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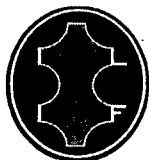
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ILIFO

INDIAN LEATHER INDUSTRY FOUNDATION

December 2000

FINAL REPORT

UNIDO PROJECT: US/IND/97/124, CONTRACT NO: 99/013, ACTIVITY CODE: 430C41

DISSEMINATION OF

**CLEANER TECHNOLOGIES / WASTE MINIMISATION AND / OR
UTILISATION AND IMPROVED PRACTICES OF OCCUPATIONAL
SAFETY & HEALTH OF WORKERS IN TANNERIES; AND END OF
PIPE TREATMENT TECHNOLOGIES IN EFFLUENT TREATMENT
PLANTS**

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LIST OF ABBREVIATIONS / SYMBOLS USED

AISHTMA	: All India Skins and Hides Tanners and Merchants Association
CETP	: Common effluent treatment plant
CLRI	: Central Leather Research Institute
ETP	: Effluent treatment plant
GTZ	: German Technical Cooperation
ILIFO	: Indian Leather Industry Foundation
OSH	: Occupational safety and health
PPE	: Personal protective equipment
RePO	: Regional Programme Office
SIDCO	: Small Industries Development Corporation (of Govt. of Tamil Nadu)
TDS	: Total dissolved solids
TNPCB	: Tamil Nadu Pollution Control Board
UNIDO	: United Nations Industrial Development Organization

EXECUTIVE SUMMARY

The Indian Leather Industry Foundation (ILIFO) was established by the industry to address the environmental aspects of leather manufacturing. It has been registered as a non-profit organization under Indian companies act. It is closely working with the UNIDO's regional programme office (RePO) at Chennai. A subcontract was awarded to ILIFO by UNIDO to disseminate the useful technical information and results obtained through the UNIDO's regional programme.

The dissemination is done through the following activities.

- Organization of workshops/seminars at different tannery clusters
- Organizing training camps at (C)ETPs and volunteer tanneries
- Publishing in quarterly journal of cleaner tanning

So far, eight workshops were conducted. About 440 people were trained in these workshops. The participants include tannery owners, managers and shop floor supervisors. Through the training camps held at CETPs and volunteer tanneries, about 100 persons including operators and chemists of 8 CETPs and 12 ETPs were provided guidance.

During the contract period, four issues of the journal were published. The journal is distributed to about 500 subscribers. The main subjects covered in these journals are the papers presented in UNIDO and ILIFO workshops at different locations.

This report contains details of the activities carried out by ILIFO under the subcontract.

1. INTRODUCTION

The Indian Leather Industry Foundation (ILIFO), a non-profit organization, was established by the tanning industry to address the environmental aspects of leather manufacturing and incorporated in May 1996 under section 25 of the Indian Companies Act, 1956. The main objectives of ILIFO are as follows:

1. To promote and / or sponsor the development of environment friendly cleaner tanning technologies
2. To promote and / or sponsor the development of suitable end-of-pipe treatment technologies for the leather industry wastes
3.
 - i. To organize information cells and databank relating to leather industries in India and abroad
 - ii. To provide information on process control, low waste technologies, recycling, reuse and end of pipe treatment solutions to the tanning industry and its allied industries
4.
 - i. To liaise with United Nations Industrial Development Organisation (UNIDO) Regional Programme for Pollution Control in the Tanning Industry in South East Asia.
 - ii. To act as the private sector arm of this programme
 - iii. To establish contact with bilateral and multilateral funding agencies for securing resources pursuing the activities of ILIFO
 - iv. To establish liaison with educational and research institutions, trade associations, and any other agency in any part of the world that may be involved in activities similar to the objectives of ILIFO.

It is closely working with the Regional Programme Office (RePO) of the United Nations Industrial Development Organisation (UNIDO).

UNIDO has been implementing a regional programme for pollution control in the tanning industry in South East Asia through its regional programme office at Chennai, India for some years. The main objective of the programme has been to enable development of leather industrial sector in these countries without causing unnecessary degradation of the environment. The main focus of programme is containment of pollution at sources by adopting and propagation of cleaner technologies, end of pipe treatment technologies and occupational safety and health of the tannery workers. Fifteen pilot and demonstration units (PDUs) were established. The operations of three CETPs were optimized and these plants serve as models in the South East Asian region. A number of OSH model sites were developed. The dissemination of the results obtained is done through ILIFO in India.

Under output-6 of UNIDO project US/IND/97/124 a subcontract was entered into in March/April 1999 between UNIDO and ILIFO in order to create an appropriate mechanism for the dissemination of results obtained under UNIDO's projects. The dissemination strategy of the subcontract is as follows:

1. Organization of workshops / seminars at different tanning clusters
2. Organization of training camps / demonstrations in volunteer tanneries and CETPs
3. Publication of the results and experiences obtained under the various projects in the foundation's quarterly journal of cleaner tanning

The details of the workshops conducted in different locations, training camps, on-site demonstrations, publications made in the ILIFO's journal are given in the following sections.

2. WORKSHOPS / SEMINARS AT DIFFERENT TANNING CLUSTERS

The Foundation's activities on the dissemination of results of UNIDO projects started in December 1998 before the formal signing of the subcontract. So far, eight workshops were conducted at different locations. These workshops were conducted in Chennai, Ranipet, Ambur, Erode and Dindigul. During the workshops, the participants were also provided with the details of the presentations and other relevant background papers as study material.

2.1. Subjects covered in these workshops

A summary of topics covered in these workshops is given below.

2.1.1. General

Environment management in tanning industry – dealing with unresolved issues – UNIDO's initiatives

2.1.2. Cleaner technologies

1. Relevance of cleaner technologies
2. Desalting of raw hides and reuse of dusted salt in pickling
3. Improved conventional chrome tanning
4. Chrome management in tanneries
5. Recycling of floats
6. Pollution reduction in post tanning (wet) operations
7. TDS management in tanneries
8. Water management in tanneries
9. Solid waste management

2.1.3. Effluent treatment

1. Optimization of primary treatment in CETPs and ETPs
2. Optimization of CETP management
3. Sludge management
4. Sampling and monitoring

5. Application of treated effluent for irrigation
6. Optimization of CETPs and ETPs
7. Composting of sludge produced in CETPs and ETPs

2.1.4. Occupational safety and health

1. OSH management
2. Safety and health Auditing / Monitoring
3. Safety in workplace – general principles of occupational safety & health in tanneries
4. Safety in use of chemicals at work
5. Machine and electrical safety
6. Improvement of workplace conditions
7. Emergency preparedness
8. Use of PPEs
9. First aid training
10. Factory rules and safety

2.2. Participants in these workshops

About 440 people from these tannery clusters were trained through the workshops. These participants include tannery owners, managers and shop floor supervisors. The number of participants in these workshops is given in the following table.

S. No.	Name of the workshop	Date	Location	No. of participants
1.	Workshop on Occupational safety and health for the personnel of tanneries and ETPs	9-10 December 1998	Ranipet	52
2.	Workshop on occupational safety and health	29-30 January 1999	Chennai	60
3.	Workshop on occupational safety and health	10-11 March 1999	Dindigul	60
4.	Workshop on optimization of primary treatment in CETPs and ETPs	26 April 1999	Ranipet	45
5.	Workshop on cleaner technologies and occupational safety and health in tanneries	08 May 2000	Ambur	70
6.	Workshop on cleaner technologies	31 July 2000	Ranipet	53
7.	Workshop on Environment management in tanning industry – dealing with unresolved issues – UNIDO's initiatives	05 September 2000	Chennai	54

8.	Workshop on cleaner technologies, occupational safety and health and optimization of ETPs	07 November 2000	Erode	45
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Details of each workshop are given below:

2.3. Workshop on occupational safety and health for Tannery and ETP personnel at Ranipet, 9-10 December 1998

A two-day training camp was jointly organized by ILIFO and UNIDO with the help of the South India Tanners and Dealers Association at Ranipet. 52 representatives of tanneries and (C)ETPs comprising mostly tannery owners, managers and supervisors from Ranipet, Melvisharam and SIDCO industrial estate participated and got themselves trained. Among the participants five represented exclusively, the tannery effluent treatment plants. The most encouraging and promising sign of the workshop was the active participation of three female employees from neighbouring shoe upper manufacturing units.

The subjects of the workshop are:

S.No.	Subject	Facilitators
1.	Introduction to OSH management	Mr. Sajid Hussain, Plant Manager, Ranitec
2.	Principles and methods of OSH auditing and monitoring in the OSH management OSH management	Mr. Shankar & Dr. Srividya, Sri Ramachandra Medical College and Research Institute, Chennai
3.	Safety in use of chemicals at work	Mr. G. Swaminathan, Assistant Director, Cell for Industrial Safety and Risk Analysis, CLRI, Chennai
4.	Productive machine safety	Mr. Mathew Alexander, Consultant, Tannery machine safety and maintenance, UNIDO
5.	Improvement of workplace conditions	Mr. A. John Kennedy Jawahar, Manager-Technical, ILIFO
6.	Emergency preparedness	Dr. G. Jayaraj, OSH consultant, UNIDO
7.	Protective equipment	-do-
8.	First aid training	St. John's Ambulance
9.	On-site introduction to OSH measures in CETP	

A detailed report on the event was prepared and submitted to UNIDO.

2.4. Workshop on occupational safety and health at Chennai, 29-30 January 1999

A two-day seminar was organized in cooperation with RePO, UNIDO at Chennai. In this workshop the following papers were presented.

1. Identification of Hazards, Mr. P.M. Belliappa
2. Factory rules and safety, Mr. G. Jeevanandam, Hony. Secretary, National Safety Council, TN Chapter
3. Chemical safety, Mr. G. Swaminathan, Asst. Director, CISRA, CLRI
4. Machine and electrical safety, Mr. Mathew Alexander, Consultant, RePO, UNIDO
5. Safety and health Auditing / Monitoring, Dr. Kalpana Balakrishnan, Head, Environmental Health engg. cell, SRMC
6. Work environment improvement, Mr. A. John Kennedy Jawahar
7. Emergency preparedness, Dr. Jayaraj, OSH Consultant, RePO, UNIDO
8. First medical aid, Dr. Jeyaraj, OSH Consultant, RePO, UNIDO
9. Environment and safety, Mr. G. Rengasamy, Member Secretary, TNPCB.

Apart from classroom deliberations, a field visit to OSH demonstration sites in Pallavaram near Chennai was organized on the second day of the workshop. 60 participants attended the workshop.

2.5. Workshop on occupational safety and health at Dindigul, 10-11 March 1999

This workshop on occupational safety and health in series was organized in Dindigul in cooperation with RePO, UNIDO and Dindigul Tanners Association from 10 to 11 March 1999. The programme details of the workshop are given in Annex-1. About 60 participants including managers and supervisors from tanneries attended the seminar.

2.6. Workshop on optimization of primary treatment in CETPs and ETPs, Ranipet, 26 April 1999

A one-day seminar on primary treatment of CETPs and ETPs was organized in Ranipet for the managers and chemists of CETPs and ETPs in and around Ranipet. This workshop was organized in close cooperation with RePO, UNIDO, South India Tanners and Dealers Association and Ranitec CETP. 45 participants attended the programme. The programme details and list of participants are given in Annex-2.

2.7. Workshop on cleaner technologies and occupational safety and health in tanneries at Ambur

A one-day workshop was organized by Indian Leather Industry Foundation and Ambur Tanners Association in cooperation with Regional Programme Office of UNIDO on 8 May 2000. The workshop was conducted in M.U. Higher Secondary School, Ambur for three tannery clusters, namely, Ambur, Vaniyambadi and Pernambut. In all 70 participants attended the workshop. Most of the participants were owners and tannery technicians. Mr. N. Mohammed Sayeed, President, Ambur Tanners Association inaugurated the workshop. Mr. A. Sahasranaman, Programme Coordinator, in his special

address on relevance of cleaner technologies, briefed the participants of the results achieved under UNIDO's regional programme in the last four years.

Technical presentations were made on the following topics.

1. Safety in the workplace
2. Chemical safety
3. Containing TDS in wastewater through inhouse measures
4. Containing chromium in wastewater through inhouse measures



A section of the participants in the workshop

Mr. N. Mohammed Sayeed, President, Ambur Tanners Association, inaugurating the workshop

A report prepared on the event is enclosed in Annex-3.

2.8. Workshop on cleaner technologies, occupational safety & health for tanneries and optimization of (C)ETPs at Ranipet

The South India Tanners and Dealers Association, UNIDO and the Indian Leather Industry Foundation (ILIFO) organized a one-day workshop on cleaner technologies, occupational safety & health for tanneries and optimization of (C)ETPs on 31st July 2000. The workshop was conducted in the Meeting-Hall of the association at Ranipet. Fifty-three (53) participants attended the workshop. Mr. M.M. Hashim, Chairman of CLE (Council for Leather Exports) inaugurated the workshop.



Mr. M.M. Hashim inaugurating the workshop



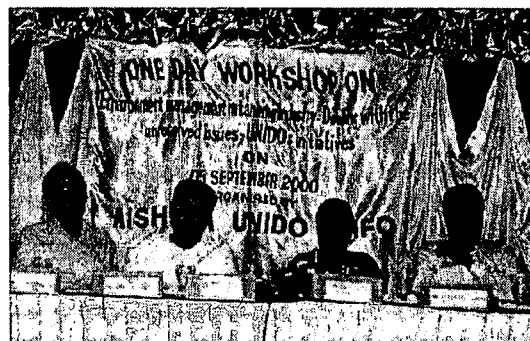
A section of the participants

The proceedings of the workshop is given in Annex-4.

2.9. Workshop at Chennai

ILIFO conducted a one-day workshop in cooperation with AISHTMA and RePO, UNIDO on “Environment management in tanning industry – Dealing with the unresolved issues – UNIDO’s initiatives” on 5 September 2000 at Hotel Breeze in Chennai.

The workshop was inaugurated by Ms. Sheela Rani Chunkath, Chairperson, Tamil Nadu Pollution Control Board. During her inaugural address, she stressed that the role of lower level employees in each factory in the cleaner production or pollution control measures. Hence they also should be given proper training on the new developments in the above field. Mr. M. M. Hashim, Chairman, ILIFO, during his address stated the importance of the workshop in many ways as it dealt with unresolved environmental issues. Followed by the inaugural address, Mr. Rafeeqe Ahmed, President, AISHTMA spoke on the industry’s viewpoint on the environment management.



Mr. A. Sahasranaman, Programme Coordinator, RePO, UNIDO spoke on the UNIDO’s initiatives dealing with the unresolved technical issues.



Participants of the workshop at Chennai

After the inaugural session, short video films on solid waste management and sludge management were shown to the participants. Followed by the video show, technical presentations on the following topics were made.

1. Optimization of CETP management
2. TDS Management in Tanneries
3. Sludge Management
4. Sampling and Monitoring – Basis for efficient treatment
5. Occupational Safety and Health in Tanneries
6. Treated Effluent in Irrigation
7. Chrome Management in Tanneries

A report on the workshop is given in Annex-5.

2.10. Workshop at Erode

A one-day workshop on cleaner technologies and occupational safety & health in tanneries was organized by Indian Leather Industry Foundation (ILIFO) in cooperation with The Erode Tannery Merchants' Association and the Erode Tannery Owners Association at The Hotel Oasis, Erode on 7 November 2000. The workshop was inaugurated by Mr. A. Sahasranaman, Programme Coordinator, RePO, UNIDO, Chennai. Mr. Burkhard Peil welcomed the participants. 53 participants attended the workshop. Mr. E.K.M. Ahmed Abdul Kader, President, Erode Tannery Merchants' Association presided. Mr. Sahasranaman, in his inaugural address, appreciated the tanners in Erode for the tremendous investment made in pollution control measures particularly in effluent treatment plants amounting to Rs. 200 million (US\$ 4.3 million).

After the inaugural session, the following technical presentations were made:

S.No.	Subject	Presenter
1.	Pollution control in Tanneries – UNIDO's initiatives	A. Sahasranaman, Programme Coordinator
2.	Relevance of cleaner technology with focus on chrome management	Solomon Sampathkumar, National Expert, UNIDO
3.	Occupational safety and health	Burkhard Peil, Executive

	in tanneries	Secretary, GTZ-CIM Expert, ILIFO
4.	Optimization of ETPs	-do-
5.	Water management in tanneries	M. Viswanathan, Leather Technologist, UNIDO

In between the technical presentations, the following videos, which are produced by RePO, UNIDO were shown to the participants.

1. Solid waste management
2. TDS management
3. Sludge management

3. ORGANIZATION OF TRAINING CAMPS / ON-SITE DEMONSTRATIONS IN VOLUNTEER TANNERIES AND CETPS

Mr. Burkhard Peil, GTZ-CIM expert, who is also executive secretary of ILIFO, has been conducting a series of on site training programmes for the CETPs and ETPs based on preliminary audits conducted. The audit was designed to study and evaluate the following aspects of the treatment plants:

- ☞ Efficiency of treatment
- ☞ Cost of treatment
- ☞ Minimisation of wastes
- ☞ Consumption of energy (mainly electrical)

The following (C)ETPs were shortlisted for the audit and the exercise is ongoing. The parameter(s) studied by the audit is/are indicated against each plant:

#	CETP/ETP	Energy consumption	Chemical dosing	Treatment efficiency
1.	Ranitec, CETP	X	X	X
2.	Sidco, Ranipet	X		X
3.	Vaniyambadi CETP	X	X	X
4.	Udayendiram CETP		X	X
5.	Amburtec, Ambur	X	X	X
6.	Ganappa Leathers	X	X	
7.	Montari Leathers	X	X	X
8.	Habeeb Tanning	X	X	
9.	Maypar Leathers	X	X	X
10.	Trichy CETP		X	
11.	Melvisharam			X
12.	ECTC-Tannery	X		X
13.	RSL Tannery	X		
14.	MKH Tannery	X		
15.	Selathaar Tannery	X		
16.	N.M. Tannery	X		X

17.	Dindigul CETP	X		X
18.	Teeyem Leathers	X		X
19.	H. M. Meera Sahib & Sons, Erode	X	X	
20.	Haseena-Traders	X	X	X

The audit exercise includes training of technical personnel of the (C)ETP, particularly those involved in the analysis of samples in laboratory and monitoring of process.

3.1. ILIFO's activities to handle the present situation of the (C)ETPs

With the modifications done in several CETPs and ETPs, with the active involvement of ILIFO, a good improvement in the CETP performance could be obtained. The progress in the reduction of energy consumption by regular monitoring and reduction in chemical consumption is reflected in the analytical reports of CETPs of Ambur, Vaniyambadi, Ranitec, Habeeb-tanning, ECTC and Shanmugam tannery.

The benefits of using the laboratory monitoring facilities could be felt in all ETPs and CETPs. The present difficulties are not only in monitoring but also the under loading of the plants.

Following difficulties were identified during the visits after careful investigation of monitoring data.

- Presently the CETP and ETPs receive only about 15-60% of the designed flow
- The operating costs are high
- Optimisation and cost reduction could be done only in well supported CETPs and ETPs after intensifying the self monitoring programme
- Missing laboratory equipment and consequently lack of proper monitoring lead to higher operating costs especially the energy costs
- Sludge management by optimising the primary treatment is a well recognised but not a properly managed object of the effluent treatment
- Chrome content of sludge is mostly higher than 5000 mg/kg
- The colour of treated effluent especially from plants treating wastewater from vegetable tanning units is dark

The following measures could improve the performance of the CETP.

- Adoption of cleaner technologies in the tanneries shall minimize hydraulic load and pollutants
- Improvement in the collection of funds from individual tanner members will strengthen the operation & maintenance
- Promotion of the ETPs within the factory
- Engaging skilled chemists for the (C)ETPs
- Better preventive maintenance like lubrication, painting, etc.
- Regulation of equalised effluent transfer pumps to achieve uniform flow distribution throughout the day
- Improvement in personnel management
- Improved OSH practices

In these training programmes approximately 100 technical personnel were trained. Eight CETPs and 12 ETPs were given training on the optimisation. This does not include the personnel trained in the other workshops and seminars.

3.2. Technical assistance on cleaner technologies to tanneries

E.K.H.M. tannery, a small-scale tannery in Erode sought assistance to develop and implement cleaner technologies in the tannery. The tannery has a capacity to process 3 tonne of raw hides per day and to produce 250,000 sq.ft. of finished leather per month. The tanning process adopted was studied in cooperation with RePO UNIDO. The following cleaner technologies were identified as applicable to this tannery and the processes explained to the owner-managers.

1. Water measurement and optimisation of float size throughout the processes
2. Reuse of dusted salt in pickling
3. Counter current soaking
4. Recycling of lime liquor and relime liquor – existing pits can be used for this with less investment
5. Float optimisation in deliming, pickling and chrome tanning
6. Improved conventional chrome tanning
7. Rehabilitation of chrome recovery unit
8. Recycling of pickle liquor
9. Reuse of chrome cakes available in the tannery
10. Float control in the post tanning operations

A report on the above is being prepared in cooperation with RePO UNIDO and will be sent to the tannery.

4. PUBLICATION THROUGH ILIFO JOURNAL OF CLEANER TANNING

Since the signing of the contract in March 1999, ILIFO published four journals dated December 1998, November 1999, February 2000 and July 2000. The next issue dated February 2001 is in print.

4.1. Issue No. 7 dated December 1998

The following topics were published in this issue.

- Make your tannery waste earn for you – Dog chews from Raw trimmings and limed hide splits - Muralidhar Rao and Valentin Post
- Mass balance in Leather processing – J. Buljan, G. Reich and J. Ludvik (UNIDO Vienna): Part-2
- Thickening of tannery sludge – From UNIDO's Regional workshop for design, operation and maintenance of tannery effluent treatment plants
- Model calculation for conventional sand drying bed

4.2. Issue No. 8 dated November 1999

The following topics were covered in this issue.

- Desalting of raw hides and skins.
- Upgrade lighting in your tannery / ETP – Improve safety and productivity and save energy.
- Occupational safety and health in the tanning industry in Tamil Nadu – UNIDO's experience.
- Sampling and self monitoring in effluent treatment plants.
- Chemical treatment of tannery effluent (Part-2) Clariflocculator/Primary clarifier
- Energy auditing in a CETP
- Leather board manufacturing from tannery waste

4.3. Issue No. 9 dated February 2000

Issue No. 9 dated February 2000 was brought out during the India International Leather Fair (31 January to 04 February 2000) held at Chennai. In order to reach out to the people of the industry converging at Chennai to participate in the leather fair, it was decided to print 1000 copies of the journal and distribute a portion of it to visitors to the Fair. The topics covered in this issue were as under:

- Improved conventional chrome tanning
- Chrome free upholstery leather – Two years on in South Africa
- Women's health issues in workplace – the case of tanning industry
- Evaluation of the occupational environment in tanneries through environmental biological and clinical monitoring
- Sampling and self monitoring
- Operation and maintenance of effluent treatment plants – Biological treatment of tannery effluent (Part-1) Aeration tanks
- Trouble-shooting in common effluent treatment plants – Pretreatment
- Landfill for tannery sludge – Part 1

4.4. Issue No. 10 dated July 2000

The topics covered in this issue were:

- Pollution reduction in post tanning operations
- Pollutants in tannery effluent: Part 1
- Selection and application of aerators for effluent treatment
- Lagooning: A solution for tannery effluent
- Landfill for tannery sludge – Part 2

4.5. Issue No. 11 dated February 2001

In the forthcoming issue dated February 2001 the following topics are being covered.

- Conclusions and results obtained from UNIDO Project (DG/IND/98/213) in Kanpur
- Chrome management in tanyard: Part-I
- Pollutants in tannery effluent: Part-II
- Composting of tannery sludge – UNIDO’s experience in Vellore district
- Operation and maintenance of effluent treatment plants – biological treatment of tannery effluent (Part-2) Anaerobic tank
- Landfill for tannery sludge: Part-III
- ILIFO’s cluster workshops – Ranipet, Chennai and Erode

5. FUTURE ACTIVITIES

5.1. Workshops and seminars

Two cluster workshops are on the anvil. The next workshop on the cleaner technologies and occupational safety & health in tanneries will be organised in the second week of December 2000 at Trichy.

The next workshop will be organised in January 2001 in Dindigul.

5.2. Training camps and on-site demonstrations

The existing training and demonstrations will be continued in the identified locations where the activities are ongoing.

5.3. Publication in ILIFO’s journal of cleaner tanning

The next issue of the ILIFO Journal of Cleaner tanning will be published during the month of March 2001. The following topics were identified.

- Chrome management in tanyard: Part-II
- Improved solar evaporation of saline effluent
- Operation and maintenance of effluent treatment plants – Biological treatment of tannery effluent (Part-2) Secondary clarifier
- Landfill for tannery sludge: Part-III
- Troubleshooting in common effluent treatment plants – Collection and conveyance

6. CONCLUSION

- 6.1. The workshops conducted in the different clusters were well received by the industry. The results obtained from the pilot demonstration units and other demonstration plants implemented by UNIDO were the main subjects of discussion in these workshops. The participants were provided with copies of relevant background papers as study material.

- 6.2. These workshops facilitated a good interaction between the tannery owners, leather technologists and (C)ETP managers.
- 6.3. The industry associations in the respective locations extended good cooperation in organizing the events.
- 6.4. About 440 persons were trained through the workshops and about 100 personnel were trained through on-site demonstrations. Eight CETPs and 12 ETPs were assisted through the training camps and demonstrations.
- 6.5. ILIFO Journal of cleaner tanning is presently sent to 500 addresses. This journal publishes the results obtained from PDUs. It will continue to be an effective tool of dissemination of technical information.

Annex-1

Programme details of workshop on occupational safety and health for tanneries at Dindigul

Day-1 10 March 1999

TIME	SUBJECT	FACILITATOR
10.30-11.00	Registration	Mr. A. John Kennedy Jawahar, Manager – technical, ILIFO
11.00-11.30	Welcome to workshop	Mr. R. Aravamuthan, Hony. Secretary, DTA
	Key note address	Mr. A. Sahasranaman Programme Coordinator, RePO, UNIDO, Chennai
	Inaugural address	The district collector, Dindigul
11.30-12.00	Introduction to subjects and identification of hazards	Mr. P.M. Belliyappa, Consultant, RePO, Chennai
12.00-12.45	Chemical safety	Mr. G. Swaminathan, Asst. Director, CISRA, CLRI
12.45-13.45	Lunch break	
13.45-14.45	Tannery machine and electrical safety	Mr. Mathew Alexander, Consultant, tannery machine safety and maintenance
14.45-15.30	Safety and health auditing / monitoring	Dr. Kalpana Balakrishnan, Head, Environmental Health Engg. Cell, SRMC
15.30-15.45	Coffee/ tea break	
15.45-16.30	Work environment improvement	Mr. A. John Kennedy Jawahar
16.30-17.00	Group discussion	Mr. P.M. Belliappa

Day-2 11, March 1999

TIME	SUBJECTS	FACILITATORS
9.00-11.00	Field visit to tannery and CETP	Mr. A. John Kennedy Jawahar
11.00-11.30	Coffee/ tea break	
11.30-12.00	Group discussion	Mr. P.M. Belliappa
12.00-13.00	Emergency preparedness	Dr. Jayaraj, OSH Consultant, RePO, UNIDO
13.00-14.00	Lunch break	
14.00-16.00	First medical aid	Dr. Jayaraj
16.00-16.15	Coffee/Tea break	

16.15-16.45	Workshop evaluation	Mr. P.M. Bellippa
16.45-17.00	Distribution of certificates	Dr. Jurgen Hannak, Coordinator Environmental Management, UNIDO
17.00-17.15	Vote of thanks	

Venue

The Dindigul Tanners Association
86/B, Madurai Road
Bagampur Post
Dindigul- 624 002.

Annex-2

Workshop on optimization of primary treatment in CETPs and ETPs, Ranipet, 26 April 1999

Venue : South India Tanners & Dealers Association, 18, Mahatma Gandhi Road, Ranipet. Ph : (04172-22653/25354)

Programme Details

Time (hrs.)	Title	Facilitators
09.30 - 10.00	Registration	John Kennedy Jawahar
10.00 - 10.15	Inauguration	A. Sahasranaman, Programme Coordinator, RePO, UNIDO
10.15 - 10.45	Primary treatment - definition, need, components and technologies	Mr. Burkhard M. Peil
10.45 - 11.15	Utilization of Poly aluminum chloride in the primary treatment	Dr. S. Sundaramoorthy, Engineering Director(Retd.) MMWSSB
11.15 - 11.45	Process Control of primary treatment units - Flash mixer, Clariflocculator	Mr. K.V. Emmanuel, National Expert, RePO UNIDO
11.45 - 13.00	Utilization of Polyelectrolyte in the primary treatment	M/s. Polyelectrolyte India Ltd., Hyderabad
13.00 - 14.00	Lunch - Sponsored by M/s. PolyElectrolyte India Ltd.	
14.00 - 14.30	Sludge dewatering - need,methodologies,options	Mr. John Kennedy Jawahar
14.30 - 15.00	Application of Filter press for sludge dewatering	Mr. Hans Liebel, M/s. Netzsch India Pvt. Ltd.
15.00 - 15.15	Tea Break	
15.15 - 15.45	Application of Vacuum Centrifuge for sludge dewatering	Mr. K. Parameswaran, M/s.Alfa level
15.45 - 16.15	Pumps for sludge handling	Mr. Giri, M/s.Alfa Helical Pumps
16.15 - 16.45	Disposal/utilization of sludge	Mr. Swaminathan
16.45 - 17.00	Summing up of technical sessions	Mr. Burkhard M. Peil

Participants of workshop at Ranipet 26 April 1999

S. No.	Name of the participant	Designation	Organisation
1.	R. Kirubakaran	Chemist	Talco Dindigul Tanners Enviro Control Systems Ltd
2.	M. Natarajan	Chemist	CETP, Ranitec
3.	S. V. Iqbal Basha	ETP In-charge	ATH Leder Fabrik, Melvisharam

4.	M. S. Palani	Plant Engineer	CETP, Ranitec
5.	S. Nagarajan	Area Executive	IESSC, Coimbatore.
6.	S. Nagarajan	Branch Manager	Ion Exchange India Ltd
7.	A. Zafarullah Shariff	Chemist	CETP, Ranitec
8.	J. Shafullah	ETP in-charge	ECTC, Ambur
9.	N. Abdul Sattar	Chemist	CETP, Ranitec
10.	V. N. Sharma	Chief Excutive	Industrial Chemical Suppliers
11.	P. Sankaran	Chemist/ETP -in charge	Teeyem Leather, 32, Srinivasanpet Road, Ranipet.
12.	W. Nisar Ahmed	Manager	CETP, Vishtec
13.	S. Anithalakshmi	Chemist	CETP, Sidco, Ranipet
14.	T. Umadevi	Chemist	CETP, Ranitec
15.	Firdaus.K. Ahmed	Manager	SSC, Ambur
16.	S. Manoj Kumar	Branch Manager	Alfa Helical Pumps
17.	R. Irshad Ahmed	Chief Chemist	CETP, Vishtec
18.	N. Nirmal Kumar	Chemist	CETP, Amburtec, Malligaithepe
19.	P. K. Kavitha	CETP Manager	CETP, Sidco, Ranipet
20.	C. Noorul Ameen	Manager	Anas, Pernambut,
21.	D. Rajamnurthy	ETP in charge	PKL, Kannivakkam
22.	SS. Chinniah	Plant Manager	CETP, Pallavaram.
23.	N. Asokan	ETP in charge	Coromandel Leathers, Ranipet
24.	M. Y. Imtiaz Ahmed	Partner	Mohamed Junaid tannery, Ranipet
25.	A. Raghunathan	Chemist	ICS, Chennai
26.	V. Sounder Rajan	ETP in charge	Taurus Leathers Pvt Ltd.
27.	G. Deenadayalan	ETP in charge	Sura Leathers, Ambur.
28.	R. Refeeq Ahmed	Manager	HH Nayeem & Co., Perungudi.
29.	R. Venkatesh	ETP in charge	Asmath Basha & Co. pernambut
30.	M. Subramaniam	Proprietor	Mahadev Tanners, Ranipet
31.	Minni Muzaffar Ahmed	Partner	Tasmiah leathers, Ranipet
32.	W. M. Mukthar Ahmed	Manager	MHT tannery, Nandiyalam.
33.	A. Shakeel Ahmed	ETP in charge	T.M. AR & Sons
34.	D. Paul raj	ETP manager	Srinivasa Leather, Ranipet
35.	P. Masood Ahmed	Proprietor	Kafeela leathers, Ranipet
36.	A. R. Radhakrishnan	Proprietor	Habeed tanning Co., Gudiyatham
37.	K. R. Manikkam	ETP in charge	Ravirama rangachettiam, Vellore.
38.	V. Balaraman	ETP in charge	RSL Industries, Virinchipuram
39.	C.Y. William	Chief Engineer	TAW, Ambur
40.	K. A. Parvaiz Ahmed	Chemist/ ETP in charge	Farida, Ambur
41.	G. S. Trivedi	Engg. Manager	Mastari Leather Ltd, Vellore.
42.	E. Niaz Ahmed	ETP Manager	N.M. Zaccharia & Co., Ambur
43.	Kamal Basha	ETP Supervisor	Florence Shoe Co., Ambur
44.	K. Arjunan	Proprietor	A.S. Leather Co., Ranipet
45.	G. Sivakumar	Engineer	Forbes Marshall & Co., Chennai.

Annex-3

INDIAN LEATHER INDUSTRY FOUNDATION
LEATHER CENTRE, 53, RAJA MUTHIAH ROAD
PERIAMET, CHENNAI – 600 003
TEL: 538 9945 FAX: 536 5292

REPORT ON
WORKSHOP ON CLEANER TECHNOLOGIES AND
OCCUPATIONAL SAFETY AND HEALTH IN TANNERIES

VENUE: M.U. Higher Secondary School, M.C. Road, Ambur

DATE: Monday, 08 May 2000

Prepared by
INDIAN LEATHER INDUSTRY FOUNDATION
IN COOPERATION WITH
REGIONAL PROGRAMME OFFICE, UNIDO, CHENNAI

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INTRODUCTION

1. One of the major objectives of Indian Leather Industry Foundation (ILIFO), an organization created by the tanning industry, is to propagate environmental consciousness in the tanning community. The other major objective of the organisation is to create awareness among the tanners about cleaner tanning practices, cost effective treatment of the effluent generated in the tanning process and improvement of OSH standards in tanneries and effluent treatment plants. A series of training workshops on cleaner tanning, Occupational Safety and Health and treatment of tannery effluent is being organized by ILIFO at different locations in close cooperation with the Regional Programme Office (RePO) of United Nations Industrial Development Organization (UNIDO), Chennai.
2. UNIDO's Regional Programme for pollution control in the tanning industry in South East Asia, has been under implementation in China, India, Indonesia, Népal and Sri Lanka for the past over three years. The prime objective of the regional programme is to enable expansion of the leather industrial sector in these countries without causing unnecessary degradation of the environment. The programme focuses not only on tannery pollution abatement, control and treatment but also on enhancing productivity in the industry by improving the occupational safety and health of the tannery workers.
3. UNIDO awarded a subcontract to ILIFO under output-6 of UNIDO project US/IND/97/124 for dissemination of the results of the various projects implemented by the Regional Programme. The propagation of results is done by ILIFO by the following means: -
 - ☞ Organization of workshops/ seminars/ training camps
 - ☞ Publishing a quarterly journal (ILIFO Journal of Cleaner Tanning)

With the view to propagate the results of selected cleaner technologies and OSH aspects to the tanneries of Ambur, Vaniyambadi and Pernambut, a one-day workshop was organized at Ambur on 8 May 2000.

ORGANIZATION OF THE WORKSHOP

4. The one day workshop was organized jointly by Indian Leather Industry Foundation and Ambur Tanners' Association. The workshop was designed to benefit the tanners of the three clusters, namely, Ambur, Vaniyambadi and Pernambut. In all 70 participants attended the workshop. Most of the participants were owner-managers and leather technologists.
5. RePO UNIDO provided the required technical support. The following papers were distributed to the participants as study material.
 1. Low waste leather processing, Ludvik
 2. Chrome management in tanyard, Ludvik

3. Technology package on manual / mechanical desalting and reuse of dusted salt in pickling, RePO

The programme schedule is at Annex-I.

PROCEEDINGS OF THE WORKSHOP

6. Mr. Burkhard Peil, GTZ-CIM expert working for ILIFO welcomed the participants. The workshop was inaugurated by Mr. N. Mohammed Sayeed, President, Ambur Tanners' Association. In his inaugural address, he stressed the need for introducing cleaner technologies in tanneries to eliminate pollution at source. He also welcomed the role of tanners' associations and individual tanners in making the tanning industry environment-friendly. He thanked UNIDO for its contribution towards environmental protection and OSH improvement in the tanning sector.
7. Mr. A. Sahasranaman, Programme Coordinator, in his special address on relevance of cleaner technologies, briefed the participants of the results achieved under UNIDO's regional programme in the last four years. He stated that when the programme was started in 1996, many tanneries were closed in Tamil Nadu on Supreme Court's order. The programme addressed the immediate environmental problems faced by the tanning industry. He highlighted the UNIDO's activities in the field of resolving the unresolved environmental problems, like TDS management, sludge utilization and disposal, chrome management and solid waste utilization and disposal. Over fifteen projects have been set up by UNIDO to address these problems and good progress has been made so far. He also highlighted the following projects of the programme:
 - Use of treated effluent originating from semi-finished to finish tanneries for irrigation
 - Conversion of sludge containing less chromium into compost
 - Safe disposal of sludge
 - Natural treatment of tannery effluent – root zone treatment
 - Accelerated of evaporation of saline effluent

Papers were presented following the inauguration of the workshop. The following presentations were made.

5. Safety in the workplace
 6. Chemical safety
 7. Containing TDS in wastewater through inhouse measures
 8. Containing chromium in wastewater through inhouse measures
-
8. Mr. V.M. Khaleelur Rahman, Secretary, Ambur Tanners' Association thanked UNIDO, ILIFO and all the participants for making the event a grand success.

9. A list of participants is given in Annex-II.

DISCUSSIONS

10. Mr. Mohd. Sayeed informed that the cost of desalting equipment is less than the figures indicated. The cost of DODECA wooden frame is Rs. 2,500/- and of brush type desalting machine is Rs. 30,000/-. He also explained that the cost benefit is higher, as the cost of equipment is less. He specifically referred to the activities of UNIDO in Shafeeq Shameel Company and stated that with the help of UNIDO's interventions, the problem of TDS in his tannery has been contained to an extent.
11. Mr. Venkatesan Kesavan, a participant, showed interest on the tannery posters. He requested for the specific tannery posters on safety and good house keeping measures.
12. Mr. Solomon Sampathkumar encouraged the participants to obtain more information, if necessary, from ILIFO or UNIDO on cleaner processing technologies.

CONCLUSIONS AND RECOMMENDATIONS

- 13.1. The participants being technical personnel, the subjects covered were of much interest to them.
- 13.2. The manual of occupational safety and health aspects of leather manufacture published by Council for Leather Exports had already been distributed to tanners by the Ambur Tanners' Association. In view of the additional demand at the workshop, President, Ambur Tanners Association agreed to bring more copies and distribute among interested tanners.
- 13.3. Though the participants showed positive inclination towards the cleaner technologies described, persistent efforts will be needed by ILIFO to popularize these measures effectively among tanners.

Annex-I

Schedule of the one-day workshop on cleaner technologies and OSH

Venue : M.U Higher Secondary School, M.C. Road, Ambur

Date: 8 May 2000

Time	Activity
1030 hrs	Welcome address Burkhard Peil, CIM-GTZ-ILIFO Expert
1040 hrs	Inaugural address N. Md. Sayeed, President, Ambur Tanners Association
1055 hrs	Relevance of cleaner technologies – Special Address A. Sahasranaman, Programme Coordinator, UNIDO, Chennai
1115 hrs	Session I: Safety in the workplace – General Principles of Occupational Safety & Health in tanneries A. Sahasranaman, Programme Coordinator, UNIDO, Chennai
1140 hrs	Tea break
1150 hrs	Session II: Safety in workplace – Chemical safety Burkhard Peil, GTZ-CIM-ILIFO Expert
1220 hrs	Session III:- Containing TDS Solomon Sampathkumar, National Expert, UNIDO, Chennai
1250 hrs	Session III : Containing Chromium M. Viswanathan, Leather Technologist, UNIDO, Chennai
1320 hrs	Session IV : Question & Answers – Interactive session
1340 hrs	Vote of thanks VM Khaleelur Rahman, Secretary, Ambur Tanners Association
1345 hrs	Lunch

Annex-II

List of participants

S. No.	Name	Organisation/ Company
1.	V. Santhanakrishnan	T. Abdul Wahid
2.	V. Vijayakumar	A.S. Nisar Ahmed & Co
3.	C. Yesudas Williams	T. Abdul Wahid
4.	P. Dayalan	Amburtec
5.	M.Nazir Ahmed	Thabasiya Tanning Industry
6.	V. Zubair Ahmed	Aadil Ashfaque & Co
7.	M Abdul Hameed	Vaniyambadi Tanners Association
8.	T. Mohammed Siddiq	Taha Leathers
9.	N. Nirmal Kumar	Chemist
10.	Mohemmed Firdaus	Vanitec
11.	K. Subba Rao	Jai Bharat Tanners
12.	K.A. Parvaiz Ahmed	Farida Prime Tannery
13.	Md. Waseek	Vanitec
14.	S. Afzal	K.M. Ahmed & Co
15.	S. Ezhumalai	N.K. Yahya Gani
16.	J. Saifulla	Eastern Chrome Tanning Corporation
17.	M. Ethiraj	Eastern Chrome Tanning Corporation
18.	Venkatesan Kesavan	R.M. Devan & Co, VNB
19.	C. Massod Javed	Amburtec
20.	T.M. Imthiyaz Ahmed	Eastern Chrome tanning Corporation
21.	C. Noorullah	ANAS Enterprises, Pernambut
22.	R. Muralidharan	T. Abdul Wahid 'A' Tannery
23.	A. Ameer Jan	T. Abdul Wahid 'B' Tannery
24.	N. Senthil Kumar	T. Abdul Wahid 'A' Tannery
25.	V. Irshad Ahmed	K. Mutaz & Co, Pernambut
26.	K. Qamass Nissar	Perfect Shoe Fabric
27.	N. Anwar Basha	Naser Tanning Company
28.	A. Naseer Ahmed	Florence Shoe Co. Tannery
29.	K.M. Fazal	Naser Tanning Company
30.	S. Ramesh	Florence Tannery
31.	Mohammed Ismail	P. Mohd. Ismail & Co.
32.	M. G. Mohd. Abdullah	C.M. Hussain Mubarak & Co.
33.	K.A. Nisar Ahmed	K.M. Ahmed & Co, Pernambut
34.	V. Rafeeq Ahmed	Star Leather Exports
35.	A. Khalid Hussain	Rumana Leather Company
36.	M. Kaviarasan	Star Leather Exports
37.	Rafeeq Ahmed	C. Thaiful Ahmed, Pernambut
38.	C. Mohammed Azar	International Prime Tannery
39.	M. Waseem Ahmed	M. Mohammed Habibullah & Co

40.	T. Abdul Khader	M. Mohammed Habibullah & Co
41.	K.M. Siddiqui	Zubaida Tanning Industries
42.	S. Riyaz ahmed	CAW & Sons, VNB
43.	K. Sagir	Mac Shoe Co
44.	H. Asadullah Basna	East Asia Tanning Co
45.	C. Atheeqe Ahmed	N. Abdul Wajid & Co, Ambur
46.	K. Firdaus Ahmed	Shafeeq Shameel & Co
47.	Y. Ayub Khan	Shafeeq Shameel & Co
48.	K.A. Basha	Yaseen tanning Co
49.	P. Shahid	P. Ansar Ahmed & sons
50.	K. Khalid	Middle East Tanning Co
51.	A.K. Mohammed	T. Azeezur Rahman
52.	R. Venkatesh	C. Ahmed Basha & Co
53.	C. Akbar	G. Mohammed Salid & Co
54.	K. Akbar Basha	G. Abdul Khader & Co
55.	P. Zubair Ahmed	Middle East Tanning Co
56.	Afzal	Ejaz Tanning Co
57.	A. Raji	CETP Pernambut
58.	G. Adi Kesavan	K. H. Mohd. Ghause
59.	Kaleelur Basha	Siraja Muneera
60.	E.M. Abdul Kayoon	A. Md. Khasim & Co
61.	L. H. Ahmed	C.N. Zuhail Ahmed Sameed & Co
62.	N. Azeezur Rahman	Shafeeq Shameel & Co
63.	B. Riyaz Ahmed	Shakura Tanning Company
64.	N. Mohd. Sayeed	Ambur Tanners' Association
65.	V.M. Khaleelur Rahman,	Ambur Tanners' Association
66.	Burkhard Peil	ILIFO
67.	A. Sahasranaman	RePO, UNIDO
68.	Solomon Sampathkumar	RePO, UNIDO
69.	M. Viswanathan	RePO, UNIDO
70.	Anees Ahmed	Shafeeq Shameel & Co

Annex-4

Proceedings of workshop on cleaner technologies, occupational safety & health for tanneries and optimization of (C)ETPs at Ranipet

Indian Leather Industry Foundation (ILIFO), has been organizing seminars and workshops in different tannery clusters in the state of Tamil Nadu to disseminate results obtained under the projects- US/RAS/92/120 and US/IND/97/124 of UNIDO. As part of this, a one day workshop on Cleaner Technology and Occupational Safety & Health was organised at Ranipet on Monday, 31 July 2000. Over 50 persons representing tanneries and common and individual effluent treatment plants in Ranipet, Melvisharam and SIDCO clusters. A report on this event is hereby submitted.

The event was organised in cooperation with the South India Tanners & Dealers Association (SITDA) of Ranipet in the committee hall of SITDA. Mr. Burkhard Peil, Executive Secretary, ILIFO welcomed the participants.

Mr. MM Hashim, Chairman, Council for Leather Exports and a leading tanner of Ranipet inaugurated the event. Among other things, Mr. Hashim, in his inaugural address, underlined the need for immediate adoption of CT in the place of age-old practices to reduce pollution load rather than attempting to deal with it at the end of pipe. He thanked UNIDO for the various interventions carried out by RePO and urged tanners of the Ranipet cluster to install CT and OSH measures in their respective units. He reminded the participants that treating wastes – both liquid and solid – generated while processing raw hides and skins to semi-finished or finished leather in tanneries is the responsibility of the tanners. While ensuring this, the tanner has to bear in mind that finished leather or leather product manufactured by him remains competitive in the global market. Therefore reducing pollution by following cleaner technologies in shop floor is a cost-effective way of dealing with the pollution problem. He added that in the years to come, only those tanners who have mechanisms built in their production process to ensure effective waste management will be able to sustain their business in the leather trade. He urged the tanners to attach utmost priority to pollution control and waste management in tanneries and encouraged them to take advantage of technical assistance offered by international agencies like UNIDO.

Mr. A. Sahasranaman, programme Coordinator, RePO, UNIDO spoke on the relevance of cleaner technology emphasising on the need for effective environmental management to sustain the present level of tanning activities and to plan for future growth. He dwelled elaborately on the various Pilot & Demonstration Units (PDU's) installed in Vellore district by UNIDO. A copy of the special address on relevance of CT by Mr. A. Sahasranaman is enclosed.

The workshop was divided into seven sessions as detailed below:

SESSION	Subject	Presented by
I	Application of treated effluent in Agriculture	R. Shanmugavadivu Agronomist, SIDCO CETP
II	Composting of tannery sludge	Solomon Sampathkumar

		National Expert, UNIDO, Chennai
III	Safety in the workplace – General Principles of Occupational Safety & Health in tanneries	J. Hannak, CIM-GTZ-Expert, CLRI, Chennai
IV	Electrical and Mechanical Safety in Tanneries and (C)ETPs	Mathew Alexander, Consultant, CLRI, Chennai
V	Strategies for optimization of CETPs and ETPs	Burkhard Peil,
VI	Pollution reduction in post tanning operations	M. Viswanathan, Leather Technologist, UNIDO, Chennai
VII	Question & Answers – Interactive session	

During the interactive session many participants wanted more information on the composting process and the suitability of applying sludge compost as manure in regular agriculture. They were invited to visit the composting yard at MAKH & Sons to see the ongoing activities. They were informed that a plantation field was being set up at MAKH & Sons to study the effect of sludge compost on flowering plants and edible vegetable-yielding plants.

Many participants requested the organisers to compile the papers and/or transparencies presented by the experts into a booklet and send to them. The booklets have since been compiled and sent to participants.

A list containing names and details of the participants is also enclosed.

Address by A. Sahasranaman, Programme Coordinator, RePO, UNIDO, Chennai on the occasion of inauguration of workshop on cleaner technologies, etc. at Ranipet, Vellore district, on 31 August 2000

1. Satisfactory management of environment has become an imperative for sustainability of any industrial activity. This is particularly so for an export oriented industry like the leather as the importers from industrialized countries do not want to import products from a tannery that does not satisfy the environment regulations of the country of origin. At the same time, to live in harmony with the surroundings where the tanneries are located, it has become necessary to properly treat the effluent and other wastes generated in the process of making leather. Adverse public reaction to discharge of untreated effluent or solid waste is quite strong. Tanners have a moral responsibility too towards the posterity. Thus, from both external and internal points of view, postponement of action towards better environment management by the tanneries has become impossible.
2. When the problem of pollution by tanneries was highlighted a few years back and the Supreme Court of India came down heavily particularly on the tanneries of South India, the tanners were left with no alternative but to immediately opt for the end of pipe treatment of effluent. Many effluent treatment plants and common effluent treatment plants (ETPs and CETPs) sprung up in tannery clusters in

Tamilnadu. That not a single tannery today operates without access to effluent treatment in this state is indeed a tribute to the tremendous foresight and dynamism exhibited by the tanners. But five years hence, now, it does appear that the tanners have grown somewhat tired. Or else, how could we explain the rather inadequate care being taken of the ETPs and CETPs in many places. As Mr. Hashim pointed out in his inaugural address, fluctuating fortunes in business cannot be the reason for such tardiness. Irrespective of the condition of the business, it must be accepted by the tanners that environment management is an integral part of production process and they should be prepared to spend as much money as required to deal with this as they would for purchase of raw material or paying labour.

3. Having overcome the immediate problem, it has now become necessary for the tanners to look at ways and means of reducing the cost of operation and maintenance of ETP/CETPs. While we are on this subject, some basic truths, known to all, needs reiteration. These are:
 - Of one tonne of raw material processed, more than 600 kg is discarded as solid waste in a tannery.
 - 80% of the various chemicals applied in the process of leather making is discharged alongwith the effluent as waste; only less than 20% is retained by leather.
 - Much of the chemicals and other proteinous wastes, when discharged with the effluent, add to BOD, COD, etc. and accordingly to higher cost of treatment. On the other hand, these also represent loss of valuable materials, with cost implications.
4. When we discuss the subject of cleaner technologies we have to view these in this background. The potential for saving is evident from the above figures. If these are not recovered today, it is not because it is not possible but because of inertia. One of the important tasks undertaken by UNIDO under its RePO is to demonstrate and introduce such cleaner technologies in operational tanneries so that others could easily see and assimilate such processes. The main focus of UNIDO in this regard has been towards water conservation so as to reduce hydraulic load of effluent and better uptake of chemicals, recycle, recovery and reuse of chemicals, optimization of process parameters such as pH, temperature and mechanical action to achieve best results, etc. UNIDO's approach of 'show-how' has ensured that the tanners have been able to see for themselves what is possible to achieve.
5. Apart from the cleaner technologies, there are some major unresolved technical problems faced by the industry. These are – TDS and sludge (Management and/or safe disposal). These problems may be present in many countries of this region, but these are quite acute in India.
6. What has UNIDO been able to do in the past four years in these areas ? The main areas where UNIDO has been able to show some results are optimization of CETP operation, low cost low maintenance treatment system and a basket of technological options for dealing with TDS and sludge. Also some efforts towards

utilization of other solid wastes from tanneries have been made. It must be stated here that UNIDO's activities under its various projects are yet to be completed and the final report, containing UNIDO's recommendations will be released in due course. In today's workshop, the results achieved by UNIDO thus far have been highlighted for the benefit of the listeners.

7. In the area of optimization of CETP operation, regular guidance has been provided by RePO staff to all the CETPs in the district of Vellore. Specifically equipment assistance has been given for sludge dewatering (all available types of equipment have been installed in Vellore district), rotary type mechanical screen to remove finer particles before equalization, hopper bottom settlers for settling heavy particles and an automated monitoring and control mechanism to achieve automatic chemical dosing and operation of aerators. All these have resulted in significant improvement in operation and maintenance of CETPs in the state of Tamilnadu. Specifically, the managers of the CETP are exhibiting tremendous confidence in running their plants competently.
8. The first low cost, low maintenance, natural treatment system, known as reed beds, was introduced to treat tannery effluent under UNIDO programme. Two reed beds operating in Tamilnadu have amply proved the efficacy of the system. If land does not pose a constraint, this could be a very effective mode of treatment of effluent from tanneries, particularly in isolated pockets where tanneries could not go in for CETPs. The reeds are expected to survive for more than 20 years and the harvested reed could be used as fodder or in composting.
9. Among the technological options for reduction of TDS, the first desirable option is to achieve saltless or less salt curing of hides and skins. For a country of India's size and dimensions, this would appear a tall order. Let us therefore consider the situation, assuming that there will be no immediate alternative to salting of raw material. The technologies that have been demonstrated under UNIDO programme include:
 - Desalting of hides and skins before soaking – this helps remove salt to the extent of 8% of the hide weight. This could be manual or mechanical. Three systems have been demonstrated- Dodeca wooden frame for manual desalting, mechanical desalting drum and brushing machine for desalting. TDS could be reduced to the extent of 30% by this process. It is worth consideration if the CETP could direct all tanneries to diligently follow this process.
 - Accelerated evaporation of saline effluent – in Tamilnadu tanneries are required to put up solar evaporation pans. Not many work well. UNIDO has demonstrated how the efficiency of such pans could be increased by 3.5 to 4.5 times. The results have been quite impressive. This way, salt can be recovered from the saline effluent and used or safely disposed.
 - Recycle, recovery and reuse of various effluent streams, rich in TDS, will also help reduce the volume of effluent containing TDS discharged.

- Reverse osmosis has been demonstrated for recovery of clean water from saline effluent and recovery of salt from the reject by solar evaporation. Though the cost of an experimental plant was high, it has been offered by a BOT contractor to build such a plant and supply clean water at about Rs. 35 per cubic meter for five years, whereafter the plant will belong to the buyer. This technology has potential but it is definitely energy intensive.
- High rate transpiration system advocated by NEERI envisages growing of selected varieties of plants which can absorb high volume of treated effluent high in TDS. UNIDO, however, has attempted a modified version of this by creating a forest in an area of about 8 acres, planting more than 25000 trees of different species. However the effluent applied for irrigation is of TDS less than 5000 mg/l and chloride, less than 900 mg/l. The growth of the plants is indeed good but the adverse impact on soil and ground water has been found to be rather negligible in the past two years. This method can help some CETPs to reach a zero discharge situation, if they have the required land.

10. In the area of sludge utilization and management, the technologies demonstrated by UNIDO under its regional programme include the following:

- In the context of the GoI removing from the list of hazardous wastes such sludge as may contain chromium in trivalent form at levels less than 5000 mg/l, such tanneries and CETPs which produce sludge of such characteristics can opt for utilization of such sludge for composting. The precondition is that appropriate organic wastes to combine with the sludge must be available cost effectively in the vicinity of the tannery or CETP. UNIDO has based on its experiments now persuaded two tanners, one in Ambur (SSC tannery) and one in Ranipet (MAKH) to go in for composting, with positive results. The quality of compost made is indeed good. Some process procedures are being further improved. It has been estimated that the cost of compost could be in the region of Rs. 1.5 to Rs. 2 per kg of compost produced. Presently the companies are looking for appropriate market for these composts. Once a marketing channel is established, this could be a useful route for utilization of sludge from ETP/CETPs.
- Another interesting project, carried out jointly by Ministry of Non Conventional Energy Sources, GoI, CLRI, UNIDO and CETP Melvisharam is a biomethanation plant for generation of gas and electricity from primary sludge and fleshings. The plant has been commissioned and is in the process of stabilization. It holds good promise for effective and profitable utilization of these wastes.
- There will be need for safe disposal of sludge even after its use for some purposes. UNIDO has demonstrated how safe landfills have to be designed and constructed, appropriate to the tannery sludge in CETP, Melvisharam.

- UNIDO has also shown how other wastes such as fleshings, chrome shavings, etc. could be converted into useful by products. Detailed reports, videos, etc. prepared by UNIDO will be available to the industry in the near future.

There is a good scope for the CETP managements to look at the problem of wastes from the tanning industry holistically and tackle all these, with focus on utilization and manufacture of byproducts where feasible. This would considerably enhance the financial strength of the CETPs too. ILIFO and RePO UNIDO will be willing to extend all technical help to interested tanners of ETP/CETP managers in adoption of any the new technologies that have been demonstrated. The time to act is now.

List of participants

#	Name	Company
I	Council for Leather Exports	
1.	MM Hashim, Chairman	Council for Leather Exports
II.	CETPs	
2.	Ramesh Prasad, Chairman	Ranitec CETP, Ranipet
3.	G. Md. Khaleemullah, Chairman	VISHTEC CETP, Melvisharam
4.	Amirthakatesan, Chairman	SIDCO CETP, Ranipet
5.	Rajarathinam, Director	PRC Leathers
III.	ILIFO	
6.	Mr. Burkhard Peil	
IV	South India Tanners & Dealers Association	
7.	C.M. Zafarullah, Secretary	
8.	Krishnan	
V	Resource persons	
9.	A. Sahasranaman	RePO, UNIDO
10.	R. Shanmugavadivu	SIDCO CETP, Ranipet
11.	Solomon Sampathkumar	RePO, UNIDO
12.	M. Viswanathan	RePO, UNIDO
13.	Jurgen Hannak, GTZ-CIM Expert	CLRI
14.	Mathew Alexander, Consultant	CLRI
VI	Representatives of tanneries / (C)ETPs	
15.	S. Tahir, Plant Manager	VISHTEC CETP, Melvisharam
16.	N. Akber Basha	MAKH & Sons, Ranipet
17.	P.S. Mohiadeen	MAKH & Sons, Ranipet
18.	T. Abdul Matheen	M.A. Ismeil & Co.
19.	T. Asghar Ali	Malack Chrome Company
20.	A. Kannan	Rathna Leathers
21.	A.V. Fazular Rahman	ATH Leder Fabrik
22.	S. Ashok Kumar	Geekay Leathers
23.	S.V. Iqbal Basha	Mumtaz Leathers
24.	S. Mohamed Ibrahim	Roshan Enterprises
25.	A. Shakeel Ahmed	T.M. Abdul Rahman & Sons.
26.	M. Tabraz Ahmed	Teeyem Leathers
27.	M. Md. Norullah	Rahmania Leathers

28.	K. Girirajan	Golden Leather Industries
29.	A. Lakshmanan	A. Ahmed & Co.
30.	T.M. Muneer Ahmed	Fathima Tanning Company
31.	T. Hidayathullah	M.J.S. Iqbal & Co.
32.	Nandakumar	Enyes Prime Tannery
33.	J. Noorullah	AMS Leathers
34.	Thirunavukkarasu	PRC Leathers
35.	B.G. Anees Ahmed	G. Abdul Rahaman & Co.
36.	P.R. Anwar Basha	Ghani Rasheed & Co.
37.	Thrive Leathers	S. Ashok Kumar
38.	A. Anwar Basha	Taj Leathers
39.	M. Jaipal	B.S. Leathers
40.	P. Manimozhi	Talco Ranitec
41.	M. Selvaraju	Coromandel Leathers Pvt. Ltd.
42.	M. Natarajan	Talco Ranitec
43.	N. Abdul Sathar	Talco Ranitec
44.	G. Babu	Talco Ranitec
45.	I. Sajid Hussain	Talco Ranitec
46.	M.A. Ismail	Hansa Leather Export
47.	Md. Ibrahim	Classy Leather Co.
48.	G. Ramesh	Sri Lakshmi Leathers
49.	G. Srinivasan	M. Sambandam & Sons.
50.	R. Irshad	Vishtec CETP
51.	W.M. Muqthar	P.M. Meera Hussain & Co.
52.	Minni Muzaffar Ahamed	Tasmiah Leathers
53.	P. Palam	Ranipet Srinivasa Leather

Annex-5

**The ILIFO - Workshop
on Environment management in Tanning industry
- Dealing with the unresolved issues
–UNIDO’s Initiatives**

**At Hotel Breeze, Opulence Hall
05. September 2000, Chennai, India**

Report of the workshop in Chennai, 2000

The subject of this workshop were:

1. Environment Management in Tanning Industry – Dealing with the unresolved issues – UNIDO’s initiatives – An overview, A. Sahasranaman, RePrO, UNIDO, Chennai.
2. Optimization of CETP Management, I. Sajid Hussain, Ranitec CETP, Ranipet
3. TDS Management in Tanneries, Solomon Sampath Kumar, RePO, UNIDO, Chennai.
4. Sludge Management, K.V. Emmanuel, RePO, UNIDO, Chennai.
5. Sampling and Monitoring – Basis for an efficient Treatment, Burkhard Peil, CIM-GTZ-Expert, ILIFO, Chennai,
6. Solid Waste Management, Valentin Post, UNIDO Consultant.
7. Application of treated effluent for irrigation, R. Shanmugavadivu, SIDCO CETP, Ranipet
8. Chrome Management in the Tanyard, J. Ludvik, UNIDO Consultant.
9. Improved Conventional Chrome Tanning, M. Viswanathan, RePO, UNIDO, Chennai

The details of the programme is given below:

TIME	SUBJECT	SPEAKER
0930	Registration	
1000	Welcome Address	Dipl.-Ing. Burkhard Peil, Executive Secretary, ILIFO
1005	Presidential Address	MM Hashim, Chairman Council for Leather Exports
1015	Inaugural Address	Sheela Rani Chunkunth, IAS, Chairperson, TNPCB
1025	Environment Management in Tanneries – Industry's view point	M. Rafeeqe Ahmed, President, AISHTMA
1040	Environment Management in tanning industry – Dealing with the unresolved issues – UNIDO's initiatives – An overview	A. Sahasranaman Programme Coordinator, UNIDO
1100	Tea Break	

After the welcome address of Mr. Burkhard Peil, the presidential address was delivered by Mr. M. M. Hashim. The chairperson Mrs. Sheela Rani Chunkath, TNPCB, Chennai inaugurated the workshop. Followed by Mr. R. Ahmed and Dr. S. Rajamani, CLRI spoke. The Executive Director of CLE Mr. Audiseshiah also spoke.

Presidential address of Mr. M. M. Hashim

Friends,

1. I am delighted to preside over today's workshop on 'Environmental challenges in the tanning industry – unresolved technical problems – UNIDO's initiatives'. It gives me immense pleasure to welcome Mrs. Sheela Rani Chunkath, IAS, Chairperson, TNPCB, as the chief guest of today's workshop. Soon after taking charge as the Chairperson, Mrs. Sheela Rani has been taking a proactive role in confronting various environmental challenges facing the state of Tamilnadu. We believe that under her stewardship, the Tamil-Nadu tanners will be able to overcome their remaining technical problems relating to environment management in tanning sector.
2. Today's workshop is important in more ways than one. First, it deals with some of the as yet unresolved technical problems facing the tanning industry. Secondly, UNIDO, which is implementing a Southeast Asia regional programme for pollution control in the tanning industry, has co sponsored it. We believe that what UNIDO will be presenting here today is the substance of what is happening in the entire South East Asia where the industry has been expanding at a rapid pace in the past two decades. These problems therefore are not unique to India but to many other countries of Asia and other parts of the world. Thirdly, the various solutions that have been worked out by UNIDO in India have been done in close cooperation with the tanners themselves. In fact in many of these projects, the counterpart tanners have contributed substantially in terms of resources and manpower. And in the process the concerned tanners and CETPs have learnt a lot. Though UNIDO has not yet come out with their

official conclusions in many of these projects, we expect UNIDO to share with us the results achieved until now. Many of UNIDO's projects have been evaluated both by national agencies like the CLRI and international experts. I hope that the day's workshop will prove to be useful and beneficial to all concerned.

3. I do not intend to repeat what all has been done by the Tamil-Nadu tanners until now in dealing with pollution caused by tanneries. Much has been written about it. Yet, it is appropriate to mention here that Tamil-Nadu is the first state in India where not a single tannery today operates without access to pollution control and treatment. With 12 common effluent treatment plants and over 120 individual effluent treatment plants operating in the state, capacity to process about 30000 cubic meter of effluent per day is available. Moreover, in the past over five years, with the help of national agencies like CLRI and NEERI and international organizations such as UNIDO, the CETP and ETP operating personnel have been sufficiently trained in regular operation and maintenance. That these treatment systems are able to meet, by and large, all standards of TNPCB, except TDS, is well recognized. Let me add here that continuous up gradation and improvement of these CETPs and ETPs is an ongoing process. This is necessary to achieve further reduction in cost of operation and improvement in operational efficiency.
4. Two of the major unresolved technical problems faced by the tanneries are relating to dealing with total dissolved solids, TDS, and disposal of sludge. I will not say much about these at this juncture as both these topics will be covered in the presentations today. Let us hear what has been done and what is to be said on these. It has been acknowledged all over the world, including the industrialized ones, that achieving TDS norms of 2100 mg/l at the end of pipe in a cost effective manner is yet a major challenge, not met successfully anywhere. When these norms were discussed by us with Italian tanners, they merely stated that this norm was not specified there. We understand that norms have to be related to the requirement of a particular location and therefore we do not challenge the same. But, given the global situation in this regard, we have to be technically assisted in reaching these norms in a cost effective manner. We hope that today's workshop will throw some light on possible choices. For the present, we have come to the conclusion that conveying the treated saline effluent to sea would offer the most viable solution.
5. With regard to sludge disposal, with the recent notification of the Government of India, declaring sludge containing trivalent chromium at less than 5000 mg/kg as not hazardous, there are many options for its utilization and disposal. We will keenly observe what UNIDO has to offer. This would also provide the tanners enough motivation to go in for improved chrome management systems in the tanneries. All efforts must be made to ensure that the chrome content in the effluent is drastically reduced so that chrome going into the sludge will be within the prescribed norms.
6. I take this opportunity to thank UNIDO for their timely help to the industry. UNIDO's regional office was opened in the TNPCB building in November 1995 when the industry was faced with a crisis. During these five years UNIDO Regional programme office has worked closely with the industry in dealing with its various problems concerning environment management. I hope that UNIDO's work in this

area will continue for a few more years to help the industry totally overcome all its environmental challenges.

7. I would also take this opportunity to thank Central Leather Research Institute, Chennai and National Environmental Engineering Research Institute, Nagpur, for their close involvement with the industry in tackling the environmental problems. Tamil-Nadu Pollution Control Board too has been well aware of all that has been done by the industry until now and has shown considerable understanding of the problems yet faced by the industry. We are confident that with the cooperation of all concerned, the industry will overcome all problems and achieve a standing of its own in the international arena, specifically in the area of environment management.
8. I may mention here that it is only this year, after more than three years of slump the global market for leather products has slightly picked up. It is time for the leather industry to devote its entire energy towards recapturing its lost glory. Our export in the first two months of this year has increased by 22%, a good sign. I sincerely hope that the industry's efforts towards recapturing its position in the global market will be fully supported by all agencies in the country.
9. The Indian Leather Industry Foundation, the main organizers of this workshop and their cosponsors, AISHTMA and RePO, UNIDO, Chennai, deserve our gratitude.
10. I request all participants to participate in the discussions intensively and benefit from the day's workshop.
11. Thank you all. I now invite Mrs. Sheela Rani Chunkath to kindly deliver her inaugural address and inaugurate the workshop.

Inauguration address of the Chairperson of TNPCB, Mrs. Sheela Rani Chunkath

The inauguration address of Mrs. Chunkath concerns the tanning industry in general. The balance between increasing production and welfare of workers and more employees on one hand and the difficulties in environment control on the other hand must be handled carefully to protect the environment. This should be done with an intensive training of everybody in a tannery. A worker should be also concerned in environmental problems as well as the management. To educate the management is not enough. The TDS-Problem was also targeted but also she has spoken about the responsibility of all workers not only the technical management in removing and reducing TDS from the wastewater.

After the chairpersons inauguration Mr. Rafeeqe Ahmed spoke to the participants in the name of AISHTMA. AISHTMA was the co-sponsor of this workshop and co-organizer.

Mr. R. Ahmed speech about:

ENVIRONMENTAL MANAGEMENT IN TANNERIES – INDUSTRY’S VIEW POINT

Friends,

I am very happy to be with you this morning and participate in this workshop on

“Environmental challenges faced by the tanning industry with particular reference to problems which remain unresolved”. Before I go to elaborate on the Industry’s view point on this matter, I would like to extend a very warm welcome to Ms. Sheela Rani Chunkath, IAS, Chairperson, Tamil Nadu Pollution Control Board on behalf of AISHTMA and the different Tanners’ Associations in Tamil Nadu and take this opportunity to express a genuine desire that under her leadership the tanning industry of our state is able to overcome the environmental challenges and emerge a stronger player in the international leather market.

Over the last decade or so the complexion of tanning industry in Tamil Nadu has undergone a transformation. It is very common to see tanneries in Vellore district processing rawhides of different origin - African, European, Russian, South American and Australian. The leather trade has truly gone global. While efforts are on to promote export of finished leather and leather products, a sizeable quantity of finished leather is being imported into India for conversion into value-added finished products and re-export to sophisticated markets in West Europe and North America. Equilibrium of sorts has come to stay in the International leather trade and particularly, the tanning industry in Tamil Nadu. While opportunities are plenty for entrepreneurs to grab and encash upon, the need to maintain the quality of production not only in terms of meeting stringent technical specifications but also with respect to social aspects such as safety in work place. The pressure is both from within and outside. In other words, a tanner, unlike his compatriot engaged in other industrial activities, has to maintain a work culture in conformity to those set by national authorities and to international requirements as dictated by the environment-conscious overseas consumers of his product. In other words, he is subjected to a strict environment audit, not only by the environment protection agencies of his country but by his overseas buyers too. And above all, he has to maintain the price of his finished product at competitive level to survive in the international trade. From the tanner’s point of view, it is indeed a very tall order or at least it appeared to be when it all started. However, realizing that bewilderment will lead nowhere, the tanner, summoning all his strength and resources, has fought the issue valiantly and survived the initial phase of pressure, as is evident from the fact that the overall export performance in the leather trade has not suffered much during the last 2/3 years of immense struggle. Technical inputs from international agencies like the UNIDO and research laboratories like the CLRI have helped tanners tide over the crisis.

Almost all the norms prescribed by the TNPCB regarding treatment of effluent are being met by the CETPs and the individual ETPs operating in different tanning clusters in Tamil Nadu. The recent notification of the Government of India announcing deletion of tannery sludge with chromium level at less than 5000 mg/kg from the list of hazardous wastes is indeed welcome and has served to release a lot of pressure in the disposal of

huge quantities of tannery sludge. With the options available for effective chrome management in tanneries, it is possible that all the tanneries, not only those converting semi-finished to finished leather, but also those whose main line of business is full-chrome finished leather from raw hides and skins can contain the level of chromium in the sludge within this limit of 5000 mg/kg.

The issue remaining unresolved is TDS. A solution to this problem continues to be elusive. A solution which is not too technical and which is commercially feasible and easily adaptable by tanners is yet to emerge. While the thinking in some quarters is in favour of a drainage pipeline taking the saline treated effluent from the tanneries to the sea, this is a massive exercise and will take a few years to realize. Options such as reverse osmosis which will help recover bulk of the saline effluent for reuse in tanneries need to be investigated thoroughly. I understand that a RO system has been evaluated technically by UNIDO in a tannery in Vellore district and I look forward to this option becoming commercially feasible soon. This has two advantages. It helps recover most of the water and the recovered water can be used in processing. In a few clusters tanners buy water for critical operations such as dyeing, fat liquoring, etc. Also, the recharging of the water table in the district will continue.

In conclusion, I would like to state on behalf of the tanners that the industry is willing to try any suggestion that may be made by the Pollution Control Board or UNIDO or CLRI for achieving norms with respect to TDS and implement such measures which are technically and commercially feasible in a tannery work environment.

Thank you.

The next speaker was Mr. Sahasranaman in the name of UNIDO. UNIDO was also a co-sponsor for this workshop and co-organizer.

Environment Management in the Tanning Industry – Dealing with the unresolved issues – UNIDO’s initiatives by Mr. A. Sahasranaman, Programme Coordinator of UNIDO, RePO

Introduction

1. The 1990's witnessed spectacular developments in pollution control and effluent treatment in the tanning industry in India. The industry by then had earned considerable opprobrium from the population living in the vicinity of tannery clusters. The enormous economic benefits that the tanning and downstream industries brought to the country could not help hide its ugly side. Accordingly, in the early nineties, with substantial incentives, the federal and provincial governments in the country motivated specifically the tanning industry in the country to adopt pollution prevention, control and treatment measures. A beginning was made in the province of Tamil-Nadu, the largest tanning center in the country. At the initiative of Tamil Nadu Leather Development Corporation, a number of common effluent treatment plants were conceived and construction started at many locations. In Kanpur, with the Dutch assistance, a major

composite common effluent treatment plant for domestic and tannery waste was taken up for implementation. Jullunder too followed suit, with a common effluent treatment plant in a newly designed leather complex. However, all these activities picked speed only when the Supreme Court of India came down heavily on the tanning industry in the country, especially that in Tamil-Nadu, in 1996. When the court ordered closure of more than 400 tanneries in Tamil-Nadu and a few in Kanpur, the industry was jolted out of its complacency. Frenetic activity followed. And today, there are 17 common effluent treatment plants operating in India, with 12 of these in Tamil-Nadu and more than 180 medium and large tanneries have their own effluent treatment plants. The industry's achievement in this regard has attracted favorable attention of experts from many industrialized countries.

2. UNIDO had launched its Regional Programme for pollution control in the tanning industry in South East Asia with field headquarters in Chennai, India, in November 1995, when the industry in the region was waking up to its immense responsibilities in the area of environment management. The prime objective was to allow the industry to expand in these countries without causing unnecessary degradation of environment. UNIDO realized that providing these countries with the right technology and some resources would help speed up the process further. UNIDO's experience in the last five years in India and other countries of the region, which include Bangladesh, China, Indonesia, Nepal, Sri Lanka and Pakistan, has indeed confirmed its initial perception that all these countries needed its technical support at that juncture.
3. Though end of pipe treatment of effluent offered the most immediate solution to the problem at that juncture, it was soon realized that this also raised many technical issues, some of which are yet to find satisfactory commercially viable answers globally. UNIDO, therefore, soon shifted focus from end of pipe treatment technologies to other such technically unresolved issues faced by many of the countries of South East Asia. The technical issues highlighted by the countries participating in the regional programme included dealing with total dissolved solids in effluent, management of sludge generated by effluent treatment plants, utilization or safe disposal of solid wastes from tanneries and utilization of treated effluent. With its field headquarters in Chennai, India, UNIDO decided to put up pilot and demonstration facilities for tackling such issues in India itself. Many renowned international experts collaborated with UNIDO in putting up these demonstration units. Reputed Indian institutions and research bodies such as the Indian Institute of Technology, Chennai and Central Leather Research Institute, Chennai also played an important role in some of these demonstrations.
4. This paper deals briefly with the UNIDO initiatives and results obtained until now. UNIDO's efforts will continue to further simplify technologies and improve their cost effectiveness.

Total dissolved solids (TDS)

5. Dissolved solids in the effluent are contributed by chlorides and sulphates. Sodium chloride used in preservation of hides and skins is the main contributor of

of NPK values. Two tanneries have set up large scale composting units. As the operation is almost entirely manual, this offers good scope for tanneries with their own ETPs.

13. Sludge can be combined with fleshings to generate biogas and electricity. UNIDO, in cooperation with the Ministry of Non conventional Energy Sources and Central Leather Research Institute, has set up a 5 t pd biomethanation plant at Melvisharam, Tamilnadu. The plant is currently under stabilization. It is expected to yield about 300 cubic meter of biogas every day, which will yield about 700 kWh of electric power. The biogas is stripped of hydrogen sulphide before it is used to generate electric power in a dual fuel engine. This technology will help deal with two wastes – sludge and fleshings.
14. UNIDO programme has also demonstrated that sludge can be solidified and immobilized by combining it with other wastes such as fly ash, clay, etc. in the ratio of 70:30. The resultant mass effectively immobilizes chrome. However efforts to convert this mass into unburnt bricks did not succeed, as the brick did not have adequate mechanical strength.
15. Despite the availability of many options for conversion of sludge, with chromium at a level lower than what is prescribed, a large quantity of sludge will have to be disposed in safe landfills. UNIDO has set up model safe landfills at CETP, Ranipet and Melvisharam and also shown how the landfill has to be closed after its full capacity is reached. A safe landfill will ensure that the leachate if any from the sludge does not percolate the soil and groundwater. An impervious layer between the sludge deposited and the soil helps achieve this. The capital cost of UNIDO's model landfill at Melvisharam has been estimated at US \$ 8.5 per cubic meter and the operational cost, US \$ 0.6 per cubic meter of sludge disposed. A manual has been made and widely distributed in the region. In industrialized countries sludge disposal costs anything between \$ 100 and 200 per cubic meter.

SOLID WASTES FROM TANNERIES

16. About 650 kg of solid waste is generated while processing 1 tonne of hide or skin in a tannery. The solid wastes produced in tanneries include hair/wool, fleshings, trimmings of raw, semi processed or finished leather, unusable splits and shavings and buffing dust. Semi processed and finished trimmings are generally taken away by tiny manufacturers of leather goods and cobblers. Other wastes are also converted into useful products.
17. The raw trimmings and fleshings can be converted into animal glue. There are many commercial glue factories operating in all countries of the region, though the level of technology employed varies from factory to factory. The animal glue faces stiff competition from synthetic glue. Dog chew also can be made from trimmings. Animal protein can be made from fleshings and trimmings. There is a large-scale commercial factory producing animal protein near Chennai, Tamilnadu from fleshings. The product is a partial substitute for fishmeal in poultry feed. Shavings and trimmings can be converted into leather board or composition leather. There are many factories operating in India and elsewhere

producing leather board from these wastes. Fleshings can be combined with sludge to produce biogas and energy; and with other organic wastes to produce compost.

18. UNIDO's regional programme also has demonstrated how chrome shavings can be digested enzymatically to segregate chrome and protein. Its commercial viability will however depend on country's regulations relating to use of chrome bearing waste.

USE OF TREATED EFFLUENT FOR IRRIGATION

19. Treated effluent, of sufficient quantity in many common treatment plants, provides good irrigation potential. In order to evaluate the feasibility of using treated effluent for irrigation, UNIDO undertook a major exercise in CETP, SIDCO, Ranipet where, after preliminary tests, a large-scale afforestation project has been implemented. About 800 cubic meter of treated effluent, with TDS less than 5000 mg/l and chloride less than 1000 mg/l, has been applied every day for irrigating about 25000 non-edible plants of 8 varieties grown in an area of about 8 acres. The plant growth has been very good in less than 2 years; and no adverse effect has been noted on the soil or ground water. The monitoring of this experiment is still continuing. Many tanners have taken to this route, looking at the success of UNIDO experiment.

CONSTRUCTED WET LAND SYSTEM FOR TREATMENT OF TANNERY EFFLUENT

20. In providing technical assistance in the area of end of pipe treatment technologies to more than seven large CETPs in India, UNIDO demonstrated many popular proven technologies. Notable among them are the oxidation ditches in Amburtec-CETP, Ambur, anaerobic lagoon followed by aerobic treatment in Ranitec-CETP, Ranipet and the fine bubble diffused aeration system in CETP, Pallavaram. In order to ascertain the feasibility of constructed wet land system (popularly known as reed beds), UNIDO set up two model reed beds, one for treating effluent from a tannery processing semi-processed material to finished leather and another in a CETP treating effluent from tanneries processing raw to finished leather. In both cases the survival of reeds has been found to be good and treatment efficiency very good, quite comparable to conventional treatment systems. Its much lower operational cost makes it much more attractive. The monitoring of the reed beds is still ongoing. Results obtained so far have been quite encouraging.

Other interventions

21. Improving uptake of chemicals in post tanning wet operations, rehabilitation of land purportedly degraded by past discharge of untreated effluent, better chrome management, etc. are some other initiatives of UNIDO under its regional programme. All demonstrations of UNIDO are industry-scale and thoroughly documented. The technical reports on each of these interventions with complete cost calculations are available in the UNIDO's Regional Programme Office.

Future

22. Optimization of ETP/CETP operation is a continuing activity. The Plant managers have to remain abreast of the new technologies or chemicals that enter the market. They should know what parameters are to be checked at what stage and do so in a systematic and regular manner. Technologies are only as good as these are utilized. The best of technologies cannot help a plant perform well, unless those who operate it understand and observe the protocol prescribed. The day to day management of ETP/CETPs must be in competent technically qualified hands to achieve the best results.
23. UNIDO will be continuing its efforts towards consolidation of its achievements under the regional programme and widely disseminate the results through technical reports, videos, training workshops and its own web-site.

Dr. S. Rajamani thereafter dealt with some aspects of cleaner technology. He pointed out that in UNIDO assisted CETPs it was demonstrated as to how chrome in the sludge could be reduced by effective chrome management in the member tanneries. He emphasized that the chrome level of sludge from CETP and ETP should be reduced below 5000 mg/kg of dry sludge. After his speech, the Executive Director of CLE, Mr. Audiseshiah wished much success for this workshop, which was organized by ILIFO, AISHTMA and UNIDO.

Next sessions of the workshop were as follows.

1110	Session I Optimization of CETP Management	Mr. Sajid Hussain Plant Manager, Ranitec CETP
1125	TDS Management in Tanneries	Mr. Solomon Sampath Kumar National Expert, UNIDO
1150	Sludge Management	Mr. KV Emmanuel, National Expert, UNIDO
1215	Sampling and Monitoring – Basis for efficient treatment	Dipl.-Ing. Burkhard Peil, CIM-GTZ- Expert, ILIFO
1230	Solid Waste Management	Mr. A. Sahasranaman
1300	Lunch	
1400	Occupational Safety and Health in Tanneries	Dr. Kalpana Balakrishnan, Chief, OSH Cell, SRMC & RI
1430	Treated Effluent in Irrigation	Ms. R. Shamugavadivu Agronomist, SIDCO CETP
1445	Chrome Management in Tanneries	Mr. M. Viswanathan Leather Technologist, UNIDO-
1515	Question and Answers – Summing up	
1545	Vote of thanks	Mr. Solomon Sampathkumar
1545	Tea	

Following participants joined the workshop:

S.No.	Name of the Company
1	M/s M.A Khizar Hussain & Sons
2	M/s Malack Chrome Company
3	M/s A T.H Leder Fabrics
4	M/s Shafeeq Shameel & Co
5	M/s. Shafeeq Shameel & Co
6	M/s Shafeeq Shameel & Co
7	M/s Shafeeq Shameel & Co
8	M/s. Florence Shoe Company
9	M/s Florence Shoe Company
10	M/s Lead Leathers
11	M/s Ghani Rasheed & Co
12	M/s. Ghani Rasheed & Co
13	M/s. EK Hajee Md. Meera Sb. & Sons
14	M/s KAR Leathers (P) Ltd
15	M/s.Orient Express
16	M/s. Saddique Leathers
17	Pallavaram Tanners Indl.Effluent Co.Ltd
18	M/s Teeyem Leathers
19	M/s. T.M.Abdul Rahman & Sons
20	M/s. Sri Lakshmi Leathers
21	M/s. Taurus Leather (P) Ltd
22	M/s Taurus Leather (P) Ltd
23	M/s. M.J S. Iqbal & Co
24	M/s. Thrive Leathers
25	M/s A. Mohamed Sulaiman & CO.
26	M/s T. Abdul Wahid & Co.
27	M/s. Selathaar Tanning Industry
28	Jb. KM Mohamed Abdul Gani
29	M/s. Thaya Tanning Co.
30	M/s CKCM Khadersha & Bros.
31	Vanayambadi Tanners Enviro Control Systems Ltd. Vanitec
32	- Do -
33	Ambur Tannery Effluent Treatment Co. Ltd.
34	- DO-

35	M/s. N.M. Zackriah & Co.,
36	M/s. N.M. Zackriah & Co.,
37	M/s. K.M. Saleem &Co.
38	M/s. Shri Ramajayam Prime Tanners
39	M/s. Coromandel Leathers P. Ltd.
40	M/s. Dee Gee Consultancy Services
41	M/s. Irbhaz Shoe Co.
42	Talco Ranipet Tannery Effluent Treatme Co. Ltd.
43	- Do -
44	Ranipet SIDCO Finsihed Leather
45	- Do -
46	M/s. P.M. Meera Hussain & Co.
47	M/s. EM Md. Ebraheem Sb & Sons.
48	M/s Talco Pertec
49	- Do -
50	- Do -
51	- Do -
52	- Do -
53	M/s. Eastern Chrome Tng. Corpn.
54	Mr. R.M. Subramaniam, UNIDO, Ambur