



ANNOUNCING

**51st LEATHER RESEARCH-INDUSTRY  
GET-TOGETHER (LERIG) 2018**

**29-30 January 2018  
Le Royal Meredien, Chennai**

**SUSTAIN**

**Sustainability of Leather & Allied Industries**

“Sustainability is today an important issue for the leather sector. This encompasses both ecological and economic factors, while keeping the consumer benefit as paramount. Leather Sector is innovating by the way of developing new products, chemical systems and reducing energy consumption, while maximizing raw material to leather/ product turnover.”

**LERIG 2018 will discuss SUSTAIN through:**

**SUSTAINABILITY THROUGH REDUCED ENVIRONMENTAL FOOTPRINTS  
CHEMICALS FOR SUSTAINABILITY OF TANNING INDUSTRIES  
SUSTAINABILITY OF PRODUCT INDUSTRIES  
POLICIES AND PROGRAMME NEEDS: CHALLENGES AND NEW AVENUES**



**Dr B Chandrasekaran**  
Director, CSIR-CLRI

22nd December 2017

Dear Doyens and Members of the Indian Leather Fraternity; Colleagues from CSIR; Mentors and Teachers, Colleagues and Friends! We welcome the New Year 2018 with great sense of optimism for the growth of the Indian Leather Industry and may you continue to benefit from CSIR-CLRI's R&D, Technical Services, HRD and many outreach programmes. We hope to serve the sector with added vigour. Together, we have many challenges to meet and complete to fruition and this includes the Indian Footwear, Leather & Accessories Development Programme (IFLADP). It's time for action as there is momentum yet again!

This edition coincides with the LEATHER WEEK 2018, LERIG 2018 is announced and the theme is Sustainability of Leather & Allied Industries (SUSTAIN) which is an important issue for the leather sector. CLRI would also be co-ordinating the setting-up of a Theme / Trend pavilion at IILF 2018; bringing out the Daily Newsletter IILF Happenings in association with ITPO & CLE and show its marked presence at the 3rd edition of Designers Fair 2018. It would be a great pleasure to welcome you all to join us in our endeavours.

CSIR-CLRI has been reaching out to the Industry in every sphere with its technologies and services. We hope to live up to the expectations of the Indian Leather Sector at all times.

We must walk hand-in-hand in our journey ahead!

I wish to thank you all for your unstinted support and kind co-operation at all times.

I take this opportunity to greet you a Happy New Year 2018.

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### Thought Leaders\*

**Who will set the path for discussions?**  
 Dr M Rafeeqe Ahmed  
 Shri PR Aqeel Ahmed  
 Shri N Shafeeq Ahmed  
 Dr T Ramasami

**Who will lead the discussions?**  
 Shri Mukhtarul Amin  
 Shri Atul Chaturvedi  
 Dr Ramanand N Shukla  
 Shri Habib Hussain  
 \* Tentative

### 4 Sessions

- Reducing environmental footprints
- Chemicals for sustainability
- Sustainability in product industries
- Policies and programs

# JAN 29-30, 2018

# 51<sup>ST</sup> LERIG - SUSTAIN

## Key Features

- **Venue: Le Royal Meridien, Chennai**
- **Inauguration: 29 January, 2018**
- **Nayudamma Lecture on 29 January, 2018 by Dr VK Saraswat, NITI Aayog**
- **Technical Programs on 30 January 2018**
- **4 Sessions, 9 Speakers, 7 panelists**

## Sustainability of Leather & Allied Industries

Sustainability today is an important issue for the leather sector. This encompasses both ecological and environmental factors, while keeping the consumer benefit as paramount. Leather sector is innovating by way of developing new products, chemical systems and reducing energy consumption, while maximizing raw material to leather/product turnover. 51st LERIG would introduce the state-of-art concepts in this area that Indian leather sector could consider for adoption.

Register your interest for participation by sending an email with contact details to [lerig.clri@gmail.com](mailto:lerig.clri@gmail.com) or contact Convener (Dr KJ Sreeram) at 98401 25263  
 Delegate registration: Rs. 3000 per head. Registration opens on 10th January 2018  
 Sponsorship opportunities open [Gold (session sponsor – Rs. 5 Lakhs; silver – Rs 2.5 Lakhs) (contact convener for sponsor entitlements).

**Organized by CSIR-Central Leather Research Institute**  
**In association with Stakeholders of the Indian Leather Sector**

Registrations open on 10th January 2018  
**Co-ordinating Convener: Dr KJ Sreeram, Principal Scientist & Head, CATERS**  
**Email: [kjsreeram@gmail.com](mailto:kjsreeram@gmail.com); Mobile: +91 98401 25263**  
 LERIG co-ordination: Industrial Liaison & Publicity Wing, CSIR-CLRI





## Cabinet approves special package for employment generation in leather and footwear sector

**Press Information Bureau,  
Government of India Cabinet**

(15-December, 2017 17:33 IST)

### Cabinet approves special package for employment generation in leather and footwear sector.

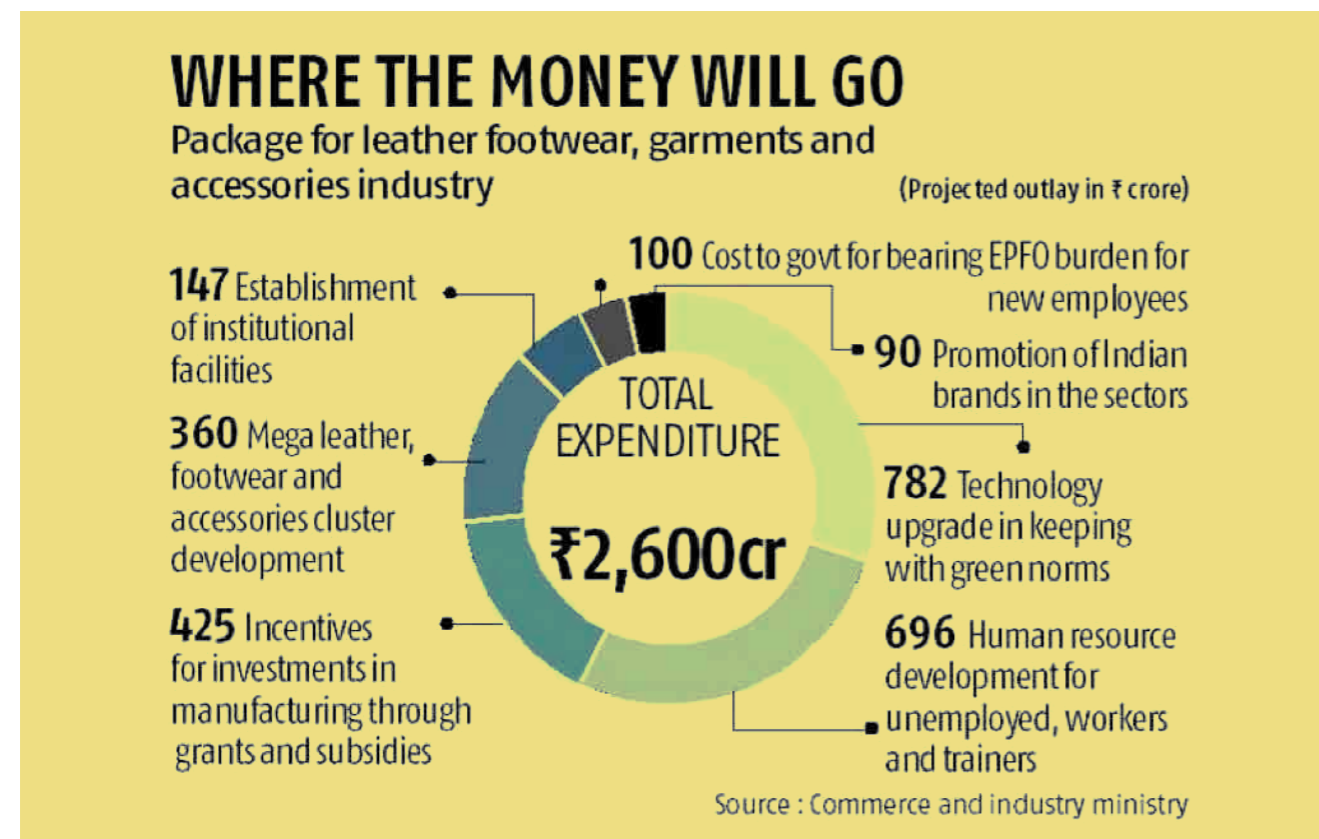
The Union Cabinet chaired by Prime Minister Shri Narendra Modi has approved the special package for employment generation in leather and footwear sector. The package involves implementation of Central Sector Scheme "Indian Footwear, Leather & Accessories Development Programme" with an approved expenditure of Rs. 2600 Crore over the three financial years from 2017-18 to 2019-20.

#### Major Impact:

The scheme would lead to development of infrastructure for the leather sector, address environment concerns specific to the leather sector, facilitate additional investments, employment generation and increase in production. Enhanced Tax incentive would attract large scale investments in the sector and reform in labour law in view of seasonal nature of the sector and will support economies of scale.

The Special Package has the potential to generate 3.24 lakhs new jobs in 3 years and assist in formalization of 2 lakh jobs as cumulative impact in Footwear, Leather & Accessories Sector.

#### Details of the Indian Footwear, Leather & Accessories Development Programme



**Human Resource Development (HRD) sub-scheme:** HRD sub-scheme proposes to provide assistance for Placement Linked Skill Development training to unemployed persons @ Rs. 15,000 per person, for skill up-gradation training to employed workers @ Rs. 5,000 per employee and for training of trainers @ Rs. 2 lakh per person. The placement of 75% of trained persons is proposed to be mandatory for availing assistance related to skill development training component. The proposal under this sub-scheme is to train/skill 4.32 lakh unemployed persons, upgrade the skills of 75,000 existing employees and train 150 master trainers during the three years with proposed outlay of Rs. 696 crore.

**Integrated Development of Leather Sector (IDLS) sub-scheme:** IDLS sub-scheme proposes to incentivize investment and manufacturing including job creation by providing backend investment grant/subsidy @ 30% of the cost of new Plant and Machinery to Micro, Small & Medium Enterprises (MSMEs) and @ 20% of the cost of Plant and Machinery to other units for Modernization /technology upgradation in existing units and also for setting up of new units. The proposal under this sub-scheme is to incentivize 1000 units in Leather, Footwear and Accessories & Components sector during the three years with proposed outlay of Rs.425 crore.

**Establishment of Institutional Facilities sub-scheme:** The sub-scheme proposes to provide assistance to Footwear Design & Development Institute (FDDI) for upgradation of some of the existing campuses of FDDI into "Centres of Excellence" and establishing 3 new fully equipped skill centres alongside the upcoming Mega Leather Clusters, based on project proposals, with proposed outlay of Rs.147 crore for the three years.

**Mega Leather, Footwear and Accessories Cluster (MLFAC) sub-scheme:** The MLFAC sub-scheme aims at providing infrastructure support to the Leather, Footwear and Accessories Sector by establishment of Mega Leather, Footwear and Accessories Cluster. Graded assistance is proposed to be provided upto 50% of the eligible project cost, excluding cost of land with maximum Government assistance being limited to Rs. 125 crore. The outlay of Rs 360 crore has been proposed to support 3-4 new MLFACs, for the three years.

**Leather Technology, Innovation and Environmental Issues sub-scheme:** Under this sub-scheme, assistance is proposed to be provided for upgradation/ installation of Common Effluent Treatment Plants (CETPs) @ 70% of the project cost. The sub-scheme will also provide support to national level sectoral industry council/ association and support for preparation of vision document for Leather Footwear and Accessories Sector. The proposed outlay for this sub-scheme is Rs. 782 crore for the three years.

**Promotion of Indian Brands in Leather, Footwear and Accessories Sector sub-scheme:** Under this sub-scheme, the eligible units approved for Brand Promotion are proposed to be assisted. The Government assistance is proposed to be 50% of total project cost subject to a limit of Rs.3 crore for each brand, each year for 3 years. The proposal under this sub-scheme is to promote 10 Indian brands in the international market in three years with proposed outlay of Rs. 90 crore.

**Additional Employment Incentive for Leather, Footwear and Accessories Sector sub-scheme:** Under this scheme, it is proposed to provide the employers' contribution of 3.67% to Employees' Provident Fund for all new employees in Leather, Footwear and Accessories sector, enrolling in EPFO for first 3 years of their employment. The sub-scheme would be applicable to employees with salary upto Rs.15,000/- The proposed outlay is Rs. 100 crore to assist in formalization of approximately 2,00,000 jobs in the sectors.

The special package also includes measures for simplification of labour laws and incentives for employment generation, as under:

**Enhancing Scope of Section 80JJAA of Income Tax Act:** For providing deduction to Indian Company engaged in manufacture of goods in a factory towards additional wages paid for three years to new workman, the provisions of minimum 240 days employment in a year to a workman under Section 80JJAA of Income Tax Act would be further relaxed to 150 days for Footwear, Leather & Accessories Sector considering the seasonal nature of this sector.

**Introduction of fixed term employment:** In order to attract large scale investments at global scale, the regulatory framework for labour related issues is proposed to be addressed by introduction of Fixed Term Employment under Sub Section (1) of section 15 of Industrial Employment (Standing Order) Act, 1946 looking at the seasonal nature of Leather, Footwear and Accessories industry.





**Dr R Mohan, Principal Scientist, CATERS Lab**  
**presented the “Quality Parameters Required for the Safety/Protective/ Occupational Footwear as per EN ISO 20344 / IS 15298” on the occasion of a Technology dissemination programme held in KANPUR on 28th November 2017.**

**Quality Parameters Required for the Safety/Protective/ Occupational Footwear as per EN ISO 20344 / IS 15298**

**Classification of Footwear**



Class I - Footwear made from leather and other materials.  
 Class II - All rubber(vulcanized) and all polymeric (moulded) footwear.

**Specific ergonomic features of footwear**

- Walk normally for 5 minutes at a speed of 5 km/hr
- Climb & descend stairs for 1 minute
- Kneel down
- Assess for comfort parameters like fitting, pressure points, hazardous material used, adequate fastening etc.

**Bond Strength**

- Upper to outsole & Interlayer bond strength (Dual Density sole)  
 Minimum requirement is 4.0N/mm
- In case of sole tear failure Minimum requirement should be 3.0 N/mm

**Toe protection - Steel top cap / Composite**  
 Internal toe cap length

**Impact resistance of toe cap**

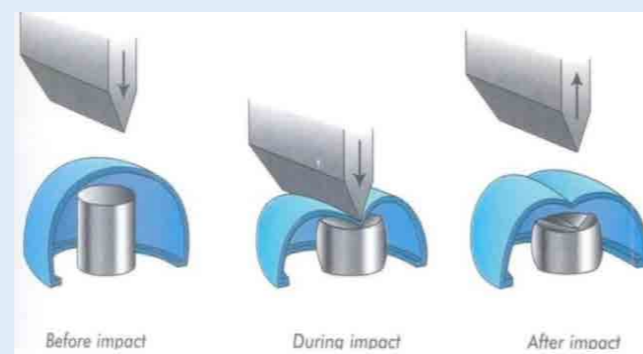
- Impact energy
- Safety footwear 200 Joules
- Protective footwear 100 Joules

**Impact resistance of toe cap**

Clearance under toe cap after impact energy

**Compression of resistance steel toe cap / Composite**

Steel toe cap was compressed under a constant speed of 5mm / minute upto 15kN for safety and 10 kN for protective compressive force.



**Corrosion resistance of toe caps & inserts**

**Method I-** Footwear is immersed in 1% sodium chloride solution for seven days. Remove the toe cap and metal inserts for evidence of corrosion marks.

**Method II-** Remove the steel toe cap from the shoe and immerse in 1% salt solution for 7 days and examine for corrosion marks

**Requirement**

No more than 3 areas of corrosion, none of which shall not exceed 2 mm<sup>2</sup>

**Penetration resistance of steel insert**

- Speed of the compressive force 10mm / minute
- Nail diameter 4.5 ± 0.05
- Requirement should be minimum 1100N

**Flexing resistance of steel inserts**

Steel mid sole insert is flexed for 10,00,000 flexes at a speed 16 cycles /second

Requirement should “No visible signs of cracking or delamination”

**Electrical resistance**

**(Conductive and Anti-static Footwear)**

Dry condition: 20 ± 2°C & 30 ± 5 % RH for 7 days

Wet condition: 20 ± 2°C & 85 ± 5 % RH for 7 days

After conditioning fill the shoe with steel balls, place it on the copper plate and connect to the terminals. Apply 100±2 V DC between the plate and steel balls for 1 minute and calculate the resistance.

**Requirements**

Conductive Footwear - Max 100K 'Ω

Antistatic Footwear - 100 K 'Ω–1000 M 'Ω

**Electrical Insulation**

After applying 15 KV current and check the any leakage of current inside the footwear.

**Requirement**

Inside Footwear the current should be 0 Ω

**Heat Insulation of footwear**

Pre heat the sand bath 150°C, place the shoe on the sand bath and fill with 4 kg steel balls inside the footwear. Measure the temperature inside the shoe over the insole after 30 minutes.

**Requirement**

Should be the temperature shall not increase more than 22°C

**Cold insulation of Footwear**

Adjust the temperature of the cold box for -17 ± 2°C. Place the shoe, fill with 4 kg steel balls inside the footwear, measure the temperature decrease over the insole after 30 minutes.

**Requirement**

Should be the temperate shall not decrease more than 10°C

**Resistance of water for whole footwear**

**Trough Test**

In this method, trained walkers are allowed to walk on a water trough approximately 10-meter length and 0.6-meter width, walking 10 normal paces between forward and return. After 100 repeated trough walks,

**Machine Method**

In this method, whole footwear made in contact to a defined depth water and subjected to flex at an angle of 22 ± 5 °C and 60 ± 6 flexes per minute for a duration of 80 minutes.

**Requirement**

should be the water shall not penetrate more than 3cm<sup>2</sup> area inside the footwear

**Impact resistance of metatarsal protective device**

To determine the resistance of metatarsal protective device used in safety footwear. Test apparatus used is similar one used for impact resistance of steel toe cap. In this test wax model of footwear last one size below is used to examine the impact damage at metatarsal region. Apply an impact energy of 100 J for size 8. Measure the damage caused to the wax model in mm.

**Energy absorption in seat region**

Place the test piece with the heel on a steel base and press the test punch against the bottom unit from the inside at the centre of the heel area at a test rate of (10 ± 3) mm/min until a force of 5000 N is obtained

**Requirement**

**Energy absorption shall not less than 20 Joules**

Slip resistance, COF

SRA SRB SRC

Ceramic floor with NaLS

Condition A (forward heel slip) ≥ 0.28

Condition B (forward flat slip) ≥ 0.32

Steel floor with Glycerol

Condition C (forward heel slip) ≥ 0.13

Condition D (forward flat slip) ≥ 0.18 SRA

+ SRB

**Tear strength of upper and lining, N**

UPPER

Leather Min. 120

Coated fabric and textile Min. 60

Lining (Vamp / Quarter / Counter)

Leather -Min. 30

Non Leather Min.15

Tongue Lining

Leather - Min. 36

Coated fabric Min. 18

**Tensile strength of upper**

Leather (split) - Min 15 N/mm<sup>2</sup>

Rubber - Min 180 N

Polymeric - Modulus at 100 %

Min 1.3 to 4.6 N/mm<sup>2</sup>

Elongation at Break- Min 250 %

**Flexing resistance of upper**

Rubber: No crack at 1,25,000 flexes

Polymeric: No crack at 1,50,000 flexes

**Water vapour permeability and Water vapour coefficient**

**Upper**

WVP - Min 0.8 mg/cm<sup>2</sup>/hr

WV.Co efficient- ,Min 15 mg/cm<sup>2</sup>

**Lining**

WVP - Min 2.0 mg/cm<sup>2</sup>/hr

WV.Co. efficient - Min 20 mg/cm<sup>2</sup>

**Hydrolysis (Only PU Upper)**

After exposing 70°C and 95 % RH for 7 days

Requirement

No crack at 1,50,000 flexes

Abrasion resistance for lining and In-sock

Dry after 25,600 cycles rubbing- No Hole formation

Wet after 12,800 cycles rubbing- No Hole formation

**Abrasion resistance of insole**

Thickness of insole: Minimum. 2.0mm  
 Abrasion resistance (Insole): The abrasion damage shall not be more severe after 400 rubs cycles  
 Water absorption and desorption of Insole  
 Water absorption: Min. 70mg/cm<sup>2</sup>  
 Water desorption: Min. 80 %

**pH value (Only for leather)**

**Upper and Lining**

Min 3.2  
 Max 0.7 for differential figure value



**Outsole construction**

Direct moulded sole - Direct pouring process / Direct injection  
 (PU sole and PVC)  
 Direct vulcanization process  
 (Rubber sole)

**Abrasion resistance of outsole**

Relative volume loss  
 ■ Max 250 mm<sup>3</sup> for material density less than 0.9 g/cm<sup>3</sup>  
 ■ Max 150 mm<sup>3</sup> for material density greater than 0.9 g/cm<sup>3</sup>

Flexing resistance of outsole  
 Flexing resistance (Bennewart) at 30,000 cycles

Requirement  
 Maximum cut growth 6mm  
 Hydrolysis Resistance of outsole (only PU)  
 After exposing 70°C and 95 % RH for 7 days  
 Flexing resistance at -5°C (at 1,50,000 flexes)  
 Requirement  
 Maximum cut growth 6mm

Resistance to fuel oil of outsole  
 Resistance to fuel oil  
 Change in volume after 24 hours immersed in iso-octane,  
 Requirement  
 Max. 12 %

Resistance to hot contact of outsole  
 (Only Nitrile rubber or Nitrile PVC)  
 Resistance to hot contact at 300±5oC for 60 seconds

Requirement  
 No crack /charring / melt when bent around the mandrel

**Basic requirements for safety Boot (SB)**

**Whole footwear**

- Construction
- Sole bond strength / interlayer bond strength
- Slip resistance      Toe protection
- Toe cap length
- Impact resistance
- Compression resistance
- Corrosion resistance

**Basic requirements for Safety Boot (SB)**

**Upper and lining**

- Thickness
- Tear strength
- Tensile strength
- Abrasion resistance
- Flexing resistance
- Water vapour permeability and co-efficient
- pH value
- Hydrolysis (PU Upper)
- Chromium VI content      Insole/In-sock
- Thickness
- Abrasion resistance
- Absorption desorption

**Outsole**

- Tear strength
- Abrasion resistance
- Flexing resistance
- Hydrolysis (PU Sole)
- Interlayer bond strength

**Requirement of safety boot for S1 category**

**Basic requirements plus+**

- Antistatic properties
- Energy absorption of seat region
- Resistance to fuel oil

Requirement of safety boot for S2 category  
 Basic requirements + S1 Category + Water penetration and absorption (upper)

Requirement of safety boot for S3 category  
 Basic requirements + S1 Category + S2 category + Penetration resistance  
 ■ Cleated outsole

Requirement of safety boot for S4 category  
 Basic requirements + S1 Category + S2 Category + S3 Category +  
 ■ Anti-Static properties  
 ■ Energy absorption of seat region  
 ■ Resistance to fuel oil

Requirement of safety boot for S5 category  
 Basic requirements + S1 Category + S2 Category + S3 Category + S4 Category +  
 ■ Penetration resistance  
 ■ Cleated outsole

Dr. Md. Sayem Alam received the prestigious '**Professor Shantilal Oswal Young Scientist Award - 2017**'. The 'Professor Shantilal Oswal Young Scientist Award' is given annually by 'The Indian Thermodynamics Society' in the fields of Thermodynamics, Bioenergetics and related areas in order to promote excellence and recognizing outstanding contributions made towards thermodynamics by the young researcher (who is not more than 40 years of age, as on December 31 of the year of the award) for work done primarily in India. "Professor Shantilal Oswal Young Scientist Award - 2017" has been presented to Dr. Md. Sayem Alam by Prof. D.A.V. Jain, President of the 'Indian Thermodynamics Society' during the Society's Annual Conference which was held at Guru Jambheshwar University of Science & Technology (GJUST), Hisar, Haryana on 17th November, 2017. At that ceremony, citation highlighting the work of Dr. Md. Sayem Alam was read out and then he delivered an invited talk.



**The Drawback Committee headed by Shri G.K.Pillai (retired Home Secretary) and other Senior officials visited Chennai and had meeting with CLRI/CLE on Dec. 7, 2017. During the meeting with the Drawback Committee Dr B Chandrasekaran, Director, CSIR-CLRI is presenting the technical opinion of CLRI on consumption of chemicals in tanning and finishing.**

Transfer of "High Grade Gelatin & Protein Hydrolysate from Trimming Waste" technology to M/s Anipro Manufacturing Company and agreement signed on 4th December 2017



Agreement signing between CSIR-CLRI and M/s. KOSH Innovations, Puducherry, for developing and producing finished leathers with different colours and textures including exotic leather on 1.12.2017: Facilitating business start-ups and new generation entrepreneurs in leather and leather products manufacturing



Meeting between CSIR-CLRI and M/s. Solidaridad and Stahl on 13.12.2017 to discuss technological interventions under Kanpur Leather project



CSIR-CLRI aims to promote and facilitate business start-ups and new generation entrepreneurs in leather and leather products manufacturing. In this line, the Incubation and Entrepreneurship Scheme (IES) has been devised. According to the scheme, any new or young or start-up company may enroll as incubatee of the institute. CSIR-CLRI will provide all the necessary support and also the incubatee may use the facilities such as design development, product development, manufacturing and testing. The aim of the scheme primarily is to provide an young or start-up company all the necessary hardware and software (intellectual) support for a significant period so that the company may elevate to the extent of being independently functional.

This service will be extended to the incubatee for one year. In the event of requirement of continuance of the services, the incubatee may extend the enrolment of incubation. For the enrolment, the incubatee may either obtain the license of one of the technologies of CLRI or pay the incubation charges of Rs. 2 lakhs. The actual cost (without profit) may be paid by the incubatee, for the facilities used and services received.

## Meeting with M/s. Smit & Zoon Team on 4.12.2017 at CSIR-CLRI

Smit & Zoon is one of the leading global leather chemical manufacturing companies having its corporate center in The Netherlands. Dr. Egbert Dijkers (Leader - Innovation and Sustainability, S&Z) and Mr. Arun Janakiram (Country Manager, S&Z) visited CLRI on 4th December 2017 and discussed opportunities for possible collaboration and technology transfer.

1. Smit & Zoon Fellowship for M Tech, M S and PhD scholars of Leather technology and footwear technology
2. Translation of the enzyme technologies presented by CLRI
3. Establishment of zero wastewater discharge application lab for S&Z in India
4. Translation of the technologies connected to leather auxiliary manufacturing
5. Translation of the other technologies presented by CLRI
6. Collaboration between CLRI and S&Z in R&D
7. Association and participation of S&Z in forthcoming LERIG
8. S&Z expressed their willingness to have contract with CSIR-CLRI for testing their raw materials at CATERS, CLRI



The 58th Annual Conference of Association of Microbiologists of India (AMI 2017) & International Symposium on "Microbes for Sustainable Development: Scope & Applications" (MSDSA-2017) was held during 16-19th November, 2017 at Babashaheb Bhimrao Ambedkar University (A Central University), Lucknow, Uttar Pradesh. The 3 day Conference was attended by eminent Microbiologist of India. The sessions for these three days comprised of a number of lead talks and oral presentation with parallel poster session comprising of 600+ posters. The poster entitled "Exploitation of microbes for bioremediation of phenolic syntan used in leather industry" authored by V. Sivaranjani, A. Sindhuja, Yasmin Khambhaty\* and P. Saravanan was adjudged the best poster and received a certification of appreciation

## "Design and Development of Innovative leather lifestyle products in combination with ethnic textile material and natural fibres of north eastern part of India for the self-sustainability and socio economic development of local population and MSME sector"

held at CSIR-NEIST, Branch Laboratory, Imphal, Manipur, 13th December 2017



### Technical Session:

Shri.P.S.Suresh Kumar, Principal Scientist, CHORD, CSIR-CLRI, Chennai presented about various natural materials available in North eastern region, extraction of fibres & fabric making, their properties and making products out of them during his lecture titled "Natural fibres & leather : a new prospect for making Amalgamated products". He also discussed on the Human Resource development for Leather products and the various schemes available in government sector for training as well as facility creation for Self-help groups (SHG).



Design and development of various products from Ethnic textile and leather combination was demonstrated by Shri K.Karthikeyan, Scientist, SPDC, CSIR-CLRI.



Product Display during the seminar (Banana Fibre, Silk products and Ethnic textile product)

The participants of the seminar were very enthusiastic and showed great interest in the lectures and demonstration. They requested the technical experts to conduct training on product making in the near future.



# Injection Molded Microcellular Polyurethane Shoe Soles Blown with Nanofiller



### Objectives of the project:

- To prepare polyurethane- nanocomposites (PU – NC) for application as footwear soling material
- Making of shoe soles based on PU- NC using Reaction Injection Molding (RIM) process.
- To characterize the developed PU soles for mechanical and physical properties required for shoe sole application
- To optimise RIM process for manufacturing PU-NC based shoe soles

**Background of the project:** Global consumption of PU is increasing year by year. In the year of 2014, global polyurethane market was valued at around USD 49.5 billion in 2014 and is expected to reach USD 77.0 billion in 2020, growing at a CAGR of around 7.5% between 2015 and 2020. Polyurethane market is mainly driven by strong demand of polyurethane in the form of sealants, thermal insulators and flooring materials from construction industry. Growing end-use industries like automotive, footwear, electrical & electronics in emerging nations is expected to drive the market for polyurethane. The rapidly expanding market of footwear in the emerging countries is expected to surge demand for polyurethane in the years to come. However, manufacturers are expected to face some challenges such as growing cost of raw materials associated with manufacturing of polyurethane.

**Methodology:** PU shoe soles with lower hardness, lower density and with increased flexibility than the conventional PU shoe soles without compromising the required properties of PU soles are prepared by increasing the microcellular nature of the product by introducing nano-filler in the PU matrix in situ. A series of flexible polyurethane shoe soles are developed by addition of increasing amount of environmental friendly, halogen free, low cost nano-filler (has been synthesized in lab) as an auxiliary chemical blowing agent. Cup test was performed before each experiment to determine the process parameters such as isocyanate index, cream time, tack free time, pinch time and free rise density. The process for manufacturing PU composite soles by RIM has also

been optimized for the existing facilities in the PU footwear Industries for both polyester and polyether based PU.

**Results:** The physical, morphological and thermal properties of the developed PU foams have been studied. The results showed that the dispersed nano particles act as heterogeneous nucleation sites during cell formation. Higher crystallinity of composites and Improvement of cushioning energy of composite foams show that there is good compatibility between nano-filler and PU. The microcellular elastomeric PU foams developed by in situ polymerization in presence of nano particles have wide industrial applications in footwear industry.

**Research outcome:** Weight of the PU sole increased respectively with increase in nanoparticle amount. It was found that with increase in nanoparticle, volume is also increased with same amount of raw material, leading to more amount of spue or flashes formation for the same sole mould. It indicates that the application of this PU composite will reduce the quantity of raw material for PU sole production and thus the cost.

**Presentation made by:** Dr (Mrs) G Saraswathy, Scientist, Shoe & product Design Centre at the Conference, organized by Centre of Nanotechnology, Department of Mechanical and Industrial Engineering, Indian Institute of Technology Roorkee (IIT), Roorkee, India on 6th December 2017. She has also chaired a session on "Diverse Applications" on 7th December 2017.



## TESTING CHARGES OF CLRI

Updated on 20.11.2017

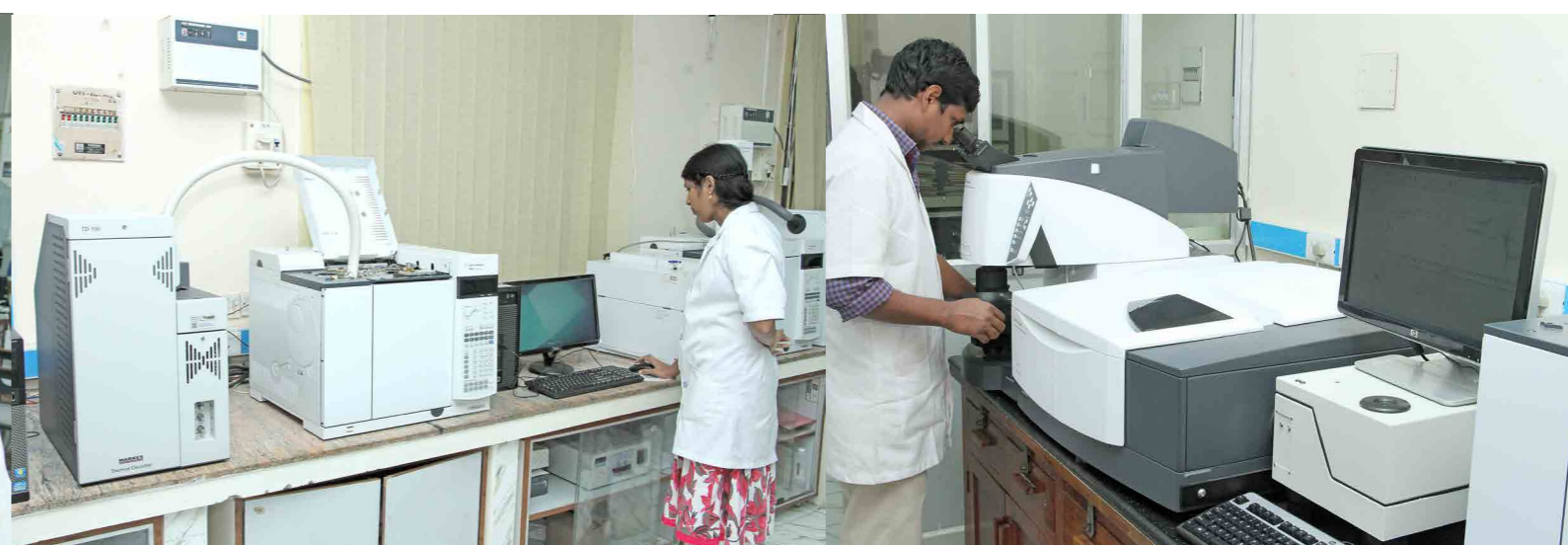
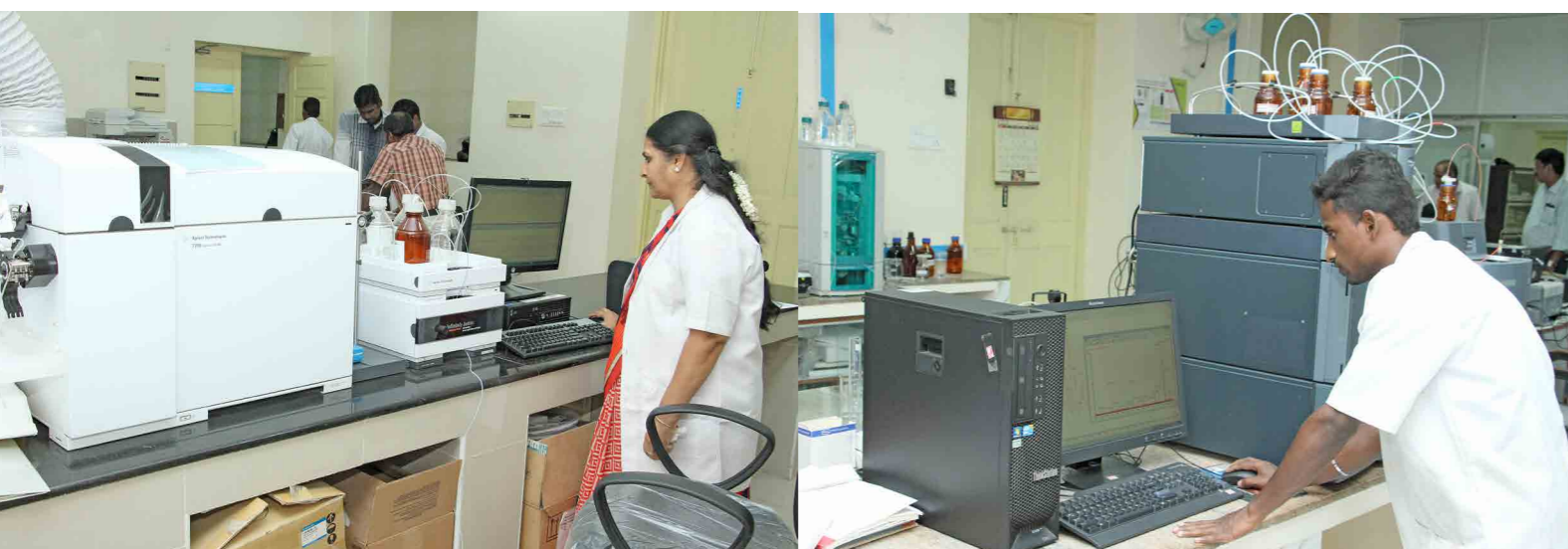
S. No.	Test Particulars	Charges/per sample (Rs.)
<b>I. LEATHER</b>		
1.	Chrome oxide	600.00
2.	Colodium	1000.00
3.	Differential number	500.00
4.	Moisture	500.00
5.	Nitrogen & hide substance	500.00
6.	pH of water solubles	250.00
7.	Solvent extractable substance	500.00
8.	Solvent extractable substance & FFA	1000.00
9.	Specific gravity (density)	500.00
10.	Spew observatory test	2500.00
11.	Sulphated ash of water soluble	600.00
12.	Total ash	500.00
13.	Total ash, hide substances (protein), % of water soluble organic and fat (or) degree of tannage	2100.00
14.	Volatile matter	500.00
15.	Water insoluble ash	600.00
16.	Water soluble chlorides	500.00
17.	Water soluble matter/ wash content	300.00
18.	Water soluble organics substances	600.00
19.	Water soluble sulphate	500.00
<b>I. Restricted substances in Leather</b>		
1.	Azo dyes	3500.00
2.	Chlorophenol (tri, tetra & penta)	5000.00
3.	Chrome VI content	1000.00
4.	Chrome VI content - (after ageing)	1500.00
5.	Chrome VI content - (before & after ageing)	2500.00
6.	DMFu	5000.00
7.	DMFA	2000.00
8.	Ethoxylated alkylphenol (nonyl & octyl)	4000.00
9.	Formaldehyde content (chemical)	3000.00
10.	Formaldehyde content (leather)	1000.00
11.	Nickel release	1000.00



12.	Organotins	4000.00
13.	PAH	4000.00
14.	PCB (polychlorinated biphenyle)	5000.00
15.	PCP (pentachlorophenol)	2000.00
16.	Pesticides	5000.00
17.	Phenol	2000.00
18.	Phthalates	2000.00
19.	Preservatives (TCMBT, PCMC, OPP, OIT)	6500.00
20.	Short chain chloro paraffins (C10-C13)	4000.00
21.	Tetrachlorophenol	2000.00
22.	Trace elements (per element)	1000.00
23.	Tri & Tetrachlorophenol	3000.00
24.	Trichlorophenol	2000.00
<b>II.</b>	<b>A. ASSAY % Purity tests for :</b>	
1.	Concentration or active matter	600.00
2.	Formic acid	1000.00
3.	Lime	2000.00
4.	Sodium chloride	2000.00
5.	Sodium formate	2000.00
6.	Sodium hydrosulphide	2000.00
7.	Sodium sulphate	2000.00
8.	Sodium sulphide	2000.00
9.	Sodium thiosulphate	2000.00
10.	Sodium-bicarbonate	2000.00
11.	Sodium-bisulphite	2000.00
12.	Solid content	600.00
	<b>B. Purity Analysis</b>	
1.	Acrylamide	1250.00
2.	Benzene	1250.00
3.	Methacrylic acid	1250.00
4.	Naphthalene	1250.00
5.	Toluene	1250.00

<b>III.</b>	<b>Auxiliary</b>	
	<b>A. OIL/FATLIQUOR ANALYSIS</b>	
1.	Acid value*	250.00
2.	Fatliquor analysis	2000.00
3.	FFA*	250.00
4.	Iodine value*	250.00
5.	Saponifiable matter*	250.00
6.	Solvent extractable substance	750.00
7.	Unsaponifiable matter*	250.00
	<b>B. WATER</b>	
1.	Water analysis (for tanning industry) (pH, total alkalinity, total hardness)	1000.00
2.	Water hardness	500.00
3.	BOD & COD	1000.00
<b>IV.</b>	<b>Tanning Material</b>	
	<b>A. Chrome Tanning</b>	
1.	Basicity of chrome	600.00
2.	BCS (Cr2O3, pH, moisture, basicity)	1500.00
3.	Chrome content (Cr2O3)	600.00
4.	Chrome VI content	1000.00
5.	Free sulphate	600.00
6.	Sulphur	1000.00
	<b>B. Vegetable Tanning</b>	
1.	Ash content	500.00
2.	Iron content	1000.00
3.	pH of water solubles	250.00
4.	Tannin analysis	1500.00
	<b>C. SYNTAN</b>	
1.	Ash content	500.00
2.	Iron content	1000.00
3.	pH of water solubles	250.00
4.	Tannin analysis	1500.00

\* Solvent extractable substance analysis is pre-requisite.



LEATHER & LINING MATERIAL		SHOE		SOLING MATERIAL	
Adhesion of finish	1200	Abrasion resistance of sole	1200	Abrasion resistance	1200
Apparent density Ability	500	Back height / quarter height	400	Adhesion strength	1200
Break / pipiness	400	Buckle attachment strength	800	Bennewart /Bata belt Flexing	1200
Breaking load	700	Colour fastness to rubbing	800	Thickness and cleat height	400
Coating adhesion	1200	Electrical resistance	800	Compression set	1000
Cold crack resistance	700	Eyelet -facing strength	800	Density	500
Collodium test	500	Eyelet- security	800	Hardness	500
Colour fastness to perspiration	800	Heel pull off strength	1000	Heat shrinkage	800
Colour fastness to water	800	Nail penetration	800	Oil resistance	1200
Contact storage	700	Perspiration/ water fastness	800	Ross flexing-room temp. / low temp.	1200
Flexing resistance – Bally / vamp	1200	Seam strength	800	Slip resistance	5000
Flexing resistance – low temp.	1200	Slip resistance	5000	Hydrolysis resistance (PU sole)	3000
Hydrolysis resistance (PU coated)	3000	Sole bond strength, inside outside	1200	Tear Strength	800
Heat fastness	800	Strap attachment strength	800	Tensile strength / extension	800
Lastometer	800	Heat ageing	3000	<b>TAPE MATERIAL</b>	
Light fastness	5000	Toe load	800	Adhesion strength	1200
Martindale abrasion	1200	Toe puff / bond strength	1200	Breaking load	800
Needle perforations strength	800	Top piece attachment strength	800	Water fastness	800

Oil Repellency test	1200	Top piece turning strength	800	<b>TOE PUFF/COUNTER</b>	
Qualitative peel test	500	Water resistance–whole shoe	1700	Adhesion strength	1200
Rub fastness – Veslic	800	Weight/Mass	400	Resilience, moisture resistance	1750
Rub fastness - Circular	800	Whole shoe flexing	1700	Breaking strength & extension	800
Rub fastness, - Crock meter	800	Whole sole bond strength	1200	<b>LACE</b>	
Seam strength	800	Whole top line strength	800	Abrasion resistance	1200
Sole leather - Abrasion resistance	1200	<b>INSOLE-FORE / BACK PART</b>		Breaking load	800
Sole Leather - Grain crack index	800	Abrasion resistance	1200	Knot slippage	800
Sole Leather – WA-Kubleka	800	Cushioning properties	1500	Light fastness	5000
Sole leather – Water resistance	1000	Density	500	Tag retention strength	800
Stitch tear strength	800	Dimensional stability	800	Water fastness	800
Stretch and flex resistance	1200	Flexing index	1200	Wick test	500
Tear strength	800	Heel pin holding strength	800	<b>BUCKLE</b>	
Tensile strength / extension	800	Peel strength	800	Corrosion resistance	800
Thickness / Substance	200	Scuff resistance	1200	Strength of fastened buckles	800
Water penetration (Bally)	1000	Surface water absorption	800	Three point bend strength	800
Water penetration (Maeser)	1000	Tensile strength / extension	800	<b>STEEL SHANK</b>	
Water spotting	500	Transverse tensile strength	1200	Fatigue resistance	1200
Water vapor absorption	800	Stitch tear strength	800	Hardness (Rockwell)	500



Water vapour permeability	1200	Water absorption & desorption	800	Stiffness	800
Water vapour permeability & coeff.	1200	<b>SAFETY SHOES</b>		<b>ADHESIVE</b>	
Weight/ Mass	400	Electrical resistance	800	Adhesion characteristics	1200
Wicking test	500	Flexing resistance of midsole	1200	Solid content	500
Wrinklometer	300	Fuel oil resistance	1200	<b>VELCRO</b>	
Silica gel effectiveness	500	Heat / cold resistance of shoe	800	Needle perforation	800
Shrinkage temp	500	Heel pin holding strength	800		
Heat ageing	3000				
<b>ZIP</b>		Hot contact for sole	800	Peel strength initial & after wear	1600
Burst strength	800	Inter layer bond strength	1200	Shear strength initial & after wear	1600
Closure under lateral load	800	Nail penetration for steel mid sole	800	Colour fastness	800
Colour fastness to rubbing	800	Slip resistance	5000	Water fastness	800
End stop st. (top, bottom, stringer)	800	Toe cap- Compression resistance	800	<b>INDUSTRIAL GLOVES</b>	
Fatigue resistance	1000	Toe cap- Corrosion resistance	800	Abrasion resistance	1200
Lateral load	800	Toe cap- Impact resistance	800	Tear strength	800
Needle perforation	800	Toe cap-internal length	400	Water vapour permeability	1200
Puller strength	800			Seam strength	800
Slider locking strength	800	Abrasion resistance	1200	<b>ELASTICS TAPE</b>	
Water / perspiration fastness	800	Attachment strength	800	Flexing resistance	1200
<b>THREAD</b>		Security of eyelet	800	Limit of useful extension	1000
Breaking load	1000	Colour tarnishing test and	800	Needle perforation strength	800
Tex value	500	Corrosion resistance		Rub fastness	800
Water / perspiration fastness	800			Water fastness	800

S. No.	Test Particulars	Charges/per sample (Rs.) INDUSTRY
II.	Instrumentation	
	1. Atomic Force Microscopic - AFM	7000
	2. Capillary Flow Porometer, Air-Permeability	3900
	3. Capillary Flow Porometer, Porosity	7800
	4. CHNS – Elemental Analyzer	3000
	5. Circular Dichroism Spectrapolarimeter	3000
	6. Contact Angle meter	1000
	7. Desktop SEM – Low resolution	3000
	8. Desktop TEM	4000
	9. Differential Scanning Calorimetry – DSC (per heating cycle)	3000
	10. Electrochemical Workstation	2000
	11. Electron Paramagnetic Resonance Spectrometer (EPR)	2000/Powder RT
	12. Electron Paramagnetic Resonance Spectrometer (EPR)	2500/Liquid LT
	13. Electrospinning	1500/Hour
	14. ESI-MS	1800
	15. Flow Cytometer (FACS)	2500/Hour
	16. Fluorescence lifetime Spectra	2500
	17. Fluorescence Spectrometer	2000
	18. Fourier Transform Infrared Spectroscopy - FTIR	1500
	19. Gait And Motion Analysis	10000
	20. Gel Permeation Chromatography (GPC)	2500
	21. High Pressure Liquid Chromatography - HPLC	Charges based on the samples
	22. ICP-OES	1000/element (300/- for subsequent elements)
	23. Instrumented Treadmill	6000
	24. LC-MS	4000
	25. LC HR-MS	5000
	26. Macromolecular X-ray Diffractometer (Data Collection)	8000



27. MALDI-TOF	Charges based on the samples
28. Particle Size Analysis	3500
29. Powder XRD	1750
30. RAMAN Spectroscopy	2500
31. Reflectance Spectrophotometer	1000
32. SEM analysis – High Resolution	6000
33. SEM with EDS	12000
34. Small angle X-ray Scattering (SAXS)	5000
35. Solid-State 400MHz Nuclear Magnetic Resonance Spectrometer (NMR)	10000/Hour (5000/- for each additional ½ hour)
36. Solution-State 400MHz Nuclear Magnetic Resonance Spectrometer (NMR)	2500/Hour (1250/- for each additional ½ hour)
37. Solution-State 500MHz Nuclear Magnetic Resonance Spectrometer (NMR)	2250/Hour (1125/- for each additional ½ hour)
38. Surface Tension	1200
39. Tensiometer (CMC determination)	1200
40. Tensiometer (Plate/Ring)	1000
41. Thermo Gravimetric Analysis – TGA (10°C per min)	3000
42. Time Resolved Emission spectra (TRES)	4000
43. TOC Analysis	750
44. UV-PDA (liquid) Spectrophotometer	600
45. UV-Visible NIR diffuse reflectance Spectra (200-3000nm) and color measurements	4000
46. UV-Visible NIR Spectra (200-3000nm)	3250
47. UV-Visible NIR Spectra, Chemical Kinetics per hour (200-3000nm)	2000/Hour
48. Xenon Lamp (300 W) and Solar simulator (1.5 AM)	2000/Hour
49. Zeta Potential Analysis	3500



## India International Leather Fair Chennai 2018 FACTS AT A GLANCE

<b>Venue</b>	<b>Chennai Trade Centre</b> , Mount Poonamallee Road Nandambakkam, Chennai
<b>Duration</b>	February 01-03, 2018
<b>Timings</b>	10.00 AM to 6.00 PM
<b>Business Days</b>	February 01-03, 2018
<b>Main supporting organisations</b>	<ul style="list-style-type: none"> <li>□ Council for Leather Exports (CLE)</li> <li>□ Central Leather Research Institute (CLRI)</li> <li>□ Footwear Design &amp; Development Institute (FDDI)</li> <li>□ Indian Shoe Federation (ISF)</li> <li>□ Indian Finished Leather Manufacturers &amp; Exporters Association (IFLMEA)</li> <li>□ Indian Footwear Components Manufacturers' Association (IFCOMA)</li> <li>□ Association of Footwear Components and Machinery Manufacturers of India (AFCAMI)</li> </ul>
<b>Sale of Tickets</b>	10.00 a.m. to 5.00 p.m. on all days at Entrance Gate and Registration Counters at Halls No. 3A and 1D Note : (i) There is no free entry or concession group price for students groups (ii) There shall be no advance sale of tickets (iii) Free entry for pre-registered visitors, foreign buyers/ buying (iv) Visitors registering at Registration Counters with ITPO's Single-Entry Invite
<b>Entry to Chennai Trade Centre</b>	9.45 a.m. to 5.00 p.m. on all days
<b>Country and Group Pavilions</b>	Brazil, China, France, Germany, Italy and group pavilions by : <ul style="list-style-type: none"> <li>□ Wenzhou Donnor Exhibition Group</li> <li>□ G&amp;F (Fujian Foreign Economic Service Trade Corp.)</li> <li>□ CICB Brazil</li> <li>□ ASSOMAC/ITC , Italy</li> <li>□ Federal Ministry for Economic Affairs &amp; Energy, Germany</li> </ul>
<b>New Features in IILF-2018</b>	<ul style="list-style-type: none"> <li>□ Online booking for exhibitors with payment gateway</li> <li>□ Free distribution of Visitors' Guide (Company name, hall plan and booth numbers) to all the trade visitors.</li> <li>□ Tickets sale at Entrance Gate of TNTPO, and registration counters at Hall 3A and Convention Centre</li> <li>□ Car hailing facility at Convention Centre</li> <li>□ Radio Taxi bay at TNTPO at the entrance gate for exhibitors going back to city/ hotels in the evening.</li> </ul>
<b>EXHIBITORS – more than 450</b>	
<b>Area</b>	More than 10,000 sqm
<b>Domestic</b>	More than 300 exhibitors from all over India
<b>Foreign</b>	More than 150 exhibitors from overseas National Pavilions of 5 countries - China, France, Germany, Italy, Brazil
<b>Display Profile</b>	<ul style="list-style-type: none"> <li>□ Convention Centre : Finished leather &amp; Synthetic materials, Chemical &amp; Leather products</li> <li>□ Hall 1(A,B, C) : Machinery &amp; Equipment, Technology</li> <li>□ Hall 2 -3 : Chemicals, Footwear Components</li> <li>□ Hall 3A : Finished Leather, Synthetic material, Chemicals &amp; components</li> <li>□ Hall 1D : Finished Leather, Synthetic material, Chemicals &amp; components</li> </ul>
<b>Visitor Profile</b>	<ul style="list-style-type: none"> <li>□ Overseas Business Delegations and visitors</li> <li>□ Manufacturers &amp; Importers</li> <li>□ Buying Houses ,Suppliers, Consultants, opinion makers</li> <li>□ Retailers, Equipment &amp; Machinery Suppliers &amp; Importers</li> <li>□ Marketing &amp; Direct Selling companies</li> <li>□ Institutions</li> </ul>
<b>Organiser</b>	<b>India Trade Promotion Organisation</b> Pragati Bhawan, Pragati Maidan, New Delhi-110001 Phone : 91-11-23371822, 23371319, Fax: 91-11-23371845 E-mail : <a href="mailto:jd@itpo.gov.in">jd@itpo.gov.in</a> , <a href="mailto:tkpant@itpo.gov.in">tkpant@itpo.gov.in</a> , <a href="mailto:rpanwar@itpo.gov.in">rpanwar@itpo.gov.in</a> Regional office: India Trade Promotion Organisation Raja Annamalai Building ( 2 <sup>nd</sup> Floor), 18-A, Rukmani Lakshmi pathy Road Egmore, Chennai- 600008 Phone : 91-44-2855 4655, 2858 7297 e-mail : <a href="mailto:itpochn@md4.vsnl.net.in">itpochn@md4.vsnl.net.in</a> Event website : <a href="http://indiatradefair.com/iilf/">http://indiatradefair.com/iilf/</a>

# INDIAN LEATHER INDUSTRY - STRIDING WITH CONFIDENCE



## COUNCIL FOR LEATHER EXPORTS

(An Export Promotion Organisation sponsored by Ministry of Commerce & Industry, Govt. of India)

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