ILTA
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JILTA

Journal of Indian Leather Technologists' Association

JILTA 2022 2023

VOLUME : LXXIII NO.: 01 JANUARY,2023

Rgtn. No. KOL RMS/074/2022-24
Regd. No. ISSN 0019-5738
RNI No. 2839/57
Date of Publication: 6th

₹50.00

Our Activities

- An Association with over 600 members from India and abroad working since last 68 years for the growth and development of Leather and its allied industries.
- Organize seminars, symposiums, workshops in order to share information, knowledge & latest development and interactions for the benefit of all concerned.
- Organize Human Resource Development programmes on regular basis.
- Publish for over 60 years, a technical monthly journal namely "Journal of Indian Leather Technologists' Association" (JILTA), widely circulated through out the World.
- Publish books for the benefit of the students at various levels of study, for the Research Scholar and the Industry.
- Work as interface between Industry and the Government.
- Assist Planning Commission, various Government Institutions, Ministry and autonomous bodies to formulate appropriate policies for the growth of the Industry.
- Assist small and tiny leather goods manufacturers in marketing their products by organizing LEXPOs in Kolkata and different parts of India.

Indian Leather Technologists' Association

[A Member Society of International Union of Leather Technologists' and Chemists Societies (IULTCS)]

'Sanjoy Bhavan', 3rd Floor, 44, Shanti Pally, Kolkata- 700 107, WB, India
Phone : 91-33-2441-3429 / 3459 WhatsApp +91 94325 53949
E-mail : admin@iltaonleather.org; mailtoilta@rediffmail.com
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New Year - 2023

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ILTA


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JOURNAL OF INDIAN LEATHER TECHNOLOGISTS' ASSOCIATION (JILTA)

JANUARY, 2023 VOL.: LXXIII NO.: 01 RNI NO.: 2839/57 REGD.NO.: ISSN 0019-5738

Contents

Hony. Editor : Dr. Goutam Mukherjee

Communications to Editor through E-mail :
admin@iltaonleather.org; jiltaeditor@gmail.com

Cover Designed & Printed by :
M/s TAS Associate
11, Priya Nath Dey Lane, Kolkata - 700 036

Published & Printed by :
S. D. Set, on behalf of Indian Leather Technologists' Association

Published from :
Regd. Office : 'Sanjoy Bhavan', 3rd Floor,
44, Shanti Pally, Kasba, Kolkata - 700 107

Printed at :
M/s TAS Associate
11, Priya Nath Dey Lane, Kolkata - 700 036

Subscription :

Annual	Rs.(INR)	400.00
Foreign	$ (USD)	45.00
Single Copy	Rs.(INR)	50.00
Foreign	$ (USD)	4.00

All other business communications should be sent to :
Indian Leather Technologists' Association
'Sanjoy Bhavan', 3rd floor, 44, Shanti Pally
Kasba, Kolkata - 700 107, WB, India
Phone : 91-33-2441-3429
91-33-2441-3459
E-mail : admin@iltaonleather.org;
mailtoilta@rediffmail.com
Web site : www.iltaonleather.org

Opinions expressed by the authors of contributions published in the Journal are not necessarily those of the Association

JOURNAL OF INDIAN LEATHER TECHNOLOGISTS' ASSOCIATION (JILTA)

Indian Leather Technologists' Association is a premier organisation of its kind in India was established in 1950 by Late Prof. B.M.Das. It is a Member Society of International Union of Leather Technologists & Chemists Societies (IULTCS).

The Journal of Indian Leather Technologists' Association (JILTA) is a monthly publication which encapsulates latest state of the art in processing technology of leather and its products, commerce and economics, research & development, news & views of the industry etc. It reaches to the Leather / Footwear Technologists and the decision makers all over the country and overseas.

Advertisement Tariff

Full Page / per month

Black & White	Rs. 5,000.00/-
Colour (full page)	Rs. 10,000.00/-
Colour Insert (One side) (Provided by the Advertisers)	Rs. 5,000.00/-

Full Page / per anum

Front inside (2nd Cover)	Rs. 96,000/-
3rd Cover	Rs. 84,000/-
Back Cover	Rs. 1,20,000/-

Mechanical Specification

Overall size	:	27 cm X 21 cm
Print area	:	25 cm X17 cm

Payment should be made by A/c. Payee Cheque to be drawn in favour of :

Indian Leather Technologists' Association
and Payable at **Kolkata**

Send your enquiries to :

Indian Leather Technologists' Association
'SANJOY BHAVAN'
3rd floor, 44, Shanti Pally, Kasba, Kolkata – 700 107
Phone : 91-33-24413429 / 91-33-24413459
E-mail : admin@iltaonleather.org / mailtoilta@rediffmail.com
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JOURNAL OF INDIAN LEATHER TECHNOLOGISTS' ASSOCIATION (JILTA)

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India Progressing Silently

Indian economists have campaigned for a service-oriented export model for India, rather than following China's manufacturing-oriented model for rapid growth. Sri Raghuram Rajan has projected in his his lecture on globalization and climate change, Rajan focused on the positive effects of liberalization of services. Liberalization of services offers great potential for reducing inequalities in the industrial economy and also contributes to climate protection. Liberalization of trade in services is good for both industry and emerging economies, and even if India were to open up to China, the world would not allow India to follow China's path. He said the liberalization of manufacturing would reduce profits and create political tensions. "One of the reasons developed countries are upset about the opening of borders is that manufacturing workers are disproportionately affected by global competition and outsourcing, while service workers benefit. Both politically and economically, further liberalization of the manufacturing industry will reduce profits." explained that it can relieve the pressure of Such decentralization of services away from large cities will increase income in rural areas and provide an alternative if income is lost in agriculture. "The production of these services can be distributed across a country. In developing countries, this will reduce the burden on the large megacities that are becoming heat sinks and increasingly unlivable. It will also generate a source of income and a reliable stock of human capital to seed rural communities that would otherwise lack the economic capacity to survive the loss of agricultural incomes," Rajan highlighted. Here is how Rajan thinks the service can help mitigate climate change.

Therefore, there is a need to more effectively reuse materials (glass, wood, concrete, etc.) recovered during the demolition of climate-damaging structures. This is not the first time Rajan has spoken about the benefits of a service-driven growth model. He has warned in the past of the dangers of blindly following a China-led manufacturing growth model. He has frequently said India needs to focus on spending on education and up-skilling its youth in order to create jobs from the service sector rather than manufacturing.

Rajan also calls for a careful analysis of the merits of production-linked incentive (PLI) systems. A noted economic commentator, Swaminathan Aiyar, writing for ET, advocated a service-led growth model and said the future lies in services, not manufacturing. He said India needs to focus not only on services like IT, but also on education and health which have been severely underfunded for years. He believes an overly focused focus on providing subsidise to manufacturing exacerbates limited resources. The world is locked in a chip war and the budget is the perfect opportunity for India to prove that it is a serious contender for dominance of global wafer manufacturing.

Global Supply chains have not yet recovered from the adverse effects of Covid-19. In fact, it was the pandemic that caused the chip shortage. The far-reaching effects of the pandemic, including new outbreaks, labor issues, and geopolitical uncertainties, have compounded the woes of the components I used and aimed to build the chip industry to compete with the U.S. The factory floor was forced to suspend large-scale investments in can compete. Under these circumstances, the supply chain remains in a state of extreme turmoil, with no signs of recovery in the short term.

In such a scenario, India's efforts to incentivize continued domestic chip manufacturing could go a long way, not only for domestic needs, but also for growth as an exporter. Currently, most of India's semiconductor demand is met by imports from countries such as the US, Japan and

Taiwan. India has a sizeable human capital pool in this sector and currently lacks a consistent manufacturing base, hence the focus on design. In other words although India has chip design know-how, it has no choice but to rely on imports because it does not have a factory.

"India's biggest advantage is the entire design ecosystem. There are about 24,000 designers working in India. So, this is a huge ecosystem. So, there are talents, there are ways to apply talents, there are ways to apply talents, and this process of application exists. So, we have a huge advantage," said Minister of Railways, Communications, Electronics and Information Technology, Ashwini Vaishnaw. In December 2021, the government approved his 76,000 kroner Production Linked Incentive (PLI) scheme. The move aims to help India make the most of its global semiconductor shortage, increase production and reduce its dependence on imports.

However, there are some loopholes that the government must address. Even a small manufacturing facility costs billions of dollars. Given the introduction of new technological developments, costs continue to skyrocket. In addition, manufacturing units consume large amounts of clean water and require a stable power supply. "Even if the PLI program provided tax support for 50% of the cost of setting up at least two greenfield fabs, the current program spending on other aspects such as display fabs, test facilities, packaging facilities, etc. Not much will be left, said Rajeev Singh and Abhishek Malik, Deloitte Touche Tohmatsu India LLP: Component Incentives The program's goal is to develop a full electronics manufacturing ecosystem in India, an official with knowledge of the details of the plan told ET. It could further help Global giants to further deepen their local manufacturing. It may provide capital support. The final outline of the program has not yet been finalized, but we aim to announce it (with policies) by next fiscal year (starting April 1)," said the official, who asked not to be identified. The government has already shown its openness to joint venture (JV) partnerships for high-tech components with Chinese companies, allowing companies like Apple to further expand manufacturing in India. Component incentive schemes help companies in regions such as Taiwan, South Korea, and Japan to relocate or set up new divisions.

Electronic Industries has submitted a letter to the Government requesting an extension of his 5-year period of the Electronic Components and Semiconductor Manufacturing Subsidy Scheme (Specification) and an increase in spending of at least Rs 10,000 crore. Current Rs 3,000 kroner. Under the specification, the government provides a 25% financial incentive for capital investment in electronic component manufacturing, semiconductor or display manufacturing equipment, assembly, testing, and capital equipment that constitutes the downstream value chain of electronic products. "Since the program has been in place for three years, the Specs phase-out period will be March 2023, which means the industry will not be able to benefit beyond that period," the Mint reported. Construction of India's first chip factory has started as part of India's efforts to become a major semiconductor hub $3 billion international semiconductor Consortium ISMC. Together with ISMC, Foxconn of Taiwan and Vendanta of India are building their own Gujarat fab, a proposed $3.2 billion semiconductor park in Tamil Nadu by Singapore-based IGSS Ventures is. India must commit to the Multinational Supply Chain Recovery Fund to protect its supply chain from geopolitical risks, Deloitte's Singh and Malik say. Countries like the United States already have such security measures in place. Quad must fund specialized trailing edge fabs (45nm and above) in India, Japan or Australia while US resumes manufacturing at advanced nodes (<5nm). In recent years, the Center has increased import tariffs. Such policies could seriously hurt India's semiconductor prospects. "Reducing import duties could go a long way in building a strong multilateral semiconductor ecosystem. Indian factories are still highly connected to the World buying devices from one country and Because we are selling chips to the country," she added.

Goutam Mukherjee

Dr. Goutam Mukherjee
Hony. Editor, JILTA

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.

Our approach is modular, making it easy to tailor learning programs to specific needs. Stahl Campus® has at its core the drive to unlock human potential and make that new competitive advantage. By providing the possibility of sharing knowledge, we embrace our role in the dynamic leather and chemical industry. Stahl Campus® is a great opportunity to strengthen skills and capabilities in order to make working methods more efficient by sharing experiences and studying products and procedures.

If you're interested to receive more information on Stahl Campus®, please contact Prasanna Maduri **(Prasanna.maduri@stahl.com)**.

If it can be imagined, it can be created.

stahl


stahl
We imagine sustainable
pickle-free leather tanning
If it can be imagined
it can be created
Tanners benefit from higher process efficiency, reduced water, chemical and salt consumption and a reduced environmental impact. This makes it possible for tanners to have an efficient process that is also sustainable and yields ecofriendly premium leathers.
High-quality leather no longer forces a choice between responsible processes and efficiency. The main benefits of a pickle-free system that avoids salt addition during pickling are:
Reduction of water consumption by up to 40%
Shorter process time on cow, sheep and goat
Cleaner effluent, TDS reduction by up to 40%

STAHL TO EXPAND LOW-IMPACT AUTOMOTIVE CUSTOMER OFFERING WITH DEDICATED RANGE OF RELCABOND® ADHESIVE AND BONDING SOLUTIONS

Stahl, an active proponent of responsible chemistry, is to offer a dedicated portfolio of low-impact, high-performance adhesive and bonding solutions. As an initial step, Stahl will introduce three dedicated adhesive products, under theflRelcaBond®flbrand name, designed primarily for customers operating in the automotive sector, as well as other markets.fl

Stahl's expansion into the adhesive and bonding segment builds on the company's longstanding presence in the elastomer coatings market. With the RelcaSil®flproduct range, Stahl has developed a reputation for offering durable, reliable, high-performance coatings. The company is also leading on environmental stewardship by developing solutions that have a lower environmental impact than traditional market alternatives.

Stahl's adhesive and bonding product offering draws on the company's long-standing research and innovation focus in the automotive space. This is channelled through Stahl's dedicated Centres of Excellence for Automotive, from supporting product development to advanced technologies and testing equipment. Equally, Stahl is able to offer extensive technical and research and development support to automotive customers, including original equipment manufacturers (OEMs) and Tier 1 suppliers.

Mel Micham, Global Market Director, Stahl Performance Coatings: "At*flStahl, our aim is always to remain close to our customers and give them the tools and support they need to keep pace with fast-changing market requirements. This includes improving both the performance and the environmental credentials of products and applications. By building on our strong foothold in adjacent markets, we are proud to offer a unique range of low-impact, high-performance adhesive products that are truly best in class."*

Stahl's expansion into the adhesive and bonding market will begin with the following products:

RelcaBond® 815

RelcaBond® 815 is a low-VOC flock adhesive that provides excellent adhesion to vulcanized rubber and is ideally suited to automotive customers. This adhesive is non-staining, as well as being BTX- and HAP-free. It also offers superior flock density, durability, adhesion, and chemical resistance.

The product is designed for the adhesion of polyester or nylon flock fibers to a variety of elastomer substrates. It protects the rubber sealing from wear, facilitates glass sliding, and contributes to noise reduction and increased passenger comfort.

RelcaBond®650

RelcaBond® 650 is a glass encapsulation adhesive that offers a more sustainabl e, water-based alternative to traditional solvent-based solutions. RelcaBond® 650 provides a glass-to-polymer bond for automotive modular windows, including encapsulated side and rear windows and windshields. It works by forming a strong bond between the polymer and the window glass during the encapsulation process. Stahl is initially launching RelcaBond® 650 in selected markets, with roll-out on a global scale.

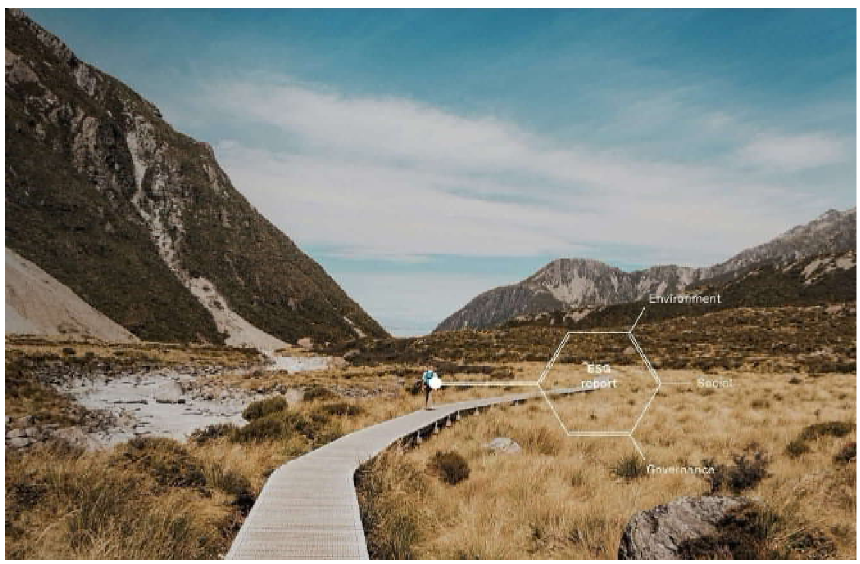
Rubber-to-metal adhesives

Stahl currently has a portfolio of rubber-to-metal adhesives in the development phase. These innovative solutions work on elastomers that need to be bonded to metal, and their applications extend far beyond the automotive industry. In particular, Stahl is focused on exploring the development of more sustainable, water-based alternatives to the traditional solvent-based products that currently dominate the rubber-to-metal adhesives segment.

Uwe Siebgens, Group Director, Performance Coatings & Polymers: *"With the new RelcaBond® series, Stahl is extending its portfolio of responsible chemicals into the field of adhesives and bonding agents. This represents a natural next step in our successful journey to offer sustainable, high-performing solutions for the coatings industry."*

(Stahl News – 12/10/2022)

STAHL UNDERLINES RESPONSIBLE SUPPLY CHAIN COMMITMENT WITH ECOVADIS PLATINUM RATING



Stahl, an active proponent of responsible chemistry, has been awarded the highest Eco-Vadis Platinum rating, placing it within the top 1% of companies assessed by Eco-Vadis. The award underlines Stahl's commitment to collaborating with its partners to reduce its environmental impact and build a more responsible and transparent supply chain.

Eco-Vadis is a globally recognized evidence-based assessment platform that reviews the performance of organizations across areas key of more than 90,000 companies including environmental impact, labour and human rights standards, ethics, and sustainable procurement practices. The latest report from Eco-Vadis highlights Stahl's positive progress across all these areas and builds on the Gold rating achieved by the company in 2021. Stahl's 2030 target is to maintain the Eco-Vadis Platinum rating by working closely with its value-chain partners to help them reduce their environmental impact – including by supporting their transition to renewable feedstocks. In 2021, 80% of Stahl's total spend on raw materials was supplied by Eco-Vadis-rated suppliers.

The new Eco-Vadis rating comes as Stahl accelerates its efforts to ensure a more responsible and transparent supply chain. Recent steps have included establishing a dedicated Supply Chain Transparency division within the company's ESG department. The division will be tasked with coordinating a new product development framework that prioritizes the responsible sourcing of raw materials. Furthermore, in July 2022 Stahl submitted a new greenhouse gas (GHG) emissions reduction target, including a specific commitment regarding the company's Scope 3 upstream emissions. Stahl aims to reduce these by at least 25% over the next 10 years, compared with the base year (2021). Stahl expects to achieve this reduction primarily by working with its suppliers to replace fossil-based raw materials with lower-carbon alternatives.

Ingrid Weijer, ESG Performance Manager: "*Achieving an Eco-Vadis Platinum rating is further evidence of Stahl's strengthened ESG focus and our commitment to working with our suppliers and other industry partners to reduce our environmental impact and build a more responsible value chain. By working side by side, we can achieve our common objective of helping limit the global temperature increase to 1.5˚C above pre-industrial levels by 2050, as agreed at the 2015 Paris Climate Accords."*

(Stahl News – 19/09/2022)

RESPONSIBLE CHEMISTRY INVOLVES RETHINKING PRIORITIES

Stahl's road to responsible chemistry started in 1978 with the launch of our first water-based leather finishing product. Since then, and over the last 20 years in particular, we have defined Responsible Chemistry and ushered it into our industry. Using our expertise to improve the performance of existing materials and productionize breakout ones, like fruit textiles, for example, that are even more sustainable. But we recognize there are more opportunities to do more. And that starts with our supply chain and the journey our products undergo from raw material to end of life.

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Our vision on responsible chemistry

As a company, we are actively trying to replace petrochemicals with renewable resources. But our road to responsible chemistry doesn't end there. From a sustainability viewpoint, it is equally important to look at what happens when the products we help to make reach the end of their respective roads. We focus on three priorities to improve our environmental footprint and that of our customers:

1. Usingfllow-impact manufacturing chemicals
2. Usingflbiotechnologyflto replace non-renewable resources
3. Using waste and recycled content contributing toflcircularity

Using theflLife Cycle Assessment methodology, we measure the impact of a product on the environment over the course of its life.fl

(Source : https://www.stahl.com/responsible-chemistry/vision)


GREEN
TECHNOLOGY
the power to heal our future
INSPIRING GREEN TECHNOLOGY

From the desk of General Secretary

LEXPO – XXXXI AT KOLKATA

The Kolkata LEXPO – XXXXI at Kolkata Ice Skating Rink was held from 23rd December'2022 to 1st January' 2023. Fourteen Exporters/Traders were participated in the fair. Handsome quantity of business has been transacted so far report collected from the participants. It has been observed that maximum of visitors were actual buyers of pure leather goods.

This was the first time LEXPO had no Entry Fees.

SANJOY SEN MEMORIAL LECTURE (21ST EDITION)

The 21st Sanjoy Sen Memorial Lecture will be organized by our association on 17th January' 2023, 3.00 pm (Registration from 2.30 pm) at Hall – A of Science City, Kolkata.

Mr. G M Kapur, Business Development Consultant, State Convener, INTACH has kindly consented to deliver the prestigious "Sanjoy Sen Memorial Lecture". Toppers of different institutes would be felicitated with Sanjoy Sen Memorial Medal. Invitation, both through email and post, has been forwarded to all Members of our association, other Organizations, Associations, Institutions and Industry.

PROF. S. S. DUTTA MEMORIAL LECTURE (4TH EDITION)

The 4th Prof. S. S. Dutta Memorial Lecture will be organized by the Southern Regional Committee of ILTA on 2nd February' 2023 at Chennai Trade Centre during India International Leather Fair' 2023.

Update of the progress will be shared in due course.

(***Susanta Mallick***)
General Secretary

YOUTUBE CHANNEL & FACEBOOK PAGE OF ILTA

An official **YouTube Channel** namely **ILTA Online** and a **Face Book Page** namely **Indian Leather Technologists' Association** has been launched for sharing the activities of our Association since November' 2020 and July' 2021 respectively.

You may find all the Lives / Video recordings of different Seminar, Symposiums & Webinars on both of these social medias along with our website **www.iltaonleather.org** time to time.

You are requested to kindly do **Like** & **Subscribe** the YouTube Channel and **''Follow**' the FaceBook Page to get regular updates on the activities of our Association.

RECEIVING PRINTED COPY OF JILTA EVERY MONTH

We have started to post Printed copy of JILTA from April' 2022 to members and all concerned as it was before Covid period. Simultaneously we have been sending the e-copy of JILTA through email also to all the concerned receivers.

If you are not receiving JILTA by Post or through email, may please verify your Postal Address and/or Email Id with our office at the earliest.

PUBLISH YOUR TECHNICAL ARTICLE

Faculties, Research Scholars and students of various Leather Institutes may wish to publish their Research / Project papers in an Article form in this monthly technical journal, JILTA.

Interested author may sent their paper (in MS Word format) along with a PP Photograph and Contact details like Email, Mobile etc. to our email IDs : admin@iltaonleather.org / jiltaeditor@gmail.com

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b) Kindly mention your **Membership No.** (If any) against your each and every communication, so that we can locate you easily in our record.

General Secretary and the Members of the Executive Committee are available to interact with members at 18.30 hrs, at our Registered Office on every Thursday

Solidaridad

With over 50 years of experience in developing sustainable solutions to make communities more resilient, Solidaridad has been working on many different issues, from supporting marginalized communities to fostering a more sustainable supply chain.

Solidaridad

switchasia GRANTS PROGRAMME

Solidaridad

switchasia GRANTS PROGRAMME

EFFECTIVE WASTE MANAGEMENT AND SUSTAINABLE DEVELOPMENT OF MSME TANNING COMPANIES IN KOLKATA LEATHER CLUSTER (BANTALA)

2022-2023

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Automative Leather - A Review

Prof. Goutam Mukherjee[1], Asit Baran Kanungo[2]

[1]Group A Officer, Govt. of West Bengal & Professor, Govt. College of Engineering & Leather Technology, Kolkata
[2]Vice President, Indian Leather Technologists' Association

Preface

Leather ware is a wisdom embedded in artificer. Despite its artisan image, there is a good case for arguing that leather making process is simply applied chemistry. Especially at moment, when tanners and chemical specialists invest vast quantities of time and plutocrat in researching, perfecting and fine tuning the chemistry of leather making process.

Firstly, leather tanning process passed naturally or was done by man using natural coffers of knowledge in a process that was the precursor of 'vegetable tanning'. But leather product has always looked for further effectiveness and better performance. Since 1840, chemistry has taken over the part of tanning agent from traditional tannins, alum and oils. In old footage and reports, we will frequently find stories about the downsides of chemicals, but at the moment this is a veritably different story.

Discussion :

Contemporary exploration by chemical suppliers and tanners focuses on minimizing the impact of chemicals on mortal health and the ecology. Over the last three decades, safe chemical operation and sustainability have become the emblems of a responsible tannery with high- quality products.

For chemical operation to make leather product, one of the major challenges is the diversity of styles. The process may be astronomically the same, but each type of leather operation and assiduity bear different technologies. Chemicals, either waterless or spray, are used to treat the hide, modify its structure and add the desirable characteristics to the final leather. The craft side of the assiduity further complicates effects, as each tannery follow its own distinct processes and form. An automotive tanner would not use the same styles for its leather as a shoe- leather tanner or automotive contender. This makes perfect sense, as each tanner relies on their hand book and feel for their product.

There are three main tanning systems in use at the moment, vide

- Wet blue tanning
- Wet white tanning
- Vegetable tanning

Leather is always around us. It is in our automotive mobile seats, upholstery, garments, shoes, and accessories. Not without reason, leather has been a material we have used for glories. Primitive man hunted creatures for food, and the hides were turned into a useful by- product leather, used for apparel, casing and protection. The ancient Egyptians wore leather sandals. The Greeks developed the first vegetable- grounded tanning styles to make leather last longer. In our modes of transport and homes, we used leather for its remarkable parcels, but how is it actually made?

- 3,30,000 soccer fields comparable to areas of beast hides
- Every time 2,200 square km of leather is created out of over one billion hides, which the meat assiduity produces.

That's the equivalent of 330,000 soccer fields or an area slightly smaller than Luxembourg in Europe or Rhode Island in the US. To make leather from these hides, it goes through a process of five ways which are both deeply traditional and hi- tech.

Let us go through it step by step to see how the leather for our cars is made.

Corresponding author E-mail : gmclt@hotmail.com / gmgcelt@gamil.com

1. **Slaughterhouse :** There is no reason to beat around the backcountry; all the hides we use for leather are a result of food consumption. No surprise also, that the tanning process of leather starts right there, with the leftover hides. These, if not used, would constitute a vast quantum of waste and pose as obnoxious waste. Hides are frequently cooled, interspersed, and dried to stabilize them, which makes it possible to start tanning them later. Generally, tanneries try to use fresh hides, as this limits the use of coffers and the environmental footmark of the process, but this is not always possible as they need to be transported to a tannery. That is where the real process begins.

2. **The Beam house :** When the hides arrive at the tannery, they enter the beam house. Historically, this was a part of the tannery where hides used to be strapped over rustic inclined shafts for preparation of tanning. The name just stuck. Currently, it is an integral part of the tannery, where the hide is processed and prepared for tanning. This is frequently a significant process, involving chemical treatment for dehairing, removing leftover fleshes and drawing the hide. Chemical inventions have made it possible to use further environmentally friendly technologies in this process, indeed going so far by using updated biochemistry. This is important, as 70 percent of water- use in the tanning process takes place in this phase. The pH value of the hide is acclimated, and the protein structure is opened up, made ready for the tanning process. The beam house phase is the process that uses the most water for its processes. Ultramodern water consumption pattern reduces the impact of this process.

3. **Tanning :** Until this point, we have spoken about hides. Tanning is the process where the protein structure of the hide is changed into a stable material i.e., leather. By tanning the hide, it gets defended against lump, heat and micro-organisms, and other decaying factors. Though leather is a long- continuing material, it is still a natural material that can ultimately be broken down and completely returned to nature. There are colorful post tanning styles, and those applied are frequently grounded on further responsible chemicals which has helped to reduce the carbon footmark significantly. Chemical use in tanning process is frequently described as an environmental issue. Responsible and eco-friendly chemistry has changed that mostly.

4. **Post-tanning :** After tanning the hide, what you have is called leather. Yet, it is not in the condition where it can be used, so it needs a lot of mechanical processing at this phase. Water is removed from the leather through sammying operation which is basically a process involving large breakers that press the water out of the material. Frequently hides are resolved at this stage, e.g., a grain side (the top) and a flesh side, which is frequently used in accoutrements like suede. Eventually, the leather is shaved and trimmed to produce an indeed, neat looking material. Frequently it is also stretched and smoothened out in this process before it goes on towards retanning process.

5. **Retanning :** The leather goes back into the tanning drums for another spin, only this time it is done to give the leather it is defining characteristics. That means fatliquoring, to ameliorate the wimpiness and incorporate strength, but also add waterproofing properties to the material a bit. The leather is also colored, and treated with other chemicals to make it ready for its final use. What exactly is added depends largely on where the leather will be used for. Upholstery requires largely resistant leather, where garments need to be soft and malleable. Automotive leather needs to meet exceptional norms on all fronts, as it will have to repel staining and soiling, but also numerous environmental factors and diurnal use.

6. **Finishing :** After leaving the processing units, the leather is finished to give it a final look. Then leather is given a color and matt or buff finish. Any grain blights or defects are fixed with a base fleece. A great coat gives the final touch, and after testing, the leather is allowed to go for use. In some cases, the manufacturer of the seats or automotive upholstery companies takes care of the final finishing of the leather. This allows them to add a specific touch to the interior or customize the aesthetics to meet clients' demand. A final treatment with aftercare results guarantees a long life for this material.

Thereby, we have it that is how the leather for our automotive seat is made! It is how from the food assiduity is turned into a sustainable, durable material to be enjoyed for times.

Requirement of Water :

Now, water is lifeline of us as well as of processing of leather.

Water is sourced from colorful origins, and artificial operations veritably infrequently use any of our drinking water resources.

There are three types of water that can be sourced for the leather making process

- Blue water – clean water drawn from service providers, gutters, lakes and groundwater
- Green water – rainwater or water collected through evaporation (not part of face or groundwater)
- Gray water – water recovered from domestic use, containing mild adulterants (banning sewage)

Mapping the sourcing of water is important to get an idea of the water impact of product. For illustration, a kilogram of beef uses 15 thousand liters of water to produce. Of this, on average, 93 is green, 4 blue and 3 Gray (Mekonnen & Hoekstra, 2010). Sourcing varies hectically depending on which part of the world you are in and what the locally available coffers are and that says a lot about the sustainability of practices and their overall impact on the terrain and mortal weal.

Presently, there are at least 17 nations facing extreme water stress (Hofste et al, 2019) and the UN recognizes the urgency towards the water quality sustainable development goals (SDG). Yet, the SDGs form a network and tries frequently to have a knock- on effect. A good illustration are SDGs related to food product (SDG thing to Zero Hunger). Food product relies on husbandry and artificial processes that need riotous quantities of water. Effects on one thing can negatively affect the other, which forms a significant challenge.

Water Footmark of Leather :

Since leather is a by- product of the meat assiduity, the water footmark is applicable in totality. Product order rules have determined that beast parenting and husbandry water- use should not be allocated to leather fully, then follow the leather PEFCR (Product Environmental Footmark order Rules. Anyhow, in the public eye, the water footmark of meat will be connected to leather as well. But how much does the water footmark actually tell us about the sustainability of leather product?

There is a correlation between a tannery water footmark, carbon footmark and energy footmark. However, there are numerous impacting factors similar as on- point recycling, renewables and so on. Two tanneries could have the same water and energy consumption, but have fully different carbon vestiges. Relative exploration set up that tanners perform with a high- water footmark frequently have a low energy footmark and vice versa (Laurenti et al, 2016). There are tanneries who manage to lower both, but it serves to indicate the complexity of environmental stewardship. Really assessing the sustainability of leather grounded on water operation alone is thus parlous.

Reduce, Exercise and Reclaim

No drop of water is wasted in European tanneries and nothing re-enters face water bodies without expansive sanctification. Utmost tanneries go a lot further however and water leaves their processes indeed cleaner than it came in or is used in indirect processes. EU-wide, expansive systems cover and reduce water consumption and nonstop enhancement helps reduce consumption. In Italy and other corridor of the world, tanneries are clustered together and directly connected to treatment shops to complete the process of returning clean and healthy water a text illustration of assiduity collaboration driven by a participated commitment to environmental sustainability.

Below are numerous of the suited practice espoused by ultramodern tanneries to minimize their water footmark and cover their original water resource :

1) They reduce water consumption with smarter processes, profitable water use and integrated processes (combined process way), with more effective chemical use. UNIDO (2011) reports important water can be wasted, and reducing water waste also involves reducing the quantum of solid waste in the water itself with filtration and waste processing results.

2) They exercise water in alternate or indeed third batches to optimally use the active agents in the water. Sustainable chemical results can play a major part in realizing this with biodegradable and reactionary/petroleum-free base accoutrements. The more effectively chemicals bind and degrade, the easier it is to exercise or discharge wastewater.

3) They reclaim water sources by working towards closed circle systems with integrated on point filtration and effective waste disposal and processing. Reclaiming chemicals fits the same earth which numerous tanneries formerly do. Inventions in tanning technologies (chemical and handyperson) and water operation play a major part in

adding the water footmark. The challenge is developing an acclimatized operation system that fits a tanners' unique blend of accoutrements, processes and practices. Monitoring and measuring water flux and effluent helps get a better grip on water operation. In this way, tanneries can help contribute to cleaner face value of water. Excellent sanctification installations and performance make a world of difference. Many exemplifications of innovative styles for water sanctification include :

Primary Treatment (Effluent Wastewater) :

- Gravitational settling allows heavy solids to fall out of the resultants and settle at the bottom of the water as sludge, which is fluently removed.
- Skimming is the physical act of removing fats on the interface of the water, precluding them from remaining part of the effluent.

Secondary Treatment (incompletely-Gutted Wastewater) :

- Anaerobic digesters break down the organic content in the waste water in an absence of oxygen.
- Chemical flocculation helps produce sludge and make chemicals applicable without the use of natural sources.
- Filtration is done by using a membrane and machines to remove adulterants. This is a physical means of treatment.
- Tertiary treatment (clean water)
- Teardrop beds let the water inflow over jewels covered with microbes that drop out the adulterants.
- Reed beds have factory roots into the wastewater sluice, which are suitable to absorb adulterants and clean the water.

Each tannery (or effluent treatment plant) will have a range of these technologies as well as others, named to produce the fantastic results for their particular conditions. The result for European Tanneries should be that discharged water that meets the EU Industrial Emissions Directive (frequently exceeding it, a source of pride for tanners). So, what is coming? The coming frontier is aimed at a better water footmark. The water footmark is presently calculated using ISO 14046. This standard only covers direct water use, where circular water use (virtual water that is used in circular processes like the cattle parenting) could tell us important about the full impact of a process. Part of it is in the allocation in the Product Environment Footprint Category Rules (PEFCR), which is a step forward for translucency. Secondly, water footmark is directly connected to the ecological, energy and carbon footmark. An integrated, holistic approach is necessary to completely comprehend the impact of tanners, so we get the full picture and not insulated goods. That way, we can truly reduce the environmental footmark. An hourly- mentioned issue of the food assiduity and its by-product leather is the carbon footmark of cattle rearing and meat product. By association, this is for egregious reasons affecting the perception of leather. Product order rules state that only a small bit of beast parenting is to be attributed to the carbon footmark of leather, yet consumers are likely to view the two as interdependent. But if we really want to understand the environmental impact, we first need to understand what a carbon footmark actually is and what it constitutes.

Carbon Footmark

Let us launch by clarifying what we actually talk about when we mention carbon footmark. The description would appear enough clear- cut as it is the measure of the quantum of green house emission produced by a process, association, or region (depending on what one wishes to measure) over a set period. The name itself implies a focus on carbon dioxide, which is one of the green house gas (GHG) directly linked to climate change, and frequently on the lips of activists, politicians, and intelligencers, generally shortened and more known under its chemical formula CO_2, it is not the only GHG around. GHG is used to indicate a multitude of gases that affect global warming. CO, still, is the one we frequently concentrate on with measures and reporting. When associations mention advancements or anticipated goods of enforcing changing factors, this is also the case. A carbon footmark LCA (life cycle assessment) will tell whether a factor is contributing to the position of greenhouse gas or not (or to what position of donation it is having). Every LCA of meat, milk, and leather, thus, provides us with an estimate of the carbon footmark and helps to identify points of enhancement. As the term 'carbon' suggests CO_2, these results do not always give you with a fully clear picture.

The Green House Effect

CO_2 is not the only gas contributing to the green house effect. It is important like the green houses we use for growing crops;

this term describes the atmospheric effect were chemicals in gaseous form cinch- in heat that is emitted from the earth. They act like a giant glass green house keeping warmth from escaping, the global temperatures gradationally increase, which can have disastrous consequences in the long run for our earth, with extreme rainfall events, pitfalls to the global food force, acidification of the abysses and rising ocean situations. Scientists argue that some goods are formerly showing and recent data shows that the current GHG situations have dropped significantly as a result of the braked or halted business preventing the long- term future requires limiting the average increase to below 2□C, which is a daunting task. Achieving this lofty thing requires change and numerous diligence have precisely acclimated their styles over the last decades. The food assiduity is no exception, yet falls victim to a peculiar confusion about the language. Let us look into that.

The Food Assiduity and Green House Gases

The main gases that contribute to the green house effect are carbon dioxide (CO_2), methane (CH_4), nitrous oxide(N_2O), and the gas groups hydrofluorocarbons 9HFCs), and chlorofluorocarbons (CFCs). Water (H_2O) is technically a green house gas but is not considered part of the problem. This easily shows carbon dioxide is not the only structure block of the green house effect. That makes an important point because a lot of the current debate on environmental impact focuses on this confused notion of a carbon footmark seems explicitly to zone in the food assiduity and cattle rearing grounded on the idea that it produces a lot of CO_2. There are indeed significant emigrations from this process.

Creatures do produce emigrations. It is important to note, still, that not each green house gas contributes to the effect in the same manner, and cattle substantially emit methane (CH_4), not CO_2. Where CO_2 lasts for at least 1000 times in the atmosphere, methane is broken down in just nine times.

Part of this confusion stems from the use of a CO_2 fellow (CO_2-e) to establish the warming eventuality of each gas and the current computation of Global Warming Potential (GWP) that assumes that all GHG have the same impact over the domestic time period. This dimension system, unfortunately, excludes part of the perceptivity demanded to understand the impact of each assiduity completely, as explained in a recent paper (Lynch et al, 2020). The factual emigrations of the food assiduity have been enough harmonious over time in recent times, as we will discuss below. The type of dimension used for LCA analysis that's honored as the model suited to beast husbandry is the Global Livestock Environmental Assessment Model (GLEAM) and is guided by the language defined in the Intergovernmental Panel on Climate Change (IPCC) forum, specifically IPCC (2006).

Food Assiduity Migrations and Leather

What does all of this have to do with leather? A frequent argument against the use of leather focuses on the impact of cattle rearing for food. As a by- product from this process, leather is held responsible for a proportion of this footmark, not all of it. Still, the rapid-fire deterioration and recycling of methane in the atmosphere means that any gases emitted by the current herds are stable as their emigrations are harmonious with herds of 10 times further. Yet, smarter husbandry practices indeed have a reductive effect on the impact of cattle rearing, of which regenerative husbandry is a high illustration as it helps fertilization of the soil. Rich soil is home to a rich biodiversity of shops and microbes that pull redundant carbon dioxide out of the atmosphere.

Experts have said that a reduction of meat and dairy consumption are implicit contributors to pushing back against climate change, but fully discarding these food sources is another matter. In fact, there are far- reaching arguments concerning beast husbandry as an integral part of this fight for our earth. Because of that, the by- product leather will remain a resource extensively available with distinct rates that fits the earth of an indirect frugality. There has been a long and complicated debate on how to measure the environmental impact of leather product. In recent papers, where leather is compared to other accoutrements, the content of its resourcing comes up as a divisive aspect. Chancing a way to define, measure directly and dissect the environmental impact of leather has been a significant challenge, but the blessing of the Product Environmental Footmark Category Rules (PEFCR) by the EU's Environmental Footprint Steering Committee is a defining step forward. It is important to note that over to 16 impact orders make up the environmental footmark of a product. The impact on climate change, or carbon footmark of leather, is just one of them. This is frequently overlooked in public perception, perfecting therefore a tannery's environmental performance which means also reducing water consumption and optimizing chemical use, enforcing effective waste and emigration operation and some other aspects. Major advancements have been made in all these areas. At the moment, the PEFCR for leather eventually offers a comprehensive system of measuring its impact.

Beast Parenting, Leather and Product Impact

The big question about the footmark of leather has always been about the addition or rejection of beast parenting, as it significantly affects the computation. The major part of the environmental footmark of leather, if included, would be in beast parenting. This would hide the factual impact of leather- product, which is what makes the difference between one and the other tanner. This is why, the system boundaries, conceded by the PCR- CEN Standard EN 16887, set the launch of the lifecycle of leather at the slaughterhouse, where the hide or skin is actually attained. The reason is that skins and hides are a non-determining by- product of the food assiduity. This means that no beast will be massacred for its hide or skin and that the quantum of available leather will always be determined by meat consumption (hence non-determining). This does not change the fact that the footmark of beast parenting is an important factor, as it'll continue to affect public perception and hence the vacuity of leather. This is an important question, and the PEFCR's close- to- zero- allocation of impact on skins and hides provides formerly a reasonable base for assessing the environmental footmark of leather. Leather manufacturing may depend on the food assiduity, but the other way around this is not so. In other words, the high reason for cattle rearing in the agrarian sector is food, not leather. This form of attributing process impact on the main product is not a novelty but grounded on consequential LCA methodologies, which distinguish between products and by- products on the one hand and by- products and waste, on the other hand. However, the impact cannot be credited to a by- product B, which is a necessary residue or wastes, If the process intends to realize a product.

Life Cycle Assessment towards a Methodology for Impact Assessment

The PEFCR opens the way for methodically assessing the impact of leather on the terrain, with regard to global warming, acidification, ozone reduction, resource reduction, eutrophication, etc. The PEF system is grounded on a so- called attributional Life Cycle Assessment (LCA) methodology, where consequential aspects are not yet honored. This slows down the criterion of allocation for hides and skins. The current allocation rules are, still, not inflexible and there are chances for correcting the EU tool to measure the impact of leather and identify openings for enhancement

The Real Footmark

To understand why LCA is essential, it is important to realize it is not only a measuring tool. It offers a fact- grounded and scientific approach towards environmental impact. The PEFCR for leather enables tanners to look at the entire process and how it affects colorful ecological orders, which are frequently simplified by talking about the carbon footmark alone. It necessitates a qualitative collection of data on chemicals, water and energy, but also air, waste, and the end of product life itself.

Forthcoming way taken by enforcing PEF

Formerly, a lot of exploration has been conducted to find crucial process way that can be bettered in leather product. The dehairing of beast hides, which is one of the first ways a skin or hide undergoes, was traditionally done using chemicals that significantly impacted the eco-toxicity of brackish and marine waters when disposed of. The beam house phase, as this step is called, could use up to 70 of all the water used in the leather product process and could be a source of water eutrophication if not controlled.

After identification of this issue, druthers have been introduced, similar as enzymes for the cleaning of the hides. The hair save system has been in use as the suited available technology for at least 20 times. Dimension of the impact of enzymes compared to chemicals through an LCA system shows conclusively that the enzymes have a reduced impact, particularly, when the waste material is also composted. The PEFCR helps to identify crucial points of enhancement in the process that will help reduce the footmark indeed further in the future.

Towards an Environmental Product Presentation

For automotive organizations, the product environmental footprint (PEF) opens new possibilities in consumer translucency. The only strike, for now, is that this methodology does not allow for a direct comparison between different products (e.g., leather versus plastics). Piecemeal from the egregious benefit of having data on colorful interior options, it also enables communicating to consumers and business mates with clarity on the leather's environmental impact. In the future, this is likely to come as a legal obligation. Such a development would enable green enterprise to be captured in results and data, rather of bare green washing statements. CO2 parity as carbon standard

Carbon Dioxide Equivalence uses CO_2 as a base to establish the implicit impact of emission. The base value for CO_2 is thus a CO_2-e of 1, which represents one metric tonne of CO_2. This form of conversion is veritably useful, but also creates contestation as the global warming eventuality of different gases changes over time. The suited illustration is methane in comparison to CO_2, the first has a CO_2-e of 28, but its effect only lasts for 9 times. CO_2 stays active in the atmosphere for 1000 times, so has a much longer warming period and thus a bigger impact. The current system of calculating the CO_2-e does not take this difference in life into account.

The Carbon Footmark of Beast Husbandry

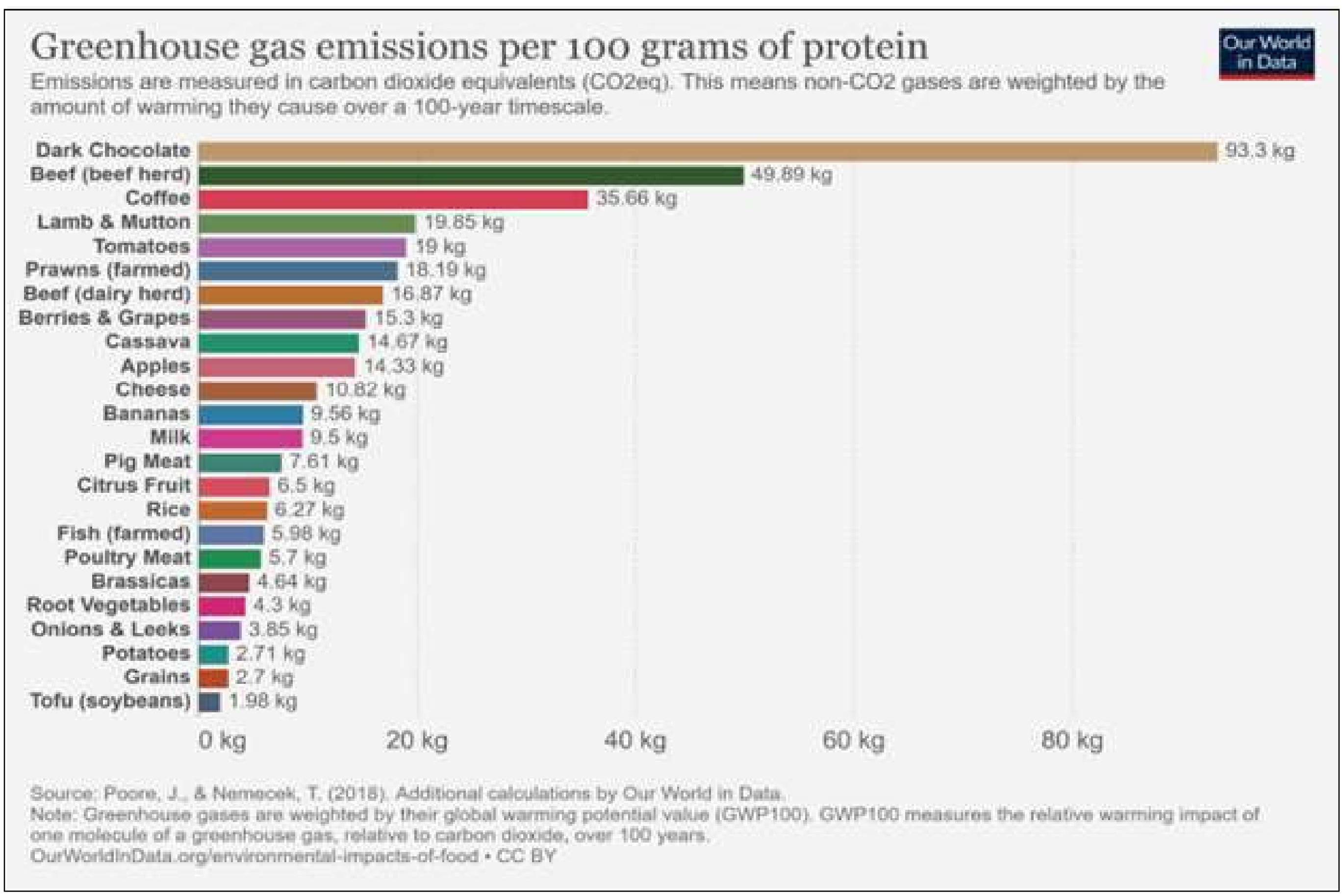
The global footmark of beast husbandry is measured using direct dimension in the air, but the donation different sectors make are estimated. These estimates are continuously bettered as better data comes by. As mentioned ahead, utmost of the beast carbon footmark comes from methane, a short- lived gas.

In 2005, the total amount of GHG emitted by the world was 49 Gt CO_2-e. Cattle accounts for 7.1 Gt CO_2-e, which breaks down like this :

Methane	3.2 Gt CO_2-e
N_2O	2 Gt CO_2-
CO_2	1.9 Gt CO_2-e
Total	7.1 Gt CO_2-e

The exact breakdown differs per country, feed and rearing methods.

Of the 7.1 Gt CO_2-e total emissions, 65% comes from cattle rearing (4.6 Gt CO_2-e). This represents 6% of the total global GHG. High-income countries have up to 36% fewer cattle, but still produce the same amount of meat. Beef contributes 2.9 Gt CO_2-e and milk is 1.4 Gt CO_2-e. Estimates of how much carbon footprint is associated with a kilogram of aggregated meat and milk protein is placed at 160.3 kg CO_2-e/kg protein.

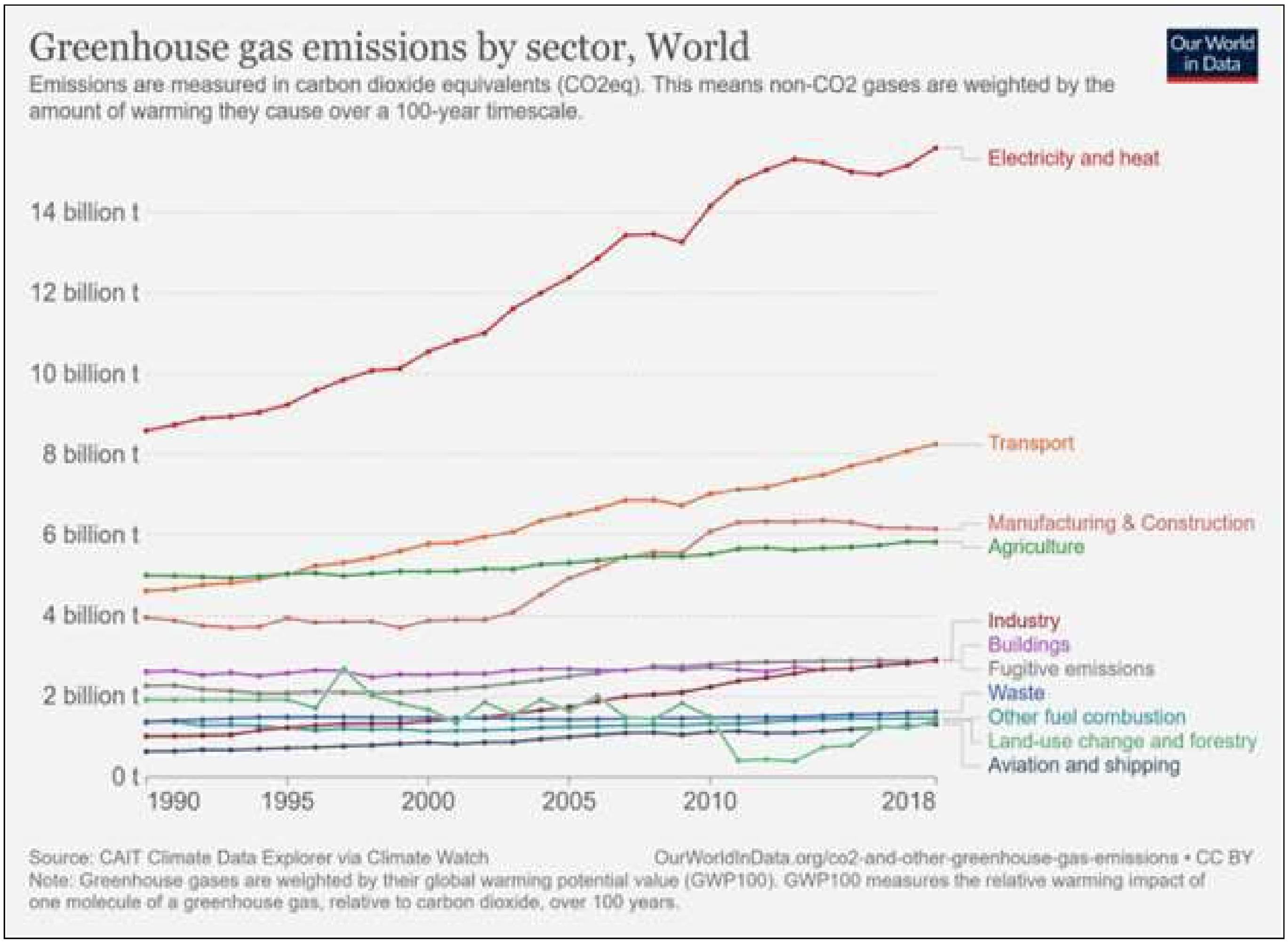


Regional differences in CO_2 Footprint

A clear assessment of the cattle-farming footprint has been provided by the Food and Agriculture Organisation (FAO) of the United Nations in a report on the relationship between livestock and climate change (Gerber *et al.*, 2013). It states that livestock contributes around 14.5% of global emissions. Obviously, there is not one standard for emissions from cattle rearing and regional differences can be significant. For example, livestock plays a smaller part in the total of GHG emissions in the USA, with only 3.6%. In high-income countries almost 85% of the GHG comes from transport and energy generation. The type of animal (ruminants vs. non-ruminants), type of farming, manure management and animal age all affect the final emissions. The longer life an animal has, the greater the emissions.

A Necessity for a Growing World

What does this all mean? One obvious conclusion is that CO_2-e helps to show that the food industry is only one of the marginal contributors to global warming. Even more important, according to Haniotis (2019) global beef consumption has increased by 0.6%. This would seem contradictory to the previous statement, but we have to look at the growth of the global population, which is at 1%. This means beef consumption is relatively dwindling.



Yet, meat plays a vital part in feeding our growing population and the land livestock occupies (around 70% of farming land) is unsuitable for crop farming. Many plants that livestock consume are inedible for humans and many other mammals. These plants contain cellulose and cattle can break this down and release the solar energy contained in this vast resource.

Encyclopedically, 1 billion people make a living through husbandry. This includes making of leather and leather product, which uses the leftover hides in an indirect way. Our world may be changing, but cattle remain a most vital part of our lives. Colour is applied to leather in different phases of the tanning, retanning and finishing process. Indeed, after wet processing, color changes can be made with colorful finishing technologies. Because color in leather is achieved through a combination of dyeing and spot finishing, the nuances for the material are unlimited and that has numerous advantages for our automotive innards.

Think of custom innards, where you can have the color you ask, but also in different tones and goods. Leather is easy to produce in unlimited, knitter- made designs and colors. That inflexibility opens up endless possibilities for personalized innards. Other accoutrements have to be produced in bulk, which makes customized innards a precious and frequently unattainable commodity.

When we have the leather seats of our asked look and feel installed, we clearly will enjoy them for numerous times. After all, automotive leather is finagled to be colorfast and repel fading or other attritious effects by sun, sweat, and other forms of material stress. Unlike other accoutrements, leather does not bear replacing features for numerous times.

Tanneries use color- checking instruments to ensure 100 color matches. So, what color would we choose? The way we use our transport which is changing and this affects our choice of innards. Through the times our vehicles have come more silent and luxurious, but electronic driving is opening up whole new possibilities, and demands new comfort norms. Shared mobility is the rearmost trend that shakes up our modes of transport and with people looking for durable purchases, we demand more from our automotive innards. Leather has always been a desirable choice for interior seat and trim and not without reason; the material has numerous functional parcels coupled with outstanding performance and continuity.

Preferred Interior Material through the periods

Leather has been a part of our modes of trip for periods, from hydrofoil chair cushions and carriages to our ultramodern day yachts, public transport, aeroplanes and automotive. Historically, it has always been a favored material for a number of reasons and one of them is its life and abidance. Indeed on old automotive there might be some rust then and there, but the leather, if treated well, remains in pristine condition. But those are big words; what parcels does leather actually have that give it such an extended continuance?

Our automotive is used daily and that includes the innards. Every time you go for a drive, you sit down on our seat, we handle the steering wheel and maybe you put a mug of coffee in the holder. You hit a bump, the coffee tumbles. You fidget in our seat as you sit down on our keys. You pick up our youthful child from football practice, who jumps in the backseat with dirty shoes and all, dropping the trouncing on the door with the shoe harpoons. All this is a diurnal ritual for us and the interior bears it with us. That requires some exceptional performance rates.

Leather has a notable advantage on other interior accoutrements, similar as replicas and woven fabrics. This is due to its natural origin, which makes it a material that’s made to acclimatize and respond to a diversity of circumstances. For illustration, it can take a remarkable quantum of pressure and recover without tearing, and its rigidity prevents cracking and makes it rub- presto (color would not rub off the leather). Hides are made to cover and contain, which is a quality leather retains. So, it can handle that jump onto the seat, and the imprint of the soccer shoes.

Enhancing Homestretches to Repel Liquids, Dirt and Bacteria

Leather by itself is well conditioned to repel liquids and dirt, but thanks to high- end finishes it becomes indeed more resistant to smirching, staining, scuffing and scratching. Leather has a flex resistance that knows no equal, which also ensures excellent adhesion of flexible coating systems, which infrequently crack or peel, making it a top choice for innards. The revealed coffee or may be a drop of water from a bottle will stay on the surface and can be fluently gutted. That is because leather is water- resistant and this can be enhanced with coatings (they used to indeed use leather for drinking vessels).

Only in extremely wet circumstances might leather not be suitable to handle the humidity and need a little care. Also, it is a bacteria and bug repellant material, which is a huge plus in vehicles that we use increasingly. With the dawn of participated mobility, these rates can offer a huge advantage in automotive conservation, though proper care is still needed.

Heat and cold wave can greatly affect accoutrements, as it can make them swell and shrink which could beget severe deterioration over time. This is particularly true for emulsion accoutrements, which warrant the capability to handle changing conditions. Leather has that capability in its veritable nature as it expands and shrinks with heat to save its integrity A lot of this has to do with the porous fiber structure that can expand to breathe, but also contract by end. In fact, leather is one of the utmost heat retardant accoutrements, thanks to its natural capability to repel heat. It will maintain its color and appearance, indeed with nonstop exposure to the Sun, thanks to its excellent light fastness. Day in, day out, our automotive innards will maintain its supple, comfortable nature, ready for the coming drive.

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Statistics tell us that 1 in 100,000 people failed in fires between 2001 and 2016. Yet in vehicles, the chance of this passing is doubly as high. This is grounded on figures reported by the Center of Fire Statistics (CTIF). This number is significant and each life lost to fire is one too numerous. That is why it is important, when we choose the accoutrements for our homes and cars, to look beyond comfort and appeal. We can enhance our safety quite a lot with the right material choices and measures. Leather, as one of those material options, has the great benefit of natural flame-retardant parcels, which is vital when the stakes are loftiest.

Safety from fire when every alternate counts

There are a number of ways to test the flammability of accoutrements and generally this is done according to specifically set ISO norms (or ANSI in the United States). These norms allow for a universal way of measuring the flame retardance by comparing the way accoutrements respond. We could let the hare and tortoise run the same race in water and the result would be veritably different. That is why these norms count; where samples are exposed to heat and flame in standard conditions and the burning speed is covered for comparison. The slower the fire races down a sample of the material, the further flame resistant it is.

ISO-norms for interior material and leather used to assess the flammability are ISO 37951989(E), EN ISO 69402004 and ISO-56600-12002(E) (now revised by ISO 5660-12002). The styles are veritably and rigorously described. With these tests, the rates of natural leather on flame resistance get clear.

- Exposing natural leather to temperatures of 130-170°C for extended ages does not do any structural damage.
- Leather can repel short- time exposure to temperatures up to 200°C.
- Extended exposure to temperatures above 200°C results in pyrolysis (the material decomposes, or becks, which is obviously unrecoverable).

Now, expansive testing proves that leather outperforms other accoutrements when it comes to flame resistance, similar as fabrics or replicas. It also is resistant to ignition, which is particularly applicable for fire forestallment as 80 percent of fires cases are associated with “flashover”, which is what we call the fast and unforeseen spread of fires. Decelerating down the fire and structure material walls into automotive upholstery helps to help this from being. But is the natural quality of leather in defying heat up to 200°C enough?

Flame retardants to enhance natural rates

During an automotive fire, it is only a matter of twinkles until temperatures soar to an astonishing 900ºC. During trials, it becomes clear how vital the flame- retardant parcels actually are, as the first many twinkles of smoldering are still at lower temperatures, before the flame spread and 'flashover' occurs. This is where leather can buy us vital time, particularly with flame retardant technology (treatment with fire retardant chemistry) that slows down ignition and eventual combustion. It is the last line of defense that can make the difference between life and death. That is why flame retardants matter, as they enhance the vulnerability of parcels that are formerly there and that is again where leather has the advantage, as its natural rates can be bettered during the whole product process from tanning to finishing (and aftercare). Other accoutrements substantially calculate on treatment during the finishing stage, where leather is enhanced to its veritable filaments. The difference is that the burning speed of artificial PU laminate was tested in comparison to leather, it showed a burn length of +82%. If we go back the race, it means the PU is the hare that finishes almost twice as fast! Now, in a starting car fire, that means a difference between having two minutes or just one.

Chemical Use in Fire Safety

Within the EU, the use of chemicals is precisely covered. The leather assiduity is always looking to reduce its environmental footmark and looks for safer water- grounded chemistry when It comes to perfecting fire safety of interior accoutrements. This way, leather manufacturers give high safety norms, but with a lower environmental impact, to make the difference there where it matters most.

Utmost consumers are not apprehensive that there is any difference between the leather of their shoes, lounge, or automotive seats. Leather is leather (unless it is not), but near examination reveals that there is a big difference between the accoutrements used in fashion or upholstery and the bones used in our automotive. Automotive leathers are an entirely different product, largely engineered and designed to meet the most strict performance, aesthetic and environmental conditions, and client demands

Quality and Performance

Leather is a natural product, which means there is a certain position of variety. Typically, it is the grain that tells us about the quality of commodity. Yet, like with every product, you need to find the right balance between quality, performance and operation. Some exemplifications in different kinds of leathers are that upholstery leather will need to be softer and further malleable than shoe upper. Fatliquors are used to make the hide fibres soft. Belts, saddles and riding boots have a focus on appearance but are working particulars that need further firmness and may have lower wispiness. Chamois leather used to dry our automotive uses fish canvases.

Why are all these leathers produced with different parcels and not just treated to have the suited on all fronts? Different ways of making leather result in performance acclimatized for the purpose. Unlike the leather for our jacket or shoes, automotive leather would be too firm. Compare it to fabrics the material that would be beautiful for a marriage gown is a horrible choice for hiking gear. Another illustration is denim shirts, which are a important softer, thinner denim than is used for our jeans. Further and different performance rates than demanded would simply be wasted and use further coffers than demanded.

Automotive leather is a peculiar case in that regard, as it is one of the leathers that needs to do a lot. Its property is not singularly concentrated on hardness, inflexibility, resistance, or touch. It is all of these parcels. Let us have a near look.

Automotive Leather – Consistence

One of the differences is in the consistence of leather. Weight reduction in automotive innards is a focal point and has been for some times, especially with the increase of electric automotive mobility. Other mobility sectors face the same challenge because lower weight means a reduction in energy consumption. The consistence of leather, however, determines how strong and resistant it is to damage. Automotive leathers are generally lower than1.4 mm thick, with face coatings lower than 50μm thick.

To achieve this consistence, the hide is shaved. The consistence is always quoted as a range by the tanner as it will vary by as little as 0.1 mm (one-tenth of a millimeter).

Automotive leather - Performance

Another major difference between automotive leather and other leather types are performance norms. Consumers anticipate advanced prospects from automotive leather compared to other leather types. After all, automotive innards are subordinated to heavy use, high temperatures, Sun(UV), staining, and smirching. Numerous of these issues are formerly dealt with by the natural parcels of leather. Norms continue to ameliorate and coatings enhance the natural rates of the accoutrements. Lightfastness, rubfastness, chemical resistance, and inflexibility help automotive seats to repel the diurnal wear and tear, gash, clang, stain, and smirching. Temperatures in vehicles can go up to around 100^{0}C, so stopping the leather from shrinking or cracking is vital. This is one of the reasons why high specification leather is the favored choice for mobility innards outside of automotive. Seating in aeronautics takes a heavy beating day in, day out, especially with regard to smirching. Leather only needs occasional wiping down.

Obviously, these parcels are not unique to automotive leather, but combining high- resistance situations with a affable touch and feel rates is where it stands out.

Automotive leather - Look and Touch

Leather gets a lot of fresh parcels during the finishing stage. It determines resistance situations, but also the final look and sense of the material. Automotive innards demand perfection, so every leather is finished in such a way to produce an equal face and indeed cut. It needs to be flexible as well, move with its stoner, but bounce back latterly.

Special coloring using dyes and pigments add a unique appeal, frequently with a dull look effect. This serves both aesthetic and safety requirements, as sun should not be reflected from the shells. Special coating technologies help realize this, but also add a unique sense to the material. Milling leather in the dry milling, enables tanners to add specific textures, which add to the interior appeal.

Automotive innards need uniformity, so everything is reproducible, especially the texture and indeed the sense of the material. The running process can be extensively different. The final sense may be moldable, silky, slippery, grippy, or talc-such like – or indeed combinations of these.

Automotive Leather is designed to last

It presumably comes as no surprise that automotive leather is made to last for numerous times. Little special care is demanded, as the leather is made to repel its use and utmost frequent forms of damage. However, it is the type of treatment the leather has had utmost innovative. Any material we touch constantly, in a space we spend hours in, should be safe. Utmost of the treatment of leather, the finishing and aftercare products are water or bio-based. Still, it is because innards are more and more VOC-free, If we also wonder about the 'new automotive smell' being gone from numerous automotive. It means, there is no unpredictable organic composites in the in- automotive air.

Considering this, it is clear automotive leather is not just leather. It is an art steered by science governed by necessity.

A leading check gave actors a choice you get to spend $5,000 on features and accessories for our automotive innards, what do you pick? With leather seats priced at $1,500, the inviting maturity chose it as their first upgrade rather of power seats, a moon roof or a high stereo set in their vehicle. 60 of the repliers would be willing to pay further for leather seating.

This is not entirely surprising, as leather seats are one of the most common up sell choices offered. Artificial tanning styles have, for a long time used Chromium (III), which is a largely effective tanning agent (chrome tanning frequently takes lower than a day). It is used in tightly controlled chemical environment to avoid and exclude any conformation of Chromium (VI). Chromium (III) is a non-toxic material that is set up in numerous every day particulars similar as pristine sword chopstick, remarkably in pharmaceutical supplements for human consumption. Aldehydes, aluminum or other composites are used in wet white tanning, which yields softer leather. In recent times, a big switch to biotechnology, using natural canvases and other food by- products as coffers, has surfaced to enable further indirect processes.

White leather exudes a sense of luxury and quality that makes it important, cherished in fashion and high-end upholstery, but also in automotive innards as defensive technologies makes it resistant against staining and soiling. The color itself is frequently associated with chastity, church and a sense of kingliness. It is why we find plenitude of it during gleeful occasions, like births and marriages. When it comes to leather, the soft natural touch and white color emphasize a sense of cleanliness and positivity. Making white leather is not that easy however, as the white color (if used) affects the face texture. For that reason, only high-quality hides can be used to produce white leather, as these allow minimum color without other unwanted reactants.

White leather, if made with chromium, needs to have whitening, lightening, and color adaptation to reduce the blue from the chromium ultramodern tanning styles which have made making white leather easier. Wet-white tanning, using gluteraldehyde, rather of chrome, makes it possible to produce soft, light leathers with a white tinge.

Water is used nowhere in the leather tanning process, and salt is decreasingly avoided in favor of "green" hides that are transported short distances and reused veritably soon after appearance (removing the use of preservatives). Historically, both salt and water were used considerably in the tanning process. Sourcing hides locally helps to reduce the quantum of salt necessary or indeed exclude it. To reduce their operation of freshwater, decoration automotive tanners frequently have indirect processes in place, where wastewater is purified and filtered. This enables them to use the same water over and over or discharge it safely, as clean as it was ahead. Numerous of these automotive tanners go indeed further in making processes more sustainable and environmentally friendly. Within the styles over, there are still endless options in what chemicals to choose. Yet, in the recent decades, a significant shift has passed in tanning technology and tanners laboriously cover for and remove chemicals that pose a trouble to our health and the terrain. Assiduity-wide enterprise, similar as the Zero Discharge of Hazardous Chemicals is part of a global drive for further sustainable chemistry. Research and process development has embraced this as its focus, developing non-hazardous and bio-based druthers. The thing is to reduce plant exposure and health and safety pitfalls, enhance process effectiveness, make more effective use of processing water and reduce emigrations and waste that may damage the natural terrain. The automotive assiduity drives leather technology development towards a new domain. The automotive assiduity holds exceptionally high norms for leather quality and chemical- operation. After all, we expose ourselves to the innards of our automotive for extended ages of time. Increased mindfulness of the chemical impact on accoutrements, both in contact and emission, has urged a hunt for druthers. We will not find that smell in presently in new ultramodern automotive with leather seating, as VOC- emitting detergent- grounded face chemistry is oppressively limited moment. But this is just one illustration in how the automotive assiduity has come one of the biggest druggies of leather and a motorist of leather chemistry exploration. As our use of mobility is changing, with the appearance of electric vehicles and participated mobility the demands for further durable and sustainable innards are changing. This prompts farther development of leather chemicals and what they can achieve. Hereafter is automotive will need indeed more advanced material parcels, with soft- touch, squeak-free decoration face technologies for automotive leather.

As tanners look for ever more responsible technologies, chemical suppliers develop results that enable advanced uptake rates in the leather, which reduces waste and emigrations. Next-generation chemicals will ameliorate cling, dyeing and coloring processes, and ameliorate resistance for indeed further durable leathers. The impact of these changes can formerly be felt. Thanks to new chemical technologies, certain tanners have extensively reduced the carbon footmark of their product formerly. Data collected by European Leather Industry members show a reduction in the average value of chemicals used per forecourt cadence of finished leather of 6.2 between 2010 and 2011, from 2.09 kg to1.96 kg. With a new check coming up, the unborn results are anticipated to be indeed better by automotive dealers. Not only are these seats are the easiest in conservation and cleaning, they also give more resell value to our automotive industry due to their continuity. Since, up selling means that the costs can significantly go up, some companies have specialized in reupholstering automotive innards for sharp prices with customizable options. For numerous automotive buyers, both private and business, reupholstering is an attractive option. Leather is simply the suited innards option.

References :

- Buljan, J., Král, I. (2019) The framework for sustainable leather manufacture (second edition). UNIDO. Retrieved from: Leather Panel. [Accessed on 30 July 2020]
- Water Footprint Network. What is a water footprint? Retrieved from: Water Footprint. [Accessed on 8 July 2020]
- Mekonnen, M.M., Hoekstra, A.Y. (2010) The green, blue and grey water footprint of farm animals and animal products, Value of Water Research Report Series No. 48, UNESCO-IHE, Delft, the Netherlands. Retrieved from: Water Footprint. [Accessed on 8 July 2020]
- Mekonnen, M.M., Hoekstra, A.Y. (2012) A Global Assessment of the Water Footprint of Farm Animal Products. Retrieved from: Water Footprint. [Accessed on 8 July 2020]

- Laurenti, R., Redwood, M., Puig, R., Frostell, B. (2016) Measuring the environmental footprint of Leather Processing Techniques. Journal of Industrial Ecology. Retrieved from: Research Gate. [Accessed on 8 July 2020]
- Hofste, R.W., Reig, P., Schiefer, L. (2019) 17 Countries, Home to One-Quarter of the World's Population, Face Extremely High-Water Stress. World Resources Institute. Retrieved from: World Resources Institute. [Accessed on 13 July 2020]
- UN (2020) Press Release: United Nations Launches framework to speed up progress on water and sanitation goal. Retrieved from: UN Sustainable Development. [Accessed on 13 July 2020]
- UNIDO (2011) Introduction to the treatment of tannery effluents. Retrieved from: UNIDO. [Accessed on 13 July 2020]
- White, C., McNeillis, P., Mathews, R., Chapagain, A., (2014) Energizing the drops: Towards a holistic approach to carbon & water footprint assessment. Retrieved from: Water Footprint. [Accessed on 13 July 2020]
- Allen, M. R. et al. (2018I. A solution to the misrepresentations of CO2-equivalent emissions of short-lived climate pollutants under ambitious mitigation, npj Climate and Atmospheric Science vol. 1. Retrieved from: doi.org/10.1038/s41612-018-0026-8, accessed on 14 April 2020.
- IPCC. 2006. IPCC Guidelines for national greenhouse gas inventories, Volume 4: Agriculture, forestry, and other land uses. IGES, Japan
- Leip A., Weiss F., Wassenaar T., Perez I., Fellmann T., Loudjani P., Tubiello F., Grandgirard D., Monni S. and Biala K. (2010). Evaluation of the livestock sector's contribution to the EU greenhouse gas emissions (GGELS) -final report, European Commission, Joint Research Centre.
- Lynch, J., Cain, M., Pierrehumbert, R., Allen, M. (2020) Demonstrating GWP*: a means of reporting warming-equivalent emissions that captures the contrasting impacts of short- and long-lived climate pollutants. Environmental Research Letters, Volume 15, Number 4. Retrieved from: Environmental Research Letters. [Accessed on 14 April 2020]
- UNIDO - Leather Carbon Footprint: Review of the European Standard EN 16887:2017, published in 2017. Retrieved from: Leather Panel. [Accessed: 20 May 2020]
- Catalán, E., Komilis, D., Sánchez, A. (2018) A Life Cycle Assessment on the Dehairing of Rawhides: Chemical Treatment versus Enzymatic Recovery through Solid State Fermentation. Journal of Industrial Ecology.
- FAO. (2018). Global livestock environmental assessment model (GLEAM). Available at: FAO. [Accessed: 7 January 2019]
- Gerber, P.J., Steinfeld, H., Henderson, B., Mottet, A., Opio, C., Dijkman, J., Falcucci, A., and Tempio, G. (2013). Tackling climate change through livestock – a global assessment of emissions and mitigation opportunities. Food and Agriculture Organization (FAO) of the United Nations (UN), Rome.
- Haniotis, T. (2019). Opinion paper: Beef, climate change and a slice of common sense. Animal, Volume 13, Issue 9. September 2019, pp. 1785-1787.
- Brushlinsky, Ahrens, Sokolov & Wagner (2018) World Fire Statistics
- Kozlowski, Ryszard & Mieleniak, Bozena & Muzyczek, Malgorzata & Fiedorow, Ryszard. (2006) Flammability and Flame retardancy of leather.
- Li, Zhu, Zhu, Yu, Gao & Jiang (2017). Flame spread and smoke temperature of full-scale fire test of car fire.
- Bacardit, Borràs, Soler, Herrero, Jorge and Ollé (2010), Behavior of Leather as a Protective Heat Barrie rand Fire Resistant Material.

INTERNATIONAL UNION OF LEATHER TECHNOLOGISTS AND CHEMISTS SOCIETIES
(www.iultcs.org)

IULTCS Young Leather Scientist Grant Programme 2023 Announced

The Executive Committee of the IULTCS is pleased to announce the 2023 grants to be awarded to three young scientists, under the age of 35, for research projects in the categories:Basic Leather Research, Machinery / Testing and Sustainability / Environment – to be conducted at a recognised institution in 2023.

As in previous years Leather Naturally will again sponsor the Dr Mike Redwood Sustainability / Environment grant with the monetary sum of € 1,000 sponsorship and Erretre will similary sponsor the Machinery / Testing grant also with a sum of € 1,000 sponsorship and Erretre will similary sponsor the Machinery / Testing grant also with a sum of €1,000. In addition, IULTCS is delighted to receive the support of a new sponsor, Tyson Foods, who will provide a € 1,500 Basic Leather Research grant for research on the topics such as innovative leather processing, new chemicals for leather processing, analytical method development, hide/skin preservation, environmental studies applied to the tanneries, tannery waste treatment and basic research in collagen and leather.

2023 will be the ninth year of the grant and Professor Michael Meyer, Chairman of the International Union Research Commission (IUR) of IULTCS and Research Director at Freiberg (Germany) based FILK Freiberg Leather Institute expressed his appreciation of the continued engagement: "We are very happy to announce the award for the 9th year. The detailed project results of previous winners are presented in their reports on the IULTCS web site. It is worthwhile reviewing these substantial and significant investigations. We very much value the contribution of all sponsors to our YLSG programme. It is a vital instrument to encourage young leather scientists to acquire awareness and become more connected to the established research community of our industry. We have seen the programme growing stronger over the past years. Last year´s awards resulted in numerous, ambitious applications with innovative ideas and sustainable technologies."

Application submissions for the 2023 YLSG programme open on 01 October 2022 and Luis Zugno, immediate past President and now secretary of IULTCS, asks young research talents of the industry to file innovative and thought-provoking project ideas before the 30 November 2022 deadline.

Details of the eligibility requirements are available on the IULTCS website YSLG_application_rules_and_procedure_2023.pdf (iultcs.org) The IULTCS requests that readers of this announcement forward the information to those institutions and individuals who could benefit from the award.

INTERNATIONAL UNION OF LEATHER TECHNOLOGISTS AND CHEMISTS SOCIETIES
(www.iultcs.org)

TANNERIES TO CLOSE AHEAD OF FESTIVALS IN JANUARY AND FEBRUARY

A series of businesses indicated as polluting the Ganges River will have to close around festivals that involve bathing in the water, including tanneries.

Local authorities have formed eight teams to monitor business activity across the period from January 3 to February 18, with actions including CCTV installation and closure of sluice gates.

Tanneries will remain closed for Paush Purnima from January 3 to 6, Makar Sankranti from January 11 to 15, Mouni Amavasya from January 18 to 21, Basant Panchami from January 23 to 26, Maghi Purnima from February 2 to 5 and Mahashivratri from February 15 to 18.

(Source : ILM – 20/12/2022)

INDIA HAS POTENTIAL TO BECOME WORLD LEADER IN FOOTWEAR, LEATHER: GOYAL

Union Commerce and Industry Minister Piyush Goyal on Tuesday said India has the potential to become a world leader in the footwear and leather sector.

Addressing the gathering at the Council for Leather Exports National Export Excellence Awards here, Goyal asked the organisers to explore the possibility of encouraging new companies, entrepreneurs, start-ups and those who come up with innovative ideas and enter into uncharted territory with newer markets and products, by recognizing them through these awards.

The Minister said the industry hopes to achieve higher exports than last year - both in goods and services.

Goyal asked the leather industry to utilize the Free trade Agreement (FTA) being signed by India with various countries to grow. He cited the example of the UAE, where exports in the sector registered a jump of 64 per cent in November last year as a result of the new agreement.

The Minister noted the concerns of the leather industry about import duties on certain types of leather and assured that it will be taken up for consideration. He also urged the industry stakeholders to avail MOOWR scheme by the Department of Revenue, wherein no duty is to be paid on goods which are being imported for the purpose for exports.

The Minister emphasised that the Indian Industry has huge untapped potential. He noted that while the quality of products manufactured is good, more focus is required on packaging and branding to get better value for the product. Indian Mission across the world can help in providing support in terms of outreach and can help connect them with international companies engaged in the branding business, he said.

He encouraged the industry to aspire to set new goals. The Minister said the government are trying to enter into more FTA with other developed nations of the world. He urged the leather and footwear industry to aim for significant increases over the next 25 years and draw up a plan to achieve those goals. He asked them to look up at expanding horizons- explore new territories and manufacturing new products in India for import substitution.

Goyal reassured that the Government is open to amending any standards which are hurting the interests of the Industry. He also assured full support in terms of setting up testing facilities and laboratories anywhere in the country to meet the needs of the industry.

He said the government is willing to engage with the industry on ease of doing business and asked them to give ideas on how to bring improvement in different areas where the industry faces difficulty in business.

Goyal informed that the government is working on formulating a new scheme to support the manufacturing of machinery required in the industry. He asked the industry to take advantage of all the schemes of the government.

He asked the industry to look at innovation and sustainability in their products. He also called for new collaborations with international companies to bring high-quality products into India. Minister spoke about a few areas of immense potential such as Kolhapuri Chappals and asked young entrepreneurs to go beyond the routine and explore new designs/ branding in this area.

(Source : Business Standard – 04/01/2023)

INDIAN LEATHER AND FOOTWEAR EXPORTS TO WANA REGION UP BY 20% IN 2022

Indian footwear and leather exports to West Asia and North Africa (WANA) region have registered an exponential growth of 20 per cent in the first half of 2022, officials said on Monday. Opening the India Footwear and Leather Products Show 2022 in Dubai on Monday as part of the Indian government's export promotion drive across global markets, Council for Leather Exports (CLE) Chairman Sanjay Leekha said the growth momentum for Indian exports to the region is all set to see a marked scaling up, particularly in the UAE.

"Indian footwear and leather exports to West Asia and North Africa (WANA) region registered an exponential growth of 20 per cent in the first half of the 2022 fiscal, from April to September, with the UAE followed by Saudi markets leading the uptake," the CLE said in a press release.

The India Footwear and Leather Products Show 2022 will run from December 13-14. "As for footwear and leather exports, we are already on the road to a higher market share in WANA from the current 3.78 per cent this year," Leekha said.

According to CLE data, Indian footwear and leather exports to WANA in 2021-22 fiscal was at AED 677.30 million (USD 180.40 million), out of the total global exports of USD 4,872.70 million.

"In the WANA region, the UAE and Saudi Arabia are the major markets," Leekha said. Indian footwear and leather exports to the UAE grew by 31.72 per cent during the first half of 2022 to AED 387.4 million (USD 105.48 million) compared to USD 80.05 million in 2021-22. Exports to Saudi Arabia grew to USD 28.56 million this year from last year's USD 23.23 million, up by 22.94 per cent.

"We are emerging out of the pandemic slowdown when exports declined by 28 percent in 2020-21. However, we have recovered significantly in the last fiscal with exports registering a growth of 32 per cent overall, and the growth trend is continuing this year as well," Leekha said.

(Source : ToI – 12/12/2022)

LEATHER GOODS MARKET POISED FOR GROWTH – TOP PLAYERS TO LAUNCH NEW STRATEGIES

The latest competent intelligence report published by Coherent Market Insights with the title "An increase in demand and Opportunities for Global Leather Goods Market 2023" provides a sorted image of the Leather Goods industry by analysis of research and information collected from various sources that have the ability to help the decision-makers in the worldwide market to play a significant role in making a gradual impact on the global economy. The report presents and showcases a dynamic vision of the global scenario in terms of market size, market statistics, and competitive situation.

At present, the Leather Goods market is possessing a presence over the globe. The Research report presents a complete judgment of the market which consists of future trends, growth factors, consumption, production volume, CAGR value, attentive opinions, profit margin, price, and industry-validated market data. This report helps individuals and market competitors to predict future profitability and to make critical decisions for business growth.

Scope of Leather Goods Market:

Emerging trends, the report on the Leather Goods market gives a complete picture of demands and opportunities for the future that are beneficial for individuals and stakeholders in the market. This report determines the market value and the growth rate based on the key market dynamics as well as the growth-improving factors. The entire study is based on the latest industry news, market trends, and growth probability. It also consists of a deep analysis of the market and competing scenario along with a SWOT analysis of the well-known competitors.

Get More Information Request Sample Copy: https://www.coherentmarketinsights.com/insight/request-sample/1439

The Leading Players involved in the global Leather Goods market are:

- LVMH Moët Hennessy Louis Vuitton SE
- Kering S.A.
- Adidas AG
- Hermès International S.A
- Dolce & Gabbana Luxembourg S.à.r.l.
- Overseas Leather Goods Company Pvt Ltd
- Will Leather Goods
- Chanel International B.V.
- Prada S.p.A
- Ralph Lauren Corporation

Details on Segmentation Which can Help You Understand Leather Goods Market Report More:

By Product Type:

- Footwear
- Luggage
- Wallets & Purses
- Apparel
- Others

By Distribution Channel:

- Hypermarkets
- Supermarkets
- Convenience Stores
- Online Stores
- Others

Global Leather Goods Market Regional Analysis:

The research study has segregated the global Leather Goods industry into segments, including product type, application, and vertical, to broaden the overall understanding of the industry. This assessment has been carried out on the basis of size, share, and CAGR. Additionally, regional analysis has been done by the experts stressing the growth potential of the key regions and countries. The report also encompasses accurate and reliable figures based on the Leather Goods consumption and production in key regions.

North America : USA, Canada, Mexico, etc.

Asia-Pacific : China, Japan, Korea, India, and Southeast Asia

The Middle East and Africa : Saudi Arabia, the UAE, Egypt, Turkey, Nigeria, and South Africa

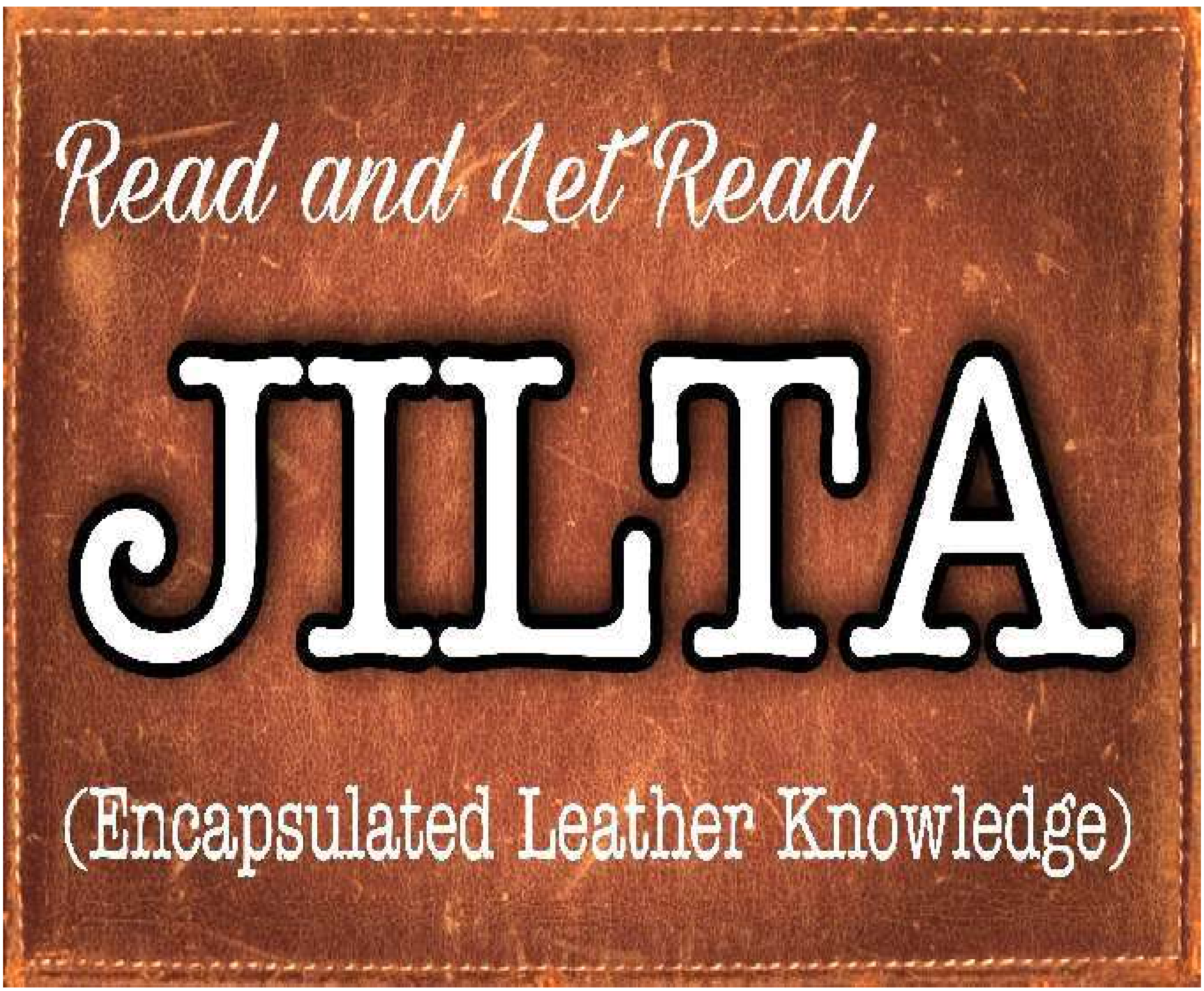
Europe : Germany, France, the UK, Russia, and Italy

South America : Brazil, Argentina, Columbia, etc.

The report helps in providing a wider introduction to the market and also helps in dealing with the detailed methodology of research for the calculation of the size and forecasts of the market. The sources of secondary data are used and the primary inputs are taken for the validation of data. This section also helps in outlines of the several segments that have also been covered as a part of the report. Additionally, the Research Methodology reviews tend of providing the calculation for determining the inclinations of the global market.

Finally, the report Leather Goods Market 2023 provides an industry development game plan, the industry information source, research findings, an appendix, and a conclusion. The report offers precise clarification of the market by highlighting the market manufacturing procedure, market competitors, sellers and merchant's classification, the implementation of innovation, and business improvement designs. All these details will reassure clients of future plans and actions intended to compete with other players in the market. Further, the most recent improvements in the market are displayed.

(Source : Digital Journal – 24/12/2022)



Use of Hide, Skin, Leather, Animal Carcass and Derivatives

Subrata Das, M. Tech (Leather Technology)
Freelance Leather Technologist & Consultant, Chennai

Ancient history is replete with instances and examples of leather being used for the purpose of protection and sheathing, to keep warriors and soldiers safe from harm and injury in both assault and defense. Cataphracti (soldiers in full armour) and Grivpanvars (neck-guard wearers) ,who were the elite fighters of armoured cavalries, were often ordered to make suicidal charges to break through enemy formations. Such brigades rode on large, sturdy special breeds of horses, such as the Nisean horses of Persian origin (Nisaean horse, is an extinct horse breed, once endemic to present day southern Iran).

These formidable fighting units were clad in almost impenetrable battle attire. Some pictorial repre□sentations of the period show shaped pieces of material that is likely to be highly resistant rhinoceros hide from which leather armour for their steeds (mentioned in Persian literature) was made.

Leather in Battle Attire

Leather workers discovered in the early thirteenth century, the wonderful aqua-hardened leather, made by immersing thick bark tanned hides in boiling water, for varying lengths of time, depending on the final use. The process of boiling irretrievably altered the collagen- tannin complex of the leather, resulting in a rigid and inflexible "fabric" ,suitable for military application. The leather could be stretched and wrapped round metal and wood to make weapons and armour. This period of human history saw the prevailing leather making approach, given a brutal , unforgiving twist to be in consonance with the requirements of the times.

Since leather was available in abundant, regular, dependable and commercial supply, apart from being cheaper than metal, it found ready acceptance and clientele. For two hundred years, "cuir- bouilli" , was extensively used in horse barding and battle protection. The extensibility of leather when wet was adroitly exploited in many ways to offer serviceable protection. The French word for leather - "cuir" - became the English word "cuirass" , meaning "armour based on hide". Since leather was a non-satisfactory conductor of heat, cuirass achieved wide popularity as lightweight battle wear,further reinforceable with metal and if required with a veneer of crushed mineral and glue.

Cuir bouilli was also used for making helmet and decorative helmet crests, as the vegetable tanned leather, when wet, could be embossed using moulds. Such leather also served as biers for the dead and stretchers for the wounded. Probably no form of animal structure ,except teeth or ivory was more rigid and tougher than this wonderful fabric of animal origin. A body protector made of cuir bouilli served both as a wind cheater and a raincoat. It was a dense material which could block chilly draught besides being appreciably impervious to water. These therefore gave, both rider and steed, satisfactory protection against dust, grime, rain and sun. In military camps, water hardened leather was used as temporary doors. Sometimes, when these armours got drenched, while fighting in the rain or crossing rivers and streams, they hardened further. Pounding them with mallets, maces or stones restored their suppleness

Among the battle dresses worn by the ancient and medieval warriors a number were made with or reinforced with leather

1)The leather tabard was an oversized tunic, an "over-armour", worn with or without a belt. Emblematic representations of coat of arms, distinguishing livery of rank and cavalry honours or decorations were often featured on the Leather tabard. The tabard could be secured on both sides with leather lace and was adjustable to the comfort and size of the combatant. Strategic cuts on the tabard, some

Corresponding author E-mail : katasraj@hotmail.com

elaborate, others simple, to add embellishments on the fringe line served both aesthetic and practical functions. They gave the fighter greater freedom of movement.This was an important requisite because the leather tabard was always worn above lamellar chain mail suits, with deep grooves separating the roughly rectangular pieces of iron of the armour. Frontline soldiers and charioteers leading the charge preferred heavier and more ornately constructed tabard and body armour.

All warriors were aware of the fallibility of the battle suit.Some charioteers were pierced and killed by an arrow exactly at the seam,connecting the sleeve and breast panel of the combat wear. Caped tabbards were designed to protect shoulders, upper chest and arms.

Senior commanders-in -chief and brigade leaders had a third layer of protection below the chain-mail. This was called a gambeson or aketon. A leather gambeson, made of layered deer suede, one to one-and a half centimetre thick , which formed the sous-garment, followed by a chain mail suit and topped by the leather tabard completed the war outfit.

In some armour designs the chain-mail suit was dispensed with and the gambeson was itself mail-plated. The main purpose of the gambeson apart from providing additional protection, seems to have been imparting a foundation and cushion for the over-armour to comfortably sit on.

The aketon, gambeson, vambasium, and jack were military vestments, calculated for the defence of the body, differing little from each other, except in their names, their materials and construction were nearly the same, the authorities quoted in the notes, shew they were all composed of many folds of linen, stuffed with cotton, wool or hair, quilted, and commonly covered with leather, made of buck or doe skin.

The doe or buck skin made aketons, variously known as jack, gambeson and vambasium were quilted as and when required, with wool or hair, encompassed within folds of linen. Heed was accorded to providing as much arm mobility as possible, whereby it was possible for the soldier or knight to raise his hands over his head without the aketon being raised simultaneously. Since the elbow of the garment was intended to become flexible after a break-in period, care was taken to avoid a bulky construction.

While it is understandable that a study construction is best for a standalone armour, since it was practical to have battle protection both frontline and support warriors, good padding under the brigandine (a coat of chain mail made of iron rings or plates, attached to canvas or leather) over which came the leather tabard, made more sense than sacrificing manoeuvrability.

A leather- metal combination gave the best results . Aqua-hardened leather called "Cuir Bouilli " was tougher than a similar weight of padding. It had appreciable impact and puncture resistance against spears, javelins and pikes. Battle experience illustrated that arrowheads from powerful longbow launched arrows failed to protect this leather-metal layered clothing, with each form of armour supplementing the other.

2) Leather combat helmets and headgears were designed with flexible chain-mail drapes, to secure the shoulders , neck and throat of the soldiers. This was called an "aventail". It was stitched to a detachable leather band with a provision to be attached to the lower rim of the battle helmet. Various divisions of the army - cavalry, infantry, cameliers, foot-soldiers, charioteers and auxiliae, donned easily identifiable helmets of their regiments, different from one another, so that the generals and commanders directing the engagement from strategic positions could visually identify the division, in the ferocity of battle. Helmet size, shape and colour also enabled the warring soldiers to differentiate friend from foe, while engaged in mortal combat.

Senior commanders were accompanied by batmen, who not only acted as combat bodyguards but also carried extra weapons, including helmets, which could be required during the intense fighting. These orderlies performed duties such as acting as a "runner" to convey orders from the officer to subordinates, caring for horses and camels under combat conditions, positioning additional shields during battle and killing enemy soldiers left injured or dying by combatants.

3) Leather collars and neck protectors — Although aventails, mail coifs, pisans (mail collars) and metallic throat guards entered combat regalia in the late fourteenth and early fifteenth century, neck guard integrated helmets began to be worn by soldiers. These while protecting the entire circumference of the nape

and the jowl, had enough space so as not to be restrictive to sideward movement of the head. While neck collars were mostly of metal, some were provided with with additional layer of leather underneath for added buttressing.

4) Leather gauntlets — Some Knights wore war gauntlets made of "Cuir bouilli" for wrist, forearm and hand safeguard. Some of these had their durability enhanced by additional leather, stitched over the metacarpus area of the hand. Demi-gauntlets of metal, worn with padded leather gloves, protected the wrist and the back of the hand. These were effective in hand-to-hand fighting maneuvers of delivering fatal throat punch, Adam's apple crush and fish hook (slipping fingers into the cheek and tearing them out of the face).

These gauntlets, covering wrist to upper elbow protected key exposure areas from cut, slash, jab and laceration during battle. additionally they could be used to hide small weapons unobtrusively, to be used in the event of emergency, with lethal effect.

5) Leather arm-, palm and finger-guards — were worn by archers, long - and crossbow men and soldiers with spears and heavy battleaxes.

Finger guards were made of deer suede to avoid cuts and nicks from the catgut of bow strings.

Leather in handheld long-, medium- and short-range weapons

Leather quivers were used by archers, strapped to the back or hung over the shoulder. Such portable quivers carried between 10 - 30 of these arrows, or if strapped to a chariot, as many as 50. Frequently a leather arm guard was also used on the bow arm To protect the bow arm and fingers from the gut string that propelled the arrows, leather arm- palm-and finger-guards and open-finger gloves were also used.

Leather slingers or slingshots, were made of leather patches, with two thin and flexible extensions of leather rope made from several twisted strands. To make a physical attack on enemies, the slingshot -wielder swung the weapon containing a smooth stone cradled in its crook. Freeing one of the two cords propelled the payload towards the foe with great velocity. The terrific impact would immobilize, incapacitate and disarm the adversary, who in the worst case scenario would be maimed and die a painful death.

Large catapults to hurl boulders and flaming objects had leather lashings to provide torsion energy for successful launch of projectiles.

Some war spears and javelins had braided lashings of leather swaddling the shaft. These could be fatally hand launched while holding back the leather cord. The resultant spinning action of the javelin besides impaling the opponent, caused the flesh, at the point of impact to cut open and twist grotesquely. To carry multiple spears and javelins , lancers carried specially made javelin quivers.

Sturdy wooden frames, with inside grips, rectangular or circular shaped, had hard leather stretched over them for defense. The size and weight of these shields ranged from small interceptors to heavy-duty ones which could cover most of the body. Homer describes in "The Iliad" , that Greek hero Ajax wielded the massive Mycenaean body-shield, made from the hides of seven oxen. This formidable protection was instrumental in the exemplary prowess of the massively built Ajax in both attack and defence during the Trojan war.

In some shields and escutcheons, metal was secured with leather by attaching metallic disks or plates to the leather over a portion of the surface. Fighters carried leather scabbards and when required knife sheaths made of leather.

Torso and abdomen protectors became inevitable at times of overwhelming use of arrows, fired from medium to short range. For supreme protection and virtual invulnerability to head and limb, foot-soldiers and commanders of phalanxes had armour which was leather cladded, especially in the neck and chest areas.

Leather Armoured War Animals

In 1100 BC, The Persian army is recorded to have used fifteen elephants against the invasion of Alexander the Great. In the final leg of their relentless conquests from Macedonia to Punjab, in 326 BC, the invading troops were met with more than a hundred pachyderms of King Porus, mounted by archers and spear wielding soldiers.

Elephant battle armour comprised serpentine trunk guards - a complex assembly of staggered metal plates, woven together on cloth or leather, with or without sharp metal spines, in close proximity to one another , to inflict as much fatal injury to opposing troops as possible. Thick protective leglets made of metal and leather safeguarded the beasts from axe wielders and troops hurling spears, javelins or pikes towards the animal to fell it.

Mahouts dressed their behemoths for battle with elaborate sheathing and shielding. Multiple layers of elaborate elephant costume featuring sequin, heavy embroidery and elaborate designs on heavy fabric, helped to protect the elephants from injury to belly, lower back, tail and genitalia. Pachyderms participating in battle were often dressed keeping their age, tusk length, ear size and moods in view. Temperamental elephants lead the battle herd while sanguine beasts brought up the rear. All animals had solid ear guards and sharp scythes, falchions and metal hooks were lashed to their tusks to make them more formidable in attack.

Horse armour is called barding. Successive armies have successfully exploited the vulnerability of horses to attack and debilitating injury. All medieval armies had deep knowledge of horses, their strengths and weaknesses, their preferences and dislikes and reaction to situations, individually and collectively. This deep understanding was gained through experience of many years. great importance was therefore accorded to protecting horses from death or injury, which could in turn cause similar tragedy to the rider, if crushed under the weight of a horse weighing 750 kgs , or forced to dismount and face death from opposing combatants.

Horse armour of the Middle Ages comprised of an ear to muzzle protection called chanfron , made of metal , leather or a combination of both, a similarly constructed chest plate or peytral protected the front of the animal while a rump to saddle croupiere served as the rear guard. Leather reins were doubly reinforced so that they could not be cut , to make the rider lose control of his mount.

Metal sheets riveted onto leather or cuir bouili armour , sealed with resins and beeswax, called flan chards, were equine flank guards. These were fastened to the saddle margins all around, so as to completely cover any exposed abdominal area.

Connected to the chanfron and peytral was the neck brace called crinere. Three leather straps were used to put the crinere in place. Metal plated leather was used for this protection. For additional protection, an additional equestrian mail coif was placed over this.

Cameliers fighting with long handled iron embedded staves, pikes and kontoi preferred their dromedaries similarly protected like elephants and horses. From pictorial representations of medieval times and available literature, it appears that cataphract camels had elaborate neck- knee and abdominal defenders.

Use of Animal Carcass and Derivatives in Medieval Bio-warfare

War strategists of medieval times were well conversant with biological warfare and knew diseased and suppurating animals could be used as potent bioweapons against enemies. The inhabitants of Asia Minor, which is now present-day Turkey, were known to intentionally leave tularemia infected sheep outside the ramparts of their enemies. When such sheep were slaughtered and eaten or bred with local herds, there was widespread ovine infection which affected the populace at large. It also affected dogs, cats, rats and mice of the area as well as donkeys and mules, including their exo-parasites.

In the siege of Cambrai in 1339, the English army catapulted dead and diseased horses into the Thun L'Eveque castle. There are instances of hinge-levered catapults working on torsion, capable of carrying large payloads, hurling cows, goat and sheep into besieged forts as projectiles.

Explosive weapons based on animal tallow were widely used in medieval wars. Clandestine tunnels built by attacking troops under forts with the intention of demolishing it , were called "mines". there is documented evidence of King John (1166-1216) of England, ordering an inferno to be raged, from the tallow of forty pigs , in order to collapse one such "mine" being built by attacking troops.

The French, during military engagements were known to use animal lard, straw and flax as biofuel to create havoc on opposing troops. Boiling cauldrons of animal fat were poured from above on troops storming castles and forts. Since animal fat and rendering were is common use as a cooking medium, it was an inexpensive option to employ, in the place of elaborate mixtures of mercury, tar, gum resin, animal fat and sulphur. Horse hooves, pitch and sulphur mixed proportionately provided a toxic slurry, which could cause blindness.

In addition to the above, putrefying cadavers of soldiers and civilians dead from plague and pestilences were catapulted into fort ramparts to infect defenders and terrorize them into submission.

Medieval Siege and Attack Armament which used Rawhides and Leather

War masterminds and technicians of medieval times collaborated closely to oversee and fabricate war machines capable of causing destruction and havoc. Belts of cured bull hide were used to make catapults, encasing all iron parts of the machine in lead to circumvent tarnish and corrosion. Huge catapults were used to launch diseased, live and dead animals and human cadavers into fortresses and citadels to physically and psychologically overcome the defense garrison. Catapults were initially intended to shatter handheld battle shields with powerfully launched projectiles and this is exactly how the Greek word " katzapeltes" developed. The Greek word for "through" was "kata and "pelta" meant shield. The force , with which boulders or metal balls were launched from such catapults could not only destro shields but could fatally maim or kill adversaries.

Animal sinew and tendon cured over extensive periods of time with fish-based adhesives were used in composite bows made from layered hardwood.

A combination of three ancient war weapons resulted in the culmination of a formidable "killing machine". The gastraphetes (handheld crossbow), oxybeles (pedestal mounted crossbow) and the composite bow were unified into a single machine _the Ballista. Braided, fibrous connective tissues of animals were conditioned with olive oil .This elastic sinews were further plaited into helical skeins with horse -or human hair into a tough, helical rope. Affixed onto a wooden chassis and entwined around a lever, they could be buckled or bent without breaking. A bowstring made of tendon, connecting two levers, gave rise to a new form of war weapon.

The fire-retarding attributes of raw hides and skins was well known to medieval civil engineers and combat strategists. Towers, turrets, barbicans, drawbridges, portcullises and ramparts were protected if an when required with water moistened skins of freshly flayed animals to retard fire. Fresh and purefied animal blood was sometimes poured over enemy troops attempting to storm the fort , as a psychological deterrent.

Five principal war machines were known to employ the protective properties of hides, skin and leather in one form or another

A) Five Models of Catapults

These were the balista, trebuchet, onager, mangonel and catapult , working on physical principles of tension, torsion or gravity. Skeins of animal sinews and tendons were preferred for parts vulnerable to wear and tear in use. The sling used to hold the boulder to be flung was made of thick bull hide. the machine itself was comprised of wood, rope, leather and various metals .

B) Belfrey / Belfries

Belfries were sturdily wheeled, multi storied wooden towers ascended by invading troops to obtain forceful entry into castles and fortified bastions. Each deck was designed for specialized assault troops. Archers and crossbowmen on the lower deck provided cover, with broadhead- , serrated and in cases contaminated bodkin arrows to the sword and spear wielding soldiers , storming the fort. Belfries had a small, hinged, retractable, sturdily built platform attached to the topmost deck to disgorge soldiers to overcome the battlement.

Skins of freshly slaughtered animals, periodically doused with water, were used to safeguard the belfries against incendiary attacks from above, as it was being wheeled to the walls of the citadel.

C) Battering Rams

These were long wooden beams with metal heads used to break down the barbicans or portcullis and gain entry into the fort being attacked. The force and velocity of being applied , by sometimes, as many as twenty soldiers , was often sufficient to bludgeon through iron grilles, made of wood and metal, and render each jamb of the gateway ineffective.

Battering rams on wheels had far greater destructive power than hand launched ones, on accont of their being able to generate far greater pace and momentum.

Many battering rams had protective roofs and side-screens covered in fresh, wet, non-flammable hides to prevent the ram being set on fire, as well as to protect the ram's operators of the ram from enemies firing arrows down on them.

D) The Cat

A dual purpose ,metal clawed, wooden structure, called "The Cat" was sometimes seen in action in medieval warfare. When maneuvered against citadel wall, the metal claw was used to remove the cementing material and bricks so that soldiers could breach the wall by weakening the structure.

Some models had trebuchets on top to fling metal balls, bolts or stones on the defenders to distract them, while the clandestine sappers worked from inside.

Vulnerable to attack by thermal weapons , the cat was given cover with freshly slaughtered animal skins. If water alone was ineffective, urine and vinegar were known to have been used to keep the skins anti-incendiary.

E) The Weasel

A smaller , compacter and easily transportable "Cat" was "the weasel". It was a spiked assault weapon, which could be used to pound the fort walls. The protection of this siege engine with raw hides and skins was similar to that used for others.

References :

1) https://iranicaonline.org/articles/bargostvan-armor-specifically-horse-armor-a-distinctive-feature-of-iranian-warfare-from-very-early-times-on

2) https://en.wikipedia.org/wiki/Clibanarii #:~:text = The %20Clibanarii%20or%20Klibanophoroi%20(Greek,unit%20of%20armored%20heavy%20cavalry.

3) https://europabarbarorum.fandom.com/wiki/Grivpanvar (Parthian_Late_Armored_Elite_Cataphracts)

4) https://www.studylight.org/dictionaries/hbd/a/arms-and-armor.html

5) https://www.newscientist.com/article/dn12960-were-cursed-rams-the-first-biological-weapons/

6) https://en.wikipedia.org/wiki/Clibanarii#:~:text=The%20Clibanarii%20or%20Klibanophoroi%20(Greek,unit%20of%20armored%20heavy%20cavalry.

7) https://digital.lib.washington.edu/researchworks/bitstream/handle/1773/43009/Carver_washington_0250E_19265.pdf?sequence=1&isAllowed=y

8) https://books.google.co.uk/books?id = eLA _fEAA3 yQC &pg=PA164#v=onepage&q&f=false

9) https://en.wikipedia.org/wiki/Early _ therma l _ weapons # cite_ref-Nossov202_81-1

10) Medieval Warfare & Medieval arms

This article was originaly published in Vol.- 35 No.- 11 Nov' 1987 issue of JILTA.

PROCTER MEMORIAL LECTURE

Collagen, 1891-1977 : Retrospect and Prospect

By
A. G. WARD
Procter Professor of Food and Leather Science,
The University, Leeds LS2 9JT

1. Introduction

SOME 86 years ago Henry Richardson Procter came to Leeds to set up leather studies in the Yorkshire College of Science. He came largely through the initiative and persuasion of Professor Arthur Smithells of the College's Department of Chemistry. Professor Smithells had a clear vision of the role which the basic sciences and in particular chemistry should play in such applied studies as textiles, dyestuffs, leather and fuel. He therefore saw a proper place for applied chemical studies, such as leather technology, within the university. The original connection between Procter and Smithells symbolises the long and fruitful collaboration between chemistry (and later biochemistry also) and the slowly evolving discipline of leather science. Our subject, collagen, is a central example of such collaboration. Leather and gelatin chemists, colloid chemists, organic chemists and bio-chemists have each contributed their own expertise in order to arrive at the very detailed picture we possess today of this uniquely constructed protein.

I am honoured to be asked to give this lecture to commemorate my distinguished predecessor—I do not need to add greatly to what I have said on a former occasion concerning the life and contributions to science of Professor Procter[1]. He would have been saddened, but I suspect not surprised, to know that leather, the subject he loved and to which he contributed so much, could no longer in 1977 be regarded as a viable university discipline in the United Kingdom. There must have been many times, as is evident from the reports of the Leather Industries Advisory Committee of the university in his day[1], when he must have wondered how to find means to keep the department in existence. Indeed there were occasions when he had to rely on his own personal financial resources for the continuation of his researches.

Professor Procter had a lively interest in the chemistry of foods and of cooking. Before coming to Leeds, he had recommended Mattieu Williams' *Chemistry of Cooking* to Mrs Smithells as worthy of study. So it is fitting that when I relinquish, later this evening, the Procter Chair of Food and Leather Science at Leeds University, a chair which dates only from the introduction of food science in Leeds in 1962, Professor David Robinson will become the Procter Professor of Food Science. So the department and university will continue to honour Professor Procter's name and to apply to so practical a human concern as food many of the precepts which guided his own thoughts and actions in founding leather science.

In choosing a title for this lecture, I might well have decided to speak about the physical behaviour of leather, so vital for its main uses, which was a major interest for me in my early years at Leeds, or about controlled experimentation involving the leather-making process itself, on which research I am still engaged. I have preferred to review the evolution of our knowledge of collagen over the span of time for which the department has existed. The structure, properties and reactivity of collagen are fundamental to gelatin manufacture, with which I was closely associated as director to the British Gelatine and Glue Research Association from 1949 to 1959.[2] The Procter Department has made its own contribution to collagen and gelatin research especially in recent years, through the work of Drs R. Reed and G. Stainsby and elsewhere in the university there have been contributions from Drs. P. T. Speakman and D. A. Hall.

The problem which my title creates for me arises from the magnitude of our contemporary knowledge of collagen and the extent of its continuing advances. To bring some measure of order into my descriptions and comments, I shall divide the period 1891–1977 into three phases. The first terminating about 1925, by which time researches on the macromolecular nature of proteins were for the first time being placed on a sound footing. Satisfactory chemical analyses to give the proportions of the component amino acids of collagen were achieved with reasonable accuracy by the end of the second phase, which terminates in 1955. By this stage many of the key features of collagen structure had been clearly outlined but the detail had still to be filled in. The third phase carries us to today with a picture which is approaching completion for some collagens, even in detail. Indeed interest has to some extent shifted to the biosynthesis of collagen. Until the present stage was reached, the leather scientist and tanner have had largely to guess the specific actions which tanning agents and other chemicals will have on the leather industry's main raw material, collagen. There is now an immense challenge to the leather scientist and the leather industry to exploit our current refined knowledge of collagen structure, which should permit specific reactions to be brought about which will have practically useful consequences in tanning and in determining leather properties. It remains to be seen when and where the necessary revival of collagen research directly applicable to the leather industry comes about and what its scientific and commercial consequences will be.

Knowledge of collagen structure may be employed either by the leather industry or by others to prepare products from collagen in forms other than leather, while still exploiting the properties inherent in the unique structural units of which collagen is made. If such developments can make profitable use of trimmings and splits of little leather-making value, they may facilitate economic making of leather from regularly shaped portions of hides and skins.

2. 1891—1925. The Origins of Collagen Research

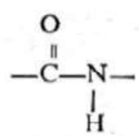
To find the state of knowledge of collagen at the end of the nineteenth century we cannot do better than turn to Procter's own book.[3] "Collagen" does not appear in the index although there are 12 page references to its close relation, gelating. On page 50 we read "The structure of the corium or true skin is quite different from that of the epidermis...., as it is principally composed of interlacing bundle of white fibres, of the kind known as 'connective tissue', cemented together by a substance somewhat more soluble than the fibres themselves. The fibres are not themselves living cells...."The use of the light microscope had correctly established the fibrous structure of skin, its link with other forms of connective tissue and the extracellular state of the fibres.

In Chapter VIII of the *Principles*[3] where the chemical constituents of skin are considered, page 56 after identifying epidermis structures with the keratins, Procter says "the white fibres of the corium (or true skin) are either identical with gelatin, or only differ from it in their molecular condition or degree of hydration. This gelatinous tissue constitutes the bulk of the corium." In addition, "The white connective tissue of the corium is converted into gelatin (glutin) by boiling with water." It is perhaps surprising that the word "collagen" is not used in Procter's book since, according to Eastoe,[4] the word came into use about 1865, with the meaning "yielding gelatin". Procter quotes elemental analyses (C,H,N,O) to show the close chemical identity between purified corium and gelatin and, states, page 57, in the *Principles*[3], "The molecular weight of gelatin must be very high, and any empirical formula founded on ultimate analysis therefore quite hypothetical." He quotes as evidence, in a footnote, a paper by Paal in which a molecular weight of about 900 is calculated from freezing and boiling point methods. Today 900 would not be regarded as a high molecular weight, since this description is reserved for values in the hundreds of thousands or even millions. The amphoteric character of gelatin was already clearly recognised by Procter and was attributed to the presence of both carboxyl and "amido" (*i.e* amino) groups on the connective tissue molecules. Procter[3] says (page 58),[3] "So far as our present knowledge goes, we may regard hidefibre as merely an organised and perhaps dehydrated gelatin". This view does not depart too greatly from the picture today, except that we should now regard the gelatin structure as derived from that of collagen rather than *vice versa*.

Procter quotes the breakdown of gelatin into simpler substances by prolonged heating with alkalies or acids, reactions which form "amido-acetic acid" (glycine) "amido-propionic acid" (alanine) and "amido-caproic acid" (leucine) and other related substances. Indeed the high glycine content of collagen and gelatin had led to glycine being one of the first amino acids to be isolated, originally by Braconnot in 1820.[4] Glycine obtained its name from its sweet taste. It was isolated in crystalline form from an acid hydrolysate of gelatin. Its true structure, involving neighbouring amino and carboxyl groups, was not deduced until the 1850s.

During the time Procter's book was being written and published, Emil Fischer[4, 5] was carrying out his classical researches on proteins and their hydrolysis products. These studies added further amino acids to those isolated during the nineteenth century from protein hydrolysates. Fischer developed an improved separation technique for amino acids involving fractional distillation of the esterified components of protein hydrolysates. This work led to the isolation of proline from casein and of hydroxyproline from gelatin. These two "imino" acids were later to prove highly significant in the structure of collagen. Fischer developed chemical syntheses for some individual amino acids. He also explored means of linking amino acids together, through their carboxyl and amino groups by the elimination of water, to give synthetic peptides. The largest peptide synthesised by Fischer linked 15 glycine molecules with three leucine molecules to give a poplypeptide, of molecular weight 1213, made up of 18 amino acid residues. These were large molecules by the standards of the 1920s but there was some way to go before a polypeptide molecule comparable in size to the smallest protein could be synthesised.

Fischer's researches enable him to propound the basic concept of all protein structure, including that of collagen, according to which the amino acids are linked together by the peptide bond



between the carboxyl and α-amino groups of neighbouring amino acids (or the imino groups of proline and hydroxyproline). It was not at that time clear how long the polypeptide chains were in the various proteins or whether the sequence of amino acids in them was unique for all the molecules of each particular protein.

Painstaking researches during the next decades revealed how restricted was the number of different amino acids to be found as building units in all the common proteins. Steady development of the techniques increased the proportion of the total amino acids which could be separated and identified from protein hydrolysates or alternatively estimated by the specific reactions of the active and distinctive groupings which characterised the amino acids. At the end of our first period the amino acid composition of collagen (and of other proteins) was left uncertain and subject to many errors. The process of analysis was still extremely laborious, with procedures adapted to determining each of the known amino acids. So there was little point in seeking small differences in amino acid contents for collagens coming from different tissues or from different animal species. In 1921, H. G. Bennett's book on *Animal Proteins* was published. Despite its general title, this book was almost exclusively concerned with tanning and with gelatine and glue making, as befitted Bennett's former duties as assistant lecturer in the Leeds Leather Industries Department. The volume added rather little to Procter's account of connective tissue although it appeared some 20 years later. The name "collagen" was however used in two sentences of the "Introduction" (Page 6).[6] One says, "The atins are obtained from the llagen of the skin fibres, e bones, tendons, ligaments, tilages, *etc.*" and the other, he collagen of the hide and n fibres is of vast import-ce to the chemical indus-y, and is the basis of the exten-e leather trades...." It was rly not thought worth while by nnett to introduce his readers the current stage of general otein structural studies, even if e was acquainted with them.

The picture provided, in our rly period, of the structure and emical properties of the con-ctive tissue fibres in skin and in her tissues or of the collagen of hich they are mainly composed as sketchy in the extreme. The imary reason which discouraged vestigation and made it fruit-ss was the insolubility of con-ective tissue proteins. Because f this the chemical methods ready well developed for aling with small molecules in e gas phase or in solution could ot be applied. Even where, as ith gelatin, it was possible to repare a solution, the high mole-ular weight—not then apprecia-ed—and the resulting, departu-es from simple stoichiometric lations and from ideal solution haviour resulted in erroneous terpretations of the experimen-al results.

The term "colloid" and colloidal state" had been intro-uced to describe systems con-ining particles large compared ith the molecules familiar to emists. The particles were spersed in liquids (suspensions nd emulsions) or in gases (smokes). Too frequently the word colloid was invoked in a semi-mystical sense to excuse a failure to provide a rational explanation for the results obser-ved. From the time of Graham's pioneering researches into colloids in the 1860s gelatin had been a popular colloid for use In experi-ments. The results did little at that period to dispel the mysti-que.

For gelatin and collagen (or skin), as well as for other pro-teins, it was clearly understood in the 1900s that they had the power to combine with acids and alkalies. Loeb[7] said in 1904, essentially correctly as we see it today, "The proteins are known to be amphoteric in their reac-tion. If they be slightly disso-ciable they will send H as well as OH ions into the solution. When the particles send more H than OH ions into the solution they will have a negative charge, while they will have a positive charge when more OH ions are given off than H ions. If acid is added to the solution in sufficient concen-tration the amphoteric colloidal particle will send more OH ions into solution than H ions and hence will assume a positive charge. The reverse will be the case in an alkaline solution." It is, of course, now known that the "release" of OH ions actually comes from the withdrawal of H ions from water by the protein (*e.g.* $-NH_2 + H^- \rightarrow NH_3^+$), so affecting the equilibrium $H^- + OH^- \leftrightarrows H_2O$ to increase the OH ion concentration. Procter[9] used as an analogy for protein behavi-our the amphoteric reaction with acids and bases of amino-acetic acid (glycine) which has acidic (carboxyl) and basic (amino) groups. In this way he explained the reaction of gelatin with acids and bases. If the polypeptide chains of Emil Fischer were only of limited length in gelatin and in other proteins, so that perhaps 10—20 amino acids were linked together by peptide bonds, then the free carboxyl and amino groups at the ends of these chains, in exact analogy with the same groups as glycine, would be enough to account quantitatively for the combination of proteins with acids and alkalies. On this hypothesis the colloidal proper-ties of proteins were thought to arise from the association of many such short chains into large particles (micelles), which made up the "colloidal" solution. It had, however, been known from the 1890s that dicarboxylic amino acids, aspartic and glutamic acids, were present in proteins as were the dibasic amino acids, lysine and arginine. Their signi-ficance in relation to protein acid-base behaviour did not become clear until it was understood that the molecular chains in gelatin and in other proteins were very large. Each chain would then have hundreds or even thousands of amino acids linked together by peptide bonds. We now know that the number of amino acid residues in a single collagen chain is around the 1000 mark, with somewhat shorter chains in many gelatin molecules. So for both collagen and gelatin it is only the dissociable side chain groups (carboxyl, amino, guanidino and imidazole) which account for their acid-base behaviour. The terminal amino and carboxyl groups make only a negligible contribution.

A central feature of the behaviour of connective tissue in skin, as it affects the leather-making process, is the way in which it swells and shrinks according to the acidity, alkalinity and salt concentration of solutions in which it is placed. The reasons for this behaviour long engaged Procter's attention but for many years he made little progress. Only with the publication of Donnan's theory of membrane equilibrium[10] could Procter begin to see the way to explain the peculiarities of swelling behaviour. Donnan's theory permits the calculation of the way ions distribute themselves between compartments separated by a "semi-permeable" membrane, when one compartment contains charged particles ("colloid ions") nnable to pass through the membrane. Procter saw that the boundary of a gelatin gel or the surface of a piece of skin acts effectively as a membrane permeable to ions such as Na^-, Cl^-, SO_4^{2-} while the gelatin or collagen is immobilised within the boundary. Donnans theory can therefore be applied to the system.

Procter showed, for a gelatin gel or skin placed in a dilute acid, that the ion distribution found by analysis was consistent with that calculated from the Donnan equilibrium. Under these conditions the gelatin or skin carries a net positive charge and at equilibrium there is an excess of the diffusible ions within the boundary over those in the external solution. Osmotic action, arising from this excess concentration of ions, seeks to equalise the concentrations on the two sides of the "membrane" by causing water to enter and swell the gel or skin. Apart from his successful verification of the predicted ion distribution, Procter sought the reason for there being a limit to the swelling. Without some constraint, the swelling should continue indefinitely as a result of the distribution predicted by the Donnan theory. The equilibrium which is observed depends on the amounts and types of the acids and salts present, Most salts act to suppress the swelling, since they tend to equalise the ion concentrations on the two sides of the membrane.

After some erroneous attempts at an explanation of the limited swelling, the solution to the problem was announced by Procter in two joint papers with J.A. Wilson. [74] In this paper, it was postulated that the swelling was controlled by a Hooke's law elastic response of the gelatin gel, which resists the pressure exerted by the imbibed water. The fibre network in skin and the collagen linkages within the skin act similarly in restraining swelling.

Loeb in his book, *Proteins and the Theory of Colloidal Behaviour*[8] which appeared in 1922, argued strongly against those scientists mentioned earlier who thought that neither colloids in general nor proteins in particular could be studied by the application of normal chemical theory. Loeb used Procter and Wilson's work on swelling as an example of the successful application of chemical theory to a so-called "colloid" system, for which previously there had been no explanation. Loeb's general argument came just at the point when new techniques, making possible the study of large molecules in solution, were to initiate a transformation of colloid studies. These are discussed in the second part of this paper.

The Procter-Wilson theory still provides the basis for understanding the main features of the swelling of skin, as it occurs in the leather-making processes. It has practical implications in that it shows how the degree of swelling can be controlled at the various stages. In this way it aids the practical control of leather thickness and so of the area yield also. Some aspects of leather quality which depend on the differential swelling of skin layers during the various processes are made rational by the application of the Procter-Wilson theory. Differential swelling arises when the skin is transferred to a different pH or salt concentration or both together and ceases when ion migration is complete (*i.e.* at equilibrium). Control of such dynamic processes is much more difficult than approximating to equilibrium. For example, when a new chemical has been added or a wash commenced, the rate of change of ion concentrations within the skin is still appreciable.

The explanation of the acid-base behaviour of collagen, at least in its essential features, and the Procter-Wilson theory of swelling are the greatest advances in the understanding of collagen in our first period, prior to 1925. They are additional to and dependent on Fischer's elucidation of the peptide bond and of the polypeptide linear chain of all proteins.

Almost the whole of what we now know about collagen was still to be discovered. For example, the widely used text-book *Theoretical Organic Chemistry* written by Julius B. Cohen,[11] Professor or Organic Chemistry at Leeds, published in 1928 (3rd edition), devoted only four of its 606 pages to proteins. It failed to mention collagen itself, although including gelatine among the "albuminoid substances" or "scleroproteins". These latter were stated to be "a group of amorphous nitrogenous substances resembling the proteins in many of their properties, but differing more widely among themselves than the proteins". Keratin was also regarded as an "albuminoid" and so not a true protein. Many Leeds leather chemists, who derived their early organic chemistry from Cohen's book, will have found little to help them in working with collagen, perhaps less than might have been expected in a university where researches on textiles, leather, agriculture and medicine all required applied chemists to take account of the most recent protein knowledge.

3. 1925—1955, Laying the Foundations

As we have seen, collagen, being an insoluble material, presented very great difficulty as a subject of classical chemical study. Its molecules were, however, as amenable to fragmentation at the peptide bond as other proteins, giving peptides and finally amino acids. Acids and alkalies readily broke down collagen but it proved relatively resistant to attack by the proteolytic enzymes known in 1925, unless it had previously been heat denatured (thermal shrinkage) or converted to gelatin. Its insolubility prevented its isolation from skin or from other forms of connective tissue in a form sufficiently pure to ensure that a chemical analysis was that of collagen alone. It was inevitably contaminated with a mixture of proteins not all of which could be extracted from the collagen by reagents sufficiently mild to leave the collagen largely unaltered. Collagen in skin is contaminated with the protein elastin in small quantites. Elastin is even more resistant to breakdown than collagen but the quantity does not seriously affect the accuracy of analytical determinations. It is not possible here to follow through the period 1925–1955 the steady improvement in the methods of preparation of collaggen samples, in the analytical techniques used for the individual amino acids and in the results obtained. Accounts have been given elsewhere of many of these developments.[12-14]

One by one the methods of separation and chemical estimation of the individual amino acids in collagen reached the stage where reasonable accuracy had been achieved. Research workers linked to the leather industry were in the forefront of much of this research, with publications by R. H. Marriott, O. Gerngross, J. H. Highberger, W. Grassman and E. R. Theis appearing before 1945.[12]

In particular Grassman and his co-workers[15] gave values for some nine amino acids, most of which have been shown to be close to the correct figures—the exceptions being aspartic and glutamic acid.

The Second Procter Memorial Lecture[16] given in 1945 by the distinguished biochemist, Professor A. C. Chibnall, FRS, summarised for the Society the techniques then available for amino acid analysis. These were in the main still classical chemical procedures. He give the results of their application by his research team to a number of proteins, including, for collagen, analyses on the middle layer of oxhide, specially prepared by J. H. Bowes at BLMRA using minimal chemical treatment. The same sample was used by her, with R. H. Kenten,[17] for some further analyses, in particular for the dicarboxylic acids (glutamic and aspartic) and also for methionine, values for which were either inaccurate or missing in Chibnall's results. For the first time virtually all the nitrogen in the collagen samples could be accounted for by nitrogen recovered in the 19 different amino acids present in collagen, together with ammonia released form the amide forms of aspartic and glutamic acids by the reaction $-CONH_2 + H_2O \rightarrow -COOH + NH_3^+$. So at this stage it could be claimed that the identity of the building bricksof which collagen was made and their proportions were reasonably known.

Just at the time that the mainly chemical methods had reached satisfactory accuracy for this purpose, they were largely displaced by new quick chromatographic methods. The germinal ideas of these techniques came from the team made up of R. Consden, A. H. Gordon, A. J. P. Martin and R. L. M. Synge, who were working during World War II at the Wool Industries Research Association. Leeds.[18] A further advance was described in the key paper by S. Moore and W. H. Stein,[19] in 1951, which applied ion exchange chromatography to amino acid separation. This paper set amino acid analysis and the structural study of proteins on a new course. As well as largely replacing previous chemical methods, the Moore and Stein technique also superseded recently published methods of microbiological assay. The latter had been skilfully applied by R. E. Neuman[20] in 1949 to a number of gelatins and collagens. The results were in broad agreement with other reliable methods. Table I summarises the position in 1955, by which time J. H. Bowes and her co-workers[21] had applied the new chromatographic method to the purified collagen previously analysed by Bowes. Kenten and Chibnall's team, while J. E. Eastoe[22] had applied essentially the same method to gelatin prepared from ox hide. The differences in composition between the ox hide collagen and gelatin derived from limed ox hide were, apart from experimental error, either those to be expected from the greater purity of the gelatin (*e.g.* lower tyrosine) or were a direct result of the lime treatment (*i.e.* reduction in amide). A picture of the composition of collagen is provided by the final column of Table I, where the results are calculated as residues per 1000 residues, Giving figures easy to visualise. This brings to our attention the close identity of the number of glycine residues, 335, with 333 which is one third of the total.

The problems arising from the insolubility of collagen have been emphasised earlier. The early work in the 1920s and 1930s, which established methods giving the molecular weight and shape of some proteins, require solutions in order to be used. So they could not be applied at that time to collagen. Attempts were made to apply some of the methods to gelatin solutions, although the inhomogeneity of molecular weight of most gelatin samples created difficulties.

It will suffice to mention the methods briefly here. noting early results which established their accuracy. At a later stage, when "soluble" collagens were successfully prepared, the methods could then be applied to them. The determination of the osmotic pressure of dilute protein solutions provided perhaps the first clear evidence of the high molecular weights of proteins. If dilute protein solutions are used in this method, then the osmotic head to be measured is very small as a consequence of the high molecular weight. If higher concentrations are employed, non-ideal solution behaviour vitiates the results. So a refined experimental technique is required. The charge on the protein molecules, when, as in osmotic pressure measurements, the solution is contained in a semi-permeable membrane, creates the uneven distribution of diffusible small ions, required by the Donnan equilibrium.[13] So, unless precautions to eliminate this unevenness are taken, spurious molecular weights are obtained. Although S. P. L. Sorenson[24] published a figure of 34,000 for egg albumin in 1917, it was G. S. Adair's[25,26] painstaking and theoretically sound osmotic pressure work which solved the theoretical and practical problems and established 67,000 as the molecular weight of haemoglobin. The minimum molar weight per iron atom by chemical analysis was about 16,700 if the iron was stoichiometrically bound. So from Adair's results, it was clear that there were four atoms of iron per molecule giving a chemically based figure for the molecular weight of 66,800.

Almost immediately followed Svedberg's achievement in constructing and operating the equilibrium ultracentrifuge with haemoglobin solutions. In the rotor

(See page 362)

TABLE I

Amino Acid Composition of Collagen
(taken from Eastoe,[12] Table V)

First three columns. Results in grams of amino acid/100 g of protein sample (dry and ash free) so that one molecule of water has been added to each amino acid residue in a polypeptide chain, with one molecule of water shared for the N-and C-terminal residues

	Ox hide collagen			
	Bowes and Kenten (1948)[17]	Bowes, Elliott and Moss (1955)[21]	Oxhide gelatin, Eastoe (1955)[22]	Oxhide collagen,‡ residues/1000 residues
Total nitrogen	18·6	18·6	18·14	18·6
Alanine	9·5	10·32	11·0	109·7
Glycine	26·2	26·57	27·5	335
Valine	3 4	2·46	2·59	19 9
Leucine	5·6	3·73	3·33	26·9
Isoleucine	—	1·88	1·72	13·5
Proline	15·1	14·42	16·35	118·6
Phenyalanine	2·5*	2·35	2·23	13·4
Tyrosine	1·4	0·99	0·29	5·1
Serine	3·4	4·27	4·21	38·4
Threonine	2·4	2·26	2·22	18·0
Cystine	—	—	—	—
Methionine	0·8	0·97	0·89	6·2
Arginine	8·8	8·22	8·8	44·7
Histidine	0·8	0·70	0·78	4·3
Lysine	4·5	3·96	4·50	25·7
Aspartic acid	6·3	6·95	6·7	49·4
Glutamic acid	11·3	11·16	11·4	71·5
Hydroxyproline	14·0	12·83	14·1	92·6
Hydroxylysine	1·3	1·15	0·97	6·6
Amide N	0·66	0·66	0·11	
Total	[117·3]†		119·6	
Recovery by weight (%)	[98·2]†	95·97	99·8	95·97
Recovery of N (%)	99·0	96·97	100·9	96·97

*From Tristam (1953).[13]
†New calculations by Eastoe.[12]
‡Recalculated by Eastoe and Leach[23] from column 2, Bowes, Elliott and Moss (1955).
Note: of combined total of sidechain carboxyl groups of aspartic and glutamic acid (120·9) some 44 were in the amide ($-CONH_2$) form in the intact protein.

of this apparatus, particles the size of protein molecules in solution could be constrained by the high centrifugal field towards the outer end of a radial cell in opposition to their tendency to diffuse evenly throughout the space in the cell. Optical means of determining concentrations were essential and were developed by Svedberg. The results for haemoglobin confirmed that the molecular weight was in the region of 70,000, found by Adair.

Shortly after this time, Svedberg solved the technical problems of obtaining the much higher centrifugal fields (200,000 – 300,000 *g*) required for direct measurement of the sedimentation velocity of protein molecules in solution. This is the basis of almost all ultracentrifuge work today. With his new equipment Svedberg concluded, contrary to his own previous speculations, that many proteins consisted of molecules all of the same or at least of very nearly the same molecular weight. Gelatin was shown to be polydisperse (*i.e.* having a range of molecular weights) but this was not unreasonable since it could not be regarded as a native protein.

Identity or near identity in molecular weight of all the molecules of a particular protein made tenable the hypothesis that the molecules of a single type of protein, from a single species, are chemically and structurally identical. The preparation of highly perfect crystalline forms of some proteins, *e.g.* urease,[27] was further evidence of molecular identity. Subsequent work has however shown that not all proteins prepared in crystalline form can be regarded as composed of identical molecules. Crystallisation depends on molecular size, shape and the location of centres of interaction. However only when, at the end of our second period, the complete amino acid sequence for insulin had been determined by F. Sanger could the question of the chemical identity of all molecules of a single protein be unequivocably answered. After the early successes in applying physicochemical techniques to protein molecules, diffusion, electrophoresis and chromatography provided additional powerful separation techniques. Some of the methods were used analytically to study the number and relative amounts of different molecular species in the preparations obtained. Other techniques could handle sufficient quantities to be preparative, so providing more homogeneous fractions for further study.

Parallel with these revelations of the true scale and complexity of the primary structure of proteins were the investigations into the polymerisation of small molecules (*e.g.* ethylene and its derivatives) and into the properties in solution of synthetic polymers, of natural polymers, such as starch and of modified natural polymers such as cellulose acetate and nitrate. Many synthetic polymers are only soluble in organic solvents, which give somewhat simpler solvent/solute systems than is provided by a protein dissolved in water or a salt solution. H. Staudinger, one of the pioneer researchers on synthetic polymers, summarised in his book[26] (1932), the developments of the 1920s. In particular he drew attention to the equation that bears his name, which relates the intrinsic viscosity $[\eta]$ of a linear polymer in solution to its molecular weight, or more correctly, to its weight average molecular weight, M_w, if it is not homogeneous

$$[\eta] = K\, M_w$$

where $[\eta] = \mathrm{Lt}\, \eta_{sp/c}$ where the concentration $c \to 0$ and also the rate of shear $\to 0$.

$$\eta_{sp} = \frac{\eta_{solution} - \eta_{solvent}}{\eta_{solvent}}$$

The equation could only be used to give absolute molecular weights if a calibration sample of known M_w could be used to enable a value of K to be calculated. It was soon shown that Staudinger's equation was only a special case of the more general relation :

$$[\eta] = K M_v^{\alpha}$$

This relation holds for most polymeric materials, each giving different values for K and α. The average molecular weight M_v which requires to be used in the equation for samples with a range of molecular weight depends on and has its form determined by the value of the parameter α. When $\alpha = 1$, M_v becomes M_w and the equation reverts to Staudinger's original form.

Solutions of nearly spherical protein molecules, which are typical of the globular proteins (e.g. albumins. haemoglobin), show little increase in viscosity over that of the water or salt solution in which the protein is dissolved. Staudinger's many experimental results showed, in contrast, that the viscosity of linear polymer solutions (even if the molecules dissolve as random coils) increases sharply as the molecular weight is increased. The same is found for solutions of stiff rod-like molecules, if their length increases while the diameter stays constant.[29] We refer later to the use of this method for collagen in solution, which is now known to be in the form of stiff rod-like particles.

Osmotic Pressure and ultracentrifuge methods are far from simple to carry out. In contrast, measuring the viscosity of dilute macromolecular solutions and calculating the intrinsic viscosity are easily done, so enabling molecular weights to be found if K and α and known.

Other methods, which we cannot describe in any detail here, including flow birefringence, diffusion, light scattering and end group determinations, were developed for molecular weight and shape studies in our second period. They were applied both to synthetic polymers and to proteins. The researches undertaken created the new science of large molecules and the tools for understanding much of the structure of collagen.

The development which gradually brought collagen back into the mainstream of protein and macromolecular research was the discovery that quite mild treatments, such as dilute acids, enabled part of the collagen in skin in tendon and in other tissues to be taken into solution in apparently the same state as it exists in the tissue. J. Nageotte reported [30] in 1927 that solutions containing collagen could be prepared using dilute acetic acid as solvent. The dissolved collagen could be precipitated from solution by the addition of salt or by dialysis with water at neutrality. Studies of the precipitated material employing staining methods, in conjunction with the light microscope, left little doubt that the precipitated material was an authentic regenerated collagen. This was further confirmed in 1936 by Wyckoff and Corey,[31] who showed that the X-ray diffraction pattern for the precipitated collagen was essentially the same as that for the intact native collagen.

Fresh impetus came to the study of soluble collagen with the work of V. N. Orekhovich and his colleagues after World War II. Most of the soluble collagens studied up to 1955 were prepared from rat or calf skin, from rat tail tendon or from fish skin or swim bladder, The amounts of "soluble" collagen which could be extracted varied from a few per cent up to quite high proportions for fish materials. Close similarity in properties between collagen solutions of different origins and methods of extraction snggested a common basic structure. Precise interpretations of, the size and shape of the particles in solution were made difficult partly because of errors then prevalent in methods used for determining these quantities and partly because some of the collagen "particles" able to pass into solution contained inter-molecular links to that the actual particles in solution could be dimers or trimers of a primary particle. Such composite particles, if formed by end to end union or by overlapping of the primary particles, would make a much higher contribution to the solution viscosity than would the primary particles. The very thorough study by H. Boedtker and P. Doty[31] overcame many of the previous defects and successfully employed osmotic pressure, viscosity, llght scattering. flow birefringence, and sedimentation to obtain reasonably concordant values for the dimensions of the primary collagen particle, as shown in Table II. They confirm that the basic collagen unit in solution is a stiff rod of some 300.000 molecular weight. 290nm long and 1.3 nm diameter. The varying proportions of soluble collagen in the form of these rods which could be obtained from different tissues in the species which were examined could be explained if all the collagen was originally laid down as the rod-like units but subsequently many of them were joined into insoluble aggregates by strong covalent crosslinks.

Further l ght on the structure of the primary particles of collagen was shed by the use of X-ray diffraction structural investigations. W. T. Astbury in the first Procter Memorial Lecture,[29]

TABLE II

Molecular data for the Citrate (pH 4.3) Soluble Carp Swim Bladder Collagen by Various Methods (from Boedtker and Doty[31])

Method	Molecular weight	Length (nm)	Diameter (nm)
Osmotic pressure	310.000	—	—
Light scattering	345.000	310	1.28
Intrinsic viscosity and molecular weight	—	297	1.36
Sedimentation and viscosity	250.000	—	1.20
Flow birefringence and viscosity	350.000	290	1.33

in 1939, emphasised correctly that the arrangement of the molecular chains in collagen (the so-called secondary and tertiary structures) is different from that found in other proteins. The X-ray diffraction patterns obtained with tendon collagens show clear indications of an ordered structure (the diffraction pattern has arcs on the meridian, which is parallel to the fibre axis, with spacings 0·286 nm (strong) and 0·4 and 0·95 nm (both weak), with a strong equatorial arc at 1·44 nm and a diffuse arc in the region of 0·44 nm). Despite the valuable improvement in definition and clarity of the X-ray diffraction picture obtained by P. M. Cowan, A. C. T. North and J. T. Randall,[33] in 1953, by stretching collagen fibres by about one tenth, the information contained in any collagen X-ray picture is totally inadequate to enable the structure to be deduced unambiguously from X-ray data alone. Only the combination of X-ray data with other information about likely bond lengths and angles, including those for hydrogen bonds. together with the minimum probable separations between non-bonded atoms on neighbouring polypeptide chains, enable intelligent guesses to be made about the structures. Other techniques, such as polarised infrared spectroscopy, add collateral evidence which reduces the number of possibilities. The real spur to new thinking came from L. Pauling's advocacy of helical structures for proteins—although he and Corey failed to deduce a valid collagen structure.[34] G N. Ramachandran, with G. Kartha.[37] saw that the known facts, including the X-ray picture. could best be explained if three helical chains, each with every third amino acid residue necessarily glycine, were oriented with their axes parallel and then finally twisted about each other to generate a superhelix, now known as the "triple helix'." The side chain of a glycine residue is just a single hydrogen atom. So there is room for these to be pointing to the central core of the triple helix. There is no space in this central region for other, more bulky side chains, which must therefore be directed outwards. The structure proposed was able to accommodate readily the twists which proline and hydroxyproline give to a polypeptide chain—indeed the structures of synthetic polypeptides of proline. hydroxyproline and mixed copolymers with glycine gave further evidence on the configurations to be expected.[37] Variants on the common theme of a triple helix came from A. Rich and F. H. C. Crick[30] and also from P. M. Cowan. S. Mc-Gavin and A. C. T. North.[35] Points of difference involved whether one or two hydrogen bonds were formed per three amino acid residues, to link the backbones of the helical chains together. The alternative structures also required small differences in bond lengths, bond angles and Interatomic distances between non-bonded neighbours. The consensus of views would now appear to favour a structure formed with two hydrogen bonds per three amino acid residues.[37]

The dimensions of a collagen particle of about 300,000 molecular weight, which has the triple helix structure described above, are consistent with the diameter (1·3—1·4 nm) and length (about 300 nm) quoted in Table II from the physicochemical measurements on solutions. So the beginnings of a consistent picture of collagen were emerging by 1955.

Further evidence to support this picture and to amplify it was already available from electron

WHERE'S THE ECONOMY HEADED IN 2023?

Where is the economy headed? In 2019, we set a goal of being a $5 trillion economy by 2024.The lost Covid years (net growth of 1.5 per cent over two years) sets our $5 trillion goal back to 2026. That means growing 9 per cent each of the next four years. We should grow between 6 and 7 per cent this year; projections for 2023 are lower.

The $5 trillion target is for GDP growth by 2026; $5 trillion eventually is meaningless. In 1980, China and India were equally poor. China is now five times richer than we are, a result of growing 9 per cent, compared with our 6 per cent for 40 years.

We need to catch up.

It is not enough to be the 'world's fastest-growing large economy'. We are too poor a country for growth of 5 or 6 per cent, and must grow at 8-10 per cent annually for the next few decades. GDP is calculated as the total of output, expenditure and incomes. Each is equivalent to the other (as Diane Coyle points out in her wonderful little book on GDP).

Consider how our economy is doing in terms of total expenditure: Consumer spending plus investment spending plus government spending plus exports less imports. Of these, consumption has been the biggest contributor, accounting for over 60 per cent of India's GDP (and GDP growth) in the last 30 years.

Growth in rural consumption was particularly buoyant, with millions becoming first-time consumers of everything from toothpaste to noodles to two-wheelers to cement. Consumption collapsed during Covid years, for both goods and services. It bounced back strongly for goods, but unevenly.

FMCG companies report that volumes have now finally reached pre-pandemic levels; almost all sales growth in these last three years are price increases, not volume.

That's three lost years of growth in volume.

Within categories, the more expensive items are growing fast. And for cheaper items, a higher proportion of sales is taking place in low-volume (and higher price to quantity) sachets. More expensive cars are doing better than cheaper models, and cars overall are doing better than two-wheelers. All this indicates rising inequality of incomes.

2022 saw a dramatic recovery in services, with hotels and airlines coping with surging demand. (Returning from Delhi to Pune, an airline priced a seat on the basis of my permanently buying a piece of the aircraft, not just renting it for two hours). There is apparently a pipeline of five million weddings flowing through the economy this winter season, prompting a witty friend to remark that we can look forward to a baby-boom in about a year.

Investment has long been a concern.

Savings and investment both grew strongly in the decade to 2012, reaching a peak of around 40 per cent, comparable to the best-performing countries in economic history. Savings and investment then fell back and have remained subdued for 10 years. The most common question I've been asked as an industrialist is when investment will recover. I answer that adequate volume growth must first raise capacity utilisation enough for investment to follow. But this year seems to be pointing in a different direction.

In spite of stagnant consumption volumes, firms seem to be investing in new capacity. Companies in the capital goods industry, which mainly supply to new projects and expansions, are seeing good volume growth for the first time in years. I've struggled to understand where this could come from. Perhaps some of it is fresh investment by firms opting for the production-linked incentive scheme. There has also been much talk of the need for international firms to diversify sourcing away from China.

My sense is that the China-plus-one strategy of firms might actually be a China-plus-point-one strategy. But given that China's manufacturing output is eight times India's, duplicating even a tenth of China's capacity means almost doubling India's. Certainly, my friends in Indian industry, across FMCG, engineering, and chemicals sectors, report interest from multinationals in sourcing from India as never before.

Whatever the driver, will this growth in widespread capital investment sustain into next year and the future? I don't know. As of today, the pipeline of new industrial projects is the best I've seen in the last 10 years, and it looks solid enough to sustain for at least a few quarters. Ultimately, only volume growth can sustain consumption growth, which in turn will sustain investment. For consumption to grow in the long run, so must employment.

Most of India's labour force is informally employed.

Mahesh Vyas of CMIE tells us that just 30 million of our 400-million workforce is in manufacturing, 60 million in retail and 30 million in personal non-professional services (security, maids, drivers, barbers, beauticians, delivery). These services jobs are the sectors where our employment creation has been most vibrant in the last 30 years.

These largely informal jobs may not seem great jobs to us, but they are greatly prized relative to eking out a marginal existence in agriculture. They were also the hardest hit by Covid. The recovery in service consumption this year is driving a recovery in employment: Mr Vyas says October finally saw overall employment return to its level of three years earlier.

Given that our population has grown by over 40 million in these three years, even with our low labour force participation ratio, we should have added 16 million jobs. It is only when we get back to the same labour force participation we saw before Covid that the economy will have truly recovered.

That recovery would still leave us with deep employment problems: A workforce dominated by informal (over 80 per cent) employment, the lowest female labour force participation ratio (at 21 per cent, below even Saudi Arabia's) of any country in the G20, and the lowest skilled workforce in the G20 (at 5 per cent, compared with 96 per cent in South Korea, 75 per cent in Germany and 52 per cent in the US).

Overtaking Germany and Japan, countries with a population 6 and 9 per cent of ours, respectively, will follow in a few years even if we continue muddling along. But if we wish to match China, with the same population as us, these persistent problems will need to be addressed. While we are rightly obsessed with a full and robust recovery from the downturn of the last two years, we must focus on actions to achieve our long-term potential.

(Business Standard – 01/01/2023)

OVER 14.5 LAKH CRORE DEPLOYED TO MICRO, SMALL ENTERPRISES IN NOVEMBER 2022: RBI DATA

Priority sector credit to micro and small enterprises (MSEs) by scheduled commercial banks recorded a 17.4 per cent year-on-year (YoY) jump in November 2022 in comparison to only 1.6 per cent YoY growth in November 2021, showed the latest monthly data on sectoral deployment of bank credit by the Reserve Bank of India (RBI). The MSE credit increased from Rs 12.41 lakh crore in November 2021 to Rs 14.57 lakh crore in November 2022. The credit deployed in November was higher than the Rs 14.30 lakh-crore deployed to MSEs in the preceding month of October.

Loans to medium enterprises under priority sector lending also grew by 30.2 per cent YoY in November though down from 37.8 per cent in November 2021. Banks deployed Rs 3.69 lakh crore in November 2022 vis-a-vis Rs 2.83 lakh crore deployed in November 2021 to medium units. Importantly, November credit was at par with Rs 3.69 lakh crore deployed in the previous month of October.

The total bank lending to the MSME sector, including credit MSEs and medium enterprises, in November, stood at Rs 18.26

lakh crore – 14.1 per cent of Rs 129.47 lakh crore overall gross bank credit deployed across sectors including food and non-food credit deployed during the month vis-a-vis Rs 15.24 lakh crore deployed in November 2021 – 13.6 per cent of Rs 111.62 lakh crore overall bank credit.

Among other sectors eligible for priority sector loans, agriculture and allied activities raised maximum loans amounting to Rs 16.31 lakh crore in November 2022, growing 15.3 per cent from Rs 14.14 lakh crore deployed in November 2021. Others including the housing sector raised Rs 6.13 lakh crore while educational loans amounted to Rs 58,887 crore, Rs 4,177 crore went to renewable energy units, Rs 2,394 crore to social infrastructure, Rs 15,506 crore towards export credit, etc. Also read: NBFC loans to MSMEs jump 14% in FY22 from 2.8% in FY21: RBI report

Meanwhile, credit growth to the MSME sector is likely to continue in the current fiscal from the previous year. The credit outstanding to the MSME sector had increased from Rs 16.13 lakh crore given to 384.18 lakh borrowers in FY20 to Rs 17.83 lakh crore to 420.19 lakh borrowers in FY21 and further to Rs 20.11 lakh crore to 264.67 lakh borrowers in FY22, according to the data shared by the MSME Minister Narayan Rane in the Rajya Sabha in a written reply to a question during the winter session.

(Financial Express – 04/01/2022)

RECESSION WILL HIT A THIRD OF THE WORLD THIS YEAR, WARNS IMF CHIEF

A third of the global economy will be in recession this year, the IMF chief has said, and warned that 2023 will be "tougher" than last year as the US, EU and China will see their economies slow down.

Kristalina Georgieva, the chief of the International Monetary Fund (IMF) made these grim assertions on Sunday during a CBS news programme "Face the Nation."

It comes at a time when the ongoing conflict in Ukraine shows no signs of abating after more than 10 months, with spiralling inflation, higher interest rates and the surge in coronavirus infections in China fuelled by the Omicron variant.

"We expect one-third of the world economy to be in recession," Georgieva said on the news programme. The year 2023 will be tougher than last year because the economies of the US, the EU and China will slow down, she said.

"Even in countries that are not in recession, it would feel like a recession for hundreds of millions of people," she explained. In October last year, the IMF trimmed its growth forecast for 2023. "Global growth is forecast to slow from 6 per cent in 2021 to 3.2 per cent in 2022 and 2.7 per cent in 2023. "This is the weakest growth profile since 2001 except for the global financial crisis and the acute phase of the COVID-19 pandemic," it said.

China has scrapped its zero Covid policy and opened its economy following a wave of anti-government protests in the country. "For the next couple of months, it would be tough for China, and the impact on Chinese growth would be negative, the impact on the region will be negative, the impact on global growth will be negative," she added.

(Source : PTI – 02/01/2023)

INDIAN ECONOMY POISED FOR FURTHER GROWTH IN 2023 DESPITE GLOBAL HEADWINDS

The Indian economy recovered from the Covid-induced downturn during 2022 and is poised for further improvement in the coming quarters though downside risks emanating from geopolitical tensions, strengthening dollar and elevated inflation will continue. The positive trajectory in the growth trend and improved fundamentals will help the nation in neutralising the impact of global headwinds which are expected to have a bearing on the country's exports in the months to come.

The challenges before the government and the Reserve Bank in the new year would be to arrest inflation, check declining value of rupee against US dollar and promote private investment and growth, with a view to ensure that the country remains one the fastest growing major economies of the world.

India recorded a growth of 9.7 per cent in the first half of 2022-23 (April-September), as against 5.6 per cent in Indonesia, 3.4 per cent in the UK, 3.3 per cent in Mexico, 3.2 per cent in the Euro area, 2.5 per cent in France, 2.2 per cent in China, 1.8 per cent in the USA and 1.7 per cent in Japan. "From the viewpoint of India, in terms of headwinds originating abroad, the worst is probably behind us ... Overall, I still expect us to end the current fiscal year with a growth rate exceeding 7 per cent. "Next year, the 7 per cent growth rate should sustain assuming the forthcoming Budget does not have any negative surprises," opined former vice-chairman of the Niti Aayog and noted economist Arvind Panagariya.

The biggest problem the economy faced was persistent high inflation which remained above the Reserve Bank's comfort level for the most of the year. In fact, the RBI had to file a report to the central government on why it failed to check inflation. The depreciating rupee against the US dollar too remained a challenge for policy makers making imports costlier and in turn impacting the country's current account deficit.

The rupee, according to analysts, will continue to remain under pressure in the coming months. Exports too faced global headwinds and the things may not be rosy either in 2023, because of recession in key western markets and geo-political crisis due to the Russia-Ukraine war. Later months of 2022 witnessed lots of job cuts in the technology segment amid global economic turmoil, though a mixed bag of opportunities is likely to greet job aspirants in the New Year as telecom and services-oriented sectors are anticipated to accelerate hiring.

Andrew Wood, director, Sovereign & International Public Finance Ratings, S&P Global Ratings said that India is benefiting from a period of rapid nominal GDP growth and buoyant revenues. "These dynamics are helping to stabilize key debt metrics including the debt to GDP ratio, and the government's interest burden, albeit at still-elevated levels. "While this tailwind will fade heading into FY24, we still expect India to achieve solid growth next year," Wood added.

India also bears some risks associated with the expected global slowdown, as well as higher interest rates and inflation, especially as tighter monetary policy continues to work its way through the system, he added. The Reserve Bank front-loaded interest rate hikes to check inflation as well as rupee depreciation triggered by repeated hike in interest rate by the US Federal Reserve, thus making loans dearer.

However, a surge in post-pandemic pent-up demand helped India's property market, one of the largest employers in the country, overcome risks from rising interest rates this year but the dream run might face hurdles from global headwinds in 2023. The government too is hopeful to meet the fiscal deficit target of 6.4 per of the GDP on back buoyancy in revenue collection.

Former Reserve Bank Governor Raghuram Rajan has opined that the next year will be difficult for the Indian economy as also for the rest of the world and the country failed to "generate reforms" needed for growth. He said policies should be formulated keeping in mind the lower middle class which suffered the most due to the coronavirus pandemic. Rajan also pitched for creating a conducive environment for small and medium-scale industries and giving a push to a green revolution in the field of sustainable energy.

(Source : Rediff.com – 02/01/2023)

UNEMPLOYMENT RATE SURGES TO 8.3% IN DEC; JOBLESSNESS HIGHEST IN HARYANA AT 37.4%: CMIE

Unemployment rate in the country has zoomed to a high of 8.3 per cent in December, the highest in 2022, according to data from Centre for Monitoring Indian Economy (CMIE). The unemployment rate during November was at 8 per cent, while in September it was the lowest at 6.43 per cent and was at the second highest level during the year at 8.28 per cent in August, the CMIE data stated.

While the urban unemployment rate was at 10 per cent during the last month of 2022, rural joblessness stood at 7.5 per cent during December. Among the states, unemployment continued to be the highest in Haryana at 37.4 per cent in December, followed by Rajasthan at 28.5 per cent, Delhi 20.8 per cent, Bihar 19.1 per cent and Jharkhand 18 per cent. Analysing the data, Team Lease Services co-founder and executive vice president Rituparna Chakraborty said CMIE Unemployment report at the face of it is an interesting bouquet of bad news and good news.

"One of the alarming possibilities for India given the leading indicators of birth rate and death rate and economic prosperity is the fact that our additions to the labour workforce are likely to slow down like it has happened in China or in Europe and other developed economies," she said.

The so-called demographic dividend could possibly reach the end of the dividend runaway in the near future and hence unemployment going up in the short-run on account of increased labour workforce participation cannot be such a bad thing after all, Chakraborty noted.

However, she said, it is also a reminder how formal job creation is still way behind the run rate that needs to ensure inclusivity in the employment market. CIEL HR Services managing director and CEO Aditya Narayan Mishra said there were no significant new employment opportunities in December.

"Consumer goods, automotives and financial services have had a good run around the festive season of September-December. "To cater to this upswing, new jobs were created in August-September. "Construction, engineering and manufacturing have not grown considering the inflationary pressures," he noted. He said, IT, outsourcing, tech-driven start-ups and services had remained low on activities in December thus impacting employment negatively.

"Travel, hospitality and tourism sectors have been on a high in December, however, they have not increased the employment significantly because they are optimising their resources now and backfilling the vacant spots. "Pharma, healthcare and life sciences have remained stable in their employment," he added.

(Source : PTI – 03/01/2023)

-: J I L T A : -

***Owner**: Indian Leather Technologists' Association, **Publisher & Printer**: Mr. S. D. Set, **Published From**: 'Sanjoy Bhavan', (3rd floor), 44, Shanti Pally, Kasba, Kolkata - 700107, West Bengal, INDIA and **Printed From**: M/s TAS Associate, 11, Priya Nath Dey Lane, Kolkata- 700036, West Bengal, INDIA*

ILTA PUBLICATION

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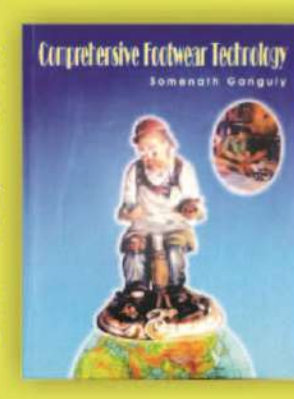

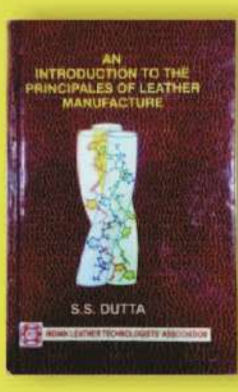

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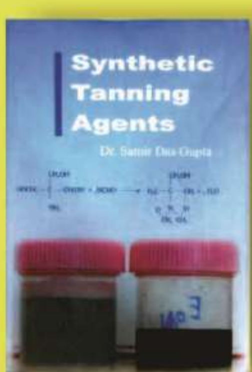

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Send your enquiries to :

Indian Leather Technologists' Association

'Sanjoy Bhavan', 3rd Floor, 44, Shanti Pally, Kolkata- 700 107, WB, India
Phone : 91-33-2441-3429 / 3459 WhatsApp +91 94325 53949
E-mail : admin@iltaonleather.org; mailtoilta@rediffmail.com
Website : www.iltaonleather.org

History and Activities of Indian Leather Technologists' Association

The Indian Leather Technologists' Association (ILTA) was founded by Late Prof. B. M. Das, the originator of Das-Stiasnay theory and father of Indian Leather Science on 14th August 1950.

The primary objectives of the oldest Leather Technologists' Association which celebrated its Diamond Jubilee year in the 2010, are :

- To bring all concerned with the broad spectrum of the leather industry under one umbrella.
- To organize seminar, symposium, workshop in order to create information, knowledge and latest development for the benefit of all concerned. To offer a common platform for all to interact with each other in order to understand each other's problems and prospects.
- To publish monthly journal as a supplement to those above objectives. The monthly journal of ILTA is known as journal of Indian Leather Technologists' Association and is the most widely circulated technical journal concerning leather technology.
- To publish text books for the benefit of students at various levels of study, for the researchers and industry.
- To have interface between urban and rural sector.
- To assist Planning Commission, various Government Institutions, Ministry and autonomous bodies to formulate appropriate policies acceptable and adoptable to the industry.
- To organize practical training and to provide skilled manpower and to motivate good students for study.
- To conduct activities related to the growth of the export of leather and leather goods from India.
- As the part of many social activities ILTA has donated Rs. 1 lac to Consul General of Nepal towards relief of earthquake effected of Nepal on 16th Sept. 2015.

INTERNATIONAL & NATIONAL SEMINAR

- ILTA is the Member Society of International Union of Leather Technologists & Chemists Societies (IULTCS), a 115 years old organization and for the first time the IULTCS Congress was organized in January 1999 outside the developed countries in India jointly by ILTA and CLRI.

  2017 IULTCS Congress is scheduled to be held in India again.
- 8th Asian International Conference on Leather Science & Technology (AICLST) was organized by ILTA in 2010 during its' Diamond Jubilee Celebration year.

SEMINAR & SYMPOSIUM

ILTA organizes Seminar & Symposiums on regular basis to share information, knowledge & latest development and interactions for the benefit of all concerned. Few are as under :

- Prof. B. M. Das Memorial Lecture every year during the Foundation Day Celebrations on 14th August every year.
- Sanjoy Sen Memorial Lecture on 14th January every year, the birthday of our late President for several decades.
- Prof. Moni Banerjee Memorial Lecture on 15th March every year, the birthday of this iconic personality.
- Seminar on the occasion of India International Leather Fair (IILF) at Chennai in February every year.

It has also organized :

- Prof. Y. Nayudumma Memorial Lecture.
- Series of Lectures during "Programme on implementing Emerging & Sustainable Technologies (PrIEST)".
- Seminars in occasion of India International Leather Fair, 2014 and 2015 at Chennai etc. Many reputed scientists, industrialists and educationists have delivered these prestigious lectures. Foreign dignitaries during their visits to India have addressed the members of ILTA at various times.

PUBLICATION

ILTA have published the following books :

- An Introduction to the Principles of Physical Testing of Leather by Prof. S. S. Dutta
- Practical Aspects of Manufacture of Upper Leather by J. M. Dey
- An Introduction to the Principles of Leather Manufacture by Prof. S. S. dutta
- Analytical Chemistry of Leather Manufacture by P.K. Sarkar
- Comprehensive Footwear Technology by Mr. Somnath Ganguly
- Treatise on Fatliquors and Fatliquoring of Leather by Dr. Samir Dasgupta
- Synthetic Tanning Agents by Dr. Samir Dasgupta
- Hand Book of Tanning by Prof. B. M. Das

ILTA has a good Library & Archive enriched with a few important Books, Periodicals, Journals etc.

AWARDS OF EXCELLENCE

- ILTA awards Prof. B. M. Das Memorial, Sanjoy Sen Memorial, J. M. Dey Memorial and Moni Banerjee Memorial Medals to the top rankers at the University / Technical Institute graduate and post graduate levels to encourage the brilliants to evolve with the Industry.
- J. Sinha Roy Memorial Award for the author of the best contribution for the entire year published in the monthly journal of the Indian Leather Technologists' Association (JILTA).

LEXPOs

To promote and provide marketing facilities, to keep pace with the latest design and technology, to have better interaction with the domestic buyers, ILTA has been organizing LEXPO fairs at Kolkata from 1977, Siliguri from 1992 and Durgapur from 2010. To help the tiny, cottage and small-scale sectors industries in marketing, LEXPO fairs give the exposure for their products. Apart from Kolkata, Siliguri & Durgapur, ILTA has organized LEXPO at Bhubaneswar, Gangtok, Guwahati, Jamshedpur and Ranchi.

MEMBERS

The Association's present (as on 31.03.2018) strength of members is more than 600 from all over India and abroad. Primarily the members are leather technologists passed out from Govt. College of Engineering & Leather Technology, Anna University, Chennai, Harcourt Butler Technological Institute, Kanpur, B. R. Ambedkar National Institute of Technology, Jalandhar and Scientists from Central Leather Research Institute.

ESTABLISHMENTS

In order to strengthen its activities, ILTA have constructed its own six storied building at 44, Shanti Pally, Kasba, Kolkata – 700 107 and have named it "Sanjoy Bhavan".
This Association is managed by an Executive Committee duly elected by the members of the Association. It is absolutely a voluntary organization working for the betterment of the Leather Industry. None of the Executive Committee members gets any remuneration for the services rendered but they get the satisfaction of being a part of this esteemed organization.

Indian Leather Technologists' Association

[A Member Society of International Union of Leather Technologists' and Chemists Societies]

ILTA
Since 1950

'Sanjoy Bhavan', 3rd Floor, 44, Shanti Pally, Kolkata- 700 107, WB, India
Phone : 91-33-2441-3429 / 3459 WhatsApp +91 94325 53949
E-mail : admin@iltaonleather.org; mailtoilta@rediffmail.com
Website : www.iltaonleather.org