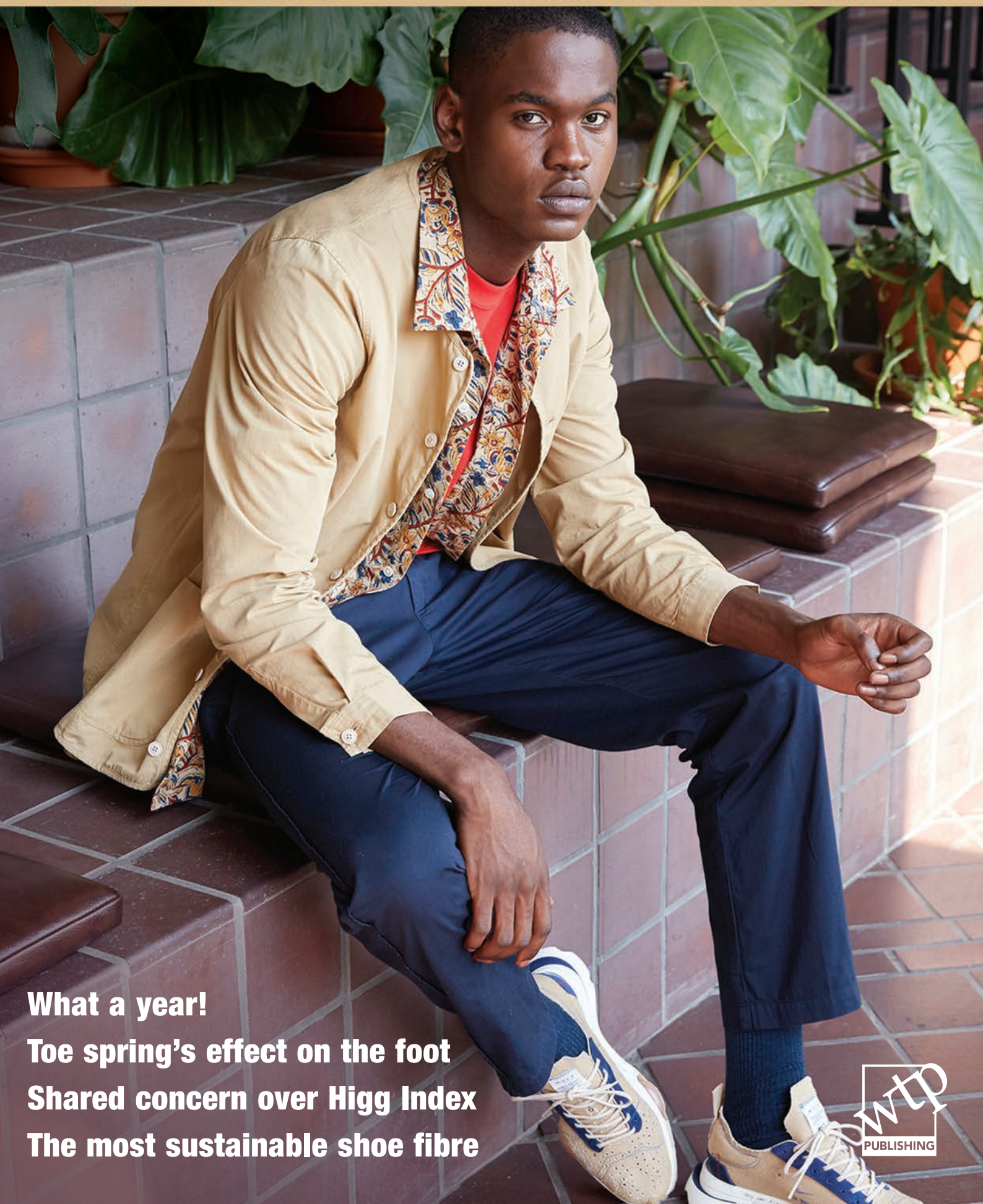


WORLD FOOTWEAR

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THE MAGAZINE FOR THE GLOBAL SHOE INDUSTRY



What a year!

Toe spring's effect on the foot

Shared concern over Higg Index

The most sustainable shoe fibre

WTP
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The Size? x Nike collaboration is built around the silhouette of Nike's Air Zoom Alphafly Next% running shoe. It draws on influence from minimalist Japanese design, the brand states, and has hemp across its uppers for "a raw, natural aesthetic". *Image: Size?*

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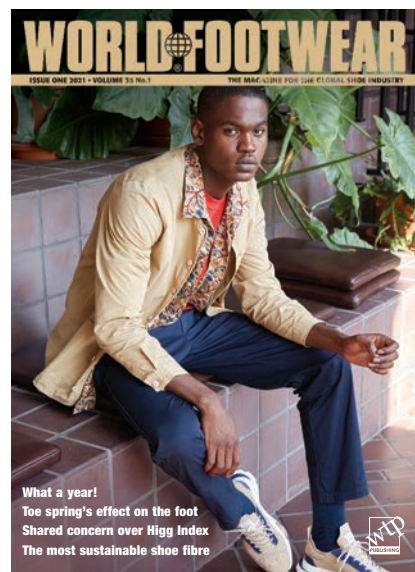
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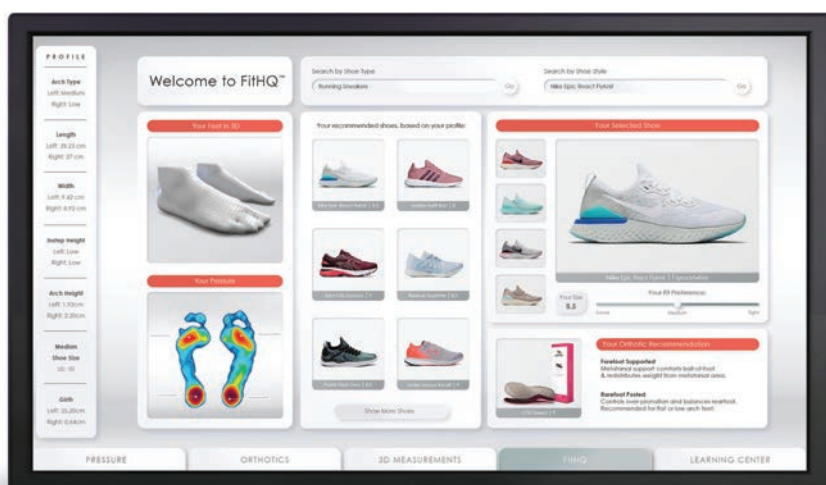
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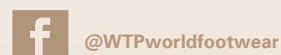
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News

FRANCE Lyon-based fashion brand Arpenteur has incorporated footwear from high-end French manufacturer Paraboot into its latest collection. Arpenteur's founders, Marc Asseily and Laurent Bourven, describe the brand's products as combining the "utilitarian quality" of outerwear, workwear and sportswear with the "sophistication" of traditional designs. They aim to support local menswear manufacturing and, therefore, all the products are entirely made in France.

UK Private equity firm LionRock Capital's move to acquire a majority stake in footwear group C&J Clark Limited seems likely to succeed. Creditors of Clarks have agreed a Company Voluntary Arrangement (CVA) that administrators Deloitte have proposed to enable the restructuring of the footwear firm. LionRock said in November that it would invest £100 million to help the business build "future, long-term, sustainable growth", especially in China and other parts of Asia.

ITALY Luxury industry analysts at Bain and Altagamma have issued a new report highlighting the extent to which this sector has been affected by covid-19. They have estimated a value of €217 billion for the wider luxury industry for 2020, a decline of 23% compared with 2019. This will represent the first decline for the sector since 2009. Their estimate is that in 2021 the market will recover 50% of the profit brands lost in 2020. They expect the recovery to gather pace over the next three years, with the market returning to 2019 levels by the end of 2022 or early 2023.

DENMARK Footwear brand Ecco won the 'Green Imprint' award for its DriTan technology at the ELLE Denmark Style Awards in late 2020. DriTan technology is designed to be a water-saving alternative to traditional tanning methods and keeps the shoes "made for the elements", according to the brand.

RUSSIA Novosibirsk-headquartered shoe retailer Obuv Rossii rebranded itself as a "universal retailer" in late 2020. The company will be known as OR Group going forward. In expanding beyond footwear, the group will prioritise a "universal retail format and offline and online marketplace", as well as develop a financial service offering, the organisation stated.

TANZANIA The president of Tanzania, Dr John Pombe Magufuli, formally opened a tannery and finished product factory that will make finished leather, footwear, leather soles, bags, belts and garments in Moshi, the capital of the country's Kilimanjaro region. The complex opened in late 2020. Kilimanjaro International Leather Industries will aim to produce 13 million square-feet of finished leather per year. Around 60% of this leather will remain on site for the company for its own use to make 1.2 million pairs of shoes and boots per year in addition to 2 million pairs of soles.

JAPAN Sports brand Asics has become the first Japanese company to join the Global Fashion Pact. It made the announcement in December. Thirty-two fashion and textile companies signed the Fashion Pact in August 2019 as a new commitment to protecting climate, biodiversity and the oceans of the world.

CHINA A China-Italy fashion road event took place at the Dalang "fashion town" complex in Shenzhen in December. Co-sponsored by China Leather Industry Association (CLIA), Shenzhen Leather Industry Association and the Dalang fashion town construction management centre, the event saw the official opening of a China-Italy footwear creative design centre.

US The American Apparel & Footwear Association and Footwear Distributors and Retailers of America are among the signatories of a letter that 160 organisations have sent to President-elect Joe Biden about the US's ongoing trade dispute with China. The signatories urged the president-elect to remove ongoing disputes and tariffs. They said that, as a result of the trade war with China, which began at the start of 2018, US businesses had paid more than \$68 billion in tariffs.



PAKISTAN Pakistan's leather sector reported export revenues of \$277 million for the first four months of the current financial year, July-October 2020. This represents a fall of 6.8% compared to the same months a year earlier. The figures come from the country's Federal Bureau of Statistics. There was a fall for footwear, too. The number of pairs exported was flat at 5 million, but revenues fell by 5.8% to \$42.6 million.

VIETNAM South America has been touted as a promising market for Vietnam's leather and footwear manufacturers. An online trade forum between companies in South America and Vietnam highlighted ways to expand businesses. Vice general secretary of the Vietnam Logistics Business Association, Nguyn Tuong, told Vietnam Net News that the sector was undergoing a digital transformation to meet demand following the pandemic. He said more meetings via agents were necessary, and suggested embassies should also hold trade promotion trips to support partnerships and deals.



ARGENTINA After a four-year pause, a long-standing footwear trade dispute between Brazil and Argentina has reignited. Brazilian industry body Abicalçados has said that, in early December, there were 328,000 pairs in a bottleneck at the border and that around 95% of these products had been held at the border for longer than 60 days, which Abicalçados said was in contravention of World Trade Organisation rules.

AUSTRALIA Entrepreneur Andrew Forrest has taken up the ownership of Adelaide-based boot brand RM Williams. Business media in Australia said the company owned by Mr Forrest had paid around \$135 million to buy the brand from L Catterton, a US-based equity capital fund that has backing from LVMH. In a statement, Mr Forrest described the boot company as a national icon and said he was proud and humbled to become its owner.



Footprints

SHOE GROUP ANNOUNCES CHANGE OF CEO

Footwear group Bata has announced that the head of its business in India, **Sandeep Kataria**, is to take over as chief executive of the company with immediate effect. He replaces **Alexis Nasard**, who has left the organisation.

Chairman of the board, **Graham Allan**, said he was confident Mr Kataria, who has led Bata India since 2017, would lead the global company well "at such a critical time".

For his part, Mr Kataria said: "While 2020 has presented unique challenges, the appeal of our brands and the passion of our people provide every reason for confidence regarding our prospects in the years ahead."

NEW COMPANY PRESIDENT FOR CALERES

Footwear group Caleres has appointed **Jay Schmidt** to the role of president of the company. He was previously president of the group's brand portfolio division. He will assume responsibility for all consumer and brand strategy for Caleres' entire portfolio, which includes Famous Footwear, Allen Edmonds, Dr Scholl's, Naturalizer, Sam Edelman and Vionic.

At the same time, **Lydia Park Luis** is joining the group to become president of its New York-based brands; she will also have responsibility for the company's international business. **Keith Duplain** has been promoted to president of its St Louis-based brand portfolio. He has been with Caleres for 15 years and has been leading the organisation's sustainability efforts. At the end of November, **Michael Edwards** was named president of Famous Footwear, the group's largest brand.

ASSOMAC NAMES NEW PRESIDENT

Italy's national association of tanning and footwear machinery manufacturers, Assomac, has a new president.

At its general assembly for 2020 in late November, it named **Maria Vittoria Brustia** as the person to take over from



ASSOCALZATURIFICI "VERY CONCERNED" ABOUT THE MONTHS TO COME

Italy's main national footwear industry body, Assocalzaturifici, has said its member companies experienced an average fall in sales of 33% in the first three quarters of 2020.

President of the organisation, **Siro Badon**, said: "The figures for the first nine months of the year reveal a sector that has been sorely tried by the covid emergency."

To illustrate this, he pointed out that 101 Italian footwear producers ceased operating in the course of the

first nine months of 2020 and that the industry shed 2,600 jobs. Mr Badon also pointed out that, taking component manufacturers into account, these figures increase to 231 companies closing their doors and 3,453 jobs being lost.

He said that there had been "timid signals of a return to normality" in the last month for which figures are available, September 2020. Exports and domestic sales for the month were on a par with the same month in 2019. However, he said that there was a real danger of a second wave of covid-19 wiping this out immediately, with "severe repercussions" for the Italian footwear industry's ability to hold out.

In export markets, Italian footwear manufacturers sold 127.1 million pairs of shoes in the first nine months of 2020, a decline of about 20% in volume. "We are very concerned about the months to come," Mr Badon said.

Gabriella Marchioni Bocca in the role.

Ms Brustia is president of Brustia-Alfameccanica, a Vigevano-based technology provider that specialises in footwear machinery, especially machines for heel-fixing and backpart- and toe-moulding.

In the course of the meeting, the chief executive of tanning machinery manufacturer Bergi, **Mauro Bergozza**, was elected as one of Assomac's vice-presidents, as was **Cristiano Paccagnella**, chief executive of leather finishing and stitching machine provider Omac.

FORMER BALMAIN COLLEAGUES LAUNCH THEIR OWN BRAND

In spite of covid-19, two former executives at Balmain, **Françoise Misiraca** and **Charlotte Sauvat**, have gone ahead with plans to launch their own high-end women's footwear also

brand, La Ligne Numérotée.

Ms Sauvat has been a shoe and accessories designer for 17 years, working at Michel Vivien, Lanvin and Isabel Marant before joining Balmain. Ms Misiraca spent 18 years at Balmain, working in a variety of roles, including as the head of its men's department.

They have said that launching Paris-based La Ligne Numérotée this autumn is their attempt to "reconnect with a certain couture spirit" and that the brand will create "high-quality, timeless, meaningful" products that put style before trends. Their footwear is produced in a small, family-run atelier in Tuscany.

HONOUR FOR EX-CLIA PRESIDENT

Su Chaoying, honorary president of the China Leather Industry Association, and **Wang Xuechan**, vice president of Xi'an's Shaanxi University of Science

and Technology, were joint winners of the 2020 Zhang Quan Fund Award in China. The selection committee bestowed the accolade for their “outstanding contributions” towards the management and sustainable development of the Chinese footwear and leather sector.

RHENOFLEX RENEWAL

Shoe components supplier Rhenoflex has appointed **Matthias Oberfichtner** as director of business development for shoes, Europe. With 20 years of experience Mr Oberfichtner will use his know-how to support clients and grow the customer base.

BASF BOSS MOVES

Textile chemicals producer BASF has announced that the current president of its performance chemicals division, **Anup Kothari**, is to leave the role and take up responsibility for the company's nutrition and health division. He will move on February 1. BASF's senior vice-president for automotive coatings, **Thomas Kloster**, will take charge of performance chemicals in addition to his current responsibilities.

MADE FOR LIFE

Under new ownership since last year, when London-based One Luxury Group took over, heritage leathersgoods brand Tanner Krolle has named **Tabitha Simmons** as its new creative director. Ms Simmons is best known for her footwear designs. “I love the idea of products being made for life,” Ms Simmons has said in comments to the *Financial Times*.

FFANY TO BE 'REINVIGORATED'

Footwear executives from groups including Converse and Pentland have joined the board of the Footwear Distributors and Retailers of America (FDRA), in what it calls an “effort to reinvigorate the Fashion Footwear Association of New York (FFANY)”. FDRA has taken over the FFANY Market Week events.

INDUSTRY AUTHORITY JOINS DAHU

Ski boot brand Dahu has asked industry veteran **Dano Bruno** to lead up a new initiative called the Corsair Fit Experience, a digital fitting service.



ATHLETE LAUNCHES PHILANTHROPY-FOCUSED SPORTS BRAND

Basketball star **Stephen Curry** launched an own-name footwear, apparel and accessories brand in December in partnership with Under Armour.

A percentage of the Curry brand's annual revenues will be invested in under-resourced communities. By 2025, it aims to create at least 20 safe places to play, support 125 programmes that impact young athletes, and deliver opportunities to train more than 15,000 coaches, with the intention of making an overall impact on more than 100,000 young people.

Stephen Curry explained that he wanted to “unlock play” for children in disadvantaged communities, explaining that more than 70% of children and teenagers from low-income households in the US take part in organised sport but are six times more likely to stop taking part because of financial costs.

Studies suggest that increased fees and logistical hurdles in response to the coronavirus pandemic will make participation even more difficult for these young people.

Chief executive of the Swiss brand, **Clark Gundlach**, said Mr Bruno's status as an industry authority was “indisputable”; he said Dano Bruno had built ski boots for “the world's most accomplished athletes”.

TWO SENIOR APPOINTMENTS AT WOLVERINE

Outdoor footwear group Wolverine World Wide announced two senior appointments at the start of the year.

It has hired the global head of digital business at Reebok, **Matt Blonder**, placing him in the role of Wolverine's president of global e-commerce. Wolverine said it had set itself “the bold goal” of achieving \$500 million in global e-commerce revenue for 2021 and that Matt Blonder's track record made him the ideal person to lead “this ongoing digital transformation”.

The group has also made **Jim Zwiers** president of its global operations

group, responsible for portfolio-wide sourcing, logistics, distribution, customer service, and information technology.

Mr Zwiers has been president of Wolverine's international group since 2014 and has spent almost 23 years in total working for the group. He will succeed **Mike Jeppesen** in this new role. Mr Jeppesen is to retire after more than 33 years in the footwear industry, the last nine of which have been with Wolverine World Wide.

TAPESTRY CEO CONFIRMED

Luxury group Tapestry has officially appointed **Joanne Crevoiserat** as CEO, following the departure of **Jide Zeitlin** for personal reasons in July. Mr Zeitlin had been in the role for less than a year, after taking over from **Victor Luis** in September 2019. Ms Crevoiserat has served as the interim CEO since Mr Zeitlin's departure. 📌



Industry&Innovation

SAFETY FOOTWEAR REVOLUTION WEEK COMES TO SUCCESSFUL CONCLUSION

Organisers of the Safety Footwear Revolution Week said at the end of the online conference that the event had been a success. Running across four mornings from November 23-26, there were 2,000 registered attendees from more than 70 countries.

Safety footwear brands AMF and Toworkfor, and specialist soling provider Aloft, who jointly organised the event, said at the end of the final session that they had received a high volume of positive messages.

Pedro Castro, representing Aloft, said the event had provided "four fantastic days". He said a high number of good ideas had come to light during the panel discussions and presentations.

LED SHOELACES BOOST RUNNERS' VISIBILITY

Researchers at the UK's Nottingham Trent University have designed shoelaces that light up and flash to improve safety at night for joggers and cyclists.

The laces – created by researchers in the Advanced Textiles Research Group (ATRG) in collaboration with technology group QinetiQ – contain light emitting diodes (LEDs) the size of fleas and are switched on or off by the wearer tapping the shoes together.

Professor Tilak Dias, who leads the ATRG in the School of Art & Design, said: "These laces could become a very simple way for runners or cyclists to improve their visibility on dark winter nights. They could also become popular as a fashion accessory and worn for aesthetic purposes."

ISPO NAMES 10 TOP START-UPS

Trade show ISPO has named its top start-ups for 2021 with 10 winners and 20 runners up. The 30 new companies will feature as part of a virtual ISPO Munich 2021 (February 1 to 5).

Footwear-focused participants include Auftrieb, Switzerland, whose Crampow technology is a combination



CEC LAUNCHES PROJECT FOR SHOES FOR DIABETICS

The European Footwear Confederation (CEC) and partners from Czechia, Germany, Poland, Portugal, Spain, and Romania have begun a new project called DiaSHOE. With funding from the European Commission, the project's aim will be to help footwear manufacturers address the needs of people with diabetes.

"Diabetes currently affects 463 million people worldwide and complications in the lower limbs caused by the disease are frequent," CEC said on announcing the development. In 80% of cases, there is a link between Diabetic Foot Syndrome (DFS) and inappropriate footwear.

Project partners will produce a series of digital education packages to guide footwear manufacturers, patients, healthcare workers, and shoe-store staff towards, making, choosing and selling "appropriate footwear" for people with diabetes.

of crampons and snow shoe, designed for ski mountaineers and freeriders. On the last few metres to the summit, wide and light plates give the user a boost in the deep snow, while the integrated front teeth offer the grip of crampons.

CHINESE OFFICIALS VISIT TOPSCORE

In late December, Chinese communist party members and high-ranking leather and footwear officials visited Guangdong-based Topscore (also known as Tianchuang Fashion), a leading shoe-manufacturing company "for a visit and guidance", local media have reported.

Particular attention was paid to Topscore's digital innovations, such as its smart production lines and live broadcast rooms, as well as its

environmental protection achievements during production.

Officials gave advice to the brand on the subject of its participation in the formulation of industry standards, plus professional skills improvement training.

During the visit, Topscore reaffirmed its commitment to "creating a new national brand of fashionable and environmentally friendly footwear", while keeping up with industrial developments.

SIMAC-TANNING TECH POSTPONED

Machinery manufacturers' association Assomac has said that the 2021 edition of its annual Simac-Tanning Tech will not take place in the first quarter of the year, but will be rescheduled for the

second half. Assomac usually schedules Simac-Tanning Tech to run concurrently with Lineapelle. The next edition of Lineapelle will run from March 20-24, alongside finished-product events Micam and Mipel.

LONG LIFE PROJECT

Soling technology provider Desma has said it will use the findings of a research project it is involved in to update its Desparts tool for spare-parts ordering. Germany's ministry for education and research is funding a project called Long Life to design reliable forecasting models for identifying wear and tear and possible faults in machines at an early stage. Long Life will run until 2022.

SEA OF PVC

Billions of square-metres of synthetic materials for footwear manufacturers to use instead of leather continue to come out of factories in China. Near the end of 2020, the China Leather Industry Association reported that the country's production of these PU- and PVC-based materials declined by almost 5% in 2019 compared to the previous year. However, in 2019, China's production of those synthetic materials still reached the enormous volume of 34 billion square-metres.

BASF RAISES PRICES

Chemicals manufacturer BASF has announced increases in prices in the European market for butanediol and derivative products. Its 1,4-Butanediol (BDO) product will go up in price by €300 per tonne. BDO and its derivatives are used in the production of polyurethanes, spandex fibres and other products.

TANNING TECHNIQUES

The secretary general of COTANCE, Gustavo González-Quijano, has said chrome tanning is just as sustainable and environmentally responsible as other tanning techniques. Speaking at the Safety Footwear Revolution Week event, Mr González-Quijano said: "There is no tanning technique that is better than another. We have chrome or mineral tanning, vegetable tanning with tara or chestnut or other vegetable materials and we have synthetic tanning. All of them have their merits and they are more or less equivalent."

MACHINE REGIME

A European project called Reclaim, part of the wider Horizon 2020 programme, which aims to restore and update manufacturing technology in five industrial sectors (including footwear), has just completed its first year. According to CTRC, the specialist footwear technology centre for manufacturers in La Rioja in Spain, one of the project partners, the first phase of the project has focused on finding out what machinery is in place in European shoe factories, how well it performs and what the most frequent faults are.

NO-GLUE SHOE

Footwear brand Twisted X has launched its first no-glue shoe after three years of research and development. The Zero-X uses an interlocking, double-stitching system instead of glue, which the company says results in energy savings and environmental benefits as fewer chemicals are used.

10M PAIRS PER YEAR FOR ADIDAS

China-based Zhansheng Group completed work on its new Adidas Taoyuan Industrial Park (in Taoyuan, Hunan province) in November. Zhansheng is the only domestic Chinese company making adidas products in mainland China. The park is reportedly the largest intelligent, automated and standardised production base in the country. It features 48 intelligent production lines and will be able to produce 10 million pairs of adidas shoes per year.

EXTRA TESTING

Independent research organisation Oeko-Tex has announced a series of new regulations for its leather standard. These will come into effect in April after a three-month transition period. Among the changes is one that means an additional lab test will now be required for companies wishing to present the leather they use as chrome-free or metal-free. 



SHOE INNOVATIONS AIM TO MEET TENNIS PLAYERS' NEED FOR SPEED

Tennis players Julia Görges, David Goffin and Álex de Miñaur have all played a role in helping sports brand Asics develop a new shoe, Solution Speed FF2. The brand said the footwear is especially suited to athletes who put emphasis on acceleration in their efforts to cover the court.

Technological advancements Asics pointed to include Dynawrap, a proprietary system of panels that cradle the foot and use the wearer's own momentum to provide a good fit.

Another innovation is Flytefoam technology, which provides high levels of cushioning, but helps make the shoe lighter at the same time, and Flytefoam Propel, which is placed in the medial forefoot to give better control of weight in the forefoot. This, in turn, makes it easier for athletes to make a quick start.

Players who depend on speed in their game especially depend on the speed of their first few steps in any direction, forwards or backwards, left or right, according to Asics.



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.

06/01/2021

Launch of leather with anti-microbial technology permanently tanned in. Shoe sector must seize post-pandemic chance.

05/01/2021

CLIA, leather footwear and the CPC's 14th five-year plan. Parley for the Oceans shoes to reach 17 million pairs this year.

16/12/2020

UK's footwear workers encouraged to apply for funding. As Reebok returns to growth, adidas mulls its future. Old becomes new: Nike Air Max 1 Yours.

15/12/2020

Savills: luxury brands' concrete pivot to Asia. ISA TanTec adds hide sourcing programme to its LITE concept.

14/12/2020

Exor invests in Shang Xia, becoming Hermès partner.

10/12/2020

New wave: Prada x adidas Luna Rossa 21 sails out. Fashion and footwear join SDG-accelerating platform.

09/12/2020

Anta x Salehe Bembury collab flies the nest. China's leather shoe industry has 'bottomed out'.

08/12/2020

New DIY Nike Air Force 1/1.

07/12/2020

Long route of evolution for footwear fair.

04/12/2020

Guangzhou building customisation city. Puma teams up with one of Gulden's favourites.

03/12/2020

€5m for Swedish digital sourcing platform.

02/12/2020

EC chooses 'sustainable fashion' innovators. Two leather companies earn sustainability seal.

01/12/2020

Finished leather prices in Turkey have dropped by 50% since June 2019.

27/11/2020

Wrong to play one material against another, COTANCE says.

26/11/2020

Leather footwear volumes steady in Vietnam.

25/11/2020

Chinese artisan an inheritor of Dongguan ICH. Wide-ranging discussion on technology at Safety Footwear Revolution Week. Vivobarefoot: Customers value end-of life-options.

24/11/2020

Global shoe market to lose 5 billion pairs in 2020.

23/11/2020

Vision 2030 sets out the company Asics 'aspires to be'.

20/11/2020

Caleres revenues down by 30%. Anta Group beats its 2019 Double 11 sales by 53%.

19/11/2020

First cohort starts fashion sustainability certificate with IFM-Kering tie-up.

18/11/2020

Pandemic provides unexpected boost for made-to-measure. RCEP to benefit Chinese exports. Interest in Safety Footwear Revolution Week is 'overwhelming'. Mental health focus for Vans.

17/11/2020

Lenzing rolls out TextileGenesis for full traceability. RCEP deal secured on world's largest trade agreement.

16/11/2020

Limited-edition Reeboks use repurposed airbags. Shoppable, live broadcasting of fake shoes in China.

13/11/2020

Nine-month figures show declines in volume and value for Yue Yuen. Adidas claims strong recovery despite sales dip.

12/11/2020

Mizuno has plans to revive revenue after covid-affected six months. Ferragamo fears covid's second wave.

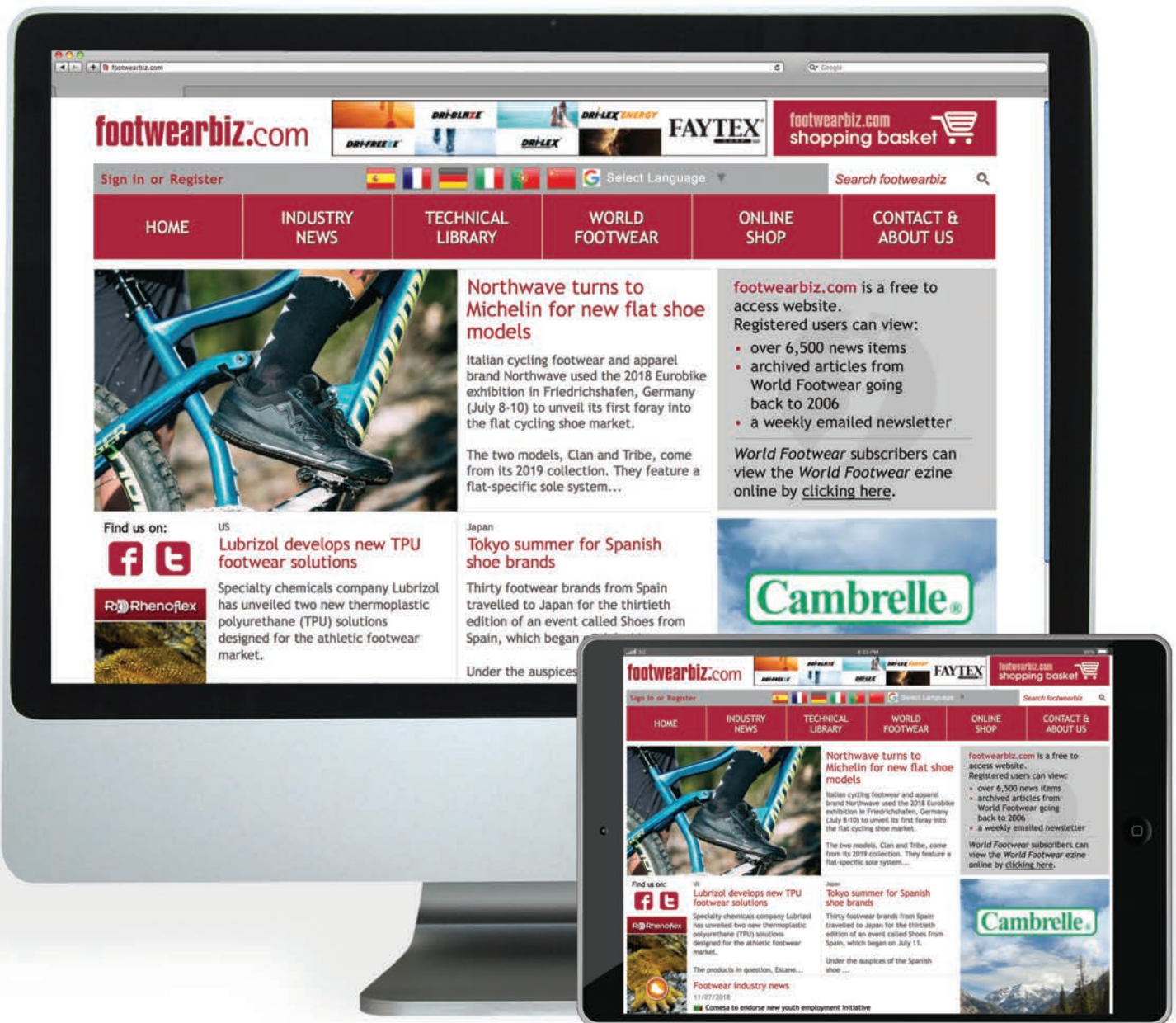
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Effects of the pandemic

STUART CLEAVER

The main event during 2020 was, of course, covid-19. Seemingly originating in Wujan, China, the initial assessment was that it would be mostly restricted to that region of the country. To this end, mass retailers of apparel and footwear such as Primark, H&M and Zara started to use suppliers in Turkey, especially for apparel, or Vietnam, Cambodia and Indonesia for footwear on the assumption by some that the delay in the China supply chain would only last about three months. However, the actual catastrophic spread of the disease during the year has had a devastating effect globally and has probably accelerated a rethink amongst Western buyers as to their over-reliance on China. To some extent, this was taking place in any case such as, for

example, in the sports shoe and safety footwear sectors.

At the time of writing (end November 2020), it is perhaps still too soon to give any forecasts as to the year-end, especially with a second wave and consequent lock downs in the US, Europe, Australia and elsewhere. The positive news about vaccine availability which, although impacting more on 2021, at least brought more positivity to the last few weeks of 2020. By late October, the IMF was predicting that only China of the major G20 economies would see a positive GDP rise of 1.9% which, although the lowest Chinese rise for some years, compared well with, for example, the US down 4.3%, Germany down 6.0% and UK down 9.8%. China performed better as a result of largely state supported infrastructure projects,

but it also saw industrial production up 6.9% for the year to September 2020 and even exports up 9.9% in September itself, with strong demand from the US. Of course, this may change somewhat if the infrastructure projects are completed and export markets are further affected by the second wave of the pandemic.

Retail sales in China were fairly static as consumer confidence remained low. However, in September sales jumped from +0.5% to +3.3%, giving a second positive month after seven consecutive negatives. Unemployment was 5.4% in September, only 0.2% higher than at the end of 2019. Manufacturing grew with industry in general achieving six consecutive months of growth after President Xi ordered factories to reopen in March. China therefore seems to

have been the only major economy to show any type of a V-shaped recovery thus far. Vietnam was also looking more positive with even a 7.2% rise mooted for 2021. Overall, the IMF has indicated that its best prediction was that global GDP would fall by 4.4% for 2020.

POSSIBLE EFFECTS

If any effects of the virus on an industry such as footwear are yet apparent (there will be more), they are likely to include the following:

1. E-commerce has fared much better than store sales. For example, Zalando based in Germany is expecting sales to be up by between 10-20% for the year. Although this trend had already started, it has been given a boost by the pandemic that is unlikely to be reversed unless governments decide to raise taxes on e-commerce to aid the high street.
2. Many retailers have furloughed staff and closed stores. They have also taken the opportunity to reassess their businesses including number, size and position of stores, merchandise, rents paid to landlords, supply chain sustainability, eco-friendliness and other factors to help them survive. On the other hand, supermarkets and Amazon have been able to extend their sales significantly and consequently sell more, mainly lower cost footwear.
3. A review of their reliance on China and existing supply chains with a view to more flexibility and not relying on a single source. Chinese shoe exports to the US fell by over 400 million pairs or 35.8% January to September 2020. Cambodia was the only exporter of any size to increase sales to the US with a rise of 17.9% to 5.8 million pairs. It nevertheless still saw 200 factories suspend or relocate production with a loss of some 5,000 jobs.
4. Coronavirus problems combined with other potential 'flashpoints' impacting on business prospects such as President Trump's trade wars and sanctions with China, Iran and others, and a UK exit from the EU without a deal. Overall, prospects for trade do look brighter



Online sales grew while bricks-and-mortar retailers suffered badly.

CREDIT: SHUTTERSTOCK / BLUEE 77

- for 2021 onwards with perhaps a revival of proposed trade agreements and environmental measures.
5. Widescale unemployment. Abicalcados (Shoe Federation in Brazil) has indicated that 60,000 had lost their jobs in the Brazilian shoe industry by the middle of 2020. The forecast for shoe production in Brazil in 2020, which had been up 2.5% in January, was downgraded to a loss of 29% and exports 31% in volume terms. This suggests that shoe production could have fallen by between 190 million to 265 million pairs during the year.
6. Governmental stimulation of trade can be expected to play a role in some countries with items such as VAT being reduced (e.g in Germany from 19% to 16%), and other industry specific incentives.
7. Most footwear companies are small- to medium-sized. Will they fall under the radar of government assistance? A country like Germany with its pride in 'Mittelstand' (medium and small size) may be more accommodating.
8. Safety footwear manufacturers and suppliers can and have turned their hand to safety masks and other PPE products. One aspect of the huge debts incurred through the virus may be more infrastructure building, which should help safety and protective footwear industries.
9. With footwear being in part a fashion industry, will consumer attitude change towards disposable cheap clothing and footwear, especially where 'sweat shops' are involved in their manufacture, with less items purchased and even a return (to some extent) to on-shore manufacturing? With covid-19 vaccines becoming available, consumer attitudes could harden once more, especially if disposable incomes are limited for many.
10. If there is an increase in working from home, there may be less need for new shoes. However, this could be counterbalanced by more emphasis on keeping fit and avoiding public transport and cars. Walking and cycling have increased during the pandemic and may give a stimulus to the hiking boot industry and others.

LEADING INDICATORS

Whilst China has performed better than most and, as the leading shoe producer has a pivotal role in the development of the industry, what of the United States as the leading shoe consumer and home of leading shoe brands? For the period January to September 2020, total shoe imports into the US appear to have fallen by some 28% to 1,266.7 million pairs, down from 1,762.3 million pairs in 2019. Imports from China actually fell by 35.8% to 741.7 million pairs against 1,156.3 million pairs in 2019 as well as from

Vietnam — another fall of 11.0% to 330.5 million pairs compared to 371.4 million pairs the previous year. As noted earlier, Cambodia was the only leading country to show an increase of any size with a rise of 17.9% to 38.1 million pairs. Burma (Myanmar) up 28.1%, Germany 4.6% and Bangladesh 4.2% were the only other 'positives'. US exports also fell by 37.1% from 43.5 million pairs to 27.4 million pairs, with exports to China falling to 10.5 million pairs from 16.6 million pairs. Based on these incomplete annual statistics, US footwear imports for the year 2020 could fall by as much as 24%, which would give a shortfall of 538 million pairs and the effect on consumption could see a decrease of 546 million pairs or 24.5%.

The huge fall in Chinese exports to the US in the January to September period was greater than the decreases suffered by its main competitors. Vietnam at 41 million pairs was down 11% and Indonesia, at 15 million pairs, down 17.3%. Whilst they did not do as badly as China, they nevertheless still suffered considerable losses. Brazil was also hit, losing 60,000 jobs during the first wave of the pandemic, when production was down by 30% and capacity at only 50%. By the end of October, exports amounted to 74.9 million pairs, a reduction of 22.3% and with value also down by 33.6% to \$545.3 million. For the complete year Abicalcados predicted exports would decrease by 27%. The leading markets of the US, Argentina and France were all down in the first 10 months. It is interesting that only Angola, a country with a population of some 31 million, showed any increase.

The large shoe producers and brands were, needless to say, also affected. Nike's financial year means that only part of 2020 results were covered in a single financial year. The first quarter 2020/21 saw a loss of \$790 million, with revenue down 1% at \$10.6 billion. Adidas saw a decrease of 35% in sales to \$4.3 billion in the second quarter with online sales representing one third of the total, whilst third quarter sales were down by 7% at \$7.04 billion. Yue Yuen/Pou Chen, one of the very largest global shoe manufacturers, recorded a first half loss of 19.4% or \$136.9 million, with footwear down by 16.7%. In terms of volume, the loss was 129.9 million



Working from home may mean less need for new shoes.

CREDIT: SHUTTERSTOCK / GOODLUZ

pairs or 20.4%. January to September sales were down by 19.1% to \$6 billion.

Taking into account the effects on leading shoe producing and consuming countries China, USA, India, Vietnam, Brazil and Indonesia, footwear manufacturers such as Yue Yuen and the effect of the second wave of the virus in the last three months of the year, it is likely that 2020 will have seen a fall in global output and consumption of between 20-25%. This is not too dissimilar to the World Footwear Experts Panel, which was predicting a decrease of 22.2% in global shoe consumption (5.1 billion pairs) with the EU falling 27% (908 million pairs), North America 21% (696 million pairs) and

Asia 20% (2.4 billion pairs).

With November's announcements of vaccines becoming available there is hope that 2021 will be a better year but, even so, the damage caused by increased unemployment, reduced production capacity due to closures of shoe manufacturers, reduced workforces, customer uncertainty and other factors will need to be addressed whilst the industry reassesses and reforms. It should be an interesting journey, as the politicians say. The likely 'winners' should include e-commerce, Vietnam, Cambodia, supermarkets and Amazon, with China, Nike, adidas, safety and sports footwear also probable 'recoverers'. 🍀



Adidas is a probable 'recoverer' from the pandemic.

CREDIT: SHUTTERSTOCK / ANDY FENG

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The Portuguese footwear and allied trades cluster brings together materials, components, equipment,

automation, robotics, software, leather goods and footwear companies and institutes, under the coordination of the sectorial association APICCAPS and the Portuguese Footwear Technology Centre (CTCP). In recent years, it has launched strategic action plans to promote the cluster's digitalisation and transformation towards a greater degree of sustainability. These plans, including research, manufacturing capacity and economic objectives, are being successfully implemented. The biggest project being developed is FAMEST, a Portugal 2020 R&D collaborative project involving a consortium of 23 companies and nine R&D bodies.

As explained by Maria José Ferreira, head of the Research and Quality Department at CTCP and a FAMEST director, the project's aim is to research and develop new concepts of fashion and technical footwear, materials, footwear components, advanced technologies and solutions to maximise the value of production waste and post-consumer products. The results and innovations are now ready for demonstration and dissemination.

TANNAGES FROM UNUSUAL SOURCES

The conversion of animal hides into leather recycles an organic by-product from the meat industry and it creates a valuable material that can be used for products such as footwear, that meet consumer requirements in terms of health, comfort and fashion. Despite the many methodologies that have been studied, there are still alternative tannages and processes appearing to satisfy the ever growing demand for eco-friendly solutions.

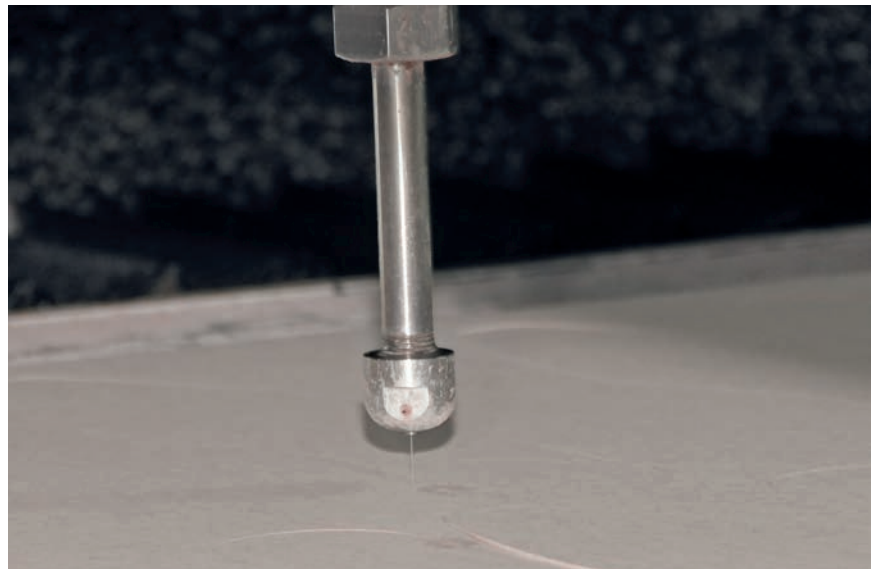
For example, FAMEST chemicals and leather partners have developed tanning agents and processes based on lignin products derived from spent liquors from the Portuguese wood pulp industry and natural vegetable tannins extracted from *Pinus* (pine tree) waste bark. These new vegetable tanned leathers may be used in footwear and leather goods and present tear resistance and shrinkage temperature values of over 100 N and 70°C, respectively.

Additionally, tannins and additives have been prepared from sub-products



Under the FAMEST project, eco-friendly leathers have been produced using alternative tannages and processes.

CREDIT: CTCP



CEI by ZIPOR's oscillating knife cutting system offers both accuracy and high speed.

CREDIT: CEI BY ZIPOR



CEI by ZIPOR's water jet cutting system has two cutting heads and automatic work planning.

CREDIT: CEI BY ZIPOR

that find no application in foods for either humans or animals such as those from chestnuts, vegetable oils, fats and others, and combined with alternative tannins to prepare leathers. The production process uses less energy and water as well as no chromium, formaldehyde nor glutaraldehyde, resulting in leathers with good properties and shrinkage temperatures of around 80°C.

ADVANCED CUTTING SYSTEMS

Cutting systems play a central role in the footwear production process. They contribute to its agility and cost efficiency, the quality of the finished product and minimise the amount of waste generated. FAMEST partner CEI by ZIPOR has developed two innovative cutting systems in response to all the cutting needs identified in the footwear industry and allied trades. All materials and footwear components including natural leather and synthetics for uppers, insoles, insocks and outsoles can now be cut using highly automated and efficient digital systems.

An innovative water jet cutting system featuring two cutting heads functioning independently but simultaneously and with automatic work planning, offers remarkable cutting speed. Productivity can increase by up to 70% when cutting leather and up to 100% with synthetics for uppers, insoles and outsoles when compared to single head cutting systems. Depending on the materials and quantities to be cut, manufacturers also have the option of choosing a new oscillating knife cutting system incorporating a number of cutting heads. Proprietary hardware and software algorithms provide rapid and accurate cutting of flexible, semi-rigid or rigid materials at high speed.

Both of these cutting systems are economical as automatic nesting contributes to maximum use of the materials involved to significantly reduce the waste generated. In addition, systems development is supported by Ecodesign strategies that contribute towards the reduction of the energy consumed. Both cutting systems and all embedded software are produced in Portugal and exported worldwide. Robustness and quality of

Figure 1: Chemical critical substances evaluated in recycled rubber soles.

Parameter	Standard	Unit	Result
Organotin compounds (DOT, TPT, TBT, DBT, MBT)	ISO/TS 16179:2012	mg/Kg	< 0.20 (QL)
Dimethyl fumarate (DMFU)	ISO/TS 16186:2012	mg/Kg	< 0.1
Polycyclic Aromatic Hydrocarbons (PAH)	ZEK 01.4-08:2011	mg/Kg	< 0.1
N-nitrosamines	DIN EN 12868:2017	mg/Kg	Not detected
Heavy metals (Cd, Pb)	EN 14602:2012 EN 8288:1986	mg/Kg	< 2.5 (QL)
QL – Quantification limit			

the component parts and digitalisation should ensure low maintenance costs for long term operation.

RECYCLING VULCANISED RUBBER AND FOOTWEAR

Several stakeholders are researching and implementing innovations to address the ‘make-use-reclaim-remake’ circular process. Bolflex-Rubberlink is a pioneer in the recycling of vulcanised rubber from outsole manufacturing, materials from footwear production and, more recently, has been working towards the use of post-consumer shoes. This can be accomplished through the physical/chemical treatment of the materials to be recycled, followed by

incorporation into specific formulations and systematic evaluation of the amounts used and their relationship with the desired properties of the final recycled material or component.

The upper materials and soles that have been developed demonstrate adequate physical and chemical properties for use in footwear. Figure 1 shows an example of chemical critical substances evaluated in recycled rubber moulded soles. The processes developed are flexible and allow the introduction of functional and fashion features such as reinforcing fillers, leaves, natural fibres among others, resulting in materials and products that may again be recycled after use. 🔄



Footwear produced with rubber-based upper and soling materials. CREDIT: CEI BY ZIPOR



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Timberland's PRO safety boot features a Cordura water resistant recycled textile upper.

CREDIT: TIMBERLAND



Discarded to durable

With global consumer trends increasingly focused on utility and protection, there is a growing demand for functional footwear that, at the same time, offers a solution to the problem of sustainability. Products that are designed for the long haul, with high levels of performance and incorporating green credentials that fit the 4R (reduce, recycle, reuse, renewable) remit needed to attract today's environmentally aware consumers. As a result, 'recycled content' has fast become one of the leading considerations for materials used in footwear manufacture. Specialist fabric producer Cordura* has reacted to this with a growing portfolio of new fabrics engineered with yarns derived from either recycled or reclaimed materials. These fabrics, it states, help tick the boxes for environmentally conscious consumers, while at the same time giving creative teams freedom to innovate and explore new concepts centred around durability and sustainability.

The company has stated that brands

across the whole footwear spectrum from fashion and casual lifestyle shoes, sports trainers and hiking boots through to industry protective safety footwear, have all picked up on the opportunities these fabrics have to offer. Early adopters include minimalist and natural footwear brand Vivobarefoot that launched a range of lightweight 'vegan' boots using post-consumer recycled polyester Cordura fabrics. Among the big brands, Timberland sees sustainability as a way to set itself apart and have an active focus on making better products using responsible materials to help minimise environmental impact. This is demonstrated in its Pro safety boot which features a water resistant recycled Cordura textile upper. The company is now reaching out to specialist designers, agencies and manufacturers in order to share the knowledge behind these new footwear fabric developments.

Cindy McNaul, Business Development Director, says, "We're excited at both the creative and business potential

generated by these latest speciality fabrics and the wide range of sustainable solutions they offer. Our Cordura ECO recycled fabric portfolio adds yet another dimension to the durability that has always been the core element of the brand's DNA. Products made with our fabrics are built to last and long-lasting products need to be replaced less often." She has a point, as the company's fabrics have long been recognised for their durability, resistance to scuffs and abrasion, as well as their all-round versatility

TWO STRANDS TO THE STORY

From a technical perspective, two distinct routes have been taken in addressing reuse requirements, the first being 'recycling'. This takes discarded post-consumer waste such as plastic bottles and packaging, which is then processed to produce Cordura qualifying RPET, a 100% recycled high tenacity polyester yarn engineered to meet the company's strict fabric performance and durability specifications. The yarn is being incorporated across a range of its

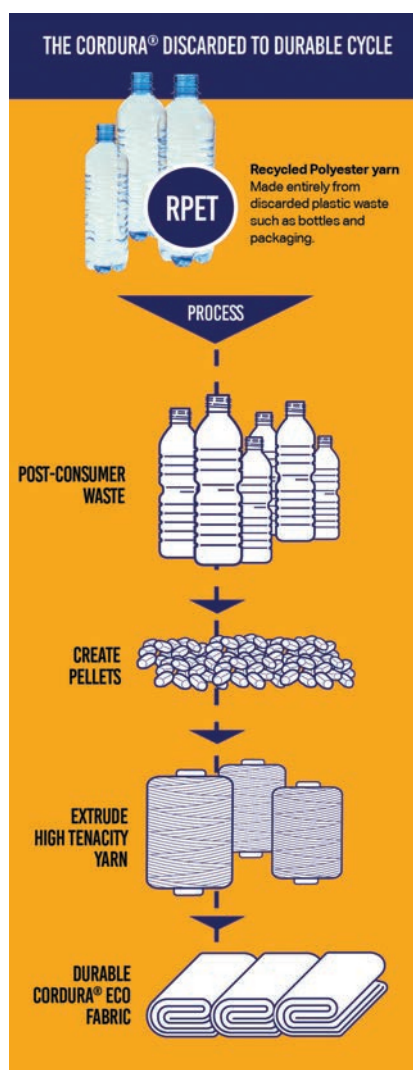
durable woven Eco fabrics, which can contain between 40% and 100% recycled polyester content by weight of fabric, excluding any subsequent coating.

The second is 'reclaiming', which takes reclaimed waste resources such as fibre from industrial manufacturing processes and re-engineers it into Cordura qualifying RN6, a 100% recycled nylon 6 yarn. This yarn has also been used to create a range of resilient woven Cordura Eco fabrics. Cindy McNaull says that, "Both developments are a key part of our recycled platform which is focused on repurposing and re-engineering waste materials into durable fabrics that offer long term performance." These yarns are reported as meeting all the relevant requirements of the Global Recycled Standard and have GRS certification. RPET is GRS certified as 100% post-consumer recycled polyester yarn and RN6 as 100% pre-consumer recycled nylon yarn.

MAKING AN IMPACT

One of the primary requirements for footwear is 'built to last performance' and this has been addressed by focusing on fabric strength combined with resistance to abrasion. For knit constructions, the emphasis is on enhanced tensile and bursting strength, together with resistance to snagging. These key measures of durability define the characteristics that have long been associated with the company's fabrics and are now inherent requirements across the recycled portfolio as well. To give an example of how they have been tailored for footwear applications, a new range of recycled Cordura AFT fabrics is now on-stream from Vela Technologies, an Italian footwear laminator specialising in high quality sustainable solutions for the international market.

The range incorporates 2D warp knit fabrics made with 200D recycled polyamide filament yarn. These resilient eco fabrics with good bursting strength, abrasion and snagging performance are part of the brand's Air Flow Technology (AFT) group that features highly breathable, durable knit and mesh constructions. These fabrics are typically laminated to a variety of specialist felt backings including water repellent options, particularly when used in hiking, trekking and safety



Cordura's discarded to durable cycle turns post consumer waste into durable woven.

CREDIT: CORDURA

footwear. Roberto Vetta of Vega Technologies adds, "As a Bluesign system partner servicing the footwear industry we are naturally committed to embracing all aspects of sustainability and implementing technologies that are commercially viable and offer our customers successful outcomes. Through the use of these recycled yarn technologies we are able to create fabrics that help achieve these objectives."

Other accredited mills in Cordura's international network are also actively involved in developing new footwear-focused recycled fabrics. Taiwan-based Tiong Liong Corp. in particular is exploring recycled and yarn-dye options for one-piece uppers. The recycled yarns for the one-piece upper programme mainly comprise high tenacity polyester ranging in size from 150D through to 300D. These yarn

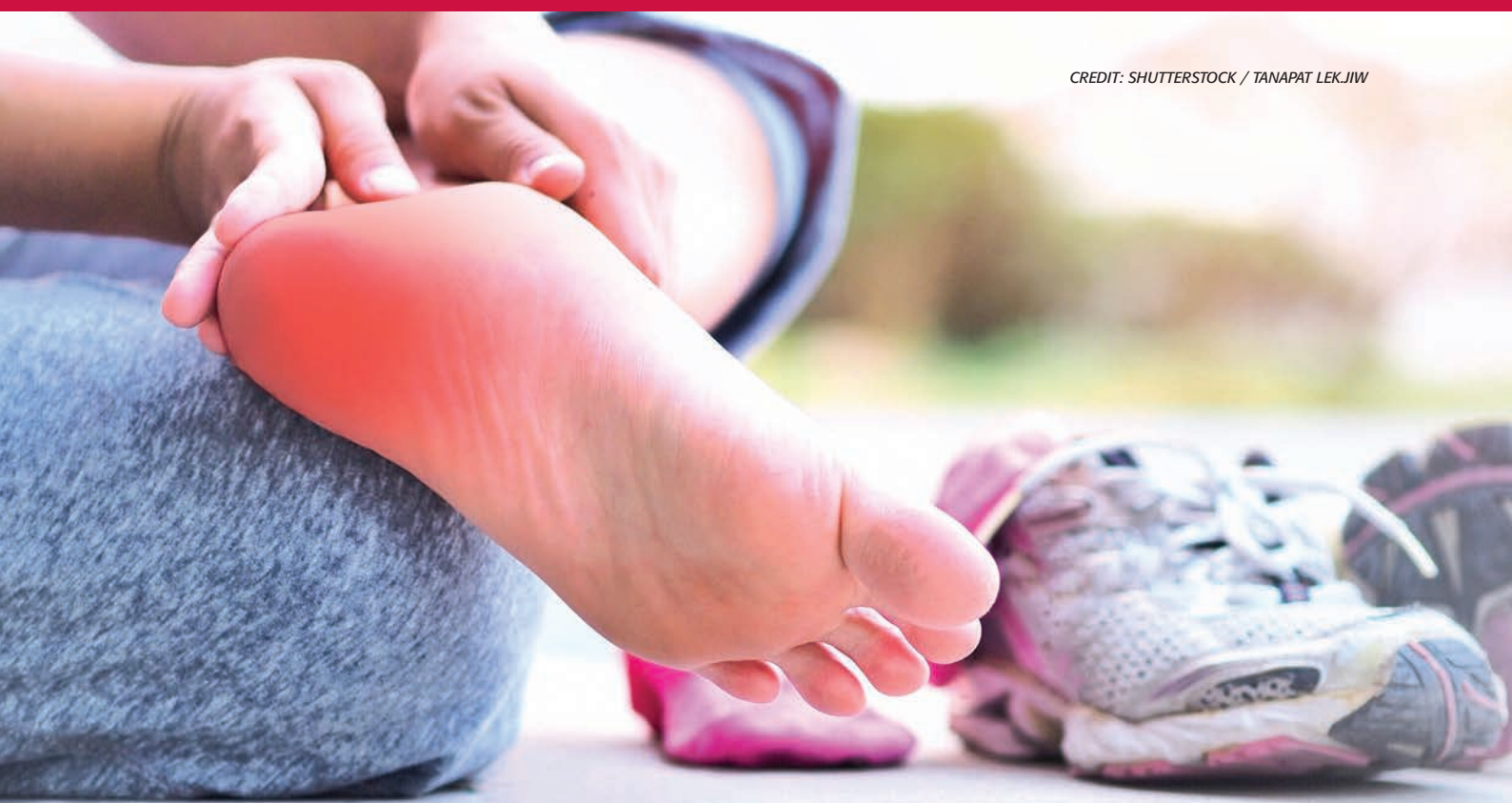
solutions offer an opportunity to repurpose plastic consumer packaging that, in turn, helps reduce waste going into landfills and oceans. They also bring manufacturing benefits such as targeted complex patterns and constructions, as well as the opportunity to help minimise leftover fabric fragments generated in the cutting and assembly phases of footwear production. Laura Wang, Tiong Liong marketing manager, says, "We are considering all aspects of sustainability in our innovation and technical development including online interface platforms that help to display materials in real time to support today's sourcing needs. We are devoted to the 4R concept throughout our manufacturing chain."

RECYCLING FOR THE FUTURE

Cordura sees recycling as not being simply a phase or short-term option but a foundation for product development and recognises that it is also on the agenda for the new generation of consumers who are asking "What's in my clothes?" In response to this, it is taking a more collaborative approach with partners throughout the supply chain to encourage new levels of innovative thinking and to help share specialist knowledge. The desire is to create fabric technology that opens up new possibilities and sustainable solutions that deliver diversity combined with durability. The outcome today is a range of fabrics using recycled yarns that Cordura says will help meet consumer expectations of quality and performance across a broad spectrum of footwear and give designers scope to create new concepts that combine fashion and functionality.

Cindy McNaull wants to involve other forward-thinking companies in moves to shape and drive the future of the footwear sector: "Over the last five decades, Cordura has built continuously on the strength of collaboration, so we realise how vitally important this is in evolving new and practical solutions that anticipate trends and stay ahead of the curve. We are now actively seeking to forge new partnerships throughout the supply chain, including both product designers and manufacturers." 

**Cordura is a registered trademark*



Toe spring - is there a downside?

Although most features of modern footwear have been intensively studied, there has been surprisingly little research on the effects of toe spring. While it is generally recognised that toe spring facilitates the forefoot's ability to roll forward, it may also have some effect on natural foot function. A recent study by the Chemnitz University of Technology in Germany, University at Buffalo (NY), USA and Harvard University (MA), USA, investigated the effect of varying degrees of toe spring on foot biomechanics. It found that toe spring alters joint moments and work at the toes when there are greater degrees of spring resulting in lower work requirements during walking. While this has long been recognised, it suggested that it may also contribute to weakening of the foot muscles and possibly to increased susceptibility to common pathological conditions such as plantar fasciitis and resultant intense

heel pain.

The ability to dorsiflex the toes relative to the rest of the foot at the metatarsophalangeal (MTP) joints is one of the key evolved features that enable humans to walk and run efficiently. It has long been argued that dorsiflexion at the MTP joints also helps stiffen the foot through a 'windlass' mechanism (Figure 1a). During this action, dorsiflexion of the toes (flexing upwards) tightens the plantar aponeurosis, a broad sheet of highly fibrous tissue whose collagen fibres span the plantar aspect of the foot from the heel to the toes. This in turn creates an upward force that elevates the longitudinal arch, counters compressive forces from above and stiffens the foot as a whole.

During the propulsive phase of walking, the metatarsal heads and distal phalanges are the only points of contact with the ground on the trailing leg and hence become load-bearing. As

a result, the ground reaction force loads applied to the distal phalanges generate a moment that causes the MTP joints to dorsiflex (Figure 1b). Studies indicate that the intrinsic muscles of the foot (those that produce fine movements of the toes and also support the arches of the foot) are active at the end of stance phase, balancing the dorsiflexion moments at the MTP joints (Figure 1c). Foot muscle activity therefore acts in concert with passive mechanisms such as the windlass to maintain foot stability during propulsion. Because of the role these muscles play in stabilising the forefoot, any weakness or dysfunction may be associated with a variety of overuse injuries including plantar fasciitis which causes pain and immobility in millions of people world wide.

Recent evidence suggests that plantar fasciitis could be related to weak foot muscles that are not strong

enough to provide adequate foot stability, thus increasing strain in the plantar fascia, which wraps around the MTP joints. Several lines of evidence suggest that weak foot muscles may be partly a consequence of features in modern shoes that support the longitudinal arch and passively stiffen the foot. As these studies have shown, individuals who habitually wear minimal footwear have intrinsic foot muscles (those that originate and insert in the foot) with large cross sectional areas and dynamically stiffer longitudinal arches than those who habitually wear modern shoes.

WINDLASS MECHANISM

Weak intrinsic foot muscles may thus be an evolutionary mismatch caused by the foot not being entirely adapted for modern footwear. Although the first evidence for minimal footwear dates back 10,000 years, most shoes until very recently were minimal and did not have arch supports, cushioning and other supportive features that increase comfort and reduce the work that foot muscles have to do. While it is generally recognised that toe spring facilitates the forefoot's ability to roll forward at the end of stance, it may also have some effect on arch stiffness via the windlass mechanism.

It is reasonable to suppose that toe spring continually engages this mechanism by permanently orienting the toes in a dorsiflexed position when they might otherwise be in a neutral and horizontal one, thereby elevating the arch. Without toe spring, loading the arch should cause a 'reverse windlass' effect in which the toes are plantarflexed (flexed downwards) as the arch is compressed during walking. Toe spring could be preventing this from occurring, effectively stiffening the arch by preventing compression. This should be pronounced at midstance, when the foot is loaded by body mass prior to dorsiflexion of the toes at heel lift. Following this traditional perspective of the windlass mechanism, toe spring could thus passively reduce the need for intrinsic foot muscles to actively resist arch deformation.

BIOMECHANICS

It is well established that the digital flexor muscles do a significant amount

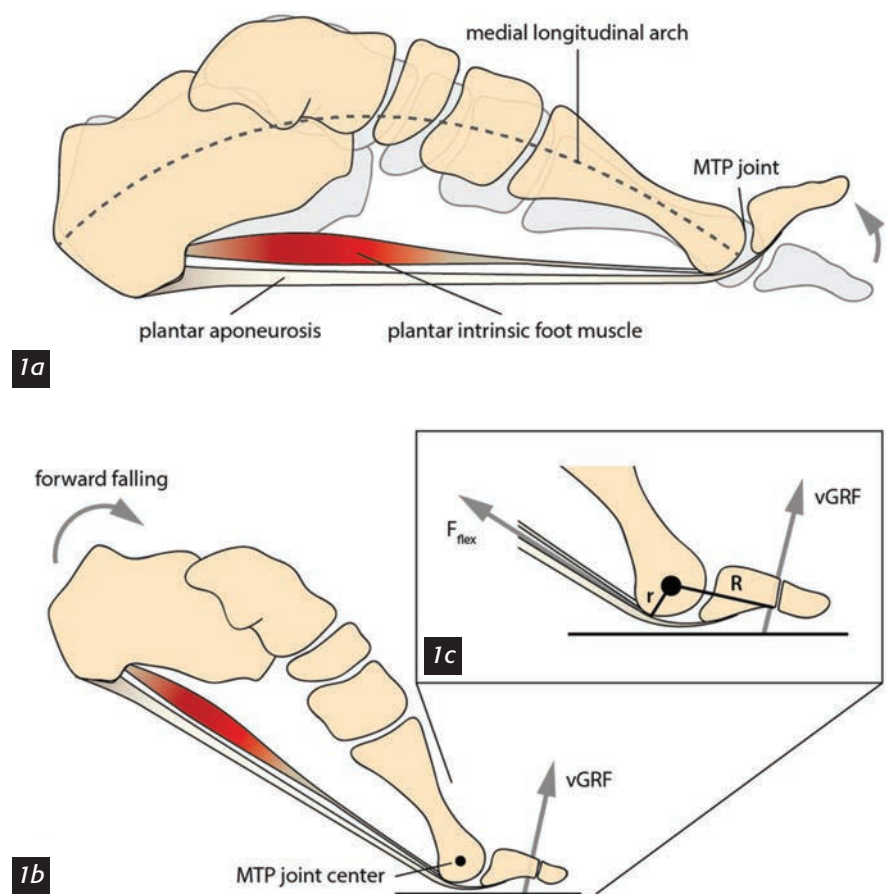


Figure 1 – The ability to dorsiflex the toes at the MTP joints enables humans to walk and run efficiently.

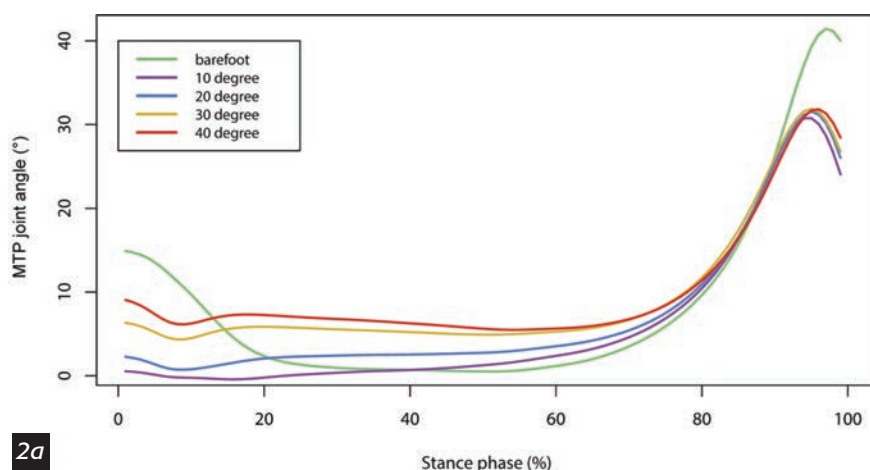
of work as the MTP joints dorsiflex and previous studies have estimated that the work done by the digital flexor muscles is proportional to the amount of MTP joint rotation during push-off. By passively dorsiflexing the toes before push-off, toe spring could thus decrease the total angle through which the toes rotate while these muscles are active. These effects on foot biomechanics would reduce the total work required of the intrinsic foot muscles, possibly helping to explain muscle atrophy in individuals who habitually wear modern shoes.

While toe spring may have general effects on overall gait, as has been demonstrated in studies of prosthetic toe shape and shoe midsole stiffness, the Chemnitz study focussed on the immediate effect of toe spring on intrinsic foot biomechanics to see how they potentially affect foot function. It concentrated on the medial longitudinal arch and the MTP joints during midstance and propulsive phase to test the general hypothesis that shoes with a toe spring will affect

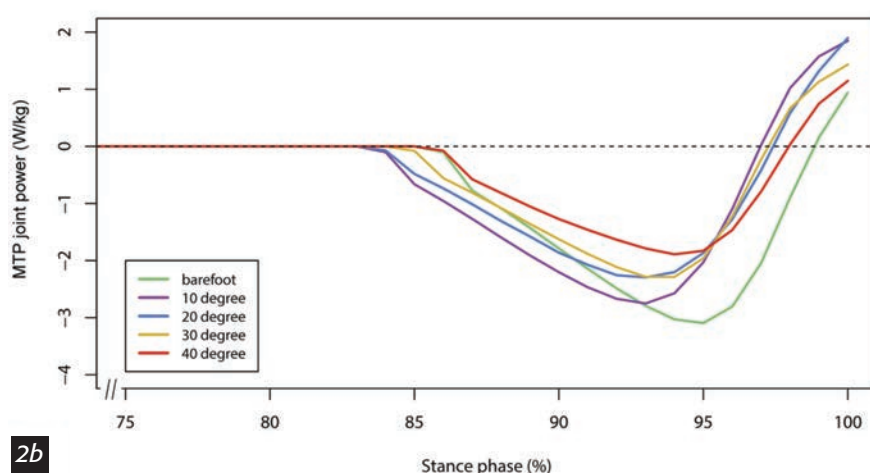
stiffness of the foot-shoe-complex and the total work done at the MTP joints.

It also tested two specific hypotheses. The first is that during midstance, the stiffness of the medial longitudinal arch will increase with greater toe spring angles since the dorsiflexed position of the toes activates the windlass mechanism. The second is that during the propulsive phase, increasing toe spring angles will gradually decrease the total angle through which the toes rotate and subsequently decrease the total work at the MTP joint. In tests, participants walked on a treadmill barefoot and in four pairs of custom-made sandals with varying degrees of toe spring angle (10°, 20°, 30° and 40°). The 10° condition was chosen as the lowest profile to ensure a minimum of natural foot roll-over during the propulsive phase. The sandals were designed to mimic the stiffness and shape of toe springs commonly found in commercially available footwear.

The most interesting finding to emerge from data obtained during the propulsive phase of walking is that



2a



2b

Figure 2a – MTP joint dorsiflexion angle during normalised stance phase, increasing at midstance but decreasing at end of stance).

Figure 2b – MTP joint power during normalised stance phase.

peak moment increased with the 10° sandals compared to the barefoot condition, but decreased gradually with increasing toe spring angle by up to 31.63% between the 10° and 40° sandals. This behaviour in peak moment is likely related to the fact that the distance of travel of the centre of pressure (COP) distal to the MTP joint increased between barefoot and 10° sandal condition, but decreased significantly with increasing toe spring angle by just over 22% between the 10° and 40° sandals (Figure 2a and 2b).

ARCH STIFFNESS

The study was designed to analyse the effects of toe spring on foot biomechanics during walking. It was thought that it would increase the stiffness of the medial longitudinal arch during midstance by engaging the windlass mechanism and that negative work at the MTP joints would decrease during the propulsive phase because

toe spring would reduce the total angle through which the toes rotate. While no change in arch stiffness was found, toe spring did decrease the negative work at the MTP joints during push-off and greater toe spring angles reduced the total range of MTP joint rotation (Figure 3a and 3b).

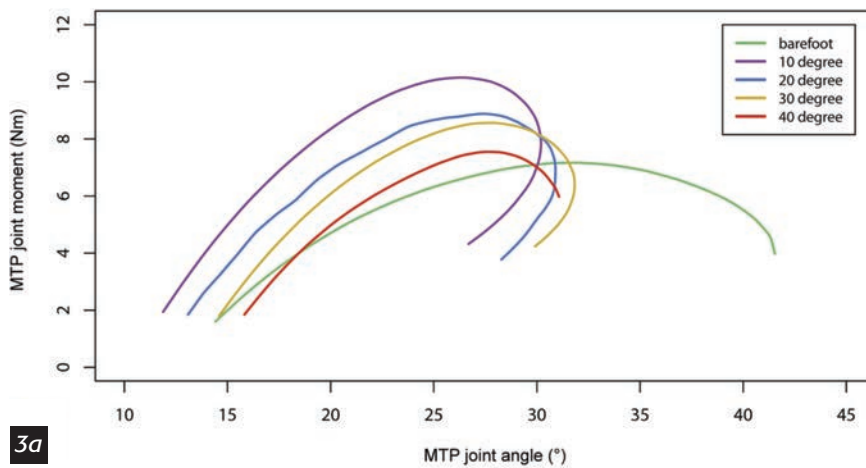
Furthermore, toe spring appears to be able to compensate for the negative effects of stiff shoes on MTP work requirements. The small increases in MTP joint dorsiflexion angles caused by toe springs in this study did not affect measured arch stiffness, further evidence that the windlass mechanism does not contribute substantially to stiffening the longitudinal arch at midstance. In contrast, during the propulsive phase, toe spring affects MTP joint dynamics as shown by a significant decrease in negative work associated with increasing toe spring angles. Paradoxically, this was highest when walking barefoot and with 10° sandals.

NEGATIVE WORK

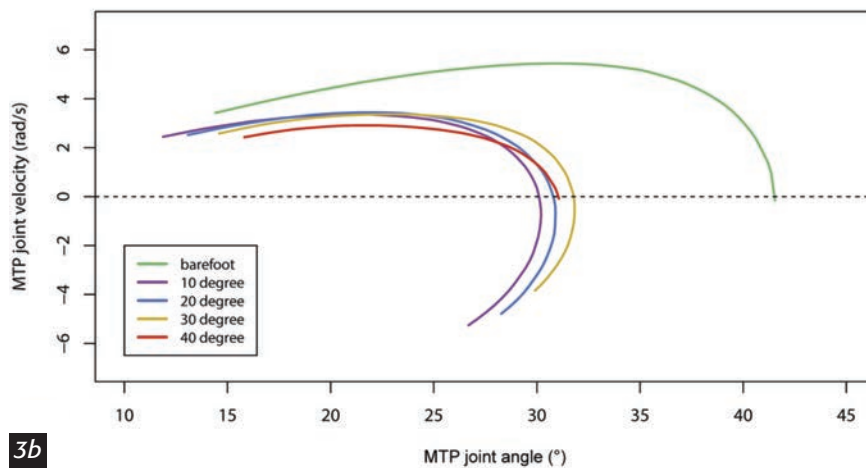
Overall, test results showed a significant decline in negative work coincident with the reductions in MTP joint range and COP travel due to increasing toe spring angles. In addition, the data suggest a gradual downturn of the peak angular velocity with increasing toe spring angles. Thus, toe spring does seem to counteract the negative effects of stiff shoes on MTP work requirements. While stiff shoes do stiffen the MTP joints, toe spring may well compensate for the effects of increased COP travel distal to the MTP joints and further reduce total MTP joint range and possibly peak angular velocity, thereby reducing negative work.

This decrease in negative work at the MTP joints suggests that intrinsic foot muscles have to perform less work during the propulsion phase. While the differences in joint work measured were relatively small, the muscles themselves are also small so that a higher proportion of the available fascicles (muscle fibres) will be involved compared to larger limb muscles. Furthermore, these small differences add up over time with the average individual in industrialized countries taking 4,000 to 6,000 steps per day. Thus, habitually wearing shoes with toe spring could inhibit or de-condition the force generating capacity of intrinsic foot muscles. This in turn may increase susceptibility to flat feet and associated problems such as plantar fasciitis and is something that calls for further research.

Additional limitations that need further testing are walking speed and gait. This initial study tested only one walking speed, so greater speeds that increase the demands on arch stability and muscle activity also need to be examined. Furthermore, uncertainty remains as to whether changes in muscle activity reflect the alterations in MTP joint work. It is possible that the intrinsic foot muscles contract isometrically as the toes are being dorsiflexed during walking and that changes in power at the MTP joints among toe spring conditions reflect differences in elastic energy storage and release, rather than changes in intrinsic foot muscle work. This needs to be considered.



3a



3b

Figure 3a – MTP joint angle against the MTP joint moment.

Figure 3b – MTP joint angle against the MTP joint velocity.

WHAT IS PLANTAR FASCIITIS?

Plantar fasciitis is a common orthopaedic complaint due to the fact that the plantar fascia ligaments under the foot undergo a great deal of wear and tear during everyday life. Too much pressure on feet can damage or tear ligaments so that the plantar fascia becomes inflamed, causing pain and stiffness. The pain is usually felt at the bottom of the heel or mid-foot area and normally affects just one foot. It develops gradually over time and is genuinely worse first thing in the morning or after sitting or lying down for a while. It can also appear after prolonged activity due to increased inflammation though not normally during the activity itself.

Active people between the ages of 40 and 70 are at the highest risk for developing plantar fasciitis, particularly if they are overweight, due to increased pressure on the plantar fascia ligaments. Long-distance runners are also at risk as are people such as factory workers who spend much of their time on their feet. Ignoring the symptoms of plantar fasciitis can result in chronic heel pain which in turn may lead to changes in the way a person walks and risk injury to the legs, knees, hips and back.

At one time, it was thought that heel spurs caused pain in people with plantar fasciitis. This is not the case however. A heel spur is a hook of bone that can form on the calcaneus (heel bone) of the foot. Like plantar fasciitis, it can be the result of long-term stress on the feet. It is often assumed that foot pain is caused by a heel spur, but this is usually not the case and they often cause no symptoms. Having plantar fasciitis does however increase the likelihood of forming heel spurs.

CONCLUSIONS SO FAR

Based on the work carried out so far, the conclusion reached is that toe spring has important heretofore unrecognised biomechanical effects on foot function that merit consideration, especially since it has become increasingly exaggerated in modern athletic shoes. As these tests have shown, toe spring can alter the natural biomechanics of the foot during walking, principally by altering total work at the MTP joint and thus potentially reducing the work required by the intrinsic foot muscles. Consequently, while toe spring may increase comfort by reducing the effort required of the foot muscles, it may also increase susceptibility to plantar fasciitis and other foot-related problems. That said, it must be stressed that this study has only scratched the surface of this subject and considerably more work will be needed in order to understand more fully the effects of toe spring on foot function and overall gait.

Future research might therefore also need to explore the impact of toe spring in combination with other shoe features such as insoles, shoe stiffness and cushioning. It should investigate how toe spring could affect more general aspects of gait such as centre of mass mechanics, which have previously been shown to be affected by MTP joint stiffness and shoe sole curvature. Studies could also explore additional walking speeds and running to provide a more comprehensive understanding of how toe spring affects gait that might help improve footwear design and use. Toe spring has long been an accepted feature of many types of footwear but this study shows that we still do not fully understand its long term effect on the human body. 🧠

This article by Philip Lattaway, Technical Editor of World Footwear magazine is based on a paper by Freddy Sichtung (Chemnitz University of Technology), Nicholas B. Holowka (University at Buffalo), Oliver B. Hansen and Daniel E. Lieberman (both Harvard University) which was first published in the journal Scientific Reports.

Sustainability index criticised: unfair, inaccurate

The leather and footwear industry in general has never been noted for its ability to work together for a common end. The crisis in the leather industry resulting from over inflated hide prices forcing many footwear brands to seek synthetic alternatives, is a good example. There has been a great deal of talk but little concerted effort to find a solution. In the meantime, synthetic 'leather', vegan 'leather', etc. have steadily gained ground such that one might think there is now a conscious bias against real leather, especially when a supposedly impartial organisation holds such a negative view of the material.

The guilty party is SAC or, to give it its full title, the Sustainable Apparel Coalition. SAC is a nonprofit organisation that produces the Higg Materials Sustainability Index (MSI). Launched in 2012, it is meant to help brands, retailers and manufacturers assess the sustainability of materials for use in footwear, garments and other consumer products. In August 2020, it released an updated version giving leather a notably adverse rating which has raised the ire of the global leather industry and driven it to a rare but welcome display of unity.

Last October, it formally asked SAC to suspend the score pending review. In a letter, the secretary of the International Council of Tanners (ICT), Dr. Kerry Senior, said the leather industry accepted the need for assessment of the environmental impact of products and remained committed to dialogue with SAC to make its assessment of leather fairer and more accurate. Most significantly, he also said that senior representatives of the global leather sector were in no doubt that the use of 'inappropriate methodologies' and 'out-of-date, unrepresentative, inaccurate and incomplete data' had led to leather being burdened with a disproportionately high Higg Index score.

He went on to observe that, "This has led to a negative perception of leather that does not reflect its sustainable, circular nature. On the basis of the current Higg score, manufacturers are deselecting leather in favour of fossil fuel-derived, unsustainable synthetic products. We believe that the reputation and viability of leather and leather manufacturers is being unfairly damaged by an assessment that does not reflect the true nature of leather or, indeed, the alternatives."

Specific concerns raised included the MSI's use of old, inaccurate data, a narrow geographical focus, misconceptions about the raw materials tanners use and a reluctance to take into account the durability and longevity of leather in assessing its environmental impact. "More troubling is the lack of transparency on the basis for the score and the lack of engagement with the wider leather industry to ensure that the data is accurate," the letter says.

A RESPONSE OF SORTS

There was no response even after the joint-letter became public on October 8. A week later, leather industry figures became aware from posts on LinkedIn that SAC had published an entry on its in-house blog in which it set out a response of sorts to the leather industry. Note, there was no phone call or email to any representative of the leather sector. In fact no direct response of any kind. Just the blog entry. Needless to say, this does not augur well for the chances of success for any future dialogue. However poor the response, it appears it could have been worse. Bodies representing wool and alpaca fibre, who also complained about

CREDIT: SHUTTERSTOCK / GESTALT IMAGERY



scores their products received, appear to have been ignored entirely.

In its response, SAC said that transparency was 'paramount' to its work and that it welcomed an open dialogue with industry partners such as the International Council of Tanners, to ensure that its tools reflect the most current science. It nevertheless made it clear that it had no intention of agreeing to the leather industry's main request and would not suspend the score for leather at this time. Is this a case of SAC being caught on the hop and afraid to acknowledge it might be wrong? Let's look at the facts.

The Higg MSI August update apportions an impact-per-kilo score to bovine leather that is worse than those for polyester, spandex, acrylic, viscose, nylon and polyurethane (PU). It specifically states that leather's impact is almost three times greater than that of PU used as a synthetic substitute for leather. It supports a widespread opinion in the leather industry that there is a clear bias in the Higg MSI against natural materials in general. Silk, wool, cotton and alpaca fibre all fare far worse than fossil-fuel based alternatives. In contrast, polyester's impact has strangely gone down from 44 to 36.

A FAINT GLIMMER OF HOPE?

SAC does however accept some specific criticisms. The ICT's letter said that the Higg Index only takes Brazilian and US cattle herds into account and, therefore, does not reflect the varying

impacts of the different farming methods used in the rest of the world. As a result it has assumed the lifespan of cattle to be five years and calculated five years' worth of environmental impact. As the letter pointed out, and any farmer will tell you, the lifespan of a typical beef animal is usually between 12 and 36 months, so the apparent impact under the Higg Index is 'significantly larger' than it should be.

SAC agrees that it would be beneficial to have 'more geographical coverage' to reflect farming methods in different regions. With regard to the lifespan factor, it says that it has already identified this as an assumption it will be requesting Sphera (provider of a cloud-based risk management platform that SAC uses to accumulate data) to update for this dataset. It therefore looks as if SAC accepts its five-year assumption 'might' well be wrong and that it 'might' change it at some point in the future. It clearly does not like being caught out.

Another criticism of the Higg Index is that its focus is limited to a cradle-to-gate analysis. In other words, it only examines the environmental impact of producing materials and does not take into account the material's use, its durability and its end-of-life possibilities. In the blog entry, SAC's response to this is that it does not claim that the Higg can provide a complete picture for any material. "It does not replace other sourcing considerations, nor does it claim to," it says. It points out that there is a second tool in its own suite, the Higg

Product Module (Higg PM). A second edition of the Higg PM is due next year which SAC says will include 'consideration of use and end-of-life'.

GOING FORWARD

SAC has said that it places great store in a dialogue it has been conducting for several years with multi-stakeholder body the Leather Working Group and says it wants to use this to identify 'credible data sources' that it can use to update its information in future versions. It is also likely that the leather industry will now seek to broaden the representation it has in this ongoing conversation. Leather's representatives for their part have said they want this ongoing discussion to be public and for SAC to be publicly accountable for progress or lack of progress in areas that need improving.

Nevertheless, fears remain that it may feel it has already done enough to put the industry's complaints to bed and that it has seen off the uncomfortable reaction of those representing leather and other natural materials to its August update. As remarked earlier, the leather industry has not defended itself well and one of the reasons for this has been the lack a powerful, single voice because it has lacked unity. If nothing else, this row over the Higg Index's unfair treatment of leather has brought about a welcome spirit of shared concern and commitment to common action in fighting back against harmful and wrongly promoted synthetics. 🐮



The look of Aetrex's Albert 2 is partly inspired by Apple's aesthetic, which Mr Schwartz considers to be the "gold standard" in design. CREDIT: AETREX



Best tech forward

National lockdowns have left many physical shops shuttered around the world, leading to a rise in augmented reality (AR)-enabled virtual try-ons and other forms of technology-forward, digital interactions. Out of necessity, adoption of e-commerce (especially m-commerce or mobile shopping) has accelerated because of the pandemic. Retailers that are abreast of this trend are keen to boost profitable customer engagement with products ahead of purchase – not only to drive conversion, but also to mitigate against ever-escalating online return rates.

In a report released last June, Boston Consulting Group (BCG) estimated that 14% of consumers in the US and 17% in China had bought fashion (at all price points) online for the first time due to covid-19's devastating impact on the global physical retail landscape in the first half of last year. By December, however, BCG partner, managing director and global head of luxury, Sarah Willersdorf, estimated that three-quarters of customer service calls to luxury brands, alone, were motivated by returns (or delivery) queries.

Prone to returns

Prior to the surge in online shopping prompted by the pandemic, online sales amounted to some \$427 billion in 2019, and returns were \$41 billion, of which footwear and apparel accounted for 28% according to a report by Appriss Retail, a returns fraud detection service. Also in 2019, CEO and

Hassle-free returns come at a cost but have never been more in vogue than in the current covid-19 era, for both footwear retailers and shoppers.

Technology providers are working hard to ease the burden by improving consumers' chances of choosing the right size from the outset.

co-founder of returns management enterprise Happy Returns, David Sobie, suggested that online shoppers return around 15-40% of their purchases on average, compared to approximately 5-10% of merchandise purchased in-store. While apparel bought online is especially prone to returns, according to GlobalWebIndex data, owing to some e-commerce shoppers' practice of 'bracketing' (ordering the same item in multiple sizes, only to return those pieces that don't fit), footwear does not fall far from the clothing tree.

As pointed out to *World Footwear* by VP of measurement projects at Zozo (the parent company behind Zozotown, Japan's leading online fashion retailer), Takayasu Yamada, the inability to try on footwear prior to purchase makes buying –

and selling – footwear online “exceptionally challenging”. Mr Yamada views bracketing as unsustainable for e-retailers such as Zozotown, which he says is particularly committed to solving sizing-related shopping problems for its customers, in order to keep product returns low. (Zozo independently measures all units purchased from suppliers, for example, which enables Zozotown to make sizing recommendations to its Japan-based shoppers with a greater degree of confidence.)

Welcome mat

The company's foot measuring Zozomat device, a printed mat released exclusively via Zozotown in June 2019, is a testament to this. Designed to solve the sizing-related challenges posed by purchasing footwear online, including returns, roughly 1.4 million Zozomats had been distributed throughout Japan as of last November. First conceived as Bluetooth-enabled “smart socks” with woven sensors, Zozo later found a printed mat to be more “accurate” and “cost-effective”.

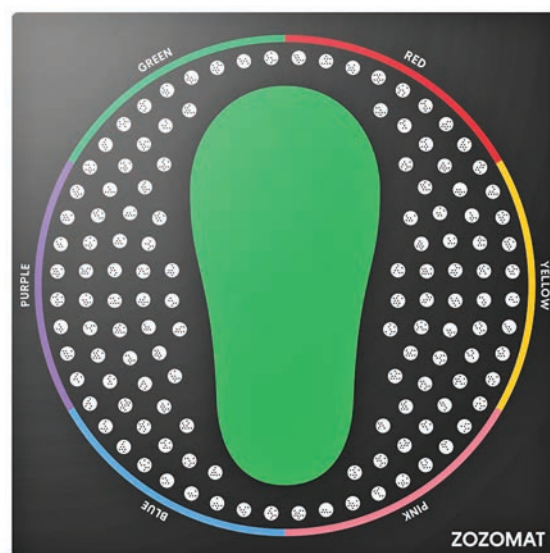
Over 1.3 million people have so far scanned their feet using the Zozomat and its linked Zozotown app, which wirelessly supports and records the foot-measuring process. Data collected from these foot scans has subsequently been used to support the sizing recommendation of “well over 1,000” shoe models sold by the company, with this figure expected to “continue to rise substantially”. It can even map what an “average” Japanese foot looks like mathematically based on the scan data, which can then be used by footwear brands to design better-fitting products for the Japanese market, Mr Yamada says.

In comparison to non-Zozomat-compatible shoes, the return rate for Zozomat-compatible footwear is 36.9% less. What is more, the company has been able to track that around 25% of customers who have purchased footwear after scanning their feet using the mat are first-time shoe buyers on Zozotown, suggesting a keen appetite in Japan, at least, for technology-driven home body-measuring devices.

Accurate and complete

US-based Aetrex, which describes itself as the global leader in foot-scanning technology and orthotics, but also specialises in comfort shoes, today sees that around 57% of its sales come from its technology and orthotics divisions combined. Its latest foot-scanning device, Albert 2, is set to launch in stores across North America in February. Covid or no covid, Albert 2 is primarily designed to help retailers “solve today's challenges” by providing in-store customers with “accurate and complete” foot information (including 3D sizing and pressure underfoot data) in 20 seconds or less, CEO of Aetrex, Larry Schwartz, tells *World Footwear*. Servicing remotely and helping to reduce returns through finding the right fit “on the first try” are all central

Aetrex's AI-powered FitHQ empowers users to access and make purchasing decisions based on their unique foot data from their phone, tablet or computer. CREDIT: AETREX.

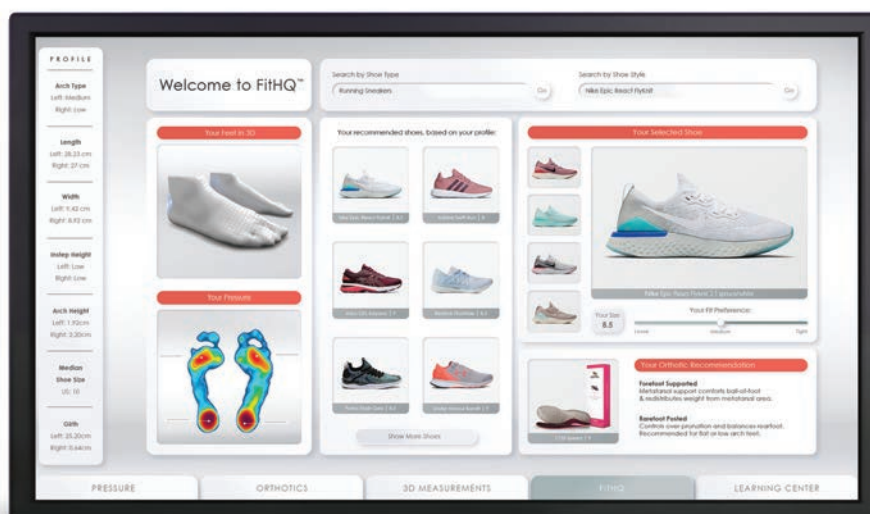


Lightweight and portable, the Zozomat is ideal for personal use at home. CREDIT: ZOZO

components to this ambitious plan.

When *World Footwear* spoke to Mr Schwartz in late 2020, Aetrex was in the middle of updating its mobile app, in order to achieve “an at-home experience in line with Albert 2”. Currently, its mobile technology can capture foot size measurements, but it is unable to read customers’ pressure underfoot as they would experience when stepping onto an Albert 2 device in a physical store, Mr Schwartz says. (To Albert 2’s in-store users, Aetrex supplies its proprietary, artificial intelligence [AI]-enabled FitHQ technology, which allows customers to access their unique 3D footprint data from any digital device and shop their “best fitting” Aetrex orthotic or other footwear by brand, style and size.)

BCG predicts that consumers will be choosier about when they shop, what they shop for and how much they spend going forward, as a direct consequence of the coronavirus crisis, with digital channels in key markets making up a larger proportion of total sales. How retailers and digital disruptors respond to these shifts, both during and post covid-19, will map their rise or fall. Returns – an inevitable, innate part of shopping – will not be eliminated, but retailers who put their best (home-friendly) tech forward can make returns less of a problem. 🧐



The material, which is available on rolls, can be finished at tanneries and finishers using the same techniques as hide leather, according to the company.

ALL CREDITS: SUSTAINABLE COMPOSITES

From football to footwear: leather gets a second chance

After years in development and millions spent on the research process, US-based Sustainable Composites has developed a material that uses leathergoods makers' and tanneries' waste, turning it into a new material that can be used to make footwear, without bonding with polymers.

The company's founders, Tom Tymon and Frank Fox, had previously worked in an engineering company that dealt with composites and waste and an opportunity arose to research uses for leather's leftovers. "We had technology and manufacturing capability that seemed to be relevant and we worked on that project for a number of years, but we never made a product that was viable commercially," says Mr Tymon of the initial research period. But they believed there could be interest in a product if they could find a way to boost its properties, so the pair left their former business and set up a small lab to work on prototypes. Once these had progressed, they scaled up to their current premises. "We have five patents, so it took a lot of invention, not only with the chemistry but how to develop the material and the mechanics," says Mr Tymon. It was an intense and long process to get us where we are now."

He says the material, called Enspire Leather, contains about the same leather fibre content as traditional leather, and the fibre is the leather fibre that is derived from the waste material,

A US company has coined a way of turning leather waste into a new material and sees shoes as its main target market. After collaborating for three years, Timberland is the first big brand to use it in a new collection.

although processing materials and performance-enhancing materials are added. Compared with bonded leather, where the leather-derived component is ground to a fine size and bonded with a polymer, here mechanical and chemical processes have been developed to extract the leather fibres to preserve its microstructure. "Our material is not exactly the same as traditional hide leather, it has some differences," he admits. "We are continuing to work on the technology and look at advanced materials that will expand the market options."

Timberland tie-up

The Timberland connection was formed when a partner introduced the material to VF's outdoor division, who were 'intrigued'. "They saw something that was unique and they thought it had potential," says Frank. At the time, however, it

was not deemed to have sufficient properties. Timberland gave the desired specifications and asked them to match them, and the companies have now been working together for around three years.

Timberland's creative director, Christopher Raeburn, is known for choosing recycled materials in his collections, and he discussed the recycled leather project with *World Footwear* when we caught up with him during summer 2019. He told us one of the reasons for looking at this was to reduce waste, as with recycled leather on a roll the yield is 97%. And unlike the Flyleather bonded product that Nike has used, it will not be backed with, or glued together with, plastics: "That would be counterintuitive, I need to be quite clear on that," he told us.

The material has initially been used for a men's casual footwear collection but there is scope for expanding it to other ranges, and has been touted as helping the group to meet its circularity targets. At the end of 2019, VF Corp published targets for materials as part of its sustainability report, Made for Change. By 2030, all its top nine materials (90% of materials-related carbon emissions) will originate from regenerative, responsibly sourced renewable or recycled sources.

Timberland's target is to have a "net-positive impact on nature" by 2030, and a large part of its strategy will be to source all natural materials from regenerative agriculture. Products will also be designed for circularity (recyclable), and be made using materials that would have otherwise gone to waste, such as plastic bottles, scrap wool and – where Enspire comes in – scrap leather.

Football off-cuts

For Sustainable Composites, its major source of leather waste is the Wilson Football Factory in Ohio, as well as some tanneries and other leathersgoods manufacturers. While the focus is currently the US, the plan is to scale up, and it is in discussion

with some European leathersgoods companies about supplying the material to them – at which point a European processing facility might be necessary. Footwear companies are seen as its major clientele, making up around half of the potential market; furniture manufacturers could make up about 12%, it suggests, with trials at two US companies under way, while leathersgoods prototypes are under construction in other facilities.

Mr Tymon says they have a good relationship with some tanners in the US, collecting their dry waste and paying for the freight. "There's a strong belief within the tanning community that leather has durability and luxury attributes that haven't been reproduced by any faux leather or leather alternatives, and that while the market might not be as strong as it had been, there's a belief that when marketed properly, it can return to the levels it used to. We believe our product is part of that, we fit into tanneries' stories because we take their waste that would go to landfill or incineration and we convert it into a value-added product."

The product does have some other limitations at the moment, such as colour. "There are limits on what we can do depending on the original material, but we can put it through a process and dye it to another colour," he says, with dark colours working better. A paint finish can be added but "that's not going to be applicable to all markets". Using the word leather could also cause problems in countries like Italy and Brazil where the word can only be associated with real leather, but the company has not addressed this matter yet.

As the company moves from R&D into the commercial sphere, Mr Tymon believes the need for companies to address waste issues, as well as a growing awareness of circularity, means they can address a gap. "There are huge quantities of leather waste that's created," he adds, "and we believe we'll be able to have a significant impact on converting that into a product that's going to be desirable." 🌱



Founders Frank Fox and Tom Tymon have transferred their technical know-how.

AMF's To Work For brand has a focus primarily on the "hard physical labour" market.

ALL CREDITS: AMF

Improvement step by step

Since its foundation in 1999, specialist footwear producer AMF Safety Shoes has built up its operations in Guimarães in northern Portugal and now produces 600,000 pairs of technical safety and work shoes and boots every year. Its To Work For brand focuses primarily on the "hard physical labour" market, while a second brand, Too'l, is more for sneaker-style shoes that can help people stay safe in the workplace as well as comfortable after work.

AMF's technical development manager, Arsénio Ribeiro, and product design manager, Nelson Amorim, contend that meticulous attention to detail is what drives performance. What they seek to have front of mind when working on the group's collections is what the products are "supposed to do" in environments such as logistics, forestry, the food industry and firefighting.

Simulate the job

A starting point for this, Nelson Amorim explains, is to analyse step by step the working day of the people who do these jobs. This gives insight into what he refers to as the "ergonomic aspect" and any problems they might experience as they go about their work, making clear the footwear company's task of manufacturing functional and visually attractive products. "It's crucial to think about and simulate the job the wearer will do," he says.

At this juncture, reverse engineering begins and AMF starts to develop a last and toe-cap design for the project in

Portuguese safety footwear group AMF has provided a breakdown of the work it does to conceive, plan, create and construct a new model. It says that looking at the processes step by step allows it to see all the opportunities that exist for improvement.

hand. Combining both features correctly at the outset is essential for achieving the right fit and anatomical proportions for each foot, Mr Amorim continues, adding that stability, the right volume and comfort are "the main goals".

Before the creative process starts, the team next thinks about what material to use, with an emphasis on materials that are proven to work well in technical constructions and to have a high level of performance attributes while offering high levels of comfort and sustainability. "We take into consideration the type of work, resistance, durability and a good feeling in the feet," Mr Amorim says. "After this, we design several concepts, organise brainstorming sessions and analyse different lasting characteristics. At this point, we also start to imagine the product with colours, textures and the materials we have selected."

Best options

Arsénio Ribeiro points out that designers and non-design colleagues work closely together to create prototypes and he insists that this helps make sure the best options will go through to “the next stage”. Prototyping starts with outsole development and, in an example the AMF team worked on recently, a safety boot called Lumberjack for the To Work For brand, this involved a material choice of natural rubber combined with synthetic rubber. What followed was a discussion with a mould-maker covering details such as the last, the toe-cap, and the thickness of the materials required.

The result of this conversation, Nelson Amorim reveals, was an outline that allowed AMF to draw in 3D the outsole it wanted to use. With this drawing complete, it was able to continue the step-by-step process by making a mock-up and using it to check that the design and technical specifications were in keeping with the “target”, the Lumberjack boot. With a 3D mock-up in place, the discussion with the mould-maker partner resumed, leading to the production of a sample mould and the real start of the construction of the complete shoe.

A whole series of tests had to take place during this process, though, leading to any necessary improvements to features both on the inside and outside of the shoe before a final sample, the one the production team would use, was ready. Mr Amorim points out the importance of carrying out these tests carefully before the full production process started, checking every part of the construction against the standards and establishing guidelines for what would happen on the factory floor. Impact-tests, tests for anti-slip resistance, shock-absorbency and chemical content all featured, “essential”, Mr Amorim explains, in helping the group understand how a new shoe would perform.



A technician applies a toe-cap to the upper of a workwear boot in the AMF factory in Guimarães, Portugal.



Nelson Amorim (left) and Arsénio Ribeiro in discussion over designs and materials at AMF Safety Shoes.

Size by size

With definition of the design in place, materials, components, colours, labels and so on all underwent review again and, if necessary, redesign in the CAD system. Grading for each size took place, piece by piece, at this stage and this optimised the automated cutting technology that AMF has in place. The team next separated the pieces for each size and applied finishing treatments and stamped labelling marks on these pieces before assembly. Using valuable material such as leather in the Lumberjack meant it was important to carry out this step very carefully, Arsénio Ribeiro insists. And only when construction of the upper was complete were the hooks and eyelets for laces placed.

When the time came to attach the upper to the outsole, the latter component underwent a special chemical wash treatment to ensure good adhesion to the upper. It was at this point that the upper went onto the last and the technicians next applied the toe-cap using a hydraulic press. They then removed all excess material before gluing on the outsole using reactivation and pressure technology to make sure the best possible adhesion could take place. “The final production step was to put the finished shoe into a stabilisation machine to make sure of a fine balance between all the chemical and physical properties,” Mr Ribeiro says.

From here, the product went to a special finishing room at the factory for final touches such as cleaning and water-resistance treatment. Then the product was ready for shipping to customers. Mr Ribeiro points out that it is only by breaking the process down in this step-by-step way that the full range of improvement opportunities becomes clear. 

Hemp uppers in a Size? x Nike collaboration.
CREDIT: SIZE?

The more consumers know about hemp as a fabric, the more they want products made from the sustainable, durable plant. That's why hemp footwear brands are building education into their business models.

A perception shift

Hemp has a bit of a perception problem. While hemp and marijuana are the same species of cannabis plant, science makes a vital distinction: Hemp contains less than .3% of tetrahydrocannabinol (THC), the chemical found in the cannabis plant that makes people "high". Marijuana typically contains between 5% and 20%.

Marijuana, therefore, is a mind-altering drug that gets smoked or otherwise consumed, and hemp gets processed and made into products such as rope, textiles, shoes and many, many other things.

The multiple varieties of cannabis cause confusion around this plant that has far-reaching consequences and has in many cases inhibited hemp's widespread adoption for industrial purposes. This confusion is why, last month, the US's National Hemp Association (NHA), the European Industrial Hemp Association (EIHA) and a number of other hemp associations published a paper in anticipation of an upcoming World Health Organisation vote on the subject, outlining why industrial hemp is an agricultural product, not a drug. (It is also why parents of children with epilepsy still must fight for access to a treatment like Charlotte's Web, even though it too contains less than .3% THC.)

As a result, hemp-focused footwear companies like Prague-based Bohempia must split their time between selling hemp-based shoes and highlighting information about the hemp from which the shoes are made. At a time when consumers are seeking more sustainable products that are long lasting and kind to the environment, hemp footwear retailers know that educating consumers is good for business.

The misunderstood superplant

Hemp is "the strongest organic fibre which is also ecological," Tomas Rohal, founder, co-owner and CEO of Bohempia tells *World Footwear*. He likes to describe hemp as "functional fabric which grows on the field".

"If you compare hemp to cotton, you need two times less water, four times less growing land and almost no agrochemistry to grow it. That speaks for itself," he says. In addition to these environmental credentials, hemp is naturally antimicrobial, moisture-wicking, thermo-regulating and strong. These, he adds, are "great properties for shoes."

Currently Bohempia carries shoes made of hemp in an extensive range of styles — high tops, low court shoes, espadrilles, Chelsea boots, plimsolls, slip-ons and more — in colours ranging from earthy browns to bright blue and pink.

The only limitations Mr Rohal sees is in fibre thickness. "You can't produce a fibre as thin as the one made from cotton, but that isn't a problem for most shoe designs," he says. But, "when you want to make elegant women's pumps, functional outdoor shoes or alternatives to leather shoes, hemp could be a limitation."

Hemp barefoot-style shoes, which have a thinner sole, make up more than 50% of Bohempia's sales, and the company's autumn/winter collection is packed with them. (Mr Rohal also says that the Czech Republic and Slovakia have more barefoot users per capita than anywhere else in the world.)

Nevertheless, his company contends with misunderstanding surrounding cannabis that becomes marijuana versus cannabis that gets turned into fibre and fabric. He is working "to break the stereotypes of cannabis which are still in many people's minds".

Doing so is key to his company's stated mission to 'bring hemp back to mainstream use'. "There's still a big problem with legislation in some countries because of confusion with cannabis; not so many people know that those are two different plants," he says. "When we present our shoes as sustainable and ecological — both qualities of the hemp material — we get better responses. We're working on getting out of the stoner/hippie style of clothing and get to be seen more in a broader public."

The home page of the company's website features not only shoes but big-font stats on hemp. By the time a potential customer scrolls to the bottom of that first page, they have seen the plant needs 50% less water to grow than cotton, is less damaging to soil and needs less land to grow, has four times the yield of cotton, is a good tool for carbon capture (one tonne of harvested hemp, according to Bohempia, removes 1.62 tonnes of carbon dioxide from the atmosphere), and requires 95% less agrochemicals than cotton.

A similar strategy can be seen by US-based 8000 Kicks, a startup that launched a waterproof hemp shoe in 2019 and released a second batch in September last year. For waterproofing, the 8000 Kicks hemp has a coating added during manufacturing, and then a waterproof membrane added to the finished shoe. Again, the company's website emphasises the ecological benefits of hemp; the home page's first words include "72% less CO₂ used" and "70% less water used". Interestingly, the startup's name was originally DopeKicks but the company recently changed it — possibly an effort to further distinguish hemp's purpose. (The number 8000 refers to the number of years hemp has been around, whereas 'dope' is another synonym for marijuana.)

The fruits of targeted consumer education, which stands on the shoulders of broader, systematic work by organisations such as NHA and EIHA, are reflected in a growing mainstream consumer base.

When Mr Rohal launched Bohempia in 2015, it was through a crowdfunding campaign on Hithit — a Czech equivalent to Kickstarter. "Even though it was more a combination of money raising and market research, it was a success — we raised about CZK 300,000 (around €11,000) and found out there is a demand for hemp sneakers in Czech Republic," he says.



Hemp espadrilles are one of the many styles Bohempia produces. CREDIT: BOHEMPIA

The brand's popularity began to grow and when Bohempia launched a second campaign on the same platform, it raised a record-breaking CZK 4,000,000 (nearly €150,000) in the first four hours.

A 2018 Kickstarter campaign has also been successful, helping to spread the brand's name worldwide. This year Bohempia opened a branch in the US and has signed with a distributor in Japan and Australia.

It is not only niche brands bringing hemp to the footwear world. This year alone, Nike has collaborated with at least two other labels to produce shoes made with the plant, including one with Size?, a footwear and apparel brand that is part of the JD Sports family.

The Size? x Nike collaboration is built around the silhouette of Nike's Air Zoom Alphafly Next% running shoe. "We've drawn influence from minimalist Japanese design," the brand states, "and built the pair with hemp across its uppers for a raw, natural aesthetic."

Nike is also said to have collaborated with Stussy on a hemp version of the Air Force 1 Low, available in black and natural "fossil stone" colour. Several reliable sneaker-preview websites have published images of the shoes which were to be available in late December.

Adidas' history with hemp is a long one and includes the controversial launch of "The Hemp" sneaker in December 1995. As the *Los Angeles Times* reported at the time, adidas described the shoe as a response to growing demand for products made of natural and recyclable materials, but Lee Brown, the then-director of the White House's National Drug Control Policy Office, wanted adidas to change the shoe's name because of its association with marijuana. The shoe was eventually renamed the "Gazelle Natural".

Since then, adidas has continued to use hemp fabric in select shoes, including limited-edition collaborations with other brands. A fruitless search of the word 'hemp' on the sportswear giant's website, though, suggests the company may still be uneasy with the connotations of the word.

Room to grow

An eventual global embrace and utilisation of industrial hemp feels inevitable, though challenges in both attitudes and logistics remain. The US 2018 Farm Bill has been praised by American pro-hemp associations; the bill made hemp production and distribution legal under federal law and permitted the interstate transfer of hemp products for commercial or other purposes in the US.

As mentioned, the UN Single Treaty on Drugs is up for discussion and review. Geoffrey Whaling, chairman of the board of directors for NHA, is currently working with the US State Department to insert modifying language to update the definition of hemp — with the goal, he says, of creating a level playing field for the world.

NHA, EIHA and other advocacy groups have published a paper called “Common Position of the Industrial Hemp Sector on the Single Convention and the International Drug Control System”. Prior to the UN vote in December and in the midst of a puzzling and unfair situation concerning the legal status of *Cannabis sativa L.* around the globe, a press release about the paper reads, this consortium wants to make clear: industrial hemp is an agricultural product, not a drug.

Mr Whaling notes there has been significant progress in this realm and is seeing real innovation happening — such as a major global brand (he does not say which one) that is developing an app with which users can take images of their feet and 3D-print a pair of shoes at home using a hemp-based filament.

“There is a huge and growing acceptance of hemp-based products — by consumers, industry and governments,” Mr Whaling tells *World Footwear*. “We receive calls every day from manufacturers who are looking for commercial levels of hemp fibre, seed, hurd/shives and cold press seed oil. We believe that this is a direct result of legalising hemp as a commodity crop in the United States.”

However, as education and law begin to work in hemp’s favour, Mr Whaling says there is also much work to do in establishing a viable supply chain.

“Farmers will not grow hemp unless we can answer two fundamental questions: ‘How do we plant and harvest a crop that can grow 20 feet tall?’ and ‘Where do we sell it? Where’s the market?’”, he says.

Supply chain also inhibits large-scale users of hemp raw materials who need a supply chain through which “tonnes of processed hemp” can be supplied. “Without the answers to these questions in place,” he says, “this will remain a regionalised or cottage industry.”



Tomas Rohal, founder of Bohempia.

CREDIT: BOHEMPIA

Last September, Panda Biotech announced plans to open a 500,000 square foot hemp fibre processing centre in Wichita Falls, Texas. The company said the Panda Texas Plains Hemp Gin will have two 10-tonne-per-hour decorticators, which separate the outer bast fibre from the inner woody core (the ‘hurd’). When running at full production, the machines are said to be capable of processing around 300 million pounds of industrial hemp per year and, Panda estimates, could generate around \$30,000,000 per year for farmers in Texas.

It is worth noting that, in December 2019, the company announced that they would be opening a different facility elsewhere in Texas, but cancelled their plans earlier this year after it said the location failed to pass inspection.

However, should the promised Wichita Falls location open as planned, it will be a significant contributor to establishing the supply chain. The company says operations are expected to commence in the first quarter of this year with full production anticipated by first quarter 2022.

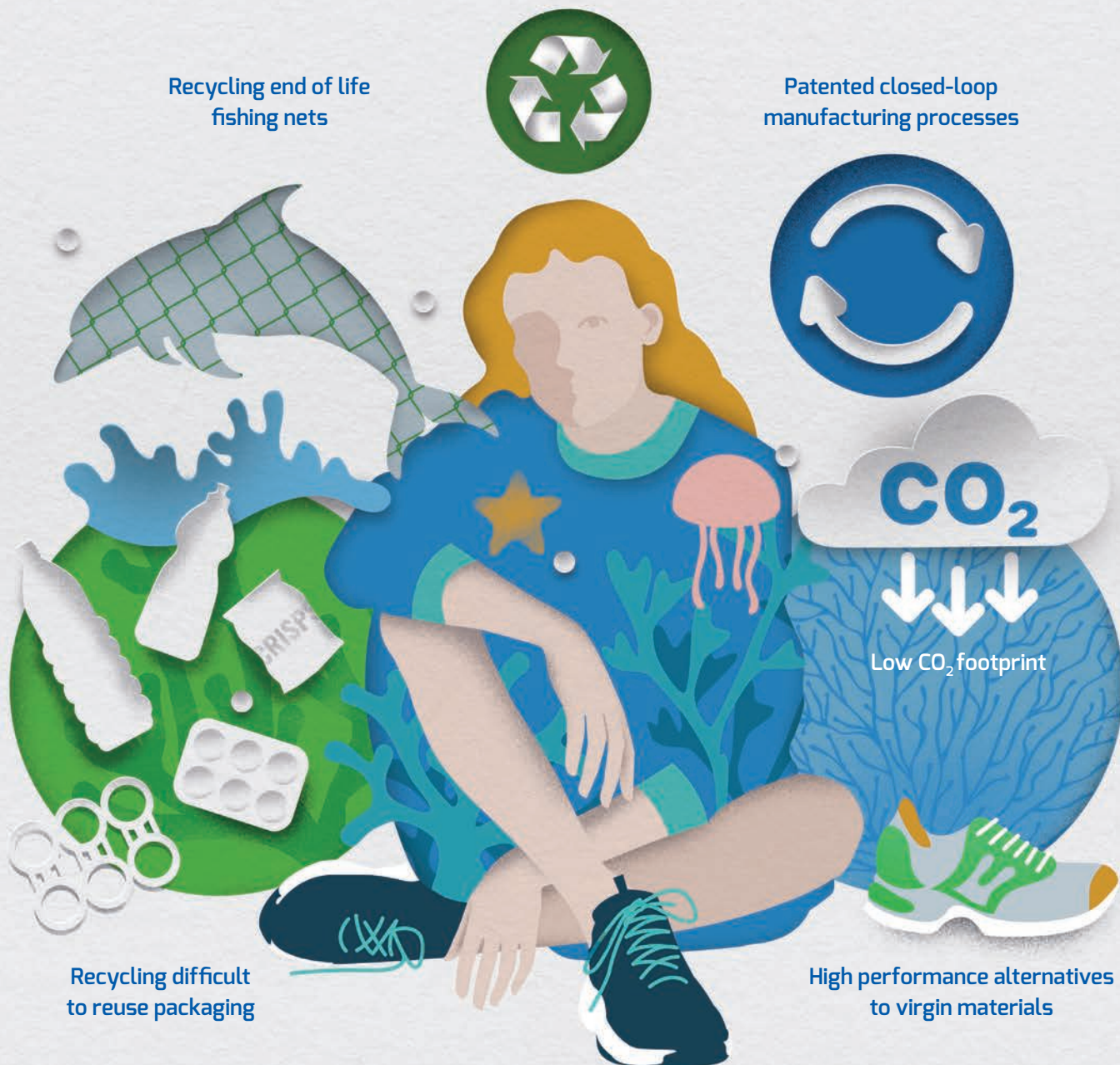
In the meantime, groups such as the NHA and companies like Bohempia will continue their efforts to help lawmakers and consumers understand the distinctions and benefits of industrial hemp.

“Hemp has so many potential benefits — it can heal the planet by reducing CO₂ and all parts of the plant can be used to feed, house, fuel and clothe the planet,” says Mr Whaling. “We are looking to the investment industry to respond and we continue our work to educate all sectors.” 🌱

The barefoot-style Kolda is Bohempia’s most popular hemp shoe.

CREDIT: BOHEMPIA





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The price of leather is at its most affordable for years and footwear producers shopping in the lower-quality range of the upper materials market have the option to bring a beautiful, renewable, high-performing material back into their collections. And because millions of hides are now going to waste, to save them from that fate and use them would also offer shoe companies a huge boost to their sustainability credentials..

No contest

During the first ten months of 2020, US wet-salted hides cost importers around the world an average of \$31.40 per piece. In the same period a year earlier, the average price was \$38.95, more than \$7.50 more. A year before that, the price was \$49.78 and in 2017, for the same months, the average export price for US wet-salted hides was \$61.69 per piece. The price has fallen by almost 50% in three years. Hide prices may go up again in 2021, but in 2020, they were cheap.

Reports have made it clear that tanners and their customers in certain finished-product segments have moved to take advantage of the situation. Upholstery leather manufacturers and furniture producers, particularly in China, have made the most of this opportunity. Side leather tanners and footwear manufacturers seem to have been more reluctant to seize the day.

Five billion pairs vanish

There are many possible layers to explanation this. At an obvious level, people had to spend more time at home than they were expecting in 2020, because of covid-19. Some will have decided to invest in new furniture to make the environment as pleasant as possible. The corollary is that fewer trips outside to the office, to restaurants, to meet clients, to attend events and so on have meant a diminished need for new footwear. Why buy new shoes if no one is going to see you wearing them and if a lack of use has made your old ones last longer? On top of that, shops have spent weeks on end with their doors closed to customers owing to restrictions imposed by governments that were working to combat the pandemic (this affected most other product categories, too, of course).

Certainly, according to the calculations of the chief executive of a leading footwear technology provider, the global shoe market shrank by 5 billion pairs in 2020. Soling machinery developer Desma has installed and maintains its technology in shoe factories all over the world. Its chief executive, Christian Decker, puts the size of the market for 2019 at 22.75 billion pairs, but he says the market fell by 22% in 2020 to 17.75 billion pairs of shoes, boots and sandals, taking footwear back 10 or even 15 years in terms of market size.

The end of the affair

It is not just covid-19, though. Look more deeply and it's easy to see that the mainstream footwear industry's millennia-old love affair with leather has been going through a problematic patch for some time. Knitted uppers made using synthetic yarn, bio-based alternative materials and, of course, plastic are all

playing a part in displacing leather as the material of choice for a number of footwear brands and for consumers. It is easy to find examples of manufacturers of these materials claiming that what they offer is more sustainable than leather. It's still second-nature for leather industry people to shout these alternative materials down and point out the flaws in the arguments that their manufacturers put forward against leather. This isn't a difficult task.

Mexican entrepreneurs Adrián López Velarde and Marte Cázares are friendly and responsive and appear to be attracting a high level of interest in their cactus-based material, Desserto. In July, it won a finalist's prize in the 2020 LVMH Innovation Award. On making the announcement, LVMH said: "The fashion industry is looking for high-quality vegan alternatives to leathers that can be produced in large capacity." In October, Desserto won gold in Australia's Good Design Award Fashion Impact competition. Footwear companies are among those who have taken note of these achievements and have made enquiries about testing and sourcing the material.

Unslain myths

What the entrepreneurs say, though, is a repeat of many of the myths that leather industry commentators probably believed they had slain long before now. Leather is bad, the Desserto founders suggest, because the fashion industry in general creates a high volume of waste and leather is a staple of the fashion industry. Leather is bad because it comes from cows and cows drink water [the connection between saving water and deciding to send the hide of a slaughtered cow to landfill rather than turn it into leather remains a mystery]. Leather is also bad because "it's treated with toxic chemicals that hurt the environment" [cue images of historic pit-dyeing of skins in Morocco as part of the promotional video that Desserto showed at the Safety Footwear Revolution Week event in November]. They went on to say that finding a replacement for leather would mean "less harm to cows" [this suggests that if brands use cactus instead of cattle hides abattoirs will become less busy; those who want fewer head of cattle in fields and fewer animals at abattoirs need to talk to the meat and dairy sectors]. They also criticised alternative materials that are already on the market for being made from plastic, which, they pointed out "doesn't breathe, contains toxic chemicals and is bad for the environment".

They searched for plant-based materials to use instead and worked out a patented process that uses the fibres from nopal cactus leaves to produce the dyeable, cuttable material that has caught the eye of LVMH and others. They say this material will

last for “up to ten years”. When we asked Adrián López exactly what the finished article consists of, he kindly pointed us to a briefing document that the company has made public. This makes it clear that Desserto contains a maximum of 55% nopal fibres. The rest is polyurethane, although the company points out that the polyurethane is “partially made from biological compounds”.

Meritocracy

In the face of arguments like these, there seems to be have been a shift in the mood among some in the leather industry. Confrontation has not worked. Politely pointing out that a refusal to use the hide of a cow to make leather does nothing to lower the animal’s consumption of water during its life is another option, but this has not worked either. Getting to know one another a little and engaging in dialogue may be a better way.

Speaking at the same November footwear conference as Desserto, the secretary general of COTANCE, the leather industry’s representative body in the European Union, Gustavo González-Quijano, said he thought it was wrong to play one material against another. He believes manufacturers of all materials must do their best to deliver their products as sustainably as possible and promote each one truthfully and accurately. “Every material has its merits and we have to make the best materials we can and promote each one on its own merits,” he says.

He has a warning for the makers of alternative materials who use sustainability as a basis for trying to persuade leather buyers to change tack. He insists that tanners can be proud because leather “is the oldest circular-economy product you could find”. To set out to entice brands and consumers away from leather is to put these sustainability-conscious start-ups in danger of making the problem of waste worse, even if indirectly. “People eat meat,” he points out,

Fine, sustainable material is available to footwear companies at a favourable price. And if they choose leather made from lower-quality hides, they can save the material from going to waste, the way 5.5 million pieces did in the US in 2019.

CREDIT: DEICHMANN



"and hides are produced, and we can either use those hides or waste them. If we waste them, we have to manage that waste."

Plastic is the problem

Many of the new materials, including those made from fibres from pineapple, mycelium and apple, as well as cactus of course, are still constrained by a series of issues, ranging from proof of concept to scale of production. Perhaps they have a prosperous future ahead of them, and perhaps not. Today, most of the competition that leather faces is not from them, but from rolls of plastic. If you let your imagination run wild, this plastic can sometimes look a tiny bit like leather. Manufacturers take advantage of this to try to win business from tanners. The China Leather Industry Association said recently that, taking into account only products that were made in China as substitutes for leather, manufacturers there produced 34 billion square-metres of these materials in 2019. That is 15 times more than total annual leather production across the globe.

Tanning group ISA TanTec has made it clear that it wants to increase its challenge to these plastic substitutes. It wants a new division called Creation of Sustainable Materials to compete, not with its own main product, leather, but with plastic. "We are not saying that this is an alternative to leather," founder, Tom Schneider, has told our sister publication *World Leather*. "No. Absolutely not. I don't want to have an alternative to leather. I want to have an alternative to the vegan materials, to the polyurethane stuff."

If some footwear manufacturers seek materials that do not derive from animals, Mr Schneider has decided to try to supply it to them. He does not believe that this decision undermines his commitment to producing responsibly made leather. He will continue to make leather, and in much larger volumes, often for the same footwear companies. He is convinced that, if he can persuade them to use less polyurethane and polyvinyl chloride in the niche collections to which they want to attach a vegan label, it will be a good for the sustainability credentials of those shoe producers. To avoid leather and use plastic in its place would do the opposite.

No contest

Someone who is convinced that, at the moment, shoe companies could find no more sustainable material than leather is Veronica Bates Kassatly, a London-based consultant, ex-World Bank financial analyst and economist. Her specialism is carrying out independent analysis of the sustainability claims of brands and of bodies such as the Sustainable Apparel Coalition (SAC), the organisation behind the Higg Materials Sustainability Index (MSI). She has been one of a number of commentators who have criticised the MSI loudly in recent months after an update to the index showed increased favouritism towards fossil-fuel based synthetics over natural materials, including leather. If she detects greenwashing, Ms Bates Kassatly calls it out without fear or favour.

In her recent writing, she has provided sharp critiques of the cotton, silk and polyester value chains. She has flagged up a lack of clarity over organisations' use of lifecycle analysis (LCA) studies. There is more than one type of LCA, she points out, and unless LCA studies have been produced with the same boundaries and methodologies, using them to compare different products, different companies, different materials makes no sense. Some of her main complaints about the Higg Index are



The long relationship between leather and footwear must continue. CREDIT: LINEAPELLE

that nobody is allowed to see the data or methodologies; it was not developed by the scientific community and has never been subject to peer review.

When she found out that the leather industry had joined counterparts from other sectors, including silk and alpaca wool, in expressing dismay at their treatment from the SAC, she made enquiries. After a discussion with the Leather and Hide Council of America, she concluded that the Higg Index score for leather is "completely wrong out of the starting gate".

The score is based on hides having a value of 3.6% of the total economic worth of the cow at a time when the real share of US hides has been hovering below 1%. And it was when she found out that 5.5 million US hides went to waste in 2019 that she concluded that there is no more sustainable material that shoe companies could choose than leather. Specifically, what she said was: "The most sustainable shoe fibre at present is leather from low-quality hides. No contest."

She specifies low-quality hides because these are the ones that have gone to landfill or incineration; higher-quality ones have continued to find buyers. Some in the leather industry are convinced packers only have themselves to blame for hides going to waste. Had they lent their weight and money to recent campaigns to promote leather, a higher number of mainstream footwear brands may have resisted the temptation to put plastic in their shoe uppers instead. The meat companies chose not to do this and have watched as hide prices fell (see the figures above) as a result of demand for leather diminishing, to the extent now that all these millions of hides have gone to waste. And the hides keep coming because cattle slaughter rates in the US remain at more than 650,000 head every week.

Veronica Bates Kassatly sees it clearly: footwear brands that really are serious about sustainability should choose to use leather made from the lower-quality range of these hides in their forthcoming collections. The material is cheap, long-lasting, versatile, beautiful, natural, renewable, available, tried and tested, sustainable and circular. To choose it would be to save huge volumes of useful raw material from going to waste. To use it would mean there would be less need to use environmentally inimical synthetic substitutes deriving from fossil fuels. She's right: there is no contest. 🍷

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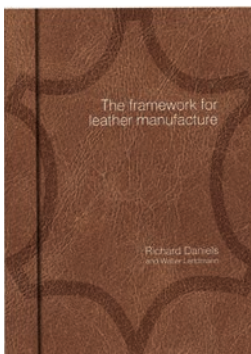


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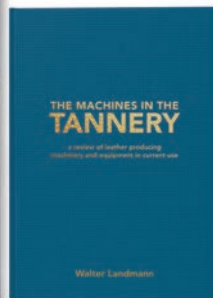
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