Indian Leather

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Indian Leather
Digest of Leather News

59th Year

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Welcome News

Hon'ble Prime Minister of India, Shri Narendra Modi and Hon'ble Prime Minister of the United Kingdom, Sir Keir Starmer, have successfully concluded a historic and an ambitious and mutually beneficial Free Trade Agreement (FTA), along with a Double Contribution Convention.

This FTA provides positive impact on manufacturing across labour and technology intensive sectors and opens up massive export opportunities for sectors such as textiles, marine products, leather, footwear, sports goods and toys, gems & jewellery engineering goods, auto parts & engines and organic chemicals.

The FTA guarantees complete market access for Indian commodities in the United Kingdom, encompassing all of India's export interests, according to a statement issued by the Ministry of Commerce and Industry. "The removal of tariffs on approximately 99% of tariff lines, which account for nearly 100% of the trade value, will benefit India and present enormous opportunities to expand bilateral trade between India and the United Kingdom."

Shri Piysh Goyal, Hon'ble Minister for Commerce and Industry has stated "This Agreement sets a new benchmark for equitable and ambitious trade between two large economies. It will benefit Indian farmers, fishermen, workers, MSMEs, startups and innovators. It brings us closer to our goal of becoming a global economic powerhouse. This FTA is not only about goods and services, but also about people, possibilities and prosperity. It protects our core interests while opening doors to India's greater participation in global value chains".

India is poised to lead the global economy once again, with the International Monetary Fund (IMF) projecting it to remain the **fastest growing major economy** over the next two years. According to the April 2025 edition of the IMF's World Economic Outlook, India's economy is expected to grow by **6.2 per cent in 2025** and **6.3 per cent in 2026**, maintaining a solid lead over global and regional peers.

India is now world's 4th largest economy ahead of Japan and the country's GDP has reached $ 4 trillion placing it behind only the US, China and Germany, according to IMF data, as sated by Shri BVR Subrahmanyam, CEO, NITI Aayog.

Self sufficiency - Best efficiency

- Vasan Suri
A Passionate Leather Lover & Professional
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(This subject of self sufficiency will be dealt as a series every month picking up 3-4 topics mentioned above and worked in detail.)

It is important that our Leather & Leather Products sectors grow more self sufficient, rather than dependant.

The dependency factor pulls the tannery or factory down, against their targets to be achieved.

I have always been recommending and suggesting a healthy consortium for the benefit of the Industry. Though, the message is well received, doubts, mistrust, ego and introvert are some of the reasons which does not make it work.

Self-sufficiency is a different subject. How one individual tannery or factory nurtures the supply chain and becomes self sufficient.

International war scenario, geo-political environment, the recent operation sindoor prompts us to open our minds to create a better working system where we become self-sufficient and do not get affected during such situations.

Block Chain Management holds the key for better functioning of any industry.

Due to international unrest in various regions the raw material availability, vessel & container movements, longer air travel distance all these hurt the leather & leather products industry along with every other industry in a Country.

Such disturbances throw every industry out of proportion. Hence, the need to be self-sufficient reduces the damages to a great extent.

1. **Raw Materials (Skins & Hides)**
2. **Chemicals (Beam House, Wet-end, Finishing)**
3. **Machinery Spares & Tools**
4. **Availability of Containers**
5. **Vessel movements**
6. **Last manufacturers**
7. **Die manufacturers**
8. **Unit sole manufacturers**
9. **Lining both warm and cool for Summers**
10. **Leather Sole, Insole**
11. **Shoe Creams and waxes.**
12. **Inlays for the bags**
13. **Lining varieties**
14. **Metal Hardware**
15. **Zippers**
16. **Bonded Leather**
17. **Cellulose Boards**
18. **Fur and other warmth lining.**
19. **Fillers**
20. **Edge colors**
21. **Buttons & other accessories**
22. **Packaging**
23. **Boxes**
24. **Humidifiers**

To name a few, the above list already consists of 24 such products where we need to be self-sufficient.

The fluctuations in foreign currencies and ending up in paying higher rates for imports hurts all our plans when we are dependent out of our Country.

Imagine a fully self sufficient Country to make the products, the currency fluctuations will be a great advantage as they tend to realise more than what they had expected or planned.

We need to make ourselves strong by recommending solutions and opportunities to the Government rather than talk about incentives and grants everytime.

Frankly speaking, we must make the Government look up to us and come forward for more and more support.

There is enough directions from the Government and we need to bring all the schemes to light and make everyone aware of it.

The purpose is to make everyone in the Industry aware of the opportunities, strength, weakness and the threats like SWOT analysis.

Many of us will have the solution but, do not bring it to the common forum for obvious reasons.

Being self-sufficient will be the best mantra for our bright future.

Take the case of Iranian community. They have made themselves self-, sufficient in every way and are living comfortably with international sanctions imposed on them for so many years.

The Government and their political lines are a different issue but, the people have understood that, if they have to survive with all comforts they need to be self-sufficient.

(to be contd.,)

Back-to-School Column

Dr. N K Chandra Babu

Raw Materials for the Leather Industry - Part II

Part I dealt with general introduction to raw material base of the global leather industry, basic structural features of the important hides and skins used in the industry from different sources and major breeds. The Part II will discuss in detail the structural characteristics of the skin matrix with focus on various components distributed across the cross section and also introduce the architecture of skin matrix starting from amino acids. The structural features of hair along with major components are also discussed. The method of manual/microscopical identification of skin type based on the grain surface morphological characteristics will be introduced in brief.

Chemical Composition of skin matrix and description of major components distributed across cross section

It is a general knowledge that skin matrix is constituted by about 65% water, about 30% structural proteins including collagen, elastin and keratin and about 2% non-fibrous proteins including albumins, globulins and glycoproteins, and varying amounts of fats depending on the type of skin and other minor components. For the sake of complete understanding, it is relevant to know how various components are distributed across cross section and their role in the overall skin matrix formation.

Distribution of various components and their role in skin matrix formation

Skin, being the outermost organ of animal body involved in various functions for the preservation of body function by providing protection

against external environment and protecting internal organs during the life time of the animals. As mentioned earlier in Part I, the skin consists of three distinct layers of which, the dermis or corium in tanners' parlance is the leather making portion. Epidermis is the top most layer, and beneath the corium is the sub-cutaneous or the hypodermis layer (flesh layer) made up of adipose tissues with loose connective tissues containing lipids, and fibroblasts.

The epidermis or the outermost layer of skin contains four layers – Stratum corneum which houses non-viable keratinocytes and biochemically active corneocytes, the next inner layer is the Stratum granulosum containing the non-dividing keratinocytes producing a protein called keratinohyalin, and below that is the Stratum spinosum layer or the spiny layer, comprising the poorly dividing keratinocytes.

Next is stratum basale or stratum germinativum or the basal layer which is closely associated with the basement membrane that connects the epidermis with the dermis. This layer accommodates keratinocytes that are highly dividing merkel cells which act as mechanoreceptors to contact with the nerve endings, and the melanocytes for giving colour to the skin and its other appendages. The four different layers of epidermis possess varying amounts of keratin ranging from 30% in stratum basale to 80% in Stratum corneum.

There are about 54 keratin protein types reported classified under the two broad categories – 28 types of acidic keratins/ Type I and 26 types of neutral or basic keratins/Type II, of which, 26 are known to be present in the hair follicles.

Basement Membrane

The basement membrane is the connective bridge which underlies the epidermis and connects to the dermis. The components mainly present are Integrin α5β1, a receptor of the extra cellular matrix (ECM) molecule fibronectin, laminins, and collagen type IV and VII.

These are the key regulators of keratinocyte migration to the basement membrane.

The highly keratinous epidermal portion of skin and the hair follicle along with the basement membrane are removed to reveal the clear grain surface with distinct grain pattern during processing.

Dermis

The underlying connective tissue called the dermis serving the role of shock absorber contains mainly of collagen, fibroblasts, elastic fibers and other ground substances. The upper dermis, otherwise called grain layer or corium minor, and the lower dermis, also known as reticular dermis or corium major, form two distinct parts of the dermis. Though fewer cells are present in dermis compared to epidermis, the reason for the bulkiness of the dermis is due to the fibrous and amorphous extracellular matrix components surrounding the glands, nerves, blood vessels and skin appendages like nail and hair.

The dermis is largely filled with the fibroblasts, an extracellular matrix cell type. The principle extracellular matrix material present is the collagen from which the leather is made, along with the other non-collagenous binding components like fibronectin, elastin, laminins, glycosamioglycans, glycoproteins, proteoglycans and some extracellular matrix degrading enzymes like Matrix metalo proteinases (MMPs) for migration. Collagen being the major component accounting for about 90% comprises collagen type I (85-90 %), type III (8 – 11%) and type V (2 – 4%). Collagen type VII which makes up the ‘anchoring fibrils’ is essential for attaching the basement membrane to the grain layer whereas collagen type XVIII forms the ‘anchoring filaments’ for establishing the connective bond between basal layer and the basement membrane. The elasticity of the skin is provided by the elastin without which the skin will lose its firmness.

Apart from collagen and elastin fibrils, ECM also contains extra-fibrillar matrix component made up of non-structural proteins. This amorphous matrix material holds considerable amounts of proteoglycans, glycoproteins, hyaluronic acid (non-sulphated glycoprotein aggregate) and water. The proteoglycans are built up by the binding of a protein core to the anionic polysaccharides called glycosaminoglycans (GAGs) either sulfated or acetylated. The prime backbone of the glycosaminoglycans is provided by the hyaluronic acid and branches are often chondroitin sulfate (CS), dermatan sulfate (DS), keratin sulphate (KS), heparan sulfate (HS) or heparin.

Collagen type I is a fibrous protein constituting the major proportion of the skin matrix and is important from leather making point of view. It is made up of amino acids arranged in specific sequence to form polypeptide chains in helical form with mostly repeating units of PGR where G represents glycine, P stands for proline or hydroxyproline (unique to collagen) and R is any other amino acid.

Smallest amino acid, glycine gives the flexibility to form helical structure, and the structural rigidity is provided by cyclic amino acids, proline and hydroxyproline. Collagen molecule has three helical strands of polypeptide chains (2 alpha-1 and 1 alpha-2 chains) wound over one another to form a triple helical structure with a molecular weight of about 300000 Daltons and size of 5 Angstrom in diameter and 280 nm in length. Collagen molecules are arranged with quarter staggering to form collagen fibrils which are the basic units in the collagen network in dermis.

Collagen fibrils are composed of fine fibrils of about 0.005mm diameter. The fibrils are cemented together by proteoglycans and hyaluronic acid substances to form collagen fibres, which in turn form fibre bundles, and fibre bundles are woven to form the overall matrix. Collagen fibres in the bundles are encased in sheaths of another kind of fibre made up of type III collagen, often referred to as reticulin by Leather scientists. The fibre bundles reduce in size in upper

portion of the corium and at the levels of the hair roots. At the upper most surface, the bundles are less in number and the weave is also weak. But this layer contains high amounts of elastin which gives flexibility to the layer.

The collagen alone should be preserved and the other ECM components entangled with the collagen are of limited importance to the tanners. The other components like elastin, hyaluron and PGs are to be completely or partially removed for achieving required fibre opening. The elastin, the second most abundant protein in the skin is extremely stable than collagen with a double helical structure. It can be digested only by employing the elastase enzyme.

The elastin can be preserved or degraded in the skin for leather as required, which is accomplished in bating. If preserved, the elasticity could be maintained; else the leather will be seen relaxed ending up in a greater surface area. The major non-structural protein in the skin is hyaluron serving as a backbone for the minor PGs and GPs. The presence of this protein will give unusual rigidity to the leather and hence enzymes are used to remove this during processing.

Hair and its structure

The hair is firmly anchored in the dermis by hair follicle, which is covered inside and outside by root sheaths. The hair follicle is a proteinaceous fibre having primary subunit α- keratin chains, which form fibre via the intermediate filaments. Hair is defined by the follicle and the shaft and divided into different zones. Zone 1 is bulb zone, where proliferation and differentiation of the cells happen, zone 2, where elongation and fibril formation take place, zone 3, where pre-keratinization happens with the formation of fibrous keratin containing cysteine residues, zone 4, where soft keratin is formed by keratinization by the oxidation of cysteine residues to form disulphide bond of cystine and finally zone 5 on the shaft dead end, where post hardening happens resulting in the formation of hard keratins.

The hair follicle is composed of the epidermal part as well as the dermal part. The epithelial part of the hair forms when the epidermis grows inwards covering the hair follicle and that comprises hair shaft (HS), inner root sheath (IRS) and outer root sheath (ORS). The outer root sheath comprises supra basal and basal layer of epidermis whereas the inner root sheath comprises the cuticle, Hexley and Henle layers. The cuticle of the hair is the outer surface of the hair staple containing the high amount of disulphide links.

The cuticle contains sheet like cells over its surface and thus making it chemically inert. The cortex of hair shaft is made up of hard keratin involving very high amount of keratin. The medulla of hair shaft varies from species to species in its composition and structure. It primarily contains citrulline containing protein composed of ε-(γ-glutamyl) lysine crosslinks.

The dermal portion of the hair is subdivided into dermal papilla (DP) and dermal sheath (DS) loaded with plenty of extracellular matrix components. The dermal papilla is located at the base of the hair follicle holding the hair root bulb. It produces the hair cells which then finally forms the hair shaft that gets pushed out as the keratinization proceeds. The root bulb is the region where the hair grows. The dermal sheath or the connective tissue sheath (CTS) outlines the epithelium of the hair follicle through the shaft continues to the bulb as well as the dermal papilla.

The dermal papilla and dermal sheath are parted from the epidermal portion by the basement membrane which is non-cellular. The cells in these regions are of mesenchymal origin. In anagen phase, the period of active growth, the dermal papilla stays deep in the subcutaneous layer. As the hair pass through the catagen phase, the dermal papilla moves out to reside in the dermal part. Keratin is totally absent in basement membrane as well as dermal part of the hair.

Identification of skin Type from surface morphological Characteristics

The species identification refers to finding the animal from which the hide or skin is obtained for making leather. Though the major anatomical features of the skins or hides of these animals are similar, there are certain unique characteristics specific to each species. Generally, they differ in total thickness, the proportions of three distinct layers in the overall thickness, fibre bundle size and weave pattern in the cross section and most importantly grain pattern. There may be noticeable differences in these characteristics within the same species depending on the breed, sex, age and factors related to rearing.

Histological studies have been carried to identify species and the signature characteristics for major breeds have been well defined. The leather grain pattern with its hair pore structure is viewed by experienced/trained microscopists under microscope to identify the species. The unique features of the different hides/skins are discussed as follows.

Features of grain pattern in buffalo hide

Two types of hairs, *viz,* long or coarse and short or fine are found in buffalo hide. The coarse hairs are rooted deeper compared to fine hairs often going well below the grain layer. The coarse hairs are lesser in number and are not equally distributed over the hide area. In general, there are more hairs in the buffalo hides of the southern region of India than in those of the north where the hides are much bigger in size.

Buffalo leather species are identified under microscope by their scattered prominent hair pores as shown in Fig 1. A high degree of papillation, *i.e.,* small projections or papillae from the layer below contributes to the roughness of the grain surface of the buffalo hide. This roughness is more pronounced in belly and shank area.

Fig. 1 Grain pattern of buffalo hide

Features of grain pattern in cow hide

Cow leather species are identified under microscope by their numerous fine hair pores as shown in Fig 2. The average number of hairs in cow hide is in the range of 13000 - 20000 per square inch of the surface area. Excepting in the belly area, the hairs in cow hide are not very deeply rooted. The smooth surface of the cow hide is due to the numerous fine hair pores and absence of papillation.

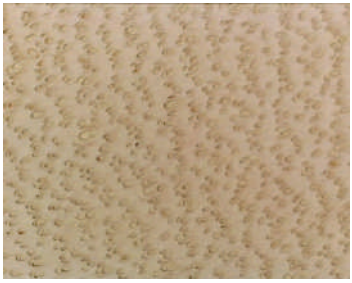

Fig. 2. Grain structure of cow hide

Grain pattern of Goat skin

In goat skins, the average number being 8000-12000 hairs per sq. inch of the skin surface area. Two types of hair *viz.,* coarse and fine are found in the goat with fine hairs being greater in number. The

coarse and fine hairs are arranged in more or less parallel alignment. The hair follicles in goat are deeply rooted. The hair pores in goat leather are arranged in half-moon-shaped groups and also follow a trios pattern as shown in Fig. 3.

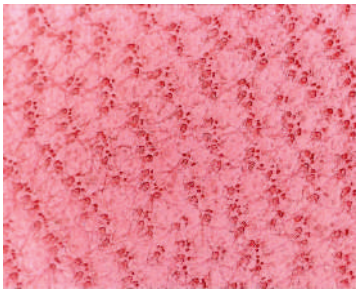

Fig. 3. Grain structure of goat skin

Grain Structure of Sheep skin

In sheep skins the hairs are not equally distributed over the area of the skin, and an average there are about 8000 hairs per sq.inch of the skin surface area. The hair pores in sheep leather are in rows and follow a wavery pattern as shown in Fig. 4.

Fig. 4. Grain structure of sheep skin

Though, experienced leather technologists and microscopists can identify the type of hide/skin from which the leather has been made, still the manual method is very subjective and the success to a large extent will depend on the experience of the individuals. Computer

aided image analysis techniques are increasingly screened to develop objective species identification systems. The species identification becomes more difficult in the case of heavily corrected leathers and chamois leather (where grain layer is completely removed). In the case of chamois and wild life skins, DNA finger printing techniques are being resorted to, to ascertain genuineness and for protecting endangered species.

For any feedback, mail to babunkc@yahoo.com

Tell me and I forget, teach me and I may remember, involve me and I learn

Stahl Campus®

As an active proponent of responsible chemistry, Stahl has established the Stahl Campus® training institute in its Center of Excellence for sustainable leather technologies in Kanpur. With our Stahl Campus® Leather Modules, we can offer training and information, such as responsible chemistry and sustainability in leather production. We believe that in this way, we facilitate transparency that inevitably will lead to a better supply chain with responsible chemistry.

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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.

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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.


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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 !

Meet at Agra 2025 a premier B2B Fair, organised by the Agra Footwear Manufacturers & Exporters Chamber (AFMEC), dedicated to Footwear Components and Technology will be held at Agra Trade Centre, Village Singhna, NH-19, Agra from 7-9 November, 2025.

"This year promises to be even more dynamic, with an increased number of exhibitors from across India and overseas, all showcasing cutting-edge innovations and the latest advancements in the footwear industry. As India's largest footwear manufacturing hub, Agra offers the ideal setting for this prestigious event." says Shri Puran Dawar, President, AFMEC.

The overall objectives that were set for Meet at Agra were:

- To meet its growth projections vis-a-vis the increase in the quantum of exports;
- To mobilize the exhibitor participation;
- To maximize the overall footfall in the fair, while at the same time strive to optimize 'sharing and collaborating' at global levels.

For More Information & Registration, Please Contact :
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19TH IATF CLOSES WITH RESOUNDING SUCCESS

Global Fashion Trade Converges in Dubai: IATF 2025 Delivers Unmatched Sourcing Power Across 3 High-Impact Days

The 19th edition of the International Apparel & Textile Fair (IATF) concluded with resounding success, reaffirming its position as the Gulf Biggest International B2B Fashion Trade sourcing fair for the fashion and textile industry. Held from 20 - 21- 22, May 2025, at Festival Arena Dubai, the show welcomed over 400+ Exhibitors, 23+ Countries, 4,850+ Buyers – IATF Cements Its Position as the Gulf's Premier B2B Fashion Trade Sourcing Destination.

From fabric specialists and fashion manufacturers to accessories suppliers and sustainable innovators, IATF brought together an impressive cross-section of the global fashion supply chain. The event proved once again to be the ultimate sourcing destination for brands, retailers, and industry professionals looking to scale, diversify, or localize their production strategies.

“This edition was about more than just sourcing - it was about building meaningful relationships, discovering future-ready innovations, and creating pathways for sustainable growth,” said Ms. Bhavna Nihalani, Show Director. “We’re proud to be at the forefront of global trade, empowering fashion professionals and connecting continents through commerce.”

Global Reach, Local Impact

This year’s International Apparel and Textile Fair (IATF) highlighted strong participation from global sourcing leaders including India, China, Turkey, Bangladesh, Italy, France, Russia, Australia, the UK, and South Korea. Exhibitors showcased national craftsmanship and production capabilities tailored for the Middle Eastern market. A standout was Hong Kong’s influential presence, featuring a dedicated national pavilion that reaffirmed its status as a pioneer in the global textile and apparel industry.

Sustainability in Focus

2025 marked IATF’s strongest sustainability push to date, with an expanded range of eco-fabrics, ethical production solutions, and circular design innovations. Exhibitors and buyers alike engaged in meaningful dialogue on how to align sourcing strategies with the values of transparency, responsibility, and longevity.

A Seamless Experience for Buyers

IATF continued to raise the bar for buyer convenience, with free entry, on-site registration, a dedicated Buyers Lounge, and over 1,500 free parking spaces. This, combined with structured networking spaces and an international ambiance, created the ideal environment for sourcing deals and strategic meetings.

The Road Ahead: 20th Edition Coming Soon

The 20th Edition will be held from 17-19 November 2025 at the Dubai World Trade Centre. With a decade of consistent growth, IATF remains committed to serving as a trusted gateway for the global fashion trade.

For information : bhavna@internationaltextilefair.com / www.internationalapparelandtextilefair.com

FDDI Organises Workshops

Workshop on '3D- Printing: From Concept to Realistic Prototyping' held at FDDI, Ankleshwar Campus

An insightful workshop on '3D Printing: From Concept to Realistic Prototyping' was held at FDDI, Ankleshwar Campus from 21 to 25 April 2025 during which the students of other campuses of FDDI were connected virtually.

Organized by School of Footwear Design & production (FDP), the workshop featured training on surface and wireframe modeling using Rhino 3D and CLO 3D software, a live demonstration of 3D printing techniques by Mr. Tarun Nakrani (Founder, 3D Fintech), and hands-on sessions on architectural modeling and structural prototyping led by Ms. Venus Rakholia (Architectural Designer).

The workshop not only equipped B.Des. Foundation and FDP students with valuable technical skills but also motivated them to pursue self-reliance in the fields of design and innovation.

On the final day of the workshop, students showcased their ideas through 3D-printed prototypes, shared their learning experiences, and were awarded e-certificates by 3D Fintech.

Workshop on 'Thread Knowledge and Its Relevance in the Apparel Industry' held at FDDI, Kolkata Campus

Aimed at equipping students with essential knowledge about sewing threads and their significant role in the apparel and textile industry, a comprehensive and insightful workshop on 'Thread Knowledge and Its Relevance in the Apparel Industry' was held at FDDI, Kolkata Campus on 25th April 2025.

FDDI School of Fashion Design (FD) organized this workshop during which Mr. Sumesh Minhas, Manager - Brands / GRS India, Vardhman Threads shared his experience & expertise with the students and staffs of the campus.

He covered a broad spectrum of technical and practical topics which included, importance of thread knowledge in professional life, thread's role in garments, choosing the right thread, needle, and fabric combination etc.

The workshop provided students with a strong foundation in thread knowledge, encouraging them to approach garment construction with greater technical awareness.

Global Leather Industry News

Brazilian Footwear Exports

According to latest data prepared by the Brazilian Footwear Industry Association (Abicalçados), based on figures from Secex, the sector's exports totaled 39 million pairs and US$ 349 million in the first four months of the year, higher results both in volume (+9.7%) and in revenue (+1.5%) compared to the same period last year.

In the monthly breakdown, however, there were setbacks of 5.5% in pairs and 12.4% in revenue, with 7.5 million pairs and US$ 79.23 million. The main designations of yellow green shoes are Argentina, followed by the United States and France.

Abicalçados CEO Haroldo Ferreira emphasizes that the unstable international environment had an impact on results, especially on exports to the United States.

“The drop in imports to the United States in April can be explained by the growth bubble in imports recorded since the end of last year, above the dynamics of domestic consumption. Many importers anticipated their purchases and shipments in order to avoid the expected surcharges on Chinese footwear, ensuring lower costs and increasing inventory levels,” explains the executive, highlighting that the effect should last for a period of inventory reduction cycle and, consequently, North American imports.

According to Ferreira, the April results show that “the impact of uncertainty is, at least in the short term, more significant than the opportunities.”

Source : leatherinsiders

Portuguese Footwear grows in 2025

In the first quarter of the year, the sector exported 20 million pairs of shoes

The Portuguese footwear industry has literally started the year on the right foot. In the first quarter of the year, the sector exported 20 million pairs of shoes, worth 453 million euros. Compared to the previous year, there was a growth of 4.9% in quantity and 5.4% in value.

“This is a very promising start to the year, in a particularly difficult international context”, admits Luís Onofre, President of APICCAPS. Indeed, Europe has once again become the reference market for Portuguese footwear. From January to March this year, it received 18 million pairs (growth of 6.6%), worth 382 million euros (up 8.3%).

In the first quarter of 2025, the good performance of Germany (up 18.8% to 114 million euros), France (up 1.3% to 96 million euros) and Spain (up 31% to 46 million euros) is noteworthy. In the EU, there is concern about the decline in the Netherlands, of 5.6% to 49 million euros.

Outside the EU, Portuguese footwear continues to grow in the United Kingdom (up 9% to 27 million euros). In the USA and Canada, there was a decline of 12.7% and 14%, respectively, to 18 and 4 million euros.

The situation in the USA is the one that is causing the greatest concern at this stage. "We are living in a moment of great uncertainty", following the announcement by the President of the United States, Donald Trump, of the application of new customs

duties. "Although we already export more than 90% of our production to 170 countries, we consider the North American market to be strategic and the Portuguese footwear industry's big bet for the next decade", stressed Luís Onofre. "The current situation is worrying, but we will not abandon the market", defended the President of APICCAPS.

It should be noted that the United States is the world's largest footwear market, importing almost two billion pairs annually, which corresponds to values close to 26 billion dollars (24.9 billion euros). For Portugal, the United States is the sixth destination market for Portuguese footwear exports, which doubled in the last decade, to approximately 100 million euros last year.

Overall, the Portuguese footwear industry exported 90% of its production to 170 markets on five continents at the beginning of the year. For the President of APICCAPS, “although there are many variables affecting world trade, in the footwear sector there is an expectation that 2025 will be a year of consolidation for Portuguese footwear abroad, where we have already assumed a relevant position”.

FDRA

Nike, Adidas, Puma, Steve Madden, Skechers, Caleres + Dozens More Companies Urge Trump to Exempt Shoes From Tariffs in FDRA Letter

In total, more than 80 companies signed the letter, which was sent to President Trump.

The **footwear** industry is making sure its voice is heard in Washington.

The **Footwear** Distributors and Retailers of America (**FDRA**), along with more than 80 leading U.S. footwear firms, have sent a letter to U.S. President Donald J. Trump urging him to exempt footwear from his administration's reciprocal tariff plan.

"We are hit particularly hard by the tariff actions, because the U.S. government already places a significant tariff burden on our industry before any new **tariffs** are added," the letter stated. It cited as one example children's shoes, which has "rates of 20 percent, 37.5 percent, and higher, before accounting for the reciprocal **tariffs**."

The letter also noted that the new reciprocal rates are "stacked on top of the existing high footwear tariff rates," resulting in many American footwear companies now having to pay tariffs ranging from "more than 150 percent to nearly 220 percent."

(FDRA)

Footwear and accessories: China strengthens ties with Expo Riva Schuh and Gardabags

CHINESE MANUFACTURING, A FIXTURE IN RIVA DEL GARDA FOR YEARS, CALLS ON THE TRADE FAIR TO PRESERVE ITS STATUS AS AN INTERNATIONAL BUSINESS HUB. THE UNCERTAINTY CAUSED BY THE TARIFF DISPUTE REINFORCES EUROPE'S IMPORTANCE AS AN OUTLET MARKET FOR ASIAN PRODUCTION. EXPO RIVA SCHUH AND GARDABAGS THUS RETURNS FROM 14 TO 17 JUNE AS A CORNERSTONE EVENT FOR THE FOOTWEAR AND ACCESSORIES MARKET.

The **Expo Riva Schuh and Gardabags Around the World** program continues. The organisers of the trade fair confirm their commitment to maintaining a strong presence across all major centres of footwear, bag and accessory production. The aim is to deepen market knowledge, build relationships with institutions, and meet with the key players who work in the sector every day. The goal? To provide ever more and ever better business opportunities for those who take part in the fair. The next edition is scheduled from **14 to 17 June 2025**.

April provided the opportunity to **return to China**, specifically to the districts of **Jinjiang** and **Xiamen**. It was a week packed with meetings with both local institutions and companies of significant standing on the international manufacturing scene. The agenda included visits to research and development centres, as well as testing and certification laboratories.

Particularly noteworthy was the key participation in the Opening Ceremony of the 26th edition of the **China (Jinjiang) International Footwear Expo** and the 9th edition of the **International Sports Industry Expo**. During the event, the Chinese trade fairs and Expo Riva Schuh and Gardabags **signed a letter of intent**, committing to close collaboration aimed at facilitating increasingly productive trade exchanges between Western and Asian markets.

Chinese production is undoubtedly an essential component of the offering at the Riva fair. With key Chinese manufacturing districts well represented in Riva del Garda, buyers and visitors are ensured access to top-tier business partners and a broad selection of products.

Also worth noting is the increasing interest with which China today views Expo Riva Schuh and Gardabags. China looks to the fair to remain a cutting-edge commercial hub, helping its manufacturing sector gain access to the European market.

“The trade conflict triggered by tariffs,” notes **Alessandra Albarelli, General Manager of Riva del Garda Fierecongressi**, “has undoubtedly disrupted the flow of footwear and accessories from China to the USA. Chinese manufacturers are aware of this and see Europe as a market to target with renewed energy.”

And for those questioning whether Chinese manufacturing can meet the demands of Europe's mid-range consumers – beyond just the established mass market — Albarelli responds firmly: “We visited a great many companies and met those who develop collections for internationally renowned brands. What we observed revealed a Chinese manufacturing landscape that not only excels in large-scale production, but is also well-equipped to meet the expectations of those seeking higher-end products. We saw with our own eyes workforces ready to deliver on both quality and product innovation.”

The director of Expo Riva Schuh and Gardabags also highlights another important and noteworthy point: the business model of Chinese companies no longer relies solely on large orders, but is now also open to smaller quantities. She points to their capacity for product innovation: “Especially through the use of new materials that impact both product quality and the efficiency of production processes.”

A new appointment with fashion trends

The exclusive analysis of **current consumer trends in the footwear and leather goods sectors** is back. Everyone is invited to meet in the **Highlights Area**, promoted in collaboration with Arsutoria School and Arsutoria Studio, to explore and share ideas, projects and visions.

A reference point for **anticipating consumer desires** for the coming seasons, it will once again offer unique meetings dedicated to:

- **Shoes** for men and women
- **Bags** for men and women
- **Sneakers**
- Insight into the German and Northern European **markets**

The area will also offer an **exclusive selection of products** from the exhibitors' collections. These articles have been carefully chosen by the **fair's Fashion Committee** to represent the trends discussed during the meetings, providing buyers and professionals with a visual and tangible reference.

Discover all the events at Expo Riva Schuh and Gardabags!

There is much more to discover!

As well as appointments dedicated to consumer trends, there will be **events dedicated to innovation**, featuring the pitches of the nine start-ups competing in the Startup Competition. There will also be appointments dedicated to **facilitating meetings between buyers and exhibitors**, providing an opportunity to gain insight into markets such as those in Asia, America, Europe and Africa.

To keep everything at your fingertips, download the official Expo Riva Schuh and Gardabags app. **Find out how!**

www.exporivaschuh.it www.gardabags.it

COTANCE meets DG ENV to discuss the future of European leather

On 8 May, the COTANCE Presidency met with Aurel Ciobanu-Dordea (DG ENV) to present leather's circular economy role & discuss key EU files: ESPR, WFD, PEF.

The COTANCE Presidency met on 8 May 2025 Mr Aurel Ciobanu-Dordea, Director in DG ENV of the European Commission.

The European leather industry presented the key environmental features that position leather as an ideal circular economy material. Discussions covered major legislative initiatives and tools, including Ecodesign (ESPR), by-products & recycled content (WFD), and allocation & durability (PEF).

Mr Ciobanu-Dordea welcomed COTANCE's active engagement, inviting to participate in the upcoming Ecodesign Forum, a follow-up meeting with PEF officers, and to continue contributing input across

the directorate's work. He also reaffirmed the Commission's willingness to maintain an open and constructive dialogue.

On the same day, in the afternoon, the COTANCE Presidency also met with Emanuele Pitto (DG ENV) to discuss the critical state of play around the EU Deforestation Regulation (EUDR).

COTANCE President Manuel Rios and Vice-President Fabrizio Nutti delivered a clear message:

If hides, skins, and leather remain in Annex I, EU tanners face a supply crisis. With traceability tied to the meat sector-and no clear signals from intra- or extra-EU suppliers-European tanners are left waiting and uncertain whether they'll have access to the raw materials they need.

The meeting reaffirmed that COTANCE stands firmly with our people, family businesses, and regions-unfairly impacted by regulations that have no real connection to the leather sector.

We are grateful for the opportunity to engage in this dialogue and will continue communicating, advocating, and defending the interests of European tanners for as long as it takes.

Building a high-quality material library in Romans CAD. A must to enhance your product development process

For brands, a well-organized material library is essential. It significantly enhances the visual quality of your designs and accelerates your product development process, saving you valuable time and boosting efficiency. Romans CAD (RCS) provides the tools to seamlessly build, manage, and apply materials, ensuring consistent, high-quality results across all your projects. Let's explore the importance of a robust material library and how RCS empowers you to create one.

Three approaches to building your material library in RCS

RCS provides diverse methods for constructing your material library, accommodating various workflows and requirements. Whether you prefer scanning real-world textures, leveraging digital material libraries, or integrating with existing systems, RCS offers comprehensive support.

1. Capture hyper-realism by scanning real-world materials.

Scanning real-world materials is the optimal approach when you need unparalleled realism in your designs. This technique captures every subtle detail, from the grain of leather to the weave of fabric, ensuring your textures appear incredibly lifelike.

How It Works:

• Scan the Material: Employ specialized equipment to capture textures and properties like color, roughness, bump, and opacity. A variety of material scanners are available on the market.

• Import into RCS: Directly import your scanned materials into the RCS material library, complete with detailed descriptions.

Pro Tip: Contact us for recommendations on the best tools for your specific needs.

This method is ideal for designers who require precise, real-world textures and want complete control over their material assets.

2. *Integrate Digital Material Libraries*

Integrating digital material libraries such as Swatchbook©™ or Substance by Adobe©™ provides a fast and efficient alternative when scanning isn't feasible. These platforms offer vast collections of high-quality, professionally curated materials-from metals to textiles-that you can quickly import and use in your RCS projects.

This approach is perfect for designers seeking a rapid and easy way to access a diverse range of materials while retaining flexibility and control over their appearance.

3. Import materials from Your PLM/ERP System

RCS facilitates directly integrating materials from your company's existing PLM or ERP system into your product development workflow. This is particularly beneficial for teams that require centralized, consistent material management across multiple projects.

Streamline material management with macro family/family/sub-family structures

RCS enhances material organization through its intuitive macro family/family/sub-family hierarchy, seamlessly aligning with your product development process and business requirements. This structured approach ensures precise categorization and scalability.

For example:

• Macro family: leather

• Family: natural genuine leather / synthetic / vegan / exotic

• Sub-family: full-grain leather / top-grain leather / suede / nubuck

Materials can be further refined by attributes such as size, color, and supplier, enabling efficient management of variations and ensuring consistency across projects. You can also adjust pricing based on seasonal trends and supplier agreements.

The RCS raw material library enables a seamless combination of materials and colors to create virtually limitless design possibilities.

At the engineering level, the RCS digital platform provides comprehensive reports on material properties, sustainability, BOM as follows:

• 3D level: enhances rendering with high-quality, realistic materials.

• 2D level: supports Production Bill of Materials (BOM) creation, ensuring accuracy and efficiency.

• Surface Length (SL) level: calculates material consumption, helping you optimize resource usage.

• Cutting rooms level: ensures seamless integration, enabling precise material nesting during production.

Furthermore, the RCS API enables effortless integration with external systems like ERP and PLM, ensuring real-time synchronous data flow and consistency across your organization.

Ready to Elevate Your Development Process?

Building a material library in RCS is more than just an organization. It's about unlocking your productivity by centralizing all your materials data in a unique place and updating them easily (price, properties, suppliers, etc.). Right from the start, at the design level, one can generate a pre-BOM and control the target price.

Start building your material library today and experience the transformative impact it can have on your 3D designs. With RCS, you're not just creating models-you're crafting your next masterpiece.

PORTUGUESE SHOES
APICCAPS

RECYCLING IS AN ART

New developments to be presented to professionals in the first quarter of 2025

Global plastics production has increased significantly in recent years, reaching around 430 million tonnes in 2024. This figure reflects a steady increase since 1950, when production was around 2 million tonnes.

However, only 9% of this is recycled. There is still a long way to go. The consumption and production of plastics requires the use of large amounts of fossil fuels, which has a negative effect on the environment. To make matters worse, the decline in economic activity has led to a sharp fall in the global price of oil, making the production of plastics from virgin fossil materials significantly cheaper than the use of recycled plastics. According to the European Environment Agency, if the production and use of plastics continues to grow as predicted, the plastics industry will be responsible for consuming 20% of the world's oil by 2050, a significant increase from the current 7%.

The ever-increasing amount of plastic, its impact on biodiversity and its contribution to climate change, as well as its integration into a circular economy, are all issues on the footwear and leather industry's agenda.

Against this backdrop, the footwear and leather goods industry is no stranger to climate change and sustainability issues. Particularly in recent years, many research and innovation projects and investments have been made by companies in the field of sustainability to develop new materials, products, processes, production technologies and business models.

Sustainable development requires a holistic approach and the adoption of practices and sustainable policies aimed at reducing the environmental impact of the industry, guaranteeing good working conditions and contributing to society, without ever forgetting the economic component – without profit there is no business, and without business there is no sustainable development.

Therefore, companies and brands need to define the concept of sustainable products and what information and environmental attributes should be communicated to consumers. Communication with consumers needs to be straightforward, transparent and reliable, building trust in the product.

RECYCLING FOR 100% CIRCULARITY

Recyclable material is a material that is collected, reprocessed and used in the production of recycled materials. Plastic materials can be recycled several times through extrusion (reprocessing process) and injection (mechanixal forming), metal materials can be melted down

and reprocessed to produce new materials, and fibres can be extruded to produce new yarns.

In the footwear cluster, for example, waste from the production of thermoplastic polyurethane (TPU) and thermoplastic rubber (TR) soles can be collected, crushed and reformulated (adding additives if necessary to ensure the properties required for function) for injection into new footwear components. These materials can be recycled several times while maintaining their functional properties.

Post-consumer waste, materials or products discarded by consumers at their end-of-life, can be collected, sorted, and reprocessed to create new recycled materials for product manufacturing. Multiple methodologies are available for the recycling of these materials, such as the development of dedicated recycling processes for individual material types, the production of composite materials, or the recycling of thermoplastic materials, among others. Another, still in its infancy but with potential, is the recycling of post-consumer footwear which, after collection, sorting and separation of materials, can be ground, and the resulting material is used to develop new materials/components for footwear or other applications such as flooring or construction. The recycling process is facilitated in products with less material diversity and by using materials of the same type and similar composition..

The use of recycled materials in the production of footwear is one of the strategies with the greatest impact on reducing the environmental footprint of products, both by reducing the extraction and consumption of raw materials and by reducing the amount of waste sent to landfills or incineration. Recycled materials that can be reused and reintroduced into the value chain should be valorised.

Bioshoes4All is researching and developing various approaches for the recycling and valorization of footwear waste (post-production and post-consumer). These include, among others, the recycling of

thermoplastic and thermoset materials for shoe soles; the production of textile-based composite materials for footwear and leather goods; the development of composites for insoles and soles; and the development of non-woven materials and construction materials, incorporating footwear waste. The project is also studying the implementation of a collection model for post-consumer injected footwear, with a view to its reprocessing and production of new footwear products.

As part of the Bioshoes4all project, 'Innovation and empowerment of the footwear sector for sustainable bioeconomy,' coordinated by APICCAPS and the Footwear Technology Center of Portugal, and supported by the PRR (Recovery and Resilience Plan), recycling is one of the main priorities.

By the end of the year, a new generation of products will be completed.

(Source : Apiccaps)

Learning by Doing: A New Era for Leather Goods Training in Europe

In the month of April, partners from Spain, Portugal, Belgium, Poland, and Romania came together in Iasi, Romania, to drive forward the Erasmus+ project *Learning Factories*, a pioneering initiative that places European leather goods companies at the forefront of innovation, sustainability, and education through a “learning by doing” approach.

Partners have completed the development of the four forward-looking curricula: Leather Goods Design for Circularity, AI Supporting Design and Pattern-Making, 3D Printing for Prototyping and Tools for Industrialisation, and Digital Transformation of Manufacturing Operations.

The focus is now on the creation of the respective innovative, multilingual learning materials (in English, Portuguese, Spanish,

Polish, and Romanian) that combine concise video modules ("video pills") with AI-powered learning resources. These resources will include interactive questions, real-world problems, and case-based solutions delivered through an intuitive app designed for use by trainers and trainees, particularly within workplace settings.

The app will support work-based learning by offering contextualised, machine-learning-driven responses tailored to each trainee's needs. It will evolve with use, delivering new, relevant content each time a trainee presents a real-life question, issue, or challenge from the shopfloor. Complementing this, a digital scanning tool has already been launched to assess training needs and guide users toward a personalised learning path aligned with the most suitable curriculum.

The project consortium is also organising two upcoming bootcamps in July 2025, one in Porto, Portugal, and another in Ubrique, Spain. Aimed at trainers, tutors, and teachers in the leather goods sector, these sessions will offer a deep dive into core project topics, encourage the co-creation of training materials, especially work-based learning activities, and spark fresh, innovative collaboration between companies and VET providers, with a strong emphasis on placing companies at the forefront of the training process.

To stay updated on the upcoming events and progress of the project, connect with us on **LinkedIn** and visit our **website**! Join us in shaping the future of European leather goods, a future where tradition meets technology, ensuring sustainability and competitiveness for generations to come!

The Learning Factories project is co-funded by the Erasmus+ programme of the European Union.

ECHA proposes restrictions on Chromium (VI) substances to protect health

The European Chemicals Agency brings forward a proposal for an EU-wide restriction on certain hexavalent chromium, Cr(VI), substances. The aim is to reduce the harmful effects of these carcinogenic chemicals for both workers and the public.

At the request of the European Commission, ECHA has assessed the risks posed by certain Cr(VI) substances to workers and the public as well as the socio-economic impacts of potential restrictions.

The Agency concluded that an EU-wide restriction is justified as Cr(VI) substances are among the most potent workplace carcinogens and pose a serious risk to workers' health. People living near industrial sites that release these substances into the environment are also at risk of lung and intestinal cancers.

ECHA proposes to introduce a ban on Cr(VI) substances, except in the following use categories when they meet defined limits for worker exposure and environmental emissions:

1. **Formulation of mixtures**
2. **Electroplating on plastic substrate**
3. **Electroplating on metal substrate**
4. **Use of primers and other slurries**
5. **Other surface treatment**
6. **Functional additives/process aids**

Such a restriction could replace the current authorisation requirements under REACH, ensuring that the risks associated with Cr(VI) substances are effectively controlled once they are no longer subject to REACH authorisation. Additionally, barium chromate is included in the scope of the restriction to avoid regrettable substitution.

The restriction could prevent up to 17 tonnes of Cr(VI) from being released into the environment and avoid up to 195 cancer cases each year. Over 20 years, the total monetised benefits are estimated to be €331 million or €1.07 billion, depending on the restriction option chosen. The total cost to European society is estimated at either €314 million or €3.23 billion. These costs include investments in measures to reduce environmental releases and worker exposure, cost of closures and relocations, and replacing Cr(VI) substances with safer alternatives.

All stakeholders have the opportunity to provide information backed by robust evidence during a six-month consultation, which is expected to start on 18 June 2025. ECHA is planning to organise an online information session to explain the restriction process and help stakeholders take part in the consultation.

Next steps

ECHA's scientific Committees for Risk Assessment and Socio-Economic Analysis will evaluate the restriction proposal. In their evaluation, they will consider the scientific evidence received during the consultations.

The European Commission, together with the 27 EU Member States, will take the decision on the restriction and its conditions – based on ECHA's proposal and the committees' opinion.

Background

In September 2023, the European Commission requested ECHA to prepare a REACH restriction proposal on certain Cr(VI) substances currently on the REACH Authorisation List. The shift from authorisation to restriction aims to manage the risks to people and the environment in a timely and effective manner, while keeping the internal market working properly.

https://echa.europa.eu/

SGS and Shepherd of Sweden take steps to boost footwear production

A partnership between SGS, the world's leading testing, inspection and certification company, and luxury goods retailer, Shepherd of Sweden, has led to a transformation in footwear quality, reduced waste and increased production from one of the Swedish company's principal European suppliers.

Known for its high-quality sheepskin and woolen products, including slippers, shoes and home furnishings, Shepherd of Sweden is proud of its reputation for the high quality of its products.

The Svenljunga-based retailer conducts regular sourcing reviews to determine whether to maintain production within Europe or explore options in the Far East. Its ultimate decision to keep production in Europe was due to the benefits of flexibility, reduced lead times, a smaller carbon footprint and brand value.

However, this decision makes it imperative that Shepherd of Sweden's manufacturing suppliers meet its rigorous standards. The company was concerned that a well-established factory in Macedonia supplying its footwear, Dimko Mitrev, may not have updated its processes to meet the evolving demands of its key customer and the wider market.

Knowing SGS's expertise in the footwear industry, Anders Johannson, Supply Chain Manager at Shepherd of Sweden, sought help from the company. SGS recommended a Technical Factory Assessment (TFA) which would provide a detailed overview of the factory to document, score and report on its capabilities, capacity, skills and safety.

The TFA forms a pillar of SGS's unique Footwear Operational Optimization Technical Services (FOOTS™) program.

A two-day assessment was carried out by SGS's footwear specialist based in Porto, Portugal, working closely with a UK-based colleague.

SGS worked upstream with departments, partners and suppliers in a highly detailed process to identify faults and recommend corrective actions. The TFA concluded in a meeting with factory management and the customer, in which findings and recommendations were presented in an open and transparent forum.

Shepherd of Sweden supplies a curated selection of sheep skin and woolen consumer products

Technical Factory Assessment outcomes

The key areas SGS identified for corrective action were process control and employee training, with recommendations – which have now been implemented by factory management – including improved training, better online control, employee rewards and incentivization, replacement of the head of the sewing plant and a single final production inspection instead of two.

Each employee on the factory line gained a better understanding of their specific role and the importance of achieving a perfect product to pass on to the next process, taking pride in their work and their contribution to the finished product.

Anders Johannson, Supply Chain Manager at Shepherd of Sweden, said: “The impression from the Dimko team was that the SGS representative adopted an advisory approach rather than that of a traditional auditor, which was very much appreciated. The weaknesses were clearly highlighted in the final written report as well as in the verbal closing meeting. We have already seen a positive effect with increasing productivity and reduction of rejects.”

To find out more about SGS’s FOOTS™ program visit: https://www.sgs.com/en/services/foots-and-goods

Recertification ZDHC

TFL Ledertechnik GmbH earns ZDHC MRSL V3.1 Level 3 recertification with top ratings

TFL Ledertechnik GmbH has announced the successful renewal of its ZDHC MRSL V3.1 Level 3 certification, reaffirming its commitment to the Zero Discharge of Hazardous Chemicals (ZDHC) initiative and sustainable chemical management in the leather industry.

This certification, conducted in partnership with Eurofins | BLC Leather Technology Centre Ltd. under the Chem-MAP program, confirms that all TFL Gateway-listed products meet the highest standards of chemical safety. The rigorous biennial process includes comprehensive testing of raw materials and finished goods, along with multi-day audits at manufacturing sites worldwide.

Audits began at TFL Quinn India Private Limited in Hyderabad and Mumbai, followed by TFL China Ltd. in Changzhou. All sites received Grade A ratings, earning TFL the Eurofins | Chem-MAP Leader status—recognizing excellence across its global operations.

“This achievement reflects our team’s dedication to continuous improvement and sustainability,” said Arunkumar Patil, Director – Operations, Manufacturing & EHS at TFL Quinn India.

“We’ve embedded compliance throughout our operations, from design to production,” added Dr. Hu DongQi, Executive Team, TFL China.

TFL now looks ahead to audit results in France, Brazil, and Italy, continuing its drive for excellence in environmental responsibility and product safety which goes in line with our mission to provide “Great Chemicals. Excellent Advice”.

DyStar Further Consolidates Manufacturing Operations in Americas to Accelerate Growth

DyStar, a leading specialty chemical company with a heritage of more than a century in product development and innovation, announced the cessation of manufacturing operations at **DyStar Hilton Davis** with partial integration of production within DyStar LP in Reidsville, North Carolina.

The latest integration will impact the production facility of **DyStar Hilton Davis**, which primarily manufactures Food, Drug, and Cosmetic Dyes **(FD&C)**, Drug and Cosmetic Dyes**(D&C)**, Lakes, Technical Dyes, and Pigment Dispersions. As part of our ongoing efforts to consolidate and optimize our **manufacturing footprint (MFO) in Americas,** the facility will cease production operations on**30 June 2025**.

Following the final instalment of the Group's consolidation plan, DyStar's Americas will focus our main production activities at the sites in Reidsville, North Carolina, and Cheyenne, Wyoming.

Mr. Xu Yalin, **Managing Director and President, DyStar Group** said, "We believe that the success of the strategic plan will position DyStar to decisively respond to the fundamental changes taking place in the industry and enables us to improve profitability while maintaining strategic product development capability, and to accelerate growth over the long-term."

Mr. Clement Yang, Vice President, Global Manufacturing, DyStar Group said, "The overall plan builds upon our global capabilities and

resources, and it reinforces DyStar's strong commitment to strategic investments, product and service excellence, as well as productivity improvements that will drive our Company, customers and industry forward."

"DyStar remains committed to working closely with all stakeholders, including affected employees, customers, suppliers, and partners to minimize the impact on business operations and to ensure a smooth global transition.

We will treat all affected parties with due respect and dignity, adhering to company policies, collective bargaining agreements and regulatory requirements.

The company will support affected employees with necessary resources during this transition, including resources and opportunities for employees to apply for open positions at other DyStar locations in Americas." he added.

DyStar is taking every measure to minimize the impact on business operations. We will continue to supply FD&C and D&C Dyes, Lakes, Technical Dyes and Pigment Dispersions from other sites within our global network. These offerings will be made **without compromising quality, safety, and sustainability**.

DyStar remains optimistic about these essential changes to our business as we continue to support the global supply chain and all stakeholders in a competitive and sustainable manner across the industries we operate.

For further information, please contact your local representative. www.DyStar.com

loopamid®
A BRAND OF BASF

trinamiX
A brand of
BASF – We create chemistry

Textiles Recycling Expo 2025: BASF and trinamiX present solutions supporting textile circularity

- trinamiX showcase its mobile solution for reliable textile identification, including the new handheld spectrometer trinamiX PAL Two

- BASF presents loopamid®, the recycled polyamide 6 based entirely on textile waste

- Joint presence highlights solutions enabling textile sorting, recycling, and circular economy

BASF SE with loopamid®, a recycled polyamide 6 entirely made from textile waste and trinamiX GmbH, a leading provider of mobile spectroscopy solutions and a subsidiary of BASF, will jointly present their solutions for textile sorting and circularity at the Textiles Recycling Expo at booth 2341 in hall 3. The event takes place in Brussels, Belgium from June 4 to 5, 2025. Together, they will showcase approaches to textile circularity – from reliable material identification to the use of recycled polyamide 6 for high-performance textiles.

loopamid: Polyamide 6 made entirely from textile waste

loopamid is a recycled polyamide 6 that is entirely based on textile waste. “The technology behind loopamid allows textile-to-textile recycling for polyamide 6 in a wide variety of fabric blends, including those with elastane,” said Dag Wiebelhaus, Head of Innovation Management at BASF’s Monomers division and loopamid project lead. BASF recently announced the start-up of the world’s first

commercial loopamid plant. The production facility at the Caojing site in Shanghai, China, has an annual capacity of 500 metric tons and utilizes industrial textile waste from textile manufacturing and post-consumer waste for producing loopamid. The feedstock includes cutting scraps, defective cuts, offcuts and other production textile waste from the textile industry.

These materials are collected and provided to BASF by partners. End-of-life garments made from polyamide 6 and other textile products can also be utilized for the production of loopamid. All these waste materials are challenging to recycle because they typically consist of a mixture of different fibers and materials as well as dyes and additives. Additionally, for post-consumer waste recycling, buttons, zippers and accessories must be removed in advance. BASF works closely with partners and customers to accelerate the development of collection and sorting systems.

trinamiX: Textile identification made easy

trinamiX Mobile Near-Infrared (NIR) Spectroscopy Solution enables fast, reliable and non-destructive identification of a wide range of textiles and blends – such as polyester, cotton, wool or polyamide including PA 6 and PA 6.6. BASF has utilized trinamiX technology to qualify PA 6 waste streams for their loopamid® product.

The system features a robust, portable NIR spectrometer, accompanied by an app that leverages sophisticated cloud-based data analysis, along with a customer portal for managing results, downloading reports, and exporting data.

To meet the specific needs of recyclers, trinamiX offers a flexible solution that accommodates different workflows. Users can choose between a compact handheld device for spot checks or a semi-automated setup that can be seamlessly integrated into a sorting

table, allowing for automatically triggered scans for enhanced efficiency.

trinamiX PAL Two – Next generation handheld spectrometer

Visitors will also experience trinamiX PAL Two, the latest generation of trinamiX's handheld spectrometer. Designed for even more convenient, single-handed operation, it features a built-in display for direct, on-device results – making it ideal for use in various environments and industries.

"We're excited to join the Textiles Recycling Expo for the first time and meet the vibrant community. Our innovative solution promotes greater transparency and empowers informed decision-making throughout the textile value chain by providing reliable on- the-spot identification. We are making this accessible to everyone dedicated to creating a more sustainable future for textiles. Together, we can drive positive change and transformation in our industry!", says Adrian Vogel, Team Lead Circular Economy at trinamiX.

More information: https://trinamixsensing.com/textiles

Leather Auxiliaries – A Review PART – I

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(Contd. from April issue)

7. Technologies - Leather Chemicals & Leather Process Technologies – CLRI [7]

CLRI has over the years built up a strong base of a wide range of technologies. Conscious efforts are made by this Institute to secure appropriate Intellectual Property (IP) Rights like PATENT (in India and abroad) and COPYRIGHT in respect of the new developments.

7.1 Technologies - Leather Chemicals [7]

Leather Chemicals Table – 7 A **Departments / R&D Services / Knowledge Portfolio Management Department (KPMD), CLRI**
Pretanning auxiliaries • A composition for salt-free preservation of raw hide/skin • A composition for preservation cum hair loosening of hide / skin in leather processing • A dispersing agent composition for tanning of hides/skins and a process for the preparation thereof • A novel composition for preservation of raw hide/skin and preservation process thereof • A synergistic composition for short term preservation of raw hides/skins and a process for the preparation thereof • A novel composition for deliming of hides and skins and a process for the preparation thereof
Tanning Auxiliary • A collagen based multifunctional group polymer and a process for the preparation thereof • An improved dispersing agent composition for application in tanning and a process for the preparation thereof • A composition useful for pre-treatment in waterless tanning

Leather Chemicals Table – 7 A Departments / R&D Services / Knowledge Portfolio Management Department (KPMD), CLRI
Mineral Syntan • A novel melamine-chrome complex for leather processing and a process for the preparation thereof • A novel composition for water free, pickle free chrome tanning without medium and a chrome tanning process thereof • A process for the preparation of a tanning cum dyeing agent • An improved process for the preparation of a tanning agent • Process for preparing a synthetic Aluminium tanning agent • A process for the preparation of a novel synthetic tanning agent

Leather Chemicals Table – 7 B Departments / R&D Services / Knowledge Portfolio Management Department (KPMD), CLRI
Vegetable / Non - Protein Based Syntan • A process for the preparation of plant-based acrylate composite • Process for the preparation of a formaldehyde-free synthetic tanning agent The process has been transferred and commercialized successfully in India. • An improved process for the preparation of a tanning agent. • An improved process for the preparation of jatropha oil--acrylic co-polymer for tanning applications
Protein Based Syntan • Novel acrylic grafted keratin hydrolysate copolymer for industrial applications and a process for the preparation thereof• A chromium - keratin complex and a process for the preparation thereof • A bioactive keratin-silica matrix and a process for the preparation thereof • A process for the preparation of a novel proteinoid-acrylate composite having molecular weight in the range of 15000-20000 KD. • A process for the preparation of a novel proteinoid for industrial applications • A tanning composition and a process for the preparation thereof • Process for the preparation of bio-tanning agent • A novel retanning agent and a process for the preparation thereof • An improved tanning composition and a tanning process thereof

Leather Chemicals Table – 7 B Departments / R&D Services / Knowledge Portfolio Management Department (KPMD), CLRI
Post Tanning auxiliaries • A multi - functional proteinous product for leather application and a process for the preparation thereof • A composition for water free post tanning process in leather making

Leather Chemicals Table – 7 C Departments / R&D Services / Knowledge Portfolio Management Department (KPMD), CLRI
Dyeing auxiliaries • A synergistic composition for improved colour characteristics in dyed leather •A novel Silica based Organic colourant for leather and a process for the preparation thereof. **Fatliquor** • An improved process for the preparation of fatliquor for application in leather processing • A novel fatliquor for leather processing and a process for the preparation thereof
Finishing Auxiliaries • A metal-organic pigment for industrial applications and a process for the preparation thereof • Nano sized sulfide compound of Cerium and a process for the preparation thereof. • An improved process for the preparation of a novel graft copolymer having molecular weight up to 300 000 • An improved process for the preparation of wax emulsion. • An inorganic yellow pigment for industrial applications and a process for the preparation thereof **Antifungal composition** • A novel cyclohexyl carbo-dihydropyrimidine thione compound and a process for the preparation thereof

Leather Chemicals Table – 7 C Departments / R&D Services / Knowledge Portfolio Management Department (KPMD), CLRI
Chemicals for hazardous substance free leather • A novel composition useful for removal of restricted substances from leather and a process for the preparation thereof **Adhesives** • A Novel Adhesive and a microbial process For the preparation thereof. • A process for the preparation of poly (acyl sulfide) for industrial applications. • A process for the preparation of novel polysulfide copolymers. • An eco- friendly Adhesive composition and a process for the preparation thereof.

Reference : Tables 7A & 7 B & 7 C. - Leather Chemicals - Project Planning & Business Development, CSIR-Central Leather Research Institute Adyar, Chennai, Tamil Nadu, India - 600 020 https://www.clri.org

7.2 Technologies - Leather Process Technologies – CLRI [7]

Leather Processing Table – 7 D Departments / R&D Services / Knowledge Portfolio Management Department (KPMD), CLRI
• Transparent leather and a process for preparation thereof • Bi-functional Leather and A Process for the Preparation Thereof • An improved process for leather making using aloe vera extract • A process for making antifungal fragrant leather • A process for zero water discharge for post tanning operations • A process for curing cum dehairing of hide/skin • A waterless bioprocessing for dehairing and fibre opening in leather manufacture • An improved process for making retanned leather with dyeing effect • A process for the preservation of hide and/or skin • A leather making process using plant material • An improved Chrome Tanning Process • A waterless tanning process for making leather • A Process for fibre opening in leather making • An improved process for uniform dyeing of leather

Leather Processing Table – 7 E

Departments / R&D Services / Knowledge Portfolio Management Department (KPMD), CLRI

• A Process for lubrication of hide/skin by ultrasound • An improved tanning process • A Process For The Rehydration Of Crust Leather • An Improved Post Tanning Process For Leather • A Zero Emission Chrome Tanning Process for Leather Making • Zero Wastewater Discharge process for Pretanning operations • A synergistic degreasing composition and an improved process for aqueous degreasing of hides and skins therewith • An enzymatic process for the removal of fleshings from hides and skins• A lime and sulphide free process for the preparation of pickled stingray fish skin • An improved eco-friendly process for curing of raw hides and skins • A novel composition for chrome tanning of hides/ skins • An improved process for making chamois leathers • An improved process for the unhairing of hides/skins • An improved process for making chrome tanned Leathers • Eco-friendly bio-process for leather processing • A novel process for preparation of dyed leather in more than one tone • An improved process for producing leathers in more than one tone

Leather Processing Table – 7 F

Departments / R&D Services / Knowledge Portfolio Management Department (KPMD), CLRI

• A novel process of aqueous finishing for waterproof leathers • An improved process for making crust leather for transfer coat finishing • A process for leather making using saline water • A novel dehairing and fibre opening process for complete elimination of lime and sodium sulfide.

The technology has already been transferred in India. • An improved process for dehairing and fibre opening of hide/skin • Transposed process for making leather • A novel oxidative process for the unhairing of hides/skins • An improved oxidative process for making chamois leather

Leather Processing Table – 7 F Departments / R&D Services / Knowledge Portfolio Management Department (KPMD), CLRI
• A process for making wet- pink leather • Bio-tanning process for leather making • A process for making iron tanned leather using natural polysaccharide • An improved process for making iron tanned leather. • Application of an alkaline protease in the pretanning process of leather manufacture • Process for total lime sulfide free unhairing in skins/hides using plant/animal-based enzymes The technology has already been transferred in India.

Reference : Tables – 7 D & 7 E & 7 F. Leather Processing. Project Planning & Business Development, CSIR-Central Leather Research Institute Adyar, Chennai, Tamil Nadu, India - 600 020 https://www.clri.org

8. Green Technologies for the Leather Production – Clariant [8]

8.1 Green Leather –Industry Achievements in the Past [8]

- Wet White tanning as alternative to Chrome tanning
- Enzymatic Unhairing process
- Continuous improvement of chemical exhaustion for the beamhouse, tanning and wet end processes
- Complete waterborne finishing replacing solvent systems or solvent/water emulsions Replacement of hazardous substances (Nonylphenols, Phthalates, Ethylglycol, Dimethylformamide, cancerogenic azo dyes and aromatic amines, lead chromate pigments, short chain chloro paraffins)
- Development of Upgrading technologies for improved raw hide utilization
- Continuous chemical reduction in finishing (low pressure spraying, RRC technology)

8.2 Stakeholder for the Leather – Manufacturing Process

Stakeholder for the Leather – Manufacturing Process Table - 8 A
Environment - High Yield –Low Resources-Minimizing Water quantity, Minimizing chemical Demand, Minimal chemical and water waste, Minimal leather waste, Maximizing leather yield
Economy- High Speed –Low Cost- Lowest production costs, Production speed, Highest production yield, Lowest waste, Lowest chemical and water consumption
Customer Demand-High Quality –Low Cost-Leather Quality, Lowest possible cost, Lowest possible risk (hazardous substances), Fashion, Function, Wearing comfort

8.3 Green Leather –New Ecological Demands

Green Leather –New Ecological Demands Table - 8 B
Chemicals - Green chemistry in leather chemicals
Safety- Environmentally friendly substances, reduction of hazardous substances
Waste- Updated leather production with minimized waste and resources
Raw material - Further development of the manufacturing process with maximizing the raw material

8.4 Green Leather –Examples for new achievements

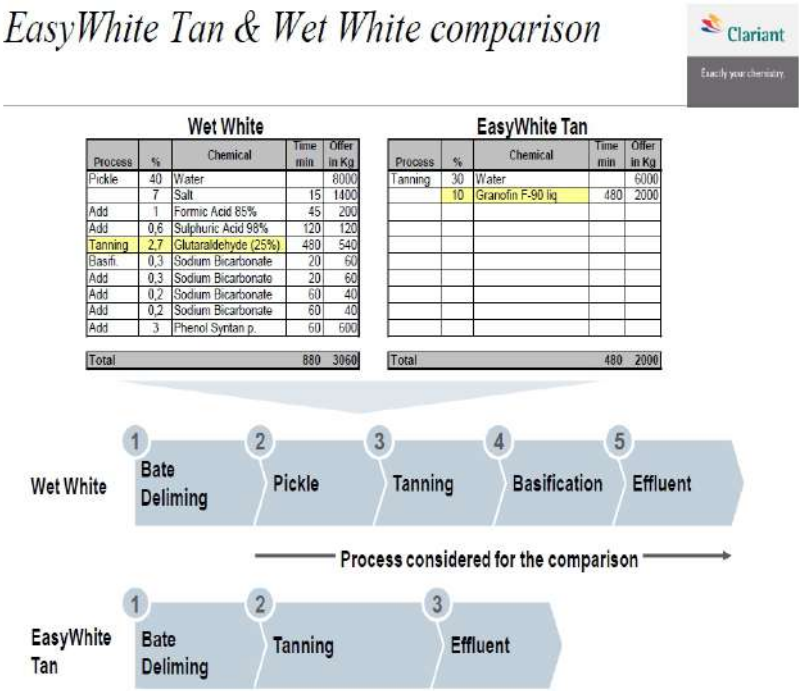
Green Leather –Examples for new achievements Table - 8 C
Water/salt reduction - Process Innovation –New Wet White Tanning Technology
Chemicals- Greener Fatliquors and Retanning Agents
VOC - NMP free Finishing systems **Yield -** Modern Upgrading Technologies

8.5 Most commonly used mineral free tanning systems

Most commonly used mineral free tanning systems Table - 8 D
Phosphonium salts, Glutaraldehyde, Vegetable Replacement Syntans, Oxazolidine, Silicates, Oxidisable oil tannage

8.6 Easy White Tan & Wet White Comparison - Clariant [8]

Figure – 8 E



8.7 Granofin Easy F-90 (Clariant) [8]

EasyWhite Tan. Increasing demand for chrome-free Leather.

Environment perspective -Increasing ecological demand. Environmental awareness Production perspective-Process simplification, Cost reduction, Operator safety Less scope for processing errors.

Reference : 8. & Tables – 8 A & 8 B & 8 C & 8 D & Figure – 8 E. Green Technologies for the Leather Production 45th Leather Research Industry Get Together (LERIG) 29 January 2011- Clariant

9. Retanning Agents –Ecological Update [9]

Retanning Agents –Ecological Update Table – 9 A		
Synthanes	Aromatic base (Phenol, Naphthalene, cresol etc.) with sulphonate or hydroxy function Formaldehyde condensation	Residual content of Formaldehyde and Phenol of both < 50 ppm Resins
Resins	Urea-Formaldehyde Dicyandiamide-Formaldehyde Melamine-Formaldehyde	Residual content of Formaldehyde< 50 ppm
Polymeric	Polyacrylic acid Combination and copolymerisation with natural substances	Incorporation of renewable (and biodegradable) raw materials Tergotan PMB

9.1 Fatliquors –Ecological Update [9]

Fatliquors –Ecological Update Table – 9 B		
Natural	Sulfated or sulfited natural oils (castor, neatsfoot, soya)	Long term experience in using natural oils Recovered natural oils Synthetic
Synthetic	Alkylsulfosuccinates Quaternary amines as cationic fatliquors	Use of by-products as raw materials Higher exhaustion, lower COD values for the waste water

Fatliquors –Ecological Update Table – 9 B		
Polymeric	Polymeric succinates and sulfosuccinates	Reuse of synthesis waste as raw materials Higher exhaustion, lower COD values for the waste water Tergotan PO-60

9.2 NMP-free Finishing (NMP – N-methyl pyrrolidone) Topcoats – Highest Performance without NMP [9]

NMP-free Finishing NMP – N-methyl pyrrolidone	
Topcoats – Highest performance without NMP Table – 9 C	
Application	Application process parameters (Flow, viscosity)
Fastness	Wear properties, Ageing resistance Soilability, Squeaking behaviour
Aesthetics and haptics	Cracked grain, Matt / Gloss grade Depth of black, Feel

9.3 NMP-free Finishing - Summary [9]

NMP-free products and finishing systems available with the same performance. Long-term usability of NMP-related substances is questionable. Reduction in NMP is not sufficient to meet car and furniture manufacturers‘ specifications Elimination of NMP succeeded with concomitant sustainable VOC reduction By VOC reduction and NMP Elimination sets a new ecological standard in finishing.

Reference – 9.& Tables – 9 A& 9 B & 9 C. Green Technologies for the Leather Production 45th Leather Research Industry Get Together (LERIG) 29 January 2011- Clariant

10. Product Range - KEMIA TAU, Italy [10]

Product Range - KEMIA TAU, Italy Table -10	
Wet End	**BEAMHOUSE** Soaking specialties, Specific biocides, Liming specialties Deliming specialties Bating enzimes Degreasing agents, Pickling agents **TANNING** Pretanning specialties, Chrome tanning specialties, Specific biocides White tanning specialties, Ecologic tanning specialties, Polymeric tanning systems **RETANNING** Retanning specialties, Polymeric retanning specialties Degreasing agents **FATLIQUORS AND WATER REPELLENTS** Polymeric fatliquors, Anionic fatliquors, Cationic fatliquors Specific fatliquors, Water repellents, Specific biocides, Emulsifying specialties **DYES** Powder anionic dyes, Liquid anionic dyes, Liquid cationic dyes, Dyeing specialties Dispersed in drums pigments
Finishing	**DYES AND PIGMENTS** Liquid anionic dyes, Liquid cationic dyes, Dispersed pigments, Caseinic pigments, **BINDERS** Binders, Compact binders, Polyurethane binders, Protein binders **LACQUERS** Water-based lacquers, Nitrocellulose emulsions **AUXILIARIES** Crosslinking agents, Fillers and waxes, Miscellaneous specialties, Pull-up oils and waxes, Handle modifiers, Specialty wax systems, Specific biocides, Solvents

Services - Research and Development & Tailor-made solutions & Problem Solving &Testing.

Reference : 10.& Table 10 A. KEMIA TAU, Italy info@kemiatau.com

11. Smit & Zoon – Leather Solutions

Smit & Zoon – Leather Solutions Table -11 A
1.Zeology Suede for sport sneakers
Sports company PUMA has developed an experimental version of its most iconic sneaker, the SUEDE, to test for a product to make it biodegradable.
2.Nappa Bag Leather
Low emission Nappa with optimized and free formaldehyde products resulting in uniform dyeing and excellent printability without hardening the grain. High quality products in wet end with the simplicity concept to reduce costs and the environmental impact. A fashionable and artistic article for fancy leather goods with a high-performance top coat.
3.Soft Nappa for comfortable office shoes for women
Very light Nappa made on simplicity concept with polymers for high chemical uptake in wet end with very low COD-values and very low formaldehyde emission. A very easy wet end process and finishing on selected polymers and waxes. A leather which is soft, light and stretchy for woman office shoes.
4.Medium thick box calf leather for shoes
Medium-thick box calf for tough usage. Renewed classic box calf made with simplicity concept and a renewed finishing with a fashion metallic appearance.
5.Chrome free waterproof split suede
Chrome free split suede with high waterproofness. High quality products in wet end with the simplicity concept to reduce costs and the environmental impact.

Smit & Zoon – Leather Solutions Table -11 B
6.White split suede urban lifestyle shoe
Low formaldehyde soft and silky suede with excellent heat yellowing and

Smit & Zoon – Leather Solutions Table -11 B

light fastness. High quality products in wet end with the simplicity production process concept to reduce costs and environmental impact.

7.Brown biobased retanning active lifestyle shoe

Tight and soft nappa in white colour with excellent light fastness, heat yellowing and water repellence for long lasting whiteness. High quality products in wet end to reduce costs and the environmental impact. High performance finishing with the HP product range.

8.Classical nappa for white sports shoe

Tight and soft nappa in white colour with excellent light fastness, heat yellowing and water repellence for long lasting whiteness. High quality products in wet end to reduce costs and the environmental impact. High performance finishing with the HP product range.

9.Natural floater for shoe upper or leather goods

Natural floater with even and uniform pebble with superb light fastness and high resistance for long lasting light colours. Soft leather with warm touch for the ultimate comfort. High quality products in wet end to reduce costs and the environmental impact.

10.Light weight floater with natural pebble upholstery leather

Natural, even pebbled floater with light weight touch and feel. Contemporary style with light and fluffy sitting feeling. High quality products in wet end to reduce costs and the environmental impact. Finished with a specific focus on upgrading together with a fashion two-tone wash-off.

Smit & Zoon – Leather Solutions Table -11 C

11.Vintage waxy pull-up upholstery leather

Waxy pull-up with deep light effect with a vintage look. High quality products in wet end to reduce costs and the environmental impact. A very light finishing with excellent technical performances and a nice touch.

12.Embossed printed upholstery leather

Light embossed leather with vegetable look. Contemporary sofa sports stylish seams and tufting along with panelled flare arms in eye-catching leather. High quality products in wet end to reduce costs and the

Smit & Zoon – Leather Solutions Table -11 C

environmental impact. A finishing focussed on natural upgrading and additionally a fashion 'Crazy-waxy-look has been realized.

13.Natural floater / pebble for upholstery

Spongy and comfortable leather with even natural milling pebble. A very natural finishing with an aniline look. High quality products in wet end to reduce costs and the environmental impact.

14.Medium thick box calf leather for shoes

Medium-thick box calf for tough usage. Renewed classic box calf made with simplicity concept and a renewed finishing with a fashion metallic appearance.

15.Soft and Smooth Upholstery

A smooth, modern silky sofa leather with a very flat grain which has a warm tight, soft and waxy touch. The article is made using high quality products in Wet End to reduce costs and the environmental impact.

Reference : Tables – 11 A & 11 B & 11 C. Royal Smit & Zoon https://www.smitzoon.com/

12. Overview of the main tanning systems Figure - 12

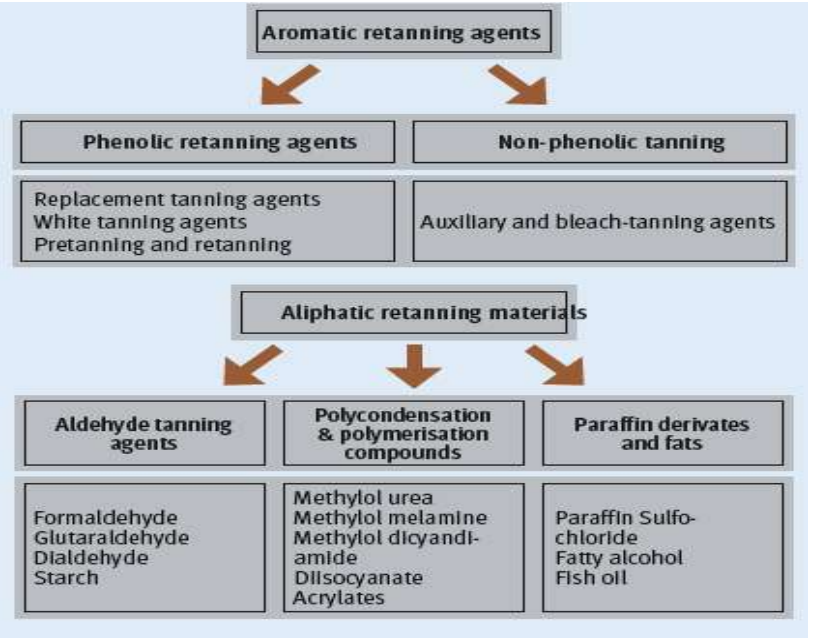
Type of tannage	Tanning agent used	Auxiliaries used
Chrome tannage	Basic sulphate complex of trivalent chromium	Salt, basifying agents (magnesium oxide, sodium carbonate or sodium bicarbonate), fungicides, masking, agents (e.g. formic acid, sodium diphtalate, oxalic acid, sodium sulphite), fatliquors, syntans, resins, etc.
Other mineral tannages	Aluminium, zirconium and titanium salts	Masking agents [1], basifying agents, fatliquors, salts, synthans, resins, etc.
Vegetable tannage	Polyphenolic compounds leached from vegetable material (e.g. quebracho, mimosa, oak)	Pretanning agents, bleaching and sequestering agents, fatliquors, formic acid, syntans, resins, etc.
Synthetic tannage (resin-syntans)	Sulphonated products of phenol, cresol, naphtalene, cresylics, polyacrylates, melamine resins etc.	Fixing agents, either acid or alkali, fatliquors
Aldehyde tannage	Glutaraldehyde and modified aldehydes	Alkali, bleaching agents, tanning agent carrier
Oil tannage	Cod oil and marine oils	Catalysts such as manganese, copper or chromium. Sodium bicarbonate or other alkali, aldehydes, emulsifiers

[1] The auxiliary used varies depending on the mineral used and the type of cross-link with collagen

Source: BREF 2013

Reference : Figure -12. The framework for sustainable leather manufacture, Second edition - Jakov Buljan, Ivan Kral' – 2019. the United Nations Industrial Development Organization.

13. Structures of aromatic and aliphatic retanning agents Figure - 13



Reference : Figure -13. The framework for sustainable leather manufacture, Second edition - Jakov Buljan, Ivan Kraľ – 2019. the United Nations Industrial Development Organization

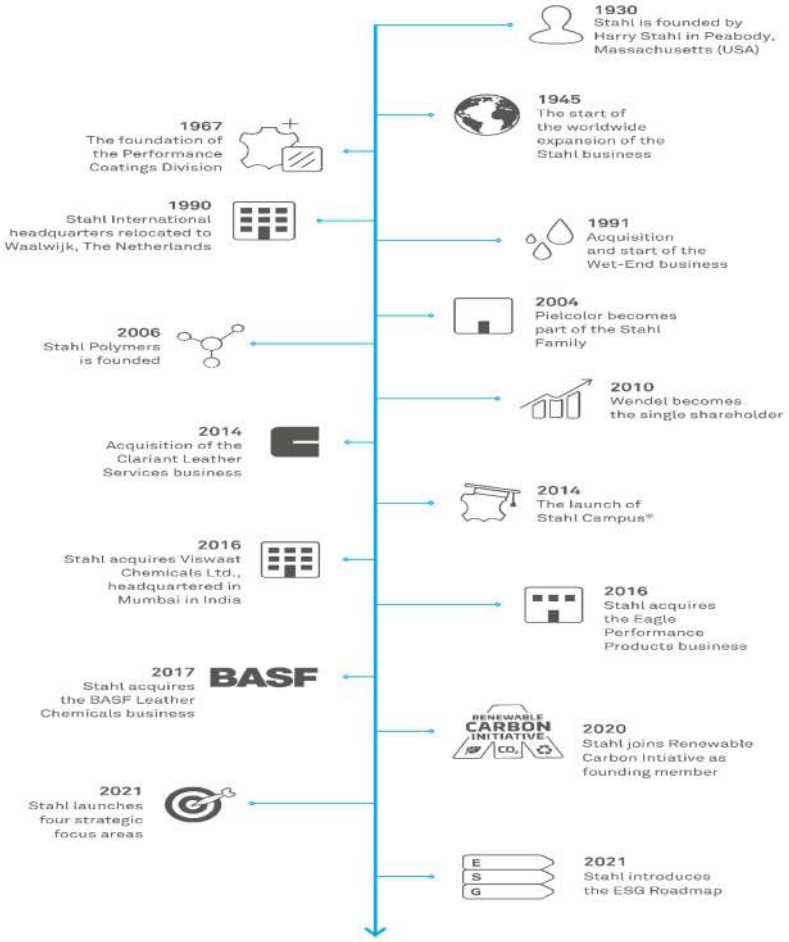
14. Finishing coats: main components and additives Figure - 14

Type of coat	Main components	Additives
Base coats	Water/organic solvent	Waxes
	Pigments/dyes	Surfactants
	Resins	Thickening agents
		Fillers
Intermediate coats	Water/organic solvent	Waxes
	Pigments/dyes	Thickening agents
	Resins	Fillers
Top coats	Water/organic solvent	Waxes
	Solvent based lacquers	Silicon based agents
	Water based lacquers	Matting agents
	Binders	Cross linkers

Reference : Figure -14. Integrated Pollution Prevention and Control (IPPC) Reference Document on Best Available Techniques for the Tanning of Hides and Skins February 2003EUROPEAN COMMISSION

15. International expansion to meet global demand – Stahl Figure -15

- 2014 – Acquisition of the Clariant Leather Service Business.
- 2017- Stahl acquires the BASF Leather Chemicals Business



Reference : Figure -15. Stahl, stahl.com

(to be contd.)

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