13th Asian International Conference on Leather Science and Technology (AICLST 2026)

Theme:

"LEATHER 2050: CHALLENGES AND OPPORTUNITIES"

Organized by:

Indian Leather Technologists' Association (ILTA)

and Central Leather Research Institute (CLRI)

at Hotel The Stadel, Yuba Bharati Krirangan, Salt Lake, Kolkata

from 6 – 8th March 2026

Report Prepared By Mr. Susanta Mallick
General Secretary, ILTA

As a part of the year-long Platinum Jubilee Celebration Programme, the above conference was successfully organized by the Indian Leather Technologists' Association (ILTA) jointly with CSIR–Central Leather Research Institute (CLRI), with active support from the Indian Leather Products Association (ILPA), Government College of Engineering & Leather Technology (GCELT), and Calcutta Leather Complex Tanners' Association (CLCTA), in close association with the Council for Leather Exports (CLE).

The conference was held at Hotel "The Stadel", Gate No. 3, Vivekananda Yuba Bharati Krirangan, Salt Lake City, Kolkata – 700106, over a period of three days from 6th March to 8th March, 2026.

Hotel "The Stadel", Gate No. 3, Vivekananda Yuba Bharati Krirangan

Mission of the Conference

- Advancement of Leather Science and Technology.
- Fostering Cooperation and Collaboration among stakeholders.
- Promoting Sustainability across the Leather Value Chain.
- Facilitating Scientific Knowledge Exchange.
- Upholding the spirit that Leather Science and Technology is in our DNA.

Vision Statement

To explore and promote innovative pathways through research, education, and skill development while simultaneously combating misinformation through a unified global voice, thereby contributing towards a sustainable future based on the principles of circular economy and Net Zero CO_2e emissions.

Aims and Objectives of the Conference

To ensure the long-term viability and sustainable growth of the broad-spectrum Leather Industry in Asia and across the globe through:

- Scientific Rigor.
- Environmental Responsibility.
- A Cleaner and Safer Industry Image.
- Enhanced and Smarter Visibility.
- Smart Management Practices.
- Strengthening Brand Equity.
- Global Collaboration and Knowledge Sharing.

About the Conference

Conference Overview

The Asia International Conference on Leather Science and Technology (AICLST) is one of the most prestigious scientific forums for the global leather sector. Held biennially under the patronage of the International Union of Leather Technologists and Chemists Societies (IULTCS), AICLST serves as a platform for researchers, academicians, industry leaders, policy-makers, and technologists to exchange knowledge and discuss emerging developments in leather science, technology, sustainability, and innovation.

Established in 1992 in Chengdu, China, AICLST was conceived to strengthen scientific cooperation among Asian nations and promote technological advancement within the leather industry. Over the years, it has evolved into a significant international event, facilitating collaboration between academia and industry while enhancing Asia's contribution to global leather research and innovation.

Significance of the 13th AICLST 2026

The 13th Asia International Conference on Leather Science and Technology (AICLST 2026) was organized as part of the year-long Platinum Jubilee celebrations of the Indian Leather Technologists' Association (ILTA). The conference adopted the overarching theme of **"Leather 2050 – Plans for Sustained Development of the Leather Sector in its March Towards 2050."**

The conference focused on addressing future challenges and opportunities facing the leather industry through six major thematic areas:

1. Livestock Analysis & Quality Appropriation
2. Marketing Policy & Strategy
3. Artificial Intelligence and Productivity
4. Carbon Capture & Utilization
5. Innovative Process Technology
6. Footwear – Future & Roadmap

These themes reflected the industry's commitment towards sustainability, technological innovation, digital transformation, circular economy practices, and global competitiveness.

Host Organizations

The conference was jointly organized by the Indian Leather Technologists' Association (ILTA) and CSIR–Central Leather Research Institute (CLRI), with active support from the Indian Leather Products Association (ILPA), Government College of Engineering & Leather Technology (GCELT), Calcutta Leather Complex Tanners' Association (CLCTA), and in association with the Council for Leather Exports (CLE).

ILTA
Since 1950

Indian Leather Technologists' Association (ILTA)

Founded in 1950, ILTA has played a pioneering role in advancing leather science and technology in India and represents the country at the International Union of Leather Technologists and Chemists Societies (IULTCS). CSIR-CLRI, established in 1948, is India's premier leather research institution and has been instrumental in transforming

the Indian leather sector through scientific innovation, cleaner technologies, and sustainable development initiatives.

Together, ILTA and CLRI have successfully hosted several landmark international events, including the IULTCS Congress in Chennai (1999 and 2017) and the 8th AICLST in Kolkata (2010).

CSIR–Central Leather Research Institute (CLRI)

Participation and International Representation

The conference received an enthusiastic response from the global leather fraternity. A total of **92 technical papers** were presented, comprising **54 oral presentations** and **38 poster presentations**, reflecting a strong contribution from researchers, scientists, industry professionals, and academicians.

The conference witnessed participation from several countries, including **India, China, Japan, Russia, and Romania**, highlighting its international character and reinforcing the importance of global collaboration in advancing leather science and technology.

The high percentage of full-paper submissions against accepted abstracts further demonstrated the scientific quality and research significance of the conference proceedings.

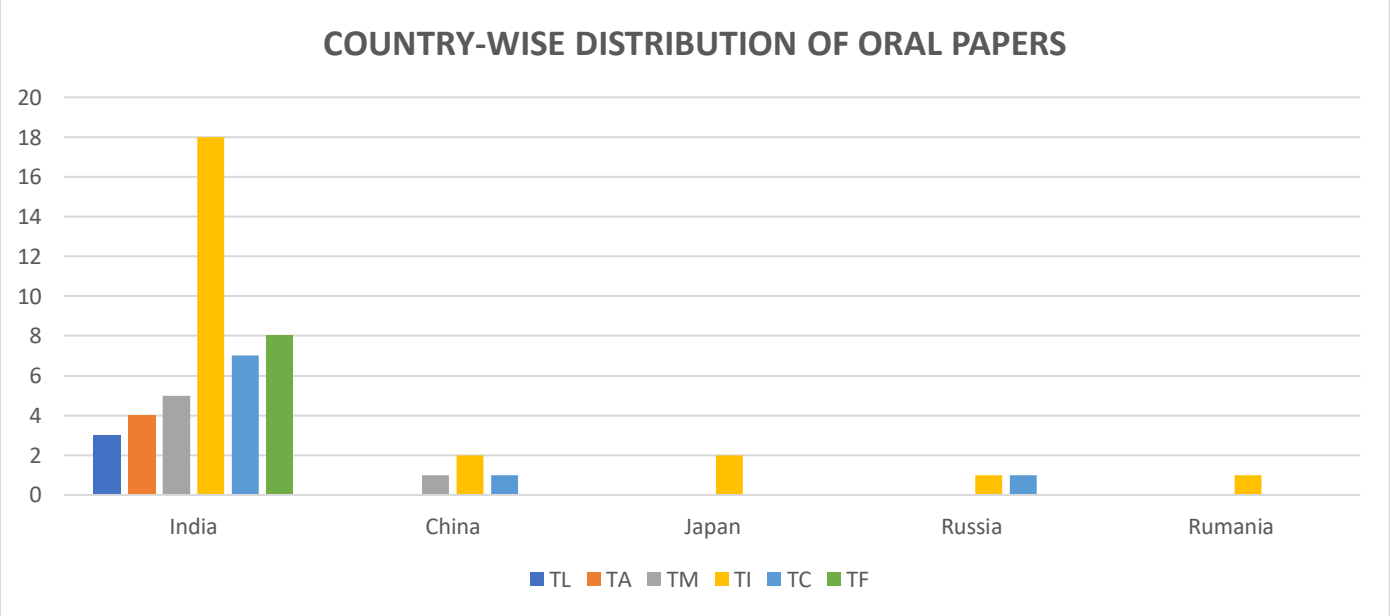
Conference Statistics Section

Conference at a Glance

Table 1: COUNTRY-WISE DISTRIBUTION OF ORAL PAPERS

Theme	India	China	Japan	Russia	Rumania
TL	3	0	0	0	0
TA	4	0	0	0	0
TM	5	1	0	0	0
TI	18	2	2	1	1
TC	7	1	0	1	0
TF	8	0	0	0	0
TOTAL	45	4	2	2	1

Total Oral Presentation = 54

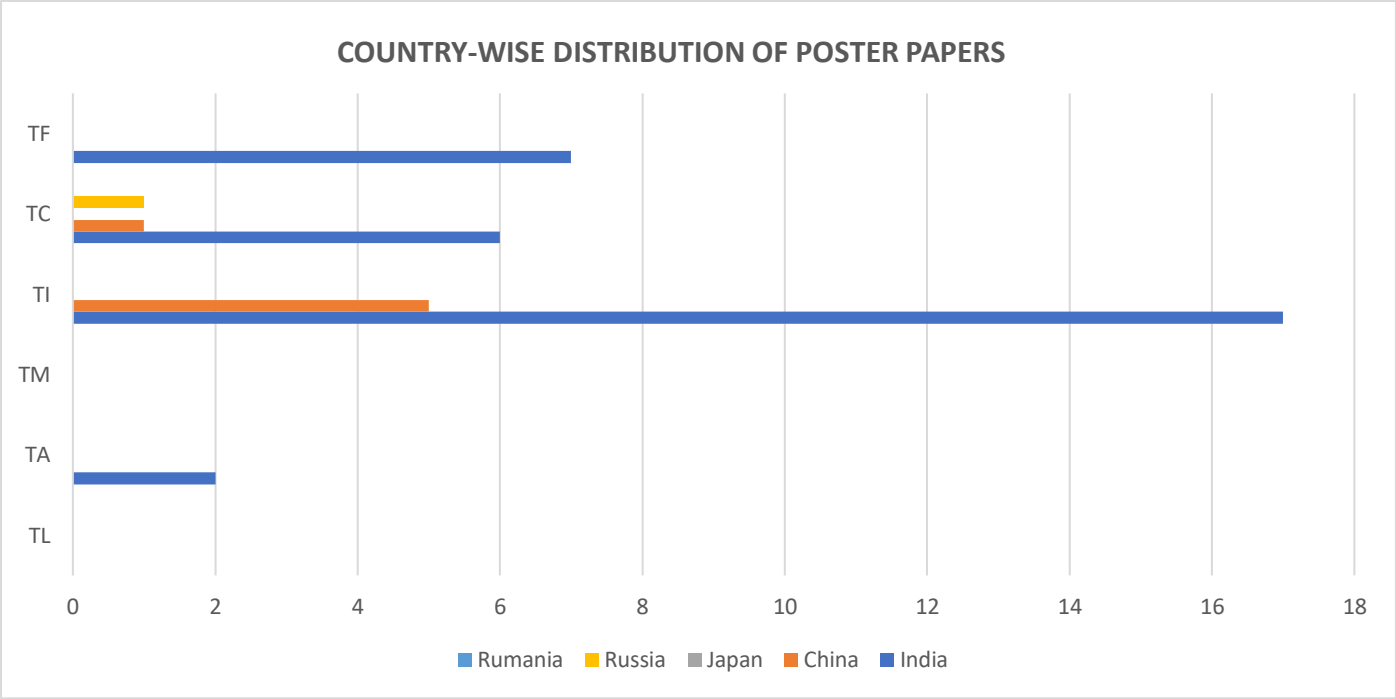


TL	Papers on Livestock Analysis & Quality Appropriation
TA	Papers on AI and Productivity
TM	Papers on Marketing Policy and Strategy
TI	Papers on Innovative Process Technology
TC	Papers on Carbon Capture and Utilization
TF	Papers on Footwear – Future and Roadmap

Table 2: COUNTRY-WISE DISTRIBUTION OF POSTER PAPERS

Theme	India	China	Japan	Russia	Rumania
TL	0	0	0	0	0
TA	2	0	0	0	0
TM	0	0	0	0	0
TI	17	5	0	0	0
TC	6	1	0	1	0
TF	7	0	0	0	0
TOTAL	32	6	0	0	0

Total Poster Presentation = 38. Oral:Poster :: 27:19

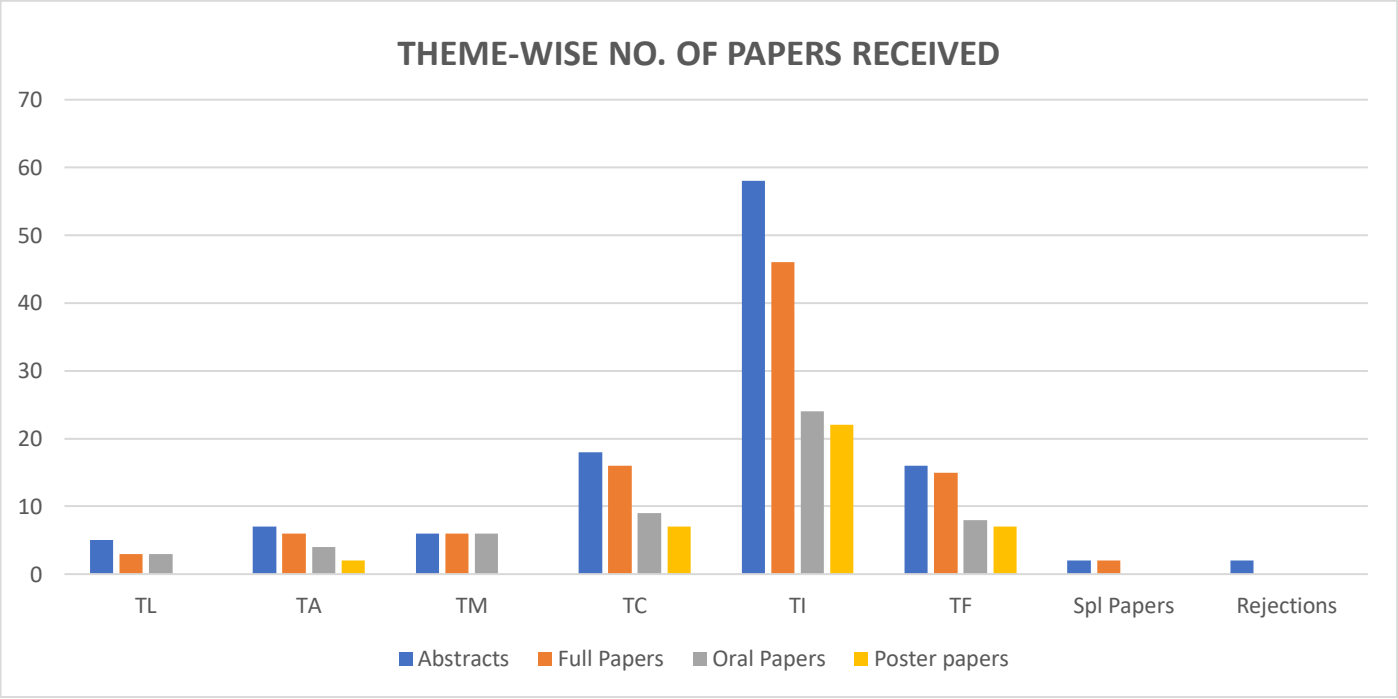


TL	Papers on Livestock Analysis & Quality Appropriation
TA	Papers on AI and Productivity
TM	Papers on Marketing Policy and Strategy
TI	Papers on Innovative Process Technology
TC	Papers on Carbon Capture and Utilization
TF	Papers on Footwear – Future and Roadmap

Table 3: THEME-WISE NO. OF PAPERS RECEIVED

Theme	Abstracts	Full Papers	Oral Papers	Poster papers
TL	5	3	3	0
TA	7	6	4	2
TM	6	6	6	0
TC	18	16	9	7
TI	58	46	24	22
TF	16	15	8	7
Spl Papers	2	2	0	0
Rejections	2	0	0	0
Total	114	94	54	38

Full papers against Abstracts is 82.46 %; Oral : Poster : : 27:19



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Day – 1: Friday, 6th March, 2026

Inaugural Ceremony

Registration commenced at 8:30 AM onwards. Approximately 200 delegates registered and participated in this contemporary global event.

The National Anthem and the IULTCS Anthem

Owing to the prevailing geopolitical situation in West Asia, delegates from several countries, including China, Japan, Taiwan, Switzerland, Italy, the United Kingdom, and the United States, were unfortunately unable to attend the conference. However, extensive correspondence was undertaken with prospective participants from China, as well as with the relevant consulates and embassies. Despite these efforts, visa-related constraints prevented their participation.

Each delegate received a Registration Kit comprising the 13th AICLST Proceedings, conference badge, writing pad, and pen.

The conference formally commenced with the National Anthem and the IULTCS Anthem, followed by the welcoming of dignitaries on the dais through the presentation of potted plants. The Welcome Address was delivered by Mr. Arnab Jha, President, ILTA and Chairman of the 13th AICLST Organizing Committee. This was followed by an address from Dr. S. Rajamani, Vice President, ILTA and Technical Chair of the 13th AICLST.

Padma Bhushan Dr. T. Ramasami, former Secretary, Department of Science and Technology, Government of India, and Chief Patron of the 13th AICLST, delivered the inaugural address. The conference was then officially inaugurated through the ceremonial lighting of the lamp.

Inauguration of the 13th AICLST ceremony by lighting the lamp.

Inaugural address by Padma Bhushan Dr. T. Ramasami

In his address, Dr. Ramasami welcomed all participants to the 13th Asian International Conference on Leather Science and Technology (AICLST), held in Kolkata from 6–8 March 2026. He highlighted the truly international character of the conference, noting contributions from researchers representing China, Japan, Russia, Romania, and India. He emphasized that AICLST serves as a vital platform for leather technologists across Asia to exchange scientific knowledge, foster innovation, and contribute to the sustainable development of the global leather sector.

Padma Bhushan Dr. T. Ramasami, former Secretary, Chief Patron of the 13th AICLST, delivering the inaugural address

Dr. Ramasami further informed the delegates that a participative and internationally coordinated peer-review process had been adopted for the evaluation of conference submissions. The review panel comprised experts from Austria, China, India, New Zealand, and Taiwan. A total of 114 abstracts were received, of which 94 full papers were submitted within the stipulated timeframe. These papers underwent a blind peer-review process to ensure objectivity and quality. Following evaluation, 54 papers were selected for oral presentation and 38 for poster presentation.

He expressed his delight that nearly 98% of the accepted papers focused on responsible innovations, including carbon capture technologies and the application of Artificial Intelligence for enhanced productivity. He described this as a highly encouraging trend in contemporary leather research across Asia.

Dr. Ramasami also noted that the limitation of oral presentations to 54 papers within a 12-hour technical schedule was intended to maintain quality discussions, while poster presentations would facilitate meaningful one-to-one interactions between presenters and interested delegates. He emphasized that all accepted papers, both oral and poster, would be included in the edited conference proceedings and that a downloadable electronic version would be hosted on the ILTA website.

He concluded by congratulating all participants of the 13th AICLST and expressing his appreciation to the multinational peer-review committee, the office bearers and staff of ILTA, and the printers for their valuable contributions towards the successful organization of the conference and publication of the proceedings.

Following the inaugural address, the dignitaries, led by Dr. T. Ramasami, jointly released the "13th AICLST Proceedings." The first copy of the proceedings was ceremonially presented by Mr. Arnab Jha, President, ILTA, to Dr. T. Ramasami, Chief Patron of the 13th AICLST.

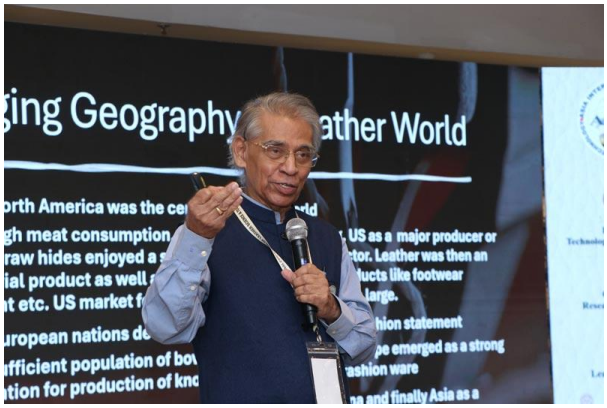
The release the "13th AICLST Proceedings."

Plenary Session – I

"Asia in Changing Leather World: Opportunities and Challenges"

Speaker: Padma Bhushan Dr. T. Ramasami

The first plenary session of the 13th Asian International Conference on Leather Science and Technology (AICLST 2026) was delivered by **Padma Bhushan Dr. T. Ramasami**, Former Secretary, Department of Science & Technology, Government of India. The session focused on the theme **"Asia in Changing Leather World: Opportunities and Challenges."**



Padma Bhushan Dr. T. Ramasami delivering Plenary Session – I

Dr. T. Ramasami presented an overwhelming perspective on the challenges and opportunities facing the leather industry in Asia. He discussed the evolution of the global leather sector and explained how the centre of gravity of the leather industry gradually shifted from North America and Europe to Asia. He highlighted that in the 1920s North America was the centre of the leather world due to its strong meat and leather processing industries. During the 1950s, Europe emerged as a major hub for leather fashion and footwear production. Subsequently, from the 1970s onwards, the leather industry progressively relocated to South Korea, China, and eventually Asia as a whole, driven by economic viability and manufacturing competitiveness.

He stated that **Asia enjoys several strategic advantages in the geography of the leather world**, including abundant availability of bovine hides and ovine skins, large employment generation potential, and a substantial share of global trade revenue. He further emphasized that Asia has emerged as the most significant knowledge generator in leather science and technology, as evidenced by scientific publications and research outputs.

According to the data presented, Asia currently contributes nearly 72% of the publications in Web of Science-indexed journals related to leather science and technology and accounts for nearly 50% of publications in Scopus-indexed journals. Asia also dominates emerging technological areas relevant to leather production, including Artificial Intelligence, Machine Learning, Nanotechnology, Sensor Technology, and Robotics.

Padma Bhushan Dr. T. Ramasami delivering Plenary Session – I

Dr. Ramasami highlighted that Asia today accounts for nearly 50% of the global leather and footwear trade and provides employment to approximately 58% of the workforce engaged in the leather and footwear sector worldwide. He pointed out that while the global supply of bovine hides has remained stagnant, Asia has witnessed a positive growth trend in raw hide and skin availability, thereby strengthening its position in the global leather value chain. Furthermore, Asia possesses nearly 56% of the world's ovine skin resources, creating significant opportunities for value-added fashion and leather products.

In the technology arena, he observed that game-changing developments such as Artificial Intelligence, Machine Learning, Nanotechnology, Sensors, and Robotics are transforming the leather sector. Asian institutions and research organizations are at the forefront of embracing research and development in these advanced areas, thereby strengthening the region's position as a global innovation hub.

Dr. Ramasami also highlighted several important paradigms that merit deeper understanding within the leather and footwear sector. He stated that leather is no longer the sole material of choice for footwear, as several man-made alternatives have captured significant market share. Consequently, leather may increasingly serve niche and premium product segments rather than mass-market footwear. He emphasized that leather products must provide enhanced value propositions to justify their premium positioning in a highly competitive market environment.

He further observed that leather has the potential to evolve into a fashion statement product characterized by lower production volumes but higher value realization. To achieve this, the leather industry must firmly establish itself within the global sustainability framework by delivering on the triple bottom line of sustainability through social equity, economic viability, and environmental compliance.

Challenges and Opportunities in the Leather and Footwear Sector

Discussing the future outlook for the industry, Dr. Ramasami outlined several key challenges and opportunities.

Challenges:

- Rendering leather and footwear production systems compliant with emerging Net Zero carbon footprint requirements through both technological and management interventions.
- Generating robust scientific evidence and sustainability data to counter increasing market pressures from synthetic and alternative materials.

Opportunities:

- Innovating for Net Zero carbon footprint goals through carbon capture technologies, circular economy practices, and advanced technological tools.
- Leveraging Asia's position as the world's leading knowledge producer in leather science and technology to drive sustainable growth and innovation.

- Applying the principle of **"Science for Humanity"** in leather and footwear research and development to create economic, social, and environmental benefits for society.

In conclusion, Dr. Ramasami highlighted the rising importance of Asia as a global source of raw hides and skins, a leading producer of leather and footwear products, and a dominant contributor to research and development in leather science and technology. He underscored the need for the Asian leather community to assume leadership in achieving Net Zero carbon footprint goals and to continue driving innovation for a sustainable future.

The session concluded with a strong appeal to the research and development community of Asia's leather and footwear sector. Dr. Ramasami emphasized that the responsibility of leadership rests on the shoulders of Asian leather technologists and researchers, who must work collectively to ensure that future leather and footwear manufacturing complies with global sustainability and Net Zero carbon footprint norms.

Plenary Session – II

Theme-wise Summary of AICLST 2026

Speaker: Dr. Buddhadeb Chattopadhyay

Dr. Buddhadeb Chattopadhyay delivering Plenary Session – II

The second plenary session of the 13th Asian International Conference on Leather Science and Technology (AICLST 2026) was delivered by **Dr. Buddhadeb Chattopadhyay, Member, ILTA, Kolkata**, on the theme **"Theme-wise Summary of AICLST 2026."**

He summarized the theme-wise and country-wise distribution of papers and presented an executive summary of each thematic area in his concise and insightful presentation.

The presentation provided a comprehensive overview of the scientific contributions, emerging research trends, and strategic directions discussed during the conference. Dr. Chattopadhyay began by reiterating the core mission of AICLST, namely the advancement of leather science and technology through scientific knowledge exchange, international cooperation, and sustainable development.

He emphasized that the leather industry must continue to pursue innovation, education, and skill development while collectively addressing misinformation and working towards a circular economy and Net Zero CO_2e future.
He highlighted that the conference aimed to ensure the long-term viability of the global leather industry through scientific rigor, environmental responsibility, smart management practices, stronger brand equity, enhanced visibility, and global collaboration.
Overview of Technical Contributions

A total of **114 abstracts** were received for the conference, out of which **94 full papers** were submitted and accepted following peer review. The conference featured **54 oral presentations** and **38 poster presentations** distributed across six thematic areas.
The largest contribution was received under **Innovative Process Technology (TI)** with 58 abstracts and 46 full papers, followed by **Carbon Capture and Utilization (TC)** with 18 abstracts and **Footwear – Future and Roadmap (TF)** with 16 abstracts. The conference also included papers on **Livestock Analysis and Quality Appropriation (TL)**, **AI and Productivity (TA)**, and **Marketing Policy and Strategy (TM).**
The country-wise distribution of papers demonstrated strong international participation, with contributions from India, China, Japan, Russia, and Romania. India accounted for the majority of presentations, while researchers from other participating countries contributed significantly to advancing scientific discourse within the leather sector.

Theme: Livestock Analysis and Quality Appropriation (TL)

The Livestock Analysis and Quality Appropriation session consisted of one keynote address and two oral presentations focusing on the quality and availability of bovine hides and ovine skins.
The session highlighted the significant contribution of animal husbandry to the Indian economy, accounting for approximately 28–30% of agricultural output and 4–6% of the national GDP. Presenters discussed challenges affecting hide and skin quality, including pre- and post-mortem defects, disease-related issues, and inadequate farming practices. Special emphasis was placed on DNA mapping, breed improvement through cross-breeding programmes, skill enhancement in flaying operations, and the development of organized farming systems. The discussions underscored the importance of improving raw material quality while strengthening rural livelihoods and the circular economy associated with livestock farming.

Theme: AI and Productivity (TA)

Papers presented under the AI and Productivity theme demonstrated the growing integration of Artificial Intelligence and digital technologies within the leather value chain. The studies explored the application of AI-driven tools for process optimization, productivity enhancement, data analytics, and decision-making support systems. The theme reflected the increasing importance of digital transformation in improving operational efficiency and competitiveness within the leather industry.

Theme: Marketing Policy and Strategy (TM)

The Marketing Policy and Strategy session featured one keynote address and six oral presentations. The discussions revealed a significant shift in the marketplace from product-centric approaches towards value-centric and sustainability-driven business models.
Presenters emphasized the need for creating strong narratives around circular economy principles, traceability, transparency, and consumer trust. Particular attention was given to evidence-based sustainability communication rather than generic environmental claims.
The session also explored ethical marketing strategies, including Leather Working Group (LWG) accreditation, environmental labeling, life-cycle approaches, and responsible branding. Advanced technologies such as Big Data, Data Mining, Machine Learning, and Blockchain were identified as important tools for future market intelligence and consumer engagement.

Dr. Buddhadeb Chattopadhyay delivering Plenary Session – II

Theme: Carbon Capture and Utilization (TC)

Carbon Capture and Utilization emerged as one of the most significant themes of the conference, comprising one keynote address, nine oral presentations, and seven poster presentations.
The discussions focused on achieving Net Zero CO_2e targets and aligning the leather industry with evolving global sustainability standards. Researchers presented innovative approaches aimed at reducing carbon footprints through cleaner production technologies, improved effluent management systems, and the replacement of carbon-intensive chemicals with environmentally preferable alternatives.
Several studies demonstrated the use of AI-driven platforms to identify carbon hotspots within manufacturing systems. Advanced scientific techniques such as EDAX, AFM, PIXI, SEM, TEM, and immuno-gold labeling were presented as powerful tools for environmental monitoring and contamination assessment. The role of wetlands and natural ecosystems in carbon sequestration was also highlighted as a promising area of future research.

Theme: Innovative Process Technology (TI)

Innovative Process Technology represented the largest research segment of AICLST 2026, comprising one keynote address, twenty-four oral presentations, and twenty-two poster presentations.
The presentations covered a broad spectrum of innovations extending beyond conventional leather processing into auxiliary chemical development and advanced manufacturing technologies.
Key research areas included colour standardization, process automation, nano-technology applications for imparting super-hydrophobic and flame-retardant properties, and the utilization of multimodal NMR imaging for process monitoring and standardization.

Researchers also explored alternative tanning systems using unconventional mineral and natural tanning agents, the conversion of tannery waste streams into value-added products, the development of novel surfactants, computer-aided protein interaction studies, and the application of Deep Eutectic Solvents in leather manufacture. Collectively, these studies demonstrated the industry's commitment to cleaner, smarter, and more sustainable processing technologies.

Theme: Footwear – Future and Roadmap (TF)

The Footwear – Future and Roadmap session consisted of one keynote address, eight oral presentations, and seven poster presentations.
The presentations highlighted the growing influence of advanced technologies such as Robotics, Artificial Intelligence, Big Data, Machine Learning, Data Mining, and Blockchain within footwear design and manufacturing.
Researchers discussed innovations aimed at improving performance footwear, extending product life cycles, enhancing design capabilities, and forecasting colour and fashion trends. Considerable attention was also given to branding strategies, consumer engagement, and sustainability initiatives aligned with Net Zero CO_2e objectives.
The session demonstrated that future footwear development will increasingly depend on the successful integration of technological innovation, sustainability, and consumer-centric design principles.

Conclusion

In his concluding remarks, Dr. Buddhadeb Chattopadhyay observed that the overwhelming majority of research presented at AICLST 2026 reflected a strong commitment towards responsible innovation, sustainability, digital transformation, and carbon neutrality. The conference successfully showcased cutting-edge scientific developments and reinforced the role of international collaboration in shaping the future of the global leather sector.
The plenary session provided delegates with a comprehensive synthesis of the conference proceedings and highlighted the emerging research priorities that will influence the future direction of leather science, technology, and sustainability.

Dr. Buddhadeb Chattopadhyay honouring Padma Bhushan Dr. T. Ramasami with a memento.

Technical Session – I (12:00 PM – 02:00 PM)

Livestock Analysis & Quality Appropriation (TL) and AI & Productivity (TA)

Chair: Dr. P. Thanikaivelan, Director, CSIR-Central Leather Research Institute (CLRI), Chennai
Co-Chair: Mr. R. M. Uthayaraja, Director (MB), Balmer Lawrie & Co. Ltd., Chennai

Technical Session – I was chaired by **Dr. P. Thanikaivelan, Director, CSIR-CLRI, Chennai**, and **Mr. R. M. Uthayaraja, Director (MB), Balmer Lawrie & Co. Ltd., Chennai**. Prior to the commencement of the session, both dignitaries were welcomed to the dais and presented with mementoes by **Mr. Asit Baran Kanungo, Vice President, ILTA and Coordinator, AICLST Working Committee.**

The session focused on two important themes: **Livestock Analysis & Quality Appropriation (TL)** and **AI & Productivity (TA).**

Left: Mr. R. M. Uthayaraja,
Right: Dr. P. Thanikaivelan,
Co-chair and Chair of Technical Session -I

The **Livestock Analysis & Quality Appropriation** theme covered a wide range of subjects including livestock population dynamics through cluster creation and rural skill-based entrepreneurship, animal husbandry systems and disease control measures, genetic improvement strategies for enhancing skin quality, quality control measures from farm to tannery, transmission of bacteria and viruses through hides and skins, slaughter and preservation practices for hygienic and effective outputs, traceability and quality labelling through digital and AI initiatives, and the role of animal husbandry in reducing carbon footprint while improving livestock health and skin quality.

Keynote Address by Dr. Arnab Sen

The **AI & Productivity** theme focused on the growing application of Artificial Intelligence in leather and leather product manufacturing. Discussions included machine learning inputs for quality grading and sorting, process monitoring and control, predictive maintenance, AI-powered ERP systems, AI-driven sustainability initiatives, fashion and design forecasting, and data-driven decision-making across all stages of leather production and product development.

The session featured the following presentations:

1. **Keynote Address by Dr. Arnab Sen** – *One Health Approaches and the Impact of Transboundary Diseases in Livestock Productivity*
2. **Dr. Manoranjan Roy** – *Exploring Genetic Potential of Indian Goats for Superior Skin Quality*
3. **Dr. Suman Biswas** – *Indigenous Indian Cattle and Buffalo Breeds as a Resource for Sustainable Hide Production*
4. **Mr. Saikat Chakraborty** – *From Empirical Craft to Data-Driven Control: Artificial Intelligence and Emerging Quantum Perspectives in Leather Technology*
5. **Mr. Anurag Tripathi** – *Deep Learning-Based Automated Defect Recognition and Quality Grading in Leather for Zero-Error Inspection*
6. **Ms. Divya M. S.** – *Leather Fashion Colour Forecasting Using Artificial Intelligence*
7. **Ms. Ipsita Sengupta** – *Improving Performance in a Wi-Fi Enabled Smart Leather Jacket with Integrated Sensors through the Application of Dual-Mode Index Modulation Aided Orthogonal Frequency Division Multiplexing Technology*

Paper Presentation by Dr. Manoranjan Roy

The presentations generated significant interest among the delegates and highlighted the increasing importance of scientific livestock management and digital transformation in shaping the future of the leather industry. The papers demonstrated how advancements in animal health, genetic improvement, traceability systems, Artificial Intelligence, machine learning, and smart wearable technologies can contribute towards improved productivity, quality enhancement, sustainability, and value creation within the leather value chain.

In his concluding remarks, **Dr. P. Thanikaivelan** expressed his appreciation for the quality of the presentations and the active participation of delegates throughout the session. Referring to the discussions from the inaugural and technical sessions, he emphasized that the leather industry must increasingly focus on **high-value and premium market segments** in order to remain globally competitive.

Paper Presentation by Dr. Suman Biswas

Highlighting the transformative role of technology, he noted that developments in **Artificial Intelligence, digitalization, and 3D printing technologies** are expected to create new opportunities for the leather and footwear sector. He informed the audience about the Government's initiative to establish a **3D Printing Centre in Guwahati**, which is expected to provide significant support to the industry and facilitate the future development of customized leather products, including footwear and garments. He

observed that the future market is likely to move beyond standard sizing towards personalized and customized products tailored to individual consumer requirements.

Paper Presentation by Mr. Anurag Tripathi

Dr. Thanikaivelan further emphasized the need for the Indian leather industry to strengthen its presence in the premium and specialized product segments. He cited examples from highly specialized footwear applications to illustrate the immense value potential that exists within niche markets and encouraged industry stakeholders to explore these opportunities through innovation and technology-driven solutions.

Addressing common perceptions regarding the leather sector, he remarked that the industry should not be viewed merely as a pollution-generating sector. Rather, he emphasized that the leather industry is fundamentally a **by-product-based industry** that plays a vital role in supporting the meat sector while simultaneously fulfilling diverse human requirements ranging from fashion and comfort to safety and protection. He reiterated that the industry contributes significantly to resource utilization and circular economy principles.

Paper Presentation by Ms. Divya M. S.

He also observed that although the leather sector remains largely fragmented and unorganized in several areas, there is immense potential for growth through organized operations, ethical business practices, technological adoption, and greater industry collaboration. He urged stakeholders to work collectively towards enhancing transparency, professionalism, and sustainability throughout the value chain.

Concluding his address, **Dr. Thanikaivelan** called upon all participants to continue working together for the advancement of the leather sector through innovation, responsible practices, and collaborative efforts aimed at ensuring long-term growth and global competitiveness.

In his keynote address, **Dr. Arnab Sen** highlighted the significance of the "One Health" approach, emphasizing the interdependence of animal, human, and environmental health. He discussed how transboundary diseases adversely affect livestock productivity, raw material quality, and the overall sustainability of the leather value chain, stressing the need for effective disease surveillance and preventive measures.

Dr. Manoranjan Roy presented the potential of indigenous Indian goat breeds in producing superior-quality skins. He emphasized the importance of identifying and utilizing desirable genetic traits through scientific breeding programmes to improve skin quality and strengthen the raw material base of the leather industry.

Paper Presentation by Ms. Ipsita Sengupta

Dr. Suman Biswas highlighted the value of indigenous cattle and buffalo breeds as sustainable sources of quality hides. He discussed the importance of breed conservation, scientific animal husbandry practices, and improved livestock management in ensuring a consistent supply of quality raw materials for the leather sector.

Mr. Saikat Chakraborty explored the transformative role of Artificial Intelligence in leather manufacturing, demonstrating how data-driven systems can improve process control, quality assurance, and operational efficiency. He also provided insights into the future potential of quantum technologies in solving complex industrial challenges.

Mr. Anurag Tripathi presented a deep learning-based approach for automated defect detection and quality grading of leather. The technology offers improved accuracy, consistency, and efficiency in inspection processes, supporting the industry's move towards intelligent and automated manufacturing systems.

Ms. Divya M. S. demonstrated how Artificial Intelligence can be used to predict future colour trends in leather fashion by analysing market data, consumer preferences, and fashion dynamics. The approach provides valuable support for product development, marketing strategies, and trend forecasting.

Ms. Ipsita Sengupta presented an innovative study on smart leather wearables, focusing on improving communication efficiency and performance in sensor-enabled leather jackets. The work showcased the growing convergence of leather technology, wearable electronics, and advanced wireless communication systems.

Following the technical presentations, **Dr. Arnab Sen** was presented with a **Memento and Citation** in recognition of his keynote address. All other paper presenters were also honoured with **Citations** by **Dr. P. Thanikaivelan** and **Mr. R. M. Uthayaraja** for their valuable contributions to the session.

Thereafter, both the Chair and Co-Chair were felicitated with **plants and citations** by **Mr. Susanta Mallick, General Secretary, ILTA**, as a token of appreciation for their guidance and contribution towards the successful conduct of the session.

Chair and Co-Chair were felicitated with **plants and citations** by **Mr. Susanta Mallick, General Secretary, ILTA**

Technical Session – II (03:00 PM – 05:00 PM)

Carbon Capture & Utilization (TC)

Chair: Dr. A. B. Mandal, Former Director, CSIR-Central Leather Research Institute (CLRI), Chennai
Co-Chair: Mr. Diganta Ghosh, Director – Sales & Marketing (India & Bangladesh), TFL Quinn India Pvt. Ltd., Hyderabad

Technical Session – II on **"Carbon Capture & Utilization (TC)"** was chaired by **Dr. A. B. Mandal, Former Director, CSIR-CLRI, Chennai**, and co-chaired by **Mr. Diganta Ghosh, Director – Sales & Marketing (India & Bangladesh), TFL Quinn India Pvt. Ltd., Hyderabad**.

Prior to the commencement of the session, both dignitaries were welcomed to the dais and presented with mementoes by **Mr. Asit Baran Kanungo, Vice President, ILTA and Coordinator, AICLST Working Committee.**

Right: Dr. A. B. Mandal
Left: Mr. Diganta Ghosh
Chair and Co-Chair of Technical session

Keynote Address by Dr. S. Rajamani

The session focused on one of the most significant themes of AICLST 2026, namely **Carbon Capture & Utilization (CCU)**, which is increasingly becoming a critical component in the global transition towards sustainable manufacturing and Net Zero carbon footprint goals. The technical deliberations addressed a wide range of topics including carbon capture and utilization at various stages of leather manufacturing, carbon footprint assessment and reduction strategies, innovations in carbon capture technologies suitable for the leather industry, challenges and opportunities associated with CCU implementation, waste treatment plants and carbon utilization systems, and the role of circular economy principles in achieving sustainable leather production.

The session brought together researchers, technologists, and industry experts who presented innovative solutions aimed at reducing environmental impact while enhancing resource efficiency and sustainability within the leather value chain.

The following papers were presented during the session:

1. **Keynote Address by Dr. S. Rajamani** – *Challenges in World Leather Sector and Sustainable Options*
2. **Dr. Utpal Singha Roy** – *Impact of Tannery Effluents on Aquatic Biota: Fish as Bioindicator for Sustainable Environmental Management*
3. **Mr. Sreeparna Das** – *Sustainable Algal Technologies for Detoxifying and Valorizing Tannery Wastewater*
4. **Ms. Ramya Gunasekaran** – *Sustainable Conversion of Tannery Hair Waste into Electrospun Nanofibers for Transdermal Drug Delivery*
5. **Dr. S. Sundarapandiyan** – *CLI-Mate: A Sector-Specific Digital Platform for Carbon Footprint Assessment and Decarbonization Pathways in Leather Manufacturing*
6. **Dr. Soumya Chatterjee** – *East Calcutta Wetlands: A Comprehensive Study on its Contribution in Wastewater Remediation and Reuse*
7. **Dr. Vera Radnaeva** – *Solving Environmental Problems in Leather Production by Implementing an Original Process Flow and Using New Materials*

Dr. Utpal Singha Roy receiving Citations by Dr. A. B. Mandal

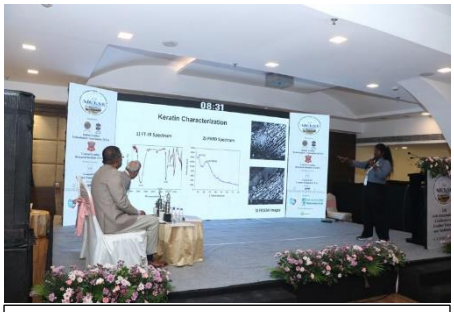
The keynote address by **Dr. S. Rajamani** provided a comprehensive overview of the contemporary challenges facing the global leather sector and highlighted sustainable pathways for addressing environmental, economic, and technological concerns. The presentation emphasized the importance of adopting cleaner production technologies, resource-efficient manufacturing practices, and innovative approaches to ensure the long-term sustainability of the leather industry.

The subsequent presentations showcased diverse research efforts directed towards environmental protection, waste valorization, carbon footprint reduction, and circular economy implementation. Several speakers demonstrated how industrial by-products and waste streams could be transformed into value-added products, thereby reducing environmental burden while creating new economic opportunities.

Paper presentation by Mr. Sreeparna Das

Particular attention was given to sustainable wastewater management practices. Research on algal technologies, aquatic bioindicators, and the ecological significance of the East Calcutta Wetlands highlighted the potential of nature-based solutions for wastewater treatment, environmental remediation, and carbon sequestration. These studies demonstrated how ecological systems can play a vital role in achieving sustainable industrial development.

The session also featured innovative approaches for converting tannery waste into high-value materials. The transformation of tannery hair waste into electrospun nanofibers for biomedical applications and the development of mycelial leather alternatives illustrated how waste materials can be successfully integrated into circular economy models, thereby reducing waste generation and enhancing resource utilization.



Paper presentation by Ms. Ramya Gunasekaran

Another important aspect of the session was the application of digital technologies in sustainability management. The presentation on **CLI-Mate**, a sector-specific digital platform for carbon footprint assessment and decarbonization planning, demonstrated how digital tools can support leather manufacturers in measuring environmental performance, identifying carbon hotspots, and developing effective pathways towards Net Zero emissions.

Dr. Utpal Singha Roy discussed the environmental impact of tannery effluents on aquatic ecosystems, highlighting the use of fish as bioindicators for monitoring water quality and ecological health. The study emphasized the importance of effective effluent management and continuous environmental monitoring to ensure sustainable industrial practices.

Paper presentation by Dr. S. Sundarapandiyan

Mr. Sreeparna Das highlighted the potential of algal technologies in treating tannery wastewater through the removal of pollutants and recovery of valuable by-products. The study demonstrated how algae-based systems can support environmentally sustainable wastewater management while creating opportunities for resource recovery.

Ms. Ramya Gunasekaran presented an innovative approach to converting tannery hair waste into high-value electrospun nanofibers for transdermal drug delivery applications. The work demonstrated the potential of transforming industrial waste into advanced biomaterials, promoting both sustainability and value addition.

Dr. Soumya Chatterjee receiving Citations by Dr. A. B. Mandal and Mr. Diganta Ghosh

Dr. S. Sundarapandiyan introduced CLI-Mate, a digital platform designed to assess carbon footprints and identify decarbonization pathways within leather manufacturing operations. The platform provides data-driven insights to support sustainability goals, regulatory compliance, and the industry's transition towards Net Zero emissions.

Dr. Soumya Chatterjee presented a comprehensive assessment of the East Calcutta Wetlands and their unique role in natural wastewater treatment and resource recovery. The study demonstrated how this internationally recognized wetland ecosystem contributes significantly to environmental sustainability through wastewater remediation, aquaculture, and water reuse practices.

The presentation by **Dr. Vera Radnaeva** showcased innovative process modifications and the use of new materials to address environmental challenges associated with leather production. The research demonstrated how technological innovation can contribute to reducing environmental impacts while maintaining product quality and industrial competitiveness.

The session generated lively discussions among delegates on the future of sustainable leather manufacturing and the importance of integrating carbon capture technologies, circular economy principles, waste-to-wealth initiatives, digital sustainability tools, and nature-based solutions into mainstream industrial practices.

Online paper presentation by Dr. Vera Radnaeva

The presentations collectively highlighted that the leather industry possesses significant opportunities to contribute towards global climate goals through responsible innovation, resource efficiency, carbon footprint reduction, and sustainable utilization of waste resources. The session strongly reinforced the conference theme of advancing leather science and technology while ensuring environmental stewardship and long-term sustainability.

At the conclusion of the session, the Chair and Co-Chair commended the presenters for their valuable scientific contributions and emphasized the growing importance of Carbon Capture & Utilization technologies in shaping the future of the global leather industry. They appreciated the quality of the research presented and

encouraged continued collaboration among academia, research institutions, and industry stakeholders to accelerate the adoption of sustainable technologies and achieve Net Zero carbon footprint objectives.

The session concluded with the presentation of citations to all speakers in recognition of their valuable contributions. The Chair and Co-Chair were also felicitated with plants and citations as a token of appreciation for their guidance and leadership in conducting the session successfully.

Following the technical presentations, **Dr. S. Rajamani** was presented with a **Memento and Citation** in recognition of his keynote address and valuable contribution to the session. All other paper presenters were also honoured with **Citations** by **Dr. A. B. Mandal** and **Mr. Diganta Ghosh** in appreciation of their scientific contributions and participation in the conference.

Thereafter, both the Chair and Co-Chair were felicitated with **plants and citations** by **Mr. Asit Baran Kanungo, Vice President, ILTA and Coordinator, AICLST Working Committee**, as a token of appreciation for their leadership, guidance, and successful conduct of the technical session.

Dr. S. Rajamani being presented with a **Memento and Citation**

Day – 2: Saturday, 7th March, 2026

Technical Session – III (09:30 AM – 11:30 AM)

Innovative Process Technology (TI)

Chair: Dr. B. Chandradekaran, Former Director, CSIR-Central Leather Research Institute (CLRI), Chennai
Co-Chair: Mr. Jayanta Chaudhuri, Head Chemicals, SBU Chemicals, Balmer Lawrie & Co. Ltd., Chennai

**Right: Dr. B. Chandradekaran,
Left: Mr. Jayanta Chaudhuri,
Chair and Co-Chair of Technical session -III**

The second day of the conference commenced with **Technical Session – III** on the theme **"Innovative Process Technology (TI)"**, chaired by **Dr. B. Chandradekaran, Former Director, CSIR-CLRI, Chennai**, and co-chaired by **Mr. Jayanta Chaudhuri, Head Chemicals, SBU Chemicals, Balmer Lawrie & Co. Ltd., Chennai**.

Before the commencement of the session, both dignitaries were welcomed to the dais and presented with mementoes by **Mr. N. R. Jagannathan, President, ILTA Southern Region**.

The session focused on emerging innovations that are transforming leather manufacturing and allied industries. The technical deliberations covered a broad spectrum of topics including **nanotechnology applications, automation and robotics, sustainable chemistries, sustainable materials and processes, process intensification, green chemistry, transition of leather processing from batch operations to continuous systems, sustainable environmental management practices, and the conversion of industrial wastes into value-added chemicals and products.**

In his opening remarks, **Dr. B. Chandradekaran** welcomed the delegates and expressed his pleasure at being associated with the conference. Referring to the technical discussions held since the inaugural day, he observed that the conference had successfully showcased a number of innovative ideas addressing contemporary challenges faced by the leather sector. He emphasized that innovation remains the key driver of technological advancement and sustainability in the industry.

He noted that the global leather sector is currently confronted with multiple challenges relating to environmental sustainability, resource optimization, regulatory compliance, and market competitiveness. Addressing these challenges requires continuous innovation in both materials and manufacturing processes. He highlighted that technological innovations can significantly contribute towards sustainable production, enhanced process efficiency, improved material utilization, and reduced environmental impact. He further remarked that the session had been designed to showcase some of the latest developments in these areas and would provide valuable insights into future directions of leather processing technologies.

Keynote Address by Dr. Volkar Rabe

In his introductory remarks, **Mr. Jayanta Chaudhuri** emphasized that process innovation has become an urgent necessity for the leather industry in view of increasing environmental expectations and global ESG (Environmental, Social and Governance) requirements. He observed that the leather and leather chemical industries are often perceived as environmentally challenging sectors and stressed the responsibility of

industry stakeholders to continuously develop cleaner technologies, sustainable processes, and environmentally responsible manufacturing practices.

He expressed confidence that the keynote address and technical papers presented during the session would address many of these concerns and provide practical solutions for achieving sustainable industrial growth. He encouraged active participation and interaction among delegates to maximize the value of the technical discussions.

Dr. Volkar Rabe was presented with a Memento and Citation

The session featured the following presentations:

1. **Keynote Address by Dr. Volkar Rabe** – *Bisphenols in Leather*
2. **Dr. Bindia Sahu** – *Fatty Acids Based Fatliquor with Antifogging Properties*
3. **Ms. Janani V.** – *Sustainable Fatliquoring through Amphoteric Polymer Design: A Comparative Study on Chrome-Tanned and Chrome-Free Leather*
4. **Dr. Sangeetha D. R.** – *Superhydrophobic Leathers through Sustainable Nanocomposites Coating Technology*
5. **Ms. Anusuya Annamalai** – *Leather Tanning Based on Al(III)-Phloroglucinol Metal Complex Combined with Vegetable Tannin as a Chrome-Free Approach*
6. **Presentation by Diamond Sponsor – M/s TFL Quinn**

Paper presentation by Dr. Bindia Sahu

The keynote address by **Dr. Volkar Rabe**, Global Head, TFL, was one of the highlights of the session. Introducing the speaker, Dr. Chandradekaran outlined Dr. Rabe's academic and professional achievements, including his doctoral studies at the University of Stuttgart, his tenure at the Freiberg Institute of Leather Technology, and his extensive industrial experience spanning more than a decade in leading multinational organizations before assuming his current global leadership role at TFL.

The keynote presentation focused on **"Bisphenols in Leather"**, a subject of growing importance for the global leather industry due to evolving regulatory requirements and increasing scrutiny of chemicals used in leather processing. Dr. Rabe provided an in-depth overview of the chemistry, applications, regulatory concerns, and future challenges associated with bisphenols in leather manufacture.

The presentation examined the historical use of bisphenol-based compounds in leather chemicals and their contribution to product performance and process efficiency. At the same time, it addressed emerging international regulations concerning restricted substances and highlighted the growing need for the industry to develop safer and more sustainable alternatives.

Particular emphasis was placed on the challenges faced by leather chemical manufacturers as regulatory frameworks continue to evolve worldwide. Dr. Rabe discussed how increasing restrictions on certain chemical groups necessitate continuous research and innovation to develop environmentally acceptable substitutes while maintaining product quality and processing performance.

Ms. Janani V. receiving Citations by Dr. B. Chandradekaran and Mr. Jayanta Chaudhuri

The keynote stimulated considerable interest among delegates as it addressed both the scientific and regulatory dimensions of leather processing chemistry. The presentation underscored the importance of proactive research and innovation in ensuring compliance with future regulations while supporting sustainable growth of the leather sector.

The subsequent technical presentations showcased a diverse range of innovative approaches aimed at improving leather processing efficiency, product performance, and environmental sustainability. Several papers focused on chrome-free technologies, sustainable tanning systems, advanced fatliquoring techniques, nanotechnology-based surface modifications, and environmentally friendly finishing processes.

Dr. Sangeetha D. R. receiving Citations by Dr. B. Chandradekaran and Mr. Jayanta Chaudhuri

Dr. Bindia Sahu presented the development of a novel fatty acid-based fatliquor imparting antifogging properties to leather surfaces. The study demonstrated how functional fatliquors can enhance both the performance and value of leather products while maintaining processing efficiency and product quality.

Ms. Anusuya Annamalai receiving Citations by Dr. B. Chandradekaran and Mr. Jayanta Chaudhuri

Ms. Janani V. discussed the design and application of amphoteric polymer-based fatliquors as a sustainable alternative for leather processing. The comparative study evaluated their performance on both chrome-tanned and chrome-free leathers, highlighting improvements in softness, physical properties, and environmental compatibility.

Dr. Sangeetha D. R. presented an innovative nanocomposite coating technology for producing superhydrophobic leather surfaces. The sustainable coating system significantly enhanced water repellency and durability, offering potential applications in high-performance and specialty leather products.

Ms. Anusuya Annamalai showcased a chrome-free tanning system utilizing an Al(III)-Phloroglucinol metal complex in combination with vegetable tannins. The study demonstrated promising tanning performance and leather quality, contributing to the development of environmentally sustainable alternatives to conventional chrome tanning.

The session also featured innovative developments in leather finishing technology, including the utilization of natural rubber as a sustainable finishing material, demonstrating the increasing integration of renewable resources into leather manufacturing.

The Chair and Co-Chair were felicitated with plants and citations **by** Dr. J. Raghava Rao,

Overall, the session reflected the industry's strong commitment towards innovation, sustainability, cleaner production technologies, resource efficiency, and the development of environmentally responsible leather manufacturing practices. The presentations generated significant discussions among delegates and highlighted the important role of research and development in addressing future technological and sustainability challenges.

Following the technical presentations, **Dr. Volkar Rabe** was presented with a **Memento and Citation** in recognition of his keynote address and valuable contribution to the conference. All other paper presenters were also honoured with **Citations** by **Dr. B. Chandradekaran** and **Mr. Jayanta Chaudhuri** in appreciation of their scientific contributions and participation in the session.

Thereafter, both the Chair and Co-Chair were felicitated with **plants and citations** by **Dr. J. Raghava Rao, Member, AICLST Scientific Committee and Vice President, ILTA Southern Region**, as a token of appreciation for their guidance and successful conduct of the session.

Technical Session – IV (12:00 PM – 02:00 PM)

Innovative Process Technology (TI)

Chair: Mr. Pulok Mazumder, Vice President, ILTA

Co-Chair: Dr. J. Raghava Rao, Member, AICLST Scientific Committee & Vice President, ILTA Southern Region

Technical Session – IV on **"Innovative Process Technology (TI)"** was chaired by **Mr. Pulok Mazumder, Vice President, ILTA**, and co-chaired by **Dr. J. Raghava Rao, Member, AICLST Scientific Committee and Vice President, ILTA Southern Region**.

Right: Mr. Pulok Mazumder,
Left: Dr. J. Raghava Rao,
Chair and Co-Chair of Technical session -IV

Before the commencement of the session, both dignitaries were welcomed to the dais and presented with mementoes by **Mr. Susanta Mallick, General Secretary, ILTA**.

The session continued the deliberations on one of the most significant themes of AICLST 2026, namely **Innovative Process Technology**, which has emerged as a key driver for ensuring the future sustainability, competitiveness, and value creation potential of the global leather industry. The technical discussions focused on the development of novel materials, advanced processing technologies, sustainable chemistries, smart functional properties, and innovative approaches capable of enhancing the performance and market value of leather products.

Paper presentation by Mr. G. Mothi Prasad

In his introductory remarks, **Dr. J. Raghava Rao** reflected upon the broader objectives of the conference and emphasized that the 13th AICLST had commenced with an important discussion on the challenges and opportunities confronting the leather sector. He observed that the industry must continuously identify and strengthen the unique characteristics of leather in order to successfully address the increasing competition from alternative materials.

He emphasized that the future of leather lies not merely in competing with other materials but in creating distinctive value propositions through innovation. According to him, innovation in chemicals, processes,

materials, and products is the primary driving force that can ensure leather retains its position as a premium and desirable material in the global marketplace.

Paper presentation by Dr. Renganath Rao Ramesh

Reflecting on the technical sessions conducted earlier in the conference, Dr. Rao noted that the focus of innovation within the leather industry has evolved significantly over the years. Traditionally, research efforts concentrated on beamhouse operations, including enzyme technologies, sulfide-free processing, deliming innovations, pickle-free tanning, chrome management, and water-saving technologies. While these developments remain important, the current direction of research is increasingly oriented towards the development of advanced materials, smart functionalities, specialty chemicals, and performance-enhancing technologies that add value to leather products.

Paper presentation by Ms. Poulomi Ghosh

He remarked that the presentations delivered during the previous Innovative Process Technology sessions clearly demonstrated this shift in focus. Many of the papers addressed innovations in fatliquoring, syntans, finishing chemicals, advanced materials, and product performance enhancement. He observed that the leather research community has increasingly recognized that the future success of the industry depends upon developing "smart leather" capable of delivering unique functionalities and enhanced consumer value.

Dr. Rao further highlighted that Indian leather technologists and researchers are making significant contributions in this direction and are successfully aligning themselves with global technological trends. He expressed confidence that the papers scheduled for the session would provide valuable insights into the latest developments in innovative process technologies and stimulate meaningful discussions among delegates.

The session featured the following technical presentations:

1. **Mr. G. Mothi Prasad** – *Characterization of Leather Processing Stages through Multimodal Magnetic Resonance Imaging Approaches*
2. **Dr. Renganath Rao Ramesh** – *Development of Bromine-Free Aluminum-Carboxymethyl Melamine MOFs as Hybrid Flame Retardants for Leather Application*
3. **Ms. Poulomi Ghosh** – *Transforming Invasive Pterygoplichthys spp. Skin into Leather*
4. **Mr. Muthukumaran P.** – *Indigenous Alternatives to Vegetable Tanning Agents – Experimental Validation and Case Study*
5. **Dr. Piku Sen** – *An Overview of Potential Applications of Deep Eutectic Solvents in Leather Manufacturing*
6. **Dr. Punitha Velmurugan** – *Encapsulated Peppermint Oil for Antimicrobial Fragrant Leather*
7. **Dr. V. Vijayabaskar** – *Synthesis of Novel Surfactants, Their Copolymers and Applications in Different Stages of Leather Processing*
8. **Ms. Debosmita Sikdar** – *Antifungal Screening of Methanolic Extracts of Phytochemicals: A Strategy to Fabricate Industrially Active Antifungal Agents*

Paper presentation by Mr. Muthukumaran P

Paper presentation by Dr. Piku Sen

The presentations covered a broad spectrum of innovative technologies and scientific approaches designed to enhance both the functional and environmental performance of leather products. Several papers demonstrated how advanced scientific techniques can contribute to process optimization, improved product quality, and sustainable manufacturing practices.

The presentation by **Mr. G. Mothi Prasad** showcased the application of **multimodal magnetic resonance imaging (MRI)** as an advanced analytical tool for characterizing different stages of leather processing. The research highlighted the potential of non-destructive imaging technologies for monitoring process parameters and improving process control in leather manufacture.

Dr. Renganath Rao Ramesh presented innovative work on the development of bromine-free flame-retardant materials based on hybrid metal-organic frameworks (MOFs). The research demonstrated how advanced materials can improve fire resistance while simultaneously addressing environmental and regulatory concerns associated with conventional flame-retardant systems.

Dr. Punitha Velmurugan receiving Citations by **Mr. Pulok Mazumder** and **Dr. J. Raghava Rao**

A particularly unique presentation was delivered by **Ms. Poulomi Ghosh**, who explored the conversion of invasive *Pterygoplichthys* fish skin into leather. The study illustrated how unconventional biological resources can be transformed into value-added leather products while simultaneously contributing to ecological management and sustainability objectives.

The paper presented by **Mr. Muthukumaran P.** focused on the identification and validation of indigenous alternatives to conventional vegetable tanning agents. The research highlighted opportunities for utilizing locally available resources and reducing dependence on imported tanning materials while supporting sustainable leather production.

Dr. Piku Sen discussed the emerging role of **Deep Eutectic Solvents (DES)** in leather manufacturing. The presentation demonstrated the potential of these environmentally friendly solvent systems to replace conventional chemicals and contribute to greener processing technologies.

Innovation in functional leather development was further highlighted through the work of **Dr. Punitha Velmurugan**, who presented the use of encapsulated peppermint oil to impart antimicrobial and fragrance properties to leather. The research showcased the growing trend towards multifunctional and value-added leather products designed to meet evolving consumer expectations.

Dr. V. Vijayabaskar receiving Citations by **Mr. Pulok Mazumder** and **Dr. J. Raghava Rao**

The presentation by **Dr. V. Vijayabaskar** focused on the synthesis and application of novel surfactants and copolymers across various stages of leather processing. The study demonstrated how innovative chemical formulations can improve processing efficiency and product performance while reducing environmental impacts.

Finally, **Ms. Debosmita Sikdar** presented research on antifungal phytochemicals and their potential industrial applications. The

work explored natural alternatives for developing active antifungal agents that could contribute to leather preservation and enhanced product durability.

Online Paper Presentation by Ms. Debosmita Sikdar

Collectively, the presentations reflected the growing emphasis on advanced materials, green chemistry, process optimization, sustainability, resource efficiency, and smart functional properties. The research showcased during the session demonstrated how innovation is increasingly being directed towards creating differentiated, high-performance leather products capable of meeting future market requirements.

The session generated significant interest among delegates and stimulated productive discussions on the future direction of leather research and technology development. The papers clearly demonstrated that innovation continues to be the cornerstone for enhancing the competitiveness, sustainability, and value proposition of leather in an increasingly dynamic global marketplace.

Following the technical presentations, all paper presenters were presented with **Citations** by **Mr. Pulok Mazumder** and **Dr. J. Raghava Rao** in recognition of their valuable scientific contributions and participation in the conference.

Thereafter, both the Chair and Co-Chair were felicitated with **plants and citations** by **Dr. Buddhadeb Chattopadhyay, Former Principal, Government College of Engineering and Leather Technology (GCELT), Kolkata, and Member, AICLST Scientific Committee**, as a token of appreciation for their leadership and successful conduct of the session.

Technical Session – V (03:00 PM – 05:00 PM)

Innovative Process Technology (TI)

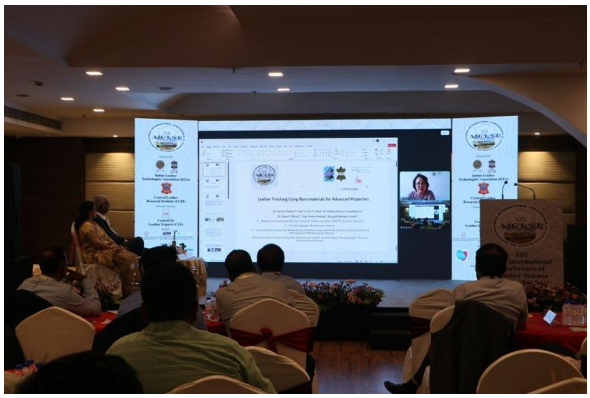
Chair: Dr. Buddhadeb Chattopadhyay, Former Principal, Government College of Engineering & Leather Technology (GCELT), Kolkata and Member, AICLST Scientific Committee

Co-Chair: Dr. N. Nishad Fathima, Chief Scientist & Head, Inorganic and Physical Chemistry Laboratory, Professor, AcSIR, CSIR-Central Leather Research Institute (CLRI)

Right: Dr. Buddhadeb Chattopadhyay
Left: Dr. N. Nishad Fathima
Chair and Co-Chair of Technical session -IV

Technical Session – V on **"Innovative Process Technology (TI)"** was chaired by **Dr. Buddhadeb Chattopadhyay, Former Principal, GCELT, Kolkata and Member, AICLST Scientific Committee**, and co-chaired by **Dr. N. Nishad Fathima, Chief Scientist & Head, Inorganic and Physical Chemistry Laboratory, Professor, AcSIR, CSIR-CLRI**.

Before the commencement of the session, both dignitaries were welcomed to the dais and presented with mementoes by **Dr. B. Chandrasekaran, Former Director, CSIR-CLRI, Chennai**.



Online Paper Presentation By Dr. Carmen Gaidau

The session continued the deliberations on the theme **"Innovative Process Technology"**, which had emerged as one of the most prominent and widely represented themes of AICLST 2026. The presentations reflected the industry's growing commitment towards sustainable manufacturing, cleaner production technologies, circular economy principles, resource conservation, advanced materials, and environmentally responsible leather processing practices.

The session brought together researchers and technologists from India and abroad who presented innovative approaches for addressing contemporary challenges in leather manufacturing while simultaneously enhancing environmental sustainability, product performance, and process efficiency.

The following papers were presented during the session:

1. **Dr. Carmen Gaidau** – *Leather Finishing Using Nanomaterials for Advanced Properties*
2. **Dr. Dmitry Shalbuev** – *Recycling of Organic Waste Generated During the Processing of Kamus Skins of Reindeer*
3. **Dr. S. V. Srinivasan** – *Tannery Wastewater Treatment Towards Sustainability in India*
4. **Dr. Pankaj Kumar Tyagi** – *Strategic Prioritisation of Environmental Sustainability Practices in Leather Industries: An Integrated Delphi–AHP–TOPSIS Analysis*
5. **Dr. Sandip Das** – *Green and Clean Deliming Technology with Acetic Acid–Sodium Acetate Buffer for Removal of Ammonia-Nitrogen from Leather Manufacturing Process*
6. **Dr. P. K. Chattopadhyay** – *Merits and Demerits of Titanium-Based Ingredients in Leather Processing: Benefits and Challenges*
7. **Ms. V. Ramadevi Pabbineedi** – *Spent Turmeric Oleoresin in Leather Processing*
8. **Presentation by Silver Sponsor – M/s Balmer Lawrie & Co. Ltd.**

Online Paper Presentation by Dr. Dmitry Shalbuev

The presentations highlighted several important areas of innovation aimed at improving environmental performance and operational sustainability within the leather sector.

Dr. S. V. Srinivasan receiving Citations by Dr. Buddhadeb Chattopadhyay and Dr. N. Nishad Fathima

Dr. Carmen Gaidau showcased advanced leather finishing technologies utilizing nanomaterials to impart enhanced functional properties to leather products. The research demonstrated the growing role of nanotechnology in developing high-performance leathers with improved durability, protection, and specialized characteristics suitable for advanced applications.

The presentation by **Dr. Dmitry Shalbuev** focused on the recycling and utilization of organic waste generated during the processing of reindeer Kamus skins. The study highlighted opportunities for converting waste materials into useful products while supporting circular economy objectives and reducing environmental burdens.

The paper presented by **Dr. S. V. Srinivasan** addressed one of the most critical issues confronting the leather industry, namely tannery wastewater management. The study focused on sustainable treatment approaches capable of improving effluent quality, reducing environmental impact, and supporting compliance with increasingly stringent environmental regulations.

A noteworthy contribution was made by **Dr. Pankaj Kumar Tyagi**, who presented a systematic and analytical framework for prioritizing environmental sustainability practices in leather industries using integrated decision-making methodologies such as Delphi, AHP, and TOPSIS. The study provided valuable insights into strategic planning and sustainability management within industrial operations.

Dr. Pankaj Kumar Tyagi, receiving Citations from Dr. Buddhadeb Chattopadhyay and Dr. N. Nishad Fathima

Environmental innovation was further emphasized through the work of **Dr. Sandip Das**, who introduced a green deliming technology based on an acetic acid–sodium acetate buffering system. The research demonstrated effective removal of ammonia-nitrogen from leather manufacturing processes and offered a cleaner alternative to conventional deliming methods.

Paper Presentation by Dr. Sandip Das

Dr. P. K. Chattopadhyay presented a comprehensive analysis of titanium-based ingredients used in leather processing. The presentation examined both the advantages and limitations of these materials and provided valuable perspectives on their potential applications, benefits, and associated challenges within modern leather manufacturing.

The session also featured an innovative study by **Ms. V. Ramadevi Pabbineedi**, who explored the utilization of spent turmeric oleoresin in leather processing. The work demonstrated the potential of utilizing natural and industrial by-products as sustainable processing inputs, thereby contributing to waste minimization and resource efficiency.

The presentations collectively demonstrated how innovative process technologies are increasingly focused on environmental sustainability, cleaner production systems, waste valorization, bio-based materials, advanced functional finishes, and resource-efficient manufacturing approaches. The session generated significant interest among delegates and stimulated productive discussions on the future direction of sustainable leather processing technologies.

Paper Presentation by Dr. P. K. Chattopadhyay

The session also included a presentation by the **Silver Sponsor, M/s Balmer Lawrie & Co. Ltd.**, highlighting the company's contributions, technological capabilities, and continued commitment towards innovation and sustainability within the leather and allied industries.

Paper Presentation by Ms. V. Ramadevi Pabbineedi

Dr. Buddhadeb Chattopadhyay and Dr. N. Nishad Fathima were presented with Citations

Following the technical presentations, all the above-mentioned paper presenters were presented with **Citations** by **Dr. Buddhadeb Chattopadhyay** and **Dr. N. Nishad Fathima** in recognition of their valuable scientific contributions and participation in the conference.

Thereafter, both the Chair and Co-Chair were felicitated with **plants and citations** by **Mr. Susanta Mallick, General Secretary, ILTA**, as a token of appreciation for their guidance, leadership, and successful conduct of the technical session.

Cultural Evening

Rhythmic Instrumental Performance

Following the conclusion of the technical sessions, delegates were treated to a vibrant cultural programme showcasing the rich artistic traditions of different regions of India.

The evening commenced with a captivating **rhythmic instrumental performance by a talented team from Chennai**, which beautifully reflected the essence of South Indian musical traditions. The performance was highly appreciated by the audience for its energy, precision, and cultural richness.

Ms. Deedhita Singha,

This was followed by an elegant **Bharatanatyam dance recital by Ms. Deedhita Singha**, whose graceful performance mesmerized the audience and highlighted the beauty, discipline, and expressive storytelling traditions of classical Indian dance.

The cultural programme continued with another spectacular rhythmic instrumental presentation by **"Team Trephony"**, which celebrated the vibrant cultural heritage of Bengal. The group's dynamic performance, infused with traditional Bengali musical elements and contemporary presentation styles, created an electrifying atmosphere and captivated the audience throughout.

Team Trephony

The cultural evening provided an excellent opportunity for delegates from different countries and regions to experience India's rich cultural diversity and artistic heritage. The performances were warmly received and added a memorable dimension to the conference, complementing the scientific and technical deliberations of the day.

Day – 3: Sunday, 8th March, 2026

Technical Session – VI (09:30 AM – 11:30 AM)

Footwear – Future & Roadmap (TF)

Chair: Dr. K. Krishnaraj, Scientist-in-Charge, CSIR-CLRI Regional Centre, Ahmedabad

Co-Chair: Mr. Arun Kumar Chattoraj, Former General Manager, Bata India Ltd.

Right: Dr. K. Krishnaraj
Left: Mr. Arun Kumar Chattoraj
Chair and Co-Chair of Technical session -VI

The third and final day of the 13th Asian International Conference on Leather Science and Technology (AICLST 2026) commenced with **Technical Session – VI** on the theme **"Footwear – Future & Roadmap (TF)"**. The session was chaired by **Dr. K. Krishnaraj, Scientist-in-Charge, CSIR-CLRI Regional Centre, Ahmedabad**, and co-chaired by **Mr. Arun Kumar Chattoraj, Former General Manager, Bata India Ltd.**

Prior to the commencement of the session, both dignitaries were welcomed to the dais and presented with mementoes by **Dr. Buddhadeb Chattopadhyay, Former Principal, Government College of Engineering & Leather Technology (GCELT), Kolkata, and Member, AICLST Scientific Committee.**

The session focused on the future direction of the global footwear sector and addressed key challenges and opportunities associated with raw material availability, sustainable manufacturing, material innovations, automation, Artificial Intelligence, and emerging technologies. The discussions revolved around the evolving relationship between leather and non-leather materials in footwear manufacturing, environmentally responsible production practices, recycling and upcycling initiatives, cost optimization, and the growing role of digital technologies in footwear design and manufacturing.

Keynote Address by Dr. Bhabendra Nath Das
presented by Dr. Buddhadeb Chattopadhyay

The thematic areas covered during the session included:

- Raw material availability and matching leather footwear consumption with supply;
- Innovations in footwear manufacturing and sustainability;
- Upcycled, recycled, and environmentally friendly processes for footwear materials;
- Leather and non-leather combinations in footwear manufacturing;
- Matching leather processing costs with footwear industry requirements – challenges and opportunities;
- Automation and Artificial Intelligence in footwear production.

In his opening remarks, **Dr. K. Krishnaraj** welcomed the delegates and dignitaries and extended his greetings on the occasion of **International Women's Day**, acknowledging the valuable contributions of women professionals, researchers, and industry leaders present at the conference.

Introducing the theme of the session, he observed that discussions on the future of footwear can no longer be confined exclusively to leather. Referring to several presentations and discussions held during the conference, he noted that the global availability of leather has remained relatively stagnant while the demand for footwear continues to increase worldwide. This imbalance has led to the growing adoption of alternative materials and has transformed the landscape of the footwear industry.

Dr. Sujata Mondal receiving Citations by Dr. K. Krishnaraj and Mr. Arun Kumar Chattoraj

Dr. Krishnaraj emphasized that while leather footwear continues to occupy an important position in premium and specialized market segments, the future footwear industry will increasingly involve a combination of leather and non-leather materials. He highlighted three critical pillars that will shape the future of footwear manufacturing: **materials, machinery, and manufacturing technologies**.

According to him, India has already achieved considerable expertise in footwear manufacturing technologies and possesses the capability to produce footwear that meets both domestic and international quality standards. He also noted significant progress in machinery development and modernization. However, he emphasized that the development of innovative materials, particularly for non-leather footwear, remains an area requiring greater research and investment despite India being one of the world's largest footwear producers.

Paper Presentation by Dr. Suresh Kumar

He expressed confidence that the keynote address and technical presentations would provide valuable insights into addressing these challenges and help define future directions for the footwear sector.

In his remarks, **Mr. Arun Kumar Chattoraj** reflected upon the changing relationship between leather and footwear over the decades. He observed that footwear manufacturing historically originated with leather as its primary material; however, contemporary consumer preferences and changing fashion trends have significantly altered the composition of the global footwear market.

He noted that a substantial proportion of footwear products available today are manufactured using synthetic and non-leather materials such as nylon, PVC, and other advanced polymers. The growing popularity of athletic, casual, and leisure footwear has accelerated this transition. Nevertheless, he emphasized that leather continues to occupy a strong position in premium, luxury, and high-quality footwear segments, where durability, comfort, craftsmanship, and aesthetics remain highly valued.

Paper Presentation by Dr. Sadhanandham J

Mr. Chattoraj further remarked that future growth in the footwear sector will depend upon the successful integration of both leather and alternative materials, supported by innovation, sustainability, and consumer-driven design approaches. He expressed hope that the

technical presentations would provide valuable perspectives on how the industry can effectively address these evolving market dynamics.

The session featured the following presentations:

1. **Keynote Address by Dr. Bhabendra Nath Das presented by Dr. Buddhadeb Chattopadhyay** – *Shoe Manufacturing Technology: Today and Tomorrow*
2. **Dr. Sujata Mondal** – *Migration of Chemicals and Colorants in Footwear and Its Effects: Precautions and Prevention for Sustainability*
3. **Dr. Suresh Kumar** – *Development of Virtual Environment with Dynamic Simulation of Color, Texture and Design for Footwear*
4. **Dr. Sadhanandham J.** – *Design & Development of Smart Analytic Footwear for Ergonomics and Safe Fatigue Tracking for Employee Protection (SAFE-STEP)*
5. **Dr. Brijesh Kumar Sriwastava** – *Application of Biclustering Algorithm in Bioinformatics and High-Quality Leather Products*
6. **Dr. Rajesh C. M.** – *Sustainable Material Innovations in Footwear Design: Natural Fibre and Waste Rubber Reinforced Bio-Enriched Soles for Footwear Applications*
7. **Dr. Karthikeyan K.** – *A Futuristic Paradigm Shift in Footwear Manufacturing: An Approach to Innovation and Sustainability through Additive Manufacturing (3D Printing)*
8. **Dr. R. Sathiyaraj** – *Development of Smart and Modular Electrical Hazard (EH)-Rated Boots for Enhanced Protection, Monitoring, and Sustainability*

The keynote address on **"Shoe Manufacturing Technology – Today and Tomorrow"** was originally

scheduled to be delivered by **Dr. Bhabendra Nath Das**, former Head of the Shoe and Product Design Centre. Due to serious illness, Dr. Das was unable to attend the conference in person. However, demonstrating his commitment to the scientific community, **Dr. Buddhadeb Chattopadhyay** delivered his keynote address.

Paper presentation by Dr. Brijesh Kumar Sriwastava

The keynote presentation provided a comprehensive overview of the evolution of shoe manufacturing technologies and examined the transformative developments shaping the future of the footwear industry. Dr. Chattopadhyay discussed the transition from traditional manufacturing systems to modern digitally integrated production environments characterized by automation, intelligent manufacturing, computer-aided design, advanced materials, and sustainability-driven innovations.

Paper presentation by Dr. Rajesh C. M

Particular emphasis was placed on the growing influence of digital technologies, simulation tools, smart manufacturing systems, and additive manufacturing processes in enhancing product quality, reducing development cycles, and improving manufacturing efficiency. The keynote also highlighted the increasing importance of customization, consumer-centric design, sustainable materials, and environmentally responsible production methods in defining the future roadmap of the footwear sector.

The subsequent technical presentations reflected many of these emerging trends. Several speakers showcased innovations in smart footwear systems, digital design

environments, virtual product development, advanced protective footwear, sustainable materials, and data-driven manufacturing approaches.

Dr. Karthikeyan K receiving Citations by Dr. K. Krishnaraj and Mr. Arun Kumar Chattoraj

Research on smart footwear technologies demonstrated how wearable electronics, sensors, and monitoring systems can improve worker safety, ergonomics, and health tracking. Other presentations explored the use of advanced computational tools, simulation environments, and artificial intelligence to optimize footwear design, material selection, and manufacturing processes.

The session also highlighted the growing significance of sustainability within footwear manufacturing. Presentations on waste rubber utilization, natural fibre-reinforced composites, chemical migration prevention, and environmentally friendly materials demonstrated the industry's increasing commitment to circular economy principles and responsible production practices.

Particular interest was generated by the presentation on **3D printing and additive manufacturing**, which showcased how emerging manufacturing technologies are expected to revolutionize footwear production through customization, material efficiency, rapid prototyping, and reduced environmental impact.

Following the technical presentations, **Dr. Bhabendra Nath Das** was presented with a **Memento and Citation** in recognition of his keynote address. Since Dr. Das was unable to attend the conference physically, the memento and citation were received on his behalf by **Dr. Buddhadeb Chattopadhyay**.

Dr. Sujata Mondal discussed the migration of chemicals and colorants from footwear materials and their potential impact on consumer health and the environment. The presentation highlighted preventive measures, regulatory considerations, and sustainable manufacturing practices aimed at minimizing chemical risks and enhancing product safety.

Dr. Suresh Kumar presented the development of a virtual design environment capable of dynamically simulating footwear colour, texture, and design variations. The technology enables faster product development, reduces material wastage, and supports more efficient decision-making during the design process.

Paper Presentation by Dr. R. Sathiyaraj

Dr. Sadhanandham J. showcased SAFE-STEP, an innovative smart footwear system designed to monitor user fatigue and ergonomic parameters in real time. The technology has significant potential for improving workplace safety, employee well-being, and occupational health management.

Dr. Brijesh Kumar Sriwastava explored the application of advanced biclustering algorithms for analysing complex datasets in bioinformatics and leather production. The presentation demonstrated how data analytics can support process optimization, quality improvement, and informed decision-making in the manufacture of high-quality leather products.

The Chair and Co-Chair were felicitated with **plants and citations** by **Dr. Buddhadeb Chattopadhyay**

Dr. Rajesh C. M. presented sustainable footwear sole materials developed using natural fibres and recycled waste rubber. The study highlighted the potential of bio-enriched composites to enhance product performance while reducing environmental impact and promoting circular economy principles.

Dr. Karthikeyan K. discussed the transformative role of additive manufacturing in the footwear sector. The presentation demonstrated how 3D printing technologies can enable customized production, reduce material wastage, shorten development cycles, and contribute to more sustainable manufacturing practices.

Dr. R. Sathiyaraj presented the development of smart modular electrical hazard-rated safety boots designed to provide enhanced protection in high-risk work environments. Equipped with monitoring capabilities and sustainable design features, the footwear offers improved safety, durability, and operational efficiency.

All other paper presenters were also presented with **Citations** by **Dr. K. Krishnaraj** and **Mr. Arun Kumar Chattoraj** in appreciation of their valuable scientific contributions and participation in the conference.

Thereafter, both the Chair and Co-Chair were felicitated with **plants and citations** by **Dr. Buddhadeb Chattopadhyay** as a token of appreciation for their guidance, leadership, and successful conduct of the technical session.

The session concluded with an optimistic outlook on the future of the footwear industry and reinforced the importance of innovation, sustainability, advanced manufacturing technologies, and interdisciplinary collaboration in shaping the next generation of footwear products and manufacturing systems.

Technical Session – VII (12:00 PM – 01:00 PM)

Marketing Policy & Strategy (TM)

Chair: Mr. N. R. Jagannathan, President, ILTA Southern Region

Co-Chair: Dr. S. Rajamani, Vice President, ILTA & Technical Chair, 13th AICLST *(in the absence of Mr. Md. Azhar, Chairman, ILPA, due to prior commitments)*

The final technical session of the 13th Asian International Conference on Leather Science and Technology (AICLST 2026) was held on the theme **"Marketing Policy & Strategy (TM)"**. The session was chaired by **Mr. N. R. Jagannathan, President, ILTA Southern Region**, and co-chaired by **Dr. S. Rajamani, Vice President, ILTA and Technical Chair of the 13th AICLST**.

Right: Mr. N. R. Jagannathan
Left: Dr. S. Rajamani
Chair and Co-Chair of Technical session -VII

Prior to the commencement of the session, both dignitaries were welcomed to the dais and presented with mementoes by **Dr. Buddhadeb Chattopadhyay, Former Principal, Government College of Engineering & Leather Technology (GCELT), Kolkata, and Member, AICLST Scientific Committee.**

Keynote Address by Mr. G. M. Kapur

The session focused on the strategic dimensions of marketing and branding within the leather sector, addressing topics such as marketing environment analysis, product innovation and development, market research and consumer understanding, digital content marketing, sustainability-driven branding, and policy advocacy for country-specific marketing initiatives.

In his opening address, **Mr. N. R. Jagannathan** warmly welcomed the distinguished guests, industry leaders, delegates, researchers, and participants to the session. He emphasized that while the conference had extensively deliberated on leather science, technology, processing methodologies, and sustainability, the ultimate success of all such efforts depends on the ability of the industry to effectively connect with the end consumer.

He observed that regardless of technological advancement or manufacturing excellence, the true value of any product is realized only when it successfully reaches the market and creates value for consumers. Therefore, marketing strategy occupies a central position in determining the future growth and competitiveness of the leather sector.

Reflecting on the historical evolution of the Indian leather industry, Mr. Jagannathan noted that India has long served as a crucial component of the global leather supply chain. The country has consistently delivered world-class craftsmanship, manufacturing expertise, and large-scale production capabilities. However, despite these strengths, India has often remained invisible to the final consumer, while brand ownership, design leadership, and market intelligence largely remained concentrated in overseas markets.

He remarked that for many decades, Indian manufacturers contributed significantly to global brands but received only a limited share of the overall value generated across the supply chain. According to him, this situation must change, and the time has arrived for India—as well as other Asian nations—to move beyond the role of suppliers and contract manufacturers and emerge as brand creators, market leaders, and market makers.

Paper presentation by Mr. Chandan Panda

Mr. Jagannathan stressed that the industry must invest significantly in consumer research, market intelligence, design development, and brand building. He advocated for the creation of globally recognized brands that proudly reflect the identity, craftsmanship, and heritage of India and Asia.

He further observed that marketing today extends far beyond conventional advertising. Modern marketing encompasses strategic planning, policy advocacy, innovation management, sustainability communication, storytelling, customer engagement, and long-term brand development. Success in contemporary markets depends upon the ability to effectively communicate authenticity, sustainability, transparency, and value to increasingly conscious consumers.

Highlighting successful examples from within the industry, he referred to leading brands such as **Bata, Liberty, Mochi, Mirza, Superhouse, Tata, and iDesign**, which have demonstrated that strong market presence, consumer trust, and brand loyalty can be successfully developed. These organizations have established significant recognition in domestic markets and provide valuable models for future global expansion.

Paper presentation by Mr. Sudipta Banerjee

Mr. Jagannathan emphasized that today's global consumers are increasingly concerned about sustainability, ethical sourcing, traceability, environmental responsibility, and product authenticity. Consumers are often willing to pay premium prices for products that align with their values and provide transparency regarding their origin and manufacturing processes.

He noted that India possesses unique strengths in this regard. The country's leather craftsmanship is rooted in centuries-old traditions, its artisans possess highly specialized skills, and its tanning heritage represents a valuable cultural and industrial asset. These strengths, he remarked, should not merely be viewed as production capabilities but as powerful brand assets capable of generating significant global market value.

He further stressed that the challenge lies in translating these assets into strong global brand equity through effective marketing strategies. Key questions that the industry must address include how Indian leather products should be positioned internationally, how awareness of Indian leather can be enhanced globally, and how evolving consumer expectations regarding lifestyle, aesthetics, sustainability, ethics, and quality can be effectively understood and addressed.

He concluded by encouraging delegates to actively engage with the presentations, challenge assumptions, ask critical questions, and consider how their own organizations, factories, brands, and partnerships can contribute towards building a stronger and more globally recognized leather industry.

The session featured the following presentations:

1. **Keynote Address by Mr. G. M. Kapur** – *Marketing Policy and Strategy for Leather 2050: Challenges and Opportunities*
2. **Mr. Chandan Panda** – *Leather Aesthetics of Bengal: Bridging Indigenous Craft with Contemporary Style*
3. **Mr. Sudipta Banerjee** – *India's Smart Leather Future: Building Lean, Agile, Resilient and Responsible Value Chains through Industry 4.0–5.0 Transitions*
4. **Mr. Soumak Banerjee** – *Consumers' Willingness to Pay for Sustainable Leather: A Quantitative Analysis of Eco-Attributes, Traceability, and Ethical Orientation*

The keynote address delivered by **Mr. G. M. Kapur** on **"Marketing Policy and Strategy for Leather 2050: Challenges and Opportunities"** provided a forward-looking perspective on the future of the leather sector. The presentation examined long-term market trends, evolving consumer expectations, sustainability-driven purchasing behaviour, digital transformation, and the strategic initiatives required to position leather as a preferred material in future global markets.

The subsequent presentations addressed a broad spectrum of issues ranging from innovation-driven growth strategies and circular economy models to regional design identity, sustainability, Industry 4.0–5.0 transitions, and consumer behaviour analysis. Together, these presentations provided a comprehensive overview of the strategic, technological, and marketing interventions necessary for strengthening the global competitiveness of the leather sector.

Particular attention was given to the growing importance of sustainability, traceability, consumer awareness, responsible value chains, and circular economy principles. The discussions highlighted that future success in the leather industry will depend not only on technological excellence but also on the ability to effectively communicate value, authenticity, responsibility, and innovation to consumers worldwide.

Online Paper presentation by Mr. Soumak Banerjee

The session served as a fitting conclusion to the technical deliberations of AICLST 2026 by emphasizing that scientific innovation, technological advancement, sustainability, and marketing strategy must work together to ensure the long-term growth and global relevance of the leather industry.

Following the technical presentations, **Mr. G. M. Kapur** was presented with a **Memento and Citation** in recognition of his keynote address and valuable contribution to the conference. All other paper presenters were also presented with **Citations** by **Mr. N. R. Jagannathan** and **Dr. S. Rajamani** in appreciation of their scientific and professional contributions to the session.

The Chair and Co-Chair were felicitated with **plants and citations** by **Dr. Buddhadeb Chattopadhyay**

Thereafter, both the Chair and Co-Chair were felicitated with **plants and citations** by **Dr. Buddhadeb Chattopadhyay** as a token of appreciation for their guidance, leadership, and successful conduct of the session.

It was also noted that a total of **38 poster presentations** were exhibited across the various technical themes of the conference. The poster presentations attracted considerable interest from delegates and provided an excellent platform for one-to-one scientific interaction, discussion, and exchange of ideas. **Certificates were presented to all poster presenters** in recognition of their valuable contributions to the scientific programme of AICLST 2026.

Valedictory Session

The **Valedictory Session** marked the formal conclusion of the **13th Asian International Conference on Leather Science and Technology (AICLST 2026)**. The session was chaired by a distinguished panel comprising **Dr. Buddhadeb Chattopadhyay, Member, AICLST Scientific Committee and Former Principal, GCELT, Kolkata; Dr. J. Raghava Rao, Member, AICLST Scientific Committee and Vice President, ILTA Southern Region; Dr. B. Chandrasekaran, Former Director, CSIR-Central Leather Research Institute (CLRI), Chennai; Mr. N. R. Jagannathan, President, ILTA Southern Region; and Mr. Asit Baran Kanungo, Vice President, ILTA and Coordinator, AICLST Working Committee.**

Valedictory Session Panel

The session provided an opportunity to reflect upon the successful completion of three days of intensive scientific deliberations, knowledge sharing, networking, and collaboration among researchers, academicians, industry leaders, technologists, and students from different parts of the world. During their addresses, the dignitaries highlighted the significance of the conference in advancing leather science and technology and appreciated the high quality of research papers, technical discussions, keynote lectures, poster presentations, and industry interactions that had taken place throughout the event. They noted that the conference had successfully addressed several contemporary issues confronting the leather sector, including sustainability, carbon footprint reduction, circular economy approaches, Artificial Intelligence, innovative process technologies, footwear development, and strategic marketing initiatives.

The speakers also acknowledged the active participation and valuable contributions of delegates, researchers, industry professionals, sponsors, exhibitors, and supporting organizations, all of whom played an important role in making the conference a grand success. The deliberations conducted during the conference were recognized as meaningful contributions towards shaping the future direction of the global leather and footwear industry.

Dignitaries jointly felicitated **Dr. Piku Sen**, Oral Paper Presenter and **Master of Ceremony** of the conference, with a **Memento and Plant**

As a special gesture of appreciation, the dignitaries jointly felicitated **Dr. Piku Sen**, Oral Paper Presenter and **Master of Ceremony** of the conference, with a **Memento and Plant** in recognition of her valuable contribution towards the successful conduct of the scientific sessions and overall coordination of the conference proceedings.

The valedictory session concluded with an address by **Mr. Asit Baran Kanungo**, Vice President, ILTA and Coordinator, AICLST Working Committee. On behalf of the **Indian Leather Technologists' Association (ILTA)**, he expressed sincere gratitude to all stakeholders who contributed to the success of the conference. He conveyed his heartfelt appreciation to the **Sponsors, Advertisers, Delegates, Speakers, Poster Presenters, Session Chairs, Scientific Committee Members, Organizing Committee Members, Supporting Organizations, and Volunteers** for their enthusiastic participation, cooperation, and unwavering support throughout the event.

Mr. Kanungo also acknowledged the efforts of the conference secretariat and organizing team for their dedication and meticulous planning, which ensured the smooth execution of all technical, scientific, cultural, and networking activities associated with the conference.With the completion of the valedictory proceedings, the **third day as well as the 13th AICLST 2026 officially came to a close**. Delegates and participants then assembled in the dining hall for **high tea**, providing one final opportunity for interaction, networking, and exchange of ideas before departure.

Based on the feedback received from delegates, speakers, sponsors, exhibitors, and participants, the conference was widely regarded as a resounding success. The event successfully fulfilled its objectives of promoting scientific excellence, fostering international collaboration, encouraging innovation, and facilitating meaningful discussions on the future of the leather and footwear sector. The positive response from participants reaffirmed the relevance and importance of AICLST as one of the premier international platforms for advancing leather science, technology, sustainability, and industry development.

Thus, the **13th Asian International Conference on Leather Science and Technology (AICLST 2026)** concluded on a highly successful note, leaving participants with valuable insights, new collaborations, and a shared commitment towards building a more innovative, sustainable, and globally competitive leather industry.

Acknowledgement of Organizing Structure and Committees

The Organizing Committee of the **13th Asian International Conference on Leather Science and Technology (AICLST 2026)** records its sincere appreciation to all office bearers, committee members, reviewers, coordinators, volunteers, sponsors, speakers, delegates, and supporting organizations whose collective efforts contributed to the successful organization of the conference.

Organizing Committee

Name	Role	Affiliation
Padma Bhushan Dr. T. Ramasami	Chief Patron	Former Secretary, Department of Science & Technology, Government of India
Mr. Arnab Jha	Chairman, Organizing Committee	President, ILTA
Dr. P. Thanikavelan	Co-Chairman, Organizing Committee	Director, CSIR-CLRI
Dr. K. J. Sreeram	Conference Chair	Outstanding Scientist, CSIR-CLRI
Dr. S. Rajamani	Chairman, Technical Committee	Vice President, ILTA
Mr. Ramesh Juneja	Principal Associate	Chairman, Council for Leather Exports (CLE)

Conference Leadership

Position	Name
Chief Patron	Padma Bhushan Dr. T. Ramasami
Working President	Mr. Arnab Jha
Coordinator	Mr. Asit Baran Kanungo
General Secretary	Mr. Susanta Mallick

Steering Committee

Name	Affiliation
Mr. Arnab Jha	President, ILTA
Mr. Asit Baran Kanungo	Vice President, ILTA
Mr. Susanta Mallick	General Secretary, ILTA
Dr. S. Rajamani	Vice President, ILTA
Dr. K. J. Sreeram	Director, CSIR-CLRI, Chennai

Working Committee

Coordinator	Team Members
Mr. Asit Baran Kanungo	Mr. N. R. Jagannathan, Dr. Buddhadeb Chattopadhyay, Dr. J. Raghava Rao, Dr. Swarna V. Kanth, Mr. Diganta Ghosh, Mr. Susanta Mallick, Mr. Tapan Nandy, Md. Azhar, Mr. Rajiv Bhatia, Mr. Ratan Chowdhury, Dr. N. Nishad Fathima, Mr. Pulok Mazumder, Mr. Bibhas Chandra Jana, Mr. Pradipta Konar, Mr. Amit Mondal, Mr. Kunal Naskar, Mr. Abhijit Das, Mr. Kaushik Bhuiyan, Mr. Ajay Kumar Mishra, Dr. Malathy Jawahar, Dr. Sathish M., Mr. Laxmi Narayan Sahoo

Scientific Committee

Name	Country
Dr. Buddhadeb Chattopadhyay	India
Dr. Bhabendra Nath Das	India
Dr. J. Raghava Rao	India
Prof. Bi Shi	China
Mr. Chen Zhanguang	China
Mr. Ivan Kral (UNIDO)	Vienna, Austria
Prof. Jianzhong Ma	China
Mr. Jen Yu (Thomas Yu) Cheng	Taiwan
Dr. Geoff Holmes	New Zealand

Peer Review Committee

Name	Affiliation
Prof. (Dr.) Sanjoy Chakraborty	Former Principal, GCELT, Kolkata
Dr. N. Nishad Fathima	Chief Scientist, Head, Inorganic & Physical Chemistry, CSIR-CLRI; Professor, AcSIR
Dr. Aravindhan R.	Senior Principal Scientist, Leather Process Technology, CSIR-CLRI
Dr. Avinash Garg	Retired Chief Scientist, CSIR-CLRI, Kanpur
Dr. K. Sri Bala Kameswari	Chief Scientist, Environmental Engineering Laboratory, CSIR-CLRI
Mr. Sumanta Chatterjee	Associate Professor, HBTU, Kanpur
Dr. Goutam Mukherjee	Professor & HoD, Leather Technology Department, GCELT, Kolkata
Mr. Pulok Mazumder	Leather Technologist & Consultant
Dr. Shailendra Bajpai	Professor, Chemical Engineering, NIT Jalandhar
Mr. Ramesh Subramanium	Former President, Sri City Industrial Park & Former Vice President, TATA International
Dr. P. K. Nanda	Principal Scientist, ICAR-IVRI, Kolkata
Mr. G. M. Kapur	Chairman, AIMA Eastern India LMAs

Functional Committees

Committee	Coordinator	Team Members
Finance Committee	Mr. Ratan Chowdhury	Dr. Swarna V. Kanth, Mr. Laxmi Narayan Sahoo
Reception Committee	Mr. Bibhas Chandra Jana	Dr. Malathy Jawahar, Mr. Ajay Kumar Mishra, Mr. Aniruddha De
Logistics Committee	Mr. Pradipta Konar	Sri Nayan Sarkar
Registration Committee	Mr. Amit Mondal	Dr. Sandipan Banerjee
Dias Management Committee	Mr. Kunal Naskar	Dr. Sathish Murali, Mr. Sujit Karmakar, Mr. Arkoprabha Patra, Mr. Saikat Marik
Food Committee	Mr. Abhijit Das	Sri John Minz
Cultural Committee	Mr. Kaushik Bhuiyan	Mr. Subir Datta

Vote of Appreciation

The Organizing Committee expresses its heartfelt gratitude to all committee members, coordinators, volunteers, sponsors, advertisers, speakers, poster presenters, delegates, supporting institutions, and industry partners for their invaluable contributions. Their dedication, professionalism, and teamwork were instrumental in making the **13th AICLST 2026** a highly successful international conference and a significant platform for advancing leather science, technology, sustainability, and global collaboration.

Special Recognition

Dr. Piku Sen

Oral Paper Presenter & Master of Ceremony

The Organizing Committee extends its special appreciation to **Dr. Piku Sen** for her outstanding contribution as the **Master of Ceremony** throughout the conference.

Dr. Sen successfully anchored and conducted the proceedings of all three days of the conference with remarkable professionalism, confidence, and efficiency. Her ability to coordinate the various technical sessions, plenary lectures, inaugural and valedictory programmes ensured smooth transitions between events and significantly contributed to the overall success of the conference.

In addition to her role as an Oral Paper Presenter, Dr. Sen provided valuable coordination support to the Organizing Committee and played an instrumental role in maintaining the schedule and flow of the conference proceedings.In recognition of her dedicated service and contribution, Dr. Piku Sen was felicitated during the Valedictory Session.

Mr. Asit Baran Kanungo

Vice President, ILTA
Conference Coordinator

The Organizing Committee records its deepest appreciation to **Mr. Asit Baran Kanungo**, Vice President, ILTA, for his exemplary leadership and commitment as the **Conference Coordinator** of the 13th AICLST.

From the initial planning stages to the successful conclusion of the conference, Mr. Kanungo played a pivotal role in coordinating the activities of various committees, liaising with delegates, speakers, sponsors, and supporting organizations, and ensuring the seamless execution of all conference-related activities.

His dedication, organizational skills, and tireless efforts were instrumental in bringing together stakeholders from academia, research institutions, industry, and international organizations, thereby contributing significantly to the success of the conference.

Mr. Susanta Mallick

General Secretary, ILTA

The Organizing Committee expresses its sincere gratitude to **Mr. Susanta Mallick**, General Secretary, ILTA, for his invaluable contribution towards the planning and execution of AICLST 2026.

Mr. Mallick provided continuous administrative support and guidance throughout the conference preparation process. His active involvement in coordinating committee activities, managing conference logistics, supporting delegate services, and ensuring smooth operational functioning greatly contributed to the successful conduct of the event.

His commitment and dedication were vital in ensuring that all arrangements were executed efficiently and professionally.

Mr. Arnab Jha

President, ILTA
Working President, AICLST 2026

The Organizing Committee places on record its profound appreciation to **Mr. Arnab Jha**, President, ILTA and Working President of the Conference, for his visionary leadership and unwavering support.

As Chairman of the Organizing Committee, Mr. Jha provided strategic direction and leadership throughout the planning and implementation of the conference. His commitment to promoting scientific excellence, fostering international collaboration, and strengthening the global presence of the leather sector was reflected in every aspect of the conference programme.

His guidance, encouragement, and active involvement were instrumental in ensuring that the 13th AICLST emerged as a successful international platform for knowledge exchange and innovation.

Padma Bhushan Dr. T. Ramasami

Chief Patron, AICLST 2026

The Organizing Committee expresses its heartfelt gratitude to **Padma Bhushan Dr. T. Ramasami**, Chief Patron of the 13th AICLST, for his invaluable guidance, inspiration, and continued support.

As one of the most respected leaders in the fields of science, technology, and leather research, Dr. Ramasami provided the intellectual vision that guided the conference. His inaugural address, plenary lecture, and active participation throughout the event inspired delegates and provided important perspectives on sustainability, innovation, global competitiveness, and the future of the leather and footwear sector.

His encouragement and mentorship played a vital role in shaping the scientific direction and international significance of the conference.

Mr. Tanmay Sil

TAS Company

The Organizing Committee extends its sincere appreciation to **Mr. Tanmay Sil of TAS Company** for his dedicated efforts in producing the **AICLST 2026 Proceedings**.

The conference proceedings serve as a valuable repository of the scientific contributions presented during the conference and represent an important knowledge resource for researchers, academicians, students, and industry professionals. Mr. Sil's professionalism, attention to detail, and commitment to quality ensured the timely production and successful publication of the conference proceedings.

The Organizing Committee gratefully acknowledges his contribution towards preserving and disseminating the scientific outcomes of the conference.

Dr. Buddhadeb Chattopadhyay & Dr. Jonnalagadda Raghava Rao

The Organizing Committee places on record its deep sense of appreciation and gratitude to the Honorary Joint Editors of the Proceedings of the XIII Asia International Conference on Leather Science & Technology (AICLST 2026):

Dr. Buddhadeb Chattopadhyay
Dr. Jonnalagadda Raghava Rao

The successful publication of the Conference Proceedings is a testimony to their unwavering commitment, scholarly expertise, and meticulous attention to detail. The task involved not only compiling the scientific papers presented during the conference but also coordinating extensively with authors, reviewing submissions, ensuring adherence to prescribed guidelines, and maintaining the high technical and academic standards expected of an international conference of this stature.

Both the Honorary Joint Editors devoted considerable time and effort in scrutinizing manuscripts, communicating with authors for revisions and clarifications, verifying technical content, and overseeing the editorial process from manuscript submission to final publication. Their dedicated engagement with contributors helped improve the quality, clarity, and scientific value of the papers included in the Proceedings. Through their guidance and perseverance, the Proceedings emerged as a comprehensive and valuable repository of contemporary research, innovation, and technological developments in leather science and technology.

The Organizing Committee also gratefully acknowledges the cooperation extended by all authors, reviewers, technical experts, and contributors whose collective efforts enriched the scientific content of the Proceedings. The publication stands as a lasting record of the knowledge shared, ideas exchanged, and collaborations fostered during AICLST 2026.

Special appreciation is also extended to all those involved in the production, design, formatting, and dissemination of the Proceedings, ensuring that the valuable research contributions presented during the conference are preserved for the benefit of the global leather fraternity.

Readers interested in viewing, reading, or downloading the Proceedings may visit:

• ILTA Digital Library: https://digitalilta.org/publication-book-details.jsp?data=9

• ILTA Official Website: https://iltaonleather.org/iltanew/

The Organizing Committee also acknowledges the efforts of all authors, reviewers, editors, and contributors whose collective participation made the publication of the Proceedings possible.

Formal Acknowledgement

The Organizing Committee of the **13th Asian International Conference on Leather Science and Technology (AICLST 2026)** expresses its sincere gratitude and appreciation to all individuals and organizations whose support, participation, and contributions made the conference a resounding success.

Special thanks are extended to:

- **All Delegates** for their enthusiastic participation and valuable interactions.
- **All Speakers, Keynote Speakers, Plenary Speakers, and Session Chairs** for sharing their expertise and enriching the scientific discussions.
- **All Poster Presenters** for contributing innovative research and fostering technical exchange.
- **Sponsors and Supporting Organizations** for their generous support and commitment towards advancing leather science and technology.
- **Exhibitors and Industry Partners** for showcasing innovative products, services, and technologies.
- **Members of the Organizing, Steering, Scientific, Peer Review, and Working Committees** for their dedicated efforts in planning and executing the conference.
- **Volunteers and Support Personnel** for their tireless assistance throughout the event.
- **ILTA Office Staff** for their continuous administrative support and efficient management of conference activities.
- **The Telegraph**, the official media partner, for its valuable support in promoting the conference and enhancing its outreach and visibility.

The Organizing Committee gratefully acknowledges the collective efforts of all stakeholders whose dedication, cooperation, and professionalism contributed to making the **13th Asian International Conference on Leather Science and Technology (AICLST 2026)** a memorable and highly successful international event.

The success of AICLST 2026 stands as a testament to the power of collaboration, scientific excellence, and a shared commitment towards advancing innovation, sustainability, and global cooperation within the leather and footwear sector.

Conference Outcomes and Recommendations

The **13th Asian International Conference on Leather Science and Technology (AICLST 2026)** successfully brought together researchers, academicians, industry leaders, policymakers, technologists, and students from across Asia and beyond to deliberate on emerging challenges, opportunities, and innovations in the leather and footwear sector. The conference provided a vibrant platform for scientific exchange, technology dissemination, industry interaction, and collaborative networking.

The deliberations, presentations, discussions, and interactions during the three-day conference generated several significant outcomes and recommendations that are expected to influence the future direction of leather science, technology, sustainability, and business development.

Scientific Outcomes

The conference demonstrated that the leather sector is undergoing a significant transformation driven by sustainability, digitalization, advanced materials, and circular economy principles.

Key scientific outcomes included:

- Presentation of **94 peer-reviewed scientific papers**, comprising **54 oral presentations** and **38 poster presentations**, covering six major thematic areas.
- Strong emphasis on **responsible innovation**, with nearly **98% of the presented research focusing on sustainability, carbon footprint reduction, cleaner production technologies, circular economy practices, and productivity enhancement.**
- Significant advancements were reported in **Artificial Intelligence, Machine Learning, Digital Platforms, Automation, Robotics, Smart Manufacturing, and Data Analytics** for leather and footwear applications.
- Development of innovative **chrome-free tanning systems**, bio-based chemicals, sustainable fatliquoring technologies, nanotechnology applications, and advanced finishing materials.
- Research demonstrating effective utilization of industrial waste streams and by-products through value-added applications, supporting resource efficiency and waste minimization.
- Enhanced understanding of livestock management, genetic improvement, traceability systems, and disease control measures for improving hide and skin quality.
- New scientific insights into carbon footprint assessment, decarbonization pathways, wastewater remediation, phytoremediation, and carbon capture opportunities within the leather sector.
- Emerging developments in smart footwear, wearable technologies, additive manufacturing, virtual design environments, and customized footwear production.

The conference reinforced the growing role of interdisciplinary research and highlighted the importance of integrating science, engineering, digital technologies, environmental management, and consumer-focused innovation.

Industry Outcomes

The conference generated valuable insights for industry stakeholders and reinforced the need for strategic transformation within the leather and footwear sector.

Major industry outcomes included:

- Recognition that the future competitiveness of the leather industry will increasingly depend upon **innovation, sustainability, premiumization, and brand development.**
- Strong consensus that leather should position itself as a **high-value, premium, sustainable material** capable of offering distinct advantages over alternative materials.
- Increased awareness regarding the importance of **consumer-centric product development**, traceability, transparency, and ethical manufacturing practices.
- Identification of significant opportunities in **specialized footwear, smart products, performance materials, protective equipment, and customized manufacturing.**
- Recognition of the growing role of **Artificial Intelligence, Industry 4.0–5.0 technologies, digital platforms, and predictive analytics** in improving operational efficiency and decision-making.
- Emphasis on strengthening collaboration between academia, research institutions, chemical suppliers, manufacturers, exporters, and policymakers.
- Reinforcement of the need to develop globally recognized Asian and Indian brands capable of capturing higher value within international markets.
- Increased focus on creating agile, resilient, and technology-driven value chains capable of adapting to changing market demands.

The conference highlighted that future growth will depend not only on manufacturing excellence but also on branding, innovation, sustainability communication, and market intelligence.

Sustainability Outcomes

Sustainability emerged as the most dominant theme across the conference and formed the foundation of many technical discussions.

Important sustainability outcomes included:

- Broad agreement on the necessity of aligning the leather and footwear sector with **Net Zero Carbon Footprint objectives** and global climate commitments.
- Promotion of **Carbon Capture and Utilization (CCU)** technologies as important tools for future industrial sustainability.
- Increased emphasis on **circular economy models**, resource recovery, waste valorization, recycling, and upcycling strategies.
- Presentation of innovative approaches for converting tannery waste into high-value products including nanofibers, bio-based chemicals, and functional materials.
- Demonstration of sustainable wastewater treatment technologies, algal remediation systems, phytoremediation approaches, and ecosystem-based environmental management.
- Recognition of wetlands and natural ecosystems as important contributors to carbon sequestration, wastewater remediation, and environmental protection.
- Increased adoption of renewable, bio-based, and environmentally friendly chemicals and materials within leather processing.
- Growing acceptance of digital platforms and sustainability assessment tools for measuring and managing environmental performance.

The conference reaffirmed that sustainability is no longer an optional consideration but a fundamental requirement for the long-term viability of the leather sector.

Future Collaboration Opportunities

The conference successfully strengthened regional and international cooperation among researchers, institutions, and industry stakeholders.

Several opportunities for future collaboration were identified:

- Expansion of collaborative research programmes among Asian countries in leather science, technology, sustainability, and footwear development.
- Joint projects focusing on Artificial Intelligence, carbon management, circular economy practices, advanced materials, and sustainable manufacturing systems.
- Increased cooperation between academia and industry for technology transfer and commercialization of research outcomes.
- Development of international knowledge-sharing platforms to facilitate exchange of scientific information and best practices.
- Collaborative initiatives on traceability systems, sustainability certification, environmental compliance, and responsible sourcing.
- Strengthening partnerships among research organizations, universities, industry associations, and international agencies.
- Promotion of student exchange programmes, technical training initiatives, and capacity-building activities across participating countries.
- Establishment of thematic research networks dedicated to emerging areas such as smart materials, advanced footwear technologies, additive manufacturing, and green chemistry.

The conference demonstrated the value of international cooperation in addressing common challenges facing the global leather and footwear industry.

Recommendations for Future AICLST Conferences

Based on the deliberations and feedback received from participants, the following recommendations are proposed for future editions of AICLST:

Scientific and Technical Recommendations

- Continue prioritizing sustainability-focused research themes.
- Expand dedicated sessions on Artificial Intelligence, Machine Learning, Industry 4.0–5.0, and digital transformation.
- Increase focus on carbon neutrality, climate resilience, and environmental innovation.
- Encourage greater participation from emerging researchers, students, and early-career professionals.
- Promote interdisciplinary research involving materials science, biotechnology, environmental engineering, and digital technologies.

Industry and Business Recommendations

- Strengthen industry participation through dedicated business forums and technology showcase sessions.
- Facilitate greater interaction between researchers and industry practitioners to accelerate technology adoption.
- Promote discussions on branding, market intelligence, consumer behaviour, and global market access.
- Encourage greater focus on value-added products and premium market opportunities.

Sustainability Recommendations

- Develop a dedicated sustainability and decarbonization track in future conferences.
- Promote case studies demonstrating successful implementation of circular economy and carbon reduction initiatives.
- Encourage the adoption of sustainability metrics and environmental performance benchmarking across the industry.

International Collaboration Recommendations

- Expand participation from additional countries and international organizations.
- Strengthen global networking opportunities through collaborative workshops and roundtable discussions.
- Encourage multi-country research consortia addressing common industry challenges.

Conference Development Recommendations

- Increase opportunities for poster discussions and interactive technical sessions.
- Expand industry exhibitions and technology demonstration platforms.
- Develop stronger digital engagement through online proceedings, webinars, and post-conference knowledge-sharing initiatives.
- Create mechanisms for tracking implementation of recommendations and outcomes from successive AICLST conferences.

Concluding Remarks

The **13th AICLST 2026** successfully fulfilled its objective of creating a premier platform for scientific exchange, technological innovation, sustainability dialogue, and international collaboration within the leather and footwear sector. The conference demonstrated that the future of the industry lies in the integration of science, sustainability, digital technologies, responsible manufacturing, and strategic market development.

The outcomes and recommendations emerging from the conference provide a valuable roadmap for researchers, industry stakeholders, policymakers, and institutions committed to building a more innovative, sustainable, resilient, and globally competitive leather industry.