Indian Leather

Vol.59 April - 2025 No.02 Annual Subscription Rs.500

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Digest of Leather News

59th Year

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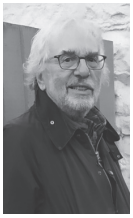
LEATHER: Studies for Information and Self-Training



Richard Daniels

(The author – Richard Daniels – has wide technical experience of leather manufacture, other leather-related practices, within formal education and counterpart training. The third study in the series -Leather: the technology of manufacture - is presently undergoing edit)

Two studies are available for download free of any charge from the website www.indianleathermagazine.com

1] Leather: AN INTRODUCTION (Volume 1 of 3)

This has been created for people who need a better general understanding of what leather is, and for those who need a better understanding of how leather is made.

It describes the versatility of this unique material, its natural origins, how it is manufactured, and why its properties are so comprehensive. It enables comparisons with plastics, laminates and conglomerates of binders/natural materials - as long as their origins, composition and environmental profiles are similarly detailed.

2] Leather: AN OVERVIEW OF MANUFACTURE (Volume 2 of 3)

This second study is for people who wish to become leather technicians, and those who need more than the most basic understanding of leather and its manufacture.

It follows the processes and operations used, and their purposes, for making different leathers from bovine hides, sheep and goat skins.

This is a very comprehensive self-learning package in 10-parts. It has been created for ease-of-study, comprises 30,000 words, and supported by 300 technical images and diagrams. It is designed for use by the individual via smart phone, tablet and computer. However, it can be used for support within more formal training and education.

These studies have been subjected to review by leather making professionals. Also, it has been accredited and recommended by the UNIDO, IULTCS, ALCA and SLTC.

This is about making Leather !

India's Leather, Leather and Non-Leather Footwear & products exports during the period 2024-2025 reached the value of US $ 5.7 billion (₹ 48,667 crore), registering an appreciable growth rate of about 25 per cent. According the data furnished by the Council for Leather Exports (CLE), the value of country's exports exceeded the target by 1 bn dollar (₹ 8,538 crore) fixed by the Department of Commerce, GoI., and going by this, the exports will surpass US$ 6.5 billion (₹ 55,497 crore) mark in the current fiscal year opined Shri R Selvam, Executive Director, CLE. Thanks to the good demand for Indian goods from the USA and the U K., the major export destinations for India, the exports continues to grow, despite the global uncertainties.

Shri R K Jalan, Chairman, CLE, said, although a 10% tariff hike has led exporters to offer discounts, there have been no order cancellations, the order books are strong for the coming months and huge demand is coming from the USA & the U K. "From April 14-15, the situation is normal. We have suggested 'zero-for-zero' duty to the government in the proposed bilateral trade agreement with the US," he added.

Indian Leather industry is labor intensive employs about 42 million people and has a total turnover of about US$ 19 billion (₹ 1,62,222 crore) which includes exports worth of US$ 5 billion (₹ 42,690 crore) The sector's potential for growth is significant, with projections indication a total turnover of US$ 39 billion (₹ 3,32,982 crore). This includes domestic production of US$ 25 billion (₹ 2,13,450 crore) and export turnover of US$ 13.7 billion (₹ 1, 16,971 crore).

It is to be noted several Chinese investors are interested to join hands with Indian Footwear manufacturers and establish manufacturing units in India. The slew of foreign investments coming into the sector bears testimony to the confidence shown by footwear manufacturers in the huge potential of the Indian footwear industry.

Leather Vision 2025

- Vasan Suri
A Passionate Leather Lover & Professional
Hi-Tech Consultancy
Tel: +91-9871504980/9999735293

Contd from March issue…

Mr. Tapan Nandi, during his speech and the SGS speaker mentioned that Leather is always Leather and the only sustainable product and the rest so called Vegan and plant based products will not sustain for many reasons.

Alternative products will never be able to match the Leather for its Natural touch, feel, aesthetics, longevity, durability and above all sustainability.

Presentation of Leathers at "Leather Vision 2025"

TFL, Smit & Zoon, Stahl, Botico, Sommer, Cromogenia & Scisco graciously participated during the event and presented their developments and vision for the future.

I am listing a brief note about each of these participants which would interest all our members and motivate to bring their entire team to the event and get all the knowledge and information.

TFL - They have showcased their upgradation technology for lower selection. It is very important for our industry in particular when we are working with Indian Hides.

Smit & Zoon - The tanning system of Zeology which helps us to move towards sustainable tanning practices is a treat to watch. They have also presented finished leathers made with zeology.

Stahl - Presented a range of products made from bio-based & renewable plant based sources for a futuristic Leather World.

Botico - Have done a good job high veg and full veg leathers. Minimal cost and maximum returns.

Sommer - Fantastic product for upgradation and have displayed a good range to understand the upgradation.

A company which could help in matching any color to the minimum of 1kg requirement, is a great support to the Industry.

Cromogenia - Cost effective, result oriented products and have some good drivers and scavengers (products) for the leather manufacturing.

This was even mentioned by the SGS speaker.

Scisco - They represent a variety of manufacturers from Chenitan to Alpa covering all the required chemicals for tanning and finishing.

My suggestion - The more the visitors and enquiries will motivate these companies to bring in more and more products beneficial for the Industry.

CSIR-CLRI Celebrates 78th Foundation Day

CSIR-Central Leather Research Institute (CSIR-CLRI), Chennai, celebrated its 78th Foundation Day on April 24, 2025. Dr. K.J. Sreeram, Director of CSIR-CLRI, welcomed the esteemed gathering and highlighted the institute's pivotal contributions to the leather and allied sectors, emphasizing sustainable development and global growth, particularly in India. He also reflected on the key technological advancements made during the past year.

Shri R. Selvam, IAS, Executive Director of the Council for Leather Exports (CLE), graced the occasion as the Chief Guest and delivered the Foundation Day Lecture. In his address, he underscored the importance of branding Indian leather products for international markets and encouraged young researchers to fully utilize the institute's research infrastructure. Shri Selvam shared insights into the evolving dynamics of the leather industry, emphasizing sustainability, innovation, and the pivotal role of CSIR-CLRI.

A key highlight of the event was the signing of an MoU between CSIR-CLRI and the Kalapuri Foundation for the development of the Kolhapur Footwear Cluster. Under this partnership, CSIR-CLRI will undertake a comprehensive diagnostic study to enhance sustainability, skill development, and infrastructure within the cluster, while also promoting traditional footwear at national and international platforms.

The celebrations also featured a Young Researcher Competition in the fields of Chemical, Biological, and Engineering Sciences, with winners honoured with mementos and certificates. Additionally, inventors who filed twelve patents and registered six copyrights during 2024–25 were recognized with certificates of appreciation. The event concluded with a vote of thanks proposed by Dr. S. Ganesh, Senior Principal Scientist, Chairman, Steering Committee, 78th CSIR-CLRI Foundation Day Celebrations.

CSIR-CLRI set to give iconic Kolhapuri chappal a makeover

The iconic Kolhapuri chappal is set for a chic revamp. Artisans from Maharashtra's Kolhapur are collaborating with Chennai-based Central Leather Research Institute to introduce fresh design elements of the handcrafted chappal known for its intricate design, and train artisans in time-saving techniques. The aim is to scale up production, modernise products without compromising on quality and encourage exports. CLRI has signed an MoU with Kolhapur-based Kalapuri Foundation which supports 200 families engaged in chappal-making.

Aparna Chavan, co-founder of Kalapuri Foundation, said the 700-year-old craft, whose practitioners still use traditional techniques, faces key challenges such as stiff leather making it uncomfortable for prolonged wear, the absence of anti-slip soles and colour bleeding. Production is also seasonal, as leather catches fungus during the monsoon.

"CLRI's technical expertise will help us find practical solutions - from improving raw material and comfort to introducing new designs and upskilling artisans - so the craft can scale and artisans can earn a stable livelihood year-round. Awareness programmes can also attract youngsters back to revive the dying chappal industry," she said.

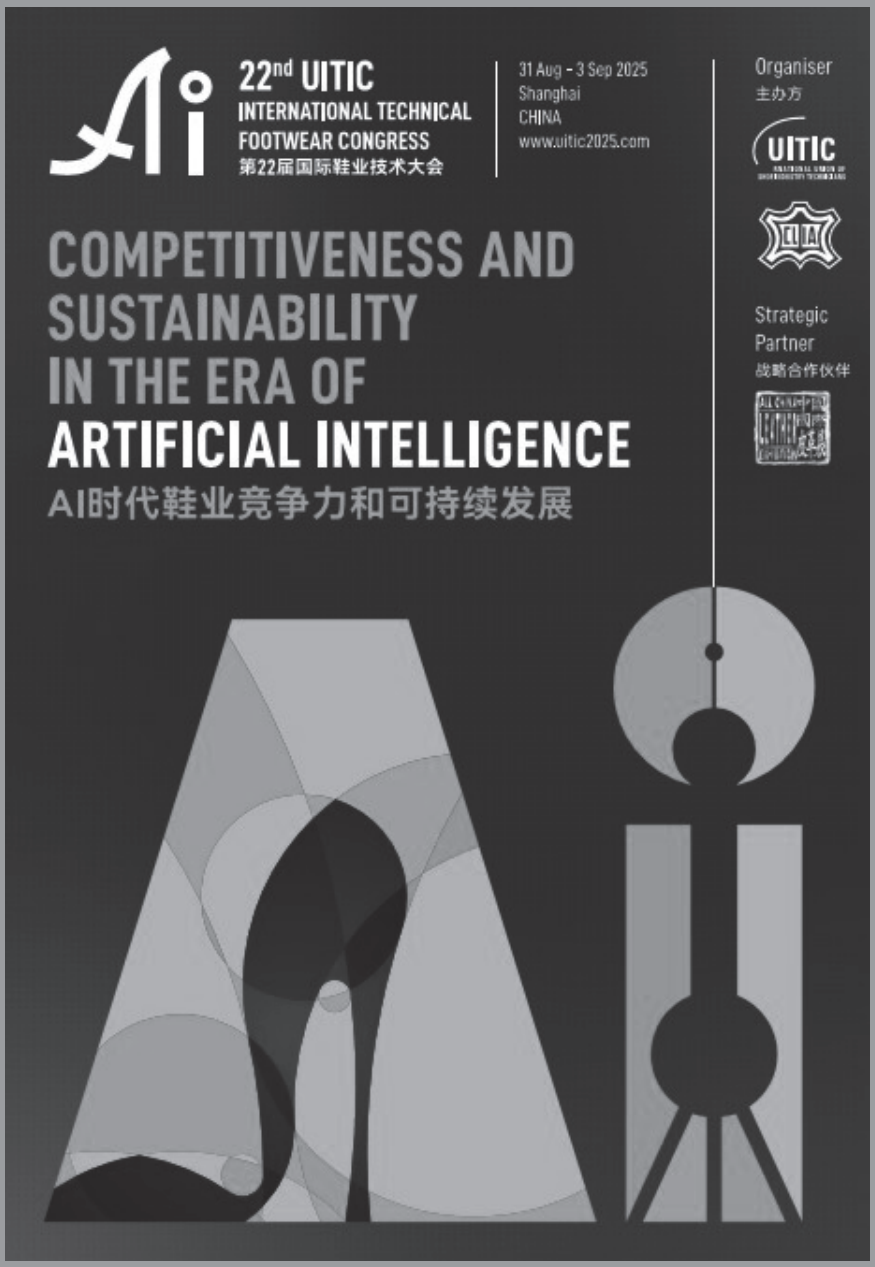
In 2019, Kolhapuri chappals produced in Maharashtra's Kolhapur, Sangli, Satara and Solapur districts and Karnataka's Bijapur, Bagalkot, Dharwad and Belgaum districts were granted a Geographical Indication (GI) tag.

Traditionally, the chappals are made with leather processed through bag tanning, a 120-day vegetable tanning method. The standard red design often bleeds when in contact with water, affecting durability and visual appeal. “New technologies can produce quality leather in just 1-2 days. Our focus is to train artisans to use this leather, preserve quality, and infuse fresh designs from their facilities,” said CLRI Director K J Sreeram.

One hundred artisans will train in Kolhapur to adapt traditional craftsmanship to modern production techniques, enhancing functionality and design. CLRI will also explore organic alternatives, cushioning options such as polyurethane foam and add modern embellishments such as gemstones and metallic accessories to appeal to younger customers.

“The artisans already have traditional skills - what we aim to do is enhance those with mechanical operations, design innovation and creative development,” said S Mathivanan, head, Shoe & Product Design Centre, CLRI. “Our aim is to help artisans increase productivity and income while ensuring the traditional essence of Kolhapuris is not lost.”

(Source : Times of India)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AI时代鞋业竞争力和可持续发展

Shoe Tech Agra 2025 demonstrates the potential of India's Footwear Industry

- **Set a strong foundation for future industry developments, showcasing the country's progress towards self-reliance and innovation.**

The 9th edition of Shoe-Tech Agra, organised by the Indian Footwear Components Manufacturers' Association (IFCOMA) on 2 & 3 April 2025, at the Madhu resorts, Sikandra in Agra, closed successfully, demonstrating the potential of India's footwear industry, with significant business opportunities and growth prospects.

The two-day event drew 5,247 visitors, which include 2,470 trade visitors, with 75 stalls put up by over 60 exhibitors from 12 states of the country, showcasing the innovative products and technologies, highlighting the industry's focus on research and development. The exhibition emphasized the importance of components in the footwear industry, with 32 critical components being manufactured by IFCOMA members.

Shoe-Tech Agra 2025 brought together industry professionals, manufacturers, and experts to share knowledge, showcase products, and explore business opportunities. According to the organizer, the event would be expected to generate around Rs 250 crore worth of business, to the much satisfaction of the participants.

Shri Puran Dawar, President - AFMEC, Chairman, Dawar Group, Agra was the Chief Guest of the function and inaugurated the event, along with Special Guest of Honour, Shri Vivek Sharma, IRS, Managing Director - FDDI, Noida and distinguished Guest of Honour, Shri Gopal Gupta, Vice President- AFMEC & Chairman, M/s Gupta Overseas.

Shri Vipan Seth greeting Ms Manju Maan ED FDDI Noida with a Bouquet plant

Dr Ashish Chandra NIFT receiving the award from Shri Puran Dawar

Shri Rajesh Sehgal, Vice President- AFMEC & Chairman, M/s Rising Steps; Shri Rajiv Wasan, Gen. Secretary - AFMEC & Chairman, M/s A.T. Exports; Shri Dharmendra Narula ,President - CIFI (U.P.) & MD, M/s Guru Kripa Enterprises; Shri Vijay Sama President, Agra Shoe Factors' Federation, Agra & Shri Opinder Singh Chhatwal, President, ASMA & MD, M/s Jap Jee Footwear (P) Ltd. graced the function as Guests of Honour,

Shri Puran Dawar, in his address, while speaking on **Industry Growth,** emphasized the rapid growth of the Indian footwear industry, driven by technological advancements, creativity, and innovative research. Mr Dawar noted that, India now manufactures all components used in shoes, reducing dependence on imports and marking a significant step towards self-reliance. He said the exhibition has provided a platform for industry professionals to connect, update themselves with the latest technologies, and explore the possible **Business opportunities** "Events like Shoe-Tech are becoming the protagonists of this industrial revolution", added Shri Dawar.

On **Self reliance,** "Shoe-Tech Agra is a significant initiative for the footwear components industry and is moving towards historic success." commented Deepak Manchanda, General Secretary, IFCOMA.

"Shoe-Tech Agra is a significant initiative for the footwear components industry and is moving towards historic success." – commented Deepak Manchanda, General Secretary, IFCOMA.

A special Seminar cum workshop was conducted by the CSIR-Central Leather Research Institute, Chennai on the 2nd April. Over 200 trade members from the Industry in Agra participated in the seminar enthusiastically.

Shri Satyamoorthy CDS Soles receiving the award from Shri Puran Dawar

Shri Shailesh Pathak, Stuck Chemicals Pvt. Ltd., receiving the award from Shri Puran Dawar

Ms Jekcy and Mr Gunteti, Green Worms, receiving the award from Shri Puran Dawar

Ms Ankita thakur receiving the award from Shri Pankaj Kumar Sinha Secretary FDDI Noida

Awards and Recognition

Exhibitors' Excellence Awards : Awards were presented to exhibitors for their excellent stalls put up in various categories, including industry-academia collaboration, innovative trends, and trusted brands. Following were the awardees in different categories.

Industry-Academia Collaboration Initiative Award - Colonel Abhay from FDDI

Best Stall for Most Innovative Trends Display Award - Dr. Ashish Chandra from NIFT, Rae Bareli (UP)

Most Trusted Brand Award - Mr. Shailesh Pathak, Stuck Chemicals Pvt Ltd., Agra for Brand "**Stuck On**"

Best Stall in Creative Product - Mr. Satyamurthy – CDS Soles Pvt Ltd., Chennai

Revolutionary Waste Management and Recycling Award - Mr. Akshay Gunteti – Green Worms, Calicut, Kerala.

All these awards were presented by the Chief Guest Shri Puran Dawar, President, Agra.

The Shoe-Tech Agra exhibition demonstrated the growth and potential of the footwear industry in India. The event provided a platform for industry professionals to connect, share knowledge, and explore business opportunities, highlighting the industry's focus on innovation and technological advancements.

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Estd.1967

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59th Year of PUBLICATION

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INDIAN LEATHER is a monthly Digest of Leather News. Established in 1967 by Sri S. Sankaran, it has now completed 58 years of its glorious publication.

Indian Leather is available both in Print & E-version.

Indian Leather covers all important news of Leather, Footwear & Allied Industries and regularly publishes informative articles, the news/reports of the International events/fairs in Leather & Footwear industry

Indian Leather has a wider readership: Tanners, Manufacturers of Chemicals & Auxiliaries, Manufacturers of Footwear, Components & Accessories, Leathergoods, Garments, Trade related Associations, Institutions etc.

The 33rd Shoes & Leather - Guangzhou

Incorporating

Int'l Footwear Exhibition (IFLE) - Guangzhou

Canton Fair Complex · Area D

Hall 17.1 · 18.1 · 19.1 · 20.1

15-17 May 2025

One-stop Sourcing Platform

Machinery | Material | Leather | Component | Chemical | Accessories | Finished Footwear

The 33rd Shoes & Leather - Guangzhou incorporating IFLE - Guangzhou is a vital platform for the footwear and leather industries. It will showcase the latest in shoe manufacturing, materials, finished footwear products, and much more, offering a comprehensive sourcing platform for industry professionals.

It is expected to have **800+** international exhibitors and **20,000+** professional visitors, covering an expo area of **40,000S.Q.M**.

Hall 17.1: Footwear & Finished Products Hall
Hall 18.1-19.1: Machinery Hall
Hall 20.1: Shoe Material / Leather / Chemical Hal

2025 FORECAST

40,000 sqm. Exhibition Space to Showcase Exhibitor Products

20,000+ Professional Buyers from **50+** Countries and Regions

20+ Groups of Participants and National Pavilions

800+ International Exhibitors from **20+** Countries & Regions

CONCURRENT EVENT

The 14th International Footwear Design Competition (IFDC)

Technical seminars

EVENT VENUE

China Import & Export Fair Complex,
Area D • Hall 17.1-20.1

Bangladeshi leather footwear exports continue to grow

Leather footwear exports are underpinning the positive performance of the leather industry in the fiscal year 2024-2025, according to the Export Promotion Bureau of the Government of Bangladesh

The latest data released by the Asian country's Export Promotion Bureau shows that **total leather exports** between July 2024 and March 2025 amounted to 852.01 million US dollars, an increase of 9.89% over the same period of the previous fiscal year. **Leather footwear exports account for about 58% of the total export value**.

More specifically, in the first eight months of its current fiscal year, Bangladeshi **leather footwear exports** grew by 25.24%, as compared to the same period in the fiscal year 2023-2024, reaching 496.17 million US dollars.

On the contrary, between July 2024 and March 2025, **leather goods exports** fell by 6.11% to 256.44 million US dollars and **finished leather exports** fell by 6.29% to 99.40 million US dollars, on a comparable basis to the same months of the last fiscal year.

Bangladesh's other footwear exports are also on the rise. In the first eight months of its current fiscal year, exports in this segment totalled 414.68 million US dollars, an increase of 34.15% as compared to the period March 2023-July 2024.

(Source : worldfootwear.com)

Lewatit MDS TP 108 from LANXESS removes short-chain PFAS from water

- **Efficient water treatment for sustainable products**
- **Significantly more effective than activated carbon adsorption**
- **Twice the service life, reduced material and disposal costs**

Specialty chemicals company LANXESS is introducing Lewatit MDS TP 108, a new ion exchange resin for removing short-chain fluorinated components (PFAS) from water. These PFAS, with three or fewer carbon atoms, are the smallest members of this substance class and are often the most difficult to remove during water treatment. The new product also enables users to save a considerable amount of material and disposal costs, because it lasts about twice as long as conventional ion exchange resins or alternative technologies such as activated carbon adsorption.

“With Lewatit MDS TP 108, we are setting new standards in water treatment and ideally complement our product portfolio for the removal of PFAS. At the same time, we help to protect water as a valuable resource,” says Dr. Dirk Steinhilber, Application Technology Manager in the LANXESS Liquid Purification Technologies business unit.

LANXESS completes sale of its Urethane Systems business to UBE Corporation

Specialty chemicals company LANXESS has completed the sale of its Urethane Systems business to Japanese UBE Corporation on April 1, 2025. UBE is a global manufacturer of chemical products and listed at the Tokyo Stock Exchange.

All relevant antitrust authorities had granted the necessary approvals for the transaction, which was announced in October 2024. With completion of this transaction, LANXESS has received gross cash proceeds of approximately €500 million. The enterprise value amounts to €460 million.

TFL Colour Trends

New TFL Colour Trends Catalogue Autumn-Winter 2026/27

TFL has released its new TFL Colour Trends Catalogue for the season Autumn Winter 2026/27.

In the catalogue, TFL presents the colour trends for leather garment, footwear, accessories and additionally for the upholstery industry.

The colour trends are divided into **"Wearing"** and **"Living"**, devoting a section to each within the publication. Wearing comprises inspirations and colour trends for garments, footwear and accessories.

The Living section features all colours that will decorate the season's interior designs.

In **"Wearing",** we will discover how, after years of standardisation of leather, we have returned to discover its unique qualities. This is why we focused on both the aesthetic and utilitarian functions of leather, identifying four primary functions: protective, informative, sensory and technological. We have thus created natural and printed grains, burnished effects and extra-glossy surfaces, not forgetting shiny and silky suedes.

In **"Living"**, we will show how in an age of hyper-choice, where for each product there are several competing materials, it is important to support the tanners' effort at bringing out the beauty and authenticity of the leather. We will demonstrate the importance of opening-up the structure of the skin starting from the beamhouse, making light leathers with a round hand, accentuating the three-dimensionality and vibrancy of the colours on soft, bright nappa.

Being confident that the TFL Colour Trends catalogue will assist you in taking decisions regarding colour trends, we wish you a happy reading.

The TFL Colour Trends Catalogue is now available. For further details please have a look at www.tfl.com.

CHINAPLAS 2025: Cellasto® and Össur collaborate to enhance performance in foot prosthesis

- **Össur's Pro-Flex® Terra foot prosthesis relies on BASF's Cellasto® microcellular material for enhanced softness, flexibility, and energy return that imitates human muscle-tendon motion**

- **Cellasto® foam design adapts to various walking conditions without mechanical adjustments, ensuring robust performance through rigorous testing and user-focused development**

At CHINAPLAS 2025 concluded recently, BASF has presented the Pro-Flex® Terra foot prosthesis, co-created with the leading global prosthetic provider, Össur. Cellasto®'s cutting-edge material solution, characterized by progressive stiffness and high impact strength, combines softness and flexibility with extraordinary energy return, allowing the Pro-Flex® Terra foot prosthesis to embody an intuitive response behavior and replicate closely the human muscle-tendon motion.

The three-step Cellasto® foam design addresses the limitations of traditional two- step designs. It adapts to a wide range of load conditions without mechanical or electrical adjustment, making it suitable for activities like slow walking, hiking, and high-impact sports in both extremely cold and hot environments. Additionally, it is ideal for use at the beach, pool, or in the shower. Users noted that they were rediscovering aspects of their mobility while using it.

Rigorous tests, including a full lifecycle assessment with over two million overloaded steps, confirmed the robustness and performance of Cellasto®, which maintained its quality as well as on day one, even after extensive testing.

The different foam densities for the serial product were fine-tuned during user tests to work in harmony with 9 specific user weight and size categories. Cellasto® application development engineers supported customer innovations from conception to production, which was implemented with an efficient tooling concept on fully automated mold lines.

“Our ambition was to combine the features of many prosthetic feet into one product. Össur designed the innovative Pro-Flex® Terra to blend the softness and flexibility of a comfortable daily-use foot with the high energy return of an active foot, thereby merging two separate attributes in one design. Our partnership with Cellasto® exemplifies a successful collaboration that has advanced prosthetic technology. By prioritizing comfort, performance, and durability, we strive to help our customers live through every step,” remarked Felix Starker, Product Designer at Össur.

“Cellasto® offers a unique balance between comfort and functionality. We take great pride in partnering with Össur to enhance mobility and quality of life for prosthetic foot users worldwide. At Cellasto®, we continue to explore tailored solutions for applications across all industries,” said Bjoern Kophstahl, Vice President, Global Business Management for Cellasto®.

African Leather and Leather Products Institute (ALLPI) Joins the Leather Traceability Cluster

The **Leather Traceability Cluster** (LTC) is proud to welcome the **African Leather and Leather Products Institute (ALLPI)** as a new member. This partnership marks a key step toward strengthening global collaboration on traceability and sustainability in the leather supply chain.

ALLPI, the institution supporting 21 member states in the Common Market for Eastern and Southern Africa (COMESA), has long been active in promoting leather traceability as a tool for quality, environmental performance, and international market access. From its initial presentation to LTC in June 2024 to its official application in March 2025, ALLPI has shown strong alignment with the Cluster's mission. **Find ALLPI's application letter**

Nicholas Mudungwe, Executive Director (ALLPI): "As an organization actively engaged in strengthening Africa's leather value chain, we view participation in the Leather Traceability Cluster as an opportunity to contribute our expertise, collaborate with key stakeholders, and promote best practices in traceability within the African leather industry".

Gustavo Gonzalez-Quijano, Secretary-General (COTANCE): "ALLPI's membership strengthens the global reach of the Leather Traceability Cluster and brings valuable regional expertise to our shared mission of building credible, harmonised traceability in the leather value chain.

This collaboration comes at a crucial moment, as the LTC has recently endorsed its draft traceability standard, developed by ICEC, SLF, OEKO-TEX® and LWG, and now advancing through the fast-track CEN standardisation process. With the EU Deforestation Regulation (EUDR) looming to reshape global supply chains, ALLPI's engagement adds valuable regional perspective to ensure the standard's broader applicability.

For more information about ALLPI, please visit: https://allpi.int/

COTANCE Withdraws from A&F PEFCR Technical Secretariat, Warning: "Durability Metrics Penalise Natural Materials and send wrong signals in an ecodesign framework"

COTANCE has officially announced its withdrawal from the Technical Secretariat (TS) of the Apparel and Footwear Product Environmental Footprint Category Rules (PEFCR).

Despite months of engagement with the TS - presenting fact-based arguments, proposing solutions, and forming a global coalition of natural material stakeholders - COTANCE regrets that no revision was permitted to the default durability values adopted in the Apparel & Footwear PEFCR. They disproportionately impact slow-fashion products made with natural materials - such as leather, wool, and cotton - ultimately encouraging brands to deselect them in favour of less sustainable alternatives.

The **COTANCE Board** has therefore decided to **disengage the European leather industry** from the A&F PEFCR. In an **Official Letter to the Chairman of the A&F PEFCR Technical Secretariat,**

COTANCE has stated, while acknowledging the work made in other areas of the PEFCR, COTANCE considers the negative implications of the durability methodology to outweigh the benefits of the rulebook.

COTANCE also requests that any reference to the organisation or its representatives be removed from the updated PEFCR document, as continued mention could be misinterpreted as support for a methodology it no longer endorses.

Gustavo Gonzalez-Quijano, Secretary-General of COTANCE: *"We joined this process in good faith to build a fair and science-based environmental framework for fashion. Instead, we've witnessed a system that punishes durable, natural materials like leather—exactly the kind of products the circular economy should be encouraging. We cannot stand behind a methodology that promotes fast fashion over long-lasting quality. That said, we remain committed to dialogue and hope to convince the European Commission to review this aspect in the forthcoming revision of the PEFCR."*

Artificial intelligence and the shoe business: the next industry revolution has already begun!

ARTIFICIAL INTELLIGENCE IS TRANSFORMING THE FOOTWEAR INDUSTRY, OPTIMISING PRODUCTION, LOGISTICS AND CUSTOMER EXPERIENCE IN A SUSTAINABLE AND PERSONALISED WAY. DURING THE SUSTAINABILITY SUMMIT, THE IMPORTANCE OF LEARNING, UNLEARNING AND RE-LEARNING TO REMAIN COMPETITIVE IN A RAPIDLY CHANGING ENVIRONMENT EMERGED. INNOVATIVE START-UPS SUCH AS SANGROVE, IFRETURNS, ACBC AND UP2U SHOW HOW AI CAN BE A CONCRETE LEVER FOR CHANGE AND VALUE.

With remarkable foresight, **futurist Alvin Toffler** declared in the 1980s: “The illiterate of the 21st century will not be those who cannot read and write, but those who cannot learn, unlearn, and relearn.”

The quote was chosen by **Alberto Mattiello**, member of the Scientific Committee of Expo Riva Schuh and Gardabags, to close his presentation on artificial intelligence and technology in the footwear industry, delivered on 3 April in Birmingham during the **Sustainability Summit** organised by the **British Footwear Association**.

The Riva del Garda exhibition has always worked to ensure its event is not only the most important international business platform for footwear and accessories, but also a hub for relationships, information, ideas and innovation.

Over the years, nearly **60 startups** have been invited to take part in the **Innovation Village Retail** – a recurring feature at Expo Riva Schuh and Gardabags, which will return **from 14 to 17 June 2025** –

offering insights and real opportunities to transform and grow the footwear and accessories distribution business.

An investment in research and “consultation” that has earned recognition beyond the exhibition itself, as demonstrated by the invitation to participate in the Sustainability Summit as speakers.

And if Toffler foresaw that the ability to quickly adapt to change would become an essential skill, today that ability is more crucial than ever in the current technological and industrial landscape, often forcing professionals to rethink traditional processes.

In the next 10 years, we will have access to such advanced computational power that we’ll be able to digitally simulate any aspect of our current world. In the past two years alone, the cost of AI has dropped by an estimated 99.6%. There are now more than 30,000 AI applications already available online.

Even looking at these figures alone, it becomes clear that this dense network of innovation and potential is well worth exploring.

BUT DOES THE FOOTWEAR INDUSTRY REALLY NEED ARTIFICIAL INTELLIGENCE?

Long a symbol of craftsmanship, style and local identity, the **footwear industry** now finds itself in the midst of a **profound transformation**. Mounting pressure for sustainable production models, the demand for greater operational efficiency and shifting consumer expectations are driving a complete rethink of the entire value chain. In this context, artificial intelligence is emerging not merely as a technological aid, but as a true catalyst for innovation.

AI enables a deep re-engineering of processes – from product conception to distribution and post-sales management. The goal is not just to produce better and faster, but to design a footwear system that is more resilient, more responsible and more tailored to individual needs.

Yet navigating the maze of new technologies and daily innovations – some headline-grabbing, others less so – is no easy task. Here, we aim to **explore some of the key areas where AI is being applied** in the footwear business, while also highlighting a number of **promising startups** and **emerging technologies** that are reshaping the face of the industry.

AI IN THE PRODUCTION CHAIN: OPTIMISATION, EFFICIENCY AND PERSONALISATION

One of the key benefits of integrating AI into the footwear industry lies in the ability to **optimise every stage of the production process**. **Machine learning algorithms** analyse vast quantities of data to streamline material flows, reduce waste and improve resource management. In particular, predictive AI systems enable production planning that closely matches real market demand, helping to minimise the risks of overproduction and obsolescence.

3D printing, when combined with generative design tools, allows for fast and cost-effective footwear **prototyping**. Artificial intelligence supports the precise modelling of each component, recommending geometries that maximise material efficiency, performance and durability. This approach also encourages **personalisation** – a growing trend in today's market.

Another important advantage is **energy efficiency**: Smart facilities equipped with connected sensors and AI-driven software can optimise energy use in real time, enabling a more environmentally sustainable production process.

WHAT THE MARKET OFFERS

We've highlighted some practical, AI-based solutions that are already available, designed to help companies improve their approach to both production and sales. These innovations come from startups that, over the years, have brought energy and ideas to the Innovation Village Retail at Expo Riva Schuh and Gardabags.


Qwen2.5-Max
Kimi
Gemini 2.5
manus


BFA

SANGROVE: Optimising Production

One of the startups that gained visibility and had the opportunity to present its technology during the Sustainability Summit was Sangrove. The New York-based company operates at the crossroads of retail and sustainable technology, with the goal of reducing overproduction and excess inventory in the consumer goods sector – particularly fashion. Their digital platform, called IMPACT SHOPPING™, uses advanced technologies and AI to aggregate consumer demand and coordinate production based on pre-orders. This approach allows brands to produce only what is truly needed, helping to eliminate waste and reduce CO□ emissions associated with overproduction.

IFRETURNS: The Startup Redefining Returns Logistics

In e-commerce, returns remain one of the most critical challenges in terms of cost, logistics and environmental impact. This is especially true in the footwear industry, where issues related to fit often lead consumers to order multiple sizes or models, fully intending to return part of their purchase. IFRETURNS tackles the problem with a radically new approach.

Using an AI-powered platform, IFRETURNS **transforms returns management into an opportunity for conversion and customer loyalty**. The system guides the user through a simplified three-click process, offering alternative product suggestions and encouraging exchanges rather than refunds. By using optimised collection points, it reduces unnecessary transportation, improving the environmental impact as well.

The platform incorporates personalised recommendation modules, which analyse user preferences and purchasing behaviour to suggest alternatives that better match expectations. The IFRETURNS approach is a win-win: the customer more easily finds

what they're looking for, the brand reduces their financial losses, and the environment benefits from a more efficient logistics process.

ACBC: Smart Materials and Circular Design

While IFRETURNS focuses on logistics and the post-sale experience, ACBC works further upstream – on the product and its materials. Founded in Italy, the company has built its success on a blend of consultancy and direct production, helping more than 100 brands improve their sustainability. At the heart of its strategy lies the **adoption of biodegradable and innovative materials**, selected and combined using artificial intelligence.

AI is used to analyse the composition, durability, environmental impact and recyclability of dozens of materials, identifying the most effective combinations for specific use cases. ACBC has developed solutions such as ZIPSHOES – modular footwear designed for durability and easy recycling – and collaborates with research labs to introduce biodegradable foams into sports products.

As a certified B Corp, ACBC also distinguishes itself through its values. To this end, AI is not just a technical tool, but a true ally – **guiding ethical, long-term choices**, translating environmental complexity into usable data.

UP2U: AI and Strategy for Companies Ready to Change

UP2U speaks to a different audience: businesses that want to begin their journey towards **sustainability** but lack the skills or tools to make it happen. Their platforms –Climax, Choral and Planet – use artificial intelligence to measure CO□ emissions, monitor ESG progress and train staff on sustainability topics.

The approach is strongly data-driven: AI enables the **creation of tailored, dynamic action plans that update in real time** based on regulatory developments, market changes or stakeholder feedback.

UP2U's strength lies in its ability to translate sustainability into competitive value, using technology that's accessible even to SMEs.

CUSTOMER EXPERIENCE: AI AS A BRIDGE BETWEEN DIGITAL AND PHYSICAL

In a market shaped by multichannel retail, delivering a consistent and personalised experience is a complex challenge. AI plays a central role in building seamless, unique **customer journeys**. By profiling users, AI technologies can recommend styles, colours and sizes based on personal taste, biometric measurements and previous feedback.

Virtual fitting rooms and 3D foot-scanning apps are significantly **reducing return rates** while also boosting customer satisfaction. Smart recommendations powered by deep-learning algorithms increase the likelihood of purchase and enhance brand loyalty.

Even the **post-sale** relationship can be managed by AI: smart chatbots, predictive support, personalised notifications and care tips create a digital ecosystem that strengthens the customer relationship.

EMERGING TECHNOLOGIES: DEEP RESEARCH, VIBE CODING AND SMART FOOTWEAR

Among the most promising technologies, **Deep Research** allows companies to map the market, analyse competitors and identify emerging trends at a speed and depth previously unimaginable. AI systems scan millions of sources in real time, generating insights that support strategic decision-making.

Vibe Coding, on the other hand, enables software development through natural language. This empowers non-programmers – designers, marketers and product managers alike – to create digital

tools for personalisation, sales or sustainable management. An important step forward in the market's digital transformation.

Finally, the integration of AI directly into shoes – **smart footwear** – opens up fascinating possibilities: shoes that adapt in real time to the shape of the foot, track physical activity and provide feedback to the wearer. These products are poised to become more than just fashion accessories, evolving into genuine tools for well-being and performance.

TOWARDS A NEW ERA FOR THE FOOTWEAR INDUSTRY

Artificial intelligence is reshaping the footwear business from every angle: production, commerce, customer relations and ethics. Companies that manage to integrate these technologies with clarity of vision and a sense of responsibility will secure a strong competitive advantage.

The shift towards a more sustainable, efficient and personalised model is not only possible – it is essential. The stories of SANGROVE, IFRETURNS, ACBC and UP2U show that innovation and sustainability are not only compatible, but mutually reinforcing.

The revolution has already begun. It's now up to entrepreneurs, designers, engineers and policymakers to recognise its potential and lead the change – towards a smarter, more inclusive and circular future for the footwear industry.

And to explore it further, all you have to do is attend Expo Riva Schuh and Gardabags. Discover the **next wave of startups in the** Innovation Village Retail area, delve into **consumer trends** in the Highlights zone, explore **market challenges** through the Market Focus, and experience the **new, forward-looking exhibition format** of Gardabags.

* * *

Back-to-School Column

Dr. N K Chandra Babu

Raw Material for the Leather Industry – Part I

Hides and skins, mostly from domestic animals form the raw material base of the leather industry. Though hides and skins are produced as a low value byproduct of the meat industry, the global leather trade far exceeds that of meat and hence many consider leather as a co-product. In the case of leather manufacture, the nature of the raw material enables the tanner to produce a unique product.

The surface morphological characteristics and three dimensional structures of skins vary considerably from one species of skin to other. Even among the same species, these features and quality vary based on breed, geographical location, animal husbandry practices, age and sex.

Hides and skins from Bovine animals, mainly cattle (but include buffaloes which are grown only in only very few countries) (about 65%) and sheep skins (~15%) form the major raw material base due to widespread distribution almost all over the world, and hence many consider them as global raw materials. Goat and pig skins are available only in certain countries, and constitute about 9 and 10% of the total global availability respectively. Skins of certain animals such as horses, camels, rabbits and fish, and skins from birds such as emu and ostrich and kangaroo skins (from officially allowed/licenced sculling during harvest seasons in Australia) are also used in small way.

Skins from endangered species such as farmed crocodile, fox etc., are also used by leather industry but legal sourcing of such exotic skins and trading of products from them are very much controlled and regulated according to CITES (Conventions on International Trade in Endangered Species of wild fauna and flora) certification rules. But skins from animals other than the cattle, buffalo, sheep,

pig and goat constitute only miniscule proportion (~1%) of the global raw material base.

Histological Characteristics of hides and skins

Each species of skin or hide has its own unique fibre structure and hence used for different end uses. The basic histological structures have major influence on the end properties of the leather and hence it becomes necessary to understand this aspect to choose the right kind of material to cater to different end uses. Although the hides and skins vary considerably from one another, their basic anatomical structure in terms of distinct layers across the cross section is more or less similar. The hide or skin has three distinct layers varying in composition and fibre structure.

The various layers are,

1. Epidermis mainly constituted by Epithelial tissue
2. Derma or Corium mainly made up of connective tissue and
3. Flesh or adipose layer comprising of subcutaneous tissue.

During the pretanning process, all the other layers except the corium are removed before it is made into tanned leather. The corium generally constitutes the collagen fibres to a maximum extent.

Epidermis:

Epidermis is the comparatively thinner portion covering 1-2% of the entire skin thickness which is removed during the course of liming. This layer is generally divided into,

1. Stratum germinatum
2. Stratum granulosum
3. Stratum lucidum
4. Stratum corneum.

The various other things (appendages) which are present in the epidermis are hairs, nails, sebaceous glands(fat glands), sudoriferous glands(sweat glands) erectorpili muscle and elastin. There is a layer called "*hyaline layer"* which is present at the junction

of the epidermis and the grain layer which actually forms the grain surface after processing.

Corium:

It is the most important layer which gets converted into leather and it constitutes of two layers namely:

1. Corium minor(grain layer)
2. Corium major(reticular layer)

The layer consists of the collagen fibres which are bound in bundles and interwoven with one another at an angle to the grain surface of the leather. The angle is known as "*angle of weave"*. It has a profound impact on the final strength characteristics of the leather.

Corium minor:

It constitutes about 20-25% of the entire thickness of the leather. It contains all the epidermal appendages of the skin. It also contains the papillae which are organs responsible for sense f*or* touch. The arrangement of the hair follicles and the papillae gives the hides or skins basic and distinct grain pattern. This will be discussed in detail later in this article.

Corium major:

This is below the corium minor and constitutes about 75-90% of total thickness of hide or skin. The collagen fibres present are surrounded by the reticulin (Type III collagen) sheath and hence this layer is also called as reticular layer. The fibres present in this layer are thicker than the fibres in minor and they have inter-fibrillary proteins deposited in between them. In specific skins and hides fat cells are also present. This is the most important layer from the tanner's point of view.

Adipose or Flesh layer:

A thin layer which is attached to the corium major is called the flesh (or) adipose layer. It is a loose connective tissue lying between the skin and the body of the animal. This layer consists of adipose tissues, mainly comprising of loosely structured collagen, elastin,

blood vessels, fat cells and voluntary muscles and the entire layer is removed during the liming operation.

The basic microscopical structure of the skin or hide, the angle of weave of the fibre bundles, the amount of elastin, fat cells, the epidermal appendages such as hair, fat glands, sweat glands, thickness of the fibre bundles, the compactness of the fibre bundles etc., determine the final qualities or strength of the leather and hence the knowledge about the basic histological characteristics of major raw materials becomes necessary to a leather technologist.

Structure of cattle hide (often commonly referred to as cow hides in India irrespective of sex):

There are many breeds found all over the world each varying in size and weight apart from structural characteristics. In India alone, there are about 26 breeds and the Indian hides are smaller in size and lesser in weight when compared to the foreign hides and most of that accounts for the tropical climate of our country and its fodders. The basic structural features of cattle hides are discussed here.

Epidermis:

- It covers approximately 0.6 to 1.8% of the total thickness of the hide or skin.
- It generally does not contain any papillation which accounts for fineness of grain surface (smoothness), but occassionally found in heavy hides making the grain in bit coarser.
- The average hairs per square inch account to 13,000 and pigment is found in epidermis. Although the number of hairs is fixed during birth, the surface area undergoes a 7 fold increase during the total growth.
- The hair follicles are rooted from 0.4 to 1.5 mm and the longer hairs are generally more pigmented.
- The sweat glands are comparatively small than that of a calf skin but enclosed by a common sac and they are more concentrated in the neck area.

- Also a row of erector pili muscles can be seen and since the number of hairs is high, all the epidermal appendages such as fat and sweat glands are also high in number.

Grain Layer:

- It is not of uniform thickness and covers approximately 8 to 35% of the total thickness.
- The collagen fibres in the grain layer are comparatively thinner than in corium major but are more compactly woven.
- Comparatively more amounts of elastin are found in cow hides than in calf skins. They are mostly noticed near the grain membrane.
- The collagen fibres of the grain layer do not usually merge into the corium and hence causes a line of separation which causes pipiness in heavy hides especially from old animals.
- And also poor merging of grain to corium mostly noticed in fallen hides (common in India).

Corium major:

- It covers approximately 62 to 85% of the total thickness of hide or skin.
- The collagen fibre bundles are quite big and are compactly woven
- The angle of weave varies between 45° and 80° and it is much less in the neck and belly which makes them less compact.
- More reticulin is present in cow hide than in calf skin and when compared to buffalo hides, it is denser.
- The thinness of fibre bundles are more pronounced in fallen hides.

Flesh layer:

- It covers approximately 2 to 5% thickness of the entire layer of the skin.

- The connective fibre tissues run nearly parallel to the surface.
- Sometimes, the layer contains the lymphoid wandering cells which when not properly cured, due to bacterial action breaks up and indicates the inflammatory condition of the tissue.

Histological characteristics of buffalo hide:

Buffalo hides are thicker than most meat cattle hides of the equal weight and the thickness varies from 3.35 to 6.89 mm (excluding the flesh layer).The hides of the female buffalos skins are usually thicker than those of male buffalos of the equal weight.

Epidermis:

- It accounts for 1.2 to 2.4% of the entire thickness of the hide. It is made of up epithelial cells.
- Two types of hairs viz, long or coarse, and short or fine are found in buffalo hides. The coarse hairs are rooted deeper a little below the junction of the grain and corium.
- The coarse hairs are lesser in number.
- The hair follicles in buffalo are straight and dip down 0.3 to 2.3 mm below the surface.
- The cells of the stratum germinatum contains pigment granules consisting of melanin and the epidermis is highly pigmented and this is the reason for black colour of the hide
- The epidermis of the buffalo hides are highly papillated contributing to the roughness of the grain surface and the papillation is more in shank and belly.
- The average number of hairs is 900 to 1200 per square inch and are highly scattered altogether giving rustic grain pattern.

Grain Layer:

- It is composed mainly of connective tissue fibres. (collagen, elastin and reticulin).
- It covers approximately 6 to 24% of the total thickness of the hide.

- In the grain layer, the collagenous fibres are quite small and fine and are very compactly woven without any apparent orderly arrangement.
- Apart from collagen fibres a considerable amount of elastin fibres are present in this layer, between the hair follicles and erectorpili muscles.
- Elastin is an important protein and provides additional strength.
- In the buffalo hides, the cells of the fat gland are not enclosed by a common sac, and gland just looks like a flower.
- The sweat glands in the buffalo hide are less numerous and less developed and this is the reason for the tendency of buffaloes to get into water to cool of the body heat during summer.

Corium major:

- It covers approximately 75 to 90% of the total thickness of the hide. It is relatively thicker in buffalo.
- The fibre bundles in the corium are relatively much larger.
- In the buffalo hides the collagen fibre bundles of the corium are neither compactly woven nor do they run at a very high angle to the grain surface. Hence cannot be used for firmer type of leathers.
- It consists of reticular tissues running in all the directions and forms a sheath over fibre bundles. More amount of reticulin is found in neck and belly.
- The buffalo hides are less greasy than all other cattle hides.
- The most noticeable feature of the Indian buffalo hide is the relatively thinner back-bone region.

Flesh layer:

- It approximately covers 3 to 5 % of the total thickness of the hide or skin.

- It contains much less amount of fat as compared to other hides and skins.
- Apart from fat cells it contains a twitch muscle (voluntary type) to drive off flies.

From the quality and thickness and the histological characters, the buffalo hides may be best suited for the manufacture of harness leathers.

Histological structure of goat skins:

There are 12 outstanding breeds of goats in India. Although goat skins are available in various parts of the world, Indian goat skins form Bengal region are usually considered the best among them.

The normal size of the skin varies from 23*12 *inch* and 33*18 *inch*. Skins of sizes below the former and above the latter are called “kids” and “heavies” respectively. In many aspects, the structure of a goat skins can be considered in between skins of cow calf and sheep.

Epidermis:

- The epidermis of a goat skin covers approximately 1 to 2.6 % of the total thickness of the skin.
- The average number of hairs varies from 8000 to 10,000 hairs per square inch. Two types of hair are present(coarse and fine hairs) and they are arranged in ‘trios’ pattern
- Like the calf the goat has straight hair follicles and hence straight hairs. The hair follicles are quite deeply rooted.
- The glands and fat cells are very much less in number in goat skins. The erectorpili muscle is well developed and long in goat skin.

Grain layer:

- The grain layer of the goat skin usually occupies approximately 24 to 54 % of the total thickness of the skin.

- In the grain layer the collagen fibre bundles are compactly woven. Because of lesser number of cellular components and fat glands, goat skin is comparatively compact than sheep skin.
- In the goat skins there is more elastin and its covers approximately 2/3rd of the entire layer of the grain. The presence of larger amount of elastin tissue is perhaps one of the reasons why greater efforts are needed to open up the grain structure during pre-tanning process.
- In good quality goat skins corium and grain layers merge uniformly.

Corium major:

- The corium proper of the goat skin occupies approximately 45 to 75 % of the total thickness of the skin.
- The collagen fibres present in this layer are firmer and fuller than the corresponding ones in the sheep skins. It is nearly equal to that of a cow calf skin.
- In goat skins a very low angle of weave is present.
- Fat cells and fat droplets are rarely found in the corium proper of goat skin.
- A considerable amount of reticular tissue is present in goat skin

Flesh layer:

It roughly covers 1 to 2 % of the total thickness of the skin.

- A considerable amount of elastin tissue is present in the layer.
- Natural fats and fat cells are present in this layer.

Histological structure of sheep skin

There are many varieties and breeds of sheep, both hair and wool sheep. The sheep is bred mainly for wool and meat and the skin is usually a by-product. In general longer the wool, thinner is the skin. The place of origin has a greater influence on the nature of the skin. Hair sheep are found in only few countries. In terms of quality of skin, hair sheep skins are relatively better compared to that of wool

sheep. In size, sheep skins are almost equal to goat skins but in texture and strength they are less compact and weaker.

Epidermis:

- The epidermis of the sheep skin roughly occupies 0.8 to 2.5 % of the total thickness of the skin.
- The hair follicles are curved in the wool sheep and hence the curliness nature of the wool. The hair/wool is deeply rooted into the skin.
- The sweat and fat glands in the sheep skins are well developed and present in great numbers making the junction of corium and grain weak.

Grain layer:

- The grain layer of the sheep skin covers approximately 44 to 74 % of the total thickness of the skin.
- The collagen fibre bundles in the grain layer are less compactly woven comparably.
- The presence of numerous sweat glands and fat cells make the leather spongy.
- Wool sheep skins have a considerable amount of natural fat along the spine line.
- A continuous layer of fat is present at the junction of grain and corium, the removal of which makes the leather weak during the pre-tanning.
- In good quality sheep skins, especially hair sheep from tropical countries, grain uniformly merges into the corium but the weakness persists in wool sheep skins

Corium major:

- The corium proper of sheep skin occupies approximately 24 to 55 % of the total thickness of the skin.

- The collagen fibre bundles are extremely thin and are not closely interwoven and tend to run parallel to the grain surface which accounts for the looseness of the structure. In terms of compactness, hair sheep skin lies between goat and wool sheep skins
- In wool sheep, considerable amount of natural fat is present in this layer distributed throughout.
- A skin containing too many fat cells will yield only a spongy leather.

Flesh layer:

- The flesh layer approximately covers 1 to 2 % of the total thickness of the skin.
- This layer consists of layers of tightly packed fat cells.

From the histological characteristics, it appears that hair sheep skin occupies a position in between goat skin and wool sheep skin and possesses certain special qualities viz.

a. Firmness with a smooth strong grain.

b. Low angulation of fibre bundles with fairly compact weave of full fibre and relatively better strength properties compared to their wool counterparts.

Characteristics of Hides and Skins from various sources

As mentioned earlier, structural features and quality vary considerably not only from one species of animal to other but also among the same species based on many parameters mentioned earlier, and hence it is necessary to learn the quality aspects of hides and skins available from different sources.

Cattle Hides and skins

They include hides from fully grown male (bull &Ox) and cows, light weight hides, skins from younger animals grown for meat (often called veal in the west when the animal is less than 1 year old) and

skins from calves. The hides from breeds slaughtered for meat from Americas and Europe are heavy and are usually in the weight range of 15-40 Kg. The light weight hides from veals are in the weight range of 6.5 to 12 kg and calf skins come in the range of 2.5 to 5.5 kg. The calf skins have fine grain and good three dimensional fibre structure compared to hides from fully grown animals and the skins also come with less surface defects and hence are often used in finest of leathers. The skins from still born are called 'slinks'.

Hides from Zebu breed (from countries like India and Pakistan) are relatively smaller in size with a weight range 9-15 kg and are called kips in the International market. The hides are generally loosely structured with a lot of surface blemishes, but areliked for their relatively fine grain characteristics.

Calfskin

In calfskin, the grain layer represents about 50% of the total thickness. With increasing age, the corium develops and increases in thickness, but not so the grain.

In common with other skins of young animals, the surface quality is much better than that of mature skin. The grain pattern is smooth and fine and scratches, disease, parasite damage and wrinkles are fewer. Calfskins can be divided into three major types:-

- Skins from calves grown for meat

These are the best quality skins, smooth grained and well-developed. The young are milk fed. The major supplying countries are France, West Germany, Netherlands, Belgium, Italy, Hungary, Yugoslavia, Czechoslovakia, Switzerland, North Americaand Australia.

- Skins from calves grown for dairy

Skins in this group are usually thin andlight weight.. The animals are grass fed. The main sources are Great Britain, Scandinavia and New Zealand.

- Skins from Zebu Herds

Zebu (humped) cattle live in tropical and sub-tropical areas. Generally considered as the poorest grade. The principal sources are India, Pakistan and tropical Africa.

Calfskins are classified for sale on a weight and quality basis. Local practice varies considerably, but “calf” usually implies a weight range of 2 – 5 kg, while “veals’ are slightly older skins in the weight range 6 ½ - 11 ½ kg.

Cattle Hides

The grain layer of the adult animal is spread over a larger area than that observed at the calf stage and represents 25- 30% of the total thickness. They have a greater abundance of hair and the glands muscles are at the highest stage of development.

Bovine hides are the major raw material of the leather industry. The sources of supply are numerous, and the quality and characteristics vary enormously. The sources of supply can be broadly classified by the type of cure as follows:-

- Wet Salted or Brined Hides

Good quality, light hides for high quality full grain, full chrome leather, and medium to heavy hides for corrected leathers. The principal sources are Scandinavia, Europe, North and South America, Australia. Brine cured hides from South America are referred to as Frigorifico Hides

- Dry Salted Hides

Light, medium quality hides for corrected grain leathers from India, Pakistan, South Africa, South America, China and the Far East.

- Dried Hides

Light, low quality hides only suitable for heavily corrected and printed leathers from South America, Africa and the Far East.

General characteristics presented above give no indication of the variety of characteristics which are available in the market. In the

United Kingdom, hides vary enormously from area to area. Danish and Dutch hides are fine grained and spready; Italian hides are plump and "butty". American "packer" hides have a high grease content: hides from sub-tropical and tropical areas have lot of surface defects. The hides coming from Australia and New Zealand are wet-salted or brined. France, Germany, Italy, Switzerland and Scandinavia there are high quality wet-salted hides

Hides are classified for sale by weight and quality and increasingly by area in the recent times especially with premium quality hides and skins.

Buffalo hides

Limited to very few countries, buffalo hides are heavy with a coarse grain and a lot of growth marks on the shoulders and surface defects. They generally have a porous fibre structure. Male calves are usually allowed to die during monsoon and winter in India and the grain of calves have fine growth marks and the defects are less and hence are generally finished into high quality aniline leathers. The main sources of buffalo hides are India, Pakistan, Nepal and Indonesia.

Sheepskins

There is an enormous variation in sheepskin characteristics. Depending on breed, the size can vary from three to twelve square feet. The grain layer normally constitutes over 50% of the total thickness of the skin. In some skins, there is present a layer of fat cells at the grain-corium junction which, when removed, can cause the skin to be vulnerable to delamination of the grain and corium layers. In the case of hair sheep, this deposit is not present.

Sheepskins can best be classified by their wool/hair:-

- Merino

Merino is the best wool of all, originally bred in Spain. The wool is of high quality, silky and long. The pelt however is of very poor quality, weak, very greasy and often associated with ribbiness of grain. The leathers produced from them tend to have 'double layer effect'due to

lack of cohesion between grain and corium after the removal of layer of fats between the two layers. They are usually preferred for fur-on leathers and double face leathers.

- Coarse Wools

Wools which have varying degrees of similarity to the Merino, basically from cross-bred sheep designed to produce prime quality meat. The wool quality is medium, and the pelts do not have the major defects of Merinos.

- Hair sheep

This breed of sheep has hair rather than wool. They are bred in hot, arid climates. The skins are thin but strong, and do not have the heavy fat deposit found in wool sheep.

The major sources of sheepskins are as follows:

Merino	-	Europe, Australia, South Africa, Russia
Coarse Wool	-	New Zealand, South America, U.K., France, Spain
Hair Sheep	-	Ethiopia (Abyssinians), South Africa (Capes), Somalia (Arabians), India and North Africa (Persians).

The hair sheep from high land breeds in Ethiopia and nearby regions (Eritrea and Somalia) are considered best material for golf leather as they are compact in fibre structure, and tend to retain strength along with softness even when the thickness is reduced to ~0.4 mm.

They are also the preferred material for classic cabretta uppers which find use in fashion oriented ladies' and dancers' shoes as well as children footwear. Hair sheep skins from South India are also good for cabretta and suedes.

The skins are available in wet salted or sun dried state (mostly from Africa) or in the pickled condition in the case of wool sheep, and are classified according to quality, area and substance.

Goatskins

As discussed in detail earlier, goat skins have a structure which is similar in some aspects to calf skin and in others to sheepskin, but the total structure is typical in character. They are more tightly fibred than sheep and have hard-wearing grain. Goats from temperate zones have large coarse grained skins, while those from tropical and sub-tropical areas have small and fine grained skins.

The major sources are as follows:-

Africa

Principal problems are grain defects caused by disease and drying faults. Nigerian skins are much in demand, particularly “Sokotos” and “Kanos”. The highland goat skins in Ethiopia and Nigerian goat skins have very compact fibre structure and are considered most suited for suedes.

India

There are more than 12 breeds of goats and hence goatskins are quite variable in quality. Small and compactly woven skins of Bengal breed (often called as Rustia goats after the name of the district in Bangladesh) are best suited for glace kid (often referred to as Bengal kid or Dacca kid) and skins from certain South Indian breed (Truchengode) are also of good quality and often preferred for fine quality glazed upper and suedes.

Pigskins

The hair of the pig (bristle) is of a larger diameter than bovine hair and the bristles extend through into the fatty adipose tissue. A compact corium is absent and is replaced by fat cell aggregates. This fatty tissue is difficult to remove. Pigskin has a very distinctive grain pattern. In Europe after slaughter, the bristles are removed by “scalding” and the skin is left on the carcase.

The increase in pig-farming and improved flaying techniques is rapidly increasing supplies of pigskin, particularly in the countries of Eastern Europe and the Far East.

For any feedback, please mail to babunkc@yahoo.com

Leather Auxiliaries – A Review PART – I

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Part- I	**Part- II**
Introduction, Salient Features, Growth Drivers, Leather Auxiliary Industry in India, Manufacturers of Leather Auxiliaries - Global & Indian Scenario,	Quality Assurance and Customer Support, Key functions, Centers of Excellence, Stahl, Role of Centre of Excellence,
Strategies for Growth & Development, Global Market – Leather Auxiliaries, Indian Market, The demand for leather chemicals in India, Projected Requirements of Leather Chemicals,	Business Development – Components & Focus, Keys to a Successful Center of Excellence, Application and Fashion Centres - TFL.
Product Range & Solutions, Stahl Sustainable Technology in Leather, Product Range * Solutions – Quimser, Leather Chemicals & Leather Process Technologies – CLRI,	Smart Science to improve lives – Croda, Certification, Collaborations & Memberships, Broad Categories of ISO Certification Standards, Relevant certification and audit bodies,
Green Technologies for the Leather Production – Clariant, Product Range - KEMIA TAU, Italy, Smit & Zoon – Leather Solutions,	Benefits of Standards, Certifications of Manufacturers of Leather Auxiliaries, TFL, Colourtex, Quimser, Stahl, Archroma, Trumpler, DyStar,

Leather Auxiliaries – A Review PART – I, II & III	
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Royal Smit & Zoon, ARCHROMA IN A NUTSHELL, Dystar - Building on a heritage of more than 150 years of experience,	Innovation, Trends, Strategy, Challenges encountered by Leather Industry,
Leather Supply Chain, Different Types of Leathers and Description. Leather Industry Association and Trade Groups,	Product & Process Innovation, Some Potential Innovations in Leather, Smit & Zoon - Milestones 2020- Reducing the Footprint & TOWARDS CIRCULARITY
Leather Panel- Links, leatherpanel.org References.	CLRI – Technology - Leather Processing, Leather Chemicals, Enzymatic Products, Environmental Technology, Health care products, References.

Leather Auxiliaries – A Review PART – I, II & III
Part- III
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Cleaner production, CLEANER TECHNOLOGIES, Green Chemistry, The 10 Green Chemistry Principles Applied,

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Creating Sustainable Value through Business Model, Product **Stewardship across Value Chain- Dystar, Product stewardship at Archroma focuses on three strategic areas,**
Archroma – Products Launch, SUSTAINABLE SOURCING, CONSUMER **PRODUCT SAFETY, STAHL BETAN : LEATHER SOLUTIONS FOR RESPONSIBLE TANNERIES,**
Services – DyStar, The ZDHC Programme, ZDHC V2.0 MRSL, **From RSL to MRSL, Input Stream Management,**
Chemical Management System, ZDHC- What does ZDHC's **Manufacturing Restricted Substances List (MRSL) mean for leather makers**
The ZDHC Toolbox, Zero Discharge of Hazardous Chemicals (ZDHC) **Certification and Testing Programs, Worldwide Responsible Accredited Production (WRAP), Going Forward, References**

1. Introduction

Leather chemicals & Auxiliaries form an important part in leather industry and are required to process raw hides and skins to obtain finished products. Leather Auxiliaries play a significant role in the beautification and value addition of leather.

Rapidly changing footwear, apparel & accessories trends owing to shift in consumer expectations and innovative production techniques is leading to fast fashion thereby driving the leather chemicals market expansion. Fast fashion comprises of trend replication, production and distribution at fast pace in response to the ongoing trends. This evolution in footwear, clothing and accessories manufacturing is providing the leather chemicals industry with opportunistic scenarios.

The manufacturers are introducing more innovative products & systems for the consumers in less amount of time. It has dramatically increased the demand for high quality and environmentally friendly processing chemicals.

1.1 Salient Features of Leather Auxiliaries

Salient Features of Leather Auxiliaries Table – 1 A
Leather is an export oriented and value-added product. The Leather Auxiliaries should be eco-friendly, responsibly manufactured, certified to International Standards besides high quality and customer support backed.
Leather chemicals & Auxiliaries are used in all stages of the manufacturing process ranging from beamhouse, tanning, retanning and finishing. It includes multiple chemicals acting as fundamental modifiers responsible for providing colour, texture, smoothness, and pattern to the final products that are further used in manufacturing of footwear, apparels, furniture, auto upholstery, and garments.

1.2 Growth Drivers - Leather chemicals & Auxiliaries [1]

Growth Drivers - Leather chemicals & Auxiliaries Table – 1 B
• Changing fashion trends and dominating fast fashion industry
• Increasing domestic household income and demand for garments
• Increasing presence of major garment manufacturers and designers
• Lower manufacturing costs & huge potential leather industry
• Improving economic conditions and political stability
• Thriving luxury goods and leather industry

Reference : 1. & Table -1 B. Leather Chemicals Market Size By Product (Beamhouse Chemicals [Soaking, Liming, Deliming & Bating], Tanning [Chrome, Non-chrome], Dyeing [Water-based, Non-water based], Finishing Chemicals [Polyurethane, Acrylic, Silicone]), By End-user Industry (Footwear, Furniture, Automobile, Garments, Gloves), Industry Analysis Report, Regional Outlook, Growth Potential, Price Trends, Competitive Market Share & Forecast, 2019 – 2026. Global Market Insights, Inc. sales@gminsights.com

In the Global & Indian Scenarios, Leather Auxiliaries Manufacturers/ Organizations with various level and capabilities exist.

- MNCs having manufacturing activities in different locations in various Continents backed by Brand and Knowledge Based Marketing & with Superior Customer Support.
- National Level Large Organizations with manufacturing activities in different locations & backward integrations as well as having activities in allied industries, meeting the Customer Needs with Brand and good Customer Support Initiatives.
- National Level Medium Size Organizations with or without backward integrations meeting the Customer Needs as well as acting as a Supplier to MNCs & Indian Large Organizations who possess Excellent Customer Support Initiatives and Good Customer base.
- Small and Micro Size Organizations meeting the Customer Needs as well as acting as a Supplier to MNCs & Indian Large Organizations.

Both Leather Auxiliaries and Textile Auxiliaries go hand in hand. In fact, the organizations which manufacture and market Leather Auxiliaries in most of the cases do the manufacturing and marketing of Textile Auxiliaries. Many Leather Auxiliary Manufacturers produce Performance Coatings, Polymers and Shoe Finishing Chemicals besides Leather, Textile & Paper Auxiliaries.

1.3. Leather Auxiliary Industry in India

Leather Auxiliary Industry in India Table – 1 C
Earlier days, Leather Industry in India was importing Leather Auxiliaries from developed countries like Germany(BASF, Bayer,), Switzerland (Sandoz, CIBA GEIGY,) England (ICI, Yorkshire Chemicals) and USA (Rohm & Hass, Salem Oil Company, Atlas Refinery).
When Finished Leather Manufacturing started from E.I. and Wet Blue Leathers, Leather Auxiliary manufacturing had been started by MNCs like Sandoz, CIBA – GEIGY, BASF & Bayer in India.
Subsequently Domestic manufacturers have started activity in a progressive way in various Leather Centres of India.

Leather Auxiliary Industry in India Table – 1 C
Presently, We have MNCs as well as Domestic Manufacturers meeting the requirement of Indian Leather Industry. High Tech Auxiliaries are being imported to a small extent from abroad. MNCs of Leather Auxiliary Manufacturers contributed to a great extent for the development of Leather Industry due to their strong Customer Support, Product and Application Development and International Experience in this industry on an ongoing basis.

1.4 Manufacturers of Leather Auxiliaries - Global & Indian Scenario

Manufacturers of Leather Auxiliaries Table – 1 D	
Global Scenario	Stahl, TFL, Smit & Zoon, Trumpler, Zschimmer & Schwarz, Kemia Tau, Pulcra Chemicals, Schill+Seilacher, Dystar, BASF, Clariant International Ltd, Lanxess, Knox Lawrence International LLC, Elementis, DuPont, Eastman Chemical Company, Solvay S.A., Asahi Kasei, Evonik Industries, SABIC, Arkema, ANGUS Chemical Company, Corbion, Chemtan, DLH Ledertechnik, TASA Group International, Heim Leather Chem, Rota Kimya,
Indian Scenario	TFL Quinn India Pvt. Ltd. Pidilite Industries Ltd, Balmer Lawrie & Co. Limited, Haryana Leather Chemicals Limited, Stahl India Private Limited, Sicagen India Limited, Lanxess India Private Limited, BASF India Limited Dadia Chemical Industries Ltd., Lanxess India Pvt. Ltd., Rohan Organics Pvt. Ltd., Sicagen India Ltd, Tex Bio Sciences Private Limited, Abhilash Chemicals & Pharmaceuticals Private Limited, GC Organics, Synkro Max Biotech Private Limited, Gruppo Biokimica India Private Limited, Colourtex, fenasia, Atlas Refinery Private Limited, ASP Chemisch, C & E Limited, HEXATAN

Reference : Table – 1 D. Indian Leather, Vol.55, February 2022, No.12 and Leather Age November 2018 and Leather Chemicals Market Size By Product (Beamhouse Chemicals [Soaking, Liming, Deliming & Bating], Tanning [Chrome, Non-chrome], Dyeing [Water-based, Non-water based], Finishing Chemicals [Polyurethane, Acrylic, Silicone]), By End-user Industry (Footwear, Furniture, Automobile, Garments, Gloves), Industry Analysis Report, Regional Outlook, Growth Potential, Price Trends, Competitive Market Share & Forecast, 2019 – 2026. Global Market Insights. Source : www.gminsights.com

2. Strategies

The Global Leather chemicals & Auxiliaries Industry started activities in Europe, America and Japan and later migrated to Asia specially India, China and Korea. Main factors attributed are :Products getting commoditized, Environmental Challenges, Less barrier in Manufacturing Technology, Shifting of User Industries from Developed Nations to Developing Nations and High value Products coming out of Patent Protection Area.

Leading players in the global pigments industry have adopted various strategies to achieve additional market share. Key strategies adopted by these players include product launch, joint venture, acquisition, partnership, expansion, and investment.

Reference : Figure- 2 A Pigments Market by Type (Azo, Phthalocyanine, Quinacridone, Titanium dioxide, Iron Oxide, Cadmium, Carbon Black, Chromium Oxide, Complex Inorganic, Classic organic, Metallic, High Performance, Light Interference, Fluorescent, Luminescent, Thermo-chromic) - Global Opportunity Analysis and Industry Forecast, 2014 – 2022 Allied Market Research, 2020. alliedmarketresearch.com

2.1 Strategies Followed by Leather Auxiliaries Industry for Growth & Development

Strategies Followed by Leather Auxiliaries Industry for Growth & Development Table – 2 B
• **Merger & Acquisition Strategies -** Stahl acquired Clariant Leather Service Business in 2014 & Stahl acquired BASF Leather Chemicals Business in 2017. TFL since the foundation in 1996, a great deal of additional finishing know-how has entered the company through the acquisitions of Deacolor and Novaria in Italy, Wilmington in the USA and QUINN in India. In August 2020, TFL agreed to acquire the organic leather chemicals business of LANXESS. Smit & Zoon - BRANDS & PROCESSES - The corporate brand Smit & Zoon has three separate brands in its portfolio: Nera, Smit and Codyeco. • **New Product Launch –** THE SUSTAINABLE TANNING CONCEPT (Cr Replacement), PROVIDING BIO-BASED SOLUTIONS, PFC-FREE WATER REPELLENT LEATHER COATING, LIGNIN MODIFIED RE-TANNING AGENTS, All products to comply with (M)RSL. • Cooperation and Support for Effective & Customer Oriented Marketing by suitable sourcing and Product Modification & Formulation Strategies.
• Forward & Backward integration in manufacturing for Market Share, Environmental Advantage & Cost Advantage. Also having activities in allied industries for better survival, growth development and sustainability. • **BASF – Verbund Strategy** [2 B] **-** Verbund is the physical integration of production, market platforms and technologies which tie the businesses together. BASF intelligently connected production plants and technologies to efficiently use resources and leverage expertise. At Verbund sites, production plants, energy and material flows, logistics, and site infrastructure are all integrated. Various Verbund practiced are - Production Verbund, Technology Verbund, Market Verbund and Digital Verbund. • Product modification and formulation for the Customized Requirements of Customers. • Center of Excellence (COE), Application & Technical Service Centres and Customer Support Centres for Product & Process Development, Training, Testing, Innovation and related activities

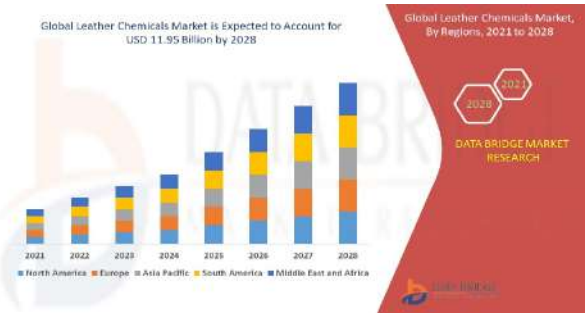
3. Global Market – Leather Auxiliaries

Leather Chemicals Market size is estimated to exhibit over 6.6% CAGR by 2026, from USD 6.86 billion in 2018. According to the report published by Global Market Insights, Inc., the leather chemicals market is expected to hit 11.42 Billion USD by 2026.

3.1 Leather Chemicals Market – Global Market Insights Figure – 3 A

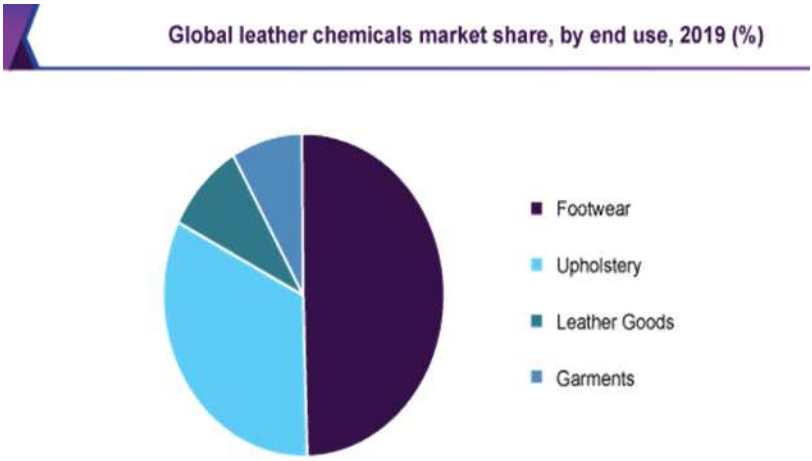
Reference : Figure – 3 A Leather Chemicals Market Size By Product (Beamhouse Chemicals [Soaking, Liming, Deliming & Bating], Tanning [Chrome, Non-chrome], Dyeing [Water-based, Non-water based], Finishing Chemicals [Polyurethane, Acrylic, Silicone]), By End-user Industry (Footwear, Furniture, Automobile, Garments, Gloves), Industry Analysis Report, Regional Outlook, Growth Potential, Price Trends, Competitive Market Share & Forecast, 2019 – 2026. Global Market Insights. Source : www.gminsights.com

3.2 Global Leather Chemicals Market is Expected to Account for USD 11.95 Billion by 2028 Figure – 3 B



Reference : Figure -3 B. Global Leather Chemicals Market – Industry Trends and Forecast to 2028. Data Bridge Market Research. www.databridgemarketresearch.com

3.3 Global Leather Chemicals Market Share by End Use, 2019 (%) Figure – 3 C



Reference : Figure – 3 C. Leather Chemicals Market Size, Share & Trends Analysis Report By Product (Biocides, Surfactants, Chromium Sulfate, Polyurethane Resins, Sodium Bicarbonate), By Process, By End Use, By Region, And Segment Forecasts, 2020 – 2027. Grand View Research Inc www.grandview research.com

4. Indian Market – Leather Auxiliaries [4]

The market for leather chemicals in India is set to grow at a robust pace on account of

- increasing demand for leather products in fashion industry,
- rising leather exports and growing footwear industry.

- Additionally, shift towards the use of eco-friendly leather chemicals and growing awareness about the benefits of vegetable tanning technique over chromium tanning are few of the other major growth drivers for India leather chemicals market.

According to "India Leather Chemicals Market, Competition Forecast & Opportunities, 2012 – 2026", India leather chemicals market is projected to reach over $ 1264 million by 2026

4.1 The demand for leather chemicals in India [4 A]

The demand for leather chemicals in India is projected to grow from 406 KTPA in 2018 to 965 KTPA by 2030, exhibiting a CAGR of 7.5% during 2019-2030.

Rising use of leather chemicals in tanneries, in addition to expected growth in the demand for specialty leather chemicals in wet-end and finishing stages of leather goods production, is expected to drive the Indian leather chemicals market during forecast period.

Increasing demand for leather products in the fashion industry, growing footwear industry and rising leather exports are some of the other factors that would drive the market.

Moreover, shifting focus towards the use of eco-friendly leather chemicals and growing awareness about the benefits of vegetable tanning technique over chromium tanning would fuel market growth.

Additionally, increasing exports of finished leather goods from India is further resulting in growing demand for specialty leather chemicals.

4.2 Projected Requirements of Leather Chemicals

The projected demand for the year 2020 for various product groups have been provided below.

One way of deriving the current demand is using % Growth Rate, Market Scenarios and Global & Domestic trends.

Projected Requirements of Leather Chemicals for the Year 2020 – Figures 4 B & 4 C

Projected Requirements for Leather Chemicals for the year 2020

The projected requirements of leather chemicals for the year 2020 is worked out on the estimated availability of raw hides and skins by various reports. It is assumed that all sectors continue the past trend without being influenced by any significant changes in the policies either by local or by the importing factors.

S.No.		Quantity (in Tons)
Chemicals		
1.	Soaking Agent	1,600
2.	Preservatives	350
3.	Sodium Sulphide	1,475
4.	Enzymatic Unhairing Agent	7,000
5.	Lime	12,000
6.	Deliming Agents	26,000
7.	Bating Agents	5,500
8.	Emulsifying Agents	1,300
9.	Sulphuric Acid	13,000
10.	Organic Acids like Formic Acid	3,300
11.	Salt	40,000
12.	Masking Agents	2,800
13.	Basic Chromium Sulphate	80,000
14.	Vegetable Tanning Materials Expressed as pure tannins. There is likelihood of increasing consumption gradually	3,00,000
Auxiliaries		
15.	Replacement Syntans	2,00,000
16.	Bleaching Syntans	3,300

Reference : Indian Leather February 2020.

S.No.		Quantity (in Tons)
17.	Raw / Synthetic Oils	2,78,000
18.	Anionic Fatliqours	3,00,000
19.	Cationic Fatliquors	10,000
20.	Epsom Salt	1,800
21.	Hypo	1,800
22.	Cod Oil	1,600
23.	Tallow	850
24.	Stripping Agent	1,250
25.	Aluminium Tanning Salts as Al_2O_3	2,000
26.	Fixing Agent / Cationic Agent	6,500
27.	Mordanting& Levelling Agents	5,500
28.	Neutralising Agent	10,000
29.	Clearing Agents	500
30.	Pigment paste Organic / Inorganic	26,000
31.	Dyes Synthetic / Natural Combined	16,000
32.	Dry Lactic Casein	800
33.	Formaldehyde 40 % Conc.	1,600
34.	Plasticisers	550
35.	Glazing Finishes	750
36.	Impregnating Resins	10,000
37.	Resin Binders	27,000
38.	Lacquer Emulsions	15,000
39.	Wax Emulsions	2,200
40.	Wetting Agents	1,250
41.	Water Proofing Agents	1,350
42.	Polyurethane Finishes	700
43.	Polymeric Syntans	12,000
44.	Polymeric Fatliquors	16,500

Reference : Figures 4 B & 4C. Indian Leather February, 2020. Volume 53 & No. 12.

5. Product Range & Solutions [5]

5.1 Product Range – Stahl, stahl.com

Product Range – Stahl, stahl.com Table – 5 A
The chemistry we create. Chemistry that triggers our senses while lowering the environmental impact. •Wet-end leather production solutions • Leather Chemicals - Wet-end, Waterproofing, Improvement, Finishing, Aftercare. • Performance Coatings- Elastomer coatings, Seat & trim, Coated fabrics, Powder coatings, Flame retardants. • Polymers - Bio-based portfolio, Architectural polymers Printing and packaging Electronics & plastics, Carbodiimide crosslinkers. • Shoe Finish & Aftercare- New materials, Shoe Finish, Aftercare, Cleaning, Upgrading.

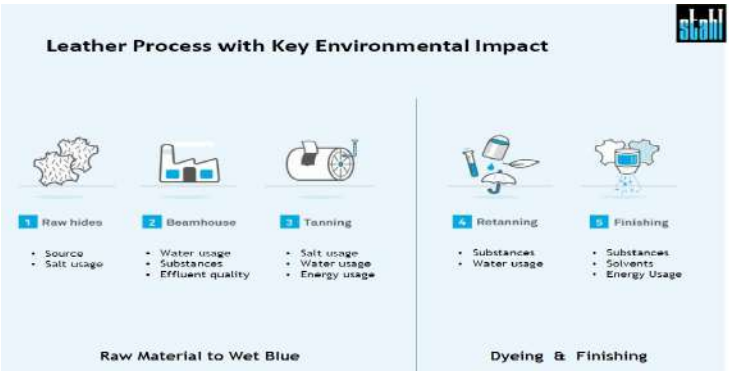
- Strategy - Digital transformation, Open Innovation, Renewable Feedstocks Sustainable Development.
- Global services - STAHL DESIGN STUDIO' BRAND SERVICES, GOLDEN HANDS, CENTER OF EXCELLENCE.

Reference : 5.& Table 5A. Stahl, stahl.com

5.2 Solutions - STAHL

Anticipating to emerging trends - Regulations, Safety, Durability, Sustainability, People's needs, Consumer trends

5.3 Leather Process with Key Environmental Impact Figure – 5 B



5.4 Stahl Sustainable Technology in Leather Figure – 5 C

Reference : Figures 5 B & 5 C. Chemicals for Sustainable Leather Manufacture 53rd LERIG Prasanna Maduri, Campus Manager, 29 January 2020

6. Product Range – Quimser, www.quimser.com [6]

6. 1 Product Range – Quimser, www.quimser.com

Product Range – Quimser, www.quimser.com Table – 6 A
A wide range of products for the leather industry that cover all stages of the manufacturing process, from the beamhouse and the wet-end to the finishing. • **Beamhouse -** Soaking / Degreasing agents, Preserving, Liming / Dehairing, Deliming, Bating, Basifying / Masking.

Product Range – Quimser, www.quimser.com Table – 6 A
• **Tanning & Retanning -** ECO Tanning, Mineral, Synthetic polymers, Syntans & natural polymers, Syntans, Filler, Pretanning, Dispersing, Pretanning, dispersing, Neutralizing, Eco-polymers, Eco-resin, Eco-melamine, Eco-dicyandiamide, Auxiliary. • **Finishing -** Special oils, Casein, Waxes, Resin, Fillers, Lacquers, Pigments, Anilines, Solvents, Auxiliaries.

Reference : 6. & Table – 6 A. Leather chemicals. Products Catalogue. Quimser, www.quimser.com

6.2 Solutions – Quimser www.quimser.com

6.2.1 Eco-leather portfolio- Current situation - Types of tanning Table – 6 B

Tanning	Chemical	Origin	% in tanning	Price	TS (ºC)	Colour in tanned leather	Light fastness
WET BLUE	Chrome III	Mine	5-10	€	100	Bluish	Yes
WET WHITE	Phenol Naphthalene Aldehyde Disulphone Triazine	Petrol Chemistry	5-30	€€€	85	Whitish	Ligth
VEGETAL EXTRACTS	Mimosa Quebracho Chestnut Tara Others	**Mimosa** is from tree bark. **Quebracho** is from tree. **Chesnut** is from grinder seeds. **Tara** is from grinder seed.	8-40	€€	75-80	Brownish	No
WET GREEN	Olive extract	Olive seeds tree.	8-40	€€€	75-80	Greenish	No
WHITE MINERAL	Zirconium Titanium	Mine	8-15	€€€	80	White	Yes
ALUMINIUM	Aluminium salts	Mine	3-10	€	80-85	White to whitish	Yes
SERTAN WT	Zeolite	Mine	6-10	€	75-80	Whitish	Yes
VEGAN LEATHER	Acrylic PU PVC Polymer-Resin Other	Petrol and other	NA	€		NA	NA

6.2.2 Eco-leather portfolio- Current situation - Pros and cons -Table 6C

Tanning	Negative points	Toxicity	Biodegradation time	Compostability	Water waste problem	ZDHC-MRSL restrictions
WET BLUE	Can produce Chrome VI.	Yes	Extremely long	Very bad	High	Yes
WET WHITE	Phenol derivates and bisphenols. Wastewater toxic chem.	Yes	Medium	Very bad	Medium high	Yes
VEGETAL EXTRACTS	Few producers in the world. **Mimosa** bark need 6-12 years to renew. **Quebracho** tree need 60-80 years to grow	No	Medium	Excellent	High BOD	No
WET GREEN	This tecnology is not available for all world. There are few quantity in the market.	No	Medium	Excellent	High BOD	NO
WHITE MINERAL	No	Yes	Long	Very bad	Very high	Yes
ALUMINIUM	No	No	Medium	Regular	Medium high	No
SERTAN WT	No	No	Short	Excellent	No	No
VEGAN LEATHER	PVC resins and other toxic chemicals. Microplastic.	No	Very long	Very bad	Very high	NA

Reference : Tables – 6 B & 6 C. Eco-leather portfolios. Quimser www.quimser.com

(to be contd.)

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