JOURNAL OF INDIAN LEATHER TECHNOLOGISTS' ASSOCIATION (JILTA)

FEBRUARY 2018 VOL.: LXVIII NO.: 02 RNI NO.: 2839/57 REGD.NO.: ISSN 0019-5738

Contents

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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', 44, Shanti Pally

3rd Floor, 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 :

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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 × 21 cm
Print area : 25 cm × 17 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
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Genesis and Significance of Trade Fair

Fair Trade is a trading partnership, based on dialogue, transparency and respect, that seeks greater equity in international trade. It contributes to sustainable development by offering better trading conditions to, and securing the rights of, marginalized producers and workers – especially in the South. Fair Trade organisations have a clear commitment to Fair Trade as the principal core of their mission. They, backed by consumers, are engaged actively in supporting producers, awareness raising and in campaigning for changes in the rules and practice of conventional international trade.
Fair Trade is more than just trading:

- It proves that greater justice in world trade is possible.
- It highlights the need for change in the rules and practice of conventional trade and shows how a successful business can also put people first.
- It is a tangible contribution to the fight against poverty, climate change and economic crisis.

Genesis of Trade Fair:

The Fair Trade movement began its journey five decades ago. The initial idea was to build trading partnerships between Fair Trade Organisations – 'FTOs' - in the USA and Europe and small-scale producer organisations in Africa, Asia and Latin America. The goal was to create development opportunities for marginalised producer communities, not through aid but by providing fair access to export markets – "TRADE NOT AID." Raising consumer-awareness in the North about the unjust and unfair practices and structures in international trade was and still is a second important goal for FTOs.

There is no doubt that a great deal has been achieved since the inception of the movement. Several thousand long-term trading-partnerships have been established between FTOs and small producer organisations. Consumers have become increasingly aware of unjust international trading structures and millions now routinely buy Fair Trade products. The guarantee for consumers that products were made and traded according to Fair Trade principles was provided by the positive image and credibility the FTOs had built through their transparency and the direct, personal and often voluntary involvement of many influential and idealistic people from various walks of life.

Until the 1980's, Fair Trade products were sold mainly in the niche market of "Fair Trade Shops" in the USA and Europe. The demand for Fair Trade products began to grow by leaps and bounds and it became evident that this simple idea had powerful potential for influencing consumer behaviour on a very large scale. In the late 1980s, some Fair Trade activists in Holland decided to take Fair Trade products beyond the niche market of Fair Trade Shops to mainstream distribution channels. These channels and their consumers required proof of the Fair Trade claims. The logical consequence of this was that an independent guarantee body was required to certify or guarantee the Fair Trade credentials of the products. This fact and the goal to safeguard Fair Trade principles led to the creation of "Max Havelaar," the first Fair Trade certifier and guarantee label. Since then, more and more Fair Trade certifiers and labels emerged in the marketplace in the following two decades; some better some worse, which changed the contours of Fair Trade substantially.

At the beginning, the ethical sensitivity of fair traders and consumers was "the driving force" through which self-development opportunities for small and marginalised producers had been created. Gradually the "ethical demand" by mainstream consumers assumed primacy. The difference is subtle and radical at the same time. Subtle enough not to be perceived as a risk by the FTOs and radical enough to change the nature of Fair Trade. A central role in this process was adopted by the Fair Trade labeling initiatives.

Primarily the aim was self-development of the producers; gradually the objective became guarantee against exploitation;

Secondarily, the excluded and marginalised communities were the final beneficiaries of fair trade; gradually the demand of the consumer became more and more important, almost to the point of being the main need to satisfy;

Tertially, the concepts of partnership, direct contact, awareness-raising and equal exchange were the means; gradually the market, ethical standards setting and the certification bodies became the means.

The new form of fair trade is often oriented to develop and promote a particular certification label and to satisfy the "ethical demand" of the consumer, thus offering the kind of guarantee against the exploitation requested by the consumer. It is a new concept that is introduced to the market, but it is certainly different from the concept expressed by Fair Trade pioneers which is centred on the process of development and partnership with small and marginalised producers, not simply that they are free from exploitation.

This metamorphosis opened a Pandora's box... certain actors in the market place have launched cynical and self-aggrandising campaigns aimed at altering the perceptions of consumers about Fair Trade by changing the definition and the original meaning of Fair Trade:

- New multi-ingredient food and personal care products are developed and introduced to market with a fair trade seal all too often with a low content of actual "Fair Trade" ingredients;
- Practically, no criteria are applied to final brand holders in the West who use fair trade seals on a limited number of their products in order to improve their overall brand image at minimal cost. This is known as "fairwashing."
- The new guarantee mechanisms fit best with agricultural producers, leaving aside those handicrafts producers that were at the origin of Fair Trade. The "new" Fair Trade has left handicraft producers aside;
- Last but not least, big producers and corporate plantations have entered as new suppliers of "fair trade" products with the inherent risk of again marginalising small producers who are supposed to be the primary beneficiaries of Fair Trade as originally envisioned.

It should be emphasized that the first independent Fair Trade guarantee and labelling initiatives were mostly supported by the pioneering FTOs with their credibility and image. To a certain extent the primary aim of this support was to establish a commercial Fair Trade brand to boost the sales of dedicated Fair Trade products, rather than to establish 'guarantee' organisations. The quandary was that the substantial difference between "label" and "brand" was not fully understood, and that the label used as a "brand" was controlled and driven now by certifying organisations that were focused more on fair trade volume than Fair Trade integrity. The 'family silver' had been given away!

Soon after their birth, the labelling initiatives began to roll on their own without accountability to the larger Fair Trade movement, and started clashing with FTOs and small producer organisations; they were driven by economic growth and the demands of the markets rather than by the political and ideological vision and values of Fair Trade. Today, 20 years later, the same FTOs that have contributed to the birth and growth of the Fair Trade labelling initiatives and who make up the "heart and soul" of the Fair Trade movement, have recognised and started to address this challenge that had been overlooked in the beginning.

"Traditional" Fair Trade and market-oriented Fair Trade, designated by the growing number of certification and labelling initiatives, are now two different realities. These may be seen as complementary concepts, both effective for the humanization of the economy if used consciously. If not used consciously they both risk to be eaten up by the practices of a profit- driven market economy.

The role of FTOs is and remains that of the principal actor of Fair Trade, which supports small and marginalised producers by building up long-term trading partnerships, based on dialogue, transparency and respect. Also awareness-raising among consumers remains an important issue and being responsive to conscious consumers is a priority, while trying to reach the general consumer only if not against the original vision and mission of FTOs. It is, therefore, very relevant and important for the FTOs to promote and highlight what we are and what we do, through the creation of our own common brand which is backed up by our own guarantee system. This is necessary in order to protect the credibility of our work and to commonly and effectively promote the image of traditional Fair Trade principles and values of FTOs.

It has to be acknowledged that Fair Trade certification and labelling initiatives are more and more oriented to the multi-national companies and to large distribution channels. This is fine as long as this is done in a transparent and truthful way.

Fair Trade certification and labelling initiatives are proceeding in a "zig zag" way, trying to keep together both the traditional Fair Trade movement (the base they don't want to lose) and large commercial licensees, who are repeatedly trying to control and water down Fair Trade principles.

As a leading pioneer in the Fair Trade movement, I believe we should welcome the new Fair Trade, which has resulted from the metamorphosis as a positive factor that, if well coordinated with the traditional Fair Trade, can represent a thrust towards the common objective: the humanisation of the economy. It is important to remain in dialogue, or start dialogue, and be clear about respective roles and different means.

At this stage of the metamorphosis process of Fair Trade, the FTOs that pioneered the Fair Trade movement have to decide, if they will become victims of their own success, or will create jointly a new success story by joining forces within the Fair Trade movement to keep the torch alive of what is truly Fair Trade, and work against what is not. Personally I am convinced that we are still young, creative and dynamic enough to start a new success story.

Few principles to be followed during trade fairs:

1. **Commitment to Fair Trade**: To trade with concern for the social, economic and environmental well-being of marginalised producers in developing countries. This means equitable commercial terms, fair wages and fair prices. Unfair trade structures, mechanisms, practices and attitudes will be identified and avoided. To cooperate and not compete. To promote fair trade and social justice in the interest of the producer, and not to maximise profit at the producer's expense.

2. **Transparency**: To openly share financial information, management policies, business practices, product sources, production, marketing and development programme plans on a regular basis. This enables both members and the public to assess WFTO's, and each organisation's social and financial effectiveness. This openness is tempered with respect to sensitive commercial or political information.

3. **Ethical Issues**: To reflect in their structures a commitment to justice, fair employment, public accountability and progressive work practices. To seek the greatest possible efficiency at the lowest cost while involving workers in decision-making and management as appropriate to each organisation. To aim for adequate income for workers to meet their basic needs, including health care, education and the capacity to save.

4. **Working Conditions**: To ensure a safe working environment that satisfied at a minimum all local statutory regulations. To provide the opportunity for all individuals to grow and reach their potential. To ensure that work is carried out under humane working conditions, using appropriate materials and technologies, while following good production and work practices.

5. **Equal Employment Opportunities**: To oppose discrimination and ensure equality of employment opportunities for both men and women who suffer from the exploitation of their labour and the effects of poverty and racial, cultural or gender bias.

6. **Concern for People**: To promote development which improves the quality of life and which is sustainable for and responsible to both people and the natural world. There will be no exploitation of child labour. Trading activities should not violate indigenous peoples' claims on land or any resources of vital importance to their way of life.

7. **Concern for the Environment**: To encourage the trading of goods which are environmentally friendly. To manage resources sustainably and to protect the environment.

8. **Respect for Producers' Cultural Identity**: To encourage production and development of products based on producers' cultural traditions and natural resources. The objective should be

to promote producers' artistic, technological and organisational knowledge as a way of helping preserve and develop their cultural identity.

9. Education and Advocacy:
To promote fair trade by encouraging people to change consumption patterns based on issues of social justice and concern for the environment. To support campaigns or campaign for national and international policies that will improve the living conditions of the poor in developing countries. To increase public and corporate consciousness of alternative trade as an effective means to change unfair international trade structures and attitudes. To increase awareness of cultural and traditional values of the South in order to promote intercultural understanding and respect.

10. Working Relationships:
Organizations participating in Fair Trade shall establish their relationships within a framework of solidarity, trust and mutual respect, avoiding prejudice or harm to their colleagues' images and reputations. These relationships are based on reciprocal benefits and fair exchanges and should be of a nature that extends beyond trading itself. WFTO members and observers agree to negotiate our differences through open and direct dialogue.

11. Creating Opportunities for Economically Disadvantaged Producers:
Poverty reduction through trade forms a key part of the organisation's aims. The organisation supports marginalised small producers, whether these are independent family businesses, or grouped in associations or co-operatives. It seeks to enable them to move from income insecurity and poverty to economic self-sufficiency and ownership. The organisation has a plan of action to carry this out.

12. Transparency and Accountability:
The organisation is transparent in its management and commercial relations. It is accountable to all its stakeholders and respects the sensitivity and confidentiality of commercial information supplied. The organisation finds appropriate, participatory ways to involve employees, members and producers in its decision-making processes. It ensures that relevant information is provided to all its trading partners. The communication channels are good and open at all levels of the supply chain.

13. Fair Trading Practices:
The organisation trades with concern for the social, economic and environmental well-being of marginalised small producers and does not maximise profit at their expense. It is responsible and professional in meeting its commitments in a timely manner. Suppliers respect contracts and deliver products on time and to the desired quality and specifications.

Fair Trade buyers, recognizing the financial disadvantages faced by Producers and Suppliers of FT products, ensure orders are paid on receipt of documents or as mutually agreed. For Handicraft FT products, an interest free pre-payment of at least 50 % is made on request. For Food FT products, pre-payment of at least 50% at a reasonable interest is made if requested. Interest rates that the suppliers pay must not be higher than the buyers' cost of borrowing from third parties. Charging interest is not required.

14. Principle Four: Fair Payment:
A fair payment is one that has been mutually negotiated and agreed by all through on-going dialogue and participation, which provides fair pay to the producers and can also be sustained by the market, taking into account the principle of equal pay for equal work by women and men. The aim is always the payment of a Local Living Wage. Fair Payment is made up of Fair Prices, Fair Wages and Local Living Wages.

15. Ensuring no Child Labour and Forced Labour:
The organisation adheres to the UN Convention on the Rights of the Child, and national / local law on the employment of children. The

organisation ensures that there is no forced labour in its workforce and / or members or homeworkers.

16. **Commitment to Non Discrimination, Gender Equity and Women's Economic Empowerment and Freedom of Association:** The organization does not discriminate in hiring, remuneration, access to training, promotion, termination or retirement based on race, caste, national origin, religion, disability, gender, sexual orientation, union membership, political affiliation, HIV/AIDS status or age.

17. **Ensuring Good Working Conditions**: The organization provides a safe and healthy working environment for employees and / or members. It complies, at a minimum, with national and local laws and ILO conventions on health and safety. Working hours and conditions for employees and / or members (and any homeworkers) comply with conditions established by national and local laws and ILO conventions. Fair Trade Organizations are aware of the health and safety conditions in the producer groups they buy from. They seek, on an ongoing basis, to raise awareness of health and safety issues and improve health and safety practices in producer groups.

18. **Providing Capacity Building:** The organisation seeks to increase positive developmental impacts for small, marginalised producers through Fair Trade.

19. **Promoting Fair Trade:** The organisation raises awareness of the aim of Fair Trade and of the need for greater justice in world trade through Fair Trade. It advocates for the objectives and activities of Fair Trade according to the scope of the organisation. The organisation provides its customers with information about itself, the products it markets, and the producer organisations or members that make or harvest the products. Honest advertising and marketing techniques are always used.

20. **Respect for the Environment:** Organisations which produce Fair Trade products maximise the use of raw materials from sustainably managed sources in their ranges, buying locally when possible. They use production technologies that seek to reduce energy consumption and where possible use renewable energy technologies that minimise greenhouse gas emissions. They seek to minimise the impact of their waste stream on the environment. Fair Trade agricultural commodity producers minimise their environmental impacts, by using organic or low pesticide use production methods wherever possible. Buyers and importers of Fair Trade products give priority to buying products made from raw materials that originate from sustainably managed sources, and have the least overall impact on the environment. All organisations use recycled or easily biodegradable materials for packing to the extent possible, and goods are dispatched by sea wherever possible.

With all the ethics followed in the fairs conducted by ITPO we are proud as a nation.

ILTA does wish the IILF Chennai 2018 a grand success.

Goutam Mukherjee

Dr. Goutam Mukherjee
Hony. Editor, JILTA

From the Desk of General Secretary

SILIGURI LEXPO – XXIV

The 24th LEXPO at Siliguri was held from 23rd December' 2017 to 7th January' 2018 at Kanchanjungha Stadium adjacent ground, as was scheduled and declared earlier.

The Inauguration ceremony was held on 22nd December' 2017 at 5.00 pm. Dignitaries present on the dais were Mr. Nantu Paul, Hon'ble Councilor, Siliguri Municipal Corporation, Mr. Asit Baran Kanungo, Vice President, ILTA and Mr. Kaushik Bhuiyan, Treasurer, ILTA.

Programme commenced with the Welcome address delivered by Mr. A. B. Kanungo. On the occasion of pre-silver jubilee year of Siliguri LEXPO, he recalled his past experience of the beginning days of the event. He also highlighted the possibilities of the growth of leather goods business in North-East states, for which Siliguri is the gateway. Also he requested to the Government authorities for simplification of the documents and other formalities to organize the fair in future at a large scale and smoothly.

Mr. Nantu Paul, in his address recalled his long involvement since inception of Siliguri LEXPO. He offered thanks to the Indian Leather Technologists' Association for honoring him by requesting to grace the function with his presence. He promised that he would tried his level best to ensure presence of a few dignitaries from the Government's side to make the Silver Jubilee year memorable.

The event was then inaugurated by lighting the lamp by all the dignitaries present on the dais.

Mr. Kaushik Bhuiyan then in his Vote of thanks especially offered thanks to Mr. Nantu Paul for his kind initiative to avail the ground in such a prime time. He also offered thanks to few local dignitaries for their kind cooperation to organize the fair smoothly. The stall holders and all present were also thanked by Mr. Bhuiyan and requested them to help themselves to refreshments being served.

16TH SANJOY SEN MEMORIAL LECTURE

Above was organized at Freya Design Studio, ILPA Leather Goods Park, Calcutta Leather Complex at 11.00 Hrs on Saturday the 13th January, 2018.

The programme commenced with garlanding of portrait of Late Sanjoy Sen by the following :-

1. Mr. Arnab Jha, President of ILTA
2. Mr. S. S. Kumar, Chairman of the Governing Council, GCELT, Kolkata and Ex-Chairman, CLE
3. Dr. Buddhadeb Chattopadhyay, Principal, MCKV Institute of Engineering & Ex-Principal, GCELT, Kolkata
4. Mr. B. C. Jana – representative of CLRI, Kolkata
5. Dr. Goutam Mukherjee – representative of GCELT
6. Mr. Patrick Lee – representative of Industry
7. A student from CFTC, Budge Budge
8. Miss Sweta Shalini, Award Winner
9. A student from GCELT, Kolkata

Above was followed by Welcome Address of Mr. Arnab Jha who briefly recapitulated various posts held by Late Sanjoy Sen and also in respect of good relations which existed between both Dr. Buddhadeb Chattopadhyay / Mr. S. S. Kumar and Late Sanjoy Sen. Mr. Jha also spoke about Late Sen's contribution to ILTA during the three and a half decades when he was President of the Association.

The names of the recipients of Sanjoy Sen Memorial Medal were then declared.

- Miss Sweta Shalini : Topper in B. Tech Leather Technology examination of MIT, Muzaffarpur in 2017.

  Medal & Certificate were handed over to her by Mr. Arnab Jha.

- Mr. Prince Babu : Topper in B. Tech Leather Technology examination of HBTI, Kanpur in 2017 who was unable to come & requested for the Medal & Certificate to be sent to him.

On behalf of the Govt. College of Engineering & Leather Technology, Dr. Goutam Mukherjee, Associate Professor announced the following Award Winners :-

- Gold Medal to Composite Topper of 4 years in Leather Technology, 2016 – Mr. Sayandip Rana who received the Medal from Mr. Arnab Jha.

Dr. P. K. Basu Memorial Scholarships were received by the following :-

- Mr. Arnab Sarkar received the award from Mr. S. S. Kumar

- Mr. Subhankar Dutta received the award from Dr. Buddhadeb Charropadhyay
- Sk. Sahadat Ali received the award from Mr. Susanta Mallick

Miss Pamela Panja, another recipient of the Award suggested that the award money be given to another person since she has already got an employment to finance her further studies which was appreciated by the gathering.

Mr. S. S. Kumar was then introduced to the gathering by Mr. Arnab Jha and Mr. Kumar was requested to deliver his lecture titled **"Sustainability of the Industry"**.

Miss Sweta Shalini then made presentation which was highly appreciated by the gathering.

Dr. Buddhadeb Chattopadhyay was then requested to deliver his lecture titled **"Forward Looking Plan for the Tanning Sector"**.

Mr. S. S. Kumar & Dr. B. Chattopadhyay were then each presented with a memento.

Mr. Susanta Mallick, General Secretay, ILTA commenced offering Vote of Thanks stating that, Late Sanjoy Sen was our President for over three decads with his immense contribution to the Industry and our Association before passing away on 31st August' 2001. From 2003 we have been organizing 'Sanjoy Sen Memorial Lecture' on his birthday. That way this has been the 16th Sanjoy Sen Memorial Lecture where we felicitate the Toppers in B.Tech Leather Technology exemination of HBTI- Kanpur, and MIT-Muzaffarpur.

He expressed his heartiest thanks to the Dignitaries, Guests and Members present and particularly to Mr. S. S. Kumar & Dr. B. Chattopadhyay who so kind to accept our last minute request to deliver lectures in memory of late Sanjoy Sen.

He also expressed his appreciation to the award winners for their achievements and wished a bright future for them.

He stated that as during three successive years from 2014 to 2016, this year also we are organizing a Seminar at Chennai on the second day of IILF-2018.

On behalf of ILTA, he extended a most cordial invitation to all to this event in Chennai.

He thanked all again and wishing a Happy, Prosperous & Peaceful 2018, requested them to join for the working lunch.

SEMINAR AT IILF–2018, CHENNAI

We have already booked Seminar Hall "A" at IILF 2018 from 10.00 hrs. on 2nd February' 2018 for the Seminar.

Due to some unavoidable circumstances Dr. B. Chandrasekaran regret his inability to deliver his lecture what we declared earlier. The name of Dr. J. Raghava Rao, Chief Scientist, CSIR - CLRI was then proposed by Dr. Chandrasekaran in liue of himself. We have received the confirmation from Dr. Raghava Rao in respect of his delivering a lecture at the seminar titled **"Waterless Chrome Tanning: Treading the Road Not Taken"**. Mr. Ivan Kral, Industrial Development Officer, UNIDO has also consented to deliver a lecture titled "**e-Learning in Leather Industry**" as another speaker.

Padmashri & Padmabhushan Dr. T. Ramasami and Mr. D. Sothi Selvam, Director (Manufacturing Business), Balmer Lawrrie & Co. Ltd. have been confirmed to be the Chief Guest and the Guest of Honour respectively, on this occasion.

Mr. N. Shafeeq Ahmed, Chairman, Indian Leather Manufacturers & Exporters Association has been approached to grace the occasion as the Guests of Honour. His consent is awaited.

7TH MONI BANERJEE MEMORIAL LECTURE

This is scheduled to be held on Thursday the 15th March, 2018. Time, Venue & other details will be communicated in due course. All are most cordially invited to participate.

BEREAVEMENT

With profound grief and a heavy heart we announce the sad demise of **Mr. Ashok Sen**, on 26th December' 2017 and **Prof. S. S. Dutta** on 14th January' 2018. Both were Life Members of ILTA.

May their soul rest in peace and may God give strength to the members of the bereaved families to bear the irreparable loss.

You are requested to :-

a) Kindly inform us your '**E-Mail ID**', '**Mobile No**', '**Land Line No**', through E-Mail ID: admin@iltaonleather.org or over Telephone Nos. : 24413429 / 3459 / 7320. This will help us to communicate you directly without help of any outsiders like Postal Department / Courier etc.

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

(Susanta Mallick)
General Secretary

Executive Committee Members meet every Thursday at 18-30 hrs. at ILTA Office.
Members willing to participate are most welcome.

Exploring New Chemistries in Leather Chemicals

V. Vijayabaskar
LEATHER CHEMICALS, BALMER LAWRIE & CO. LTD .
MANALI, CHENNAI

In leather processing, the nature of leather and different types of leather chemicals attributes to performance of leather. Although, lot of advancements have happened in mechanical operations, radical changes is yet to put in practice in terms of various chemistries used for manufacturing leather chemicals . New chemistries have gained momentum in other fields and this paper will highlight the possible opportunities to utilize many organic reactions in leather chemicals. The approaches mentioned are not pertaining to just change of substrates but new reactions with possible different outcomes. The article is divided in to four well known broad areas in leather processing namely - i. Fatliquors ii. Syntans iii. Beamhouse and iv. Finishing where the reactions mentioned could be explored.

Fatliquors

Fatliquors which are dispersions of synthetic /natural oils in a continuous phase which could be of O/W or W/O type emulsions. The nature of fats, particle size, types of co surfactants added, feel modifiers and solvents attribute the performances broadly like softness, feel to handle and other organoleptic properties. In all the fatliquors, the surfactants are adsorbed to the oil droplets by physisorption.

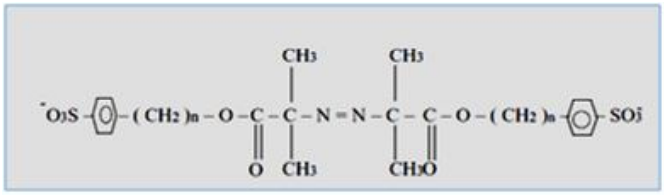
Reactive surfactants

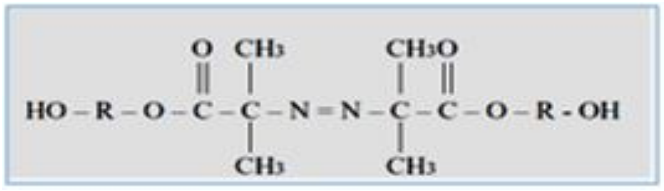
Reactive surfactants can covalently bind to the dispersed phase and as such have a distinct advantage over conventional surfactants that are only physically adsorbed and can be displaced from the interface by shear or phase changes with the subsequent loss of emulsion stability. Furthermore, if the substrate is coalesced to produce protective films like in leather finishing , the desorption can result in, e.g. reduced adhesion, increased water sensitivity and modification of the hardness, barrier and optical properties of the film.

Reactive surfactants have also economic and environmental advantages. The binding to the dispersed phase makes these surfactants an integral part of the finished product and enhances the yield in active matter on a weight basis. It furthermore prevents the release of surfactants in the water effluents on production and application and, as such, reduces the environmental impact of intermediate products and commercial formulations.The area of reactive surfactants has witnessed a surge of activity during the last decade, in part because of the combined efforts of many European laboratories[1,2]

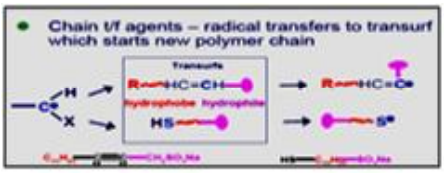
Depending upon the chemical structure and effects, there are different types of reactive Surfactants :

Surface active initiators (Inisurfs)



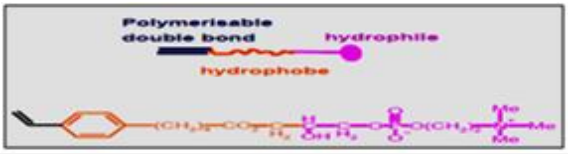


Surface active transfer agents (Transurfs)



Polymerizable surfactants (Surfmers)

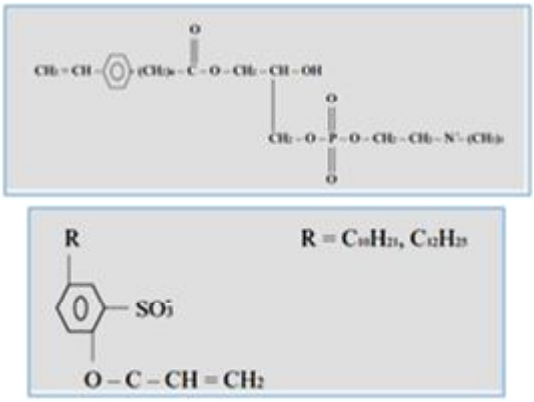
The examples are given below : 1.A hydrophilic moiety2.A hydrophobic moiety and **3.**A polymerizable group.



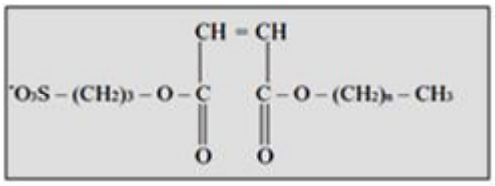
[1]Corresponding Author's E-mail ID : dibyendu.datta@nift.ac.in

In common with conventional surfactants, Inisurfs and Transurfs, Surfmers form micelles in aqueous solutions above the CMC.

Ionic Surfmer - can be of anionic, cationic and amphoteric types

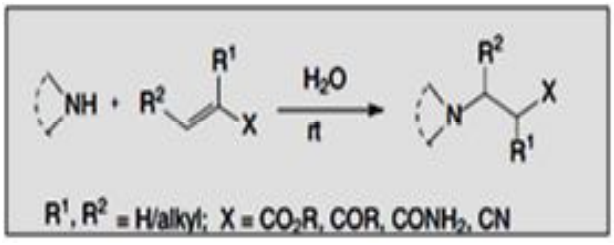


Maleate Surfmers : Surfmers with allylic, acrylic and vinylic moieties tend to homopolymerize and produce water-soluble polyelectrolytes if used above their CMC. This has shifted researchers' attention to maleic derivatives that do not homopolymerize at normal temperatures. Tauer and co-workers[3] have pioneered the synthetic work which led originally to compounds like mentioned below.



Maleate surfmer

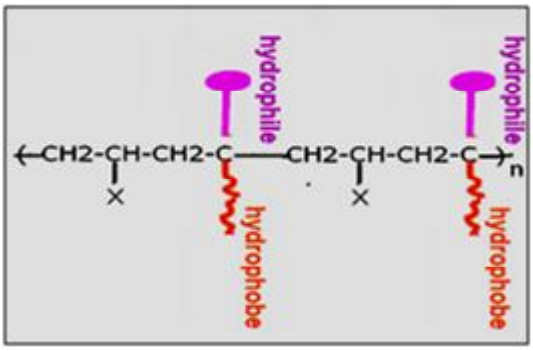
Also surfmers based on itaconic acid and stabilization of polymer latex like styrene were studied[4]. These surfmers can be covalently bonded to emulsified oils like reacting the vinylic or maleate ends to chemically modified oils / fats. One of the approach could be of Michael addition of amines to the unsaturated bonds.



Michael addition reaction

The rate of the above reaction goes well with water[5]. Another way of utilizing surfmer in fatliquor is to synthesize polymeric fat apart from using it as a Co-surfactant. The patented approach has been mentioned below [6].

Preparation of Polymeric fat preparation through Surfmers (Patented)[6]



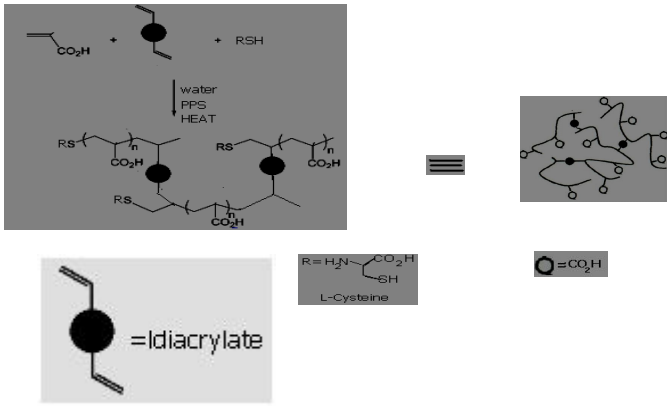
polymers[17-22], which are polydisperse are composed of successive branching units.

Illustration of more branching in Hyper branched polymers

Synthesis Methodology

We have followed a recently developed a facile and generic synthetic methodology (the "Strathclyde methodology") for the high yielding synthesis of branched vinyl polymers using conventional free radical polymerization. The methodology involves the simple free radical copolymerization of a vinyl monomer with a difunctional (or multifunctional) comonomer, wherein cross-linking and network formation is inhibited by use of appropriate levels of a stoichiometric free radical chain transfer agent, such as a thiol, or indeed a catalytic chain transfer agent. This process is patented[23].

Scheme-1



In general, leather trial results showed that these branched polymers behave as a soft acrylic syntan with less surface hardening characteristics and improved bleaching.

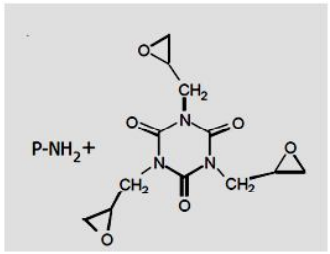
Beamhouse

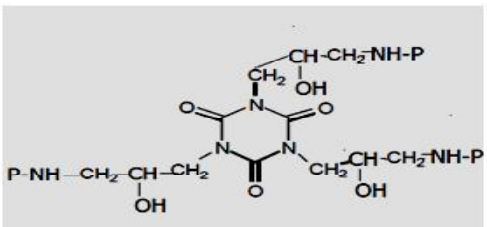
These branched polymers with multiple functionalities also served as a better dispersing and fixing agent for basic chromium sulphate (BCS); importantly, after chrome tanning the residual chromium (measured as % Cr_2O_3) left behind in exhaustion was considerably reduced[23].

The dendrimers can be used like in drug delivery for sustained release of sodium sulphides in unhairing. This could be bring down the load in effluents.

Alternate Tanning approaches

Epoxide tanning is being explored and patented[24].

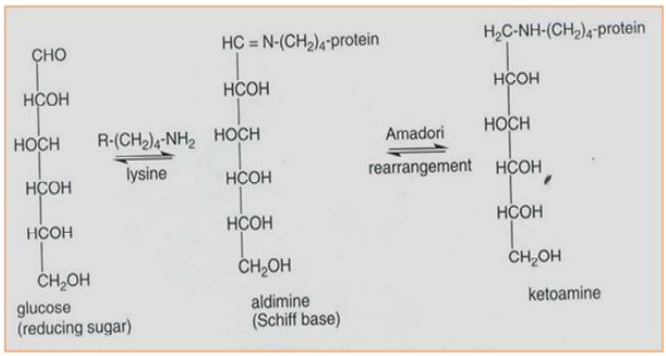




This is a mineral free and aldehyde free thermal stable organic leather having Ts>85⁰C. Multiple functional epoxides are known to have crosslinking ability with Animal skin collagen molecules[24].

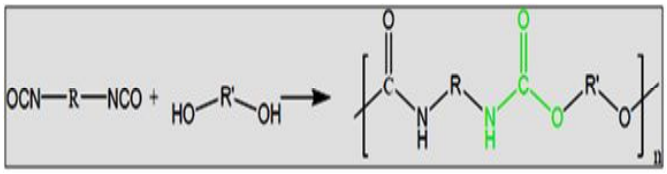
Biomimetic approaches to tanning constitute a new potentially powerful aspect to applications of biotechnology in leather making.

Maillard reaction – Amadori product – Ketosamines[25]



Derivatives of carbohydrates namely dialdehydes obtained by oxidation reacts with proteins to form permanent bonds (Maillard reaction). This is responsible for transformation during cooking of proteinaceous food. The natural products responsible for cooking reaction include sugars and the glycosaminoglycans, hylauronic acid, dermatan sulfate and chondroidroitan.

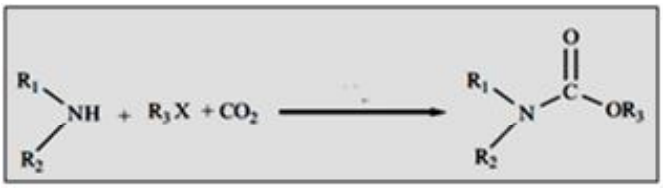
Finishing



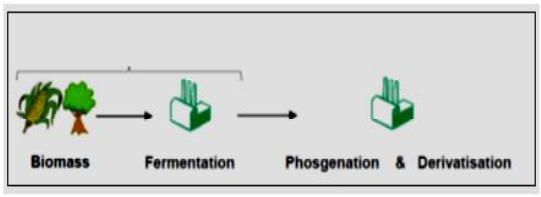
Conventionally, acrylics, urethanes and protein binders are used for film formation. Mostly they are dispersions in water and form films by coalescence on loss of water after drying. Urethanes are made by using different blocked isocyanates and diols.

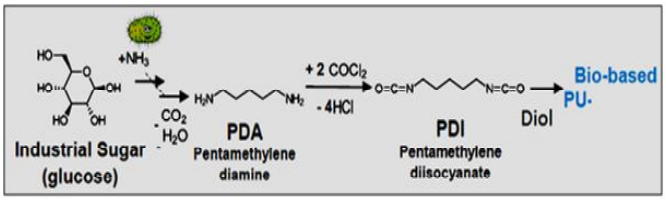
Instead of having blocked isocyanates as starting materials, polycarbamates / urethanes can be generated from poly amines by reaction with carbon dioxide . Extensive research is being carried out across and this could be a cost effective approach with utilization of greenhouse gas- carbon dioxide.

Yoshida *et al* have also reported [26] synthesis of carbamates through the one-pot reaction of amines **4** with alkyl halides using gaseous CO_2. Carbamates obtained in this method are also limited to primary and secondary aliphatic amines,



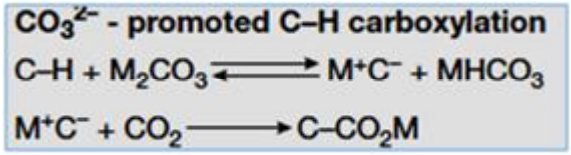
Bio based urethanes[27,]

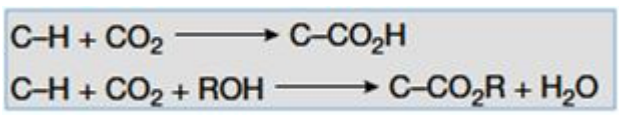


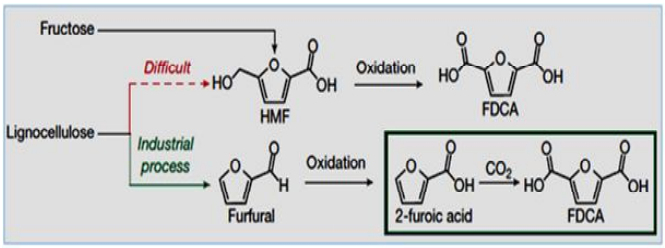


Urethanes can be made from sugars which will reduce carbon foot print.

The below scheme is a recent reaction pathway published[28] by utilizing carbon dioxide via carbonate promoted C-H carboxylation. This reaction in molten cesium carbonate can be used to make furon di carboxylic acid from ligno cellulose. In future many di carboxylic acids can be prepared from bio feed stocks by utilizing CO_2. These carboxylic acids will be helpful to synthesize polyester diols and then subsequently to urethanes. The polyesters can be totally made from renewable resources and this pathway will help to reduce the dependence on petroleum feed stocks.

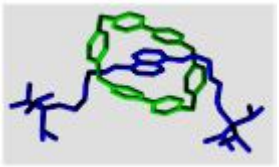




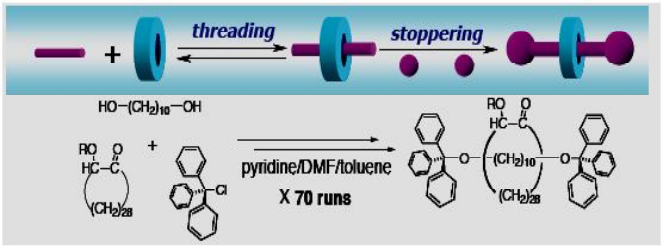


Rotaxanes[29-31]

A **rotaxane** consists of a "dumbbell shaped molecule" which is threaded through a "macro cycle"



These molecules can be considered for film formation. They are formed by different approaches like capping and clipping.



Conclusion

This paper is to highlight the various possible chemistries to be explored. The suggestive pathways needs further studies and would require modifications. The success pathways in other areas are to be 'technologically translated'. Much more organic reactions can be adopted and the culture of interdisciplinary research with an amalgamation of scientists in different fields of science and technologists could contribute and unravel the interesting aspects in this field of leather.

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Prof. S. S. Dutta

Prof. Sasanka Sekhar Dutta, well known as Prof. S. S. Dutta born at Siliguri, West Bengal. He was a senior Life Member of ILTA.

Prof. Dutta successfully crossed his every academic mile stone as a topper till graduation with distinction in B.Sc, Physics in 1955. In the year 1958 he passed out B.Sc. Leather Technology examination from Calcutta University as a First Class first, Gold Medallist.

In the beginning of his career he had undegone various trainings. First he went under practical training stipend scheme 1958 to 1959 at Kapurthala Northern India Tanneries Ltd, Punjab. Then he went under training from Central Leather Research Institute, Madras 1960 to 1961 under Dr. S. M. Bose and Dr. N. Ramanathan. He also went under training at P. Leiner & sons (wales) Ltd., Fredorest, Glamorgan, U K for manufacturing of Gelatine in 1962.

He started his professional career as the production Manager at Leiner-Knit gelatine company Limited, Jabalpur, M P from 1963 to 1967.

In the year 1967, Prof. Dutta joined at the then College of Leather Technology as the Professor of Leather Chemistry and after rendering the service for 27 years from 1967 to 1994, he took retirement on 21st July 1994.

During his career as professor, he contributed innumerable articles & papers in different National & International leather related journals / magazines. He was highly appreciated in the leather industry for his book 'Indian Leather Digest' published by Shri S. Sankaran at Madras in 1980. In 1986, after retirement of Dr. P. H. Rao, he took charge as 'Acting Principal' of College of Leather Technology, Calcutta. He also worked as Project Co-ordinator for UNPP project under the Dy. Director, Technical Education in the same year. During this assignment he again undergone a training for the "Physical Properties and Physical Testing of Leather", under UNIDO at National Leather sellers Centre, NENE College, Northampton from 1986 to 87.

His famous book on leather technology titled "An Introduction to the Principles of Leather Manufacture" was first published under Presidentship of Late Sanjoy Sen, of Indian Leather Technologists' Association in 1973.

He left his wife, a son and a daughter and a number of connoisseurs at the time of his passing away on 14th January' 2018.

Research & Development at TFL Leather Technology

As a leading supplier of chemicals to the leather industry, TFL provides products for all process steps from beamhouse right through to finishing. The company has heavily invested in research and development activities targeted at providing exciting new chemistry to customers. TFL operates R&D facilities in Switzerland, Italy, France, India, Brazil and Argentina. After opening a completely revamped R&D finishing laboratory in Buscate, Italy in 2016, TFL's brand new Wet End development centre in Muttenz, Switzerland started operation in December 2017. A team of chemists and leather experts are working here in integrated, state of the art facilities comprising chemical labs, a fully operational tannery and physical testing.

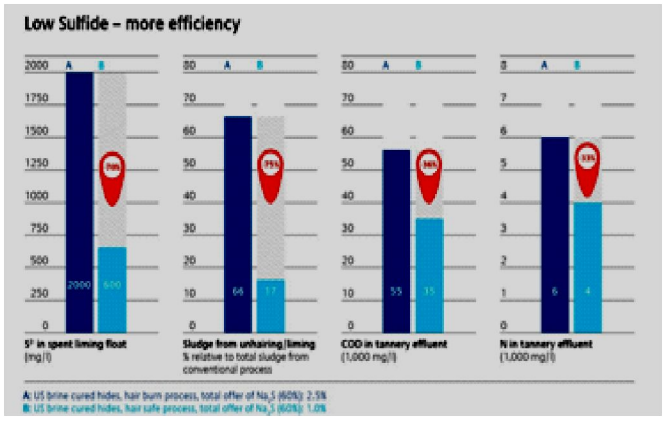
The new TFL Wet End Research & Development Centre in Muttenz, Switzerland

TFL was originally formed by combining the leather related activities of the Swiss company Ciba-Geigy and the German companies Röhm and Stockhausen under one roof. Based on this history, a large product portfolio of beamhouse and wet end products, supported by deep rooted knowledge and expertise about their chemistry and application, provided the foundation of product development in TFL. The acquisition of companies Deacolor (Italy) and Quinn (India) supported an additional focus on R&D activities related to finishing technologies. Today there are dedicated R&D teams in TFL for beamhouse and pre-tanning products, for wet end retanning agents and polymers, for fatliquors, for dyes and dyeing auxiliaries, for finishing technologies, and for transfer coatings.

Innovation at TFL is always focused on both technical excellence and the lowest possible impact on the environment. TFL has joined both the *ZDHC* (Zero Discharge of Hazardous Chemicals) and the *Leather Naturally* initiatives, an expression of the company's continued commitment to sustainable leather manufacture.

Following the motto "*Great chemicals. Excellent advice.*", this means developing environmentally friendly chemicals, together with providing innovative tools and solutions to the industry enabling tanners to reduce the impact of their operations on the environment.

A recent TFL development is BORRON® SCA, a new biodegradable scudding and bleaching agent, which is part of the TFL ECO TECH range. The product supports the removal of scud (the remains of hair and epidermis) from delimed pelts. Removed scud is then kept in suspension and is not re-absorbed by the grain. Another innovation is TFL LOW SULFIDE TECH, which not only permits to significantly reduce sulfide offers for a complete and 100% reliable unhairing, but also provides a substantial reduction of waste water pollution.



Sulfide and pollution reduction with TFL Low Sulfide Tech

In the Wet End, the novel zirconium based retanning agent TANNESCO® CPR allows a reduction of 50% of the COD of waste water from retanning operations.

One of the R&D focus areas in the coating, respectively finishing segment has been further improvements of products for upgrading, a field TFL was pioneering with the introduction of the RODA® Care product range 15 years ago. Latest developments include RODA®Nubuck N/2 a product which provides nubuck leather with a good touch and resistance to fading and wear while covering minor defects. RODA® Base DW 4088/N is a pre-bottom coat for upgrading shoe and garment leather and imparting good water resistance. Another focus is the development of high performance products for finishing automotive leathers and non-leather substrates. To

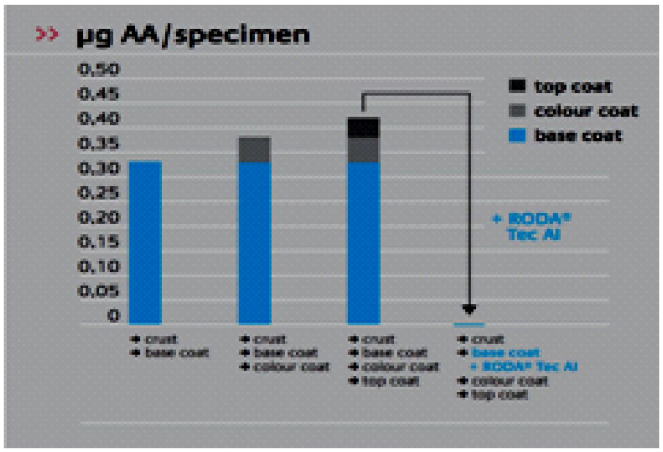
mention are RODA® Base 5098 a base coat resin for automotive nappa leathers and Product FA 5113 a novel additive to improve abrasion resistance in anti- soiling TFL top coats.

Transfer coating of leather and non-leather substrates is one area of the industry where solvent based solutions are still predominant. Here the new water based PU compounds PEVIT® XCB 5422,PEVIT® XCB 5423 and PEVIT® XCB 5424, used as pre-skin and skin coats in transfer coating processes, offer a more ecological and at the same time highly performant alternative. The new water based top coat product PEVIT® XCB 5440A together with the primer PEVIT® XTF 7231 are used i.e. for finishing PVC substrates used in automotive interiors.

An area which is gaining more and more importance is the elimination of potentially hazardous substances. Considerable R&D activities went into the successful elimination of hazardous solvents like NMP, NEP, toluene and xylene. Also formaldehyde was completely eliminated from finishing products and is not intentionally used in any TFL product formulation.

It is TFL's policy to comply with all EU REACH directives and not to intentionally use substances which are part of REACH –SVHC list (substances of very high concern) and which are part of ZDHC MRSL List.

The focus of attention regarding the ecological and toxicological impact of leather and its production process has recently broadened to include air emissions from leather, especially in the car interior. Main areas of concern are the emission of toxic substances, including certain aldehydes like acetaldehyde, but also emissions of non-toxic substances impacting safety and comfort in cars. A multitude of tests is available for assessing these emissions from leather, including thermodesorption tests, emission chamber tests and odour tests, to name just a few. With recent, novel,TFL developments such asthe acetaldehyde scavenger RODA® TEC AI and the low emission fatliquor CORIPOL® LE, TFL is leading the way in addressing these concerns.



Acetaldehyde elimination with RODA® TEC AI

TFL continuously strives to be the most innovative company in the leather field. Researchers at TFL are determined to provide new solutions to the benefit of the industry and the environment. Dr. Peter Amann, CEO – TFL Group, states: "We are committed to working together with our customers to drive improvement in product strategy and we are supporting this by developing and launching safer, more environmentally friendly products."

PRESS RELEASE

Stahl showcases forward-thinking solutions at IILF 2018

New at Stahl's IILF-portfolio: Performance Coatings for (split)leather

Waalwijk, 1st January 2018–From 1-3 February 2018 Stahl, the leading company in process and specialty chemicals for a wide variety of materials including leather, will showcase its forward-thinking portfolio at the India International Leather Fair (ILLF) in Chennai. For the first time, Stahl will show its Performance Coatings solutions for (split)leather. Next to their Wet-End Chemicals & Dyes, Leather Finish and Shoe Finish & Leather Care portfolio, Stahl will also present its L.I.F.E collections. Stahl will be located in booth 4A-4C-4D, Hall 2 at the Chennai Trade Center in Nandambakkam.

Stahl promotes various applications of their Performance Coatings solutions:

- transfer coating of high solids system on split leather and fabric;
- high solids application on foils laminated on split leather;
- transfer coating of water- and solvent based PU finish on split leather;
- double face leather finish;
- direct coating of foam finish on fabric and split leather; and
- direct coating of foam finish on micro fiber.

Sustainable supply chain

Stahl has a clear vision of the future: contributing to a more transparent and sustainable supply chain through the exchange of knowledge and experience. Stahl has various solutions that have less environmental impact like Stahl Neo, which complies with the Zero Discharge of Hazardous Chemicals (ZDHC), Manufacturing Restricted Substances List (MRSL) and goes beyond this standard. At ILLF 2018 Stahl will explain more about the complete Stahl Neo portfolio and the chrome-free tanning system Stahl EasyWhiteTan™. This tanning system creates high-quality leather in a more sustainable wayusing less chemicals, water and energy.

Stahl in India

Stahl believes that cooperation and partnership is key to finding solutions that improve both production as well as the environment. For that reason, Stahl and partners set up a public-private partnership to contribute to clean up the Ganges. The project endeavors to make the Kanpur Leather Cluster more sustainable by implementing new working methods and technologies with a lower environmental impact. The five-year project aims to address several challenges related to overall water use and pollution from the Kanpur Leather cluster, which is partly responsible for pollution loads in the Ganges. With this project, Stahl reaffirms its commitment to achieving a more sustainable leather industry via transparency.

About Stahl

Stahl is leading in process and specialty chemicals for a wide variety of materials. We offer an extensive range of technical and surface solutions to the automotive, apparel & accessories, architectural & interior design industry, among others. With more than 2,100 employees in 24 countries at 13 manufacturing sites and 38 laboratories, Stahl is expected to realize an annual turnover of over 870 million euro in 2017. Due to its expertise, innovation power and focus on accelerating a more transparent and sustainable supply chain, Stahl provides best in class solutions and services. This enables the company to fulfill the latest market needs and contribute to more sustainable industries.

IILF2018: Creating a more sustainable future through partnership

Stylish, forward thinking and sustainable.

During the India International Leather Fair (IILF) from 1-3 February 2018 in Chennai, Stahl shares their vision for the future: a more transparent and sustainable supply chain through the exchange of knowledge and experience. We will showcase our Wet-End Chemicals & Dyes, Leather Finish and Shoe Finish & Leather Care portfolio. For the first time, we will also show our Performance Coatings for (split)leather at IILF. Our solutions are applicable for various industries, from Apparel & Accessories, Interior Design to Leisure & Lifestyle.

Booth Highlights

Seeing is believing. In our booth we will have various samples and articles for you to see and experience the possibilities of our products first-hand. We will take you on a journey to forward-thinking solutions.

- **Stahl EasyWhite Tan™** is our alternative tanning system, that creates high-quality, chrome-free leather in a more sustainable way. Using less chemicals, water and energy.
- Tanning with **Stahl EasyBlue Tan™** produces top-quality leather in a sustainable manner. The simplified tanning process saves time and energy, whilst the amount of salt and chrome in waste-water is significantly reduced.
- Our range of **Stahl Neo** products is a complete portfolio for leather finishing, that complies toZDHC / MRSL and goes beyond these guidelines. The Stahl Neo rangecan be used for a wide range of applications and offers more sustainable solutions that deliver excellent quality.
- To upgrade your leather quality, Stahl provides several solutions such as **Upgrading** and **Easy-Kat**.
- Our **Densodrin®** range of waterproofing systems is AOX- and solvent-free, which makes it the natural choice when it comes to environmental friendliness. It is recommended for all types of leather, especially shoe uppers that require high waterproof performance.

Our aftercare solutions such as, Easy Crust and Shoe Aftercare protect leather and shields it by creating an invisible breathable barrier that enhances stain resistance and easy cleaning. Sustainable and with an easy application of course.

- Our **Performance Coatings** offer endless possibilities. We will show: transfer coating of high solids system on split leather and fabric, high solids application on foils laminated on split leather, transfer coating of water- and solvent based PU finish on split leather, double face leather finish, direct coating of foam finish on fabric and split leather and direct coating of foam finish on micro fiber.
- Our **L.I.F.E Collections** which you can see and feel through the inspirational, sustainable leather samples we have available at the booth.

Stahl in India

Stahl believes that cooperation and partnership is key to finding solutions that improve both production as well as the environment. For that reason, Stahl and partners set up a public-private partnership to contribute to clean up the Ganges. The project endeavors to make the Kanpur Leather Cluster more sustainable by implementing new working methods and technologies with a lower environmental impact. The five-year project aims to address several challenges related to overall water use and pollution from the Kanpur Leather cluster, which is partly responsible for pollution loads in the Ganges. With this project, Stahl reaffirms its commitment to achieving a more sustainable leather industry via transparency.

Experience our booth

We believe that by working together, we can make a difference. Visit our booth; discover the opportunities and possibilities yourself.

IILF | 1-3 February 2018 | Nandambakkam, Chennai | Hall 2 | Booth 4A-4C-4D | Opening hours: 10.00 – 18.00 | www.iilfleatherfair.com

Probiotic Solutions for Sustainable Leather

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1. Introduction

Since the introduction of industrial processing in the tanneries only little innovation has taken place. And certainly, most of the new developments were not introduced in the terms of sustainability. Yet, modern times ask for more natural alternatives to the traditional solutions.

Processing hides and skins to manufacture leather involves generating very high amounts of wastewater and solid residues, many of them valuable for other applications if they are not contaminated with chemicals.

For example, 1 ton of bovine salted hides require 500 KG of chemicals to produce 250 KG of finished leather (Joint Research Center; Rydin, Stefan; Black, Michael; Scalet, Bianca Maria;, 2013). Therefore, tanners must manage huge excesses of non-leather materials to avoid pollution. When applying R3 environment strategies (European Commission, 2008), main potential actions will focus on:

- Reducing chemicals through efficient methods that optimize dosing and ensure full exhaustion of processing agents and eliminate or improve efficiency of auxiliaries. Consequently, reduction of effluent charges will be expected by improving COD and BOD values, salinity and toxicity.

- Reusing some chemical auxiliaries that remain in the effluents and solid residues that could be applied in the leather process as raw material for, e.g., retanning agents.

- Recycling solid residues by deriving protein, fats and other components to other industries of high value like cosmetics, medicine, foodamong others.(Adzet Adzet, 2010)

Nowadays, biotechnology is suitable to support tanners to implement R3 environment strategies by reducing the need of synthetic chemicals, improving exhaustion and adding value to by-products. Additionally, technology based on probiotics presented in this work leads to other sustainable benefits, like natural fermentation process, fully renewable raw material, 100% biodegradable, safe biochemicals, reduction of carbon footprint and at the same time improving the quality of the leather articles.

2. Technology fundamentals

The word probiotic has been in common use for more than 25 years (Hamilton-Miller, 2003) and definitions have been refined but most describe probiotics as live microorganisms that confer health benefit. Probiotics is on the cutting edge of developing technology to apply the concept of "probiotics" in a variety of industries and applications – from human health, to agriculture, to industrial waste management, textile processing, leather processing, hospitality products and many others.(Proviera.com, 2016)

Probiotics Technology utilizes beneficial and effective microbes to repopulate environments with healthy microorganisms. This work presents the application of the biochemicals in the leather process obtained from a proprietary fermentation and formulation technology. Carefully particular natural raw material is fermented with a probiotic mother culture resulting in metabolites composed by a mixture of biochemicals.

The mother culture is a selection of microbes grown in "consortia", in a process of co-growth that combines multiple strains during production. Each strain develops while interacting with other. Through the consortia culturing processes, the microorganisms become a small eco system— much more resilient and capable of working together synergistically. This methodology is more similar to how microorganisms actually survive in the natural environment. In nature, strains never exist in isolation or as a pure culture. Microbes are always interacting with others. (SCD Probiotics, 2016)

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Significant differences can be noted when comparing the innovative and disruptive probiotic technology with traditional chemical synthesis:

i. Fermentation is a complete natural bio-reaction and does not require additional sources of external energy. Therefore, carbon footprint is minimized and does not cause greenhouse gas emissions.

ii. Biochemicals derived from fermentation using probiotics do not have potential toxicological effects like synthetic chemicals andare non-corrosive.

iii. Probiotic technology uses raw materials from renewable and sustainable resources and do not depend on other industries like crude oil.

iv. Fermented biochemicals are 100% biodegradable.

Each microbe strain carries specific properties together with its metabolites that enable them to offer functions such as degreasing, dispersing, conditioning etc. These end properties are derived by the cautious use of additives, which are processed using specific manufacturing systems(Proviera.com, 2016).

3. General properties of probiotic biochemicals

a. Probiotic biochemicals are hydrotropes and possess the ability to increase the solubility of sparingly soluble organic molecules in water (Travis K. Hodgdon, 2007). The biochemicals composition includes some hydrophilic and lipophilic, like typical surfactants, but they contain a very small hydrophobic fraction (Vividha Dhapte, 2015) that does not allow to form aggregates such as micelles.Dirt, dung, waxes, phospholipids among soluble or non-structured proteins, such as hyaluronic acid, dermatan sulfate, elastin, glycoaminoglycans, globulins, in the hides and skins are cleaved off, solubilized and dispersed into the floats during the first stages of the leather processing, mainly in the soaking operations. Processing chemicals, such as tanning and retanning agents, fatliquors and dyes, are dosed in water solutions to bond the functional groups of the collagen for tanning or to provide all physical properties to the leather articles in the wet-end operations.

Besides, hydrotropes are recognized as excellent wetting agents when they are in contact with collective structures, such collagen fibers. They allow the media to accept water, working like surfactants, breaking the surface tension of water and help the water transfer from particle to particle (Mark Czernota, 2013). Consequently, water molecules can permeate the fibrous collagen structure into the fibril and micro fibril tissue, up to the α-helix, break hydrogen bonds and activate the protein functional groups. This wetting effect is associated to a slight lyotropic swelling. It produces a relaxation of the fiber structure and allows the fixation of ionic substances. (Ylla-Catala Genís, 2008).

In summary, probiotic biochemicals have strong capabilities to eliminate, or at least to reduce and combine, all kind of soaking and wetting agents, enzymes, degreasers, dispersing agents, solvents, dye auxiliaries, ammonia, extensively used in tanneries in the beamhouse and wet end operation. Most of these agents have high contribution on the effluent pollutants and are not fully biodegradable.

Because they action aims to reduce superficial tension, surfactants require additional washes to be removed from the leather. Potentially, probiotic biochemicals save water consumption as they do not foam.

b. Probiotic biochemicals are compatible with all chemicals used in the leather making process and do not require to adjust the conditions, such as pH and temperature, beyond those required in the manufacturing operations.

c. Except under unusual conditions, such as deficient preservation, long soaking, water conditions..., the soaking operation using probiotics biochemicals is free of bactericides and can reduce bad odors or putrefaction. All though the need for bactericides in soaking depends on the totality of all the prevailing conditions (Covington, 2009), they are habitually added in the tanneries. Handling biocides

requires adequate safety equipment, increase effluent charges like COD and impact on the efficiency of the biological reactors in the wastewater treatment plants.

Probiotic biochemicals cannot be considered as bactericides,however, they are capable of delaying for a limited time the harmful consequences of certain putrefying bacterialike *Bacillus, Staphylococcus spp, Sreptetoccusspp, Klebseilla, E. coli* and *Listeria*,because of bacteria competition exclusion or quorum sensing (Bonnie Bassler, 2006).

4. Material and methods

This work compiles a set of trials carried out on different materials in industrial drums and pilot plants, from salted to fresh hides from different origins and sheep and goat skins and wet-blue. All demonstrations followed the same processing scheme and the doses and conditions were adjusted as is described below.

Three different probiotic biochemicals (patent pending) have been designed to be differentiated by their hydrophilic-lipophilic-balance (HLB). This was intended to obtain a higher soaking, dispersing or degreasing properties. The products were named as a Probiotic Soaking Agent (PK), Probiotic Dispersing Agent (PS) and Probiotic Degreasing Agent (PD).

Beamhouse:

Wash and presoak:

Objective: Removal of dirty substances from animal (manure, blood…) and preservation substances (salt, biocides…). In salted hides or skins, additional washes are used to reduce salt concentration measured in °Bé. Superficial degreasing to eliminate external waxes and phospholipids on the hair and epidermis.

Dosing: On green weight:
Washes: 0.1% PK and 0% + 0.05% PD.
No pH adjustment

Pre-Soak: 0.2% to 0.5% PS, higher in salted raw material + 0% to 0.05% PD.
No pH adjustments.

Alternatives to: The probiotic biochemicals replaced surfactants and enzymes (soaking agents) and degreasers. Biocides were not added.

Main soak:

Objective: Re-hydrating hides and skins and bring them to a flaccid condition for subsequent operations. Removal of some globular proteins that will interfere with the tanning process (Thorstensen, 1985).

Dosing: On green weight:
0.3% to 0.5% PK. Higher on fresh raw material + 0% to 0.3% PS.
Products are added prior alkalis to adjust pH=8.5-9.5 for liming.

Alternatives to: Most of the chemical soaking agents, either surfactants or enzymes.

Un-hairing / liming:

Objective: Removal of the hair and further completion of globular proteins by the action of the alkali. (Thorstensen, 1985).

Dosing: On green weight:
0.2 % PD, prior to lime and sulfide.

Alternatives to: Eliminate or reduce the use of amines, organic reductive agents and polyphosphates, all of them are typical auxiliaries in the unhairing and liming processes.

Degreasing:

Objectives: Strip off natural fats from adipose tissue, specially inside skins. Disperse natural fats in the float and solubilized them by emulsification with surfactants or hydrolyzation under the action of lipases.

Dosing: Tests were carried out after deliming, before or during the bating for bovine hides, goat skins and sheepskins, or after pickling/depickling for sheepskins. Posterior washes, in most cases, using non-ionic surfactants with high emulsifying effect. Dosages are based on lime pelt weight.

0.5% to 3 % PS + 3% to 6% PD, depending of the natural fat content. Degreasing can need 1 to up to 3 washes.

Alternatives to: Probiotic biochemical can replace and, at least, drastically reduce and have synergies with degreasing agents based on blends of surfactants and lipases. They can replace the need of using solvents as natural fats can be easily stripped off from pelts.

Wet-end:

Objectives: Preservation and conversion of hides and skins into useful commercial article. Achieve resistance to bacterial attack and to high temperatures. Typical tanning methods: mineral (chrome mainly), vegetable and organic (aldehydes, oils, other)

Dosing: On limed pelt weight:
2% to 5% PS

Alternatives to: Dispersing agents and tanning auxiliaries.

Wetting back/washing:

Objectives: Rehydrate tanned leather, wet blue, wet white of vegetable, after a period of piling or storage. To wash leather to obtain regular surface and obtain regular re-hydration. Chelating metallic cations leached from mineral tanning.

Dosing: On shaved weight:

0.5% to 2 % PS, depending on cleanness of tanned leather + 0% to 1 % PK, depending on the dryness + 0% to 1% PG depending on grease content.

Alternatives to: Probiotic biochemical can replace surfactants, ammonia and oxalic acid commonly used to washing and cleaning up wet blue, wet white or vegetable leathers.

Re-tanning/Fatliquoring/Dyeing:

Objective: Adding and fixing processing chemicals such as retanning agents, fatliquors and dyes, to achieve the final features of the leather articles.

Dosing: On shave weight or double on crust (pearl) weight:
0.5% to 2 % PS or PG

Alternatives to: Surfactants,ammonia and dyes auxiliaries derivate from naphthalene sulfonic and ethoxylated amines.

5. Results and discussions:

Innovative, all-natural probiotic biochemicalscan replace traditional chemicals in the leather tanning industry.Using unique probiotic formulations, the biochemicals are able to improve leather quality, increase yield, lower operating costs and reduce environmental pollution (http://www.provierabiotech.com/, 2016).

Raw hides and skins vary in animal type (bovine, sheep, pig, etc) and across breeds, fat content (prefleshing-mechanical removal of fat from raw hide, different animal types have different levels of natural fat and other characteristics), origin (temperature is the largest indicator for fat content-the colder the more fat, diets vary, species) method of preservation (salted, sun dried, chemical preservatives, raw) as well as cleanliness (raw hides are covered in blood, dung, dirt, etc). Raw hides vary by region. Each of these raw hide characteristics influences the application rate of probiotic biochemicals(Proviera.com, 2016).

In addition to raw hide characteristics each tannery will follow a unique process to produce their desired leather. This includes: brand of chemicals used in each stage, quantity of chemicals used in each stage, process time in each stage, machinery used (drums vs paddles), speed of drum rotations at each stage, water saving methods, mechanical actions, sophistication level of the tannery (fully automated or man power), environmental regulations will vary in each country (sometimes within the same country), hair saving methods or dissolved hair systems, type of tanning (chrome vs vegetable), presence of a wastewater treatment plant, climate, etc. Each of these processing characteristics influences the application rate of probiotic biochemicals (Proviera.com, 2016).

Probiotic biochemicals deliver performance as good as the best of chemicals / enzymes even while offering flexibility in application. They can be applied at wide pH and temperature range. Probiotic biochemicals are compositions, fully biodegradable, non-harmful, safe for tannery workers and leather article consumers. Figure 1 describers each of the products used in the trials and the effects on the leathers.

They can be applied in different stages of the leather making process and general results and benefits are listed follow.

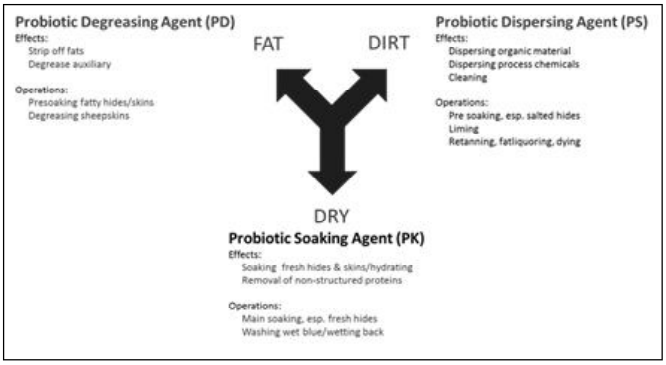

Figure 1: Probiotic biochemical range

Beamhouse:

Wash / presoaking: Avoid putrefaction and bad odors without bactericides. Reduce the soaking time if raw material is very dry. Cleaning and degreasing raw hides/ skis surface. Reduction of COD values or increase of BOD/ COD ratio. No foaming.

Main soaking: Uniform wetting back. Hides and skins are very clean with slight lyotropic swelling that enhances fiber sponginess and relaxation. Reduction of soaking time when raw hides or skins are dry or became very dry after a long period of storage time.Reduction of COD values or increase of BOD/COD ratio. No foaming.

Typical results of COD analysis of the soaking floats give values ranged between 25 Kg O_2 / tonne of hide to 35 Kg O2 / tonne of hide. With the use of probiotic biochemicals the range was reduced to 15 Kg O2 / tonne of hide to 25 Kg O2 / tonne of hide.

Un-hairing / liming: Improve dispersion of lime and open wrinkles. Avoids draw marks and limed pelts are more relaxed and flatter. Easier removal of scud and hair roots. This influences on the up-taking of tanning agents, e.g. higher chromium (III) oxide (Cr_2O_3), and potentially improves quality sorting of leather and increases area yield.

Degreasing: Probiotics biochemicals improve the efficiency of the degreasing proses, even though emulsifiers or lipases must be used in high fatty raw materials. Natural fats impact on the COD and BOD values of the effluent and they can be reduced with probiotics biochemicals. Figure 2 shows the efficiency of degreasing using conventional degreaser agent when 1/3 has been replaced with the same quantity of probiotic degreasing agent (PD).

Tanning: Dispersing of tanning agents to achieve leather more uniform in fullness among different parts, including flanks. Better fixation of tanning agents and potential reduction. Better penetration of tanning agents. Increase of shrinking temperature in wet white leathers.

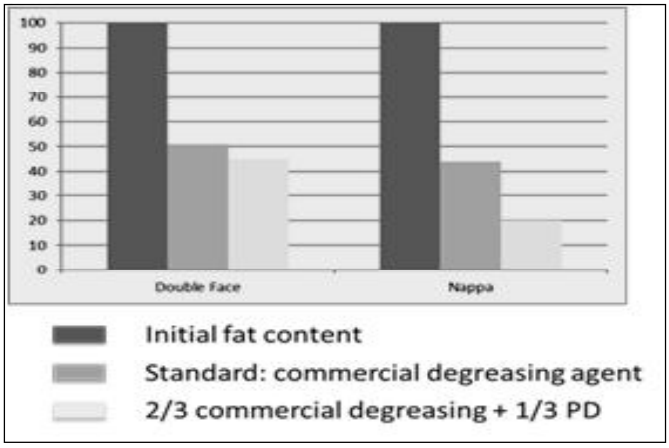

Figure 2: Degreasing efficiency on sheepskins

Wet End:

Washing / wetting back: Clean and uniform surface on the leather. The leather is of a brighter and cleaner appearance than standards. Additionally, probiotics biochemicals do not impact water resistance when manufacturing waterproof articles. No foaming.

Re-tanning / fatliquoring/dyeing: Better dispersion and exhaustion of leather processing chemicals. Brighter and more uniform colors. Better shade build-up and fault coverage from dyestuffs. Additionally, probiotics biochemicals do not impact water resistance when manufacturing waterproof articles. Potential reduction of nitrogen and sulfates on effluent when probiotic biochemicals replace auxiliaries that highly contribute on these contaminants.

Figure 3 following compares color intensity and brightness of dyeing using different dye auxiliaries.

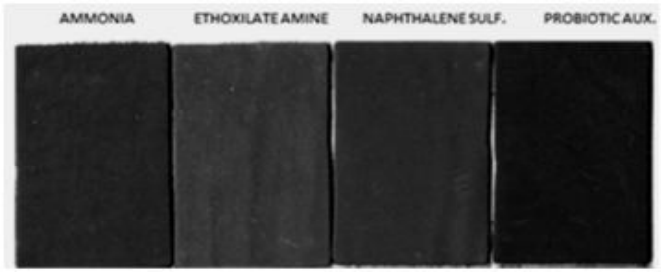

Figure 3: Dye auxiliaries, brightness and intensity

Figure 4 shows the potential COD reduction using probiotic biochemicals. Based on standards, which are widely applied and found generally acceptable (i.e. tends to ignore specific individual situations). Variables that influence the results are the chemicals already used in the tannery, origin of raw hides, preservation methods, mechanical action, etc.(UNIDO, 2016). COD processes with probiotic biochemicals were gathered from trials on wet salted bovine hides with better results.

The potential reduction of COD obtained for the whole process, from wet salted raw bovine hides up to finished leather was up to 24%.

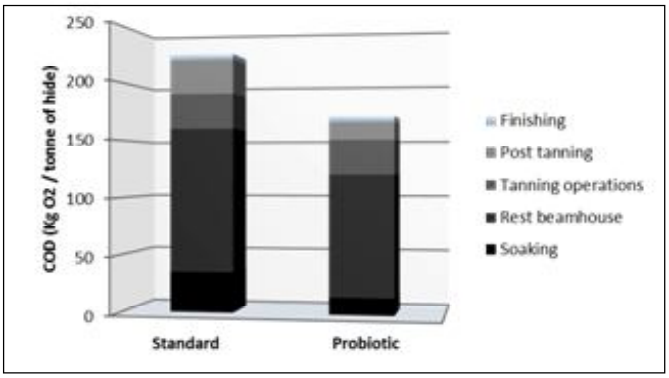

Figure 4: Improvement of COD values

6. Conclusions

Probiotics is path breaking technology that enables unmatched processing results across various industries with no impact on environment (Proviera.com, 2016)

Metabolites from proprietary fermentation process of naturalingredients from renewable sources with probiotics are consortia of biochemicals characterized by their hydrotropic properties and capable of delaying the damages caused by bacterial putrefaction, as well as the bad odors produced. Such qualities offer to tanners an exceptional opportunity to replace some chemicals auxiliaries based on chemical synthesis of oil derivate with natural, biodegradable and sustainable alternatives without amending existing manufacturing processes.

The application of probiotic technology to prepare hides and skins for the tanning and the successive operations of leather making improves the quality of the leather articles, save water consumption and costs while reducing environmental impact.

Compared with traditional chemical auxiliaries, probiotic biochemicals are able to transfer water molecules into the smallest interspaces of the fibril collagen structure up to the protein chain, cleave off and disperse substances from hides and skins not suitable to be converted in leather, solubilize organic material and improve the uptake of the reagents that confer final leather properties.

This work demonstrates the potential of the probiotic biochemicals in different stages of the leather manufacture improving the leather quality and reducing effluent pollutants.

7. Acknowledgements

The authors express our appreciation for their support on carrying out this work to:

Dr. S. Pillai and Mr. Ch. Balasubramanian from PROKLEAN TECHNOLOGIES Pvt. Ltd. Plot No: 108&109, Perumal Nagar. Thirumudivakkam, Chenai 600044 (India)

Mr. M. Wood and Dr. N. Tipsrisukond from SCD PROBIOTICS and PROVIERA BIOTECH, 1710 Walnut St. Kansas City, MO 64108 (USA)

All technical WE team from STAHL GROUP.

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INDIA'S EXPORTS TO CHINA GOES UP BY 53%

Beijing : India's exports to China registered a sharp increase of over 53 percent year-on-year to reach $1.24 billion in October, but the trade deficit continued to mount, according to the data released by the customs. The trade deficit for October stood at $3.86 billion.

Despite the strains in the bilateral ties, India-China trade increased by 13.56 percent year-on-year to reach $6.33 billion in October.

(Source : P. T. I.)

WORLD FOOTWEAR YEARBOOK : 2017

1) Worldwide footwear production stalled at 23 billion pairs in the last two years, after climbing 15% between 2010 and 2014, according to the most recent edition of the world Footwear Yearbook.
2) At continental level, the geographical structure of the industry remains broadly unchanged. In 2016, Asia's share of the world production was 86.7%, only marginally lower than in previous years.
3) At country level, China's share in the world production, which has increased in sustained way in the last few decades, peaked in 2013 (62.9%), and since then has declined steady to a 57.0% quota in 2016.
4) The last decade has seen strong growth of footwear exports worldwide with volume increasing by 25% to 13.9 billion pairs and value by 78%, to 122 billion dollars. However, over the last two years exports have fallen by 6% in volume and by 8% in value. This suggests that a new phase in the development of the industry may have arrived.
5) Even if it is the powerhouse of the footwear industry and will remain for the foreseeable future, Asis has lost 2 percentage points in its share of world exports since 2010. Moving in the opposite direction, Europe has gained 3 percentage points over the same period reversing the trend observed in earlier years.
6) China continues to be the leader in terms of worldwide exports, with a 67.3% quota in 2016, following at some distance by Vietnam.
7) Asia continues to increase its lead as the largest footwear-consuming continent, as its share of consumption (54%) approaches its share of the world population (60%). Europe and North America maintain footwear consumption at a higher level than their population would suggest. At country level, China is the largest footwear market.
8) Europe continues to lead world footwear imports and in 2016 its share, both in value (48%) and volume (37%), reached the highest levels in five years. The United States, which has a quota of 22.1% in 2010, only represented 19.6% of global imports last year. In this new scenario, Asia is already the second destination of imports in terms of volume.
9) Average export prices have fallen in the last two years by some 2.2% to 8.84 dollars; this could be another sign that the industry is entering a period of more intense competition. Even the economic crises of 2008-2010 had not stopped average prices from increasing. The decline in the average price was mainly driven by developments in Asia.
10) The average price of textile footwear was the only one to grow significantly (3.2%) in 2016, while leather footwear saw its price stabilize and the other categories registered declines. The price of leather footwear is still 3 to 5 times that of other categories.

(Source : Culled from Net – WF)

EXPORTS JUMP 30.6% TO $26.2 BILLION IN NOVEMBER, GOLD IMPORTS SEE SHARP DROP

New Delhi, December 15 : The trade deficit narrowed marginally to $13.82 billion in November, even as merchandises exports rose 30.55 percent and gold imports saw a sharp drop.

The trade deficit had widened to a near three-year high of $14.02 billion in October. It had been lower, at around $13.39 billion, in November 2016.

Data released on Friday showed that merchandise exports rose $26.19 billion in November this year, compared to $20 billion in November 2016. Exports of chemicals, petroleum products, engineering goods and gems and jewellery saw significant growth in November, according to an official release.

Goods imports during the month rose 19.61 percent to $40.02 billion, against $33.46 billion in the previous November. Oil imports jumped up by 39.14 percent to $9.55 billion, compared to $6.8 billion in November last year. Significantly, gold imports fell by 25.96 percent in November to $3.26 billion, compared to $4.41 billion a year ago.

IILF – INDIA INTERNATIONAL LEATHER FAIR, 2018

IILF – India International Leather Fair, 2018 will be held from 26th to 28th February, 2018 at Kolkata, India. IILF has all along been a vivid presentation of the leather industry. Latest expressions of the trends, styles, designs and colors in world fashion are shown. The business visitors will surely be attracted to exhibits displayed by more and more companies, including more and more from different foreign countries.

NGT ORDERS CLOSURE OF 19 TANNERIES IN JALANDHAR

New Delhi / Jalandhar, Dec 29 : The National Green Tribunal (NGT) has ordered the closure of 19 tanneries for discharging pollutants, including heavy metals, into drains in Jalandhar district which was resulting l serious environmental hazards.

An NGT Bench constituted a high-powered committee to inspect 61 industries and directed it to prepare a comprehensive report on tanneries. The committee would submit report on source of water of these tanneries, their consumption, whether any flow meters to the conveyor belts have been fixed and if they have permission from the Central Ground Water Authority.

"We direct that the 19 industries, which, according to the Punjab Pollution Control Board, are non-compliant and are polluting be closed forthwith. These would not be permitted to carry their manufacturing or any other activity unless they submit appropriate application for obtaining the board's consent," the Bench said.

The NGT direction came on a plea filed by local residents Darshan Singh and others of Chamiyara village. They have alleged that the units were discharging untreated effluents containing heavy metals into the drains, which eventually pollute the Sutlej. They also alleged that the area residents were exposed to various diseases, including cancer and skin problems.

Kahan Singh Pannu, Chairman, PPCB, said : "We are planning to file a review petition with the NGT since the matter is already being reviewed by the Punjab and Haryana High Court to avoid mix-up of directions. The tanneries are already told to run half of their capacity to cut pollution by these units."

ANALYSIS - EXPORT PERFORMANCE OF LEATHER AND LEATHER PRODUCTS DURING APRIL-MARCH 2016-17 VIS-A-VIS APRIL-MARCH 2015-16

A. Introduction :

As per officially notified DGCI&S monthly export data, the export of Leather and Leather products for the financial year **April-March 2016-17 touched US$ 5665.91 mn** as against the performance of US$ 5855.06 mn in the corresponding period of last year, recording a negative growth of -3.23%. In Rupee terms, the export touched Rs. 380024.07 mn in April-March 2016-17 as against the previous year's performance of Rs. 383321.67 mn registering a negative growth of -0.86%.

B. Product Wise Analysis :

EXPORT OF LEATHER AND LEATHER PRODUCTS FROM INDIA

DURING APRIL- MARCH 2016-17 VIS-À-VIS APRIL-MARCH 2015-16

(Value in Million Rs)

CATEGORY	APR-MAR. 2015-16	APR-MAR. 2016-17	% VARIATION
FINISHED LEATHER	68509.63	59619.47	-12.98%
LEATHER FOOTWEAR	140625.23	143259.05	1.87%
FOOTWEAR COMPONENTS	18615.1	20125.09	8.11%
LEATHER GARMENTS	36211.57	35988.87	-0.61%
LEATHER GOODS	89694.53	88642.82	-1.17%
SADDLERY AND HARNESS	9583.6	9596.66	0.14%
NON-LEATHER FOOTWEAR	20082.01	22792.11	13.50%
TOTAL	**383321.67**	**380024.07**	**-0.86%**

Source : DGCI & S

(Value in Million Rs)

CATEGORY	APR-MAR. 2015-16	APR-MAR. 2016-17	% VARIATION	% Share
FINISHED LEATHER	1046.45	888.89	-15.06%	15.69%
LEATHER FOOTWEAR	2147.98	2135.9	-0.56%	37.70%
FOOTWEAR COMPONENTS	284.34	300.05	5.53%	5.30%
LEATHER GARMENTS	553.11	536.57	-2.99%	9.47%
LEATHER GOODS	1370.04	1321.61	-3.54%	23.33%
SADDLERY AND HARNESS	146.38	143.08	-2.26%	2.53%
NON-LEATHER FOOTWEAR	306.74	339.82	10.78%	6.00%
TOTAL	**5855.06**	**5665.91**	**-3.23%**	**100.00%**

Source : DGCI & S

- Footwear holds the major share of 48.99% in the total export of leather and leather products.
- Non-Leather Footwear (10.78%) and Footwear Components (5.53%) are the products showing positive growth.
- Leather Footwear, has declined marginally by -0.56% in 2016-17 comparing to -5.75% during 2015-16.
- All other products segments Finished Leather, Leather Garments, Leather Goods & Accessories and Saddlery & Harness shows negative growth.
- The negative growth of -9.86% registered during April-March 2015-16 **has been reduced to -3.23% during April-March 2016-17**.

C. Country-wise analysis

Statement showing Export of Leather & Leather Products to different countries during April-March 2016-17 vis-à-vis April-March 2015-16 is given below :

(VALUE IN MILLION US$)

COUNTRY	TOTAL			Share in total export 2016-17
	APR-MAR. 2015-16	APR-MAR. 2016-17	% change	
GERMANY	674.19	660.03	-2.10%	11.65%
U.S.A.	834.1	870.39	4.35%	15.36%
U.K.	716.49	608.29	-15.10%	10.74%
ITALY	407.91	375.41	-7.97%	6.63%
FRANCE	308.45	288.81	-6.37%	5.10%
HONG KONG	315.26	266.16	-15.58%	4.70%
SPAIN	327.86	294.22	-10.26%	5.19%
RUSSIA	49.01	51.6	5.29%	0.91%
NETHERLANDS	182.97	169.71	-7.25%	3.00%
AUSTRALIA	84.71	82.7	-2.37%	1.46%
NEW ZEALAND	11.23	9.82	-12.55%	0.17%
DENMARK	76.17	77.51	1.76%	1.37%
GREECE	10.95	10.17	-7.07%	0.18%
CANADA	47.25	46.94	-0.65%	0.83%

(VALUE IN MILLION US$)

COUNTRY	TOTAL			Share in total export 2016-17
	APR-MAR. 2015-16	APR-MAR. 2016-17	% change	
SWITZERLAND	29.74	24.89	-16.32%	0.44%
SWEDEN	38.14	40.93	7.32%	0.72%
S. AFRICA	52.87	44.29	-16.23%	0.78%
AUSTRIA	26.2	28.11	7.30%	0.50%
BELGIUM	84.84	104.98	23.73%	1.85%
JAPAN	59.24	63.96	7.97%	1.13%
PORTUGAL	62.13	67.73	9.01%	1.20%
CHINA	162.21	174.05	7.30%	3.07%
SINGAPORE	23.49	32.98	40.41%	0.58%
U.A.E.	263.15	227.28	-13.63%	4.01%
INDONESIA	25.62	27.03	5.48%	0.48%
KOREA REP.	82.38	68.65	-16.67%	1.21%
VIETNAM	105.54	92.88	-11.99%	1.64%
SAUDI ARABIA	36.77	40.93	11.34%	0.72%
SOMALIA	100.12	94.73	-5.39%	1.67%
POLAND	65.2	101.69	55.96%	1.79%
CHILE	52.18	41.87	-19.76%	0.74%
MALAYSIA	54.58	48.7	-10.77%	0.86%
SLOVAK REP	30.71	31.69	3.18%	0.56%
TURKEY	27.6	20.02	-27.48%	0.35%
HUNGARY	23.46	28.27	20.52%	0.50%
SUDAN	20.17	14.64	-27.44%	0.26%
NIGERIA	17.02	20.68	21.51%	0.36%
BANGLADESH	17.66	35.11	98.80%	0.62%
THAILAND	18.22	19.85	8.91%	0.35%
FINLAND	16.8	17.43	3.74%	0.31%
KENYA	12.73	30.25	137.62%	0.53%
DJIBOUTI	14.79	11.29	-23.61%	0.20%
MEXICO	12.49	12.14	-2.79%	0.21%
NORWAY	12.31	7.55	-38.62%	0.13%
ISRAEL	13.35	13.24	-0.84%	0.23%
OMAN	12.76	12.02	-5.74%	0.21%
SRI LANKA DES	13.85	14.5	4.69%	0.26%
CAMBODIA	12.62	10.37	-17.86%	0.18%
CZECH REPUBLIC	10.45	9.34	-10.61%	0.16%
TAIWAN	9.87	8.96	-9.22%	0.16%
OTHERS	187.24	210.84	12.60%	3.72%
TOTAL	**5855.06**	**5665.91**	**-3.23%**	**100.00%**

Source : DGCI & S

D. Major Export Destinations of India – 2016-17 :

(Value in US$ Mn)

	Country	April-March 2016-17	% Share
1	U.S.A.	870.39	15.36
2	GERMANY	660.03	11.65
3	U.K.	608.29	10.74
4	ITALY	375.41	6.63
5	SPAIN	294.22	5.19
6	FRANCE	288.81	5.1
7	HONG KONG	266.16	4.7
8	U.A.E.	227.28	4.01
9	CHINA	174.05	3.07
10	NETHERLANDS	169.71	3
11	BELGIUM	104.98	1.85
12	POLAND	101.69	1.79

a. The major markets for Indian Leather & Leather Products are USA with a share of 15.36%, Germany 11.65%, UK 10.74%, Italy 6.63%, Spain 5.19%, France 5.10%, Hong Kong 4.70%, UAE 4.01%, China 3.07%, Netherlands 3%, Belgium 1.85% and Poland 1.79%.

b. These **12 countries together accounts for nearly 73%** of India's total leather& leather products export.

c. Export of leather & leather products to major markets like Germany, UK, Italy, Hong Kong, France, Spain, Netherlands, UAE, Korea Rep etc., have shown negative growth during April-March 2016-17.

d. The percentage share of countries namely UK, Hong Kong, UAE, South Africa etc has declined to around 1 to 2% during 2016-17 comparing to 2015-16.

e. The Countries namely **China, Russia, Belgium** which shown negative growth during April-March 2015-16 has registered positive growth during April-march 2016-17.

f. USA & Japan which shown positive growth in 2015-16 sustained the same positive trend in 2016-17 also.

g. USA continue to lead as Number one in the list of top importing countries with its percentage share increasing to 15.36% during 2016-17 from 14.25% in 2015-16.

E. Conclusion :-

India's export of Leather and Leather products for the financial year April-March 2016-17 touched US$ 5665.91 mn as against the performance of US$ 5855.06 mn in the corresponding period of last year, recording a negative growth of -3.23%.

Export of different categories of Footwear holds a major share of about 49% in India's total leather & leather Products exports with an export value of US$ 2775.77 mn. This is followed by Leather Goods & Accessories with a share of 23%, Finished Leather 16%, Leather Garments 9% and Saddlery & Harness 3%.

Except Non-Leather Footwear and Footwear Components, all other product segments shows negative trend.

QUARTERLY COMPARATIVE EXPORT PERFORMANCE ANALYSIS OF LEATHER AND LEATHER PRODUCTS DURING APRIL-JUN 2017-18 VIS-A-VIS APRIL-JUN 2016-17

A. Introduction :

As per officially notified DGCI&S monthly export data, the export of Leather and Leather products for the financial year **April-Jun 2017-18 touched US$ 1420.04 mn** as against the performance of US$ 1438.79 mn in the corresponding period of last year, recording a negative growth of -1.30%. In Rupee terms, the export touched Rs. 91533.21 mn in April-Jun 2017-18 as against the previous year's performance of Rs. 96241.93 mn registering a negative growth of -4.89%.
Gratifying

B. Product Wise Analysis :

EXPORT OF LEATHER AND LEATHER PRODUCTS FROM INDIA

DURING APRIL- JUN 2017-18 VIS-À-VIS APRIL-JUN 2016-17

CATEGORY	(Value in Million Rs)		% VARIATION
	APR-JUN 2016-17	APR-JUN 2017-18	
FINISHED LEATHER	16778.72	15348.64	-8.52%

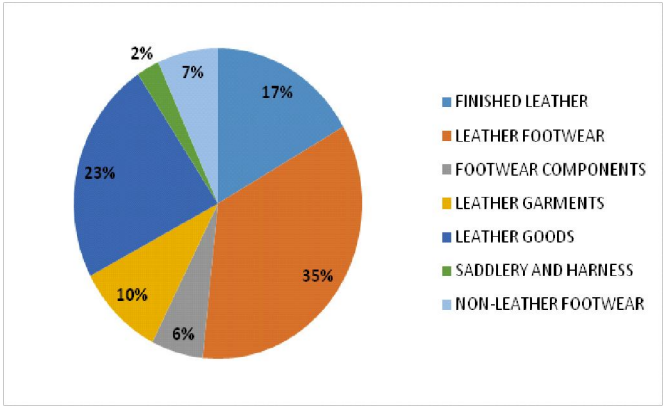
CATEGORY	(Value in Million Rs)		% VARIATION
	APR-JUN 2016-17	APR-JUN 2017-18	
LEATHER FOOTWEAR	36325.13	31954.44	-12.03%
FOOTWEAR COMPONENTS	5040.86	5336.1	5.86%
LEATHER GARMENTS	8941.29	8962.13	0.23%
LEATHER GOODS	21104.15	21364.66	1.23%
SADDLERY AND HARNESS	2235.87	2343.6	4.82%
NON-LEATHER FOOTWEAR	5815.91	6223.64	7.01%
TOTAL	**96241.93**	**91533.21**	**-4.89%**

Source : DGCI &S

CATEGORY	(Value in Million US$)		% VARIATION	% Share
	APR-JUN 2016-17	APR-JUN 2017-18		
FINISHED LEATHER	250.84	238.12	**-5.07%**	**16.77%**
LEATHER FOOTWEAR	543.05	495.74	**-8.71%**	**34.91%**
FOOTWEAR COMPONENTS	75.36	82.78	**9.85%**	**5.83%**
LEATHER GARMENTS	133.67	139.04	**4.02%**	**9.79%**
LEATHER GOODS	315.5	331.45	**5.06%**	**23.34%**
SADDLERY AND HARNESS	33.43	36.36	**8.77%**	**2.56%**
NON-LEATHER FOOTWEAR	86.95	96.55	**11.05%**	**6.80%**
TOTAL	**1438.79**	**1420.04**	**-1.30%**	**100.00%**

Source : DGCI & S

Product-wise Share :



- Footwear holds the major share of 47.54% in the total export of leather and leather products.
- Except Leather Footwear and Finished Leather, the other product categories have shown positive growth.

C. Country-wise analysis

Statement showing Export of Leather & Leather Products to different countries during April-Jun 2017-18 vis-à-vis April-Jun 2016-17 is given below :

COUNTRY	(Value in Million US$) TOTAL		% change 2017-18	Share in Total Export 2017-18
	APR-JUN 2016-17	APR-JUN 2017-18		
GERMANY	161.69	159.39	-1.42%	11.22%
U.S.A.	219.32	208.2	-5.07%	14.66%
U.K.	154.93	142.78	-7.84%	10.05%
ITALY	108.62	99.78	-8.14%	7.03%
FRANCE	69.96	73.14	4.55%	5.15%
HONG KONG	76.03	64.24	-15.50%	4.52%
SPAIN	79.03	65.7	-16.86%	4.63%
RUSSIA	11.29	12.04	6.65%	0.85%
NETHERLANDS	40.45	43.38	7.25%	3.05%
AUSTRALIA	17.38	19.27	10.86%	1.36%
NEW ZEALAND	2.42	2.18	-9.95%	0.15%
DENMARK	18	16.46	-8.58%	1.16%
GREECE	2.85	2.28	-19.84%	0.16%
CANADA	10.52	13.32	26.62%	0.94%
SWITZERLAND	6.09	5.26	-13.69%	0.37%
SWEDEN	10.21	9.47	-7.24%	0.67%
S. AFRICA	11.01	11.17	1.46%	0.79%
AUSTRIA	6.17	11.57	87.32%	0.81%
BELGIUM	25.21	20.81	-17.47%	1.47%
JAPAN	13.83	12.25	-11.40%	0.86%
PORTUGAL	19.88	16.52	-16.90%	1.16%
CHINA	48.18	43.93	-8.81%	3.09%
SINGAPORE	7.07	3.33	-52.89%	0.23%

COUNTRY	(Value in Million US$) TOTAL		% change 2017-18	Share in Total Export 2017-18
	APR-JUN 2016-17	APR-JUN 2017-18		
U.A.E.	62.97	71.59	13.69%	5.04%
INDONESIA	6.11	7.75	26.97%	0.55%
KOREA REP.	16.07	16.18	0.72%	1.14%
VIETNAM	24.9	26.71	7.25%	1.88%
SAUDI ARABIA	10.12	14.59	44.10%	1.03%
SOMALIA	23.33	19.97	-14.37%	1.41%
POLAND	20.08	31.64	57.61%	2.23%
CHILE	10.53	11.57	9.82%	0.81%
MALAYSIA	11.55	16.26	40.77%	1.14%
SLOVAK REP	7.72	9.99	29.37%	0.70%
TURKEY	5.48	6.47	18.13%	0.46%
HUNGARY	8.65	3.19	-63.13%	0.22%
SUDAN	3.67	4.7	28.00%	0.33%
NIGERIA	4.73	7.4	56.51%	0.52%
BANGLADESH	11.06	13.9	25.61%	0.98%
THAILAND	5.48	5.61	2.40%	0.39%
FINLAND	3.86	3.52	-8.70%	0.25%
KENYA	6.16	8.1	31.53%	0.57%
DJIBOUTI	4.73	3.33	-29.55%	0.23%
MEXICO	1.87	3.34	78.04%	0.24%
NORWAY	2.03	2.21	8.54%	0.16%
ISRAEL	3.14	2.89	-7.91%	0.20%
OMAN	3.69	2.32	-37.20%	0.16%
SRI LANKA DES	4.75	3.32	-30.09%	0.23%
CAMBODIA	3.39	1.55	-54.25%	0.11%
CZECH REPUBLIC	2.2	2.95	34.38%	0.21%
TAIWAN	2	1.73	-13.48%	0.12%
OTHERS	48.42	60.75	25.48%	4.28%
TOTAL	**1438.79**	**1420.04**	**-1.30%**	**100.00%**

Source : DGCI & S

D. Major Export Destinations of India – Apr – Jun 2017-18 :

(Value in Million US$)

U.S.A.	208.2
GERMANY	159.39
U.K.	142.78
ITALY	99.78
FRANCE	73.14
U.A.E.	71.59
SPAIN	65.7
HONG KONG	64.24
CHINA	43.93
NETHERLANDS	43.38
POLAND	31.64

i. The major markets for Indian Leather & Leather Products are USA with a share of 14.66%, Germany 11.22%, UK 10.05%, Italy 7.03%, France 5.15%, UAE 5.04%, Spain 4.63%, Hong Kong 4.52%, China 3.09%, Netherlands 3.05%, Poland 2.23% and Vietnam 1.88%.

ii. These **12 countries together accounts for nearly 72.55%** of India's total leather& leather products export.

iii. Export of leather & leather products to major markets like USA, Germany, UK, Italy, Hong Kong, Spain, etc., have shown negative growth during April-June 2017-18.

E. Conclusion :

India's export of Leather and Leather products for the financial year April-June 2017-18 touched US$ 1420.04 mn as against the performance of US$ 1438.79 mn in the corresponding period of last year, recording a negative growth of -1.30%.

Export of different categories of Footwear holds a major share of about 47.54% in India's total leather & leather Products exports with an export value of US$ 675.07 mn. This is followed by Leather Goods & Accessories with a share of 23.34%, Finished Leather 16.77%, Leather Garments 9.79% and Saddlery & Harness 2.56%.

Except Leather Footwear and Finished Leather, the other product categories have shown positive growth.

LESSON ON LEATHER GOODS – Part II

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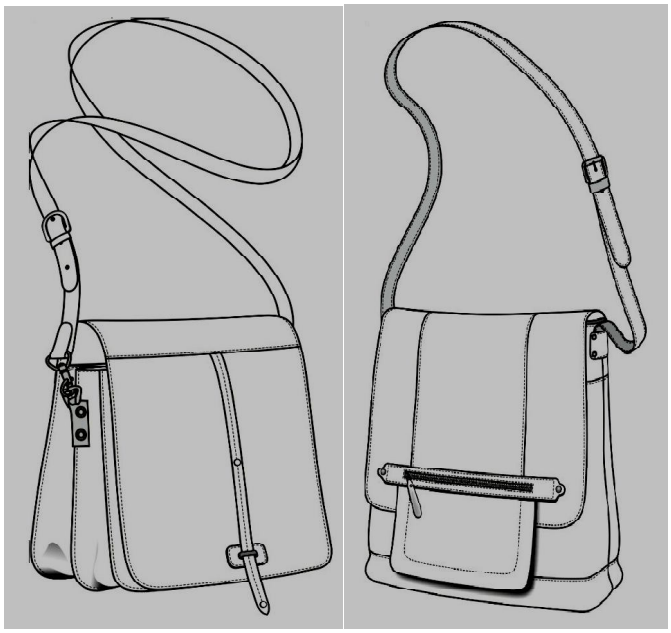
(The purpose of this article is to advise the students as well as artisans engaged in leather goods industry. Shri Puranjan Mazumder of FREYA helped me to prepare this article)

MESSENGER BAG / POSTAL BAG



A bag which carries messages, news, important papers, money etc. and transport from one place to another is known as "Messenger bag". In old days when modern means of transportation was not available such bags were useful moving light weight stuff from one place to another. It can be made of good heavy canvas or a very good type of vegetable tanned buff leather. Different types of bags were made, of different make & material, but the purpose was the same.

The messenger bag is a large spacious bag with a long strap that lies across the body, it has a flap which folds over the top of bag. The straps of the bag are adjustable to maintain the length of the bag. Men & woman can use it. It is usually made of good quality heavy leather, but it can also be made with high quality, durable and water-resistant cloth, leather, or synthetic materials. At one point in time these were strapless bags which were carried by hand but later the design was enhanced by attaching a long strap and used for carrying postal messages. This would be worn across the body or the shoulder.

The first modern messenger bag was the bag worn by utility linemen in the 1950s. It was designed by the De Martini Global Canvas Company and its purpose was to accommodate all the tools that linemen needed when going up utility poles to fix them. The initial messenger bag was made of cotton canvas and lined with waterproof fabric. The shoulder strap was also made of cotton and webbed, the bag closed with two straps and it also had a pocket on the inside.

One type of messenger bag is also called a courier bag which is a type of rucksack, usually made from natural or synthetic cloth. This bag is worn over one shoulder with a strap that goes across the chest resting the bag on the lower back. Some types of messenger bags are called carryalls and courier. Messenger bags are available in various sizes, but it is typically large enough to accommodate most frequently used objects for a person.

Occupational Health, Safety and Ergonomic Issues in Artisanal Sector

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Abstract

The informal artisanal sectors are a widespread, fundamental and essential form of production occupying a pivotal position in the economic dynamism of our country. A literature review of scientific journals papers related to occupational health safety and ergonomic issues among informal craft workers was conducted. The artisanal workers often work under harsh conditions where occupational health and safety (OHS) protection is almost non-existent. The absence of any technical protection (collective or individual) is common to most of the workshop for all types of artisanal activities. The legislative texts related to OHS are many and dispersed and would profit by being updated and regrouped within a working code which would make them easier to consult and would allow all partners in the social sector to get to know them. In addition, this legislation which has been strengthened is unfortunately not enforced. The broader goal of occupational health services is to protect and improve the physical, mental, and social well-being of its workers; it is natural that these services should give more attention to general health promotion. The most common ailments are those linked to posture and musculoskeletal problems, oral, ocular, dermatological, ear/nose/throat, respiratory, digestive and neurological. The concern for occupational risks within the artisan milieu owes its importance to their abundance, the diversity of the professions involved, and the number of different risks to which artisans are exposed. We should support every initiative focused on developing the prevention of occupational hazards and the spirit of safety within artisan workshops. The absence of occupational health guidelines, the numerous occupational hazards and the high number of people working in the handicraft sector have sparked this study.

Keywords : artisan, occupational health, ergonomic, chemicals, hazardous agents, diseases

Introduction

The artisanal sector in India is estimated to employ over 13.5 million skilled craft workers, who play a significant role in the Indian economy in terms of its share in employment, especially for women, contribution to GDP and preservation of cultural heritage. The traditional craftwork sector is an informal sector and is characterized by artisan and craft production, often organized around families and done in homes. A large skilled workforce has been engaged in traditional forms of craft in India for several hundred years; however, the occupational risks and hazards involved in these craft processes have not been researched and documented for relevant policy formation for the sector. Since the majority of craft workers in India are home based or work in small units not employing more than 10-12 workers, they are not covered under the provisions of labour laws in India. Cohen and Smith (1994) declare that the development of small business is vital in fostering an entrepreneurial spirit in the community. A home-based enterprise can be created to allow people to work without worrying about transportation or day care. They stated that a system of home-based workers forms a functional work unit which contributes a major part of the economy and provides employment. The preponderance of small-scale industries, in particular, the informal sector and cottage industries, and their employment of a substantial percentage of the work force necessitate great attention towards the health and safety problems of this sector (Koh & Jeyaratnam, 1994). Paying attention to occupational health and safety (OHS) in this sector and improving working conditions, indisputably have a noticeable impact on national production, economy, and quality of life. A healthy workforce is vital for sustainable social and economic development on local, national, and global level.

In spite of the mentioned facts and the vital importance of OHS in this sector, unfortunately, occupational health and services are practically nonexistent or, at best, minimal and have been a neglected area (McCann,1996; Cohen & Smith, 1994). This sector is almost exempted from workers' compensation law and other occupational safety and health regulations. In many cases, government agencies responsible for safety and health are unaware of the risks facing crafts people and occupational health services.

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A deep and comprehensive insight into the existing status of the informal sector in India explains out the lack of knowledge and ignorance of OHS practices, weak legal and policy framework for protecting the craft workers and meagre implementation of laws. Significant amendments were made in the archaic Indian Factory Act (1948) after the Bhopal Gas tragedy, 1984, considered the world's worst industrial disaster become a turning point for policy making in the history of OHS in India (Mannan et al., 2010). In India, the enforcement of the legal and policy provisions regarding OHS is extremely weak. This may be largely due to the fact that occupational health is the mandate of Ministry of Labour and not the Ministry of Health and Family Welfare. The Government of India declared a 'National Policy on Safety, Health and Environment at Workplace' on 20 February 2009. This policy seeks to protect workers' right to a safe working environment in all units in the organized as well as informal sector. However, at the enforcement level, it is not likely to bring about the desired compliance with health and safety rules at the workplace for the unorganized sector. The necessity of basic minimum standards encompassing craft workers in the informal sector has not been a priority area for policy makers in India. This article briefly analyses the occupational health hazards in the informal artisanal sectors of India and suggests that policy reforms need to focus on gathering relevant data, creating minimum safety standards relevant to the sector, disseminating information and building networks for establishing efficient enforcement mechanisms.

The craft sector

The craft sector encompasses a wide range of artifacts. The informal sector has been described by the International Labour Organization (ILO) as a part of economic activity characterised by certain features like reliance on locally available resources and skills, family ownership, small scale operations, labour intensity, traditional technology, skills generally acquired outside the formal school system, unregulated and competitive markets. One of the best definitions of handicrafts is that adopted by UNESCO-UNCTAD/WTO (ITC) at Manila, 6-8 October 1997 during a symposium on crafts, which is: "Artisanal products are those produced by artisans, either completely by hand, or with the help of hand tools or even mechanical means, as long as the direct manual contribution of the artisan remains the most substantial component of the finished product. The special nature of artisanal products derives from their distinctive features, which can be utilitarian, aesthetic, creative, culturally attached, decorative, functional, traditional, religiously and socially symbolic and significant."

It must be noted that each craft will have a slightly different set of processes. Artisans are usually structured into groups through informal contracts between traders, master artisans, and low-skilled artisans. More formal systems of artisan organization involve four main types of entities :

- **Self Help Groups (SHGs)** are set up with the help of external technical intermediaries such as non profits or through government schemes, and typically comprise 10-20 artisans, usually women. SHGs serve as a form of social collateral, enabling artisans to establish linkages with input providers such as raw material suppliers, microfinance institutions and banks, and downstream players such as aggregators and retailers.

- **Mutually Aided Co-operatives (MACs)** are created to provide artisans with a platform for equitable participation. Legislated at the state government level, MACs enable artisans to pool funds as equity and own their production units. However, due to strong government influence, this structure has failed to gain popularity in most states other than Andhra Pradesh and Kerala.

- **Producer** companies were created as a for-profit legal entity in the Companies Bill in 2002 to enable primacy producers to participate in ownership and contribute equity.

- **Private Limited Companies** are for-profit legal entities that allow artisans to participate in ownership as shareholders while enabling external funders to invest capital.

However, most artisans continue to work independently as there is a widespread lack of awareness about the advantages of being organized into the above forms.

Methodology

A literature review of scientific papers related to OHS and ergonomic issues among informal sector workers was conducted. Internet based search as well as some major peer--reviewed occupational health and social science journals, technical reports from credible government institutes and non-governmental organizations was done.

Literature review

The artisanal sector faces serious *OHS* challenges in most of the countries (Hasle et al., 2006) and the scenario is also same for India (Mukhopadhyay & Srivastava,2010). The level of awareness about ergonomics, good work environment and good postures in the informal sector is very low. Musculoskeletal disorders (MSDs) are very common health problems across the world and is a major cause of workplace disability (Punnett & Wegman, 2004). Working in awkward postures during various manual activities creates MSDs among the craft workers. It is, therefore, necessary to avoid working in awkward body postures (Qutubuddin et al., 2013; Meena et al., 2014). Most of the work related MSDs are cumulative disorders which result from exposures to high or low intensity repeated loads over a long period of time and the affected body regions are the low back, neck, shoulder, forearm, and hand (Singh et al., 2012). Ergonomic interventions are the best solutions for the prevention of work related MSDs. Modified workstations and newly designed tools (Gangopadhyay & Dev, 2014; Meena et al. 2014a) will highly benefit the Indian craft workers across all sectors. For the industries which wish to have a competitive edge in the present scenario, it is compulsory to give emphasis on quality and excellence through ergonomics. Ergonomics management is valuable as a cost reduction, quality improvement, performance improvement and productivity-enhancing process (Rowan & Wright, 1994). Thus, improvement of working conditions and control of MSDs and other risk factors seemed essential.

Apart from the various types of MSDs, respiratory disorders, injuries, eyesight problems, nerve disorders and skin problems are some of the high risk occupational disorders which develop among the craft workers. The poor environmental conditions combined with unhygienic circumstances is also a contributory factor to such occupational disorders. Most of the diseases and occupational health problems can be minimized by following OHS guidelines. The safety equipment like facemasks, gloves first aid facility, and proper uniform, must be used for the protection of workers (Choobineh et al., 2007; Wani et al., 2012).

Work related MSDs, low back pain, and other health problems result in increased absenteeism and lost working time, adverse effects on labour relations, higher insurance and compensation costs, increased probability of accidents and errors, job transfer and higher turnover of workers, more scrap and decreased production, low-quality work and high administrative and personnel costs. This ultimately reduces productivity and increases the cost to the company (Cardinali, 1998; Miller, 1995; Niu, 2010; Widanarko et al., 2012). These problems can be reduced through ergonomic interventions which will create a better quality of life for workers and reduces the financial losses and medical costs to companies and the economy (Roper & Yeh, 2007; Ahasan & Imbeau, 2003). A healthy worker is found nearly three times more productive than a worker in poor health (Niu, 2010).

Work Environments

Not surprisingly, the hazards of informal sector work are poorly documented. Information from ad hoc surveys indicate a wide range of hazards in informal sector production, the most common being poor housekeeping, poor lighting, long work hours, inadequate welfare facilities, poor ventilation, poor work postures and work methods, chemical exposure, inadequate provision of personnel protective equipment, poor work place design and low awareness of chemical and other risks. These hazards have been found in urban informal sector workplaces in India (ILO 1990; Institute for Labour Studies 1992b; Lukindo 1993; Manandar 1990, Strassman 1988). The use of complex machinery is not common among informal sector workers, but mechanical hazards have been found due to use of unguarded machinery and sharp hand tools. Chemicals with acute effects are more commonly recognised than those with chronic effects. For example, loss of eye sight is reported in jewellery homeworkers from splashes of acid solutions (e.g. boric, muriatic, nitric acids and caustic soda), while acute reactions have been experienced to powder chemicals (e.g. borax or potassium nitrate) and organic dust in the handicraft sectors (Das et al 1992; Institute for Labour Studies 1992a, 1992b).

These immediate work environment hazards arise in a wider risk environment arising out of the organisation of work and poor community environments. Piece-rate systems make working hours irregular and work habits unsafe. Long hours without regular breaks, repetitive movement, fixed working positions and prolonged visual concentration was commonplace for simple one-step out-sourced informal sector work tasks, such as gem cutting, net repair, garment gluing and ribbon making (Institute for Labour Studies 1992a, 1992b).

Work is performed in poor residential areas or informal

sector worksites where there are inadequate washing facilities, lockers or separate eating areas for workers, no first aid kits and an inadequate supply of clean water.

Job-related risk factors are compounded by overcrowding, limited work spaces, blocked emergency exits cluttered passageways, few or no presence of fire extinguishers, poor nutrition and other public health problems, inadequate sanitation and the more general effects of poverty. In home bases enterprises, the problems go beyond the worker and involve risks for the worker's family and home environment. The exposure of family members to poor working conditions can lead to their suffering from occupational diseases" even when they are not directly involved in the work. These conditions are themselves influenced by the underlying risk environment that is characterised by insecurity, poverty and low capital investment in the sector. Economic pressures and low levels of capital are related both to the use of primitive tools and techniques and the tendency to innovate or take short-cuts in production that are necessary for economic survival, even though they pose serious risks to the worker. Informal sector producers are poorly supported by social infrastructures, weakly organised and depend largely on their own internal networks of support. Supportive or regulatory inputs from unions, employer's organisations, and the state are absent and workers have poor access to information about hazards, their effects and possible control measures, as well as other aspects of production. Low levels of social capital thus contribute to the risk environment.

There are sometime few in-built safety measures. Personnel protective equipment (PPE) wherever applicable are used by less or often not present. Use of PPE is regarded as an additional cost burden in an already under resourced environment. Control strategies would thus more appropriately focus on the worksite design and technologies used and identify in-built design features that would enhance safety so that these are not left to the individual implementation. The need for technology support to the informal sector has been raised not only for work safety reasons but to enhance productivity, implying possibilities of synergy between these goals. Low levels of investment in and access to appropriately designed technology thus not only undermines workplace safety but also impacts negatively on the quality and general competitiveness of products from the sector (Mhone 1996).

At a superficial level, the workplace hazards are, however, not difficult to control. There is sufficient information, knowledge and technological development to eliminate a vast share of the problems that make informal sector workplaces unsafe. Further, given that occupational risks in the informal sector cluster in common areas of risk in many parts of the world, a significant share of the health burden of occupational risks could be addressed by improving hygiene, ergonomics, work organisation and hand- tool safety, and by reducing exposure to particular chemicals such as solvents and pesticides (Loewenson 1997b). As noted above, control measures would call for a mix of appropriately designed technology, improved organisation of work, improved welfare facilities and general worksite design, including ergonomic features for work benches/ platforms and seats and enhanced information dissemination on risks and their control. The implementation of what are in fact rather clear measures for controlling risks is however confounded by the wider risk environment described earlier, of poor recognition of the sector and the work and employment within it, weak levels of investment and demand on the sector and low levels of social capital and infrastructural support within the sector.

There is almost no formal monitoring or reporting of risks or injury in the sector. In many countries in the South, factory inspectorate systems have inadequate staff and resources to enforce laws, even in the formal sector. Informal sector workplaces are even less likely to be monitored, as they do not fulfill the legal definition of a 'factory', are excluded due to their small number of employees or may be excluded due to shortages of inspectors, time and transport (Sitas et al, 1988). In the absence of information on and monitoring of the informal sector, the sector, its risks and the health burden they generate remain largely hidden. Investments in technology and worksite designs that reduce occupational risks is unlikely when the costs of the current systems of production are poorly recognised at national level.

Occupational Health and Safety of artisanal workers in India

Artisans in India are mostly not aware of occupational health risks partly because they are self- employed, unorganized and partly because they accept the risk of injury or damage as being a part of the traditional occupation. Over a period of time, craft workers learn to 'adapt' to the hazards (using masks, mixers, protective gears etc.) involved in the craft, unaware of the long term impact. Occupational health risks are one of the

leading causes of morbidity and mortality in India. Lack of awareness about occupational safety and environmental hazards severely affect the vulnerable and marginalized working population.

Traditionally, handmade products in India were made using simple tools and natural resources available in the local environment. Rapid economic growth, market demand and competition from industries have resulted in changes in the traditional production processes. The old techniques are being replaced by machines, synthetic material, chemicals that reduce the cost of material and labour. This transformation has resulted in increased insecurity and risks to the workers.

With the changes in production processes, the associated hazards also change. The exposure to hazardous chemicals cannot only lead to incidents of acute toxicity but also have chronic impacts over time. Ergonomic hazards also increase with the use of new equipment and tools. Studies have indicated that majority of health impacts have chronic/long term effects caused by repeated exposure. Chronic diseases are difficult to diagnose and usually, the symptoms are hardly noticeable until severe permanent damage has occurred. For instance, exposure to small amounts of spray-solvents during a lifetime by craft workers may produce skin damage (dermatitis), chronic liver, kidney failure, brain damage etc.

The absence of the enforcement of health and safety standards, and dangerous working conditions, it is safe to assume that the micro-enterprise craft industry presents its share of dangers. Table 1 provides further information on the hazards of various craft industries.

Craft Discipline	Associated Hazardous Materials	Possible Risk
Textiles, fibre dyes, batik	Vegetable moulds, poisonous solvents, toxic mordants, corrosive vat and acid dyes are often poisonous waxes.	Allergic reactions, chronic lung, and other diseases, some dyes are suspected carcinogens
Leather	Toxic dyes and glues; chromium poisoning; improperly cured and stored hides	Irritation, intoxication; damage to vital organs; allergic reactions; bacterial disease.
Wood	Toxic glue, paint strippers, finishes, and solvents	Irritation, intoxication, damage to vital organs, allergic reactions, possible hearing impairment.
Metal, soldering, casting, welding, forging	Solders containing lead, zinc borax and fluorides produces toxic gases; cadmium solder produces deadly fumes; metal moulds o silica and asbestos.	Damage to nervous system, Fire, explosion, heat stress; electric shock, burns, and cuts; chronic lung disease
Ceramics, clay, glaze firing	Many dry clays contain silica. Glazes containing lead cadmium, chrome, zinc, asbestos silica, uranium oxides. Deadly gases and metal fumes released during kiln firing especially in salt glazing, allergic reactions, metal poisoning.	Chronic lung disease, skin irritations, allergic reactions, metal poisoning.
Enamelling	Corrosive acids, some enamels contain silica, nirobenzene, silver solder containing cadmium	Acid burns, chronic lung disease, metal poisoning.
Glass, stained glass, glass blowing	Highly toxic materials and gases, corrosive acids	Heat stress, eye damage; acid, thermal and infrared burns; carbon monoxide and metal poisoning.
Painting	Pigments containing heavy metals; toxic solvents; asbestos (pastels, gouache)	Irritation, intoxication, damage to vital organs, metal poisoning, chronic lung disease, some pigments are suspected carcinogens
Plastic, rubber	Toxic vapours from mixing and heating processes; monomers containing toxic and volatile materials	Irritation, intoxication, damage to vital organs, allergic skin reactions
Print-making	Pigments containing toxic cadmium, lead compounds, cobalt, zinc, asbestos, toxic and flammable solvents	Irritation, intoxication, damage to vital organs, metal poisoning, chronic lung disease, some pigments are suspected carcinogens
Biological materials, Plants, feathers, bone, shells, ivory	Poisonous plants, plants exposed to toxic pesticides, toxic glues, lacquers, paints, varnishes, dyes, solvents, untreated animal material	Respiratory irritation, intoxication, damage to vital organs, allergic reactions, and bacterial disease.
Sculptural media, clay, plaster, stone, wax (see also wood, metal, plastic)	Oil based modelling clay is potentially poisonous, stone containing asbestos or silica, flammable waxes release toxic fumes when heated, poisonous fumes.	Irritation, intoxication, chronic damage to vital organs, lung disease

Numerous studies and reports have raised concern over *OHS* issues of workers in India. About a decade ago, Leigh et al. (1999) estimated an annual incidence of occupational disease between 924,700 and 1,902,300 cases and 121,000 deaths in India. Studies on many industries including the leather tanning industry, textiles, and metalware have found that workers in these industries work in inhuman physical conditions for very long hours.

Nalvarangkul, 2006 showed that 63% of women engaged in carpet making had respiratory problems such as asthma due to cotton dust, or respiratory irritation due to inhalation of chemicals used to bleach silk and cotton. The Second National Commission on Labour (2002) has pointed to the high incidence of lung diseases in bangle industries due to inhalation of toxic fumes, smokes, and dust. The commission also found that dyes and chemicals used in textiles block printing and poor physical working conditions such as improper ventilation have caused serious health hazards to workers. 60 Weavers in Ramanagaram district, Karnataka, in 2010 reported eye injuries and blindness after handling chemically treated silk yarn.

Under the SWITCH Asia Project, looking at the environment, health and safety issues in the craft sector,

a baseline study was conducted by the Hazards Centre, Delhi to look at the steps that need to be taken to make production processes safe for the health of the producers and the environment. The study was conducted in five clusters; block printing (Rajasthan), leather (Rajasthan), blue pottery (Rajasthan), dhokra (Orissa), bell metal (Orissa), ikat-tie and dye weaving (Pochampally, Andhra Pradesh). The study surveyed 100 artisans in each cluster and documented the production processes, the current health status of workers, and the impact on the environment.

The results of the survey indicated that the processes that involve chemicals, leather and metal have a greater adverse health impact on the worker over time. Leather manufacturing processes involve many operations, including the use of various chemicals that are detrimental to the health of workers and nearby communities. The study also pointed out that regular work reflects better health for workers as compared to short term contractual work.

Unlike the commonly held notion, it is easy to measure the occupational health status of workers with the simple and inexpensive tools that can be handled by almost anybody and does not require sophisticated training. The hazards were studied under the following categories:

Body Mass Index (BMI) : BMI is used as a screening tool to indicate whether a person is underweight, overweight, obese or a healthy weight for their height, and applies to most adult men and women aged 20 and over. BMI indicates general physical well being of a person and is dependent on patterns of food consumption, living-working conditions, nature and duration of physical work. If a person's BMI is out of the healthy BMI range, their health risks may increase significantly. BMI values are age-independent and the same for both sexes. However, BMI may not correspond to the same degree of fatness in different populations due to different body proportions. It is computed by measuring the weight and height of each worker and using the following formula :

$$\text{Metric BMI} = \frac{\text{Weight in kilograms}}{\text{Height in meters}^2}\ \text{kg/m}^2$$

Interpretation of BMI

BMI	Weight Status
Below 18.5	Underweight
18.5 - 24.9	Normal
25 - 29.9	Overweight
30 & Above	Obese

Pulmonary Function Test (PFT) : The measurement of PFT revealed an alarming health condition of workers across the clusters. The workers exposed to vapours, gases, fibres, and particles in a work atmosphere that is not conducive to pulmonary health, display a marked tendency towards chronic bronchitis as they spent more years in the job. The absence of adequate safety measures for metallic fumes and high temperatures in the work environment is hazardous and unfavorable for the health of the artisans.

Hand Grip Meter Test (HGM) : The test measures the maximum isometric strength of the hand and forearm muscles. Strength also depends upon various activities like daily food intake, working hours, and pattern of work. As a general rule people with strong hands tend to be strong elsewhere, so this test is often used as a general test of strength. Low level of strength in the hand grip meter test is directly related to repetitive and strenuous work that the workers have to do with very little movement and minimum breaks.

Rating	Males (Kgs)	Females (Kgs)
Above average	>52	>30
Average	48-52	26-30
Below Average	<48	<26

Eyesight : Apart from the effects of work on the body, lungs and muscle tone, repetitive work and continuous visual attention to detail also seems to have impacted the eyes of the workers. The eyes are mostly affected due to the direct impact of chemical agents like metallic fumes and physical agents like dirt, dust, particles etc. Poor lighting in the workplace often creates strain in the eyes which leads to watering and damage to eyesight. Normal eyesight, hypermetropia (long-sightedness), and myopia (short-sightedness) could be estimated through eye testing using the Snellen chart consisting of several

rows of block letters or symbols of varying size.

Pains, accidents, injury and other health problems : Across different crafts groups, muscular pains in the back, joints, and lower abdomen are common. Some visible impacts include callus, hardness, spots, cuts, burns, tremors and skin problems. Other common complaints include high/low blood pressure, hernia, low appetite, insomnia, stomach upset, gastric, vomiting and weakness related to the strenuous work environment with irregular food intake. Low appetite, problems in sleeping, and weakness are mainly due to long working hours. Most of the workers suffer from health issues due to consumption of contaminated water and no proper sanitation facility.

Facilities like toilets, rooms for resting and eating, washing places, natural or artificial exhaust systems for circulation of fresh air, adequate lighting, provision of cold drinking water, first-aid facilities, safety guards on moving parts, and separate storage and mixing rooms with containers clearly marked are some of the good practices but these are few and far between the awareness and implementation of safety measures being poor across the board.

Recommendations

There is a need to raise awareness on *OHS* issues among craft workers across the country and suggest safety gears/ methods required to protect them. Such a task is hampered by two factors: firstly, there has been very little research done to document the hazards, secondly, there is a wide diversity of production processes, materials, tools used because of differences in culture and region. All these production processes need to be studied in detail and the safety measures need to be documented. Furthermore, prevention of the *OHS* hazards requires mainly a change in the mindsets as the preventive measures do not demand much in terms of resources. It must be ensured, however, that the preventive measures provided to the workers are both workers-friendly and work-friendly.

There is a need for a comprehensive legislation on *OHS* for the informal craft sector. Key remedial measures need to focus on gathering relevant data from various sub-sectors, capacity building and dissemination of information to sensitize entrepreneurs, workers and policy makers. Legislation targeting improvements in OHS for informal sectors will need to rely on creating norms, raising awareness and providing capacity building services to help small-scale craft units and workers to meet safety standards. Awareness-raising is particularly important for home- based workers, who would fall outside the preview of any enforcement mechanism, but nevertheless would suffer from basic issues such as lack of safety equipment and proper lighting and ventilation. Basic norms on work practices that improve OHS need to be publicized through partnerships with industry associations and trade networks to raise awareness of both small-scale units as well as the workers.

The rapidly changing economic scenario threatens the health and livelihoods of craft workers in India. The Government and Industry need to play a proactive role in generating awareness on the hazards involved in the various production processes and in creating a set of sector wide basic minimum standards protecting the worker.

Conclusion

The craft based industry is an important unorganized sector of Indian economy. The studies reviewed, stand as evidence that the OHS issues and MSD prevail among the artisans irrespective of different craft sectors. The scheme for creating OSH awareness may be implemented with the close involvement of the relevant government ministries and private sector stakeholders. If significant occupational health risk factor is observed, appropriate measures should be taken to identify the risk factors and eliminate or control them as early as possible.

Craft based work is high risk occupation developing various types of occupational disorders, respiratory disorders, injuries, eyesight problems, nerve disorders, skin problems. Lack of awareness's among the craft workers helps to create problems related to health issues and disorders in this sector. Most of these diseases and health risk factors found can be avoided by suitable precautions. Proper medical examinations must be made available to craft workers at no cost from time to time. Awareness programs and local group discussions are essential for improving the health status of the craft workers. There must be some provision for protecting equipment e.g. face masks, first aid facility, gloves and proper uniform, for the protection of craft workers. Exposure to excessive noise can damage hearing. It is essential that persons with impaired hearing wear earplugs or muffs to prevent further inner ear damage in very noisy places. Availability of proper lighting at the work place will avoid eye strain.

The literature regarding occupational health problems and MSDs in the informal sector has been reviewed in order to identify occupational health problems and benefits through ergonomic interventions, to develop a future research strategy. It is observed that occupational health problems and MSDs are common among the artisans of the informal sector due to manual work and un-ergonomic design of tools and work places. It is also observed that the ergonomic intervention improves the wellbeing of workers which ultimately increases productivity, revenue, and reduces rejection cost. This review gives a quick overview of ergonomic issues of craft workers. In India, a lot of work is required in the field of ergonomic intervention in a craft based industry which would greatly help the economy of the country. The action needed at present is to popularize a standard research tool. Some tools like Nordic Musculoskeletal Questionnaire may be used by all to quantitatively validate the musculoskeletal problems faced by the artisans. Thus, it would help to an easy comparison of the data across the nation.

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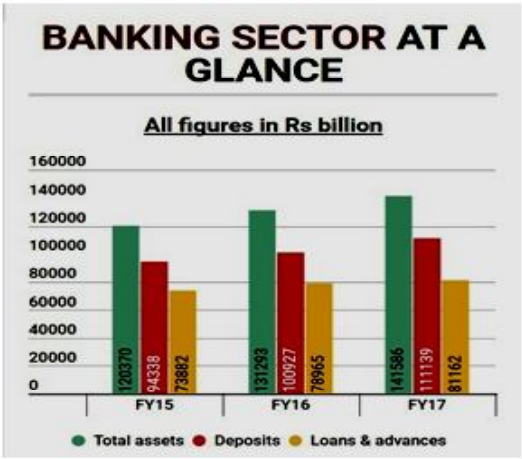
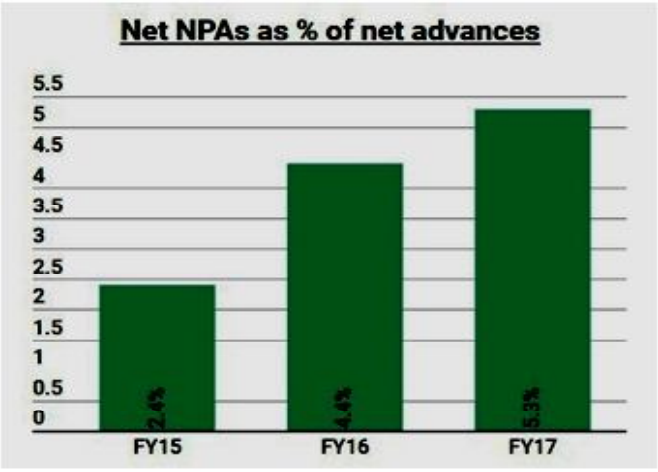
Budget 2018: From digitization to NPAs, a lot expected for banking sector

PwC and Business Standard look at the current scenario in India's banking sector, the issues facing it and what the industry expects from Finance Minister Arun Jaitley in upcoming Union Budget 2018-19

While there has been a lot of push lately on digital transactions from the Narendra Modi-led central government, it is expected that the coming Union Budget 2018-19 will see Finance Minister Arun Jaitley renewing the thrust by announcing some incentives for small businesses to increasingly go digital in so far as banking transactions are concerned.

Also, against the backdrop of the government's plan to recapitalize public-sector banks, which have been suffering because of their ballooning non-performing assets, Budget 2018 will be keenly watched for any announcement towards that end.





KEY DEVELOPMENTS

Digitization push

- Various measures and app-based services have been introduced to promote digitization
- Cabinet has approved the proposal that the govt would bear merchant discount rate (MDR) charges on digital transactions up to Rs 2,000 for two years.
- In Budget 2018, the government might introduce additional incentives like tax rebates of, say, 0.2% on digital transactions up to a threshold for small businesses

Capital infusion in PSU banks

- The govt has announced a recapitalisation scheme to infuse capital in the banking system.
- Additional capital may be infused based on banks' governance structure, bad debt recovery plan, capital planning & budgeting and HR strategy.

ISSUES FACING THE SECTOR & WHAT INDUSTRY WANTS

Bankruptcy code: It is still evolving. It needs to be strengthened and the objective and spirit have to be adequately demonstrated

Home loan benefits: Considering higher unit prices in metros, higher tax deduction is needed on principal repayment of housing loan under section 80C

Insurance penetration: Currently, a high GST rate of 18% is applicable on insurance premium. That is a drag, especially given a weak life insurance penetration of under 4%.

Regulatory timelines: Various regulations like IFRS, margining of non- centrally cleared trades, New Basel III norms are under way, but clearer timelines need to be defined.

Pension plans not tax-friendly: The pension from annuity is currently treated as income and taxed accordingly which is unfavourable when compared with PF, PPF, etc.

LTCG tax benefits: The MF industry and brokerages expect long-term capital gains tax benefits for equities/ equity-oriented funds to continue.

Dividend distribution tax: There is no dividend distribution tax applicable on equity-oriented mutual funds but debt mutual funds, AMCs pay DDT at the rate of 28.33%. Industry expects removal of this dividend distribution tax to improve investor sentiment.

(Business Standard – 19/01/2018)

Will Budget 2018 bring tax relief on rent for self employed on par with HRA exemption?

Self-employed individuals or salaried ones who do not get house rent allowance (HRA) as part of their salary but pay rent are at substantial disadvantage in terms of tax benefits as compared to salaried people who are able to use the HRA component of their salary to lower their tax outgo. It is hoped that budget 2018 would take some steps to redress this imbalance.

Section 80GG of the income tax act allows self-employed individuals paying rent for accommodation to lower their tax outgo. However, in comparison to the HRA exemption tax benefit the section 80GG benefit is miniscule.

An individual paying rent for a house can claim this deduction from his gross total income while filing income tax returns. A declaration has to be filed by him/her using Form 10BA to claim the deduction. The minimum of any of the following is taken as deduction:

1. Rent paid in excess of 10 per cent of the Total Income or;
2. Twenty five per cent of his total Income or;
3. Rs 5,000 per month

Here total income is income adjusted by reducing the following amount from the gross total income:

1. Long- Term Capital Gains if any, which have been included in the Gross Total Income.
2. Short Term Capital Gains of the nature referred to in section 111A
3. All deductions permissible u/s 80C to 80U except deduction under this section i.e. Section 80GG.
4. Income referred to in section 115A. 15AB, 115AC or 115 AD. These sections relate to income of NRI and foreign companies etc.

However, the deduction under section 80GG is not available to an assessee if any of the following:

1. Any residential accommodation owned by the assessee or by his/her spouse or minor child or as member of HUF at a place where he/she resides or performs duties of his/her office or employment;
2. Residential accommodation owned by the assessee at any other place whose value is determined by the section 23(2)(a) /23(4)(a) of the Income Tax Act.

Abhishek Soni, CEO of tax-filing website, tax2win.in explains, in layman terms, why the conditions of section 80GG make it difficult for an individual to avail the tax benefit.

The first condition states that an individual should not own any accommodation either in his name, spouse or in the name of his minor child in a city where he works. If, in order to avoid long commute hours, an individual rents a house even if he owns a house in same city then, he cannot avail of the Section 80GG tax benefit.

In comparison, there is no such restriction for claiming HRA tax relief. According to section 10(13A), a person is eligible to claim HRA tax-exemption as long as rent is paid for the accommodation.

The second condition states that if an assessee owns a residential accommodation in any other city then income from that property should be taxable as Income from house property. This means that tax should be payable on that property either on the basis of actual rent received from the property or on deemed rent basis. However, there is no such requirement for claiming HRA.

In addition to that, the maximum deduction one can available under section 80GG is Rs 60,000 per annum which is quite little when compared with actual rents prevailing in the market. Budget 2016 increased this limit from Rs 2,000 per month to Rs 5000 per month. In case of tax exempted amount under HRA, there is no monetary ceiling. The maximum amount exempted from tax is taken as the least any of the following:

1. Actual HRA received;
2. 50 percent of the salary if accommodation is in the metro cities or 40 percent for non-metro cities;

3. Excess of rent paid annually over 10 percent of annual salary.

Section 80GG deduction is available on the basis of the total Income of an assessee where HRA tax exemption is available on the basic salary adds Soni. This should be raised at least to Rs 10,000 per month given the rise in rentals.

(Economic Times – 19/01/2018)

India's proposed investment treaty terms leave foreign partners cold

After terminating over 50 bilateral investment treaties in March, India is in talks to renegotiate treaties with dozens of nations

Having cancelled investment treaties with about 50 foreign governments last year, India is struggling to convince some to accept new terms that make it harder to seek international arbitration for disputes, sources familiar with the talks said.

From New Delhi's perspective, those treaties, mainly struck in the 1990s when it was desperate for foreign capital, left it susceptible to potential claims awarded by international arbitrators.

To reduce that susceptibility, India has drafted a new model agreement that legal advisors say is similar to those used by other big emerging market economies like Brazil and Indonesia, but some of its foreign partners are balking at the more restrictive approach.

"India is getting nowhere with the negotiations," said one of the sources, who is aware of the meetings with government officials over the past 10 months, but does not want to be named as the discussions are private.

Negotiators from countries including Australia, Iran and the European Union have told the Indian side that investors are waiting to come in but the new treaty terms offer insufficient protection, the source said.

Foremost among their concerns are the setting up of a requirement that any case be fought in the Indian courts for at least five years before going in for international arbitration, and other provisions narrowing the scope for companies to make claims, the source said.

The new model treaty also has no provision for investors to bring claims against India for any tax-related matters and for disputes arising due to actions taken by local governments.

Currently, India is entangled in more than 20 international arbitration cases, and could end up paying billions of dollars in damages if it loses.

Companies like Vodafone Group, Cairn Energy and Deutsche Telekom have initiated arbitration proceedings against India seeking to protect their investments against retrospective tax claims and cancellation of contracts.

Covered by a bilateral trade and investment agreement between New Delhi and Tokyo, Japanese automaker Nissan is the latest company to sue India, claiming damages of over $770 million in unpaid tax incentives.

While several countries limit the type of tax-related claims that can be made, lawyers say India's step to omit all tax matters is excessive and could expose investors to sudden changes in tax rules or retrospective claims.

Negotiating position

These days, India appears to be in a far stronger negotiating position than it was during the 1991 balance of payments crisis. The Prime Minister has a mandate and there is more confidence in the ability of his pro-business government to get the under-achieving economy moving than there has been in that of any of its predecessors.

Since Mr. Modi came to power in 2014, annual foreign direct investment flows into India have doubled to $46 billion in 2016 from $22 billion in 2013. But the rate of growth in inflows is slowing, and the amount is lower than the $59 billion that a U.N. report says Brazil received in 2016.

A European Commission official termed India's unilateral decision to terminate treaties as "unfortunate" saying it discriminates between existing investors, who will continue to be protected by the old treaties for a few years after termination, and new ones who will have fewer safeguards.

The Commission is exploring ways to re-establish protection for European investors and resume negotiations on a free trade agreement with India that will include investment, the source said.

Canada has been in talks with India since 2004 to sign its first treaty, but there has been little progress and its trade minister told Reuters in November that Canadian investors are holding back until there is one in place.

"India needs further investments and Canada is willing, but we need a framework. What investors want is to have certainty, stability and predictability," Francois-Philippe Champagne said in Mumbai during his visit to India as part of a trade mission.

While the sources told Reuters that Australian and Iranian officials had raised concerns in private meetings with Indian counterparts, neither the Australian High Commission in New Delhi or Iran's ministry of industry, mines and trade responded to emailed requests for comment.

A spokesman at India's Ministry of External Affairs too did not respond to an email seeking comment.

Meantime, some countries, especially those that receive more investment from India than they send, are more open to signing, said the first source. Israel, for instance, does not oppose some of the provisions and the two nations could soon sign an accord, Business Standard, an Indian newspaper, reported on Wednesday.

And while India remains a capital-deficient country, some of its biggest companies have made major investments overseas and would be reassured if there were bilateral treaties in place to protect their interests.

For now, the draft model treaty is a starting point for negotiations, the second source said, but India is in a good position to press for better terms. "India is finally flexing its muscles," he said.

(The Hindu – 20/01/2018)

Budget expectations : 2018 – 19

The exemption limit for the salaried class should be pegged at a higher level

The finance minister has begun the Budget exercise for 2018. Income tax payers have high expectations of relief this time around. For senior citizens increasing the IT exemption limit and also the rebate on premium of health policies needs an upward revision. With the cost of consultation and medicines rising steeply, the domiciliary treatment amount has to be set at a minimum of Rs 50,000 per year. The exemption limit for the salaried class should be pegged at a higher level as the value of money is going down.

Reform in the administration is an urgent need which can be significantly achieved by taking simple and long overdue steps. The need for employees to produce bills for their petrol, newspaper, telephone and medical expenses can be dispensed with. Also, the submission of 15G and 15H forms to banks should be necessitated for interest earned above Rs 1 lakh per annum or completely done away with. The current regulation of filing forms for interest of more than Rs 10,000 creates manual work and piling of physical records.

CURRENT GROWTH OF INDIAN ECONOMY – STRIDING AHEAD

Bibhas Chandra Paul
OSD, Indian Leather Technologists' Association

Abstracts

The current economy of India is one of the fastest developing mixed economy. It is the world's sixth-largest economy by nominal GDP and the third-largest by purchasing power parity (PPP). The country ranks 141st in per capita GDP (nominal) with $1723 and 123rd in per capita GDP (PPP) with $6,616 as of 2016. After 1991 economic liberalization, India achieved 6-7% average GDP growth annually. In FY 2015 and 2017 India's economy became the world's fastest growing major economy surpassing China.

The long-term growth prospective of the Indian economy is positive due to its young population, corresponding low dependency ratio, healthy savings and investment rates, and increasing integration into the global economy. India topped the World Bank's growth outlook for the first time in fiscal year 2015–16, during which the economy grew 7.6%. Growth is expected to have declined slightly to 7.1% for the 2016–17 fiscal years. According to the IMF, India's growth is expected to rebound to 7.2% in the 2017–18 fiscal and 7.7% in 2018–19.

India has one of the fastest growing service sectors in the world with an annual growth rate above 9% since 2001, which contributed to 57% of GDP in 2012–13. India has become a major exporter of IT services, Business Process Outsourcing (BPO) services, and software services with $154 billion revenue in FY 2017. This is the fastest-growing part of the economy. The IT industry continues to be the largest private-sector employer in India. India is the third-largest start-up hub in the world with over 3,100 technology start-ups in 2014–15. The agricultural sector is the largest employer in India's economy but contributes to a declining share of its GDP (17% in 2013–14). India ranks second worldwide in farm output. The industry sector has held a steady share of its economic contribution (26% of GDP in 2013–14). The Indian automobile industry is one of the largest in the world with an annual production of 21.48 million vehicles (mostly two and three-wheelers) in 2013–14. India had $600 billion worth of retail market in 2015 and one of world's fastest growing e-commerce markets.

Introduction

India has emerged as the fastest growing major economy in the world as per the Central Statistics Organization (CSO) and International Monetary Fund (IMF) and it is expected to be one of the top three economic powers of the world over the next 10-15 years, backed by its strong democracy and partnerships. India's GDP increased 7.1 per cent in 2016-17 and is expected to reach a growth rate of 7 per cent by September 2018.

Eight things we should know about India's economy before penetration in the main analysis

India's economic success in recent years has helped to ensure that South Asia is the fastest-growing region in the world – but it faces significant challenges alongside its opportunities for further growth.

Ahead of the India Economic Summit 2017, taking place in New Delhi from 4-6 October, here are eight things we should know to understand the current state of India's economy.

1. Economic and population growth

India is the world's seventh-largest economy, sitting between France and Italy. Its GDP growth recently dipped to 5.7%; still, India is growing faster than any other large economy except for China. By 2050, India's economy is projected to be the world's second-largest, behind only China.

India is home to 1.34 billion people – 18% of the world's population. It will have overtaken China as the world's most populous country by 2024. It has the world's largest youth population, but isn't yet fully capturing this potential demographic dividend – over 30% of India's youth are NEETs (not in employment, education or

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training), according to the OECD.

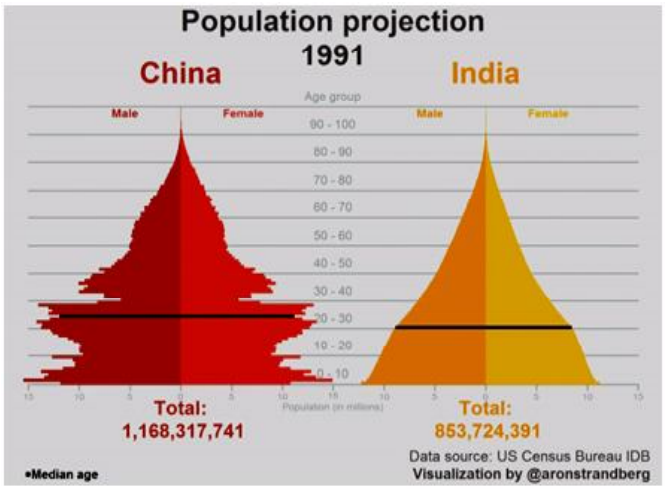

Image: Visual Capitalist

2. Some progress tackling corruption

The newly-published 2017 edition of the World Economic Forum's *Global Competitiveness Report* finds that, once again, India's executives consider corruption to be the most problematic factor they face when doing business within the country.

But it also shows that progress is being made. India again moves up the report's rankings for the quality of institutions, continuing a recovery in this area that began in 2014 with the election of the Modi government. In particular, India now ranks an impressive 23rd among all countries in the Global Competitiveness Index for perceived efficiency of public spending.

South Asia

Global Competitiveness Report 2017-2018	Global rank*
India	40
Bhutan	82
Sri Lanka	85
Nepal	88
Bangladesh	99
Pakistan	115

Source: The Global Competitiveness Report 2017-2018
Note: *2017-2018 rank out of 137 economies

Image: World Economic Forum

3. India's 29 states are now a common market

Opportunities for corruption have long been created by the confusing patchwork of taxes across India's 29 states, which also cause delays as goods cross state borders. In July, the system changed: a new goods and services tax means the 29 states are now a common market.

The new system is expected to boost efficiency, growth, and India's tax take. Despite some technical glitches with the new online tax collection system, early signs appear promising.

4. Demonetization had mixed success

Last year, Prime Minister Modi unexpectedly declared that India's highest-denomination banknotes – accounting for 86% of cash – would no longer be legal tender. Instead they had to be deposited in banks. The aim was to retrospectively punish tax evaders, as those with a stash of 'black money' would face awkward questions. Unexpectedly, however, almost all banknotes were deposited.

Disruption caused by the policy may have dampened GDP growth in the short-term, but it could also prove to have long-term benefits. It increased the number of digital transactions being conducted within India's economy, which are easier to track and to tax: since April, over twice as many Indians have filed tax returns than in the same period last year.

5. Growth needs to be more inclusive

Broadening its tax base should enable India to make much-needed progress in increasing the inclusivity of its economic growth. India ranked a disappointing 60th among the 79 developing economies assessed in the World Economic Forum's latest Inclusive Development Index.

This is reflected in growing inequality: India's richest 1% own 53% of its wealth, up from 36.8% in 2000. For comparison, the richest 1% in the United States own 37.3% of its wealth.

The rise in inequality is compromising the pace at which India is lifting people out of extreme poverty. About one-third of the world's population living on under US$1.90 live in India – some 224 million people. Oxfam calculates that if India were merely to stop inequality from growing

further, it could lift 90 million more people out of extreme poverty by 2019.

When it comes to closing the gender gap, India has a lot of catching up :-

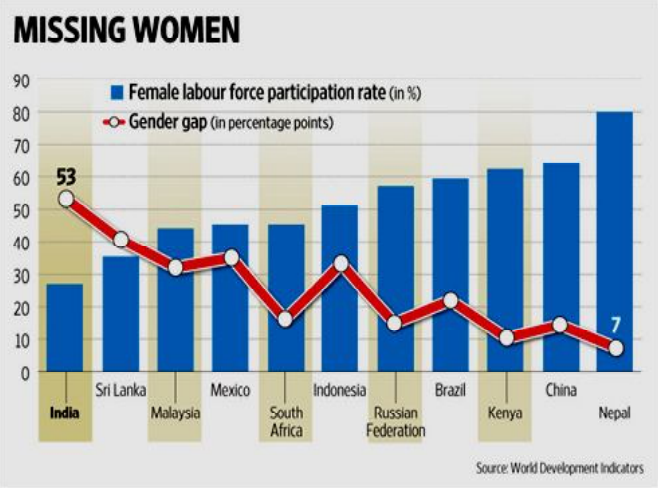

Image: World Development Indicators

1. India needs to get more women working

India has made modest progress in closing its gender gap over the last decade, rising from 98th to 87th in the World Economic Forum's *Gender Gap Report*, which aggregates a range of indicators from health and education to economic and political participation.

However, it ranks a lowly 135th out of 144 on women's labour force participation, just behind Yemen. India's economy would have much to gain from getting more women into the workforce.

2. Turbulent times for tech

Several leading companies in India's IT sector are reportedly planning significant layoffs, in part due to concern that the Trump administration's clampdown on H-1B visas will make it harder to do business in the US. The growing ability of machine learning to replace human workers is also a challenge. A recent McKinsey report reckons that within a few years, up to half of the 3.9 million Indians currently working in the IT sector will become irrelevant.

But other tech trends are more promising. India has again moved up the *Global Competitiveness Report's* rankings on technological readiness – albeit from a low base, still only 108th in the world – on the back of improvements in indicators such as internet bandwidth per user, mobile phone and broadband subscriptions and internet access in schools.

India also has scope to build on its tech start-up scene, which already boasts more companies than anywhere other than the US and UK. The country scored well in the Inclusive Development Index on access to finance for business development.

3. A push for soft power

India is making a conscious effort to translate its growing economic clout into 'soft power' on the world stage – for example by promoting International Yoga Day and building more diplomatic missions and cultural centers. India's space agency is planning a second mission to Mars, while the international outreach of Bollywood films is growing: *Dangal* recently broke box office records in China for a non-Hollywood movie.

Competition with China for regional influence is coming into sharper focus, notably in a recent military stand-off over the disputed area of Doklam in Bhutan. India has opposed China's One Belt One Road initiative, which aims to construct new infrastructure for trade by land and sea in surrounding countries – including development of a disputed region of Kashmir.

Nonetheless, the trade relationship between India and China remains important. China is by far the largest source of India's imports, and its third-largest export market after the US and UAE, providing a strong incentive for cooperation between the rising powers.

On the basis of the above points we can analyze the fact as below :

Market size

India's gross domestic product (GDP) grew by 6.3 per cent in July-September 2017 quarter as per the Central Statistics Organization (CSO). Corporate earnings in India are expected to grow by over 20 per cent in FY 2017-18 supported by normalization of profits, especially in sectors like automobiles and banks, according to Bloomberg consensus.

The tax collection figures between April-June 2017 Quarter show an increase in Net Indirect taxes by 30.8 per cent and an increase in Net Direct Taxes by 24.79 per cent year-on-year, indicating a steady trend of healthy growth. The total number of e-filed Income Tax Returns rose 21 per cent year-on-year to 42.1 million in 2016-17 (till 28.02.17), whereas the number of e-returns processed during the same period stood at 43 million.

India has retained its position as the third largest startup base in the world with over 4,750 technology startups, with about 1,400 new start-ups being founded in 2016, according to a report by NASSCOM.
India's labour force is expected to touch 160-170 million by 2020, based on rate of population growth, increased labour force participation, and higher education enrolment, among other factors, according to a study by ASSOCHAM and Thought Arbitrage Research Institute.

India's foreign exchange reserves were US$ 404.92 billion in the week up to December 22, 2017, according to data from the RBI.

Recent Developments

With the improvement in the economic scenario, there have been various investments in various sectors of the economy. The M&A activity in India increased 53.3 per cent to US$ 77.6 billion in 2017 while private equity (PE) deals reached US$ 24.4 billion. Some of the important recent developments in Indian economy are as follows:

- Indian companies raised Rs 1.6 trillion (US$ 24.96 billion) through primary market in 2017.
- Moody's upgraded India's sovereign rating after 14 years to Baa2 with a stable economic outlook.
- India received net investments of US$ 17.412 million from FIIs between April-October 2017.
- The top 100 companies in India are leading in the world in terms of disclosing their spending on corporate social responsibility (CSR), according to a 49-country study by global consultancy giant, KPMG.
- The bank recapitalization plan by Government of India is expected to push credit growth in the country to 15 per cent, according to a report by Ambit Capital.
- India has improved its ranking in the World Bank's Doing Business Report by 30 spots over its 2017 ranking and is ranked 100 among 190 countries in 2018 edition of the report.
- India's ranking in the world has improved to 126 in terms of its per capita GDP, based on purchasing power parity (PPP) as it increased to US$ 7,170 in 2017, as per data from the International Monetary Fund (IMF).
- The Government of India has saved US$ 10 billion in subsidies through direct benefit transfers with the use of technology, Aadhaar and bank accounts, as per a statement by Mr Narendra Modi, Prime Minister of India.
- India is expected to have 100,000 startups by 2025, which will create employment for 3.25 million people and US$ 500 billion in value, as per Mr T V Mohan Das Pai, Chairman, Manipal Global Education.
- The total projected expenditure of Union Budget 2018-19 is Rs 23.4 lakh crore (US$ 371.81 billion), 9 per cent higher than previous year's budget, as laid out in the Medium Term Expenditure Framework (MTEF).
- India received the highest ever inflow of equity in the form of foreign direct investments (FDI) worth US$ 43.4 billion in 2016-17 and has become one of the most open global economies by ushering in liberalisation measures, as per the mid-year economic survey of India.
- The World Bank has stated that private investments in India is expected to grow by 8.8 per cent in FY 2018-19 to overtake private consumption growth of 7.4 per cent, and thereby drive the growth in India's gross domestic product (GDP) in FY 2018-19.
- The Niti Aayog has predicted that rapid adoption of green mobility solutions like public transport, electric vehicles and car-pooling could likely help India save around Rs 3.9 trillion (US$ 60 billion) in 2030.
- Indian impact investments may grow 25 per cent annually to US$ 40 billion from US$ 4 billion by

2025, as per Mr Anil Sinha, Global Impact Investing Network's (GIIN's) advisor for South Asia.

- ❖ The Union Cabinet, Government of India, has approved the Central Goods and Services Tax (CGST), Integrated GST (IGST), Union Territory GST (UTGST), and Compensation Bill.

- ❖ Indian merchandise exports in dollar terms registered a growth of 30.55 per cent year-on-year in November 2017 at US$ 26.19 billion, according to the data from Ministry of Commerce & Industry

- ❖ The Nikkei India manufacturing Purchasing Managers' Index increased at the fastest pace in December 2017 to reach 54.7, signaling a recovery in the economy.

Government Initiatives

In the Union Budget 2017-18, the Finance Minister verified that the major push of the budget proposals is on growth stimulation, providing relief to the middle class, providing affordable housing, curbing black money, digitalization of the economy, enhancing transparency in political funding and simplifying the tax administration in the country.

India's unemployment rate has declined to 4.8 per cent in February 2017 compared to 9.5 per cent in August 2016, as a result of the Government's increased focus towards rural jobs and the Mahatma Gandhi National Rural Employment Guarantee Act (MGNREGA) scheme.

The Government of Maharashtra has set a target to double farm income by 2022 through measures like large scale micro irrigation, water conservation, expansion of formal cash credit coverage, crop insurance and agriculture diversification, as per Mr Vidyasagar Rao, Governor of Maharashtra.

Numerous foreign companies are looking to set up their facilities in India on account of various government initiatives like 'Make in India' and 'Digital India'. The 'Make in India' initiative was launched with an aim to boost the manufacturing sector of Indian economy, to increase the purchasing power of an average Indian consumer, which would further boost demand, and hence spur development, in addition to benefiting investors. The Government of India, under the Make in India initiative, is trying to give boost to the contribution made by the manufacturing sector and aims to take it up to 25 per cent of the GDP from the current 17 per cent. Besides, the Government has also come up with Digital India initiative, which focuses on three core components: creation of digital infrastructure, delivering services digitally and to increase the digital literacy.

Some of the recent initiatives and developments undertaken by the government are listed below:

- The Government of India has succeeded in providing road connectivity to 85 per cent of the 178,184 eligible rural habitations in the country under its Pradhan Mantri Gram Sadak Yojana (PMGSY) since its launch in 2014.

- A total of 15,183 villages have been electrified in India between April 2015-November 2017 and complete electrification of all villages is expected by May 2018, according to Mr Raj Kumar Singh, Minister of State (IC) for Power and New & Renewable Energy, Government of India.

- The Government of India has decided to invest Rs 2.11 trillion (US$ 32.9 billion) to recapitalise public sector banks over the next two years and Rs 7 trillion (US$ 109.31billion) for construction of new roads and highways over the next five years.

- The mid-term review of India's Foreign Trade Policy (FTP) 2015-20 has been released by Ministry of Commerce & Industry, Government of India, under which annual incentives for labour intensive MSME sectors have been increased by 2 per cent.
- The India-Japan Act East Forum, under which India and Japan will work on development projects in the North-East Region of India will be a milestone for bilateral relations between the two countries, according to Mr Kenji Hiramatsu, Ambassador of Japan to India.

- The Government of India will spend around Rs 1 lakh crore (US$ 15.62 billion) during FY 18-20 to build roads in the country under Pradhan Mantri Gram Sadak Yojana (PMGSY).
- The Government of India plans to facilitate partnerships between gram panchayats, private companies and other social organisations, to

push for rural development under its 'Mission Antyodaya' and has already selected 50,000 panchayats across the country for the same.

- The fiscal deficit of the Government of India, which was 4.5 per cent of the gross domestic product (GDP) in 2013-14, has steadily reduced to 3.5 per cent in 2016-17 and is expected to further decrease to 3.2 per cent of the GDP in 2017-18, according to the Reserve Bank of India (RBI).

- The Government of India plans to implement a new scheme, named 'Sasti Bijli Har Ghar Yojana' with an outlay of Rs 17,000 crore (US$ 2.64 billion), to provide electricity to around 40 million un-electrified households in the country.

- The Government of India and the Government of Portugal have signed 11 bilateral agreements in areas of outer space, double taxation, and nano technology, among others, which will help in strengthening the economic ties between the two countries.

- India's revenue receipts are estimated to touch Rs 28-30 trillion (US$ 436- 467 billion) by 2019, owing to Government of India's measures to strengthen infrastructure and reforms like demonetization and Goods and Services Tax (GST).

Road Ahead

India's gross domestic product (GDP) is expected to reach US$ 6 trillion by FY27 and achieve upper-middle income status on the back of digitization, globalization, favourable demographics, and reforms.

India is also focusing on renewable sources to generate energy. It is planning to achieve 40 per cent of its energy from non-fossil sources by 2030 which is currently 30 per cent and also have plans to increase its renewable energy capacity from 57 GW to 175 GW by 2022.

Conclusion

India is expected to be the third largest consumer economy as its consumption may triple to US$ 4 trillion by 2025, owing to shift in consumer behavior and expenditure pattern, according to a Boston Consulting Group (BCG) report; and is estimated to surpass USA to become the second largest economy in terms of purchasing power parity (PPP) by the year 2040, according to a report by PricewaterhouseCoopers.

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A TRIBUTE TO LATE PROF. S. S. DUTTA

THE EFFECT OF HEAT ON GLUE DURING EVAPORATION AND HEAT BALANCE

S. S. DUTTA

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The heat which converts collagen into Gelatine or glue is also highly injurious to the latters and therefore the success and failure of a gelatine or glue industry are largely determined by its method of heat applications. If heat and temperatures are not properly controlled at different stages of glue or gelatine manufacture the former may evoke calamity and the manufacturer is found to face colossal loss. Heat and temperature in a gelatine factory are just like a fire arm which can save the life and if misused can take the life of its master. These two mighty servants, heat and temperature, are therefore handled in gelatine factories by vast experienced and well trained hands. Heat is applied during gelatine and glue manufacture mainly in three stages—(i) Extraction (ii) Evaporation and (iii) Drying. The aim of the present investigation is to find out the quantum of heat required to evaporate certain amount of water from glue solutions of different concentrations, energy balance and to explore the change in qualities of glue during evaporation.

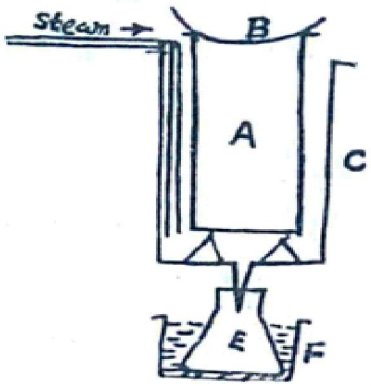
Experimental

Known quantity of glue solution of known concentration, specific heat and density was taken in the copper calorimeter A, which was then placed in the can C. The can C was fitted with an outlet at the bottom for the condensed water. The watch glass B was placed on the calorimeter and steam at atmospheric pressure passed into the annular space between A and C through the tube D for 10 minutes. This heating was done to raise the temperature of the glue solution upto the temperature of heating steam. Any loss of water from the glue solution at this stage was prevented by the watch glass B.

After 10 minutes the watch glass B was removed after taking back in A all the water condensed on the back-side of B and the conical flask E was placed under the can C to collect the condensed water. The conical flask was kept cold by cold water in the bath F.

After 30 minutes (excluding the first 10 minutes), both A and E were removed and the loss and gain of weights of A and E respectively were noted. Same experiment was also carried out with empty calorimeter to know the loss of heat due to radiation and other reasons. From the amount of condensed water in E, after correcting for radiation and other types of losses, the amount of heat absorbed by glue solution was calculated. The specific heat of the concentrated solution left in A was also determined. The concentration etc. were calculated on the zero per cent moisture basis. The specific heat of glue sols were determined in

Copper Calorimeter by the general method of mixture. For density the specific gravity bottle was used. The experimental results are as follows :



FIGURE—1

TABLE—1

Sl. No.	Initial Solution: Concentration.	Initial Solution: Amount of soln. taken in Calorimeter. m_1 gms.	Initial Solution: Amt. of glue present in m_1 grs. of soln. gms.	Initial Solution: Density of soln. gms/cc.	Initial Solution: Specific heat of soln. S_1 Cal/gm/°C	Amount of heat absorb in 30 minutes. Calories.	Amount of water evaporated from soln. in 30 minutes. m_2 gms.	Specific heat of concentrated sol. S_2 Cal/gm/°C
1.	4.5	50.82	2.249	1.017	1.058	9245	15.604	0.9677
2.	18.0	55.12	9.399	1.056	0.9315	6393	9.700	0.9055
3.	22.5	56.57	11.910	1.069	0.8876	4552	7.597	0.8596
4.	27.0	54.77	13.540	1.080	0.8557	4731	7.851	0.8275
5.	31.5	56.03	16.100	1.096	0.8618	4199	6.790	0.8569
6.	36.0	50.23	16.290	1.110	0.8387	3576	6.316	0.8680
7.	40.5	49.97	18.150	1.115	0.7872	2891	5.247	0.8349

From the seventh column of the above table, it is clear that the heat absorbing capacity of glue solution decreases as its concentration goes up. Since all the seven experiments were carried out under identical conditions and since the initial volumes of glue solutions were nearly the same in all the cases, the figures shown in the seventh column may give some idea about the rate of heat flow through glue solutions of different concentrations i.e. thermal conductivities. If the thermal conductivity of 4.5% solution is assumed to be one, the thermal conductivities of other solutions come out as follows.

TABLE—2

Concentration	*Thermal Conductivity*
4.5%	1.00
18.0%	0.6915
22.5%	0.4923
27.0%	0.5118
31.5%	0.4541
36.0%	0.3869
40.5%	0.3127

The increase of viscosity with concentration is perhaps one of the reasons of such decrease in thermal conductivity of solution. Since the mobility of glue molecules in dilute solution is more than that in concentrated solution, heat can be transmitted from layer to layer in dilute solution very easily by convection. As the concentration goes up the movement of the glue molecules slows down and therefore heat cannot be transmitted from one layer to other by convection very easily. The glue molecules, just in contact with the heating surface, in concentrated solution, therefore, receive more heat treatment than the rest of the molecules. For this reason, a thick layer of insoluble dark coloured and inferior glue is found to be deposited on the haating surface when heat is applied to concentrated solution. This layer becomes more and more thick as heating is continued and not only debases the quality of glue but lowers the heat transfer co-efficient of the material of the heating surface also. The possibility of formation of such layer can be reduced if sufficient relative velocity between the heating surface and glue solution is maintained. In the third calandria of the triple effect evaporator where the glue solution is viscous and thick, sufficient velocity of the solution through the heating tubes should be maintained either by reducing the internal diameters of the tubes or by reducing the number of tubes there. Such reduction of either diameter or number will reduce the total heating surface and therefore to compensate, the length of the tubes can be increased proportionately.

The latent heat of vaporisation of water at atmospheric pressure under which the above experiments were carried out is 539 Calories. The amount of heat which should have been required to evaporate the amounts shown in the Column 8 of Table 1 can be calculated out by multiplying the values in column 8 with 539. These are theoretical values. If these theoretical values are compared with the practical values as shown in Column 7 some interesting results can be obtained. These values are tabulated in Table No. III.

TABLE III

Concentration	Amount of water evaporated in 30 minutes gms.	Amount of heat absorbed in 30 minutes Practical values	Amount of heat should have been required Theo. values	Difference	Extra heat required to evaporate 1 gm. of water
4.5%	15.6	9245	8408	837	54
18.0%	9.7	6393	5228	1165	119*
22.5%	7.6	4552	4096	456	60
27.0%	7.8	4731	4204	527	68
31.5%	6.8	4199	3665	534	78
36.0%	6.3	3576	3395	181	28
40.5%	5.2	2891	2802	89	17

* This particular high value of extra heat per gm. of water may be due to experimental error.

The figures in Table No. III indicate that under identical conditions the amount of evaporation decreases as the concentration goes up but as far as supplied energy is concerned the case is just the reverse. The lower thermal conductivity and higher resistance to water vapour due to higher viscosity in concentrated solution are perhaps the reasons for such lower evaporation. On the other hand, the amount of heat reauired to eavporate certain quantity of water from strong liquor is comparatively lower than the weak liquor and at the same time the specific heat of strong liquor is also lower than the specific heat of weak liquor. The increase in temperature due to certain quantity of heat is therefore, more in the case of strong liquor. For this reason strong liquor deteriorates more than the weak liquor when both are subjected to same amount of heat. To overcome these difficulties therefore, sufficient vacuum upto to 25 to 26 inches of mercury is maintained in the third Calandria and separator when direct feed system is followed, Some special arrangements are also made there to stir the material constantly.

Heat is the main energy to operate a gelatine plant. It is either applied to or removed from protein at different stages of gelatine manufacture. The internal energy of protein/water system is thus affected. During extraction of glue or gelati e from collagen, energy, in the form of heat, is applied to the system at constant temperature and therefore the internal energy level of the system gradually goes up. This gradual increase in internal energy causes more and more vibration or rotation or both of the protein molecules and therefore the latters, at a certain stage, are spilitted off into lower fractions and go into solution. If heating is continued even after this extraction of glue or gelatine from collagen, the splitted fractions are further splitted up causing deterioration of the final product. . It is, therefore, advisable to stop heating as soon as glue or gelatine is extracted from collagen and to remove

the sensible heat from the system immediately. But in actual practice, this is not possible because heating is invariably necessary for concentrating the solution during evaporation and drying the gel. But fortunately both these drying and evaporating are not constant-weight processes like extraction and major portion of applied energy goes out of the system with the vapour as latent heat of vaporisation. The ideal method of drying and evaporation, therefore, is that where the input and output of energy are equal, that is, where there is no accumulation of energy in the glue or gelatine molecules. Since the thermal conductivity and viscosity of glue solution decreases and increases respectively with the increase of concentration, the rate of heat addition should, therefore, be gradually decreased as evaporation proceeds to avoid heat accumulation in the protein molecules. In a single effect evaporator it is not possible to regulate this rate of heat application and therefore multiple effect evaporator is always suggested for concentrating glue or gelatine solutions.

Investigations had been made in the laboratory of M/s. Leiner-Knit Gelatine Co. Ltd., Jabalpur, to find out the heat balance and the effect of heat on glue during evaporation. The experimental results are shown in the Table No. 4 (O°C was assumed to be as the datum).

TABLE IV

Initial concentration of glue solution %.	*Amount of glue (0% moisture) present in the solution. m. gms.*	*Total heat absorbed by the system Q_1 calories.*	*Heat removed as latent heat of vaporisation Q_2 calories.*	*Heat present in the concentrated solution $Q=(Q_1-Q_2)$ calories*	*Heat present in the conc. solution as sensible heat Q_3 calories.*	*Increase or decrease in internal energy $(Q-Q_3)=Z$ calories.*	*Increase or decrease in internal energy per gram of glue (0% moisture) Z/m calories.*
4.5	2.249	14,621	9,969.4	4,651.6	3,407	+1,244.6	+553.5
18.0	9.399	11,528	6,199.0	5,329.0	4,112	+1,217.0	+129.5
22.5	11.910	9,572	4,854.7	4,717.3	4,209	+508.3	+ 42.69
27.0	13.540	9,419	5,018.1	4,400.9	3,884	+516.9	+ 38.18
31.5	16.100	9,027	4,339.0	4,688.0	4,221	+467.0	+ 29.00
36.0	16.290	7,789	4,035.6	3,753.4	3,812	− 58.6	− 3.597
40.5	18.15	6,824	3,353.7	3,470.3	3,735	−264.7	− 14.58

Discussion

It is quite evident from the above experimental data that the change in internal energy per gram of glue when heat is applied to glue solution at constant tempera-

ture is largely influenced by the concentration of the solution. Under identical thermal conditions glue molecules behave quite differently when present in dilute and concentrated solutions respectively. When heat is applied to dilute solution at constant temperature, the glue molecules go from lower to higher level and become unstable. As the concentration of the solution goes up, the total internal energy per gram of glue decreases and therefore, it seems that the hydrolysis or rupture of glue molecules is more in dilute than concentrated solution.

Glue molecules in a very concentrated solution, on the other hand, evolve heat during evaporation and go from higher to lower internal energy level. It is, therefore, quite reasonable to conclude that glue molecules present in a concentrated solution mutually react and form some stronger type of cross-linkages during evaporation. This is perhaps the reason why heat reduces the solubility and water-absorbing power of glue when subjected to concentrated solution.

It is an established fact that alcohol, acetone etc. remove bound water from glue and gelatine and therefore due to the reduction of value of dielectric constant of the material present between two oppositely charged protein groups, one protein moves from positively charged basic group to negatively charged carboxyl group. Thus an electrovalent linkage is converted to a stronger co-ordinate type of linkage. Alcohol or acetone treatment therefore reduces the solubility and increases the thermal stability of gelatine. Same phenomenon perhaps takes place when heat is applied to a concentrated glue solution. According to Hatschek, 33% of water in glue or gelatine is bound water type. The heat, applied to a concentrated solution perhaps acts on the bound waters and converts them into free water and therefore the active groups of protein can easily react to form stronger type of cross-linkages. The total heat evolved during such stronger type of cross-links formation is much more that the total work done to rupture the water molecules (rupture of hydrogen bond) from protein and therefore the resultant effect is evolution of heat.

Finally it can be concluded that under identical temperatures the bloom strength is largely affected when heat is applied to dilute solution and heat, applied to a concentrated solution, affects the colour, clarity, solubility and water-absorbing capacity of glue and gelatine. If, on the other hand, some quantity of heat is absorbed the rise in temperature in conc. solution is found to be more and therefore deteriorates more than weak liquor.

—To be continued

The author is grateful to Mr. D. R. Krishnan of Leiner-Knit Gelatine Co. who carried out the necessary laboratory works in the laboratory of L. K. G. under the guidance of the author.

THE EFFECT OF HEAT ON GLUE AND GELATINE AND REFRIGERATION REQUIREMENTS

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In the previous part of this series, it was pointed out that the internal energy level of glue molecules at certain temperature increased when heat was applied to a dilute glue solution and also this internal energy level gradually lowered down as the concentration of the solution increased. It was, therefore, concluded that glue molecules were hydrolysed more in dilute solution and, on the other hand, some stronger type of intermolecular crosslinkages were formed when heat, at a certain temperature, was applied to a concentrated solution. If jelly-strength is dependent upon the dimensions and molecular weights of glue molecules, the former must be seriously affected when dilute glue solution is subjected to heat treatment. To verify this supposition, the present investigations were carried out in the laboratory of Messrs. Leiner-Knit Gelatine Co. Ltd., Jabalpur by the author.

Experimental

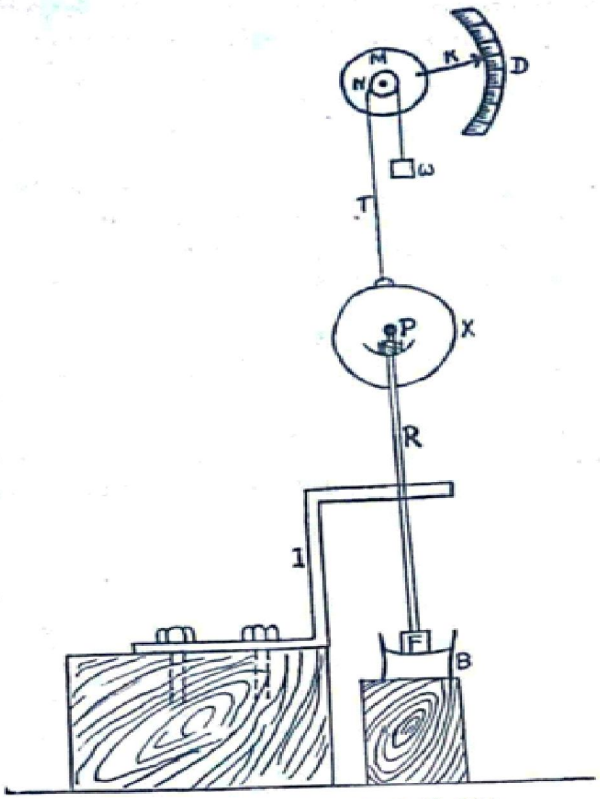
50 c.c. of glue solution of known concentration was taken in a 100 ml. beaker and heated on water bath for one hour at 100 Deg. C and then diluted to make the final solution of 5 per cent concentration. 50 ml. of this 5% solution was taken in a standard "bloom bottle" and put into ice bath for two hours. The strength of the jelly was then noted by "jelly strength comparator" devised in the laboratory of M/s Leiner-Knit Gelatine Co. Ltd., The jelly strength of original 5% glue solution (without going through the heat treatment) was also determined in the same way.

Jelly Strength Comparator

The jelly strength of glue or gelations is generally determined by the internationally accepted Bloom Gelometer. The solution ($6\frac{2}{3}$% in the case of gelatine and $12\frac{1}{2}$% for glue) is taken in Standard Bloom bottle and matured at 10 Deg. C for 16 to 18 hrs. before the bloom determination. Since there was no gelometer available the following arrangement was devised.

The float F, fitted at the lower end of the vertical rod R which again passes through a small hole in the Z-shaped iron support I, presses the jelly in the bloom-bottle B when weights are put on the pan P.

To magnify the depression of the jelly, the iron ring X, rigidly fixed up with the rod R, is connected with the small pulley N by a thin thread, T, as shown in the figure. The pulley N is again rigidly connectd with a bigger pulley M, provided with a pointer K. D is a semicircular scale on which the pointer K moves. Any depression of the jelly due to the weights on the pan P is therefore indicated by the pointer on the dial D. Higher the reading on the dial, lower is the jelly strength and vice versa. The dial readings are thus the representatives of the respective jelly strengths and therefore in our investigation, only dial readings were noted. The results are shown in the Table No. 5.



JELLY STRENGTH COMPARATOR

TABLE NO. 5

Weight on Pan P.	*Dial Reading for—*				
	Original solution 5%	*5 per cent solution heated and diluted to 5%*	*10% solution heated & diluted to 5%*	*15% solution heated & diluted to 5%*	*20% solution heated & diluted to 5%*
0 Gms.	0	0	0	0	0
20 Gms.	0.8	1.0	1.2	0.8	0.7
30 Gms.	1.2	1.8	1.7	1.3	1.0
40 Gms.	1.5	2.4	2.4	2.0	1.8
50 Gms.	2.0	3.0	2.9	2.4	2.4

Same experiment was carried out with Davi's Gelatine and the results are shown in Tables 6, 7 and 8.

TABLE NO. 6

Weight on Pan	*Dial Reading for—*		
	Original 5%	*5% solution heated & diluted to 5%*	*10% solution heated & diluted to 5%*
0 Gms.	0	0	0
20 Gms.	0.1	0.2	0.15
30 Gms.	0.2	0.35	0.2
40 Gms.	0.3	0.4	0.3
50 Gms.	0.3	0.6	0.4
60 Gms.	—	—	—
70 Gms.	0.5	0.7	0.6
100 Gms.	0.7	1.0	1.0
120 Gms.	0.8	1.2	1.2
150 Gms.	1.0	1.6	1.6

After the above experiments, the gelatine gels were kept overnight at the room temperature. Next day the strengths of the jellies were compared again Results are shown in the following Table No. 7.

TABLE NO. 7

Weight on Pan	*Dial Reading for—*		
	Original	*5% solution*	*10% solution*
0 Gms.	0	0	0
20 Gms.	0.4	0.5	0.5
30 Gms.	0.7	0.8	0.7
40 Gms.	0.9	1.1	1.0
50 Gms.	1.1	1.4	1.3
70 Gms.	1.4	1.9	1.8
100 Gms.	2.5	Jelly Broken	Jelly Broken

The jellies used for experiment as shown in Table No. 7 were melted, heated for another 2 hours at 70 Deg. C and made upto the original volumes. They were chilled as before and next day jelley strengths were compared. Results are shown in Table No. 8.

TABLE NO. 8

Weight on Pan	*Dial Reading for—*		
	Original	*5% solution*	*10 % solution*
0 Gms.	0	0	0
20 Gms.	0.5	2.0	1.2
30 Gms.	0.8	2.4	1.8
40 Gms.	1.1	3.4	2.4
50 Gms.	1.4	3.9	2.6
70 Gms.	1.8	Jelly	3.6
100 Gms.	2.7	Broken	Jelly Broken

Conclusion.

From the present experiments, it is now clear that the conclusion drawn in the previous report, i.e. the extent of reduction on jelly strength due to heat application is dependent upon the concentration of the solutions, is to some extent correct. We are not in a position, at present, to definitely conclude about the nature of linkages formed when concentrated solution is subjected to heat treatment. On commercial experiments the author experienced that gelatine could not be heated at a temperature more than 212 Deg. F so long as the moisture content was more than one per cent, othrewise the whole product became insoluble in water. To make hundred per cent spore free gelatine, some manufacturers in Europe therefore, dry the gelatine gel-crystals upto a moisture content less than one per cent at less than 200 Deg. F and then gradually increase the temperature upto 250 Deg. F. Under such condition the temperature can be raised upto 300 Deg. F. without making the gelatine insoluble in water.

Attempts were also made to determine the specific heats and latent heats of both glue and gelatine solutions and gels by the conventional calorimetric-method and the following data were obtained :

Concentration	Density gms/c.c.	Specific heat calories	Latent heat calories
Glue (Crude)			
1%	1.001	0.960	No gel.
10%	1.036	0.910	28.05
20%	1.051	0.798	19.49
40%	1.088	0.580	17.62
Davis' Gelatine			
10%		0.8762	45.96
40%	1.067	0.8816	68.87

It was afterwards observed with interest that like water and many other inorganic and organic liquids glue or gelatine solutions of any concentration did not change their state from sol to gel or vice versa at a definite temperature. The sols began to thicken at a temperature round about 40 Deg. to 50 Deg. C and finally formed gels as the temperature dropped down. During this change of state from sol to gel large amount of heat was liberated no doubt but peculiar enough, the temperature of the material did not remain constant but slowly and gradually went down. We are, therefore, obsessed with the idea that gellation is not solidification, but mutual interaction between the molecules to form a complex, three dimensional net-like structure. Any attempt to determine the latent heats of glue and gelatine gels can, therefore, be criticised. The extra heats liberated during such change of state can be called as "heat of gel formation." No method as yet is known to determine this 'heat of gel formation' and specific heats separately. The amounts of heat liberated at various temperatures by one-gram of Shaw-Wallace's Crocodile brand glue solution of 20% concentration when its temperature was lowered by one degree Centrigrade were also determined but unfortuantely those values could not be called as specific heats because some change in state always took place during the experiments. From those experimental data, it can be asserted that the amount of heat liberated by a given mass of glue or gelatine solution increases as the temperature of the solution goes down, but the rate of fall of temperature slows down gradually. After certain temperature (15 Deg. to 20 Deg. C) of course, the amount of liberated heat decreases, but the slowing rate of tempeature-fall continues.

The total amount of heat liberated by gleatine solution for a particular temperature-drop is always greater than the total amount of heat liberated by the same amount of glue solution of the same concentration and for the same temperature drop. On the other hand, the rate of fall of temperature is more in the case of glue solution, but gelatine solution forms a minceable stiff gel at a higher temperature. For proper mincing of glue gel, therefore, either its temperature should be lowered down to a very low value or its concentration should be raised atleast upto 50% in the evaporator.

Refrigeration Requirement

Cooling is a most important operation in gelatine manufacture, because almost all the desirable qualities like bloom strength, viscosity, solubility, water absorbing capacity etc. of gelatine are largely dependent upon this cooling operation. The glue obtained by directly drying the sol to a solid state always shows less strength, viscosity, solubility, water absorbing capacity etc. than gel-dried gelatine. In the sol state the gelatine molecules are mobile and can move in all directions at random, but when this sol is gradualy cooled, the gelatine molecules become more and more static and finally, at a certain temperature called the setting temperature, start to react with each other through their side chains and form a three dimensional net-like structure. This setting temperature is, of course, dependent upon many factors like concentration, hydrogen ion concentration, thermal history, quality etc. of the sol. Cooling, in a broad sense, is a reverse process of extraction or boiling. During extraction, some of the cross-linkages of insolublE collagen are ruptured by the application of heat, whereas in cooling some of those ruptured cross-linkages are re-formed by the removal of heat. In collagen, there are different types of cross-linkages but the most important one is the hydrogen bond type. There are many evidences to believe that some of the intermolecular hydrogen bonds which are ruptured during extraction are reformed during gel formation. Since it is not possible to reform all the ruptured hydrogen and other types of bonds by cooling, gelatine cannot be transformed into original collagen back.

If gellation is actually the reformation of some of the ruptured cross-linkages the refrigeration requirement to convert sol into a mincable rigid gel should be largely dependent upon the method of heat application during extraction. If large quantity of heat is applied very quickly to the collagen-water system during extraction, the heat unnecessarily raises the temperature of the system and therefore, not only the required number of hydrogen bonds but other types of bonds and even the covalent bonds of the main polypeptide chains are ruptured. Collagen is thus converted into glue instead of gelatine. If rigidity of gel is dependent upon the number and strength of the cross-linkages formed during cooling, glue solution of certain concentration should require more refrigeration than gelatine solution of same concentration. The aim of the present investigation was to find out the refrigeration requirements for both glue and gelatine solutions of 40% concentration and their nature and rate of gel formation.

Experimental

41.58 gms of 40% gelatine solution was taken into a 100 ml. beaker and put into known quantity of chilled water of known temperature. The temperature drop of the gelatine solution and the increase in temperature of the chilled water were noted against time. The gelatine solution was stirred so long as it was in the sol state. Precautions were taken to minimise the radiation and other types of heat losses as far as possible. The quantity of heats liberated against time were then calculated. Same experiment was also carried out with 46.5 gms. of 40% solution. The experimental results are as follows :

TABLE 1

Time in Mins.	Temperature of—		Amt. of heat liberated from—	
	Gelatine Sol. C	Glue Sol. C.	Gelatine Sol. Calories.	Glue Sol. Calories.
0	39	38	0	0
2	33	27	554.9	524.4
4	28	22	909.5	925.2
6	23.25	20	1248.6	1264.3
8	20	19	1541.5	1480.2
10	18	18	1788.1	1696.1
12	16.25	17	1988.5	1881.0
14	14.75	16.75	2235.1	2065.9
16	14.25	16	2420.0	2250.8
18	14	15.5	2635.8	2435.7
20	13.75	15.25	2913.2	2605.2
22	13.6	15.2	3159.8	2782.1
24	12.5	15.0	3360.2	2967.0
26	12	14.75	3576.0	3136.5
28	11.75	14.5	3776.4	3306.0
30	11.5	14.5	3992.2	3482.9

Gelatine gel became mincable at 15°C whereas glue gel became just mincable at 14 C. For refrigeration calculations these temperatures should therefore be considered.

Comparative study of Glue & Gelatine solutions as regards refrigeration requirement :

From the above results it is clear that the amount of heat to be removed from

(a) one gm. of 40% gelatine solution to drop down its temperature from 32°C (90°F) to 15°C is nearly 57.5 calories, i.e. 103.5 B.Th.U/lb.

(b) one gm. of 40% glue solution to drop down its temperature from 32°C to 14°C is nearly 83.5 calories, i.e. 150.3 B.Th.U/lb.

So, the ratio of refrigeration requirement will be—

$$\frac{\text{Glue}}{\text{Gelatine}} = \frac{150.3}{103.5} = \frac{1.43}{1}$$

Hence glue requires nearly 1½ times of refrigeration than gelatine solution.

The above experimental results indicate that the falling rates in temperatures for both glue and gelating are not uniform throughout. The rate of fall in temperature is rapid at the early stage of cooling when the temperature of the solution is high enough to keep the sol in a sufficiently fluid state, but the amount of heat evolved during this period is comparatively low. The major portion of heat is evolved when the setting of sol starts. To drop down the temperature of gelatine soln. from 39 Deg. C to 33. Deg. C 555 Calories of heat were evolved or in other words, only 92 Calories were evolved for one degree fall in temperature, whereas 298 Calories had to be extracted for each degree fall within the range 18 Deg. C to 12 Deg. C. From hot gelatine solution therefore sensible heat comes out first and then the molecules unite together to form complex structure with the liberation of internal energy which is the major portion of heat present in gelatine solution. This argument is true for glue solution also.

The above experimental results also reveal that glue and gelatine behave differently when they are cooled. At higher temperature the rate of cooling for glue is more than that of gelatine but it is reversed as soon as the setting process sets in. Moreover the total amount of heat liberated for one degree fall in temperature during setting period is much more in the case of glue. This indicates that the total number of cross-linkages formed in glue during setting within a particular temperature range is much more than gelatine. But, on the other hand, gelatine sets earlier and even at higher temperature than glue. Gelatine molecules are already big in dimension and molecular weight and therefore small number of Cross-linkages are more than sufficient to impart setting properties to gelatine molecules.

Refrigeration requirement in a Gelatine Factory in India—From the evaporator concentrated gelatine solution generally comes out at a temperature round about 120 to 140 Deg. F. This temperature is brought down to 95 Deg. F to 90 Deg. F with ordinary cold water, to economise the refreigeration load. Since the specific heat of gelatine solution within this temperature range is very low, the amount of heat evolved is not large enough to appreciably economise the refrigeration load by cooling the solution with ordinary cold water.

The gelatine solution is generally cooled down to a temperature till it becomes mincable. The above experiment indicates this temperature as 15 Deg.C. The author feels from his practical experinece that in a tropical country like India—the suitable temperature should be 10 to 12 Deg. C otherwise trouble may be experienced during drying if the relative humidity of the atomsphere goes up. Anyway the following calculations are based on temperature drop from 32 Deg. C to 15 Deg. C.

1 Ton dry gelatine = 2500 Litres of 40% Solution
= (2500 × 1.067) Kg. of 40% gelatine solution
(Sp. Gr. of 40% Sol = 1.067)

But we have seen experimentally

1 lb. 40% gelatine solution = 103.5 B.Th. U.

1 Kg. " " " = (103.5 × 2.2) B.Th.U. !

(2500 × 1.067) Kg. " = 103.5 × 2.2 × 2500 × 1.067 B.Th.U.

= 896700 B.Th.U.

If Cooling is done in 5 Litre-Trays then Cooling time is found to be 6 hours during the worst period of the year in India.

$$\text{So, Heat to be removed per minute} = \frac{896700}{6 \times 60} \text{ B.Th.U.}$$

$$\text{Refrigeration requirements} = \frac{896700}{6 \times 60 \times 200} \text{ Tons}$$

= 12.5 Tons.

The author verified this figure of refrigeration requirement on commercial basis in the factory of M/s Leiner-Knit Gelatine Co., Jabalpur and found that this figure agreed with the practical requirement.

From Commercial angle, this value of refrigeration load is not economical. This will involve huge capital investment for the installation of the refrigeration plant. The author therefore suggests indirect method of cooling with chilled water If plant can work for 14 to 16 hrs. a day for chilling water (instead of 6 hrs.) then the capacity of the plant for one ton of dry gelatine per day can be cut down from 12.5 tons to only 5 tons of refrigeration.

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Article

An overview of carbon input and output from Calcutta Leather Complex

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Key Words : Carbon, Calcutta Leather Complex, liquid waste, solid waste, East Calcutta Wetlands

Introduction

The foremost aim of the leather industry, which plays an important role in today's global economy, is to transform animal hides/skins into a physically and chemically stable material and to get products for meeting various needs of people. But due to the foul smell, organic solid wastes, huge amount of liquid waste of these leather industries have a bad reputation regarding environmental pollution. It should be noted that after processing only one-fifth of the rawhide are converted into finished leather, the rest forming wastes. Also, the tanning industry generates complex pollutants, consist a mixture of organic and inorganic substances and these substances are difficult to treat. Puntener (1995) has calculated that processing of every one tonne wet salted hides and skins yield around 150 kg finished leather, 150 kg split, 300 kg solid wastes and 30m^3 of liquid waste which contains 400 kg dissolved and suspended solids. The tannery generated solid waste and liquid waste contains huge amount of C rich different organic and inorganic materials. Sundar et al. (2001) had estimated thatworldwide690000 tonnes raw-hide and skins are processed annually and Rajamani (2010) has stated that annually 600 million m^3 waste water and 6 million tons of solid wastes are generated. These solid and liquid wastes contain C rich materials like hair, blood, flesh, splits etc. Whereas, different leather processing salts are the inorganic source of C in liquid waste and solid waste and it is estimated that near about 400 kg of chemicals are used for processing of 1 tonne raw hides and skins (Suresh et al. 2001). Most of the researches had done on measuring the heavy metals in tannery materials and their impacts on environment(Talapatra and Banerjee, 2004; Vutukuru, 2005; Javed and Abdullah, 2006). Same in Kolkata most of the research work (Chatterje et al. 2006, Aich et al. 2011, 2017 Goswami et al. 2013, Pal et al. 2013, 2014a, 2014b) has been done on the effect of Kolkata tannery industry generated waste on biotic and abiotic system of East Calcutta Wetland (ECW) ecosystem in ecotoxicological context and also assessed the amelioration capacity of ECW ecosystem. Because, without any pre-treatment these solid wastes, along with the effluent, are discharged directly into the ECW and are used for agriculture and piscicultural purpose (Pal et al, 2016a, 2016c). But apart from that these waste materials alsoenrich the C content in ECW water (Pal et al. 2018) and soil system (Pal et al. 2016b) and positive correlations are found between C content and different nutrient enrichment in soil-water system of ECW. Therefore, estimation of carbon input and output from the leather industries would be very important in the context of nutrient enrichment of ECW area by which the piscicultural and agricultural productivity are depends. However, on the other hand these carbon audit is very important in the context of greenhouse gas emission and global warming.

Materials and Methods

Calcutta Leather Complex (22.4920° N, 88.5146° E) is around 20 km away from Kolkata city and is situated on the boundary of the Ramsar area (No.1208) of East Calcutta Wetland (ECW) ecosystem. At CLC area near 300 leather processing units or tanneries are operating with the consent of the Government and on an average 1000 tons of raw hides and skins are being processed every day. Input/Output overview for the chrome-tanning processing units of CLC grossly considers raw materials and finished products, chemicals, water and wastewater and electricity. Therefore, to prepare an overview of carbon audit of tanneries of CLC area three predominant types of units, viz., gloves, bag and shoe upper leather producing units are selected; nine units in total, taking three of each type are sampled. Different liquid wastes are collected in Terson screw cap plastic bottles and raw hides and skins, finished leather, different solid wastes and leather processing chemicals are collectedin zip-lock pouches.

To measure the carbon content in liquid samples, 100µl raw liquid samples are injected directly into the Lachat

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TOC-TN Analyzer. Whereas, at first the solid samples are dried up at 70°C in a hot air oven and then each samples were weighted (2 ± 0.10 mg) in tin foils by Perkin Elmer AD6 Auto Balance. After that for the C estimation these samples were dropped into heat combustion chamber of Perkin Elmer CHNS/O analyzer (Series II, 2400) (Eaton et al. 2005).

To measure the electricity consumption for water pumping the amount of water for 1 ton raw hides and skins processing are collected from the mentioned nine tanneries. As per Frijns and Roorda, (2008)0.47kWh energy is consumed per m^3 of water pumping while on an average 0.998 kg CO_2 is emitted to generate 1kWh thermal energy. From this data the calculations are done to get the C value for water supply in leather processing units.

Results and Discussion

The total leather processing, i.e. from raw hides and skins to finish leather production, divided into three part: pre tanning, tanning and post tanning and depending on the weight of raw hides and skin or weight of the crust the percentage of chemicals are employed. Except in the last stage of post tanning i.e. in finishing operation, based on the area of the crust leather the amounts of chemicals are used. The quantity of chemicals that are used in leather processing and amount of C present in these chemicals directly influence the C output from different stages of leather processing. Correspondingly, based on the chemicals quantity and amount of C present (depending upon chemicals manufacturer) in these chemicals the C output from various stages of leather processing are influenced.

The chemicals that are used in post tanning process contribute higher amount of C that pre tanning and tanning operation. In pre tanning process through Lime and Na_2S, in tanning process through HCOOH, NaHCO3, HCOONa most of the C are incorporated in the leather processing. Whereas in post tanning process different syntans (resins, mealmines, benzene sulfonic acid, formaldehyde, oxalic acid, di-isocyanate, toluene sulfonic acid, dialdehyde) different fats, different dyes, GS powder, Fixing agents (HCOOH) and finishing agents (pigment, acrylic binder, protein, filler, shellac, waxes, mucilages, casein, synthetic polymers, albumin etc) are used which contains very high amount of C (Table 1). It is also noted that instead of generic/commom name of chemicals that are used for finishing operation the tanneries only provide finishing formulas and raw chemicals by reason of 'trade secrets.'

From the study it is revealed that the raw material, i.e. the raw hides and skins (397 ± 11.17g kg^{-1}), contain huge amount of C in form of protein, fat etc. Moreover, depending upon the age, species, breed, habit, habitat and health of the animals the protein, fat, minerals and water contents as well as the C value are changed. Whereas, in finished leather (529.07 ± 43.53g kg^{-1}) C" 33% C content are increased than raw hides and skins and these C come from the chemicals. This is also notable that every tannery has its own recipe for chemical and mechanical operation and adding with variation of customer requirement specific finished product the C content in finished product is varied. Most of the solid waste materials of tanning industry are generated from mechanical operations. These solid waste materials are mainly fat and protein rich. The collected major tannery solid wastes are: Lime fleshing, Chrome tanned Splits, Chrome shaving dust, Buffing Dusts and trimming cut offs. Lime fleshing contain the highest amount of carbon followed by buffing dust and chrome tanned splits (Fig. 1).

Immediately after each specific tanning operation from the discharge point of different tanning units of those nine factories nine major liquid wastes (Soak liquor, Lime liquor, Delimed liquor, Pickle liquor, Chrome liquor, Soak liquor 2 (after wet back), Rechroming liquor, Neutralization bath and Dye-Fat liquor) are collected. Among all the liquid waste the highest amount of C present in the dye-fat liquor. This is due to highC rich syntans, dyes and fats (Table 1) are used at the time of dying and fat liquoring process. Moderate amount of C is present in lime liquor and rechrome liquor and the lowest amount of C is present in soak liquors (Fig. 2).

The processing of one metric ton of cattle raw hides and skins the amount of chemicals required to process the raw materials contain 65.1 ± 13.36 kg C. Whereas from the same processing 40.54 ± 3.22 kg C in the forms of liquid wastes and 279.63 ± 13.23 kg C in the form of solid waste are discharges and 138.23 ± 9.83 kg C are exported through finished leather. The use of water in different leather processing operations are given in Table 2 and from that it is calculated that for the processing of 1 ton cattle hides and skins on an average 24757.7 ± 3676.8 liter of water per metric ton and to supply this amount of water 11.63 ± 1.72 kWh (kilowatt-hour) electricity is used, roughly equivalent to 3.17 ± 0.47 kg C. For processing of 1 ton raw hides and skin to finished

leather on an average 7125 ± 632.5 kWh electricity (thermal power) is consumed for different purposes and that amounts to 1940.5 ± 172.3 kg C.

Therefore, to prepare finish leather from one ton cattle raw hides and skins in beam house operation a total of 462.1 ± 21.7 kg C is incorporated through hides and skins and through leather processing chemicals. That means C"85.9% sources of C is raw hides and skins and C" 14.1% carbon is comes from the leather processing chemicals. Whereas, for the same processing 2398.9 ± 658.8 Kg C areoutputed from tannery in form of finished leather, solid waste, liquid waste and for electricity consumption. Among these four outputs maximumC is generated for the electric consumption and it is near about C"81% of the total C output. The finished leather contribute 6% C, solid waste contribute 11% C and liquid waste contribute only 2% C. In Kolkata leather complex area 300 tanneries processed 1000 tons of raw hides and skins daily. That means after excluding the carbon in finished leather from the tannery output the rest amount of C i.e. C" 2260 tons C are directly discharged to the environment daily.Moreover, in this study due to inadequate access in tanneries, technical difficulties some sources of C output not included. Firstly,wastage in chemicals handling, wastage in machine surface and wastage of finish compositionat the time of spray are not measured due to difficulties to quantify it. Secondly, from finishing operation volatile organic carbon (VOC) compounds are released and within a big tannery unit and commercial public place it is impossible to separate and quantify the level of VOC. Thirdly, the most difficult one to quantify C output from vehicles for transporting raw hides, chemicals and finished leather. It is difficult because in CLC area the source point of raw hides and skins are miscellaneous and the vehicle used for transportation is highly variable includingmechanized van-rickshaw, adorably called "vano," having no specific emission data. Lastly, CO_2 and CH_4generations by the solid and liquid wastesdisposed offto the ambient environment around could not be ascertained yet and the researches in this regard are continuing (Pal et al., 2017).

The perilous impact of excess C released in the environment upon the future of mankind is one that is being hotly debated in almost all corners of the world at the moment. The unregulated emission of C and other gases by industries and the excessive consumption of fossil fuels led to the greenhouse effect, which in turn causes global climate change. Here, the approach of the study is not to show the negativity of the leather industry, but to give some raw facts to the leather technologist to minimize the C output by inventing more ecofriendly technologies for leather processing, integrated waste management, recycling of chemicals from waste. But the best way to reduce C output is the biogas and methane basedwaste to energy generationand adopting non-conventional energy for unit operation.Because81% C output from the tannery is due to fossil fuel dependent electricity consumption and if it is replaced by non-conventional energy sources and tannery waste to energy production then the input-output ration will be reduced.

Acknowledgements

First author thankfully acknowledges UGC for DSKPDF and the contingency grantsto carry out this work. Last author is also thankful to the UGC for awarding Emeritus Fellowship. Authors express their thanks to Dr. SanjoyChakraborty, Dr. Anjan Biswas and Mr. Sandip Das,GCELT, Kolkata, for providing the laboratory facilities and necessary help.

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Table 1: C content in different leather processing chemicals used in different tanneries of CLC area

Chemicals	C content	Chemicals	C content
H_2O (mg L^{-1})	0.37 ± 0.14	H_2SO_4 (g kg^{-1})	0.41 ± 0.15
NaCl (g kg^{-1})	2.61 ± 0.77	Rechroming agents (RC) (g kg^{-1})	61.53 ± 41.26
Preservatives (g L^{-1})	52.75 ± 18.59	$(NH_4)HCO_3$ (g kg^{-1})	126.68 ± 18.68

Chemicals	C content	Chemicals	C content
Wetting Agents (g L^{-1})	0.98 ± 0.3	Dyes (g kg^{-1})	192.48 ± 44.2
Lime (g kg^{-1})	75.70 ± 14.36	Syntans (g kg^{-1})	171.24 ± 65.4
Na_2S (g kg^{-1})	63.89 ± 7.05	GS Powder (g kg^{-1})	207.55 ± 16.11
$(NH_4)_2SO_4$ (g kg^{-1})	2.10 ± 0.69	Fats (g L^{-1})	358.74 ± 107.28
NH_4Cl (g kg^{-1})	1.71 ± 0.59	TiO_2 (g kg^{-1})	1.33 ± 0.71
BCS (g kg^{-1})	13.13 ± 1.67	Fixing Agents (g L^{-1})	707.77 ± 36.77
HCOONa (g kg^{-1})	177.06 ± 31.75	Finising agents (g L^{-1})	161.06 ± 135.23
$NaHCO_3$ (g kg^{-1})	184.17 ± 21.47		

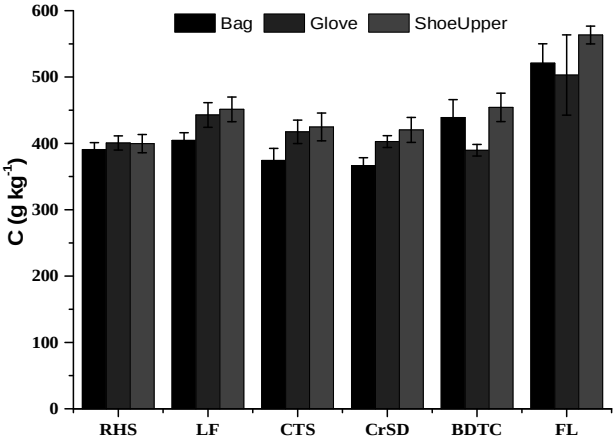

Fig. 2: Average C content (g kg^{-1}) in raw hide and skin (RHS), different solid waste (LF- Lime fleshing, CTS- Chrome tanned Splits, CrSD- Chrome shaving dust andBDTC- Buffing Dusts and trimming cut offs) and finished leather (FL) of different tanneries in CLC area

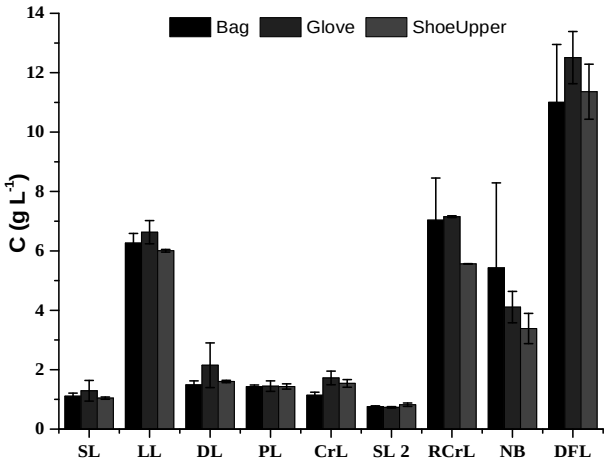

Fig. 2: Average C content (g L^{-1}) in various liquid waste (SL- Soak liquor, LL- Lime liquor, DL- Delimed liquor, PL- Pickle liquor, CrL- Chrome liquor, SL2- Soak liquor after wet back, RCrL- Rechroming liquor, NB- Neutralization bath and DFL- Dye-Fat liquor) generated from different tanneries in CLC area

Table 2: Average water used for processing of cattle raw hides and skins in CLC area

Processing	Amount of water (L)	Processing	Amount of water (L)
Prewashing	2500 -3000	Floor washing	1000 - 1500
Soaking	3000 - 4000	Pickling	900 - 1300
Washing	2000 -2500	Chrome tanning	510 - 780
Unhairing	3000 - 4000	Prewashing	750 - 1000
Fleasing	500 - 1000	Retanning	375 - 570
Rinse	1000 - 1500	Neutralizing	320 - 570
Delimimg	1200 - 1360	Rinse	500 - 750
Bating	1500 - 2000	Fat liquoring	300 - 570
Rinse	1000 - 1500	Finishing operation	100 - 115
Finishing operation	115 - 120		

On the Time Machine : - Late S. D. Set, the then Publisher of JILTA hosting the ILTA jack on the roof top of ILTA Building at 'Sanjoy Bhawan', Kolkata a few years back.
Members gathered under the jack to take promise for a brighter future of leather industry

-: J I L T A :-

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