Every year 11 May is celebrated as National Technology Day in India. This year also 11 May was celebrated as National Technology Day and celebrations were held at Ashoka Hotel, New Delhi, to mark the anniversary of the defining moment in the growth of technology prowess of India. The event was coordinated by the Ministry of Science & Technology. Shri P. Chidambaram, Finance Minister, Government of India, and Chief Guest for this programme released new products that included fibreglass technical fabrics manufactured by M/s Vishnu Fabrics Pvt. Ltd, Srivilliputtur, T.N.; improved process for manufacturing wheel rims for cars, tractors and multiutility vehicles, developed by Steel Strips Wheels Ltd, Dappar (Patiala); special-purpose electrical rotating machines of 100 to 900 Hz, 6-180 kVA generators and low
LEATHER is a valuable material provided by Nature. Hides and skins for leather making are primarily by-products from the meat industry. Leather processing has emerged as an important economic activity in several developing countries, which are dependent on an agricultural economy. Indian leather industry occupies the pride of place in economy building through an employment generation of about 2.5 million jobs. Unfortunately, the intensive processing methodologies employed for leather manufacture has rendered tanning an eco-constrained process. Conventional methods of pre-tanning and tanning have the largest discharges accounting for nearly 90% of the total pollution from a tannery. It is in this context that the achievements of the Central Leather Research Institute (CLRI), Chennai assume greater importance.

The Team-CLRI comprising of Dr J. Raghava Rao, Dr P. ThansikaVelan, Shri S. Saravanabhan, Shri S. Ramalingam and Dr Balachandran Unni Nair have been involved in the development of a new millennium bio-driven leather process. This synergy paved the way for clean and green leather processing by shifting from traditional chemical process to bioprocess. Team-CLRI has thus revolutionized leather processing in contrast to its conventional pathways.

The team members are currently involved in gaining critical and important leads towards bringing about paradigm shift in leather processing by introducing bioproducts in the place of chemicals. They have attempted an integrated solution to environmental problems in leather processing from first principles employing biotechnological tools. The process rationale designed by the members is based on the avoidance of process logic of conventional leather processing, which follows a "Do-Undo" principle. In other words, in one of the operations, certain chemicals are added and physico-chemical changes in skin or hides are brought about through a "Do" logic and in the next set of operations, the physico-chemical changes are reversed by way of "Undoing" what was done earlier. The Team-CLRI has developed an approach to overcome the inefficiencies of the conventionally and commercially used process logic through an integrated and path breaking bio-mediated alternative, where the "Do-Undo" principle is kept away.

Leather manufacturing involves chemical processing of a biological matrix, employing a range of engineering equipments. The rationale in leather processing is based on 1) removal of interfibrillar and unwanted matter through a series of pre-tanning operations; 2) protection of the collagen matrix against degradation by
microorganisms and imparting thermal stability by tanning and iii) providing aesthetic values by means of post-tanning operations.

Conventional use of lime and sodium sulfide, leading to commercially viable methods of removal of hair and opening up of fibres in skin and hide, has resulted in solid, liquid and gaseous discharges. The use of enzymes as alternatives to sulfide has been attempted before, but the process has defied application of enzyme-only methods for removal of hair and opening up of fibres.

The members have demonstrated with success the use of a lime-free enzyme-only dehairing process for hides and skins. The methodology ensures potential increase in area, abatement of pollution and elimination of lime sludge. The lead gained by the team using

Leather obtained based on the new millennium bio-driven leather process developed by CLRI
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The enzyme-only process represents a breakthrough, which has been well received. Conventional lime based fibre opening removes interfibrillar materials through osmotic forces for softening the fibres. It is possible to use substrate specific enzymes to replace lime in the softening step, where a protein carbohydrate blend called proteoglycan is stripped out of a hide to leave only a clean web of tangled fibres of the protein “collagen”. The team has shown that amylases, akin to those in saliva that turn carbohydrates into their component sugars, break down proteoglycan as effectively as lime does. The hides are as soft as limed pelts, and look the same under the microscope. Enzyme-driven tanning using commercial-grade amylase, may cost the same as in a chemical process, on an industrial scale. The lead gained by the team using enzyme for fibre opening process has been well received by the scientific community (Editorial in Nature Science Update on a paper published in Environmental Science & Technology, 36, 2002, 4187-4194).

Conventionally employed processes in chrome tanning are easy to adopt, but the discharge of huge concentration of salt, acid and chromium leads to serious environmental challenges forcing us to search for alternatives. The nominees have developed a chrome tanning system without a pickling process for conventionally limed and delimmed collagen matrix. It has now been possible to integrate the bio-driven process with a pickle free chrome tanning process leading to an impressive reduction in chemical consumption.

This new process-involving enzyme based lime-free dehairing and fibre opening has been successfully demonstrated on various substrates like goat, sheep, cow and buffalo calf. The commercial viability of the technology has been proven for vegetable and chrome tanning. The new biobased leather processing would revolutionize leather processing as this non-traditional bioprocess promises a clean and green environmental status. The methodology ensures reduction in chemicals, process time, water, power, solid and liquid wastes, too.

In sum, the team has obtained critical and important leads towards causing a paradigm shift in leather processing by introducing bioproducts in the place of chemicals. They have developed an integrated solution to current environmental problems in leather processing, from first principles, employing biotechnological tools.

The Biotech Product and Process Development and Commercialization Award 2005 has been conferred on the Team from Central Leather Research Institute for developing bio-driven leather processing alternative for conventional leather making. The award was presented to the team during the National Technology Day Awards Function, by Shri P. Chidambaram, Finance Minister, Government of India.

NAL Scientists’ Research Paper tops Citation List

The paper on ‘Fluid Mechanics in the Driven Cavity’, by Shri P. N. Shankar and Shri M. D. Deshpande of CTFD Division of the National Aerospace Laboratories, that appeared in 2000 in Annu. Rev. Fluid Mech. (32:93-136), has so far received 37 citations – placing it in the top 1 percent within its field according to ‘Essential Science Indicators.’ This paper reviews the body of work dealing with internal re-circulating flows generated by the motion of one or more of the containing walls.