

**Regional Programme
for Pollution Control
in the Tanning Industry
in South East Asia**



**Sustaining the Tanning Industry
in South East Asia**



Leather hunt in South East Asia

Impressive gains have been made in the last two decades by many countries of South East Asia due to the explosive growth of leather industry. The spectacular rise in employment, export earnings and overall economic activities engendered by this sector fully justified the support extended by the governments. In the last decade, however, the negative environmental consequences of unchecked growth of tanning industry came to the fore, thanks to the awareness campaigns launched by NGOs and environmentalists of both industrialized and developing countries. Alarmed by the spiraling discontent, the governments, pollution control authorities and in some cases, the courts of law too, began to tighten control over industrial pollution. Meantime many large importers of industrialized countries started insisting on their suppliers to conform to their national environmental regulations. Though the industry realized its vulnerability, neither the enforcement agencies nor the industry of the region, mainly comprised of small and medium enterprises, had the technology or the resources to cope with such a gigantic challenge. The industry needed urgent technical support to reduce pollution at source by improved process technologies consistent with its size and capacity; and, treat the waste generated at the end-of-pipe efficiently and cost-effectively. The very survival of this promising industry was increasingly coming under a serious threat.



Project sites of the Regional Programme



Liming paddles in a tannery

UNIDO to the industry's rescue

It was at this juncture that, responding to the appeal of many countries of the region, UNIDO came to their rescue by launching its multi-faceted, large-scale, Regional Programme for pollution control in the tanning industry in South East Asia, covering major leather producing countries of the region viz. Bangladesh, China, India, Indonesia, Nepal and Sri Lanka.

Arresting the deterioration

When UNIDO entered the scene in 1996, on the orders of the Supreme Court of India, many tanneries of Tamilnadu in the south were facing closure and those in Kolkata in the east had to relocate themselves in a new modern leather complex. Other countries of the region, particularly Bangladesh, China and Indonesia, were experiencing similar pressure from enforcement agencies and public at large. The programme therefore sought to help the industry source and adapt technologies appropriate to its specific needs in different locations. In keeping with emerging global trade requirements, the programme also sought to assist the industry improve the occupational safety and health standards at work and learn more about current status of the schemes of eco-labelling for leather and leather products. Increasing participation of women in the industry was an additional objective.

Inauguration of the Chrome Recovery Plant, in Nepal



Modern drumyard of a tannery





A common effluent treatment plant in India

The role of industrialized countries

Being the major importers and consumers of leather and leather products in the world, the industrialized countries played a truly supporting role. Generous support was given by Austria, Denmark, Germany, the Netherlands, Norway, Switzerland and the UNDP offices of New Delhi and Sri Lanka. Together these donors contributed about US \$ 14 million towards implementation of a large and crucial programme designed to help the industry sustain and grow without causing avoidable damage to the environment.

Making it happen

Understandably, for successful implementation of a multi-faceted programme of such dimensions and ramifications, the technical expertise of many world recognized research and development organizations had to be relied upon. UNIDO established networking with the BLC Leather Technology Centre, UK, CTC, France, Studio-Tecnico, Italy, TEH Projekt, Croatia and the Central Leather Research Institute, India and drew substantially upon their expertise and experience. China Leather Industry Association, China and the Institute for Research and Development of Leather and Allied Industries, Indonesia, were also associated with the implementation. Close rapport was established with relevant industry associations. The Ministry of Industry as well as the pollution control authority in each country performed the role of government counterparts.

At the UNIDO headquarters in Vienna, the Project Manager provided overall coordination and monitoring. To ensure effective and timely delivery of outputs, a Regional Programme Office was established in Chennai, India. Headed by a Programme Coordinator, this office had a core team of international and national technical experts and supporting staff. More experts were employed from time to time for specialized services.





Water conservation - direct recycling of lime liquor

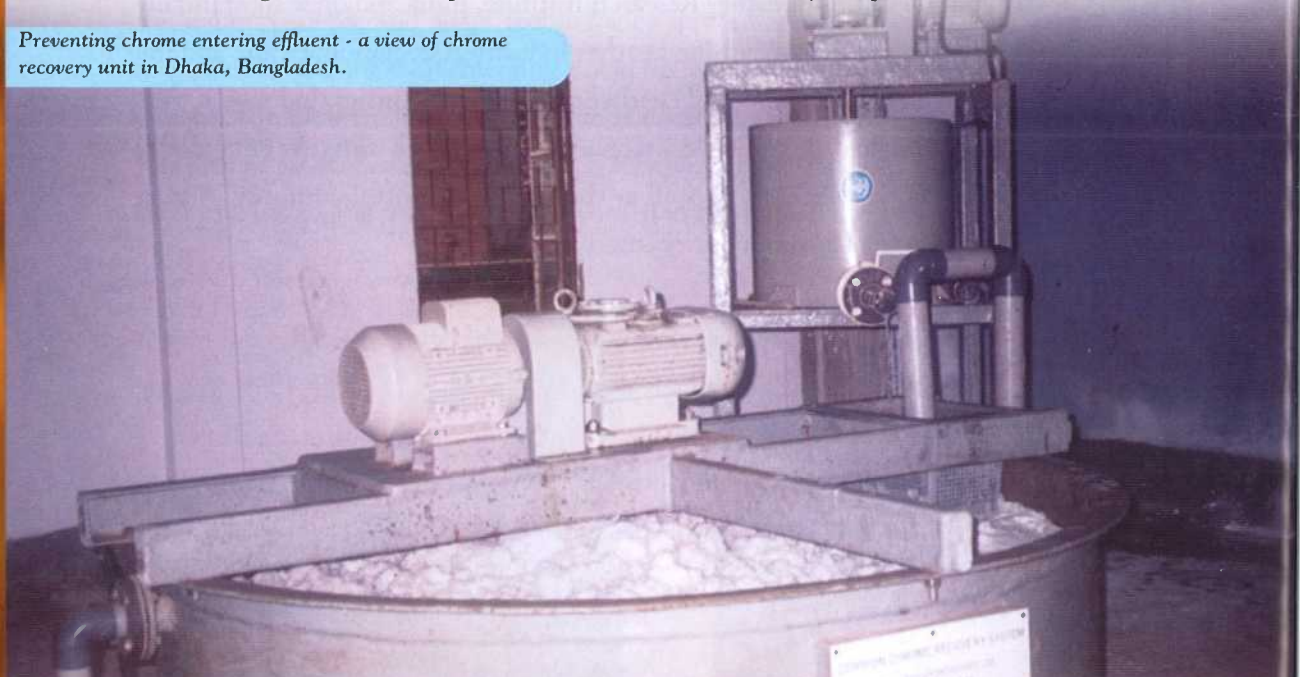
Reaching the destination

Reducing pollution at source

In many countries contamination of the environment by chromium and neutral salts has been severely frowned upon. Despite being found in its benign trivalent form, the presence of chromium in effluent or sludge is not desired for fear, perhaps not well founded, that it will convert itself into the more dangerous hexavalent form. And, with growing scarcity of water in many countries, conservation of water usage is the need of the hour. Increasing salinity of soil and water sources render these unfit for cultivation or other purposes. The three main targets of cleaner technologies demonstrated were thus focused on prevention, of chromium entering the environment and of saline contamination of soil and water sources, and, reducing water usage. After successful demonstration of their commercial and technical viability, the following technologies have been widely adopted in the participating countries.

- Recovery and reuse of chromium - in Bangladesh, India, Indonesia, Nepal and Sri Lanka. More than 100 such plants operate in India, treating about 40% of chrome waste liquor generated in the country. 70% of chrome waste water generated in Nepal and Sri Lanka are treated by the plants established under the

Preventing chrome entering effluent - a view of chrome recovery unit in Dhaka, Bangladesh.





Desalting raw stock - DODECA wooden frame

programme. The model established in Bangladesh has been adopted in toto by a large tannery. China practices direct recycling, another method demonstrated.

- Recycle and reuse of sectional - soak, lime, pickle and chrome - waste streams. Demonstrations have resulted in much reduced usage of water in many tannery clusters and lesser pollution load.
- Removal of solid salt from raw stock by mechanical or manual desalting and proper use or disposal of recovered salt demonstrated in Tamilnadu, India where salinity in effluent is a key parameter monitored. More than 40% of tanneries in India adopt any one of the technologies demonstrated.

Greater adoption of these technologies is governed by the approach adopted by the pollution control authority in these countries as well as by global trade requirements.

Improved conventional chrome tanning





End of pipe treatment - a CETP, India

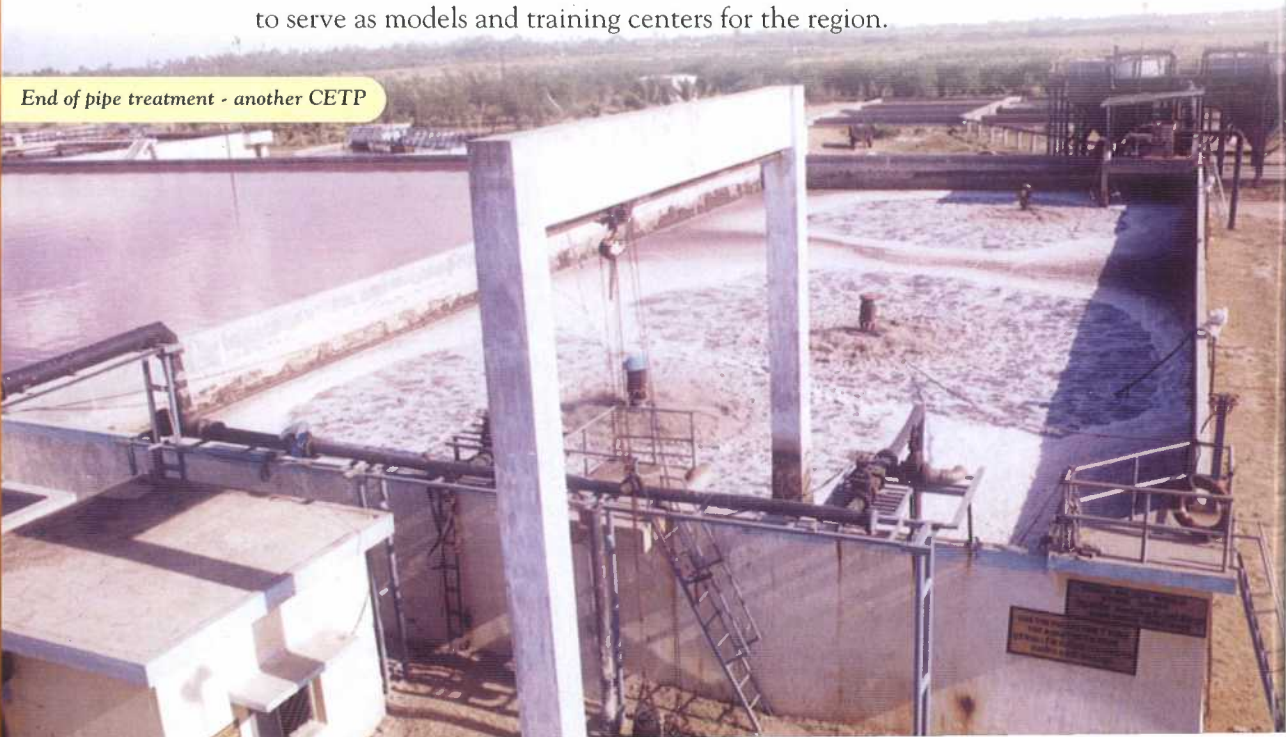
Treating at the end-of-pipe

For many countries of the region, the end-of-pipe treatment systems facilitated and established by UNIDO are the first of their kind. They thus serve as models as well. Intervention by UNIDO has ensured that large segments of tanning industry in Tamilnadu, India, have not had to close down and the large scale common effluent treatment plant (CETP) in Kolkata Leather Complex could be properly designed. Specifically:

- **China:** A large effluent treatment plant (10000 m³/d) of Shanghai Richina Leather Company, a successful joint venture now, was totally revamped; it was a precondition for the joint venture.
- Effluent treatment plants of Haining, Nanjing and Xian tanneries were upgraded; these serve as models and training centers.
- **India:** Establishment of five common effluent treatment plants, catering to waste water of 400 tanneries, about 20% of all waste water discharged by tanneries in India, was facilitated. Different proven technologies have been show-cased here to serve as models and training centers for the region.



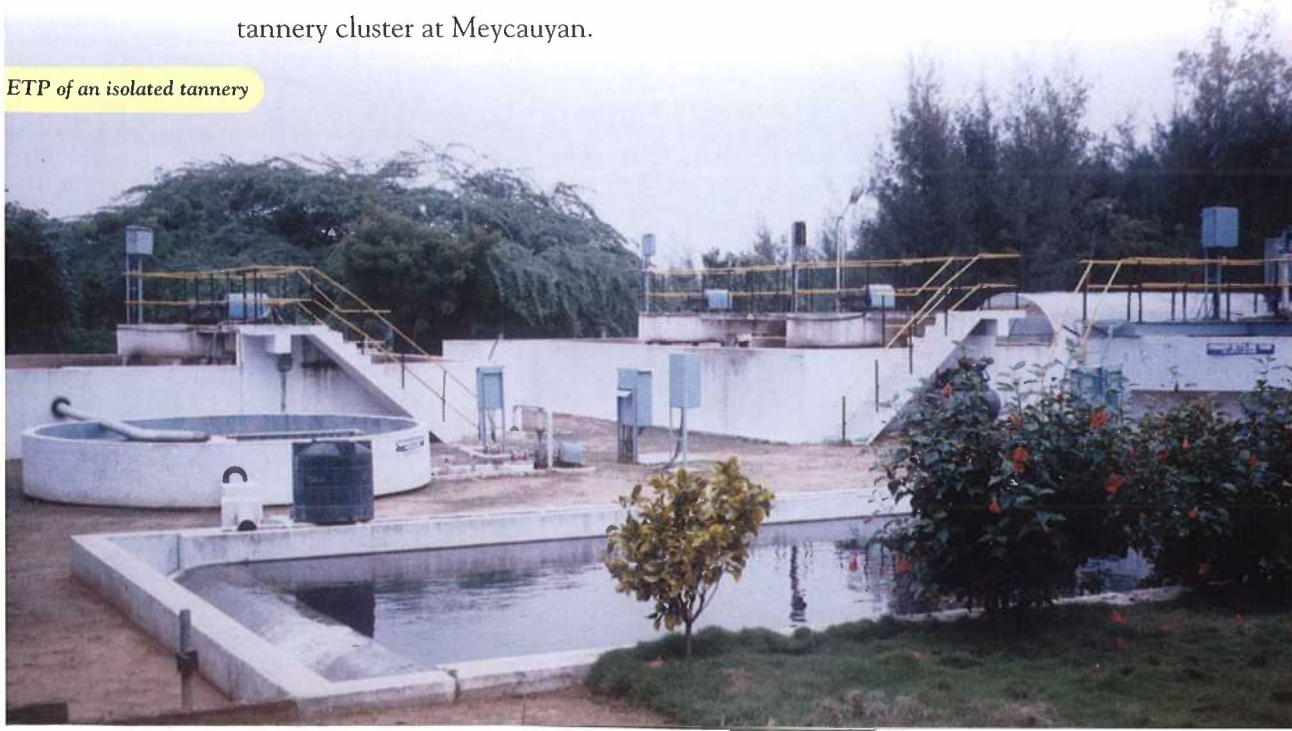
End of pipe treatment - another CETP





End of pipe treatment - ETP, Birgunj, Nepal

- Besides providing the detailed project report, engineering drawings and tender documents for the CETP of Kolkata Leather Complex, the government was assisted in the tendering process and selection of the successful bidder.
- **Nepal:** A large effluent treatment plant and a CETP, established in Birgunj, together have adequate capacity to treat 70% of waste water generated by the tanneries in the country.
- **Indonesia:** A model effluent treatment plant was established in Sitimulyo, Yogyakarta.
- **Bangladesh:** Detailed project report, engineering drawings and tender documents for a CETP of 21000 m³/d capacity for the Hazaribagh cluster of tanneries in Dhaka (accounting for 95% of tanning in the country) were presented to the government.
- **Sri Lanka:** Establishment of the Bata Atha Leather Complex for relocation of all Colombo tanneries has been facilitated and total technical support given to the CETP in it.
- **Phillipines:** The industry association and the government were provided with a report detailing technical options for dealing with pollution caused by the tannery cluster at Meycauyan.



ETP of an isolated tannery



An old drum converted for mechanical desalting

New Challenges and search for solutions

With rapidly changing framework of global trade and country's environmental regulations, the expanding leather industry is faced with new challenges. The programme's search for solutions to some of these challenges has yielded many interesting and valuable results.

Static Flaying Frame (SFF)

The traditional practice of flaying the carcass in many developing countries results in flay cuts and severe damage to the hide. A simple static flaying frame, developed by Mr. Sam Setter of Leather International magazine, had been demonstrated in Mysore and Madras, India. While the drudgery of the flayers is greatly reduced, SFF helps remove the hide faster and without damage.



Smooth flaying - Static Flaying Frame





Low-cost low maintenance treatment - Reed beds

Nature cure - constructed wet land systems - for treatment of effluent

Though widely used to treat municipal sewage, constructed wetland systems, popularly known as reed beds, have not yet been used to treat tannery effluent. This is a low-maintenance system ideal for the developing countries. Two industrial scale reed beds, operated under the programme for more than three years, have provided encouraging results. At this stage it can be concluded that reed beds are suitable as an inexpensive and viable option for treating tannery effluent.



Another reed bed





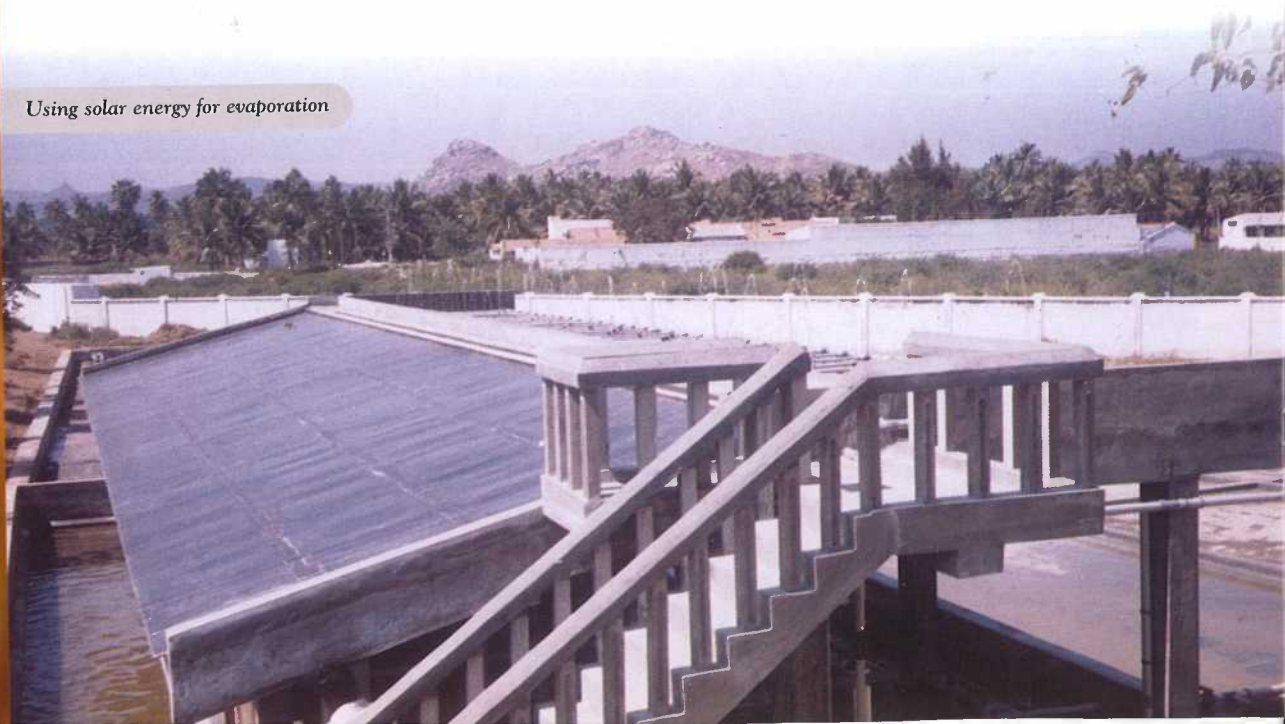
Brushing machine for desalting

Containing salinity – new vistas

Salinity in effluent cannot be reduced by conventional end-of-pipe treatment. But saline contamination is dreaded as soil and water sources are rendered unfit for cultivation and other purposes. This problem is acute in arid regions of Tamilnadu in India where the recipients of treated effluent do not offer any dilution potential. Partial or total substitution of salt as a preservative of raw stock would be a desirable step forward. However in its absence, a basket of technologies to deal with this problem has been demonstrated. These include:

- Recovery of solid salt from raw stock by manual (using a simple wooden frame called Dodeca) or mechanical desalting and its safe reuse or disposal.

Using solar energy for evaporation





Clean water from saline effluent - Pilot reverse osmosis plant, India

- In process improvements in tannery operation yielding reduction in the occurrence and discharge of TDS.
- A pilot reverse osmosis plant for recovery of clean water (about 70%) from saline effluent and reuse and disposal of concentrated reject.
- A more efficient solar evaporation system for saline effluent and reuse or safe disposal of salt.
- A technical paper outlining various options has been prepared and widely disseminated.



simplified version of solar evaporation





Digesting waste to produce energy - Biomethanation plant, India

Wealth from waste

Sludge from tannery waste water treatment plants is categorized as hazardous in many countries because it contains chromium, albeit in its benign trivalent form. As countries are revising their standards, potential uses for sludge, which contains a large amount of organic wastes, have to be found. Innovative solutions demonstrated under the programme include:

- A pilot scale biomethanation plant established in CETP, Melvisharam, in cooperation with the Ministry of Non-conventional Energy Sources of Government of India and Central Leather Research Institute, India, converts

Sludge filter press, Indonesia





Wealth from waste - sludge composting

fleshings from tannery and sludge of the CETP into bio-gas and electricity. The power generated is adequate to operate the aeration tanks of the CETP.

- Sludge was combined with other locally available carbon rich organic wastes to produce compost for use as soil conditioner.
- To immobilize heavy metals such as chromium, sludge was solidified with clay or other waste materials such as fly ash, thus prevent the leaching of heavy metals into soil or ground water.
- Safe disposal of sludge in properly designed landfills.



Cotton crops grown using sludge compost

Safe landfill for tannery sludge, India



Site of miniforest - a barren parcel of land



From barren land to picnic spot - Miniforest in Ranipet



A dump yard becomes a picnic spot

Many arid areas are parched for want of water. In such locations, treated effluent can be gainfully used for greening the area provided that it contains TDS and chloride within reasonable levels. A thoroughly degraded parcel of land of about 9 acres, used as a waste dumping ground, close to a CETP in Ranipet, Tamilnadu, earlier shunned by local population, has been transformed virtually into a picnic spot for school children by using treated effluent (about 800 cubic meters per day) for irrigation. A mini forest, with 25,000 inedible plants of eight different varieties, has been developed in less than four years. Constant monitoring has not revealed any adverse impact on soil or water sources while the forest has turned into a lush green picnic spot.

Tapping sunlight - use of solar energy for drying leather

Despite availability of sunshine in warm climate countries, usage of solar energy for industrial purposes has been rare. The first-ever solar air heating system for drying leather was established in a tannery in Ranipet, India, under technical guidance of the programme. Despite the initial high capital investment, due to very low operational cost, it has a short payback period.

Towards a safe and healthy work place - occupational safety and health (OSH) in tanneries

Work environment and worker safety are not adequately cared for in the small and medium scale enterprises of the region. These have of late become vital factors for success in global trade. The OSH standards vary widely not only among the countries of the region but also within a country between large and small/medium enterprises. Taking due account of the local practices and

Afforestation using treated tannery effluent, India.





Worker safety, top priority

situation, the programme established model OSH sites in 15 operational tanneries in the region. And drawing from this experience, an OSH reference manual had been published and widely disseminated. Tanners have now a far better awareness of OSH requirements and the required knowledge and tools to improve their work places.

Women in the tanning industry

Social customs, religious considerations and a general aversion to tanning industry are some factors operating against women joining this industry in some countries. Where they do join it, usually they are employed as unskilled or semi skilled workers. Under the programme training modules were implemented to equip women to take up supervisory and managerial positions. Lobbying with the industry associations for greater involvement of women in the industry had been a regular activity.

Women in the forefront





Electrical safety

Targeting the Consumer - eco label

With a large variety of eco-labels for leather and leather products flooding the global market to convince the consumer of their environmental integrity, there was a great deal of confusion in many developing countries. Awareness seminars were organized in China, India and Indonesia to help the industry keep abreast of the current status and thinking in this regard. Interestingly China, India and Indonesia have developed their own eco-mark schemes for leather.



A well ordered chemicals store in a tannery





Solar air heater for leather drying

Preserving knowledge

The wealth of knowledge and technical expertise developed by the programme have been preserved in a large number of technical papers and reports. Besides videos of important achievements have been made. All important documents and videos had been widely disseminated among the government and industry counterparts in all countries of the region.

Transferring know-how

In order to have the large amount of technical knowledge and expertise widely disseminated, organization of training programmes within the participating countries and in the region as a whole had been an important activity. In all 2700 technical personnel, from the participating countries as well as others such as Iran, Mongolia, Pakistan, Philippines, Thailand and Vietnam, had been trained in various aspects.



SEMINAR ON ECOLABELLING FOR THE LEATHER INDUSTRY IN INDONESIA

YOGYAKARTA MAY, 13th 1998





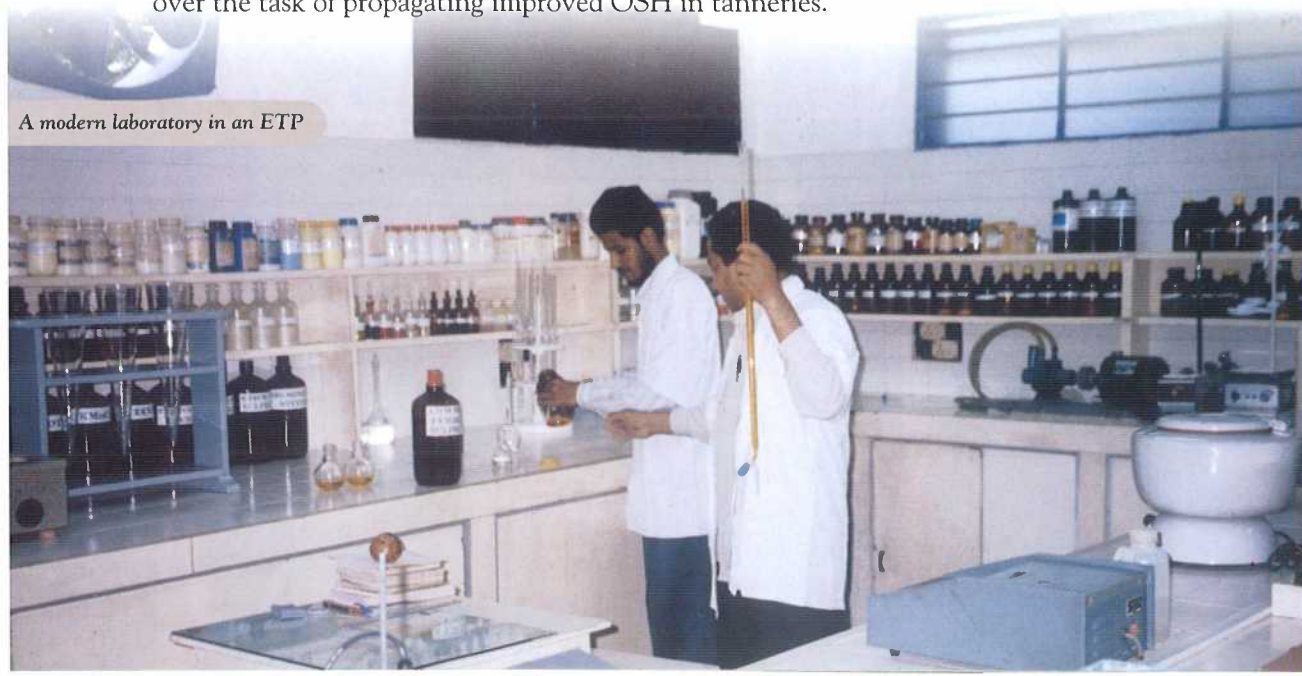
Regional meeting - exchanging experience

Impact

A few years back tanners of the region might have simply shrugged their shoulders if the topic of pollution control were discussed. Now, the knowledge of tanners relating to environmental pollution as well as various options for dealing with it has greatly enhanced. An independent evaluation of the programme concluded, after visiting many sites and interacting with a number of beneficiaries, that the programme was not only timely but produced results that far exceeded the original targets. One of its key recommendations was that the programme should continue for three more years to achieve further consolidation, replication, diffusion and assured sustainability.

Sustaining the impact

One constant concern of the programme had been to ensure sustainability of the various outputs delivered. As many of the cleaner technologies as well as ETPs and CETPs are housed in operational tanneries or cluster of tanneries, their sustainability is assured. Likewise, the pilot demonstration units have all been entrusted to either relevant industry association or specific industrial unit (s). Selected organizations of public and private sector have taken over the task of propagating improved OSH in tanneries.



A modern laboratory in an ETP

Ongoing mission

With the distinct export oriented focus of the leather industry sector in the region, maintaining a certain environmental correctness is not just desirable but it can indeed be a decisive factor and a mandatory pre-requisite for future international trading. Hence, environmental compliance is an ongoing process. In the ultimate analysis, clean environment is not some esoteric, distant or even alien entity. It is the world around us, as we would like to see it and to identify with: a healthy and invigorating environment adequately stocked with resources for succeeding generations to nurture and draw sustenance from.





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