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
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 ILIF 2018; bringing out the Daily Newsletter ILIF Happenings in association with TPO & 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.

Dr B Chandrasekaran
Director, CSIR-CLRI
22nd December 2017
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 approximately 2,00,000 jobs as cumulative impact in Footwear, Leather & Accessories Sector.

Details of the Indian Footwear, Leather & Accessories Development Programme

WHERE THE MONEY WILL GO

Package for leather footwear, garments and accessories industry

147 Establishment of institutional facilities
360 Mega Leather, Footwear and Accessories Cluster development
425 Incentives for investments in manufacturing through grants and subsidies

Cost to go up for hiring EPFO burden for new employees
Promotion of Indian brands in the sectors
Technology upgrade in keeping with green norms
Human resource development for unemployed, workers and trainees

PROJECTED OUTLAY IN T CRORE

TOTAL EXPENDITURE

 Spice Investment for 20% of the cost of Plant and Machinery to other units of Leather, Footwear and Accessories & Components sector under this sub-scheme is to incentivize 1000 units in the sectors.

Additional Employment Incentive for Leather, Footwear and Accessories Sector sub-scheme:

Under this sub-scheme, it is proposed to provide subsidies to Micro, Small & Medium Enterprises (MSMEs) and @ 30% 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 8,500 units in the sectors.

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.

Human Resource Development (HRD) sub-scheme:
HRD sub-scheme proposes to provide assistance to 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 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 incentivizing 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 the sectors.

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.

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

Penetration resistance of steel inserts
- 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 100 KΩ
- Antistatic Footwear - 100 KΩ – 1000 MΩ

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 20°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 temperature 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 ± 2° and 60 ± 6 flexes per minute for a duration of 80 minutes.

Requirement
- should be the water shall not penetrate more than 3cm² 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

SRA SRR 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 + SRR

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/mm²
- Rubber - Min 180 N
- Polymeric - Modulus at 100 %
- Min 1.3 to 4.8 N/mm²
- Elongation at Break - Min 250 %

Flexible 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/cm²/hr
  - WV, Coefficient efficient - Min 15 mg/cm²/hr
  - Lining
    - WVP - Min 2.0 mg/cm²/hr
    - WV, Coefficient efficient - Min 20 mg/cm²

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 2.0 mm
Abrasion resistance (Insole): The abrasion damage shall not be more severe after 400 rubs cycles
Water absorption and desorption of Insole
Water absorption: Min. 70 mg/cm²
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 mm³ for material density less than 0.9 g/cm³
■ Max 150 mm³ for material density greater than 0.9 g/cm³

Flexing resistance of outsole
Flexing resistance (Bennewart) at 30,000 cycles
Requirement
Maximum cut growth 6 mm
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 6 mm

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 x 5°C for 60 seconds

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

Basic requirements for safety Boot (SB)
Whole foot wear
■ 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 (GJU,ST), 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.
Transfer of “High Grade Gelatin & Protein Hydrolysate from Trimming Waste” technology to M/s Anipro Manufacturing Company and agreement signed on 4th December 2017

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

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

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 Dikkers (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.
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.
12. Organotins 4000.00
13. PAH 4000.00
14. PCB (polychlorinated biphenyls) 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

II. A. ASSAY % Purity tests for:
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. Purity Analysis
1. Acrylamide 1250.00
2. Benzene 1250.00
3. Methacrylic acid 1250.00
4. Naphthalene 1250.00
5. Toluene 1250.00

III. Auxiliary
A. OIL/FATLIQUOR ANALYSIS
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. WATER
1. Water analysis (for tanning industry) (pH, total alkalinity, total hardness) 1000.00
2. Water hardness 500.00
3. BOD & COD 1000.00

IV. Tanning Material
A. Chrome Tanning
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. Vegetable Tanning
1. Ash content 500.00
2. Iron content 1000.00
3. pH of water solubles 250.00
4. Tannin analysis 1500.00

C. SYNTAN
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.
<table>
<thead>
<tr>
<th>LEATHER &amp; LINING MATERIAL</th>
<th>SHOE</th>
<th>SOLING MATERIAL</th>
</tr>
</thead>
<tbody>
<tr>
<td>Adhesion of finish</td>
<td>1200</td>
<td>Abrasion resistance of sole</td>
</tr>
<tr>
<td>Apparent density Ability</td>
<td>500</td>
<td>Back height / quarter height</td>
</tr>
<tr>
<td>Break / pipiness</td>
<td>400</td>
<td>Buckle attachment strength</td>
</tr>
<tr>
<td>Breaking load</td>
<td>700</td>
<td>Colour fastness to rubbing</td>
</tr>
<tr>
<td>Coating adhesion</td>
<td>1200</td>
<td>Electrical resistance</td>
</tr>
<tr>
<td>Cold crack resistance</td>
<td>700</td>
<td>Eyelet - facing strength</td>
</tr>
<tr>
<td>Collodium test</td>
<td>500</td>
<td>Eyelet - security</td>
</tr>
<tr>
<td>Colour fastness to perspiration</td>
<td>800</td>
<td>Heel pull off strength</td>
</tr>
<tr>
<td>Colour fastness to water</td>
<td>800</td>
<td>Nail penetration</td>
</tr>
<tr>
<td>Contact storage</td>
<td>700</td>
<td>Perspiration/ water fastness</td>
</tr>
<tr>
<td>Flexing resistance – Bally / vamp</td>
<td>1200</td>
<td>Seam strength</td>
</tr>
<tr>
<td>Flexing resistance – low temp.</td>
<td>1200</td>
<td>Slip resistance</td>
</tr>
<tr>
<td>Hydrolysis resistance (PU coated)</td>
<td>3000</td>
<td>Sole bond strength, inside outside</td>
</tr>
<tr>
<td>Heat fastness</td>
<td>800</td>
<td>Strap attachment strength</td>
</tr>
<tr>
<td>Lastometer</td>
<td>800</td>
<td>Heat ageing</td>
</tr>
<tr>
<td>Light fastness</td>
<td>5000</td>
<td>Toe load</td>
</tr>
<tr>
<td>Martindale abrasion</td>
<td>1200</td>
<td>Top piece attachment strength</td>
</tr>
<tr>
<td>Needle perforations strength</td>
<td>800</td>
<td>Top piece turning strength</td>
</tr>
<tr>
<td>Oil Repellency test</td>
<td>1200</td>
<td>Top piece turning strength</td>
</tr>
<tr>
<td>Qualitative peel test</td>
<td>500</td>
<td>Water resistance – whole shoe</td>
</tr>
<tr>
<td>Rub fastness – Veslic</td>
<td>800</td>
<td>Weight/Mass</td>
</tr>
<tr>
<td>Rub fastness - Circular</td>
<td>800</td>
<td>Whole shoe flexing</td>
</tr>
<tr>
<td>Rub fastness, - Crock meter</td>
<td>800</td>
<td>Whole sole bond strength</td>
</tr>
<tr>
<td>Seam strength</td>
<td>800</td>
<td>Whole top line strength</td>
</tr>
<tr>
<td>Sole leather - Abrasion resistance</td>
<td>1200</td>
<td>INSOLE-FORE / BACK PART</td>
</tr>
<tr>
<td>Sole Leather - Grain crack index</td>
<td>800</td>
<td>Abrasion resistance</td>
</tr>
<tr>
<td>Sole Leather – WA-Kubleka</td>
<td>800</td>
<td>Cushioning properties</td>
</tr>
<tr>
<td>Sole leather – Water resistance</td>
<td>1000</td>
<td>Density</td>
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<tr>
<td>Stitch tear strength</td>
<td>800</td>
<td>Dimensional stability</td>
</tr>
<tr>
<td>Stretch and flex resistance</td>
<td>1200</td>
<td>Flexing index</td>
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<tr>
<td>Tear strength</td>
<td>800</td>
<td>Heel pin holding strength</td>
</tr>
<tr>
<td>Tensile strength / extension</td>
<td>800</td>
<td>Peel strength</td>
</tr>
<tr>
<td>Thickness / Substance</td>
<td>200</td>
<td>Scuff resistance</td>
</tr>
<tr>
<td>Water penetration (Bally)</td>
<td>1000</td>
<td>Surface water absorption</td>
</tr>
<tr>
<td>Water penetration (Maeser)</td>
<td>1000</td>
<td>Tensile strength / extension</td>
</tr>
<tr>
<td>Water spotting</td>
<td>500</td>
<td>Transverse tensile strength</td>
</tr>
<tr>
<td>Water vapor absorption</td>
<td>800</td>
<td>Stitch tear strength</td>
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</tbody>
</table>

The Leather Post
Water vapour permeability | 1200 | Water absorption & desorption | 800 | Stiffness | 800
Water vapour permeability & coeff. | 1200 | SAFETY SHOES | ADHESIVE | INDUSTRIAL GLOVES | ELASTICS TAPE | THREAD |
Weight/ Mass | 400 | Electrical resistance | 800 | Adhesion characteristics | 1200 | Solid content | 500 |
Wicking test | 500 | Flexing resistance of midsole | 1200 | VELCRO |
Wrinkimeter | 300 | Fuel oil resistance | 1200 | INDUSTRIAL GLOVES |
Silica gel effectiveness | 500 | Heat / cold resistance of shoe | 800 | Needle perforation | 800 |
Shrinkage temp | 500 | Heel pin holding strength | 800 |
Heat ageing | 3000 |}

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