Dr B Chandrasekaran, Director, CSIR-CLRI receiving the prestigious ‘National Project Excellence Award’ of PMA for Year 2016 at the Project Management Global Summit held in New Delhi on 21st August 2017. The Award goes to CSIR-CLRI for the “Twinning Project at LIDI, Ethiopia”
Dear Doyens and Members of the Indian Leather Fraternity; Colleagues from CSIR; Mentors and Teachers, Colleagues and Friends! It gives us great pleasure in sending you our August 2017 edition of The LEATHER POST.

This edition is a delight to read as we have many Industry-Research activities and programmes covered. We are very happy to be the recipient of the “National Project Excellence Award” of Project management Associates for Year 2016. As a special feature, we have covered the role of CSIR-CLRI in Leather Chemicals and we have traced it from our very beginning. The special Independence Day 2017 edition of India Today features CSIR which we have re-produced on the back page for your reading.

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

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

We will strive to make this magazine informative and interesting and welcome your feedback for improvement.

24th August 2017

Dr B Chandrasekaran, 
Director, CSIR-CLRI

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Dear Dr. B. Chandrasekaran,

Our congratulations to CSIR-CLRI Team!

Winners of CSIR Technology Awards - 2017 have been decided. CSIR-CLRI’s nomination titled “Water less Chrome Tanning Technology” has been selected jointly with CSIR - CMERI’s nomination titled “Development of Community Level Iron Removal Plant & Their Implementation in Rural Areas to Supply Iron Free Drinking Water” for the “Innovation” category of the said awards.

The award carries a cash prize of Rs. 2.00 lakh, a plaque and a citation.

Following the practice in place, the award will be presented to CSIR-CLRI in a specially organized ceremony on September 26, 2017, the CSIR Foundation Day at New Delhi. We’ll let you know the necessary details of the ceremony in due course.

It is our pleasure to invite you to attend the Award Ceremony along with lead member(s) of the team to receive the award.

We sincerely hope that this Award would inspire all those at CSIR-CLRI not only to accelerate their efforts of innovating more and more but also to deploy innovations, in an end to end manner successfully, for the benefit of the stakeholders.

With warm regards,

Yours sincerely,

(Anjan Ray)

Dr. B. Chandrasekaran
Director
CSIR - Central Leather Research Institute,
Adyar, Chennai-600 020, India
Inauguration of DST-FIST Lab, Stella Maris College
Kanpur is one of the major clusters of India producing leathers and leather products. There are about 1600 units manufacturing leathers and leather products in this cluster having annual turnover of more than Rs. 10000 crores; in 2014-15 the exports of leather and leather products from Kanpur had been about Rs. 7000 crores, which fell to about Rs 6500 crores in 2015-16. The exports from this cluster constitute 17% of the total exports of leather and leather products from the country. During last 6 years, the export of leather and leather products from this cluster has been doubled. There are about 430 leather manufacturing units situated in Jajmau, Unnao and Banthar. The tanning units in Kanpur have been manufacturing tanned leathers (wet-blue), vegetable tanned leathers and finished leathers.

Relocation of the tanneries from Jajmau to another suitable location?

On 13th July, 2017, Honorable National Green Tribunal (NGT) had passed an order, wherein the honorable NGT has directed the state government of UP along with the Association of industries to submit a project action plan within six weeks. The order, further enunciates that if the government fails to submit the action plan in six weeks, then steps would be taken for relocation of the tanneries from Jajmau to another suitable location. The order insists elaborately the need to opting for pollution reduction measures at source. A comprehensive list of cleaner technologies and in-process pollution reduction measures is also presented in the order.

Mr. T Zaidi and Dr. A Garg, representatives from M/s Solidaridad, a Non-Governmental Organization (NGO) approached CSIR-CLRI on 21st July 2017. The NGO requested CSIR-CLRI to have meetings with various stakeholders of Kanpur cluster and help the concerned authorities to prepare the action plan document to be submitted to the UP government. Based on the request, team from CSIR-CLRI Consisting of Dr. J Raghava Rao, Dr. P Saravanan, Dr. R Aravindhan and Mr. V Karthik along with the Director visited Kanpur Cluster on 27th and 28th July, 2017 for discussing with the members of the tannery associations. Mr. PK Bhattacharya and Dr. S Sundarapandiyan from Kanpur RCED also attended the meetings. The Team CSIR-CLRI had series of meetings with the tannery associations namely Uttar Pradesh Leather Industries Association (UPLIA), Jajmau Tanneries Environmental Protection Association (JTEPA), Leather Industries Welfare Association (LIWA) and Small Tanners Association (STA) on 27th July 2017. The meetings were organized by Solidaridad.
Best available, foolproof technologies and measures for reducing the pollution load and volume of wastewater!

IAS, Principal Secretary, Environment and Forest, Mr. Alok Kumar Sinha, IAS, Principal Secretary, Industrial Development and Mr. Manoj Kumar Singh, IAS, Principal Secretary, Urban Development have participated in the meeting. Representatives from different tannery associations have also participated in the meeting. Dr. J Raghava Rao, Dr. P Saravanan and Dr. S Sundarapandiyan participated in the meeting representing CSIR-CLRI. During the meeting, the details of the best available technologies recommended by CSIR-CLRI were briefed. Ms. Renuka Kumar, IAS, Principal Secretary, Environment, Government of UP, has asked CSIR-CLRI to submit a document detailing the various best available technological options for pollution reduction at source, the likely assured environmental benefits associated with the options, the resource requirement for implementing them, the cost-benefit analysis connected to the measures, timeline for implementation and the financial outlay. Based on the request, a document have been prepared encompassing all the aforesaid aspects of the best available technological options and has been submitted to UPPCB.
The Leather Post

Report on the visit of Director CSRI-CLRI along with CETP representatives to CSIR-CSMCRI, Bhavnagar

Director, CSIR-CLRI along with a delegation representing the Leather Industry and its CETPs from Tamil Nadu visited CSIR-CSMCRI Bhavnagar on 26/07/2017. The delegation was received by the Director CSIR-CSMCRI and his colleagues Dr Arvind Kumar and Dr Upadhyay at the Hotel Sarovar Portico, Bhavnagar. The delegation first visited the Experimental Salt Farm of CSIR-CSMCRI where a demonstration of purification of salt/RO reject received from Tamil Nadu CETPs had been arranged. The process of repeated washing with saturated brine solution to separate sodium chloride from sodium sulphate and other impurities was demonstrated through Mechanical Salt Washery and explained by Dr Arvind Kumar, Principal Scientist and his team. The change in colour and texture of the salt (RO reject) after purification process was shown and the same was appreciated by the delegates. Dr Arvind Kumar mentioned that the same brine solution can be repeatedly used for washing and later taken to their chilling facility to recover globar salt/sodium sulphate from it.

After this demonstration the delegation visited the Plasma Pyrolysis Unit of CSIR-CSMCRI for solid and liquid waste disposal.
Later the delegation was taken to CSIR-CSMCRI and the process of obtaining sodium sulphate from the washings collected from Mechanical Salt Washery was shown at its chilling plant and explained by Mr Pratyush Maiti, Principal Scientist.

A presentation on “Separation of Sodium Chloride and Sodium Sulphate from Solid Waste of Tanneries” was made by Dr Arvind Kumar (Salt & Marine Chemicals Division) and a discussion followed involving Dr Kannan Srinivasan (Business Development and info Management) and Dr Paramita Ray (Reverse Osmosis Division). The CETP representatives in the presence of the Directors, CSIR-CLRI and CSIR-CSMCRI discussed in detail about the technical and commercial aspects of installing the Mechanical Salt Washery in their clusters and sustainable solution to the pollution related issues faced by them. It was decided to enter into an MoU to establish two Washeries of capacity 5 and 10 Tonns per hour.

Finally, towards the end of the visit the industry representatives expressed their satisfaction about the visit and thanked the Director, CSIR-CLRI for leading them to a positive solution for the RO rejects from CETPs. The delegation also thanked the Director, CSIR-CSMCRI and his team for arranging the demonstration of the technology and their hospitality.

**Biogas plant upgradation and bottling at Kumbakonam Municipality**

The source segregated solid waste quantification of real time data collection for biogas plant upgradation and bottling at Kumbakonam Municipality is being done by CLRI and Kumbakonam Municipality for all 45 wards.

CSIR-CLRI CHENNAI has undertaken a consultancy project on converting MunicipalOrganic Solid Waste in to biogas for bottling of Compressed Biogas Cylinder to be used in busses and cars in Tamil Nadu.
West Bengal is the 4th largest State economy in India with 12.02% growth in terms of GVA in 2015-2016. The Industry sector of the State observed a growth rate of 11% in 2015-16, contributing significantly to the India growth story. The State is a perfect blend of economic strength and dynamism, has a strong consumer base, vibrant industry, and large talent pool with a population of 91.3 million.

The Government of West Bengal has created a landmark business event, the Bengal Global Business Summit. You may be aware that the previous three summits have received overwhelming response from the business community. BGBS 2017 witnessed Rs 2.35 lakh crore worth of business proposals. The Summit received participation of over 4000 delegates from across India and 29 countries. The 4th edition of the Summit, Bengal Global Business Summit 2018 is scheduled on 16-17 January 2018 in Kolkata with FICCI as the Summit Partner and KPMG as the Knowledge Partner.

Leather has always been an important sector for West Bengal and the State Government is taking several initiatives to promote this sector. West Bengal accounts for 50% share of the total leather goods export from India. 26.6% of tanneries in India are based in West Bengal. Leather industry leaders of Bengal have set up a Mega Leather Footwear Park at Calcutta Leather Complex with active support and help from the State Government.

A sectoral roundtable on Leather was organized on August 10, 2017 at ITC Grand Chola Hotel, Chennai. Shri Rajiva Sinha, IAS, Additional Chief Secretary, Industry, Commerce & Enterprises, Government of West Bengal and Smt Vandana Yadav, IAS, Managing Director, West Bengal Industrial Development Corporation Limited joined the interaction with industry leaders in Chennai.
Inauguration of Multi Skill Leather Training Center at Kanpur
Participation Report of the
Exhibition on Science & Technology Innovation
By
Scientific Ministries and Departments of Government of India

Department-related Parliamentary Standing Committee on Science and Technology, Environment & Forests Rajya Sabha has entrusted Department of Scientific and Industrial Research (DSIR) to act as Nodal Department for organizing exhibition from 28th July 2017 to 11th August 2017 in Parliament House Annexe, New Delhi, along with other Ministries/Departments viz. DST, DBT, Earth Sciences, Atomic Energy and Space.

The exhibition was inaugurated by Hon. Vice President of India, Shri Mohammad Hamid Ansari on 28th July 2017 at 3.00 pm at the Parliament House Annex in the August presence of Hon’ble Speaker Lok Sabha Smt. Sumitra Mahajan, Hon’ble Chairperson, Committee on Science and Technology, Environment and Forests Smt. Renuka Chowdhury, Hon’ble Minister for Science & Technology and Earth Sciences Dr Harsh Vardhan and Hon’ble Minister of State for Science & Technology and Earth Sciences Shri Y. S. Chowdary.

The main purpose of the exhibition is to showcase the S&T innovations by the Science Departments and to disseminate the socially relevant products and spin-off technologies for deployment. The idea is to convey the achievements of Indian Science to policy makers of the country.

Hon’ble Minister for Science & Technology and Earth Sciences has shared his message about CSIR-DSIR, “CSIR has entered the 75th year of its existence and is currently celebrating its Platinum Jubilee. CSIR is a catalyst and driver of sustainable socio-economic change through application of science and technology. Today, CSIR is attempting a Parivartan from Knowledge creation to Value creation. CSIR is endeavouring to create an ecosystem for ‘Ease of doing Technology Business’ to bring in right stakeholders so technologies reach beneficiaries. CSIR has commercialized several technologies for the society and industry in the areas of food and agriculture, generic drugs, leather, chemicals and petrochemicals, biopharmaceuticals, and materials. Some key achievements of the CSIR maturing during 2016 include CSIR has been ranked 12th in the world amongst the government institutions in world during the said year. The overall global ranking of CSIR also improved from 110 to 99th position”.

The Hon’ble Minister ended his message saying “I thank honourable Vice-President of India and Chairperson, Rajya Sabha for sparing his valuable time to inaugurate the exhibition. I also thank honourable Speaker, Lok Sabha for her gracious presence and encouragement. I extend my sincere thanks to Chairperson of Department related parliamentary standing committee for encouraging and guiding the departments to host this exhibition. Also, my sincere thanks to all the honourable Members of Parliament for sparing their precious time to encourage scientists of our nation”.

Hon’ble Smt. Renuka Chowdhury, Chairperson of the parliamentary standing committee on science and technology, environment and forests said that, taking technology from ‘lab to field’ is our vision.

CSIR-CLRI has showcased the following Leather Products in the exhibition,

- MODEUROP Leathers and Color Cards for Summer’18
- Comfort Shoe for Men
- Children Shoe
- Ladies Comfort Sandal
- Men Sandal and
- Products from Chicken Feet Leathers

The Leather Post
Diabetic Footwear developed by CSIR-CLRI
the Parliament
Guiding Principles
The establishment of CSIR-CLRI
One of the first laboratories to be set up by Independent India was the Central Leather Research Institute. The government then realized that a significant revenue was being lost by way of export of hides/skins and wanted an institute to develop technologies, translate them to the industry and help India turn from a raw material exporter to one exporting leather. With time, realizing the value addition happening as raw hides/skin move through various phases of crust leather, finished leather and leather products, the CSIR-CLRI developed technologies to aid the Indian leather industry transform. One of the identified lacunae in this process was the lack of availability of indigenous leather chemicals.

Driving factors in leather chemicals: through the decades
In the early years it was the perceived opportunities, which included passion to arrive first, creation of new market space and conversion of comparative to competitive advantages that led the institute’s R&D in leather chemicals. This translated into chromium and chromium-aluminium based synthetic tanning agents, with no global equivalence at that time, first set of indigenously made synthetic and semi-synthetic fatliquors etc. Subsequently, with growing environmental pressures on the industry, compulsion to change became the target for R&D. The social pressures such as presence of banned chemicals, low uptake of chemicals by the hides/skins during processing were addressed. Market pressures, such as the need to reduce cost, compete with imported auxiliaries etc. were also addressed during this period. In the current phase, new knowledge paradigm such as paradigm shifts in knowledge and technology space had driven innovation towards a shift from chemical to bioprocessing technologies, where enzyme formulations that could replace osmotic swelling agents (to assist removal of flesh) and S – S bond breakers (removal of hair), leading to massive reduction in pollutants and emission loads. A new phase of development, technology paradigm is looking at multifunctional chemicals that can reduce incompatibilities and also time for processing.

Innovation in leather chemicals funneling into leather
Global leather sector has been mostly material and market driven for long. Value addition to raw materials has been limited. Innovations in leather chemicals has led to creative approaches such as cost cutting in processing, new benign medium for chemical diffusion (as against water), smarter chemicals that could provide for transition of leather as a sensor are in development phases. In the years to come leather will become largely technology and innovation driven.

Leather chemicals: Market driven changes
Chemical input in final value of leather is about 15-30%. Quantum need of performance chemicals in leather processing is not large. However, number of proprietary formulations exceeds 1000. The complex physical and chemical interactions in leather making makes the leather chemical research extremely challenging. Many chemical inputs are not absorbed in the process and is found in wastes. This deters the environment conscious consumer. Product of chemicals is predominantly batch or semi-batch. Continuous processes are rarely employed because of low scales of operation and multiproduct requirements. Quantum increase in chemical requirements is likely.

Background into classification of chemicals
Leather processing involves the use of a variety of chemicals. Pretanning operations aim at the cleansing of raw skin and removal of unwanted materials, while tanning affords permanent stability to the skin matrix against wet heat and bacterial degradation. In the post-tanning stages, aesthetic appeal is being added and performance of leather as a consumer product is ensured. In the early stages of leather processing, chemical processing of skin aims at the alterations of bulk properties of the matrix whereas in the post tanning stages, additions to both bulk and surface properties gain importance. There are two types of chemicals used in leather processing namely bulk and performance chemicals. Chemicals like sodium chloride, sodium sulfide, lime, sulfuric acid employed in leather processing are sourced from bulk supply sources and these chemicals are common to many other industries as well.
Basic chromium sulfate and vegetable tannins are two major group of chemical inputs in leather sector which are exclusively needed by leather sector in bulk volumes. Cost reduction, higher productivity and waste minimization form the basis of development and should therefore represent process innovations. Syntans and fatliquors are performance chemicals used in leather sector exclusively and the technologies need to be developed based on performance needs of leather industry. The total annual consumption of this group of inputs could go to the order of 1.5 million tons per annum. These products need both process and product innovations. Finishing auxiliaries in leather sector are specially designed and developed. The volume of demand for these group of chemicals is generally small. However, the value of these products are large and these could be grouped as low volume high return category. Demand potential for this group falls in the range of 5000 ton per year. Product innovations dominate the criteria for new technologies.

**Approaches of CSIR-CLRI in Leather Chemical Technology Development**

CLRI established partnership approach with the main manufacturers of leather chemicals. There is an Association of Leather Chemical Manufacturers, LCMA. Since 1993, the scientists of the chemical sciences division of CLRI have met the members of LCMA in periodical strategy planning meetings. One-day brainstorming meetings was held with LCMA to predict the technology needs of the industry five years ahead and develop a R&D strategy. CLRI evolves a development strategy for meeting the technology priorities of LCMA from time to time. The institute explored laboratory scale technologies through internal resources under plan projects. When a promising product is identified, members of LCMA were invited to screen the formulation for possible application potential. Technology development initiatives were taken only for those formulations for which the application potential has been identified by potential customers. This partnership approach has paid rich dividends so far in the design, development and delivery of technologies for leather chemicals from CLRI. In this approach, sponsorship of technology development is more easily obtained from clients when the application potential has been established by the clients.

**Performance Record of Leather Chemicals Development Area in CLRI**

Total of 35 technologies were developed, of which 23 were delivered to the industry since 1970. A list of these technologies is given Table 1.

**Major technology translational efforts in leather chemicals**

<table>
<thead>
<tr>
<th>No.</th>
<th>Technology</th>
<th>Special Features</th>
<th>Function</th>
<th>Technology Translator</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>PCP substitute – TCMTB</td>
<td>Indigenous process for active principles in high yield and purity</td>
<td>Preservation</td>
<td>M/s. Chemcrown</td>
</tr>
<tr>
<td>2</td>
<td>Vegetable tannin extracts – babul-wattle-myrob blends</td>
<td>Better utilization of indigenous resources, time and cost saving process, higher leaching efficiency, microprocessor based leaching system</td>
<td>Tanning</td>
<td>M/s. Rallis India</td>
</tr>
<tr>
<td>3</td>
<td>Vegetable tannin extracts – cashew Testa – wattle – myrob</td>
<td>Better utilization of indigenous resources, improved process efficiency and color of products</td>
<td>Tanning</td>
<td>M/s. Lakshmi Starch</td>
</tr>
<tr>
<td>4</td>
<td>Blended vegetable tanning extracts</td>
<td>Optimization of material resources, higher leaching efficiency, time and cost saving, micro-processor controlled technology</td>
<td>Tanning</td>
<td>M/s. Quinn Group of Companies</td>
</tr>
<tr>
<td>5</td>
<td>Basic Chromium Sulfate – Clarichrome</td>
<td>Product consistency with respect to exhaustion established</td>
<td>Tanning</td>
<td>M/s. Quinn Group of Companies</td>
</tr>
<tr>
<td>6</td>
<td>Modified BCS – Cleartan CR</td>
<td>Enhanced chrome absorption from 55 to 85% levels through designed process alterations in chemistry and control parameters</td>
<td>Tanning</td>
<td>M/s. Golden Chemicals Ltd.</td>
</tr>
<tr>
<td>7</td>
<td>Salt Free Self Basifying chrome tanning agent</td>
<td>Eliminates pickling, very high chrome exhaustion, low TDS and no need for chrome recovery</td>
<td>Tanning</td>
<td>M/s. Arihant Intermediates (Madras) Pvt. Ltd.</td>
</tr>
<tr>
<td>9</td>
<td>Fatliquors – New generation synthetic fatliquors</td>
<td>Value addition to an indigenous raw material and development of new routes for synthetic fatliquors, better performance for some applications</td>
<td>Wet-finishing</td>
<td>M/s. Kothari Sugars</td>
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</tr>
<tr>
<td>12</td>
<td>Fatliquors: Acid stable</td>
<td>Acid stable product, fish oil based with less odour, process ease and economic</td>
<td>Wet-finishing</td>
<td>M/s. Vensbar Organics</td>
</tr>
<tr>
<td>13</td>
<td>Fatliquors: Bi-ionic formulations from rice bran wax</td>
<td>Stable emulsion from rice bran wax with applications for waxy fatliquors</td>
<td>Wet-finishing</td>
<td>M/s. Yanam Oil</td>
</tr>
<tr>
<td>14</td>
<td>Syntan: Polytan</td>
<td>An acrylic filler which affords fullness to leathers without loosening the grain</td>
<td>Wet-finishing</td>
<td>M/s. Chemcrown</td>
</tr>
<tr>
<td>16</td>
<td>Mineral syntan: Aluminium based syntan</td>
<td>Second generation product of alutan, targeted for multi-purpose application in tanning and retanning</td>
<td>Wet-finishing and tanning</td>
<td>M/s. Quinn Group of Companies</td>
</tr>
<tr>
<td>17</td>
<td>Phenolic syntan: Syntan MC</td>
<td>Filling and process ease</td>
<td>Wet finishing</td>
<td>M/s. Vensbar Organics</td>
</tr>
<tr>
<td>18</td>
<td>Binders: Clarion Binders</td>
<td>High performance, low cost</td>
<td>Finishing</td>
<td>M/s. Ramjidas Chemicals</td>
</tr>
<tr>
<td>19</td>
<td>Binders: Polyurethane binders</td>
<td>Functional polymers</td>
<td>Finishing</td>
<td>M/s. Indofil</td>
</tr>
<tr>
<td>20</td>
<td>Adhesives: PU Based</td>
<td>New technology for adhesives from polyether polyls resourced in India, value addition of polyls</td>
<td>For product sector</td>
<td>M/s. UB Petroproducts</td>
</tr>
<tr>
<td>21</td>
<td>Value added products from tanning resources: Gallic acid from myrob, teripods and other unutilised tanning materials</td>
<td>Cost effective process for value added products, alternative uses for lower grade myrob</td>
<td>Better utilization of resources</td>
<td>M/s. Silver Hill Chemicals</td>
</tr>
<tr>
<td>22</td>
<td>Syntans free of formaldehyde – TANAID</td>
<td>A complete variation from conventional aromatic phenols – formaldehyde adducts, free of formaldehyde</td>
<td>Wet-finishing, for improved uptake of chromium in tanning</td>
<td>M/s. Balmer Lawrie &amp; Co.</td>
</tr>
<tr>
<td>23</td>
<td>Chrome-Melamine syntan</td>
<td>Third generation mineral syntan free of formaldehyde and aromatic compounds</td>
<td>For retanning</td>
<td>M/s. Sellam Chemicals Pvt. Ltd.</td>
</tr>
</tbody>
</table>

There have been new initiatives taken to develop technologies for new blended vegetable tannin extracts, zirconium based tanning salts, new generation aluminum based tanning salts, syntans from wastes of leather and paper industry, new chrome exhaust aids, new acrylic syntans for imparting fullness without looseness to leathers, polyurethane binders, conducting polymers for novel finishing applications, polymer blends for soling applications, new adhesive formulations, new feel modifiers and finishing auxiliaries.

**Product Innovations in Pretanning Chemicals and Auxiliaries**

One of the environmentally most disconcerting chemical inputs in leather processing is the sodium sulphide. Enzyme assisted dehairing methods which reduce the dependence on the use of sodium sulphide for dehairing are attractive. An enzyme formulation has been developed by CLRI and scaled up to credible scales. The process enjoys the benefit of solid state fermentation and lower costs of production.

Two other formulations have been developed as new generation products for enzyme assisted dehairing. At this stage it is relevant to point out that CLRI has been able to promote the commercial application of enzyme assisted dehairing in many tanneries in Tamil Nadu.

**Process development for TCMTB**

After the ban of Pentachlorophenol, alternatives had to be found early. TCMTB has been accepted to be an alternative. A viable technology for TCMTB has been developed.
We imagine easily-applicable leather upgrading solutions that produce outstanding results

If it can be imagined, it can be created

Upgrading Solutions
Leather Finish
Process Innovations in Technologies for Tanning Agents

Process innovations have been made in the area of technologies for vegetable tannins and basic chromium sulphate. These innovations have aimed at increased productivity and improved quality consistency.

Vegetable Tannins: Conventional technologies for leaching of vegetable tannins from barks and nuts involved the use of leaching methods which demanded a process time of 16 days and leaching efficiencies of 60-65%. Process innovation has now been made in CLRI. Microprocessor based leaching counter current leaching method has been standardized for a vegetable tanning blend based on babul, wattle and myrobolam. This is semi-continuous method of leaching. Equilibrium in leaching is achieved in 16 hrs and the efficiency is about 90%. The technology is based on indigenous development of hardware and software configuration. Basic engineering design for 5000 TPA plant has been made and delivered. The blended extract has been optimized for substituting wattle to a significant extent.

Basic Chromium Sulfate: The commonly manufactured basic chromium sulfate salts for use in the leather industry in India exhibit an absorption (exhaustion) level of only 50-60%. It has been estimated that annually about Rs 40 crore worth of BCS is wasted. Further, the commonly used process of molasses reduction in the manufacture of BCS in commercial houses poses some quality consistency problems arising out the formation of humic acid during the reduction stage. Reprocessing of BCS is common in many large supply houses. Through process controls in the manufacture of BCS, it is possible to reduce or eliminate the need for reprocessing of BCS.

A controlled process for the manufacture of BCS has now been developed and released. The process innovation involves controls in the interplay of 11 process parameters. A careful audit of the nature of species present in spent chrome liquor has been made. A tetra positive tetramer has been identified to be the major constituent of the chromium bearing species in spent chrome liquor. Through designed alterations in the process conditions and scavenging of intermediates leading to the formation of the low affinity tetramer, the exhaustion levels of BCS has been raised to >85%. A modified BCS has been developed. The technology has been delivered.

Through the commercial use of the technologies for BCS developed at CLRI more than 25% of the market could be influenced. Improvements in BCS manufacture in by the clients have been traceable.

Closed pickle-tan loop for as a near zero waste chrome tanning is a process innovation which promises lasting solution to the problem of pollution from chrome tanning. Through this process, a potential for saving Rs 2000 per ton of leather processed has been demonstrated. This represents a process innovation. This has been possible through a combination of basic chromium sulfate with Alutan developed by the institute.

The utilization of chrome bearing sludge in the manufacture of bricks has been developed. The technology is yet to be commercialized.

Product and Process Innovations in Retanning Agents and Fatliquors

Retanning agents form an important group of performance chemicals in leather sector. The estimated consumption of this group of chemical inputs is about 62000 TPA. Although variety of retanning agents are employed, the technology status of many retanning systems is mature. Therefore, technology generation from CLRI had been limited to mineral syntans, acrylic syntans and a special group of products. In these both product and process innovations had to be made simultaneously for cost competitiveness. Mineral syntan based on aluminum and chromium as well as acrylic products with diverse range of particle size and filling capacity have been developed and delivered.

Reactive fatliquors based on phosphorylation, acid stable, water repellent and a range of synthetic fatliquors based on polybutene have been developed and delivered to some potential clients. The products based on phosphorylated and maliensied oils represent unique class of products, both in terms of cost competitiveness and product performance. Today the synthetic and semi synthetic fatliqour technologies provided by CSIR-CLRI contributes to about 40% of the total market share of fatliquors in the country. A similar situation has been observed in the case of mineral syntans as well.

The inputs of CLRI in the development of dyes for leather sector have remained low over the years. This is partly because the dyes are generally developed for their textile applications and screened for their use in leather. Further new dyes need to be registered for their environmental acceptability. The process is prolonged. However in the recent times there has been an attempt to develop cost effective alternatives to banned azo dyes. This includes dyes from black liquor generated by the paper industry.

Product development for Finishing and Footwear Chemicals

Acrylic Binders: Technologies for a range of acrylic binders have been developed and delivered. These technologies have been commercialised. The innovations in these products have been in the improvement of scuff resistance and tack reduction of a soft binder as well as cost reduction of medium soft binders.

Polyurethane Binders: A technology for a polyurethane binder emulsion has been developed and delivered. The technology is based on more commonly available monomers. The product performance has been
compared favourably with commercial products. More recent efforts have been based on special monomers and preparation of polyurethane ionomers which permit water dispersability.

Polyurethane Adhesives: An adhesive formulation based on polyurethane has been developed. Polyether polyol has been effectively exploited for use in the preparation of adhesives. A formulation technology for the manufacture of polyurethane adhesive based on outsourced polyurethane commercial product has also been developed.

Hot melt adhesive: A technology for hot melt adhesive based on polyamides has been developed. The formulation technology is novel. Polymer engineering for the manufacture including the extrusion process is conventional.

Looking Ahead

Technology needs for the leather chemicals sector for the period up to 2035 have been identified through a DST-TIFAC led initiative “Technology Vision 2035”. Leather processing industry is undergoing major changes following environmental pressures and global competition. Chemicals which ensure more complete exhaustion and lesser contribution to biological oxygen demand as well as total dissolved solids are likely to gain importance. This represents an area of technological gap. Beamhouse processing implicates use of large chemical inputs which contribute to COD as well as total dissolved solids. New technologies for saltless preservation, hair saving methods liming, ammonia free deliming, pickleless tanning, less chrome and chromeless tanning, are gaining importance. A closer process audit reveals that new types of polymeric formulations for fibre compaction and lubrication would be necessary. Following the REACH norms and the list of RSL (restricted substances in leather), new range of products are required to be developed from time to time.

Leather finishing involves the use of pigment formulations and solvent based polymers. Waterborne finishes are the future need of the industry. Technological gaps in the area of field modifiers for leather finishes are wide. Similarly, adhesives used for full shoe manufacture in the country do not meet the requirements. In shoe manufacture, a number of adhesive formulations are employed in the same shoe. The range and the quality of adhesive products used in the Indian shoe industry need quantum improvements. Currently used leather processing technologies generate significant amount of fibrous solid waste which are not adequately recovered and utilised. Opportunities exist for the manufacture of polymer leather composites which combine some of the special qualities of leather and function as leather supplement. Although technologies exist for the manufacture of bonded leather in the global market, significant improvements in these technologies are possible and when developed, these could reduce the pressure on leather industry in meeting the domestic demands.

In association with the leather chemical manufacturers’ association, technological gaps in the leather chemical sector have been identified and suitable areas of priority for R & D have been identified. This includes the transition of leather into a consumer preference driven commodity product. Leather, to offset the entry of synthetics into conventional areas such as footwear, will also need to look for new avenues such as high end automotive upholstery, where the ability of leather to reflect near infrared regions of sunlight, change color based on stimuli – such as presence of gases, volatile organics, UV light etc., thus playing the role of a sensor.

Some important avenues for leather are listed in Table 2.

<table>
<thead>
<tr>
<th>No.</th>
<th>Technology</th>
<th>Special Features</th>
<th>Function</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Hide/skin preservation – curing</td>
<td>Salt free. Multifunctional (preservation and unhairing)</td>
<td>Curing</td>
</tr>
<tr>
<td>2</td>
<td>Preservatives</td>
<td>Bio-based, long term sustainability based on REACH norms, dual activity (anti-bacterial/anti-fungal), nanoparticle based</td>
<td>Preservatives</td>
</tr>
<tr>
<td>3</td>
<td>Fibre opening, unhairing, degreasing, bathing</td>
<td>Multifunctional enzyme formulations, with high activity and stability. Cold/heat functional</td>
<td>Beamhouse</td>
</tr>
<tr>
<td>4</td>
<td>Chromium alternatives</td>
<td>Vegetable tanning analogues, metal free organic tanning, chromium alternatives based on Ti, Zr, Fe, rare earths, functionalized nanoparticles. Wide pH range applicability. Be able to tan without pickling</td>
<td>Tanning</td>
</tr>
</tbody>
</table>
The essence of leather chemical development for the future is to ensure sustainability of the sector, more so under increasing regulations on presence of substances that could fall under the restricted substances category. Further, chemicals should become independent of the diffusion medium as benign solvent based replacement of water for diffusion of chemicals into leather looks promising now. Multifunctional chemicals that can significantly reduce time for processing hides/skins into leather and leather products, while performing multiple jobs will be the order of the day.

- A Team Chemical LAB compilation

<table>
<thead>
<tr>
<th>No.</th>
<th>Technology</th>
<th>Special Features</th>
<th>Function</th>
</tr>
</thead>
<tbody>
<tr>
<td>5</td>
<td>Fatliquors</td>
<td>Water repellent</td>
<td>Post-tanning</td>
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<td></td>
<td></td>
<td>Cl₂ &amp; NOₓ free</td>
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<td></td>
<td>Washable leathers</td>
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<td>Antifogging type</td>
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<td>Non yellowing</td>
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<td></td>
<td></td>
<td>Polishing of fatliquors</td>
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<td></td>
<td></td>
<td>Multifunctional/multipurpose</td>
<td></td>
</tr>
<tr>
<td>6</td>
<td>Syntans</td>
<td>Heat resistant</td>
<td>Post-tanning</td>
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<td>Light resistant</td>
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<td>White</td>
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<td></td>
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<td>Phenol free</td>
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<td>Selective filling</td>
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<td>Fillers for buff &amp; cow,</td>
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<td></td>
<td></td>
<td>Biodegradable</td>
<td></td>
</tr>
<tr>
<td>7</td>
<td>Dyes and pigments</td>
<td>REACH compliance, biodegradable, natural, exhibit chromism</td>
<td>Post-tanning</td>
</tr>
<tr>
<td>8</td>
<td>Finishing agents</td>
<td>Water borne, fire retardant, sensor role</td>
<td>Finishing</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Transparent pigments, nanopigments</td>
<td></td>
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</tbody>
</table>

Dr KASI RAO V  
Principal Technical Officer  
Knowledge Resource Centre

Shri SAMY DASS G  
Senior Technician II  
Knowledge Resource Centre
Capsule exhibition will be held in CLRI as part of the CSIR platinum Jubilee Celebrations for three days from 25th to 27th September, 2017.

Other events include:

1. Open day for three days from 25th to 27th September, 2017 for Schools and colleges in and around Chennai and Industrialists to visit.
2. Poster presentation
3. Sports events will be coordinated by the Staff Club
4. To invite and honour all former RC members with mementos
5. Make provisions for compartments inside the Exhibition Hanger to conduct different events simultaneously like display of posters, display podiums for showcasing CSIR products, Seminars in Seminar Halls, Competition and Sports events. On first two days, competitions will be held and on the third day prizes shall be distributed.
These chemicals pose serious environmental problems as the effluent is rich in suspended solids.

Using enzymes produced by bacteria, scientists at the Chennai-based CSIR-Central Leather Research Institute (CSIR-CLRI) have removed hair from goat skin used in leather industry. This method was found to be safer and more environmentally friendly than the conventional method of unhairing using lime and sodium sulphide. The results were published in Environmental Science and Pollution Research.

These chemicals pose serious environmental problems as the effluent is rich in suspended solids. Besides contamination, these effluents may also release noxious gases like hydrogen sulphide causing a serious health hazard.

Microbial enzyme

A novel bacterium (Bacillus crolab MTCC 5468) was isolated and used for the study. This bacteria produces proteases (enzymes produced to break down protein) which have been found useful in unhairing processes. “The bacteria were isolated from the soil around the Buckingham canal close to Adyar region, Chennai, where a meat stall was located earlier. So the soil there was rich in proteinaceous matter making it an ideal spot for isolation of bacteria. Among the hundreds of isolated bacteria, the bacterium with highest ability to breakdown proteins (proteolytic activity) was selected and used,” explains Dr. Chellan Rose who was earlier with CLRI and one of the corresponding authors of the paper.

To extract the enzyme from the bacteria, scientists fermented wheat bran using the bacteria. The enzyme showed high proteolytic activity, which was 3.5 times greater than any reported for bacterial proteases.

Enzyme evaluation.

The effect of the enzyme on goat skin soaked in water was tested. Crude enzyme was added in different concentrations to the skin and let to soak. The enzyme was able to remove hair completely within four hours. According to J. Durga, at CLRI and one of the authors of the paper, the enzyme was stable over a wide range of alkaline pH (8 to 11).

The tensile strength, tear strength, elongation and shrinkage temperature of the leather were tested after further processing. The strength was found to be considerably better than leather processed by chemical method. The smoothness, fullness and texture were marginally better than the chemically processed ones.

The enzyme was found to remove hair completely, leaving no trace of any keratinous material. Microscopic study showed that the protease was able to penetrate much efficiently into the skin matrix and remove even the hair root.

“The environment friendly method should not compromise on quality. We are trying to change centuries-old, time-tested method of hair removal. The main aim was elimination of pollution without altering the product and we found that our enzyme treatment not only reduced pollution but also produced better quality leather compared with the chemically treated ones,” explains Dr. C. Muralidharan, Chief Scientist at the Leather Processing Division, CLRI and one of the corresponding authors of the paper.

Effluent testing.

The waste water after treatment was tested for the pollution load. The use of enzymes showed significant reduction in several parameters —biological oxygen demand (22%), chemical oxygen demand (58%), total dissolved solids (39%) and total suspended solids (22%) — compared with the chemical method. “The hydrogen sulphide that may form due to conventional unhairing process is a neurotoxin. This process lowers the environmental damage without altering the quality of leather,” says Mr. A. Ranjithkumar, research scholar at the institute and the first author of the paper.

Source: THE HINDU, 19th August,
COUNCIL FOR LEATHER EXPORTS

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

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The Leather Post
WISE COUNCIL
CSIR | ESTABLISHED IN 1942

THE BIG BANG

With a network of 38 national laboratories, 39 outreach centres, three innovation complexes and 4,600 active scientists supported by about 8,000 other scientific and technical staff, the Council of Scientific and Industrial Research (CSIR) today is the largest R&D organisation with a pan-India presence. Among CSIR’s major achievements are the development of the light combat aircraft, Tejas, and the supercomputer, Flysolver, and organising expeditions and research studies in Antarctica. Inspired by the Department of Scientific and Industrial Research, UK, the CSIR came into being after Sir Richard Gregory, then editor of Nature, reported to the British government about the dire need for such a facility after visiting scientific departments and universities in India in 1933. Then viceroy Lord Willingdon rejected the government’s suggestion and agreed only to create an Industrial Intelligence and Research Bureau in 1935. On the insistence of Arcot Ramaswamy Mudaliar, a member of the Viceroy’s council, a board for scientific and industrial research was created in 1940. He assumed office as its chairman while Dr (Sir) Shanti Swarup Bhatnagar was appointed its first director. Less than a decade after they first mooted the proposal, their persistence gave shape to the drafting of a constitution and the founding of CSIR in 1942.

M. ZHAZO

THE ROAD AHEAD

“Our dream is to develop and deploy smart science and technology solutions aimed at bringing in a socio-economic revolution, which is inclusive and sustainable,” says CSIR head Girish Sahni, outlining the vision for CSIR@80. “In fact, we are striving with both emotion and devotion to make India the compassionate technology capital of the world.” Earlier, labs were organised around science domains like chemistry and biology. Now it is on the basis of themes to strengthen links with industry.

– Amarnath K. Menon