has the potential to grow by 70% by 2025, generating \$1 billion annually. He said the Aba shoe cluster in Abia state already exports almost a million pairs of shoes weekly, mostly to destinations within Africa, but that most of this trade was "informal". Properly organised, he said there was great potential for growth.



SOUTH AFRICA To promote South Africa's Retail, Clothing, Textiles, and Leather Footwear Master Plan, government officials have visited footwear manufacturers, asking them to commit to training and building capacity. The Deputy Minister of Trade, Industry and Competition, Ms Nomalungelo Gina, said doing business locally must be prioritised so investors will view the sector as lucrative. She said: "If we do not support and manufacture our products in the country we have nothing to offer to our neighbours and the rest of the world."

SOUTH KOREA Italian Fashion Days in Korea took place in Seoul in mid-July, led by footwear industry body Assocalzaturifici, Italy's Ministry of Foreign Affairs and International Cooperation, and the Italian Trade Agency (ITA), among others. A total of 39 Italian brands participated, including several footwear and leathersgoods brands.

CHINA The Chinese city of Wenzhou, Zhejiang province, reportedly known as the country's "shoe capital" since 2001, is currently undergoing rapid digitisation. The China Shoe Capital Industrial Park in the city's shoemaking Lucheng district is being developed into a digital-first "fashion shoe town", along the lines of a smart city.

JAPAN Sports brand Asics has launched updated versions of its Novablast and Dynablast shoes in a new series it has called Blast Beyond. It said Novablast and Dynablast had received "a rapturous response from the running community" on their launch last year and that the new iterations have "even more bounce" from a proprietary foam called FF Blast in the sole.

HAITI Clothing and footwear brand Timberland has reached an important milestone in its five-year journey to reintroduce cotton growing in Haiti in partnership with the Smallholder Farmers Alliance (SFA), with the launch of footwear made with Community Cotton fibre. Atlanta McIlwraith, director of global community engagement and activation for Timberland, said: "Five years ago, Timberland set out with a vision to bring cotton farming back to Haiti after a 30-year hiatus."



INDIA India's Council for Leather Exports (CLE) has reported export revenues of just under \$3.7 billion for the country's most recent financial year, the 12 months spanning April 2020 to March 2021. This figure represents a fall of 27.4% compared to the previous financial year. For leather footwear, the figure for export revenues was just under \$1.5 billion, down by 28.6% year on year.

INDONESIA The Purchasing Managers' Index (PMI), which gauges the condition of the manufacturing sector, based on surveys of local manufacturers, gave Indonesia a score of 54.6 in April, up from 53.2 in March. A PMI above 50 indicates expansion. Indonesia's figure for April is a new high. Information provider IHS said Indonesian manufacturing was ramping up because there was a strong expansion in new orders.



BRAZIL Shoe manufacturers exported 8.5 million pairs during the month of April, according to figures published by the country's main footwear industry body, Abicalçados. It said this total represented an increase of 76% compared with the same month in 2020. Revenues from these shipments reached \$65 million, an increase of 115% year on year. For the first four months of this year, footwear exports achieved a cumulative total of 40.5 million pairs and revenues of \$258.8 million. These totals represent an increase of 10.1% in volume, but a decline of 4.6% in revenues year on year.

AUSTRALIA Two Australian scientists have called the campaign to ban the import of kangaroo products into the US an "own goal". George Wilson from the Australian National University and John Read from the University of Adelaide said a bill introduced into the US House of Representatives earlier this year would lead to more amateur culling in Australia. A marketing campaign in the US, 'Kangaroos are not shoes' is aimed at stopping Nike, adidas and other brands using kangaroo leather in football boots. The professors said: "Our research shows the kangaroo industry leads to better kangaroo welfare, more stable populations and improved conservation outcomes."

Footprints

CNC RE-ELECTS FRANK BOEHLY AS PRESIDENT

French industry body, the Conseil National du Cuir, has re-elected **Frank Boehly** as its president. Mr Boehly has held the role since 2014; he has now been re-elected for his third term in the post.

On being re-elected, he said that in his previous mandate, CNC had represented the industry well before the authorities in France, protected leather's identity well and showcased the craftsmanship and skill of the artisans who work in different areas of the industry.

For this new mandate, which will run until 2024, he said the organisation would emphasise the industry's commitment to sustainability and respond to demands for traceability and transparency.

EX-COACH CHAIRMEN LAUNCH GEN-Z IDEA

Two former chairmen of Coach, **Lew Frankfort** and **Jide Zeitlin**, are using their combined management and market expertise to identify new acquisition targets. To this end, they have set up a new special purpose acquisition company (SPAC), **Bleuacacia**.

Its founders have said specifically that they want to target businesses and brands with powerful emotional engagement with Millennial and Gen-Z consumers.

BLOCKCHAIN BODY APPOINTS GENERAL SECRETARY

Aura Blockchain has appointed former Balenciaga and Gucci executive **Dr Daniela Ott** as its first general secretary. Aura Blockchain is a new non-profit organisation launched in April by luxury companies LVMH, Prada and Cartier.

Its aim is to promote the use of blockchain technology to make sure consumers have the information they need on transparency, traceability and product authenticity. Aura will push for the use of a single global blockchain solution platform, which it says will be open to all luxury brands across the world.



Blake Krueger (left) and Brendan Hoffman.
CREDIT: BUSINESS WIRE

NEW CEO TO TAKE OVER AT WOLVERINE AT YEAR END

Outdoor footwear group Wolverine World Wide has announced that **Brendan Hoffman**, whom it appointed as company president last September, will take over as chief executive at the end of this year.

Wolverine said on appointing him as president last year that he would initially work with current chief executive and company president, **Blake Krueger**, and "transition over a period of time" into the chief executive role. That period of time will last until the end of this year.

The group paid tribute to Mr Krueger, who has worked at the company for the last 28 years. It said that in his time as chief executive, a post he took up in 2007, he had transformed Wolverine "from a traditional footwear wholesaler into a consumer-obsessed, digital-focused growth company with one of the world's largest portfolios of footwear and lifestyle brands".

He will continue to be involved. After the handover he will become executive chairman, will continue to lead the board of directors and will work with Mr Hoffman on "key international and strategic initiatives".

On taking up the post, Dr Ott described Aura as "a visionary collaboration" that will address "shared challenges" and drive change in the luxury industry.

She said blockchain technology, which works by matching information about a product to information about a client through a chain of secure, non-reproducible, digital blocks, will help luxury brands communicate with consumers about authenticity, responsible sourcing and sustainability.

BURBERRY CEO TO LEAVE FOR FERRAGAMO

London-based luxury brand Burberry has announced that its chief executive, **Marco Gobbetti**, will leave the company at the end of 2021.

Burberry explained that Mr Gobbetti

had decided to take up "another opportunity" that will allow him to return to his native Italy and be closer to his family. Bloomberg has reported that the new opportunity will be as chief executive of Ferragamo.

DE MONTFORT STUDENT WINS AWARD

A footwear design student at De Montfort University in Leicester, **Jihee Ahn**, is the winner of the 2021 Cordwainers Footwear Awards.

Students from De Montfort, the University of Northampton and London College of Fashion took part in the competition, submitting their portfolios digitally owing to covid-19.

Second prize went to **Kamile Peleckyte** from London College of Fashion, with **Reuben Crabbe**, also

from the London College of Fashion picking up the third prize. A special sustainability award went to **Louise Pietrzyk**, another London College of Fashion student, while there was a commendation for **Maartje den Boer** from De Montfort University.

Head judge, **Katie Greenyer**, the creative director of Pentland Brands, said that judging the students' portfolios had been like "entering into the minds of passionate, extremely talented footwear designers". She said this year's entries were a credit to the three participating universities and the staff who work there.

Master of the Worshipful Company of Cordwainers, the London livery company that runs the awards, **Peter Lamble**, said: "The awards embody the company's core purpose, demonstrating our ongoing commitment to supporting the footwear industry and student footwear designers."

CO-FOUNDER OF VANS DIES

Footwear brand Vans has announced the death of co-founder, **Paul Van Doren**. Mr Van Doren died on May 6 at the age of 90, just days after the publication of his autobiography, 'Authentic'. With his brother, James, and a group of friends, Paul Van Doren founded Vans in Anaheim in 1966. He ran the company until 1976, when James Van Doren took over.

On announcing his death, the brand said that Mr Van Doren had been not just an entrepreneur but an innovator. It quoted his legacy as being a determination to "do what's right, stand behind what you do every minute of every day and take care of people" and said countless consumers had bought into this across the decades.

TRIBUTE TO NIKE LEADER

Sportswear brand Nike has released a skate shoe made using its Flyknit upper, designed as a tribute to the former general manager of its skateboarding division, **Sandy Bodecker**, who died in 2018. Mr Bodecker joined Nike as a footwear test co-ordinator in 1982.

He was behind Nike's quest to break the two-hour marathon barrier and the subsequent invention of NEXT% running technology. He believed the idea could translate into skateboarding, and the Nike SB Sandy ZoomX Bruin is the result.



Shoe designer Hommy Diaz celebrates his competition success with Queen Máxima of the Netherlands during her visit to Smit & Zoon to celebrate the company's 200th anniversary.

CREDIT: TWYGER/SMIT&ZOOM



LA DESIGNER WINS SHOE CHALLENGE

Los Angeles-based designer **Hommy Diaz** has emerged as the winner of a competition that leather chemicals group Smit & Zoon organised as part of the celebration of its 200th anniversary this year.

It invited five shortlisted designers around the world to create shoes with the emphasis on longevity, using chrome-free, heavy metal-free and aldehyde-free Zeology-tanned leather from tanners working with Nera, the company Smit & Zoon set up in October last year to bring new tanning solutions to market.

Hommy Diaz's winning entry was a pair of functional and fashionable slip-on sneakers that he called Home Base. He will have the opportunity to showcase the design at WHITE Milano, during the Milan Fashion Week in September.

FORMER NIKE AND UA EXECS LAUNCH OWN BRAND

Two sports footwear executives, **Kevin Fallon** and **Dave Dombrow**, who worked together at Nike and then Under Armour, have launched their own trail-running shoe brand, Speedland.

Its first shoe, the SL:PDx, became available for pre-order in June and the brand has said it will deliver the shoes on August 15. Supplies are limited.

The product has a customisable Michelin outsole, a removable Carbitex carbon plate and a knit upper with Dyneema fibres and a moccasin stitch to eliminate lamination and glue. The shoe uses the Boa lacing system.

Mr Fallon told *Forbes* at the time of the launch that most big companies see footwear as a commodity product, with new designs needing to hit specific price points that lead to compromises in material selections. "We want to use the best components at every level and not de-cost it," he said. "It is a different way of looking at it, more like equipment."

One new idea is that the lugs can be cut. They come at a height of 6.5 millimetres, but can be cut down to a height of 3 millimetres to allow wearers

to choose the height that suits them best, depending on the terrain or the season of the year in which they want to run. The shoes cost \$375 per pair.

INFLUENCER BECOMES SHOE BRAND'S CREATIVE CONSULTANT

Danish fashion stylist and influencer **Pernille Teisbaek** was recently named creative consultant at Gia Borghini, formerly known as Gia Couture, a Florentine shoe label specialising in handmade luxury fashion footwear. Since early 2020, Ms Teisbaek has worked on four successful collaborations alongside the label's founder and designer, **Barbara Borghini**.

Together, the two creatives will now map out a "new" Gia, Ms Borghini said, with the Copenhagen-based influencer taking on a much-expanded role in design and branding across the brand as a whole. Commenting on the news, Ms Teisbaek told her more than one million Instagram followers: "We have great synergy in our ambitions for future collections and [our vision of] the brand's DNA and I look forward to being on this journey with Barbara and the team." 📌



Industry&Innovation

CIRCULAR MATERIAL FROM LEATHER WASTE

Wet blue, crust and split supplier KT Trading has joined forces with Finnish bio-materials manufacturer Spinnova to produce what the two companies are calling “a new category of sustainable and circular textiles”. They intend to begin pilot-scale production of the new material, which they have called Respin, before the end of the year.

The launch of Respin comes three years after the Applied Research division of Ecco first took an interest in what Spinnova was doing.

KT Trading, a long-term supplier of semi-finished hides to Ecco Leather, has said Respin will use wet blue shavings from European tanneries, including Ecco Leather’s facility at Dongen in the Netherlands, in the pilot phase of production.

SYSTEM HAS TECHNOLOGY FROM DESMA AND STOLL

Soling technology provider Desma has entered a new partnership with textile machinery developer Stoll to put together a new integrated shoe production system. The companies have said the system they have devised has the potential to offer shoe manufacturers a “radical reduction of lead times in the development and production process”.

This process starts with the production of seamless, 3D-knitted uppers using Stoll flat weft knitting technology, which are then attached directly to dual-layer sole constructions using direct sole attachment technology from Desma.

Both partners have said the new solution will reduce the number of production steps required to make a shoe and reduce waste.

EXPANSION PLANS FOR ISA TANTEC TANNERY

Leather manufacturing group ISA TanTec has announced that an expansion programme is already under way at TransAsia TanTec. Production began at this, the second of two tanneries the group has in Vietnam, last year.

It said it had begun a project to expand TransAsia TanTec’s capacity to 5 million square-feet of leather per month. ISA TanTec said it aims to have the project complete in the first quarter of 2022, “ready for the next peak season”. It said it regarded the expansion project as a necessary step because it is preparing for “a strong year” in 2022.

PROMISE OF CUSTOMISED SHOES FROM MYCELIUM

H&M Foundation has launched a virtual fashion collection to showcase ten “groundbreaking innovations that could disrupt the fashion industry”.

Calling it the Billion Dollar Collection, the H&M Foundation, an independent, non-profit global foundation funded by the main owners of fashion retail group H&M, has included MycoTEX among the ten ideas.

MycotEX is a manufacturing technology that allows custom-made finished products to be crafted from lab-grown mycelium. The start-up hopes winning a place in the Billion Dollar Collection will enable it to raise the \$3 million it believes it needs to scale its business up and run it between now and 2030.

Nicoline van Enter, founder of footwear design and manufacturing consultancy The Footwearists, is one of the co-founders of MycoTEX. She said at the time of the announcement that the solution can optimise the entire fashion supply chain, reducing it to only a few steps and using a mycelium-based material that requires no farmland to produce.

She claimed the technology would enable full, seamless, custom production of footwear and other soft goods using a completely automated system and a home material that could replace plastic or leather. She said there will soon be an announcement about a partnership between MycoTEX and “a technology supplier that is well known in the shoe industry”.

TIMBERLAND EDGES TOWARDS CIRCULARITY

Footwear brand Timberland is launching a product take-back programme

developed in partnership with recycling and sorting company ReCircled. It supports the brand’s vision, announced last autumn, for its products to have a “net positive impact” on nature by 2030, through a commitment to regenerative agriculture and circular design.

Beginning in August in the US, consumers will be able to return any Timberland footwear, clothing or accessories to a Timberland store, to either be refurbished for sale on a re-commerce platform, or upcycled into future products. A digital, ship-from-home option will be available later in the summer.

The programme is slated to expand to Europe in the autumn, and Asia-Pacific in spring 2022.

TAGGED THREAD CAN COMBAT COUNTERFEITING

Technology provider Applied DNA, which provides DNA-based product authentication solutions, has worked with thread manufacturer American & Efird (A&E) to develop thread that will allow brands to authenticate and validate their products anywhere within the supply chain.

A&E Integrity ECO 100 is the name of the line of sewing thread resulting from the project. It incorporates Applied DNA’s CertainT molecular-based technology, which allows A&E to tag the yarn it uses to make the thread, which in this case is yarn from 100% recycled fibre.

This, in turn, makes it possible for brands to verify their products or components in the field through the use of a portable PCR testing tool.

Australian designer Sara Caverley has already announced her intention to use A&E Integrity ECO 100 in a new footwear collection. She said she wanted to provide “tangible proof” of the authenticity of the materials in her products.

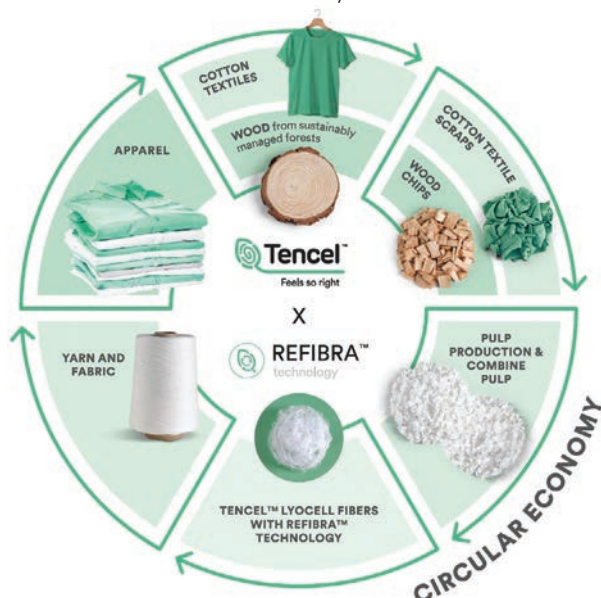
Commenting on the development, A&E executive vice-president, Chris Alt, said: “Our customers are hyper-aware of the detrimental effects of counterfeit products, from lost sales to the potential loss of brand equity. It’s a real and global threat.”

Sustainable shoes made from TENCEL™ fibers

Climate change is one of the most pressing challenges of our generation. As the first cellulosic fiber producer committed to Science Based Targets initiative (SBTi), Lenzing wants to drive the change for a decarbonization within the fashion industry. Therefore, the TENCEL™ True Carbon Zero branded lyocell and modal fibers have been introduced this year, designed to set a new benchmark for sustainability. By reducing carbon emissions and using renewable energy during production, TENCEL™ goes beyond carbon offsetting to lower its carbon footprint.

Upcycling champion: TENCEL™ x REFIBRA™

Circular economy solutions are essential to counteract the exploitation of our endless resources. Lenzing's innovation, whose origins date back to 2017, is the TENCEL™ Lyocell x REFIBRA™ technology. In this process, up to 30% cotton fabric waste is integrated into the production cycle and transformed into new virgin TENCEL™ Lyocell fibers. Based on the award-winning efficient closed loop production process of standard TENCEL™ Lyocell fiber, REFIBRA™ technology offers a pragmatic solution to accelerate circular economy also in the footwear industry. This method is designed to help tackle the industry's notorious waste problem. The goal is to offer Viscose, Modal and Lyocell staple fibers with up to 50% post-consumer recycled content on a commercial scale by 2025.



Doing good for the planet by saving resources

Another important area is water scarcity and improving the water footprint. The apparel and footwear industry is one of the biggest contributors to wastewater and water pollution and according to a publication by the Worldbank, around 20% of wastewater worldwide comes from fabric dyeing and treatment. TENCEL™ Modal x Eco Color technology, Lenzing's spun-dyed fiber solution does not require subsequent dyeing. At this



process, the color pigments are deeply embedded in the TENCEL™ Modal fibers. It consumes significantly less water, energy and carbon dioxide compared to conventional dyeing, making it an excellent choice.

Go vegan

TENCEL™ Luxe Eco Botanic Filament yarns complete the range of Lenzing's sustainable innovations for footwear. This vegan yarn option opens new areas for silky-soft luxury fabrics with a luster, derived from renewable resource wood, based on an environmentally friendly closed-loop process.

A growing number of brands and suppliers for the footwear and fashion industry are adopting the UN Sustainably Development Goals or the Science Based Targets initiative. Lenzing is the first wood-based fiber producer to obtain approved Science Based Targets and is working towards a long-term vision of being net zero. All of these innovations can help the footwear industry to achieve a better economic footprint.

To learn more, visit us at the Lenzing booth at Lineapelle Milano.



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technology

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Backtrack

World Footwear's publishing cycle and limitations on space make it impossible for us to run more than a carefully selected sample of news from across the industry. However, we publish hundreds more stories on **www.footwearbiz.com**. The site is updated every day with news from every continent and every part of the industry, making footwearbiz.com one of the most

comprehensive archives of news anywhere on the web for the global footwear industry.

We list below just a few of the headlines that have appeared on the site in recent weeks — **www.footwearbiz.com** allows you to read those you have missed.

07/07/2021

Gallery Shoes aims to keep covid away
Materials rethink could favour leather

06/07/2021

LVMH's new roots highlight sustainable luxury focus

05/07/2021

Suitors line up for Reebok

02/07/2021

Jimmy Choo owner confident on luxury outlook

01/07/2021

Istanbul event goes ahead in person

30/06/2021

Increased tech and ASEAN focus for Li-Ning
BASF rebrands plastic additives business

28/06/2021

'Pivotal' year brings big revenue increase for Nike
Micam to return to traditional form

25/06/2021

Ecco opens first Prime store in Seoul

24/06/2021

ZDHC publishes second Impact Report

23/06/2021

Yantian port delays pose golden quarter risk
Researchers assess covid risk from handling leather shoes
Fresh thinking at Designer Brands

22/06/2021

Puma celebrates skate label tie-up
Growth for Dr Martens, despite pandemic

21/06/2021

Bright horizons for Fujian's exports to Japan

18/06/2021

Investment tie-up eyes medium-sized Italian brands

17/06/2021

Xtep cash boost for K-Swiss, Palladium growth

16/06/2021

Puma translates Ferrari's vision into footwear

Trade deal will bring China big opportunities in shoes and leather

Descente on third run of R90 'Korean fit' golf shoes

15/06/2021

Tapestry increases its use of leather from LWG silver and gold tanneries

14/06/2021

Spinova prepares to hit the big time with adidas backing
Lanvin's FFG acquires Sergio Rossi

10/06/2021

Leather UK director: claims around alternative materials are untrue
Adidas Originals marks Paris eco push with recycled Stan Smiths

09/06/2021

It's 150 manual operations for each Goodyear-welting shoe at Paraboot
New Louboutin designs combat racial injustice
Puma partners Rhude's Rhuigi Villaseñor
Footwear brand banks on protection with traceable thread

08/06/2021

Factories busy again in Indonesia
Search for new apprentices under way at Dr Martens

07/06/2021

'Honey rubber waves' make their mark in Loewe shoes
Imperfections laid bare in new Puma shoe

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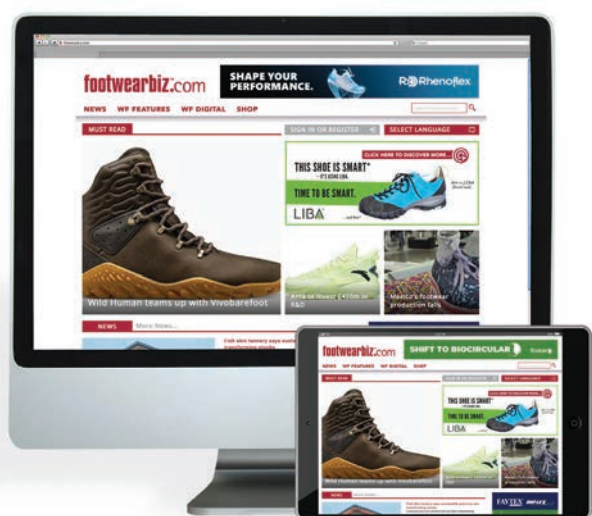
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3D printed lasts and insoles

3D printing and TPU materials offer new possibilities for orthopaedic footwear.

ALL CREDITS: COVESTRO

Some people are unfortunate enough to be either born with deformed feet or to acquire them through illness or injury and therefore need special footwear. The orthopaedic shoemaker tasked with making them faces a major problem from the outset as no two customers are ever alike. It is not just a case of different sizes between the right foot and the left, as one may be normal and the other not; alternatively, they may both be of a totally different shape. This clearly leads to all manner of manufacturing problems and it is for this reason that orthopaedic footwear is frequently so complex and always expensive.

Custom-made shoes of this nature are special. They are the therapy of choice for patients whose condition cannot be treated effectively with ready-made

shoes, alterations or orthoses. With a severely deformed foot, a custom-made shoe is the only real choice available to assure a proper fit, protection from irritation and the hope of remaining ambulatory. They can also be produced with an almost unlimited list of special accommodations such as built-in rocker bottoms, wedging, heel-pitch and toe shapes. To meet such a wide range of therapeutic requirements and cosmetic needs, special lasts have to be produced for each individual patient.

TIME CONSUMING

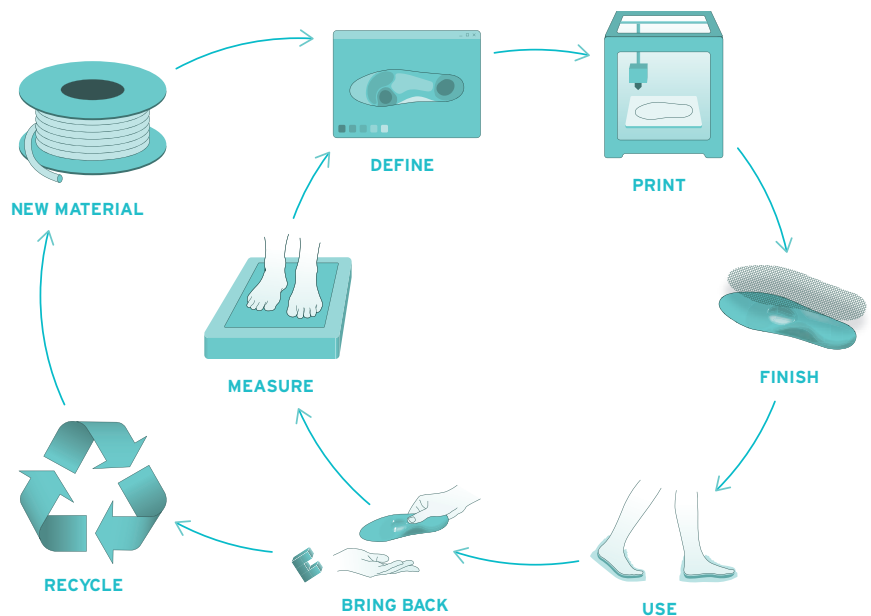
Orthopaedic shoemakers usually need weeks to make custom-fit shoes for their patients with much of the time spent in producing the necessary lasts. This has traditionally involved a great deal of time and skill which inevitably costs money.

The advent of foot scanners followed by 3D printing using advanced polymers has brought about radical changes that are helping to reduce both the time and increases costs involved in producing orthopaedic footwear. In the forefront of this trend are German materials manufacturer Covestro and orthopaedic services provider GeBioM mbH and its subsidiary go-tec GmbH, also from Germany, who have together made it possible to 3D print this type of last.

Using traditional methods, an orthopaedic last shaped to suit the individual requirements of a particular patient, is produced manually in a time-consuming process. Once it has been finished, the fit of the last is controlled by a so called trial shoe. This is a flexible, transparent foil, which gives the orthopaedic shoemaker the necessary

feedback he needs to carry out his work. This is why it has traditionally taken so long and cost so much to produce a pair of orthopaedic lasts.

All this has changed with the introduction of 3D printing. Now the foot can be scanned, the last constructed by digital means within minutes rather than hours and then, as a real game changer, the trial shoe is printed to control the work. If the trial shoe does not fit properly, the last can be adjusted digitally until it does. In this way, the shoemaker gets a digitally created 3D printed last on which he can produce his shoes. All the tedious hand measuring and shaping has been removed so both time and cost are drastically reduced and output is increased.



CUBIX 3D printed insoles are the result of an essentially circular process.

A SUCCESSFUL MARRIAGE

The key to this development has been the marriage of go-tec's specialisation in software solutions and technology with Covestro's wide experience in developing industrial 3D printing materials within its Addigy range of polymers. The challenge was to find a suitable material for 3D printing of plastic shoe lasts. The main problem encountered here was in creating a material that could meet the demanding requirements needed in order to make it similar to wood, the material usually used. It also had to cope with the heavy wear and tear the shoe last would be subjected to in the shoemaker's workshop.

The solution was a highly versatile custom-made Addigy TPU filament based on the company's polymer that provided both transparency and high elongation at break. Furthermore, the material proved tough enough to withstand nails, hot pressing and grinding in a workshop environment. This has enabled go-tec to print a bendable, transparent test shoe that can be put on a patient's foot in less than two hours after measuring and which can then be used for printing a final customised shoe last thus shortening the lead time for orthopaedic shoes by two to three weeks.

3D PRINTED INSOLES

Any orthopaedic footwear is expensive to produce and the worse the deformity of the patient's feet, the more expensive it can become. However, less severe conditions can often be

accommodated by well-designed comfort shoes, factory made on a deeper last that offers more toe room, a choice of width fittings and removable insert insole options. There can nevertheless still be extra work involved in producing these inserts to suit individual feet. They have traditionally been made by hand from cork because it is extremely light, offers excellent shock-absorption and cushioning, and is also easy to work. Today, they are increasingly being produced using polyurethane-based polymers and 3D printing where once again Covestro, GeBioM and go-tec are playing an important role.

Using their system, the patient visits an orthopaedic workshop where their feet are scanned with any one of go-tec's scanning devices in either 2D or 3D to find out where exactly the pain is located. An orthopaedic specialist then constructs the individual insole based on the scan in the go-tec CAD software. He or she then defines the stiffness of the material needed for each point of the insole, so that the patient's problem is not only solved by the shape of the insole, but also by the choice of a material with the right degree of softness. Based on these specifications, the insole is printed on a special 3D printer, which is able to print flexible Addigy FPU 79A TPU filament to produce a finished pair of Cubix insoles that fit into the patient's shoes (Cubix is a component of go-tec's CAD application that enables the individual setting of degrees of hardness).

FURTHER BENEFITS

Lukas Breuers, 3D printing expert at Covestro, says, "Our new TPU plastic and a printer developed specifically for this application make it possible to print very soft structures. The material and printer were harmonised during development to achieve a perfect result. With the help of the automated software solution, soft and hard structures can be combined in a shoe insole, achieving a level of customisation that was previously virtually impossible." The TPU used also meets the requirements for medical devices with regard to cytotoxicity and skin sensitisation in accordance with DIN EN ISO 10993-5 and 10993-10 standards.

In addition to functionality, the development of the material also focused on its ecological footprint as Marcel Domenghino, managing director of GeBioM, points out: "It was important to us that the new solution also allows for improved sustainability. Currently, the production of insoles also generates large amounts of waste. Moreover, the insoles themselves are hazardous waste after use. With 3D printing, we now enable our customers to produce in a waste-free manner by using only the material that is needed for the insoles." Covestro is in fact currently working on a recyclable TPU for this application thus creating an essentially circular process. For instance, the spools on which the filament is wound are already reused. ♻️

Slipping and falling

DR JEAN LUC CHAVEROT, MARYSE GARCEAU, CTC

Slipping represents a serious risk in the world of work and forms part of the mandatory requirements placed on safety footwear. It is also important with regard to city and leisure footwear, including trainers, intended for general day-to-day use. The anti-slip requirements for these types of footwear should therefore also be understood and assessed. In France, the permanent survey of day-to-day accidents (EPAC) estimated that almost

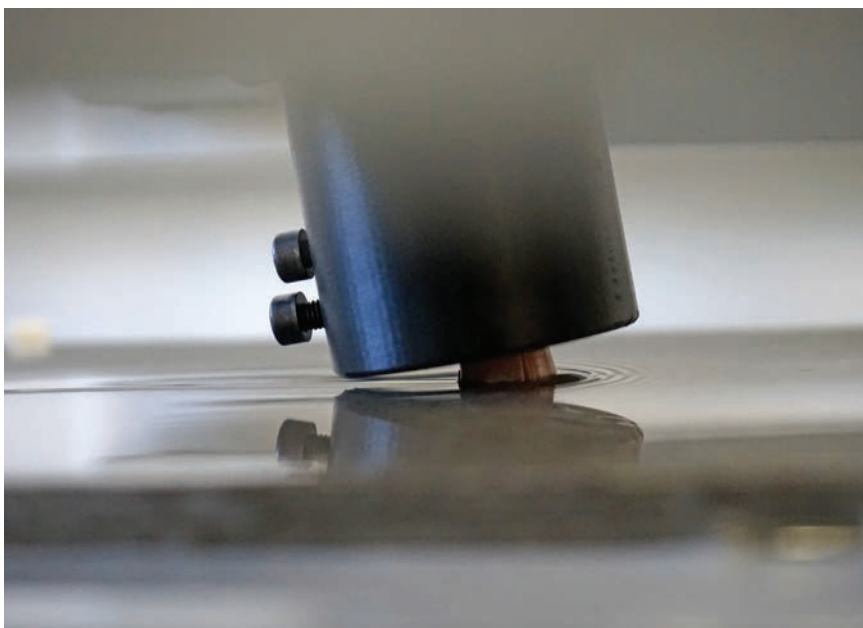
11% of the population had a day-to-day accident of some sort in 2017. Furthermore, almost 50% of accidents involve falling due to slipping. It is in fact the most frequent domestic accident.

These accidents are often considered to be harmless. However, they can cause very serious injury, ranging from permanent disability to even death. The parts of the body mainly affected by a fall are firstly, the lower limbs (feet, tibia, femur, etc.)

followed by the upper limbs (hands, elbows, wrists) due to the person's inability to fall safely. These accidents especially concern children and the elderly. In the case of children under the age of 15, accidents occur in the same place regardless of gender. They mostly have accidents at home (48%) and in public places (39%), half of which occur in sports and play areas. Falling is, by far, the most frequent type of accident (60%). Among the elderly, almost a third of whom have a

CREDIT: SHUTTERSTOCK/DMYTRO ZINKEVYCH





Testing top piece resistance to slippage. Top pieces are often a cause of slip problems on ladies shoes.

CREDIT: CTC

fall every year from the age of 65, it has a psychological as well as a medical impact.

In 2019, slipping and falling (16.3%) was the second greatest workplace risk (causing an interruption in employment for more than three days), after manual handling operations, which were the cause of 50% of accidents. Slipping and falling (15% of accidents) also represents the second cause of accidents on the journey between home and work (the first cause being the loss of control of a mode of transport (58%). Regardless of environmental conditions at the time of an accident (ground is slippery, obstructed, in poor condition or variation in the height of steps), falling due to slipping remains one of the main causes.

A RISK TO BE MASTERED

Falling is caused by a slip that cannot be controlled by the person involved who then loses their balance. Anybody who has to walk about is concerned about slipping. It is indissociable from locomotion as soon as two surfaces come into contact. Slipping is attributable to:

- A lack of grip between the sole and the ground,
- Environmental factors such as uneven surfaces, moisture and the presence of slippery elements,
- Human factors specific to each person.

As mentioned earlier, the risk of falling due to slipping is not limited to the workplace. To prevent these risks, city and leisure footwear must provide a level of grip that meets the needs of users as closely as possible. The sole, particularly the choice of soling material and the geometry of its tread pattern, plays a vital role in ensuring grip. To prevent a fall, a sole's resistance to slipping has to be determined and the coefficient of friction between interacting surfaces is an important factor for predicting slip resistance

during walking. To prevent a fall, two conditions have to be met:

- Restrict the initial slipping of the foot (static),
- Limit the speed of slipping so as not to lose the balance (dynamic).

NF EN ISO 24267

CTC, drawing on its know-how, offers various laboratory tests to assess the slipping of city and athleisure footwear. In order to respond to this problem and ensure the safety of users, standard NF EN ISO 24267 (November 2020) determines a test method. It applies to all types of footwear (casual, sports, high heels, sandals, etc.), outsoles, top pieces and sole material, except for PPE footwear and special purpose footwear containing spikes, metal studs or similar elements.

To simulate user conditions, forward-moving tests on a flat surface and forward-moving heel tests are carried out on a wet ceramic floor. Top pieces with or without a pivot are tested in the forward-moving heel position only. In order to characterise a material prior to moulding, it is also possible to carry out forward-moving tests on a flat surface on plates of material. To respond to this problem and prevent these risks, a number of European brands and specifiers have already decided to incorporate this standard and these tests into their product specifications. 🔄



Testing a complete shoe for resistance to slipping.

CREDIT: CTC



CREDIT: PEXEL/KEIRA BURTON

3D scanning and children's footwear

**DR CARINA PRICE, UNIVERSITY OF SALFORD
& DR STEWART MORRISON, UNIVERSITY OF BRIGHTON**

Foot shape and size are important factors in determining footwear shape and resultant fit. This is particularly so in childhood where shape and proportions of feet change rapidly. Feet grow very quickly, particularly before three years of age. Children, particularly when younger, may be less able to describe the fit of their shoes as appropriate or not. They are also less capable of making footwear related decisions and might well prioritise a design or a colour over fit.

A standard set of measures is commonly used to describe the dimensions of feet in relation to footwear. These include lengths (such as whole foot length), widths (such as foot

width/breadth, heel width/breadth) and circumferences (such as the ball circumference). However, these measures only tell us about these specific dimensions of the foot at specific points and do not provide a thorough measure of the morphology of the foot. The arch shape and size, for example, is not routinely captured and described, and cannot truly be so with just a two-dimensional measure. Indeed, two feet with the same width and length can look very different.

ADVANTAGES OF 3D SCANNING

The influx of affordable 3D scanning technology and improvements in mobile camera technology led us to better

capture the dimensions and shape of the whole foot in clinical and home settings. The recent trend in online footwear fitting imposed by the restrictions due to covid-19 also provides an opportunity. Various technologies exist to capture foot shape using mobile technology by wearers at home, describing the shape of the plantar or whole foot and then using a 'best-fit' to match this to dimensions of a shoe. These mobile applications are being used to match wearers to a size, some incorporating the influence of materials and also utilising user feedback to improve the process.

However, if we do not consider more measures other than two-dimensional ones between set points such as width/breadth and length, we are not

making the most of the opportunities this technology offers. Advances in processing software enable us to make a more detailed analysis of these 3D shapes which come from scanners. Researchers have considered measures such as cross-sections, volume, the location of each point on a surface and shape characteristics of the surface of the foot. These measures all make a more detailed interpretation of the shape of the foot. Some have been used to compare between genders and other factors in order to describe feet belonging to specific populations. However, their translation to footwear or clinical outcomes has not always been finalised at this relatively early stage. This is the essential step to enable these measures to be 'useful' in a more applied setting.



3D scanning provides valuable information on how young feet change.

CREDIT: DR DANIEL PARKER / UNIVERSITY OF SALFORD

CHANGING SHAPE OF CHILDREN'S FEET

Infant feet grow rapidly, with length growing by around 2mm per month up to the age of three years. Whilst later on in childhood this rapid growth becomes slower, foot length nevertheless still increases by around 1cm per year. In terms of proportions, the foot starts out relatively wide and round. Between the ages of two and seven, changes are predominately in length. Some research has found that this trend continues until 11 years of age when the proportions become more similar to the adult foot.

Variance in foot shape is multifactorial with genetic, ethnic, socio-economic, and environmental factors all thought to have an influence. Whilst this is a difficult topic to explore, there is some data that suggests ethnicity as an important variable in explaining differences in structural characteristics of children's feet. These differences are thought to underpin associations between ethnicity and the predisposition to specific foot and ankle pathologies, but much more work is needed. Despite current opinion, most studies undertaken have considered characteristics relating to shape or proportions of the feet, or frequency of pathology, with little recognition of the functional demands on the feet. Linked with this, the debate about whether footwear impacts on the structure of children's feet has been argued for decades with studies often comparing shod and non-shod populations.

WHY IS FIT SO IMPORTANT?

Appropriate design and fit of footwear in children are essential for supporting the healthy development of the foot and gait. A child's foot is a soft structure which is still developing and maturing with numerous bones yet to ossify and gain their mature shape. The footwear provided for such children must enable the foot to be free to move and not restrict developing movements. It must also not be too big. Ill-fitting footwear can lead to acute issues such as blisters and affects the way children walk.

Shoes that are too big make children walk with a shorter step length and lift their foot higher when they swing it through to the next step. This occurs alongside a more flexed knee when the foot is in the air. More chronic influences of ill-fitting footwear are less easy to identify even though impacts on foot development and morphology are apparent. Research shows us that children who grow up habitually barefoot or with less time in closed shoes have different shaped toes and higher foot arches than those who are primarily shod. The impact of these differences to overall foot health in the short or long-term however remains unclear.

On a more holistic level, footwear enabling freedom of movement of the child and facilitating them interacting in

their environment is also key. Like adulthood, in children we can recognise a requirement for footwear to be seen as facilitative. This translates as children being able to undertake activities relevant to their age group, such as running, jumping and playing football. Children, particularly those of school age, want to fit in with their peers and the expectations of their age group to not appear 'old' or 'babyish'.

We also see an importance for parents to address social expectations in terms of footwear and to purchase shoes which they think are 'beneficial' for their children. This relies on the credibility of a brand and, quite frequently, family tradition and expectation. Despite this, parents highlight a lack of awareness about foot health alongside a lack of available foot health information, with their knowledge largely coming from their experiences or being shared by peers or family members. In a normal situation, where access and finance allows, parents seemed to prioritise having their children's feet measured in a store and then purchasing recommended footwear.

PURCHASING SHOES ONLINE

A key factor during the past year has been the measurement of feet at home, so as to be able to purchase footwear

online due to the large-scale closure of retail outlets caused by covid-19. A review of online information was undertaken in 2019, before these closures, to appraise what was available to parents in terms of fitting resources and information. This review identified that the majority of available information online was produced by footwear companies and that professional bodies, such as the College of Podiatry, made up very little of these resources.

These resources from commercial footwear companies were however highly accessible for parents, frequently appearing as the first result of an online search. Nevertheless, some of them were lacking in validity in terms of the measures they were asking parents to take and their recommendations in making footwear choices using such measures. High quality advice, measures and recommendations for fitting footwear in childhood are essential.

HOW CAN 3D SCANNING IMPROVE FIT?

Scanning the feet and analysing the 3D shape enables us to understand specific structural and surface shapes. This can point to specific changes which relate to larger circumferences and volumes of a shoe last for a specific age or ethnicity of child. If we look at the 3D shape of the foot and how it changes with time we can also find valuable information concerning the grading of the last and how relative foot morphology and size changes across foot sizes (*figures 1-3*).

Each point on the surface of the foot captured by the scanner can be described mathematically. Exploring these points on the surface of the scan and its specific shape can teach us about regional variations in shape of the foot surface and how these change as children grow or age. One example is measuring the curvedness of the foot shape at each point of the medial-lateral arch of the foot.

Examining this curvedness visually shows us the longitudinal arch developing with age in these average feet. The plantar sole of the foot is blue, which means it is flat as these scans were captured during standing. With increasing age, we can see an increase in green colours which represents an increase in curved shapes with

Figure 1 – Scan at three years

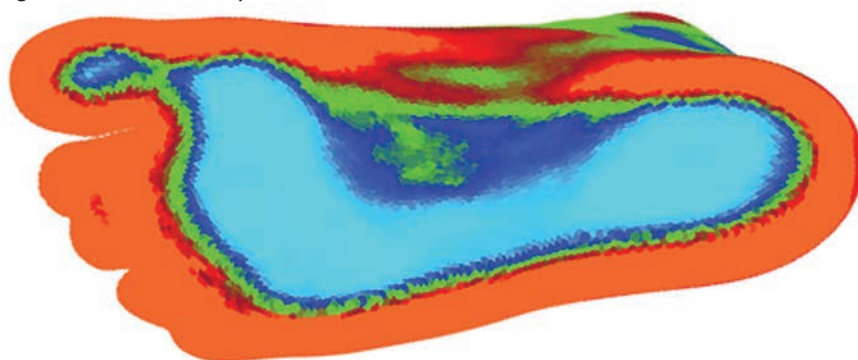


Figure 2 – Scan at five years

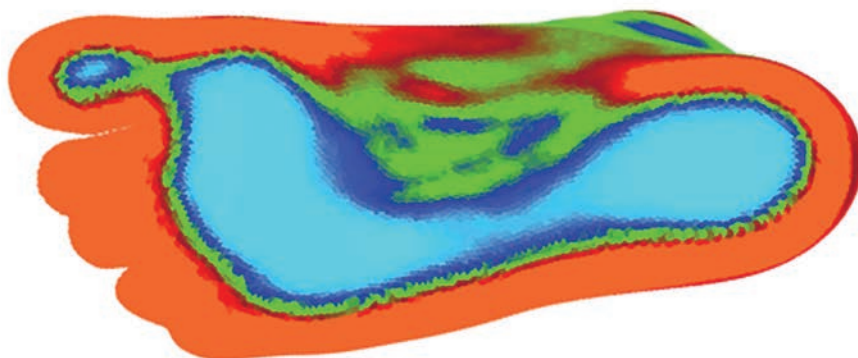
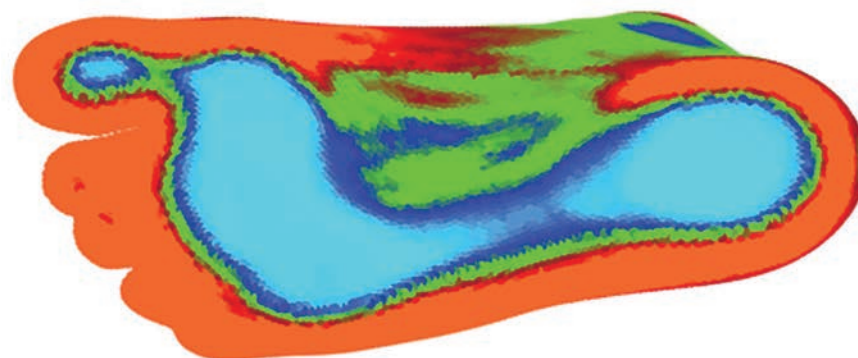


Figure 3 – Scan at seven years



Scans of a child's foot at three, five and seven years of age.

CREDIT: MATYAS VARGA PHD THESIS

orange/red being the most curved. These changes in curvedness on the plantar foot are localised to the medial midfoot area where the longitudinal arch is developing.

This change in surface shape of the foot means that the area of the foot in contact with the shoe changes with age and the overall shape of the midfoot area is altering. These measures show us that a universal children's shoe or last simply being scaled up in size is not going to fit each age or foot the same. In the same way, looking at other areas of the foot can provide us with useful information for other footwear features such as considering the dorsal foot curvedness when designing uppers.

With the new trend in fitting and

purchasing footwear online there exists a real opportunity for the integration of more complex measures from 3D scans into footwear fit. Some novel data analysis approaches might be able to provide detailed information to measure and interpret the childhood foot and be able to apply this directly to footwear design. At the same time, there is scope for the footwear industry to exploit its online messages and considerable reach. They have significant influence with parents and an opportunity to support well informed public foot health messages. Greater collaboration between health professionals and the footwear industry (both retailers and brands) is important for improving footwear fit in children.



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ALL CREDITS: RHENOFLEX

Modern toe puff and counter technology

Toe puffs and counters are often taken for granted. This is a mistake as they both perform important functions in the finished shoe. Toe puffs preserve toe shape and prevent that area of the shoe from collapsing and losing its visual appeal. Heel counters again preserve shape but also grip the heel and support it during walking. In the case of ladies fashion shoes, a strong counter plays an important part in keeping the shoe on the wearer's foot. A great deal of work has gone into improving these two components over the years to meet the changing demands of modern footwear manufacturing which has led to some very clever technology.

Both components were originally cut from veg-tanned leather, soaked in

water to soften them, pasted into the upper, lasted while still moist and then left for a few days to dry out. Increasing mechanisation created faster turn around times for the lasting process and so alternatives were developed. Toe puffs cut from a relatively soft cotton ply base impregnated with celluloid and activated with acetone were easy to last and provided a strong toe with good shape definition. The only problem was that they still needed time to dry out. Counters saw leather replaced by leather board which could be pre-moulded to match the heel of the last and produced a very strong and accurate backpart to the shoe. They are in fact still used for the best ladies shoes for that very reason.

RAPID CHANGE

Things began to change rapidly by the late 1940s and no more so than in Germany, where the Giulini brothers took the idea of plastic reinforced collars for shirts and applied it to footwear. This led to the founding of Rhenoflex GmbH in 1952. Its original toe puffs used woven fabric substrates that were saturated with urea formaldehyde resins that could be water-activated on the shoe production line. They proved popular as they were easy to use, did not affect operatives' hands and did not give off unpleasant and possibly harmful odours. But, above all, they performed extremely well and quickly became popular so that Renoflex toe puffs were soon in use throughout Europe.

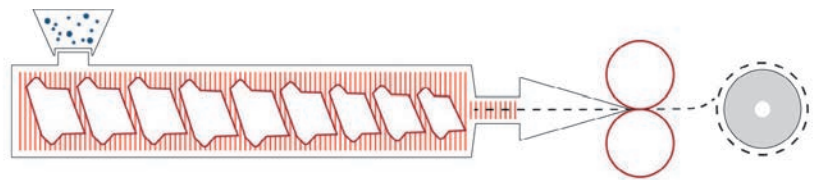
The mid-1950s also saw the development of heat-activated thermo-adhesive coated toe puffs based on saturated woven or non woven substrates. This technology also proved suitable for counters and soon began to replace leatherboard. The real change however came about in 1980 when Rhenoflex introduced its RX3000 range. This was a major breakthrough in that the adhesive was contained within the substrate rather than being an outer coating. This meant that skived edges would also stick to the upper material, thus improving the bonding area. The material was also easier to handle as it did not stick to the operator's fingers. The fact that it was also made using a powder system with synthetic fillers and polyester fabric meant that it was also recyclable.

The final refinement introduced in the late 1980s was Rhenoprint, which was totally powder-based and, although it still contained natural fillers, all woven content had been removed. This meant that it could also be moulded in the required shape with all edge reductions included so that no edge skiving was needed. It also effectively eliminated all waste as everything could be re-ground and re-used. In 2005, Rhenoflex took this a stage further by replacing synthetic ingredients with natural ones. This made the product even more environmentally friendly and today, Rhenoprint toe puffs and counters contain up to 70% recycled content.

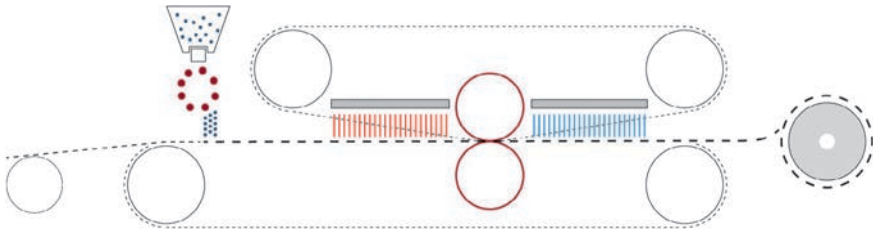
MODERN TECHNOLOGY

Most modern toe puff and counter materials are produced in roll form using a number of processes including filmic extrusion, powder coating or sintering and the impregnation of some type of substrate. They all need converting into sheet form for shipping to the customer, who then has to cut out and skive the reinforcement parts ready for applying them to the shoe upper. This takes time and costs money as these processes are difficult to automate.

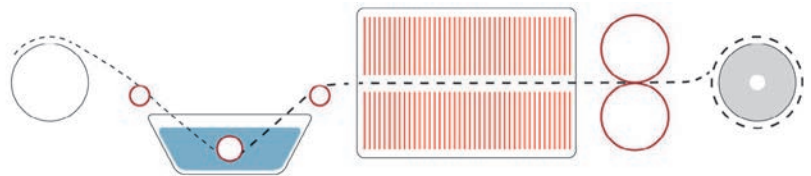
The process used to produce Rhenoprint is different in that it takes the basic sintering process and, instead of producing a continuous sheet of material, it moulds fully finished toe puffs and counters that require no further processing.



Extrusion – a polymer is extruded through a die as a homogeneous sheet of material. This is how the material used for 'Ping Pong' toe puffs and counters is produced.



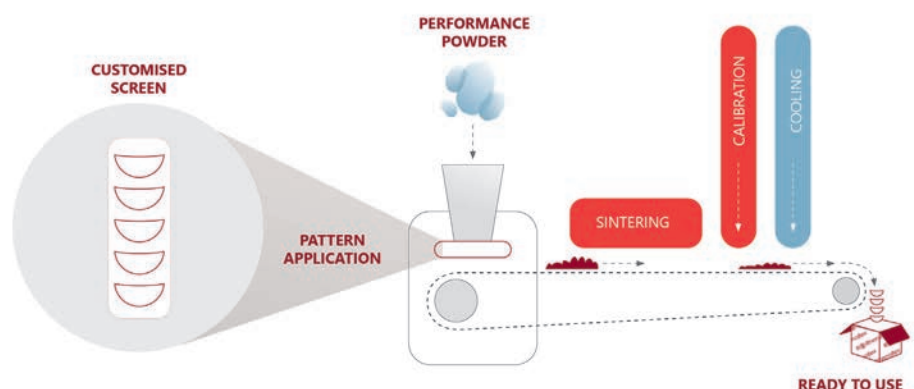
Sintering – a thermoplastic powder is applied to a conveyor belt where it is compacted by heat and pressure to form a continuous sheet of material.



Impregnation – a woven or non woven substrate is saturated with polymeric binder to again form a continuous sheet of material.

Rhenoprint can be said to tick all the boxes as far as toe puffs and counters are concerned. It is highly customisable in that it offers different thicknesses and densities in almost any shape to suit the customer's requirements. The puffs and counters come as ready to use components, rather than as sheet material requiring

cutting and skiving, which saves time, money and offers zero waste. The fact they are produced so quickly and efficiently also means that their individual CO₂ footprint is kept to a minimum. Toe puff and counter technology has indeed come a very long way and is a far cry from the way Rhenoflex started out 70 years ago. 🚀



Rhenoprint™

1. A thermoplastic powder is applied to a conveyor belt via a template matching the required toe puff or counter shape.
2. The powder is then heated in an oven until it is partially melted.
3. A hot calibration densifies the puff or counter to the required density and thickness.
4. A cooling device solidifies the puff or counter after which it is removed from the belt for packing.

Alternatives to leather fall short

Many parts of the fashion industry, supported by the vegan lobby, continue to claim that non-leather alternatives are more desirable and sustainable than the real thing. The leather industry's representative body in the European Union, COTANCE, has at long last decided to put some of the claims to the test with the help of testing and research centre FILK. The results were published earlier this year in a paper called the 'Comparison of the Technical Performance of Leather and Trendy Alternatives'. Needless to say, the results come as no surprise.

In fact, none of the substitute materials exhibited all of the performance characteristics of leather and some contained chemicals of concern. On announcing the results, COTANCE said, "The fascination with one of the oldest natural materials in the world remains unchanged, and no wonder, because the material is a true

all-rounder. It lends a noble touch to fashion, footwear, accessories and furniture, and it brings many functional properties such as durability, tear-resistance and breathability."

FILK carried out standardised physical and chemical tests on the substitute materials, all of which have come to market in recent years. It concluded that technical progress among the manufacturers of synthetic materials has led to some of these having 'individual properties that are similar here and there to those of leather. However, it also found that none of the tested substitutes could be called a true alternative to leather.

In the tests, leather proved superior in terms of water vapour absorption and water vapour permeability, with the other materials scoring significantly lower. It also showed a superior performance in flex and tear-resistance tests, indicating greater durability. Another point that COTANCE

made was that, although the producers of synthetic alternatives often present their products as being good alternatives, there is frequently a lack of transparency about exactly what they are made from. The FILK tests have uncovered more detail.

For example, one of the materials tested was Desserto. The tests showed that while the material does contain cactus fibre as claimed, in the sample tested the plant fibres were contained in a polyester carrier fabric that had two layers of polyurethane (PU) on top and was in effect actually 65% PU. The majority is actually fossil fuel-based which in view of all the furore over global warming can hardly be described as being 'desirable'.

THE ALTERNATIVES

In all, nine alternatives were tested using a shoe upper leather as the control. In recent years, much has been published about these innovative

The prickly pear is used in the production of one alternative to leather.

CREDIT: SHUTTERSTOCK/BCARMONAR



There is no real alternative to leather whether for physical performance or just sheer beauty. CREDIT: GSC

products that, in their manufacturers' terms, offer vegan, 'cruelty-free' and more sustainable alternatives. All can be considered fibrous, but their make-up differs physically and chemically. Some are naturally grown, making use of the dry mycelium of mushroom fruitbodies; others are made as alternatives to fossil-based raw materials, replacing them with more natural ones such as pineapple leaf fibre, the milled cactus leaves mentioned previously or apple pomace (solid residue from apple processing).

All are commercially available and are in use in products ranging from bags and small accessories to shoes and garments. The materials were analysed both physically and chemically. Based on their design, the more innovative materials can be sub-divided into three conceptual categories: animal-free grown materials, multi-layered coated fabrics with plant-based additives and non-woven fabrics with or without a surface finish.

GROWN

Muskin – naturally grown single-layer fibre, made from mushroom fruitbodies. Due to the restricted availability of the fungus (*Phellinus ellipsoideus*), this material is only grown in small size pieces approximately 40cm x 20cm.

Kombucha – a dense and compact material, based on polysaccharides. Made from the fermenting process of

the Kombucha beverage, it is a symbiotic community of bacteria and yeast that grows on the top of the fermenting liquid. Subsequently dried out to form a tough sheet.

COATED MULTI-LAYER

Desserto – made from nopal cactus (prickly pear). Dried and macerated leaves (pads) are incorporated into the material, which is essentially a coated polyester-based textile with a compact PU layer and partially foamed layer containing the organic content.

Appleskin – a PU-impregnated coated textile carrier with thin compact PU layers plus a foamed one incorporating apple waste. The material is made using a coagulation process and is 50% PU.

Vegea – coated textile combining compact and foamed PU layers on a cellulose-based carrier with organic constituents from grape waste in the foamed layer.

Teak Leaf – coated and laminated leaves from the teak tree with non-woven textile layers laminated onto the back and a topcoat based on polyolefin wax.

PUCF – made by a coagulation process, this is an alternative to leather that has long been used for ladies fashion shoes. It is a coated textile consisting of a thin, compact PU topcoat on a modified cellulose mid-layer with (in test sample) a polyester textile carrier.

Noani – a composite material of three individual layers. The upper layer consisted of polyester microfibre, the core was leather fibreboard and the bottom layer a coated textile with a compact PU layer and foamed polyvinylchloride layer. Being a structured material, rather than a single material, no further tests were carried out.

NON WOVENS

Pinatex – made of cellulose-based natural fibres from the waste leaves of the pineapple plant. A felt-like material is made when these fibres are combined with polylactic acid. Final finishes vary but most incorporate resin topcoats.

SnapPap – marketed as vegan paper with a leather look, this cellulose-based material incorporates natural rubber and an acrylate-based polymer.

TESTING

Focusing purely on material performance, the materials underwent the same tests, according to the appropriate internationally recognised specifications for shoes, gloves and apparel. They were also evaluated by 10 trained panellists for touch and feel. Additionally, they were also screened for hazardous substances.

Thickness – cross-section under microscopic analysis.

Tensile strength – tensile strength, elongation at a specified load and elongation at breaking point. Specification 15N/mm² minimum.

Tear strength – tear strength using trouser tear test. 40N/mm² satisfactory.

Water vapour permeability – ability to allow humidity from the body to be transported out and away from the material. Over 0.8mg/ (cm² x h) needed for comfort.

Water vapour absorption – amount of water vapour absorbed by the material.

Flex resistance – flex resistance of material when folded. Specification 80,000 flexes

RESULTS

Leather has the highest mechanical stability, representing the highest values for tensile and tear strength. Coated textiles' tensile strengths ranged from 9 to 20N/mm² with the figures dependent

Table: the weak performances of alternatives to leather

Physical Properties		Thickness	Tensile strength	Tear resistance	Water vapour permeability	Water vapour absorption	Flex resistance
		ISO 17186-A	ISO 3376	ISO 3377-1	ISO 14268	ISO 17229	ISO 32100
		[mm]	[N/mm ²]	[N/mm]	[mg/(cm ² x h)]	mg/cm ²	flex cycles to grade ≥ 2
Naturally grown material	Leather	1.93	39.5	73.6	4.6	8.4	> 200,000
	MuSkin	6.22	0.2	0.5	10.4	6.0	10,000
	Kombucha	0.29	9.2	5.1	0.1	9.2	10,000
Coated textile	PUCF	1.37	10.2	17	1.1	1.4	200,000
	Desserto	0.81	20.8	37.2	0.5	2.5	30,000
	AppleSkin	1.14	14	18.4	0.4	1.7	50,000
	Vegea	0.95	9.4	16.6	0.6	3.0	50,000
	Teak leaf	0.57	12.2	30.7	0.1	0.1	100
Non-wovens of plant fibers	Pinatex	1.43	4.5	31	2.5	3.8	150,000
	SnapPap	0.57	24.9	7.5	10.3	3.7	5,000

on the properties of the textile carrier; leather's score was 39.5. For the non wovens, physical properties relied on their fibre-bonding methods which, in the case of SnapPap, were compromised in tear strength by the short fibre length, with little compensation from the polymeric binder used.

In use, materials used for footwear undergo concave and convex flexing. In a flexometer test, once anything more than minor cracks in the topcoat are observed, the test must be stopped. It was noted that only the coated textile and pinatex had a similar performance to leather; all the others were deemed insufficient.

For a pleasant feel, humidity from the body must be transported away from the skin. Water vapour permeability is a measure of the efficiency of a material to allow this to happen. Leather, Muskin and SnapPap exceeded the limit set in the ISO standard for full chrome upper leather (ISO 20942) of sufficiently greater than 0.8mg/(cm² x h) and whilst the PUCF was satisfactory, none of the others were.

In the haptic test, the Muskin was said to feel pleasant while the Desserto, Pinatex and SnapPap felt rough. The materials that had synthetic surfaces, Desserto, Vegea, PU-coated textile and Appleskin, had a soft feel, but the touch felt artificial with a sticky tendency; this was even more apparent with the Kombucha sample.

HAZARDOUS SUBSTANCES

Using thermal desorption analysis, which involves heating a material to

release contaminants or chemicals of interest which are then identified and quantified by gas chromatography.

All the samples tested emitted volatile organic compounds. Restricted substances were found in the PUCF and also in the Appleskin, Pinatex, Desserto and Vegea materials, which could all also be classed as coated textiles. Appleskin was found to contain Butanone oxime and traces of dimethylformamide (DMFa) as well. Desserto contained five restricted substances, Butanone oxime, toluene, frees isocyanate, foltpet (an organic pesticide) and traces of the plasticiser Diisobutyl phthalate (DIBP), which was also found in the Pinatex. Toluene was also detected in the sample of Vegea.

CONCLUSIONS

Alternatives attempting to replicate the natural composition of leather, namely a graduating density of fibres through the structure increasing from the grain side towards the corium or flesh layer, was, in most instances of the coated textiles, attempted with multi-layered materials. The main strength of the structure was reliant on the composition of the textile backing or carrier. In most cases, water vapour permeability was all but lost, with a corresponding effect on flex resistance.

For the naturally grown materials, the best attributes appeared to be water vapour permeability or absorption, but to the detriment of the tensile or tear strength. For the Muskin sample, while the short fibre length aided the vapour permeability, this had a negative impact on the tensile and tear strengths. Fibre

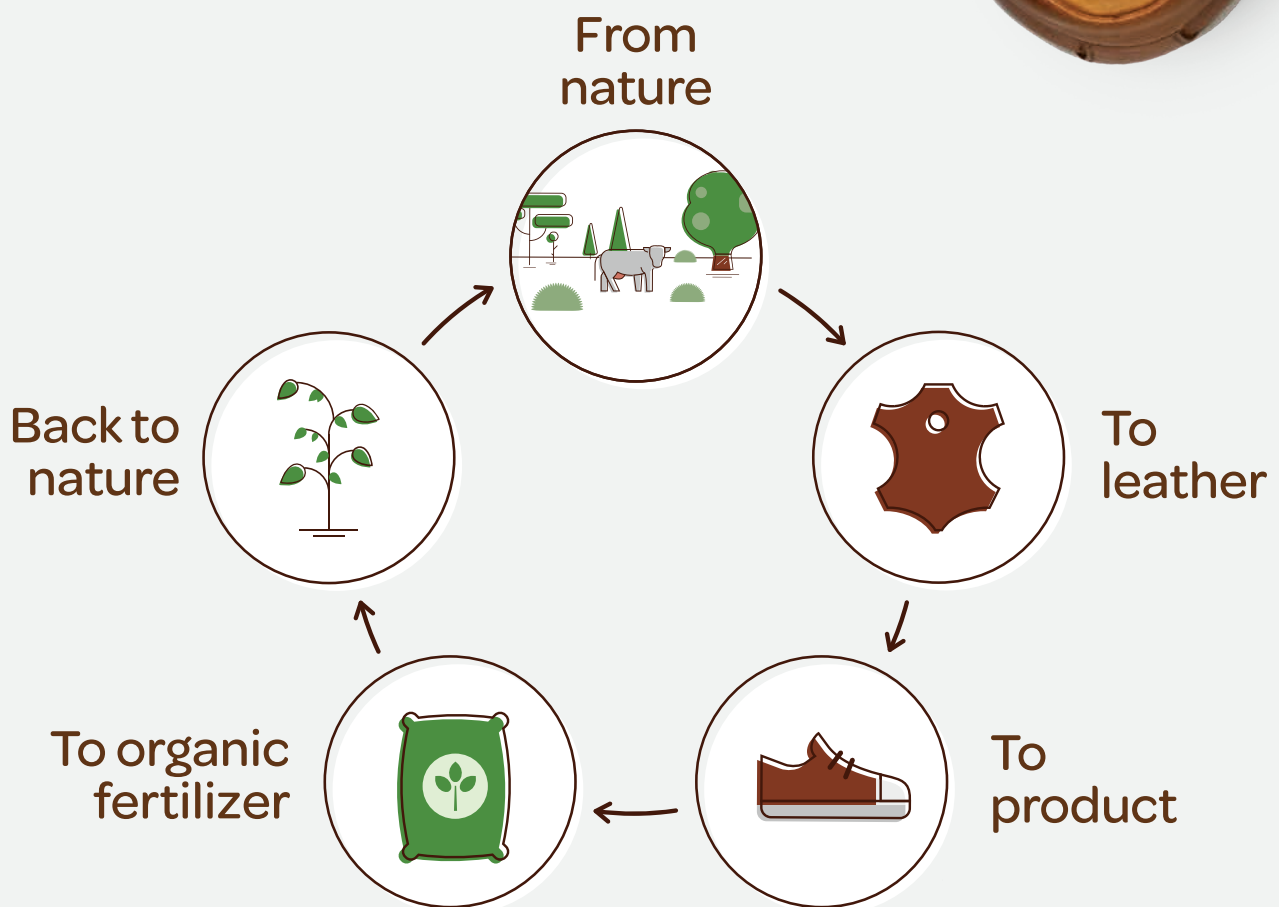
orientation was also a contributing factor and the probable cause of a lower flex resistance. Conversely, the Kombucha was almost impermeable but still highly hygroscopic, most likely due to the high sugar content and its gel-like consistency prior to drying.

In conclusion, hazardous substances aside, the challenge remains for alternatives to leather to replicate the full functionality of the bionic structure of the skin. Additions of biobased content to the already widespread PU coated textiles may give some sustainability credentials to the material, but their addition has yet to show any physical advantage to the product. As can be seen from the results table, leather outperforms all the other materials and while some come close to some of leather's inherent properties, no single alternative product can match them all.

If, according to COTANCE's findings leather is so superior to all these alternatives, why is so much of it simply allowed to go to waste? According to the Leather and Hide Council of America (LHCA), there are around one billion head in the global cattle herd of which about 300 million will go to slaughter each year. From these, 55% of the hides will be turned into leather and 45% will go to waste meaning 135 million hides per year going to landfill. The LHCA assumes these average 25kg, amounting to almost 3.4 million tonnes of waste which, incidentally, could be creating as much as three million tonnes of CO₂-equivalent emissions per year. If we want to save the planet, we should surely be using more leather, not less? 



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On display. The visually striking adidas Futurecraft Strung shoe-making robot.

CREDIT: DESIGN MUSEUM



Happy feet: the art of the sneaker

The idea that sneakers are not going anywhere fast may be something of a paradox. Call them what you will (trainers, runners, kicks or gym shoes, maybe), but the not so humble sneaker will not be fading into oblivion any time soon. Though long a staple of art school cool, it is not often that sneakers themselves come under scrutiny in the 'white cube' of museums.

Opened in May, *Sneakers Unboxed* spins a fresh web for the footwear stalwart, journeying from New York to Tokyo via California, Cape Town and the United Kingdom. Curated by Ligaya Salazar, an alum of design institutions including London College of Fashion's Fashion Space Gallery and the Victoria and Albert Museum (V&A), the show considers sneakers through two lenses: style and performance (although some eligible models appear under both categories, Ms Salazar tells *World Footwear*).

The show is certainly a timely affair. Despite the negative effects of the pandemic on other areas of retail, the exhibition's sponsor, StockX (a Detroit-based online sneakers, streetwear and collectibles marketplace, founded in 2015), recently announced that it is now worth \$3.8 billion, up 35% ahead of an expected public listing later this year, according to the *Wall Street Journal*. During the exhibition, visitors will catch a glimpse of a data visualisation piece by StockX, which values the current sneaker resale market at more than \$6 billion, plus significant

Some trendy styles may 'run' out of stock, some may never leave the box once purchased, but one thing is for sure: sneakers have miles of cultural traction. A major new exhibition at London's Design Museum, *Sneakers Unboxed: Studio to Street*, focuses on this ubiquitous shoe, highlighting the sneaker as a universal design object.

highlights from the resale platform's history, including the Jordan 1 Retro High Dior (2020's "most valuable" sneaker release) and the all-time most traded pair of sneakers, the adidas Yeezy Boost 350 V2 Zebra.

Common goods

Poised to skyrocket, market research firm Cowen estimated last summer that the global sneaker resale market will reach \$30 billion by 2030, with markets outside the United States consuming a significant portion of this pie, tipping the scales at

around \$19 billion. For the New York-headquartered firm, sneakers are an emerging asset class. Senior director for Europe at StockX, Derek Morrison, agrees that the footwear has the power to “unlock” economic opportunity for resellers.

Perhaps best underscoring sneaker’s pandemic-busting abilities, though, credit broker money.co.uk suggested earlier this year that shoppers’ moods – or “positive emotions” – actually increased by 64% following the purchase of sneakers (which, it is inferred, could either be brand-new or second-hand), based on survey data collected from 2,560 respondents over the period spanning February through March 2021. Mr Morrison concurs with this sentiment: “The love for sneakers transcends age, gender and location and, no matter your background, you probably have a connection, memory or story about your favourite pair.”

Originally developed by Design Museum curator Shasti Lowton in 2019, Ms Salazar took the reins of Sneakers Unboxed in late last year, following its postponement due to covid-19 and Ms Lowton going on maternity leave. Whereas Ms Lowton had secured much of the exhibition’s content after visiting the archives of many of the major brands and consulting with sneaker designers and collectors, Ms Salazar, who curated the Ecco-sponsored show, Fashion v Sport, at the V&A in London in 2008, largely shaped its curatorial narrative and planned visitor programme. “I believe that you can’t tell the history of sneakers without telling the stories of the people who have popularised them beyond functional sportswear,” she tells us.

Form, fit and function

Whether coveted for their form, function or both, the culture built up around sneakers is arguably defined by the sneakerhead, a sneaker aficionado who passionately seeks out exclusivity and uniqueness in design, Ms Salazar explains. Long before limited editions or collaborations became the “norm”, she says, some sneakerheads would travel abroad to buy country-specific releases or go through old stock in a sports shop to find standout deadstock or vintage wares. Some still would customise pairs they already owned for fresh appeal.

The exhibition, therefore, begins with the concept of style, profiling the fashions of young people in 1970s New York before encountering early skateboarders in California and then moving on to the experimental ‘uniforms’ worn by those involved in the British football casual, dancehall and grime

A sneaker or not a sneaker? An upcycling sneaker design collaboration from UK designers Helen Kirkum and Matthew Needham.

CREDIT: NORMAN WILCOX-GEISSEN



subcultures. Its curated journey in sneaker culture next winds its way down to Cape Town, before charting the rise of early collaborations and limited editions in 1990s Tokyo – “when brands first started to realise their impact”, Ms Salazar notes – all the way up to the present, globalised market of international resale and largescale co-creation.

After style comes performance, according to Sneakers Unboxed. This technology-focused aspect of the exhibition’s design demands a pivot back to the origins of the sneaker, where eight key, interrelated elements of sneaker-making, such as traction, fit, cushioning and stability, are dissected and considered alongside contextual material including design sketches and material swatches. Surely not to be missed, though, is the Design Museum’s take on the “most innovative sneakers throughout history”, as Ms Salazar puts it, nor its interrogation of what she describes as the most important strategic design concerns of our time: circularity and sustainability. 🌱

Sneakers Unboxed: Studio to Street runs until October 24 at the Design Museum, London.

The much-hyped A-COLD-WALL x Nike Zoom Vomero +5 Solarised sneaker will also be on display.*

CREDIT: DESIGN MUSEUM



Hanwag is proud of its roots, maintaining similar processes that were prevalent when the company started in 1921.

ALL CREDITS: HANWAG



A century of tradition

Some of the machines that join Hanwag soles to uppers in its headquarters in Vierkirchen are so old that not only are they no longer manufactured, that there is no maintenance service, so the German bootmaker's staff have to carefully tend to the machines themselves. For 100 years, the company has made rugged outdoor boots and shoes using traditional double stitching and cementing methods, eschewing some of the more modern techniques, believing the construction not only reflects the past but also creates the highest-quality shoes. "We know how mountaineering boots were made 100 years ago," says marketing director Christian Wittig. "That's an advantage; it means we can be progressive without losing sight of our heritage."

Established in 1921 by Hans Wagner, a third-generation shoemaker, the company grew slowly, first from Mr Wagner's own house, later taking on more apprentices and expanding into a workshop. The small town, near Munich, remains the company's headquarters to this day.

Mr Wagner's nephew Sepp joined in 1936, eager to learn the trade and to help grow the business. The factory was plundered at the end of the Second World War, but as the economy started to recover, so did the demand for ski and mountain

German outdoor brand Hanwag credits faithfulness to original manufacturing techniques for its longevity. It takes the best of old and new to create ranges made for mountain and road.

boots. Sepp took over the management in the 1960s, and began to expand internationally, securing partnerships in the US and being well placed for the climbing and hiking boom that took off in Germany in the 1980s.

Timeless methods

A central tenet of the business is the construction technique, as Hanwag claims it is one of the few remaining shoemakers in its category to employ such time-consuming and costly processes. In the cemented construction, the upper is moulded and stretched over the last and lasted to the insole to form a unit. The upper and insole are then cemented with adhesive under high pressure and the midsole and outsole are added. In the double stitching method, the insole is punched and tacked to the last, and then the leather upper and the lining are



New ranges are designed for hiking and mountain climbing, as well as everyday activities.

stitched to the insole rib. Excess material is trimmed and the leather upper is secured again with a second row of stitching.

"Nowadays, to make double stitched footwear, not only do you need experience of the method, you also need to have a feel for the machines," says production manager Harmut Trabert. "We keep them running ourselves, as there is no longer any maintenance and repair service. Hanwag is a traditional shoemaking company and it's a matter of prestige to continue this traditional construction method."

While the company prides itself on traditional values, it was modern-minded when it chose the construction techniques so they would enable easy resoling. Extending the useful life of shoes is something we are hearing more about, as companies look to reduce waste and tap into 'circular thinking'. Resoling is a popular service at its headquarters in Vierkirchen. "These boots are perfectly worn in; people don't want to replace them. In fact, they're often long-standing companions and the source of many happy memories," says Mr Trabert. "We often receive boots to be resoled that have seen years and years of use. It's something that makes us proud of our work."

A big factor in longevity is also down to the materials. Hanwag sources most of its leather from German tannery Heinen, a partnership it is particularly proud of. Heinen uses only German hides and has a close relationship with its hide merchants, tracking which slaughterhouses and farms the animals come from. These animals spend a lot of time outside in a range of weather conditions and have time to grow thick and firm hides.

For mountain boots, Hanwag uses Heinen's branded leather Terracare, which it says is defined by the production standards: environmentally friendly, resource efficient and socially compatible. It has also produced ranges made from yak leather. "Yak leather is also excellent, only there are not that many yaks. We're just not able to produce enough of our yak models – we could sell far more than we do," the company states.

European footprint

As the company has grown, so has production, with manufacturing now taking place at facilities in Hungary and Croatia, as well as Germany. This enables shorter transport routes and reduces corresponding CO₂ emissions, compared with outsourcing to Asia, as many companies do. "We deliberately make in Europe, not just because of shorter distances or highly skilled employees, but to uphold traditional construction techniques." It claims the proximity also proved an advantage in 2020 when the pandemic hit, in terms of flexible production.

A finished Hanwag mountain boot consists of, on average, 180 separate parts and around 120 processes – meaning employees are highly skilled and many remain with the company throughout their working lives. It cites some of the



One of the early ski boot designs, which became popular in the US.



Hanwag has made special lasts for people with bunions, meaning the shoes fit snugly but reduce the discomfort.

'Hanwag stories' on its website: Franz Kreutner joined as a refugee shortly after the Second World War and stayed for 47 years, while head of research Adam Weger, who worked for Hanwag from 1968 to 2015, tested every shoe in the mountains. The website has been updated this year with 'inspirational content' and expertise, as a way of connecting to its consumers.

After the early death of his daughter, who was previously managing director of the company, Sepp Wagner sold the family-owned business to Swedish group Fenix Outdoor in 2004. The company diversified to make more styles and tap new markets, but stayed faithful to its manufacturing techniques. Its winter 21/22 collection includes The Banks Snow GTX, a winter hiking boot that is snowshoe compatible and has a built-in mini snow gaiter. It features a warm, waterproof Gore-Tex Partelana lining and slip-resistant Vibram Endurance Ice outsoles. In its hiking category, it has launched the Torsby GTX, a mid-cut, lightweight shoe made with a suede and nubuck upper and an outsole which includes recycled rubber.

Pared-down celebrations

During the 100th anniversary year, the company plans to make 400,000 pairs of boots and shoes and capitalise on the expected increase in walking and hiking as people make the most of nature following pandemic lockdowns and restrictions. The pandemic has brought new customers to the outdoors and introduced a more balanced gender mix, according to UK brand manager Christopher King. "Our business model means we are able to offer trade customers a more interesting colour palette, as well as a better fit offering thanks to our wide range of lasts," he tells *World Footwear*.

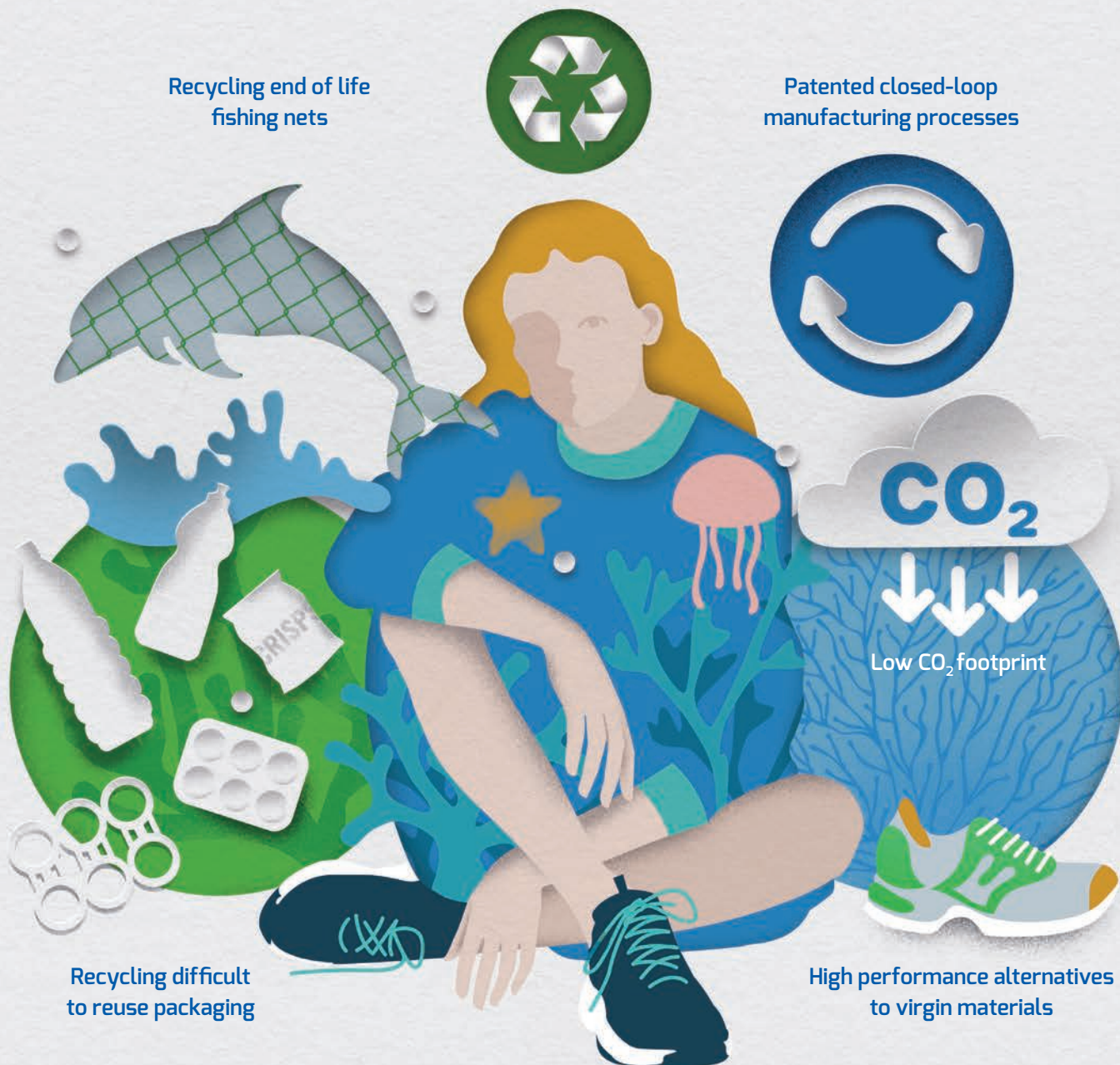
The company had originally hoped to celebrate the centenary with a big global event but, due to the pandemic, any events are now taking place on a local basis. In the UK, it will

have a large presence at Keswick Mountain Festival, which takes place in September. "We are celebrating on a global scale too," says Mr King. "We're proud to have launched a new Hans Wagner Heritage Collection, which includes ultra-premium and heritage-inspired handcrafted models that celebrate our history and honour our founder."

Hanwag is confident cementing old practices and modern materials will help it through the next 100 years. "Our approach is based on employing the best craftsman, the highest quality standards and selecting the best raw materials. As to whether it's worth the additional cost? That's simple: it's the only way to make such high-quality boots." 🌱



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The cleats on the Sphair Air Bubble outsole protrude at slightly different heights. Aloft and its partners insist there are benefits from this inbuilt unevenness and that wearing shoes that integrate this innovation is like "walking on clouds".

ALL CREDITS: ALOFT/SAFETY FOOTWEAR REVOLUTION WEEK

Portuguese outsole developer Aloft has worked with technology and research partners in Spain to produce Sphair Air Bubble, an outsole that makes a virtue of unevenness.

Benefits of instability

Technical outsole developer and producer Aloft has worked with Pamplona-based footwear technology provider Semic and the University of Navarra in Spain to make a new system they have called Sphair Air Bubble. According to Aloft chief executive, Pedro Castro, what sets the new system apart is that, here, the partners have worked out the mechanics for creating "a certain instability in the outsole" that will be of benefit to the wearer, while maintaining a strong foothold on the ground.

Sphair consists of what he calls "a typical thermoplastic polyurethane (TPU) outsole", but one that he insists is "different from the ordinary". There are, for example, cleats on the bottom that have an unusual shape. They are narrower at the top, where they meet the outsole, than they are on the bottom, where they come into contact with the floor of a building or with the earth. Mr Castro says this allows the sole to flex freely no matter how wearers put their feet on the ground. Spacing of the cleats will allow water or oil or any other liquid to run off the outsole easily while grip is always maintained.

Striking features

Another striking feature is that, at the heel, two big, airbag-like bumps protrude from the outsole. These are the bubbles that form part of the new products name. To keep

these airbags full of air, Aloft and its partners have welded a thin TPU membrane onto them. This offers lightness, plus shockproof and rebound capabilities.

"The real secret is inside, though," Pedro Castro continues. "If you look you will see that the outsole is full of small cell-structures, designed and conceived in such a way that, while you walk, you will flex these cell-structures and they will absorb most of the pressure you are applying."

This works in parallel with the cleats. These bend readily, but they are completely hollow and this, with the ability of cell-structures above to absorb pressure, provides what he calls "a superb cushioning effect". A variety of categories of footwear will benefit from integrating the Sphair Air Bubble, the partners believe. They have, for example, received an approach from a sports brand that wants to try the idea in indoor sports shoes. Children's sports clubs are going to take part in a trial. Aloft will collect a range of data and share it with its partners in Spain so that they can carry out any fine-tuning necessary.

Fine-tuning

"One of the big advantages we have at Aloft," the chief executive says, "is that we have our own laboratory, which allows us to manage material development well. We can formulate different grades of rubber and specific grades of



Outsoles awaiting delivery from the Aloft factory in Portugal.

TPU.” He explains that this means the soling technology provider has the ability to engineer specific outsole features to meet customer requirements. The fine-tuning can apply to what he calls the geometry of the outsole and to levels of comfort.

Sphair Air Bubble is, Mr Castro claims, perhaps the first outsole ever designed with as much thought going into the interior of the outsole, its inner workings, as into the outer

part. “You can only grasp the full potential of it when you see both systems working simultaneously,” he continues. “You only need to walk with a shoe that has this technology to feel immediate comfort. Imagine that you are walking on clouds.”

Another possibility that has come to light is the idea of using a different material on the back part with a view to obtaining an increase in the product’s shock-absorbing potential. At the same time, Mr Castro says there would be less elasticity at the front, allowing the wearer to have a more “self-propelling” walk. “We can achieve this by having two material flows inside a mono-cavity,” he explains. “We have developed software to control our machines and help us design where we want each material to flow and then we re-melt one over the other.”

One by one

At the end of 2020, at the time of the Safety Footwear Revolution Week, of which Aloft was one of the organisers, there were several prototypes already in place. Mr Castro said these prototypes showed delegates the unevenness of the outsole, with the cleats protruding to slightly different heights, while retaining their softness and their ability to “collapse” easily with the application of any pressure at all, even the prod of a finger.

He explains that the purpose of this is to have the cleats come into contact with the ground one by one when the wearer is walking. This means the outsole of a shoe or boot can adapt its height to the stance of the wearer and to the terrain underfoot and it is this that delivers the “walking on clouds” effect.

“Brands can use Sphair Air Bubble to co-create, with us, something of their own,” the chief executive concludes, “something in keeping with their brand genetics and their brand strength.”



Aloft chief executive, Pedro Castro.

The Andes is one of EMMA's first circular safety shoes. It has a steel toe-cap, an integrated stainless-steel plate and a double-layer, anti-slip PU sole. The manufacturer says they are particularly well suited to workers in the metal and construction industries.

ALL CREDITS: EMMA



Circularity on track

Dutch companies EMMA and Allshoes have combined to create a circular system for safety shoes, collecting used footwear from a range of work environments and using the materials and components to develop new products.

They have joined forces with FBBasic, a specialist waste recovery company also based in the Netherlands, to form the Circular Footwear Alliance. They draw their inspiration from the European Green Deal, the wide-ranging set of policies that the European Commission published at the end of 2019, with the aim of resetting its commitment to tackling climate and environment-related challenges. The document describes this undertaking as “this generation’s defining task”.

Industry response

The Circular Footwear Alliance is a footwear industry, and specifically a safety footwear industry, response to this challenge. EMMA, Allshoes and FBBasic talk of this being a milestone for the sector; they take special pride in having reached it despite the rivalry that naturally exists between

Two rival safety footwear suppliers in the Netherlands have teamed up to establish the Circular Footwear Alliance. They continue to compete in the marketplace, but are helping each other collect used safety shoes when workers have finished with them so that the components and materials can go into new products.

Allshoes and EMMA, as would be the case between competitors in any industry. The commercial and marketing manager in the Netherlands of Hultafors Group, EMMA’s parent company, Michel van Dordregt, says it was important “to see beyond our own noses” to be able to scale up sufficiently. He says he hopes this project will inspire other

companies to set up circular economy projects.

In a joint statement, the two footwear producers said: "Together, we can provide enough scale to really make a circular system work in practice." The combined volume of shoes they bring to market has allowed the idea of circular safety shoes to reach a tipping point, with enough used materials becoming available now to make their reuse viable. "The ambition is clear," they state. "To preserve raw materials and to make sure there is no more waste."

Collection points in place

The Circular Footwear Alliance partners confirmed that the first 100 collection points for used shoes have already been set up. They provided dedicated drop-off points for workers to deposit safety shoes, which the companies involved in the project will use as raw materials for new footwear. The collection points have gone up at the facilities of customers of Allshoes and EMMA. These include wholesalers, large and small employers, start-ups and multinationals, public- and private-sector organisations. The partners aim to collect two million pairs per year within the next few years. This puts into practice the promise of making sure raw materials are no longer lost. But, working backwards from there, the partners have also said that they want to design shoes in such a way as to make sure the components and raw materials can be reused in new products in the future, prolonging their useful life and preserving value.

Together, Allshoes and EMMA command a large share of the Dutch market for safety shoes. The Circular Footwear Alliance concept arose because this large combined market share makes the reverse logistics, the dismantling and recycling of shoes and the recovery of the raw materials worthwhile. Both footwear producers have committed to making this circular way of working an integrated part of their strategies. Allshoes chief executive, Michiel van Kempen, says: "We are just as fierce competitors as before, but at the Circular Footwear Alliance table we both feel that we are here together to make a difference for the future."

Endless loop

They had each tried tackling the problem unilaterally. EMMA introduced a range of circular safety shoes in 2018, outlining its vision of "an endless loop" and stating an ambition to make all of its shoes and boots in keeping with circular principles by the end of 2019. It wanted to track and trace all of its shoes from start to finish in the value chain, with the aim of incorporating the materials into a materials bank for reuse and recycling. It identified Sittard-based technology provider Cirmar as the partner it would work with to develop the track and trace system, under which all of EMMA's products were to be given a material passport. This was a positive start and, in spite of delays brought on by EMMA's acquisition in January 2020 by Swedish group Hultafors and, subsequently, by covid restrictions, it has now resulted in the Circular Footwear Alliance, with Allshoes lending its weight to the idea and FBBasic, the company behind Cirmar, joining in too.

FBBasic describes itself as a specialist in "urban mining", the practice of uncovering metals and other valuable materials from the waste our towns and cities produce rather than digging them out of the ground. It says this is "a smart contribution to reducing raw material scarcity". Its chief executive, Frans Beckers, says the Circular Footwear Alliance is "the beginning of something really big".

On launching its first circular shoes and boots in 2018, EMMA decided that it would no longer use PVC, owing to "its impact on people and the environment". It began to make even its logos out of reusable textiles and rubber instead. It replaced lacing hooks with eyelets to make damage that could prevent the shoe's longevity less likely. Seams are constructed in a groove so that they do not wear out. In the insoles, 85% of the material is foam recycled from mattresses, car seats and other sources. Bryce, Amazone, Andes, Himalaya, Zion and Alaska were the first models to be made with circular principles in mind. Now, the company says, thanks to the Circular Footwear Alliance, its entire collection is fully sustainable. ♻️

The Circular Footwear Alliance has put shoe suppliers EMMA and Allshoes on track to create circularity in safety shoes.



Accuracy and flexibility

Since its introduction in the late 1960s, polyurethane (PU) has established itself as an important soling material. It combines excellent physical properties with light weight to produce footwear that is extremely durable and comfortable to wear. It is for this reason that it is popular for use in safety footwear by direct moulding on to the lasted upper in either a single or dual density format. Nevertheless, extreme accuracy in terms of lasts and moulds are required due to its very low viscosity, so tolerances of around 0.2mm are called for to ensure no material is exuded during the injection cycle.

The milling machines used to produce lasts for this process have special holding systems that allow the entire surface of the last to be milled including both toe and heel. This results in lasts that are so precise they can be used for direct injection soling using PU without the risk of flash. This

is how German last manufacturer Fagus-GreCon produces its HPM lasts, designed for use in conjunction with rotary PU moulding machines and fitted with specialised top plates that are compatible with automated production systems and Industry 4.0.

The need for change

As we are all only too well aware, the covid-19 virus has hit the world very hard. It has also revealed the need for some changes in the footwear industry including the production of safety and work shoes. As many industries shut down or only operated part time, demand for this type of footwear fell dramatically and the resultant worldwide slump in sales has impacted heavily on company profitability and inevitably brought increased pressure on costs. Every measure to reduce the latter and increase efficiency therefore counts.

This applies especially to direct soling where there is still a great deal of untapped potential for improvements. At first glance, high investment costs prevent many companies from consistently increasing the degree of automation of their production facilities. For example, the use of a rotary table moulding machine is a given but, in many cases, automated material supply through robot support is omitted. The necessary investment sums often simply exceed the financial possibilities of the companies concerned. It may therefore well be worthwhile to divide the



Lasts for use in direct PU injection moulding have to be milled to the finest tolerances.

ALL CREDITS: FAGUS-GRECON

automation process into several phases. Enormous potential for increasing efficiency can be obtained simply by switching from conventional to HPM (high-precision milled) lasts.

Intelligent last selection

Very often, classic aluminium lasts are used for direct injection moulding. They are very accurate but heavy and relatively expensive compared to conventional plastic ones. Fagus says that, by changing to its HPM lasts, advantages of both types are combined and enormous improvements in efficiency and quality can be immediately achieved on a rotary table even without automated material supply:

- Higher productivity due to reduced machine stops for setting lasts/moulds
- Optimal fitting shoes as they stay on the last longer
- They can be adjusted in length giving flexibility in production requirements
- Prepared for a possible future increase in the level of automation
- Metal parts can be reused on future orders and savings on investment costs.

Advantages of HPM lasts

With HPM lasts, it is possible to adjust their position backwards and forwards by 2mm. Furthermore, there is also material in the hinge joint which can be removed or added to, therefore adjusting the last length by +/- 0.5mm to 2mm. This can be a great benefit in having the flexibility to cope with varying upper substances. As these lasts are fully milled, the possibilities are endless as to what can be achieved, such as anatomical last bottoms, logos, edge milling, toe cuts and last markings for upper location etc.

Fagus-GreCon has also developed an anti-sticking sealant called Fagus Antistick which can be added to the mould bite line area. This can be used for producing sandals or to give more compression allowance for upper variance. The benefit of Antistick is that PU does not stick to it as in other rubber bitelined lasts. Furthermore, HPM last back parts can be completely removed which makes the lasting and de-lasting of uppers, especially boots, so much easier.

However, the key point with HPM lasts according to Fagus-GreCon is that the last is positioned at a zero point at the



HPM lasts are compatible with automated production systems and Industry 4.0.

very start of construction. All future lasts in new developments use the identical zero point so that no manual setting of lasts is required as all round table station last holders are set identically

using the Zero setting mould. This is why the company claims that HPM lasts not only offer such a degree of accuracy but also excellent manufacturing flexibility. 🔄

SIMPLE STEPS THAT CAN BE TAKEN

MINIMAL SETUP	MEDIUM SETUP	OPTIMAL SETUP
HPM Lasts Last Holder Adjustment Tool Lasting & De-Lasting Machine	HPM Lasts Last Holder Adjustment Tool Lasting & De-Lasting Machine Heat Setter Chiller	HPM Lasts Last Holder Adjustment Tool Lasting & De-Lasting Machine Heat Setter Chiller Automated Robot Supported Material Supply
Automation ready tooling → Reduced time for machine setting → Upper remains longer on the last → Accurate upper positioning	Heat setter and chilling offer → Perfect upper fitting → Perfect stand of the sole	Automated material offers → Fast cycle times → Maximum output

COMPARISON

	HPM LAST	STANDARD DA LAST	ALUMINIUM LAST
Dimensional stability of the sole	★★★★★	★★★ (incl. cooling tunnel)	★★★ (using de-lasting lasts)
Automation ready	★★★★★	★★	
Time for the fitting of the shoe	★★★★★	★★★★★	★★
Last and de-lasting process	★★★★★	★★	★★★★
Set up time on machine	★★★★★	★★	★★
Maintenance	★★★★★	★★	★★
Reuse of components	★★★★★		★★
Length adjustable	★★★★★		

Footwear brand Paraboot's ongoing use of Goodyear-welting and Norwegian welting in its shoes and boots is part of its *raison d'être*.

Welting points

French footwear brand Paraboot is proud of its continuing commitment to traditional shoemaking techniques and of the skills its artisans have to master to carry on its heritage. It has been making footwear for at least 113 years; the first formal records of the business, set up by Rémy Richard, date back to 1908 (its current owner, Michel Richard, is the founder's grandson). But it was in the 1920s, a century ago, that the company introduced the previously unseen combination of leather uppers and rubber soles.

In a recent behind-the-scenes film that industry body the Fédération Française de la Chaussure (FFC) made about Paraboot production, the brand's marketing and communications director, Pierre Colin, says it is essential for designers and pattern-makers to have from the outset "a mastery of the materials". This includes the leather Paraboot uses, which is mostly high-quality calf leather. Calf appeals, Mr Colin explains, for its softness and because the animals have had relatively little time in which to become "scarred by the pangs of life", although the hides are still of good size and thick enough to provide the strength that Paraboot requires.

It uses automated cutting technology from Teseo to cut pieces for its uppers from each hide, using the familiar technique of first marking any flaws on the hide and allowing the technology to carry out nesting and cutting. "We need to make sure we get the maximum number of pieces from each hide," Mr Colin says, "the maximum yield we can possibly have."

Rubber lovers

Since the 1920s, rubber has also been a key material for the soles of the brand's footwear. Shoe companies began making products with light cotton canvas uppers and rubber soles in the nineteenth century, but Paraboot claims to have pioneered the combination of rubber soles and leather uppers soon after World War I. Other materials that Paraboot uses in some of its styles include raffia and canvas. "Understanding how all of these elements work, understanding the mechanics of it all is what's necessary to be able to make a shoe in the end," Mr Colin says.

He explains that Rémy Richard's idea of adapting rubber, which was, then, a relatively new material for European footwear producers to use, has proved successful because it has lasted for 100 years and is now much imitated. In the founder's time, shoes and boots with leather uppers had soles made from either leather or wood.

The company's headquarters are in Saint-Jean-de-Moirans, close to Grenoble and the Alps, and, even a century ago, there was demand for footwear suitable for walking, working and climbing in the mountains. To endow their footwear with non-slip capability, cobblers famously used hobnails, but this changed with Paraboot's inventiveness. Mr Richard realised rubber's potential for bringing this type of footwear into the twentieth century and, in the third decade of the twenty-first century, his legacy endures. "Our rubber soles are still a key part of the brand's identity," Pierre Colin says.

Based in Saint-Jean-de-Moirans, near the Alps, Paraboot's first customers wanted footwear to wear for walking, working and climbing in the mountains.

ALL CREDITS: PARABOOT



Around 150 different manual operations are required to make each shoe at Paraboot.



Public image

Goodyear-welting remains another mainstay of the brand's collections; Mr Colin makes the point that artisans in the Paraboot factory have to master 150 different manual operations to be able to produce its Goodyear-welting shoes. Goodyear-welting goes on at the factory alongside a less common method known as Norwegian welting. This involves double-stitching, with the upper being stitched to the sole vertically through the welts, with a horizontal line of stitching coming afterwards to strengthen the welts' attachment to the sole. Mr Colin describes Norwegian welting as being emblematic of Paraboot's public image. "The whole world knows Norwegian welting is an important part of what Paraboot is famous for," he maintains. He describes the technique as being a way of "imprisoning the sole", making it an integral part of the shoe.

Paraboot began its long tradition of using Norwegian welting in its ranges of mountain and equestrian footwear, but the company states that for some time that the technique has been in use more and more in everyday styles. Late last year Lyon-based fashion brand Arpenteur incorporated footwear from Paraboot into one of its collections. Arpenteur's founders, Marc Asseily and Laurent Bourven, have described the footwear brand's products as combining the "utilitarian quality" of the

outdoors, of workwear and sportswear with the sophistication of traditional designs. They have pledged to support local manufacturing and, therefore, all the products in the collection are entirely made in France.

Mystery name

Cambrile shoes and Elevage boots are the products Arpenteur opted to include in its offering. The Cambrile is a shoe based on an earlier Paraboot model, the Chambord, with the redesign taking place specifically for Arpenteur. For its part, the Elevage is an elasticated boot, again specifically designed for Arpenteur, a traditional boot worn by cattle herdsman in the Camargue in southern France as the inspiration. Both of these footwear products have uppers made from oiled nubuck, with goatskin linings and rubber soles. For both styles, Paraboot has used the Norwegian welting method to attach the sole to the upper.

Part of the reason Paraboot is such an enthusiastic user of Norwegian welting is that it makes shoes water-resistant and easy to re-sole. It acknowledges, however, that the technique's name remains something of a mystery. It seems not to have any direct connection to Norway; in fact, it appears it is much more the preserve of this corner of south-west France. 🇫🇷

Paraboot claims a footwear first for starting, a century ago now, to combine leather uppers with rubber soles.



Few storied footwear brands have kept pace with the times as well as the seemingly ever-present Dr Martens, which remains fashionably relevant following wave after wave of popular culture. *World Footwear* catches up with the company's apprenticeship supervisor, Tanya Granaghan, to find out why a Dr Martens education is much sought after.

Doctor's orders

The role of people is central to Dr Martens' story. Not only does the wearer – the front-of-mind maker and follower of trends spanning punk to grunge and beyond – have a part to play, but so too do the back-of-house hands that continue to build its famously yellow-stitched boots and shoes deserve their time under the spotlight. Since 2004, the majority of Dr Martens manufacturing has taken place in factories across Asia, but around 1% of production today happens in England, at the brand's traditional Cobbs Lane facility in Wollaston, Northamptonshire. Notably, the company told the *Guardian* in 2019 that Dr Martens' manufacturing methods in Asia and England are identical, "all the way down to putting the lid on the box".

Class in session

World Footwear learns from Ms Granaghan that the business' plan has "always" been to expand its (slightly more expensive) Made in England line. She explains that Dr Martens is operated with a long-term, custodian mindset and that "part of that means ensuring key skills are retained and passed down to new generations of skilled shoemakers". Hence, a year-long

traineeship in expressly British-style upper shoe production – including foot measurement, sizing, last types, pattern-cutting, clicking and closing – was launched by Dr Martens in April 2012. Since then, nine cohorts of Cobbs Lane-based apprentices have received a government-accredited qualification in footwear manufacturing upon completion of the scheme. (Class of 2022 applications closed on July 2.)

Prior to 2012, the only new employees joining the production team were either ex-Dr Martens personnel or those who had previously been trained at other factories in Northamptonshire, Ms Granaghan says. Thus, after identifying a lack of early career footwear professionals joining its ranks, the company formed its apprenticeship programme with the intention to "give young people a chance to train in the industry, alongside people who live and breathe the brand", she explains. For the existing production team, she tells us that passing on their skills to the next generation "fills them with pride". Ms Granaghan describes how the scheme fosters a sense of community at Cobbs Lane, inspiring young people and building bridges from one generation to the next.

Successful completion of the twelve-month traineeship

Dr Martens' iconic cherry red leather boots with the distinctive yellow welt stitch that has featured prominently since the 1960s.

ALL CREDITS: DR MARTENS





Trainees are immersed in the history of British footwear manufacturing Dr Martens, Cobbs Lane site. The brand is committed to upskilling the next generation of shoemakers.

qualifies apprentices for a full-time position at Dr Martens, either in clicking, closing, lasting or in the shoe room. The work in the clicking team mainly involves operating the cutting presses to specified quality standards (and creating the least amount of wastage possible for leather), while those who work in closing will use sewing machines to complete a Dr Martens upper. In lasting, new recruits learn the process of shaping the shoe around a last and attaching the sole to the brand's internationally recognised, yellow-stitched welt. Toe lasting, back part moulding, upper trimming, side lasting, inseam trimming, welt sewing, heat sealing, edge trimming and last slipping are also part of this work. The shoe room is where the team adds the final quality touches and where all footwear is cleaned and boxed ready for dispatch.

On average, around half of each year's apprenticeship intake stay on at the factory, where they are "heavily" relied upon throughout their initial training. Whereas some are retrained within other Dr Martens departments, such as sustainability, others may go on to pursue a career with another brand in the locality. "We still see this as a positive for British footwear manufacturing," the apprenticeship supervisor states.

Final results

2021 saw close to 200 aspiring shoemaking apprentices apply to Dr Martens – less than in previous years. Though perhaps easily attributable to the ongoing covid-19 health emergency, Ms Granaghan does not suggest a reason for this, but rather says that it was surprising. The brand's class of 2021

commenced their learning in September 2020, "in the middle of a pandemic", which resulted in apprentices and their teacher-mentors adapting to virtual training sessions. This cohort is currently working on their final projects, which ordinarily would include hands-on assistance from the whole production team as necessary, although apprentice artisans are always "mainly" responsible for their showcase product. To enable assessment of what they have learned so far in the scheme, each trainee designs and makes their own pair of Dr Martens shoes, intended to result in a creative reflection of their personality.

Due to the programme's incorporation of brand and footwear history, in addition to practical know-how, apprentices are well-prepared for "all" sectors of the company, including sourcing, product development and design, Ms Granaghan tells *World Footwear*. Previous apprentices, now employees, have had opportunity to travel or relocate to the company's factories in Asia. A digital cutting supervisor, apprenticeship training supervisor and in-training internal maintenance mechanic, all former Dr Martens apprentices, are among those who remain working at Cobbs Lane. Further, ex-apprentices' feedback helps inform future training, the aim of which is the ongoing improvement of each year's course structure.

Having sold 12.7 million pairs of shoes and boots in the 12 months ending March 21, this year (an increase in volume of 14% compared to the previous business year), plus having reported a 15% year-on-year revenue boost, there is evidently no kicking back for Dr Martens – or its apprentices. 🍷

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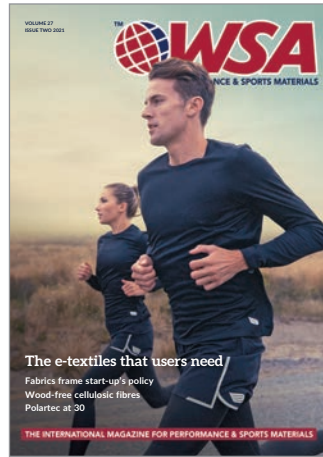
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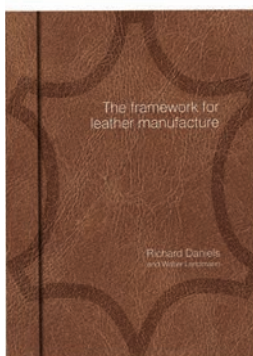


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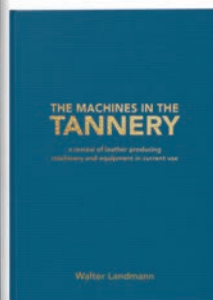
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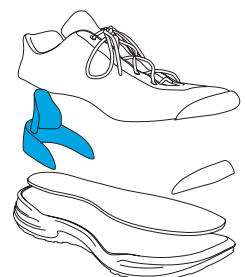
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