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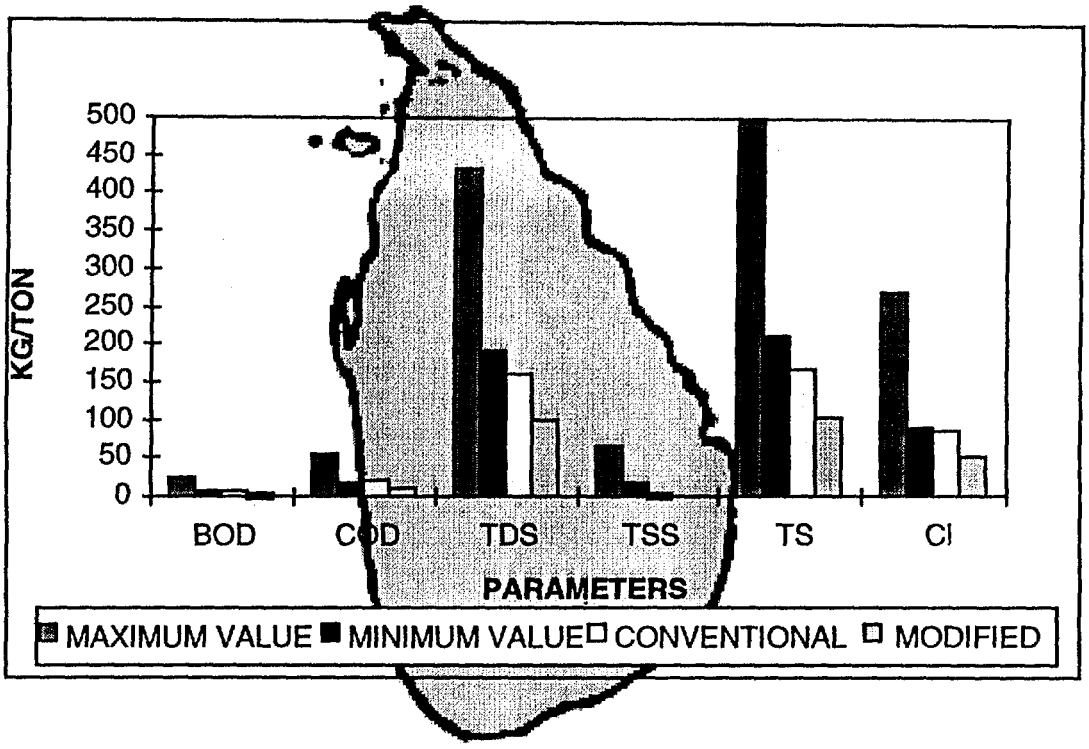
Final Report on

INDUSTRIAL POLLUTION REDUCTION PROGRAMME IN TANNERIES IN SRI LANKA

(UNIDO PROJECT : DG/SRL/91/019)
(Contract NO.97/166P)



Central Leather Research Institute
(*Council of Scientific & Industrial Research*)
Adyar, Chennai - 600 020. INDIA

July 1998

FOREWORD

Leather Industry is gaining economic and industrial importance in South East Asia. Leather manufacturing activity in this Region is increasing. There is a need to secure such a development and growth by ensuring the environmental security of the tanning sector in this Region.

United Nations Industrial Development Organization (UNIDO) has launched a land mark initiative to catalyze technological changes leading to improvement of environmental preparedness in the tanning sector in South East Asia Region. One such initiative of UNIDO has been in empowering a group of tanneries in Sri Lanka through implementation of Cleaner Production methods.

Central Leather Research Institute, the world's largest leather research centre, has gained considerable visibility in the implementation of cleaner technologies in tanning sector in the Region. UNIDO has assigned a contract no.97/166p to implement a choice cleaner production technologies in 3 tanneries in Sri Lanka. A need survey was conducted by CLRI. Based on such a survey a group of 3 tanneries Viz., M/s. Mubarak Leather Pvt. Ltd., M/s. MAM Abdul Cader & Co. Pvt. Ltd and M/s. NM Mohamed Mohideen Tannery were chosen for implementing cleaner production technologies.

Scope for the reduction of BOD and COD by 30±5%, TDS by 15-20% and sulphide by 40-60% was identified through a base line study. Necessary cleaner technology elements for achieving these improvements were identified, demonstrated and implemented in three selected tanneries in Colombo.

An environmental benefit through the reduction of BOD and COD by 45-70%, TDS by 50%, chlorides by 50-56% and sulfide by 70-80% compared to the conventional processes in vogue in a chrome based tannery has been established. In case of a tannery processing vegetable tanned leathers reduction in BOD/COD, TDS, Chloride and Sulfide by 10-14%, 27%,31% and 70% respectively has been demonstrated. Water consumption has been

reduced by 15-35%, while process time saved by 18-25% has been demonstrated.

The results have been presented in the workshop conducted in Colombo to a group of tanners in Sri Lanka. There was an enthusiastic response from tanners. Request has been received from other tanners to implement similar technologies in their tanneries.

This report highlights the out come of the work carried out under a project commissioned by UNIDO under contract No.97/166p.

I thank the collaborating tanners in Sri Lanka, Regional Programme Office of UNIDO, Leather unit in UNIDO and my colleagues who have made important contributions in this endeavour.

T Ramasami
Director, CLRI

CONTENTS

1.0 PREAMBLE

1.1 MOTIVATION

Leather processing industry is in a growth phase in many developing countries. International experience has shown that it is necessary to ensure environmental security if the development of the leather sector is to be rendered sustainable.

United Nations Industries Development Organization (UNIDO) has recognized that the leather industry enjoys unique advantage in the socio-economic development of several developing countries in South East Asia. Therefore, a regional programme has been launched in promoting environmental technologies relating to leather processing activities in some countries in South East Asia.

The role of cleaner production in leather sector as a mitigation measure has been increasingly recognised. Although the size of the leather industry in Sri Lanka is small, there is a need for implementation of cleaner technologies in tanning sector. This was programmed by the Regional Office of UNIDO in Chennai. A contract has been awarded to the Central Leather Research Institute, Chennai with a motivation to "provide demonstration and implement cleaner technologies in and catalyze advocation of environmentally sound methods in the tannery sector in Sri Lanka."

1.2 STUDY MISSIONS

Mr Sahasranaman, Programme Co-ordinator of UNIDO South East Asia Regional Programme on Pollution reduction in tanneries visited Sri Lanka and identified a need for the Project. Sri Samivelu, Scientist, CLRI made a preliminary visit to selected tanneries in Sri Lanka and identified a scope for the implementation of cleaner technologies in those units. CLRI offered to UNIDO to undertake the consultancy assignment in pollution reduction in tanning industries in Sri Lanka through implementation of Cleaner Technologies.

The contract was assigned to CLRI vide contract no **97/166P by UNIDO, Vienna**

1.3 FINDINGS OF PRELIMINARY SURVEY OF TANNERY SECTOR IN SRI LANKA

The size of the organized tanning sector in Sri Lanka is limited to a total of 11 tanneries. They are situated near Colombo. The installed capacities of the tanneries in Sri Lanka are generally low. These tanneries could be easily classified as Small and Medium Enterprises (SMEs). There are only a limited number of tanneries manufacturing finished leather. Primarily processing activity in Sri Lanka is currently limited to manufacture of intermediates like East Indian or Wet Blue Leathers.

Processes adopted are generally traditional. Volume of water consumption per kilogram of leather produced seemed larger than the global average in some cases. Reliable baseline data need to be collected. There is a scope for significant improvement in implementation of pollution reduction measures in tanneries in Sri Lanka.

Product mix and production capacities of the functional tanneries in Sri Lanka (in Colombo) region have been studied. They are represented in a nomogram based on a classification of water usage and production capacities as in **Figure 1.** The data used in Figure 1 are based on baseline data provided by the tanneries in a preliminary survey.

It is evident from the data listed in Figure 1 that tanneries with production capacities in the range of 1200-1500 kgs/day are typical. Maximal benefits are expected in representative group of such tanneries in Sri Lanka because the type or level of cleaner technologies needed are scale dependent.

1.4 CHOICE OF COUNTER PART TANNERS

A team comprising Shri A. Sahasranaman, Programme co-ordinator, Dr.S. Rajamani, Technical Expert of UNIDO, RePO, Chennai and Shri N. Samivelu visited Sri Lanka in June, 1997. They assessed the nature of assistance to be offered to the selected Sri Lankan tanneries in the field of cleaner leather processing and feasible technological upgradation.

The team held a brief meeting with the representatives of UNIDO, SLAT Pvt. Ltd., CEA, Ministry of Environment, Exports Development Board, National

Fig.1a, RAW TO EI & RAW TO WET BLUE - WATER CONSUMPTION

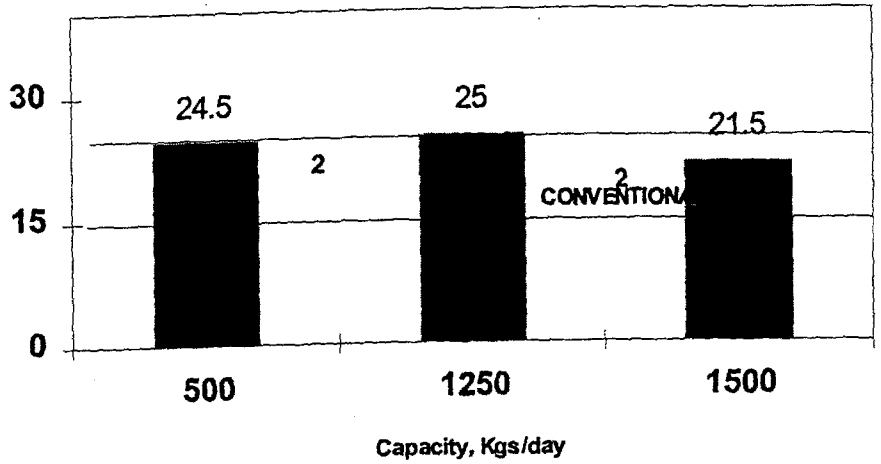


Fig.1b, RAW TO FINISH - WATER CONSUMPTION

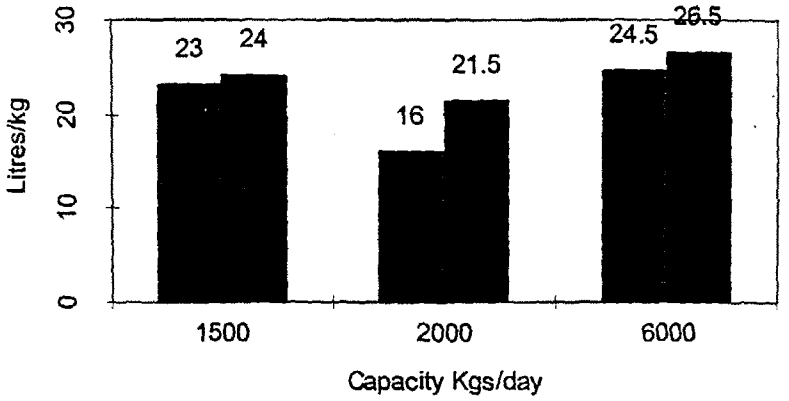


Figure 1c

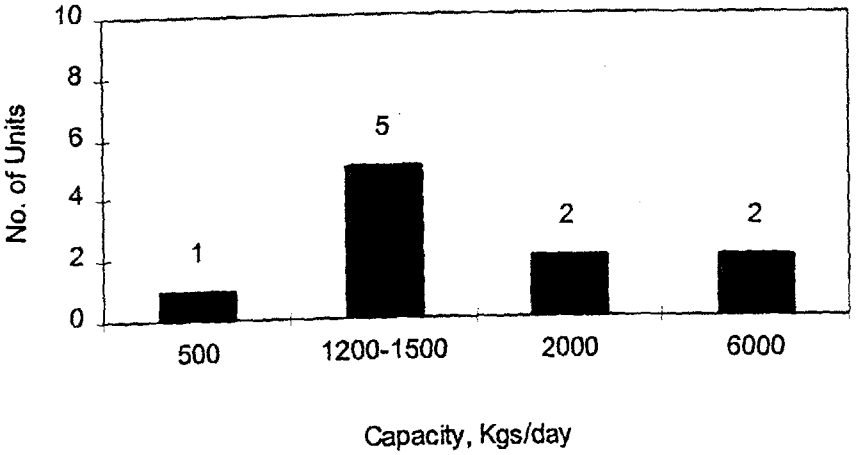
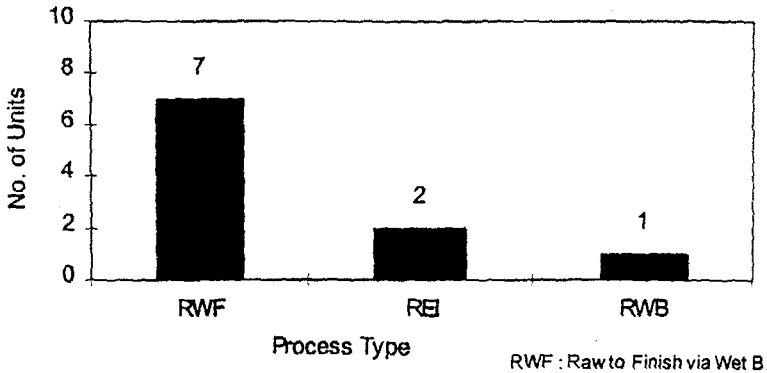
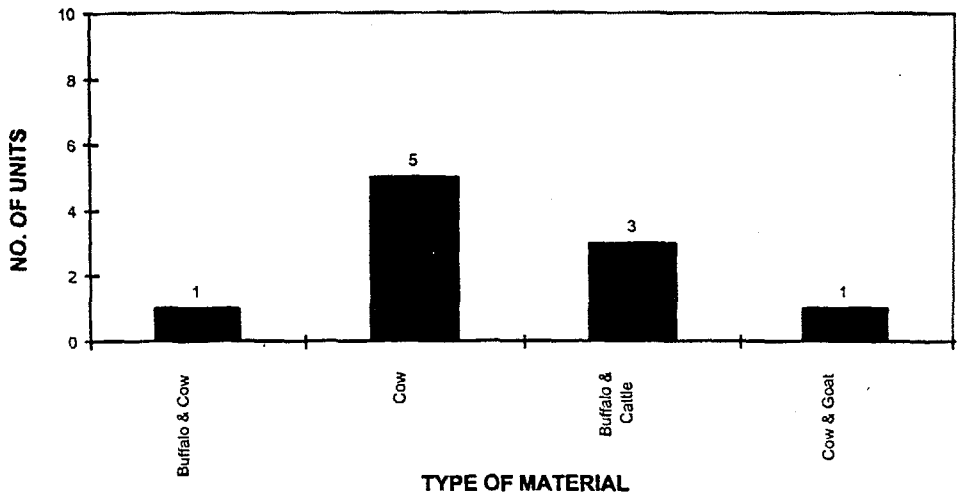


Figure 1d



RWF : Raw to Finish via Wet Blue
REI : Raw to EI
RWB : Raw to Wet Blue

Figure 1e


10
8
6
4
2
0
NO. OF UNITS
1
5
3
1
Buffalo & Cow
Cow
Buffalo & Cattle
Cow & Goat
TYPE OF MATERIAL

Development Bank, Sri Lankan Leather Products Association and the Ministry of Industrial Development Bank, Sri Lankan Leather Products Association and the Ministry of Industrial Development. The team had alerted that there is a scope for technological assistance from CLRI in the field of cleaner technologies under UNIDO/CLRI Project. Potential benefits from this programme were highlighted. The main objectives of the project are a) pollution abatement and b) technological upgradation in tanneries in Sri Lanka. During the meeting, it was identified that technical assistance may be extended to 3 tanneries in the current phase of the programme.

The tanneries identified for implementation of cleaner technology are:

M/s MAM Abdul Cader & Co.
M/s Mubarak Leather Pvt. Ltd.
M/s N.M. Mohamed Mohideen Tannery Ltd.,

The location of the tanneries are shown in a map in Fig. 2.

1.5 TYPES OF TECHNICAL ASSISTANCE CHOSEN

Choice was made to render technical assistance in

- water management
- cleaner and environmental friendly leather processing
- technology upgradation through process rationalization and improved inplant ecology
- manufacture of value added finished leather for exports.

1.6 WORK ELEMENTS IDENTIFIED

In providing technical assistance to tanners in Sri Lanka, the following work elements have been identified.

- Inventory Survey
- Collection of base line data on tannery sector
- Collection of data on water and chemical inputs
- Collection of data on waste water generated
- Choice of Cleaner technology elements
- Pilot level demonstration of cleaner technologies
- Establishing environmental benefits of the cleaner technology options
- Training and
- Documentation

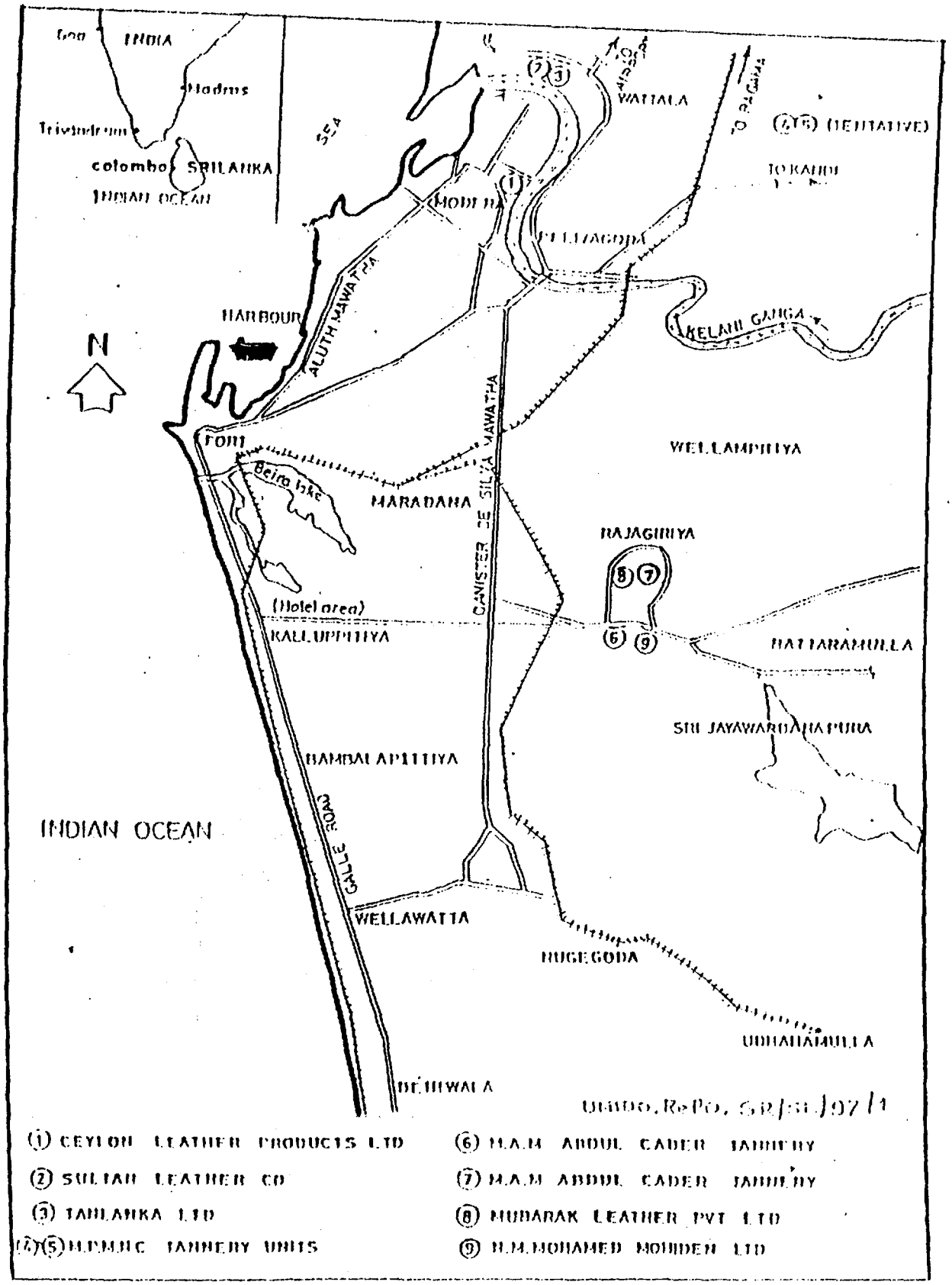


FIG 2: LOCATION OF TANNERIES IN COLOMBO, SRILANKA

2. VISITS BY CLRI SCIENTISTS

2.1 SURVEY VISIT BY CLRI SCIENTISTS

A team comprising Mr.N. Samivelu and Mr. K. Iyappan, CLRI was deputed to Sri Lanka from 29.7.97 to 22.8.97 to carry out the following assignments as part of implementation of contract no.97/166/P by UNIDO, Vienna

- To collect information on the process details, equipments/facilities available, quality of leather, quality of process, type of chemicals, duration of process, type of leathers processed etc.

- To carry out inventory of total activities of various sectional operation , volume of water usage/waste water discharge, including the washings and wastages.

- To collect samples from relevant sectional wastes of individual tanneries (3 identified tanneries) and prepare composite samples for analysis for the following parameters:

  pH, Total solids, Suspended solids, Total dissolved solids, Chlorides, Sulfate, Sulfide, 3 day BOD (total), COD (total), Chromium, Total nitrogen, Oil and grease and Phenolic compounds

- To collect waste water samples of chrome liquor from Tan Lanka Tanneries Pvt. Ltd., Sultan Leather Complex, Mubarak Leather Pvt. Ltd., and MAM Abdul Cader & Co. for analysis of the following parameters:

  pH, Chromium, Sulfate and Chloride

2.2 CONSENSUS ON SELECTION OF CLEANER TECHNOLOGY ELEMENTS : PREOPERATIVE SELECTION VISIT

The information obtained in the first visit on tanneries is compiled and disseminated. A draft plan of action was prepared for implementing cleaner technologies in the selected tanneries in Sri Lanka. Sri K Parthasarathy, Scientist and Leather Technology expert was deputed by CLRI during 30th September to 3rd October to Sri Lanka, to discuss the plan of action with the selected tanneries and develop a consensus on implementation of cleaner technology elements. The plan of action finalized based on consensus is given in chapter 6 in Summary.

On 30.09.1997, Mr RVD Piyatilaka, Director, Industrial Department, Sri Lanka was met. The plan of work to be carried out by CLRI in the Tanneries

identified was discussed. He was also apprised of the workshop to be conducted in Colombo by CLRI-UNIDO in the month of December'97. Next day (1.10.97) Mr C Batuwangala, Chairman, SLAT, Sri Lanka was met and the itinerary for the visit of tanneries drawn. As per the programme prepared by him, a visit was made on 1.10.97 to Rajagiriya Area where M/s. Mubarak Leather P. Ltd, M/s. NM Mohamed Mohideen Tannery Ltd and M/s. MAM Abdul Cader & Co are located and on 2.10.97 to Mattakuli area (M/s.Ceylon Leather Products & Co, Tan Lanka, Sultan Tannery). The facilities available in the identified tanneries have been studied.

The tanners were informed that the CLRI team would be implementing following cleaner technology elements viz. desalting, optimization of float in soaking and counter-current-system of soaking, enzyme assisted sulphide liming system and optimization of float in other unit operations.

The tanners were advised to procure dehairing enzyme and a list of chemicals needed in leather processing prior to the arrival of the CLRI team in Colombo for the commencement of implementation of cleaner technologies. Similarly the manufacturing companies were advised to expedite the supply of the dehairing enzyme formulations to the 3 tanneries in Sri Lanka.

On 03.10.1997. Dr AM Mubarak, Head, Chemical & Environmental Technology Division, Colombo was met. He was apprised of the work being done by CLRI in the tanneries of Sri Lanka under UNIDO Programme, as he had been assisting the programme by extending paid facilities for the analysis of effluent samples of the tanneries.

3.0 BASE LINE DATA ON STATUS OF TANNING PROCESS IN SELECTED TANNERIES

The team collected the filled-in questionnaire and the effluent samples from the 3 identified tanneries for both sectional and composite wastes for total analysis of all parameters.

The team had also made an inventory of total activities of various sectional operations, volume of water used, waste water discharge from all the tanneries in Sri Lanka based on the information collected from the questionnaire. The inventory was prepared by taking a total quantity of waste water discharge from each section of each tannery from soaking to retanning, dyeing and fatliquoring, washings and wastages including chrome and vegetable tanning waste liquor.

After adding the total quantity of discharge of all the tanneries from the different sectional wastes, the quantity was determined for preparing a composite waste as per the standard procedure. The sectional waste, composite waste and water from the 3 identified tanneries were submitted to the CISIR (Ceylon Institute of Scientific and Industrial Research) for the analytical determination of the following parameters:

- pH
- Total Suspended Solids
- Chemical Oxygen Demand
- Chlorides
- Total Dissolved Solids
- Sulfate
- Bio-chemical Oxygen Demand
- Sulfide
- Chromium

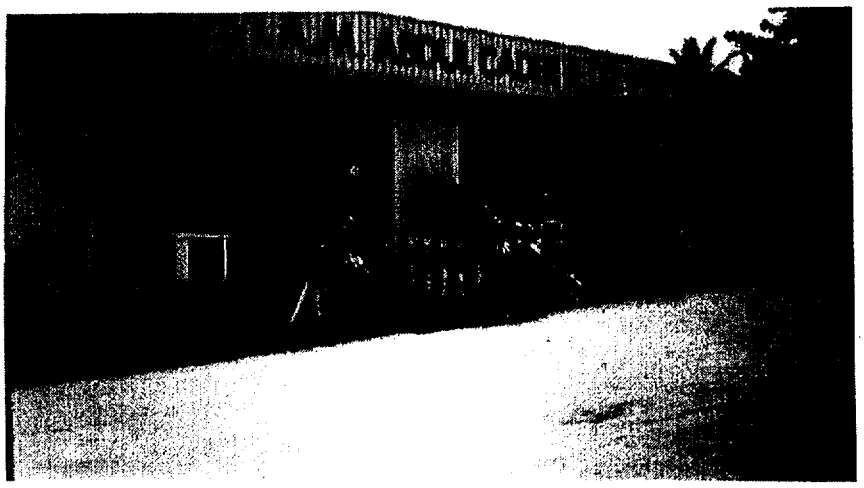
The effluent samples collected from the counterpart tanneries were submitted for analysis to CISIR Lab for analyzing the waste water characteristics. Chrome tannery waste liquors were also collected from the above mentioned four tanneries and were given for analysis. Totally 44 samples of effluent were submitted for analysis.

THE PRESENT PRACTICE OF LEATHER PROCESSING IN THREE IDENTIFIED TANNERIES:

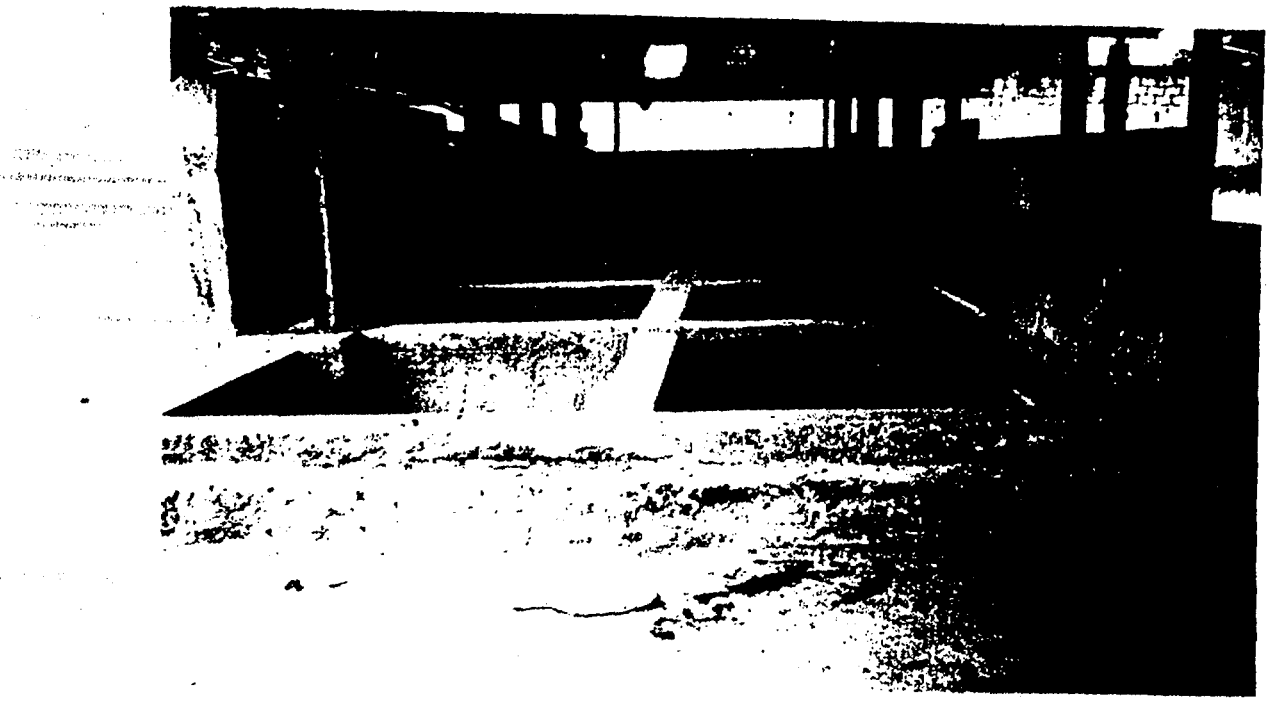
3.1. M.A.M. ABDUL CADER & Co. (Pvt.) Ltd.,
54 Buttgamuwa Road, Welikada
Rajagiriya, SRI LANKA

CONTACT PERSON : Mr. GEORGE

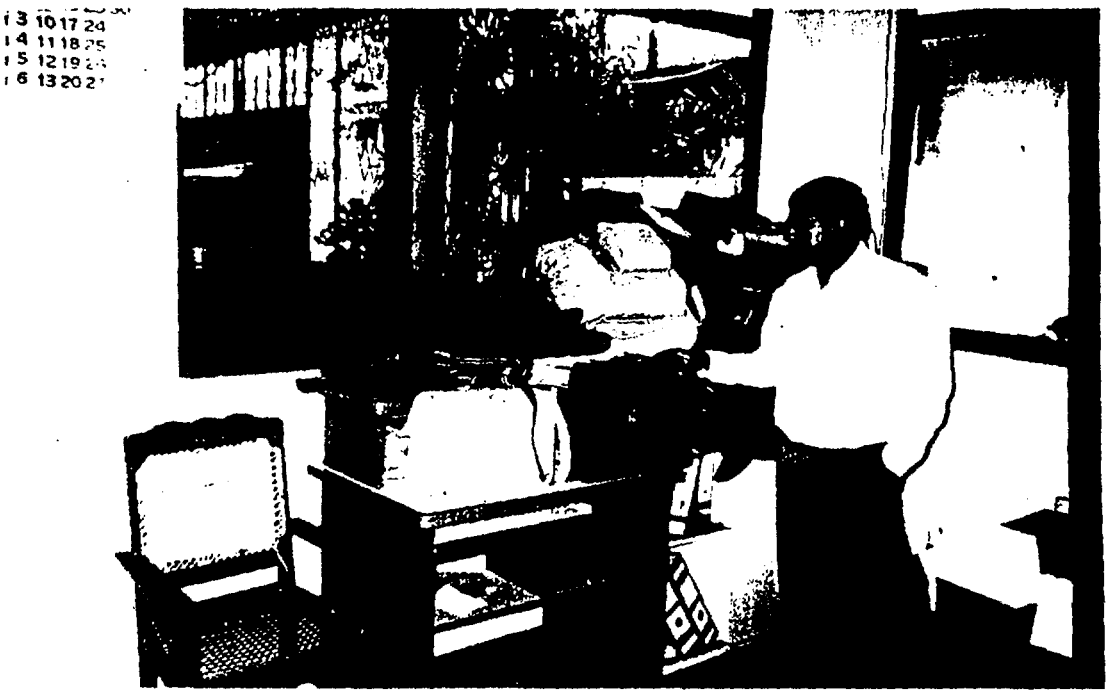
The tannery was established in the year 1913 on a total land area of 240 perches (1.5 acres) with a constructed area of 50% of the total land. The source of water supply in the tannery is from both open and a bore well. The water sample (S_{21} & S_{22}) was drawn and sent for analysis. This tannery is processing 1200 kgs. of cow hides/buff hides into resin upper leathers. The source of raw material is 25% from slaughter house and 75% from traders in green and wet salted stage in the proportion of 1:1. They process goat skins also occasionally.



Front View of Main Building of
M/s.MAM Abdul Cader & Co. Pvt. Ltd



View of Soaking Pits of M/s.MAM Abdul Cader & Co. Ltd.



View of finished products of
M/s.MAM Abdul Cader & Co. Pvt. Ltd

FACILITIES AVAILABLE

Process	Pit/ Paddle/drum	Dimensions	Capacity
Soaking	Pit - 8 Nos.	1.8 m x 1.8m x 1.2 m - 3 Nos 1.5 m x 1.94m x 0.72 m - 2 Nos. 1.65 m x 1.5 m x 0.65 m - 2 Nos. (presently using) 1.75 m x 1.8 m x 1.27 m - 1 No.	1200 kg.
Liming	Paddle - 3 sets (2 sets are not in working condition) Drum (Drum liming is also practiced often)	1.91 m x 1.88 m x 1.22 m - 2 sets 2.39 m x 1.92 m x 1.25 m - 1 set 8' x 8'	600 kgs/paddle 1200-1500 kg
Unhairing Fleshing Scudding	Manual Operation		
Deliming, Chrome, Pickling & Tanning	Drum - 1 Nos.	8' x 8'	1200-1500 kg
Veg. tanning (at present no Production)	18 Nos.(pit) 1No.(drum)	1.8 m x 1.8 m x 1.2 m 9' x 8'	250 kgs. per pit 450 kgs.
Wet finishing	Drum - 1 No.	8' x 6'	750 kgs. (wet blue weight)

Machinery available

Name of the machine	No. of machines	Make	Working width
Samming machine	1 No.	Thailand	1600 mm.
Splitting machine	2 Nos.	Turner (England) Annapoorna (India)	1800 mm. 1800 mm.
Shaving machine	2 Nos.	Alletti (Italy) Krause(German)	1800 mm 900 mm.
Setting machine	1No.	Balson (Indian)	1800 mm.
Staking machine	1 No.	Thailand	1800 mm.
Buffing machine	1 No.	Thailand	1600 mm.
Hand Spray	1 No.		
Embossing machine	1 No.	Thailand	
Drum setting out machine	1 No.	German	
Measuring machine	1 No.	Pin Wheel	
Sample drum	1 No.	4' x 3'	

PROCESS OUTLINE

Raw material : Wet salted cow/buff hides

The goods are taken for trimming and cutting into sides and then weighed.

Soaking

The goods are given two soakings with 125% water and taken for liming.

Liming

After soaking the goods are limed in the paddle using

300%	water
2.5%	Na_2S
6%	Shell lime for 24 hours

The paddle is run 30 minutes for the first time and then run for 5 minutes. for every one hour from morning till evening. The goods are left overnight in the paddle. Next day, the paddle is run for 30 minutes and then taken out for fleshing by hand. In the case of drum liming the soaked hides limed with

150%	Water
5%	Lime
2.5%	Sodium Sulfide

for a period of 24 hrs. The hides are initially drummed for a period of 1 hr and thereafter for 5' every hour. Next day the hides are drummed for 30' and then taken for fleshing. After fleshing, they are washed and delimed.

Deliming

Deliming is done in the drum using 100% water, 2% ammonium sulphate and 0.5% bate for one to one and half hours. After complete bating the goods are washed using 125% plain water.

Pickling and chrome tanning

The goods are pickled in the drum with 100% water, 6% salt, 0.5% formic acid and 1% sulphuric acid for a period of 60 minutes to 90 minutes. Then the chrome tanning is done in the same bath using 5.5 to 6.0% basic chromium sulphate for 2 hours and then basified by using 0.3% sodium formate and 0.5% sodium bicarbonate. Basification is done for 2 hours. After the chrome tanning,

the leathers are washed in water and piled overnight. Next day, the leathers are sammed, split and shaved to the required thickness. Then the shaved weight is noted. The shaved goods are then washed in plain water and then rechromed.

Rechroming

The leathers are rechromed in the drum with 100% water, 3% basic chromium sulphate, 0.3% formic acid, 0.3% sodium formate, 0.5% cationic fatliquor and then basified with 0.5% sodium bicarbonate. After rechroming, the leathers are piled overnight. Next day, they are neutralised.

Neutralization

Neutralization is done in the drum with 100% water, 1.5% neutralizing syntan, 0.75% sodium bicarbonate. They are then washed with 200% water for 20 minutes.

Retanning, dyeing and fatliquoring

The leathers are treated with syntans, dye and fatliquor as below;

Water	100%	→ 30' drumming
Wattle extract	3%	
Syntan	6%	
Fatliquor	4%	- 30' drumming
Dye	1%	- 60 minutes
+ Formic acid	1%	- 30 minutes

Then the leathers are piled overnight. Next day, the leathers are set and then nailed on boards to dry. After drying, the leathers are taken out from the boards for trimming and staking. Then the leathers are buffed on the flesh side and then snuffed on the grain side if necessary and de-dusted.

Finishing

Suitable pigment paste	100 gms.
Binder	180 gms.
Protein binder	80 gms.
Wax	20 gms.
Filler	20 gms.
Water	306 c.c

Two pad coats and one spray coats are given.

Top coat: N.C. Lacquer emulsion 1 part
Water 2 parts
one spray coat sprayed, dried and hot plated.

3.2. N.M. MOHAMED MOHIDEEN TANNERY LIMITED
87 Buthgamuwa Road
Kottuwagoda
Rajgiriya
SRI LANKA

Contact Person : Mr.Fawzi, Mr. Rahman
Phone : 828310, 325794

This tannery was established in the year 1930 on 2.5 acres of land with a constructed area of 5000 m^2. The source of water in the tannery is ground and a neighbouring river.. 90% water used is from a river source (S_{23} & S_{35}).

Front View of M/s. NM Mohamed Mohideen Tannery

A view of Raw Material Storage section of M/s. NM Mohamed Mohideen Tannery

A view of Soaking & Liming yard of M/s. NM Mohamed Mohideen Tannery

Raw material

Wet salted cow hide/buff hide. Average production of the tannery is 1500 kgs./day.

FACILITIES AVAILABLE

Process	Pit/ Paddle/drum	Dimensions
Soaking	Pit - 3Nos.	2.38m x 1.36 m x 0.90 m
Liming	Pit - 18 Nos.	1.58 m x 1.6m x 0.65 m - 16 Nos 1.7 m x 1.2 m x 1.02m 2 nos (3 pits are used for liming/day)
Unhairing Fleshing Scudding	Manual Operation	
Deliming	Pit - 1 No	2.26m x 1.92m x 1.14m.
Scudding after delime	Manual Operation	
Pickling	Pit - 2 nos.	2.26 m x 1.92m x 1.14m
Veg. tanning (at present no production)	45 Nos.(pit)	1.39M X 1.35M X 1.5 M - 15 Nos. 1.8 m x 1.88 m x 1.3 m - 30 Nos.

PROCESS OUTLINE

The Wet salted hides are trimmed and cut into side in the case of larger size while calves are taken as such for soaking.

Soaking I

The goods are soaked with 125% water for 4 hours.

Soaking II

Second soaking using 125% water with preservative 1% and 0.05% wetting agent - is carried out for 12-14 hrs.

Soaking III

Third soaking with 125% water is carried out for 10'. Then the goods are piled for some time to drain the water.

Liming

The goods are limed in the pit with 200% water, 0.5% sodium sulphide, and 25% lime powder. The duration of liming is 6 to 7 days. The goods are handled once a day. After 6 to 7 days, the goods are transferred to another pit containing 200% water, 12% lime powder. The reliming is done for one day. Then the goods are taken out, unhaired, fleshed, washed in plain water and delimed.

Deliming in pits

Water	150%
Ammonium chloride	3%

The goods are trampled for 30 minutes and left overnight. Next day, the goods are taken out, scudded, washed and pickled.

Pickling & Vegetable Tanning

Pickling is done in pit. It is done in a different manner. That is, the goods are left in the first pit containing water 150%, salt 12% and sulphuric acid 1.2% and left overnight. Next day the liquor is transferred into another pit and the goods are transferred into this pit from the earlier pit. The transfer of liquor and goods in the

manner described leads to efficient mixing and handling. In the second pit, the goods remain for a day and then they are left in the old used vegetable tanned liquor for one or two hours to colour the surface. This process is called Malani/Colouring in India.

After treating in the used vegetable tanning liquor, the goods are transferred into a pit containing 125% water, 25 kgs. of wattle extract. The goods remain in the pit for two days with one handling a day and on the 3rd day, 50kgs. of wattle extract is added in to the pit for strengthening the liquor. The goods remain for 2 days with one handling a day. After 2 days, 50 kgs. of wattle extract is added to the same pit and the goods are allowed to remain for 12 to 25 days. After complete vegetable tanning in the above said manner, the goods are taken out and piled for some time to drain the vegetable tan liquor. Then they are taken for bleaching.

Bleaching

The goods are left for a day in a pit containing 150% of water, 0.5% of oxalic acid. Next day, the goods are transferred to another pit containing 125% of fresh water and 0.5% of oxalic acid with the addition of 400 gms. of preservative. The goods are left for a day in this liquor. Next day, the leathers are taken out and piled for a day. Next day, the leathers are oiled with 3% raw coconut oil. The leathers are sammed and set by hand and dried completely. These leathers are mainly exported. The yield has been estimated to be about 33% on pelt weight.

3.3. M/s MUBARAK LEATHERS PVT. LTD.,
357 Perara Mawatta, Kotawagova
Rajagiriya
SRI LANKA

Contact person : Mr. Hilmey
Phone No. : 876259

The tannery is established in the year 1950 with a total land area of 1.5 acres and constructed area of 0.5 acres. This tannery is mainly producing chrome tanned leathers. The hides are purchased partly from slaughter house and partly from traders. The source of water is an open well (S_{12}).

A View of M/s. Mubarak Leather Pvt, Ltd, Tannery

A view of effluent collection pond of
M/s. Mubarak Leather Pvt, Ltd, Tannery

A view of the durm yard of the M/s. Mubarak Leather Pvt, Ltd, Tannery

FACILITIES AVAILABLE

Process	Pit/ Paddle/drum	Dimensions	Capacity
Soaking	2 Pits	8'10" x 6'7" x 3'10"	
Liming	5 paddles 8 pits	6 '6"x 6'6" x 5 6'3" x 6'3" x 2'8"	750 kgs./paddle 250 kgs./pit
Unhairing	Manual operation		
Fleshing	Gobi - 1 No. Turner - 1 No.	1800 mm.	30 sides/hr 100 sides/hr.
Deliming, Pickling & Tanning	Drum - 3 Nos.	8' x 8'	1500 kgs each

Machineries available

Name of the machine	No. of machines	Make	Capacity	Working width
Samming machine	1 No.	Turner	100 sides/hr.	1800 mm.
Splitting machine	2 Nos.	Turner Shalimar	200 sides/hr. 100 sides/hr.	1800 mm. 1600 mm.
Shaving machine	1 No.	Gazzni Leather	175 sides/hr.	1300 mm
Wet finishing	1 drum	(8'x8')	1500 kgs	
Setting machine	1No.	Turner	100 sides/hr.	1800 mm.
Staking machine	1 No.	Turner	50 sides/hr.	1550 mm
Buffing machine	1 No.	Turner	10 sides/hr.	2'.
Hand Spray				
Embossing machine	1 No.	Turner	200 sides/hr.	
Polishing machine	1 No.	Italian	200 sides/hr.	
Measuring machine	1 No.		200 sides/hr.	
Sample drum	1 No.	3.5' x 3'	50 kgs.	

PROCESS OUTLINE

Raw material : Wet salted cow/buff hides. Average production in the tannery is 3500 kgs./day.

Soaking

The hides are trimmed and cut into sides and soaked in 2 changes of water using approximately 300% water for each soaking. After soaking the goods are piled for some time to drain the water.

Liming

Liming is carried out in paddle using

300%	water
2%	sodium sulphide
6%	lime
1%	soda ash

The liming is done for 8 hours. The paddle is run for 10 minutes for every one hour. After liming, the sides are unhaired, fleshed, washed and delimed.

Deliming

Deliming is done in the drum with

75%	water
2%	ammonium chloride
1.5%	sodium bisulphate
1%	bate

The drum is run for 2 hours.
After complete deliming, the pelts are washed in 200% water and pickled.

Pickling

100%	water
6%	salt
0.5%	formic acid
1.5%	H_2SO_4

The drum is run for two and half hours and chrome tanning is done in the same bath.

Chrome tanning

Basic chrome sulphate 5% based on pelt weight is added. After this drum is run for 2 hours, stock is basified with 1% sodium bicarbonate over a period of 2 hours. After chrome tanning, the leathers are washed in 200% water in 10 to 15 minutes. Then the leathers are sammed, splitted and shaved to the required thickness. The shaved weight is noted and then the leathers are washed in the plain water for 10 minutes.

Rechroming

The leathers are rechromed in the drum with

60%	water
3%	BCS

and basified with 0.5% sodium bicarbonate. After rechroming the leathers are washed in plain water using 200% for 10 minutes.

Neutralisation

100%	water
1%	sodium formate
0.2%	sodium bicarbonate

After neutralisation to the required level, the leathers are washed in plain water using 200% float.

Retanning, dyeing and fatliquoring

The leathers are treated with post tanning auxillaries as below

100%	water	
1.5 to 3%	wattle extract	→ 45' drumming
2.5 to 3%	syntan	
0.25%	dye	30' drumming
0.5%	formic acid	30' drumming

After this, the leathers are piled overnight. Next day, the leathers are set and nailed on boards to effect complete drying. After drying, the leathers are trimmed and staked. The leathers are then buffed on the flesh side and de-dusted.

Finishing

Suitable pigment paste	120 gms.
Resin Binder	180 gms.
Protein binder	80 gms.
Wax	20-25 gms.
Filler	10gms.
Water	400-500ml.

Two pad coats and one spray coat were given.

Top coat: N.C. Lacquer emulsion 1 part
Water 2 part
one spray coat - dried and hot plated.

4. EFFLUENT SAMPLING AND ANALYSIS

An inventory of the total activity on the various sectional operations of all the 9 tanneries in Colombo (soaking, liming, deliming etc), volume of water usage / waste water discharge, including washing & wastage was carried out.

A composite effluent sample was prepared by mixing all the sectional wastes proportionately to the total volume of sectional waste water discharged from all the tanneries in order to have a representative composite sample. After working out the total inventory, the composite sample was collected from one of the tanneries identified for introduction of cleaner technologies. This has been done from a tannery where both chrome and vegetable tanning are carried out. The procedure adopted for the composite sampling is given in Annexure - 1.

The samples of sectional waste streams and composite in the three identified tanneries were also collected and the procedure adopted for collecting the sectional streams is given in Annexure - 2.

In addition, samples of the exhaust chrome liquor were collected from MAM Abdul Khader Tannery, Tan Lanka Ltd, Sultan Leather Co. and Mubarak Leathers. All the samples were given to M/s. Ceylon Institute of Scientific and Industrial Research, Colombo, for analysing the following parameters.

1. pH
2. Total Solids
3. S.S
4. TDS
5. Chloride as Cl
6. Sulphate as SO_4
7. Sulphide as S
8. 5 day BOD (Total
9. 5 day BOD (Filtrate or soluble)
10. COD (Total)
11. COD (Filtrate or soluble)
12. Total Chromium as Cr or Cr_2O_3
13. Total Nitrogen
14. Oils & grease
15. Phenolic Compounds (as Phenolic OH)

The results obtained are summarized and presented in tables 4.1 to 4.5 and the results of conventional processing are also presented in the same table for comparison.

TABLE4.1 SUMMARY OF ANALYTICAL DATA : MUBARAK TANNERY

Sl. No.	Name of Sample	Sample No	Parameter, ppm									
			BOD	COD	TSS	TDS	S^{-2}	Cl	SO_4	TH $CaCo_3$	Cr	pH
1	Raw water	S_{12}	4	90	-	2700	<0.1	1200	190	370	-	6.4
2	Soak liquor	S_1	1500	6940	3400	58000	-	27000	-	-	-	7.0
	Traditional Processing		1100-2500	3000-6000	3000-7000	32000-48000	-	15000-30000	-	-	-	7.5 - 8.0
3	Lime liquor	S_2	6250	28000	3630	30000	470	17000	250	-	-	12.2
	Traditional Processing		5000-10000	10000-25000	6000-20000	24000-30000		4000-8000	-	-	-	10.0 - 12.8
4	Delime water	S_4	-	-	980	36000	-	5800	-	-	-	9.2
	Traditional Processing		1000-3000	2500-7000	1500-4000	2500-6000	-	1000-2000	-	-	-	7.0 - 9.0
5	Delime wash	S_3	1750	5200	390	9700	-	4600	2860	-	-	8.8
6	Pickle liquor	S_5	1750	6400	960	68000	-	40000	16000	-	-	2.6
	Traditional Processing		400-700	1000-3000	1000-3000	34000-67000	-	20000-30000	-	-	-	2.0-3.0
7	Pickling & Chrome tanning	S_{11}	1500	3470	3620	70000	-	5400	33000	-	-	3.3
	Traditional Processing		350-800	1000-2500	1000-2500	29000-57500	-	15000-25000	-	-	2000-5000	2.5-4.0
8	Re Chrome	S_6	1250	7800	560	17000	-	-	5130	-	<0.05	3.7
9	Neutralisation	S_7	100	740	240	8200	-	5800	1710	-	-	4.4
10	Neutralisation Wash	S_8	45	50	240	6200	-	5800	350	-	-	6.1
11	Re tanning, dyeing, fat liquoring	S_9	2000	7800	530	15000	-	8300	-	-	<0.05	3.1
	Traditional Processing		1000-2000	2500-7000	600-1000	3400-9000	-	500-1000	-	-	-	3.5 - 4.5
12	Composite	S_{10}	5000	15000	3200	23000	24	15000	5510	-	<0.05	7.4
	Traditional Processing		1000 - 3000	2500 - 8000	2000 - 4000	13000 - 21000		6000 - 9500			100 - 250	

Table 4.2 : SUMMARY OF ANALYTICAL DATA : MAM ABDUL CADER TANNERY

Sl. No.	Name of Sample	Sample No	Parameter, ppm BOD	COD	TSS	TDS	S^{-2}	Cl	SO_4	TH $CaCo_3$	Cr	pH
1	Raw water A	S_{22}	4	50	-	5400	<0.1	2000	141	320	-	5.6
2	Raw water Borewell	S_{21}	4	10	<10	230	<0.1	50	115	70	-	5.7
3	Soak water	S_{13}	6750	21000	5850	50000	-	12000	-	-	-	6.3
	Traditional Processing		1100-2500	3000-6000	3000-7000	32000-48000	-	15000-30000	-	-	-	7.5 - 8.0
4	Lime liquor	S_{14}	7500	16000	2115	32000	620	17000	1510	-	-	12.0
	Traditional Processing		5000-10000	10000-25000	6000-20000	24000-30000		4000-8000	-	-	-	10.0 - 12.8
5	Delime liquor	S_{15}	10000	28000	2150	25000	-	7500	3090	-	-	7.3
	Traditional Processing		1000-3000	2500-7000	1500-4000	2500-6000	-	1000-2000	-	-	-	7.0 - 9.0
6	Delime wash	S_{16}	-	-	560	5550	-	4200	-	-	-	7.1
7	Pickle and Chrome liquor	S_{17}	1500	6000	9020	100000	-	70000	24000	-	<0.05	3.0
	Traditional Processing		350- 800	1000-2500	1000-2500	29000-57500	-	15000-25000	-	-	2000 - 5000	2.5-4.0
8	Re - Chroming tanning	S_{33}	500	11000	1320	8600	-	-	5210	-	<0.05	3.0
	Neutralization water	S_{18}	450	1000	260	8200	-	5000	1700	-	-	3.7
9	Washing after neutralization	S_{19}	200	360	240	4400	-	2900	600	-	-	3.5
10	Re tanning, dyeing and fat liquoring	S_{20}	1500	5500	320	4100	-	3300	-	-	-	2.8
	Traditional Processing		1000-2000	2500-7000	600-1000	3400-9000	-	500-1000	-	-	-	3.5 - 4.5
11	Composite	S_{34}	2000	12000	2280	24000	8	14000	-	-	<0.05	5.6
	Traditional Processing		1000 - 3000	2500 - 8000	2000 - 4000	13000 - 21000		6000 - 9500			100 - 250	

TABLE 4.3 SUMMARY OF ANALYTICAL DATA: MOHAMED MOHIDEEN TANNERY

Sl. No.	Name of Sample	Sample No	Parameter, ppm									
			BOD	COD	TSS	TDS	S^{-2}	Cl	SO_4	TH $CaCo_3$	Cr	pH
1	Raw water A	S_{35}	4	30	-	360	<0.1	58	280	85	-	6.7
2	Raw water (Borewell)	S_{23}	4	10	-	1300	<0.1	390	120	220	-	6.1
3	Soak liquor	S_{24}	5000	12000	7470	65000	-	50000	-	-	-	6.6
	Traditional Processing		1100-2500	3000-6000	3000-7000	32000-48000	-	15000-30000	-	-	-	7.5 -8.0
4	Lime liquor	S_{25}	600	15000	2660	33000	270	23000	1465	-	-	11.9
	Traditional Processing		5000-10000	10000-25000	6000-20000	24000-30000		4000-8000	-	-	-	10.0 - 12.8
	Relime water	S_{32}	1500	8000	1640	18000	-	12000	250	-	-	11.9
5	Delime	S_{26}	1500	3020	3920	13000	-	5800	5910	-	-	8.8
	Traditional Processing		1000-3000	2500-7000	1500-4000	2500-6000	-	1000-2000	-	-	-	7.0 -9.0
6	Delime wash	S_{27}	-	-	220	6200	-	4150	-	-	-	7.9
7	Pickle water	S_{28}	600	1860	1960	42000	-	28000	7650	-	-	3.5
	Traditional Processing		350-800	1000-2500	1000-2500	29000-57500	-	15000-25000	-	-	2000-5000	2.5- 4.0
8	Bleaching	S_{31}	600	7000	800	9600	-	7000	1800	-	-	2.9
9	Vegetable Tanning	S_{30}	9000	28000	3560	28000	-	20000	4080	-	-	4.1
	Traditional Processing		6000 - 18000	15000 - 40000	4000 - 10000	21000 - 50000		1000 - 2500				4.0 - 7.0
10	Composite Mixture	S_{29}	4000	6250	5900	19000	10	17000	2950	-	<0.05	8.4
	Traditional Processing		1000 - 3000	2500 - 8000	2000 - 4000	13000 - 21000		6000 - 9500			100 - 250	

4.4 SUMMARY OF ANALYTICAL DATA OF EXHAUST CHROME LIQUOR

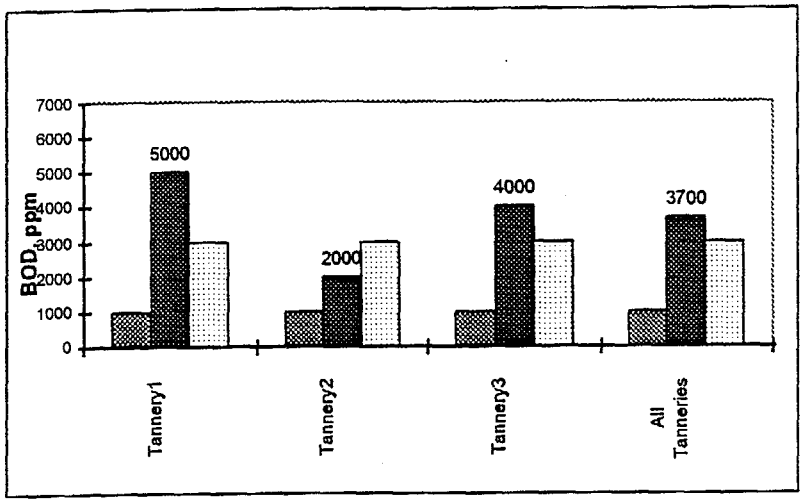
Sl.No.	Name of the Tannery	Sample		Parameter, ppm				
		Name	No	Cl	SO_4	$CaCO_3$	Cr	pH
1.	Tan Lanka Ltd	Chrome liquor	S_{39}	28,000	27,000		5,160	3.6
		Rechrome	S_{37}	6,100	6,410		555	2.6
2.	Sultan Leather Co.	Chrome liquor	S_{38}	28,000	31,000		51,25	2.9
		Rechrome	S_{40}	11,000	14,000		625	4.5
3.	MAM Abdul Cader & Co.	Chrome liquor	S_{41}	27,000	-		3,360	3.8
		Rechrome	S_{43}	7,700	-		760	3.2
4.	Mubarak Leather Pvt. Ltd	Chrome liquor	S_{42}	-	-		4,297	3.4
		Rechrome	S_{44}	-	-		710	3.4

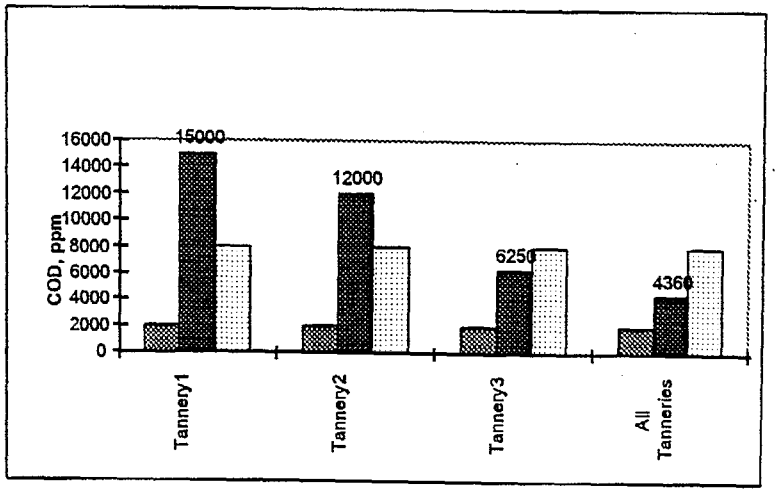
Table 4.5 : Analytical results for Composite Sample

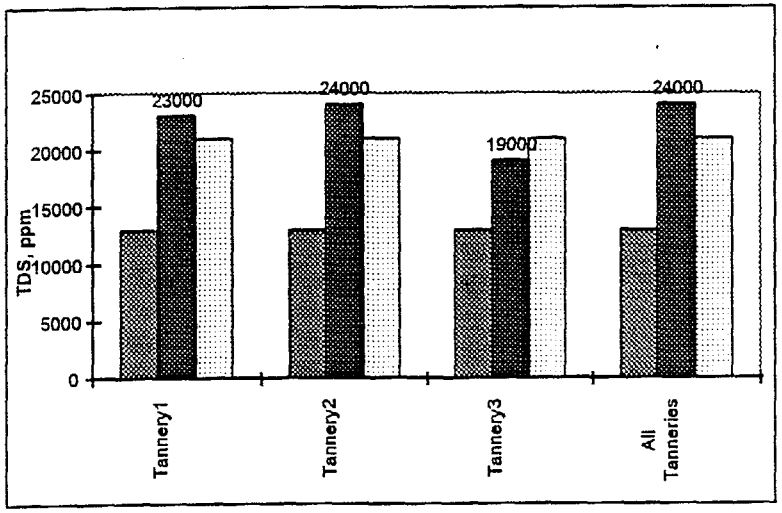
Parameter	Test Value	
	S_{36}	Traditional Processing
pH at ambient temperature	8.6	7-9
* BOD_3, (non filtered), mg/l at 30^0C	3700	1000-3000
* BOD_3, (filtered), mg/l at 30^0C	2000	
COD, non filtered, mg/l	4360	2500-8000
COD, filtered, mg/l	3400	
Total Suspended Solids, mg/l	600	2000-4000
Total Dissolved Solids, mg/l	24000	13000-21000
Sulfides, as S^{-2}, mg/l	230	
Chlorides, as Cl, mg/l	15000	6000-9500
Sulphate, as SO_4, mg/l	6440	
Total Chromium, as Cr, mg/l	49	100-250
Total Solids, mg/l	25000	15000-25000
Oil & Grease mg/l	6	
Phenolics, (as Phenolic OH), mg/l	2.1	
Total Nitrogen, mg/l	800	

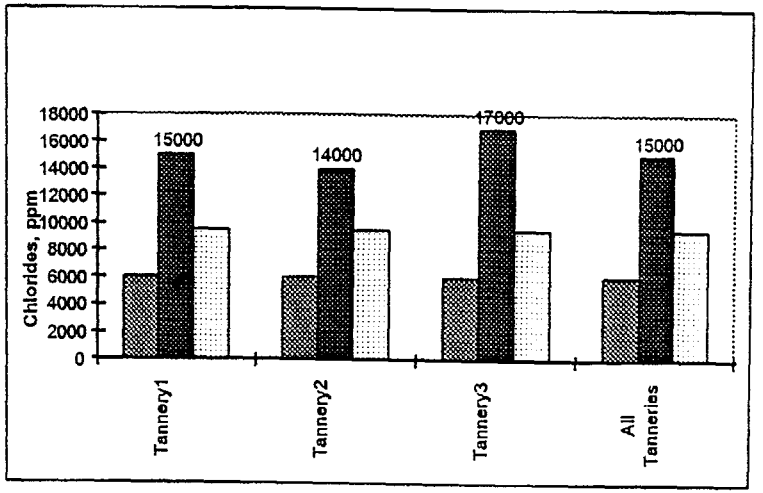
* Samples were seeded using sludge from a biological treatment plant

Fig 3 : Comparision of status of various parameters of Composite Samples









Tannery 1 : M/s. Mubarak Leather Pvt. Ltd., Tannery
Tannery 2: M/s. MAM Abdul Cader & Co. Pvt. Ltd.
Tannery 3: M/s. NM Mohamed Mohideen Tannery

CONVENTIONAL, MIN ACTUAL CONVENTIONAL, MAX

5. WATER CONSUMPTION

Based on the process information provided by the tanneries current consumption of water in counterpart tanneries has been estimated. The water consumption per kg of hide processed has also been estimated. The estimates are presented in the table given below and compared with the norms.

The estimates reveal that the current consumption of water may be as per the International practices. However, during the implementation phase, actual measurements are being envisaged as a prior need for recommending further improvements in levels of water usage.

Sl.No.	Name of the Tannery	Capacity Kgs	Type of Material	Process	Water Consumption lit / kg		Water Consumption lits/day Estimated
					Actual	Conventional	
1.	Tan Lanka Ltd	6000	Buffalo/ Cow Hides	Raw to finish (chrome)	26.5	25-40	1,57,574
2.	Antony Leather Products	1500	Cow Hides	Raw to finish (chrome)	24	25-40	35,475
3.	Sultan Leather Co.	2000	Cow Hides	Raw to finish (chrome)	16.0	25-40	31,900
4.	Indo-Ceylon & PPK Leathers Co.	1500 350	Cow Hides Goat	Raw to finish (chrome)	23	25-40	34,650
5.	Ceylon Leather Products Ltd	6000	Cow Hides	Raw to finish (chrome)	24.5	25-40	1,45,970
6.	Bettan Lanka Leather Tannery	2000	Cow Hides	Raw to finish (chrome)	21.5	25-40	42,900
7.	Standard Leather Co	500	Cow Hides	Raw to El	24.5	15-25	12,155
8.	N.M.Mohamed Mohideen Ltd	1500	Cattle or Buffalo	Raw to El	21.5	15-25	31,927
9.	Mubarak Leather Pvt. Ltd	1500	Cattle or Buffalo	Raw to finish	24	25-40	35,541
10.	MAM Abdul Cader & CO.	1200	Cattle or Buffalo	Raw to Wet Blue	25	15-25	29,865

6. CHOICE OF CLEANER TECHNOLOGY ELEMENTS

It is evident from the processes followed in the tanneries of Sri Lanka that there is wide scope for rationalization of processes and for reduction of water consumption. These are now several process technology elements for tannery operations. Some of these have been completed and listed by Bulijan, Ludvik and Ramasami and coworkers . These are included in Annexure 3.

It has been demonstrated unambiguously that more than 80% of pollution load originates from beam house and chrome tanning operations. Further, majority of leather processing activity in Sri Lanka is limited to Wet blue, EI tanning and crust leather manufacture. Therefore, the critical cleaner technology elements chosen for implementation may deal with beam house and tanning operations.

As far as the chrome tanning is concerned, the discharge of chrome into effluent appears to be negligible because of the fact that they use only about 5% B.C.S for tanning and also due to excess use of water. However, chrome recovery system may be introduced in the tanneries for the avoidance of chrome discharge into the effluent. This is being carried through a separate UNIDO assisted project in the same region of Sri Lanka. The technology plan to be implemented in the tanneries is given in the sections to follow.

6.1 CLEANER PROCESS DETAILS CHOSEN

Desalting: The hides (cow/buff) are to be desalted. Depending on the condition of the wet salted goods brushing or beating is to be employed for desalting. Recovery of salt and time taken is to be estimated for every batch of work done. Recovered salt will to be reused for pickling.

Optimization and Recycling of water in Soaking: Three changes of water is recommended for soaking by adopting the counter current system to conserve water. For each soaking 300% water is to be used. Waste water of soaking operation is to be collected as per the usual procedure for analysis of BOD, COD, TDS, Cl, SO_4 etc.

Less-Sulphide Liming: 0.5 - 1.0% of enzyme to be used by reducing the sulphide by 50% in Liming. Hair - saving method either by painting on flesh side or dip & pile method is to be adopted to reduce the pollution load.

Optimization of Float in Reliming: After unhairing by using dehairing enzyme and sulphide, the pelts are to be relimed in the paddle/pit by using 300% water and 8-10% Lime and 0.25% Caustic Soda. The waste water of reliming is to be analyzed for BOD, COD, TDS etc.

Optimization of Float in Deliming: The deliming with ammonium salts is to be done with 100% float in the drum / pit. Bating is also to be done in the same deliming drum / pit.

Pickling Process: It is recommended to use 80% float and 8% common salt for pickling and the cross-section pH should be adjusted to 2.8 - 3.0. After pickling 50% of float is to be drained before starting chrome tanning. Drained liquor sample to be collected and analyzed for BOD, COD, TDS, Chlorides.

Chrome Tanning:- Chrome tanning is to be done in the same pickle liquor after draining 50% pickle liquor by adding 6% B.C.S in two installments at an interval of 1 hour. Then 100% water is to be added to the drum after running for 1 hour after the addition of the second installment of B.C.S. Before flooding the drum with 100% water it should be checked for through penetration of chrome.

Basification : After running the drum for 30 - 60 minutes with 100% water, 1% - Sodium Formate (in 10% water) is to be added to the drum and run for 1 hour. Then 1% of sodium bicarbonate (in 10% water) is to be fed into the drum in 6

bicarbonate the drum should run for 1 hour to attain an equilibrium pH. The final pH should be around 3.8 - 4.0.

6.2 PARAMETERS TO BE MONITORED

Both conventional and modified processes,(cleaner technologies) are to be carried out simultaneously. The sectional waste water effluent samples are to be collected and analyzed.

1. Soak Liquor - (BOD, COD, TDS, TSS, SO_4, Cl)
2. Relime Liquor - (BOD, COD, TDS, TSS, S^{-2})
3. Delime Liquor - (BOD, COD, TDS, TSS)
4. Drained Pickle Liquor - (BOD, COD, TDS, TSS, Chlorides)
5. Exhaust Chrome Liquor - (BOD, COD, TDS,Cr)

7.0 Action plan for the Implementation of Cleaner Technology in Leather Processing in the Tanneries of Sri Lanka

7.1 MUBARAK LEATHER P. LTD

7.1.1 **DESALTING:**. Desalting is to be carried out on hides by either brush (if in right moisture content) and/or beating : preferably one day production level. Before removing the salt, weight of the stock is to be noted. Similarly after desalting, the stock is to be weighed to determine the quantity of salt removed from the stock.

7.1.2 **USE OF RECOVERED SALT:** The recovered salt may be dissolved in known quantity of water and made in a particular concentration and then filtered through a filter cloth to remove the insoluble impurities from the recovered salt. The recovered salt can be used in the pickling process with an addition of 0.1 - 0.2 % preservative

7.1.3 **OPTIMIZATION OF WATER IN SOAKING AND RECYCLING OF SOAK LIQUOR**: Three changes of water can be given for soaking. Counter current system may be followed. 200-300% of water on the weight of the stock is to be employed for each soaking.

7.1.5 **LIMING PROCESS**

CLEANER PROCESS
DIP & PILE METHOD

Dehairing Enzyme	1.0%
Sodium Sulphide	0.6 - 1.0 %
Lime	10%
Water	20%

The soaked sides are to be dipped one by one in the above composition and piled flesh to flesh and left over night.

7.1.6 **RELIMING:** Next day the sides are to be unhaired and relimed in the paddle using 10% lime, 300% water, 0.25% caustic soda. The paddle shall run for 15 minutes for every one hour from morning till evening. Then the goods are to be left in the lime liquor overnight. Next day the paddle shall run for 15 minutes and the sides are to be taken out for fleshing, scudding, weighing, washing.

7.1.7 **DELIMING & BATING IN DRUM:**

Water	100%	
Ammonium Sulphate	1.5%	10'
Water	20%	10'

Complete deliming shall be done by checking the pelt with phnolphthalene indicator. Then the sides are to be scudded and washed in the drum using 200% water for 10-15 minutes.

7.1.8 **PICKLING:** The float is to be optimised

Water	80%	
Common Salt	8%	
The drum is run for 20'		
+ Formic Acid Water	0.5% 5%	10'
+ Sulphuric Acid Water	1% 10%	10' 10' 10'
The drum is run for 60'		
pH	2.8 - 3.0%	10'

The goods are to be left overnight in the pickle bath. Next day the drum shall run for 30 minutes. Then 50% of pickle liquor is to be drained.

7.1.9 **CHROME TANNING:**

Pickle liquor	50%	
BCS	3%	
The drum shall run for 1 hour		
+ BCS Cationic Fatliquor	3% 0.5%	
The drum shall run for 1 hour		
+ Sodium Formate Water	1% 10%	
The drum shall run for 30 minutes		
+ Sodium bicarbonate Water	1% 10%	40'

Sod. bicarbonate to be added gradually over a period of 90 minutes. The final pH at cross-section of the hide shall be around 3.8 - 4.0.

7.2 *NM Mohammed Mohideen Ltd*

The following cleaner technologies shall be employed in the tannery

7.2.1 **DESALTING:**. Desalting shall be carried out either by and/or beating. Before removing the salt, weight of the stock is to be noted. Similarly after desalting the weight of the stock is to be noted to determine the quantity of salt removed from the stock.

7.2.2 **USE OF RECOVERED SALT:** The recovered salt may be dissolved in known quantity of water and made in a particular concentration and then filtered through a filter cloth to remove all the insoluble impurities from the recovered salt. The recovered salt can be used in the pickling process with an addition of 0.1 - 0.2 % preservative

7.2.3 **OPTIMIZATION OF WATER IN SOAKING AND RECYCLING OF SOAK LIQUOR**: 3 changes of water shall be given for soaking. Counter current system may be followed. 200-300% of water on the weight of the stock is to be employed for each soaking.

7.2.4 **LIMING PROCESS**

CLEANER PROCESS
DIP & PILE METHOD

Dehairing Enzyme	1.0%
Sodium Sulphide	0.6%
Lime	10%
Water	20%

The soaked sides are to be dipped one by one in the above composition and piled flesh to flesh and left over night.

7.2.5 **RELIMING :** After unhairing the hides shall be relimed in pits with 200-250% water, 10-15% lime for a period of 3-4 days. Then the hides shall be fleshed, weighed, washed and then taken for deliming.

7.2.6 **DELIMING :** Deliming shall be carried out in pit for a day as below

Water	100%	
Ammonium Sulphate	1.5 - 2.0%	1 day
Water	20%	10'

Complete deliming is to be done by checking the pelt with phnolphthalene indicator.

7.2.7 **PICKLING:** The float shall be optimised. The process to be adopted as being followed in the tannery.

7.2.8 **VEGETABLE TANNING:** The float is to be optimised. The process to be adopted as being followed in the tannery. The drain liquor to be analyzed for BOD, COD, TDS, Chlorides.

7.2.9 **BLEACHING:** The float is to be optimised. The process to be adopted as being followed in the tannery.

7.3 M/s. MAM Abdul Cader & Co.

7.3.1 **DESALTING:**. Desalting either by brush (if in right moisture content) and/or by beating shall be carried out. Before removing the salt, weight of the stock is to be noted. Similarly after desalting the weight of the stock is to be noted to determine the quantity of salt removed from the stock.

7.3.2 **USE OF RECOVERED SALT:** The recovered salt may be dissolved in known quantity of water and made in a particular concentration and then filtered through a filter cloth to remove all the insoluble impurities from the recovered salt. The recovered salt can be used in the pickling process with an addition of 0.1 - 0.2 % preservative

7.3.3 **OPTIMIZATION OF WATER IN SOAKING AND RECYCLING OF SOAK LIQUOR**: 3 changes of water can be given for soaking. Counter current system may be followed. 200-300% of water on the weight of the stock is to be employed for each soaking.

7.3.4 **LIMING PROCESS**

CLEANER PROCESS
DIP & PILE METHOD

Dehairing Enzyme	1.0%
Sodium Sulphide	0.75 - 1.0%
Lime	10%
Water	20%

The soaked sides shall be dipped one by one in the above composition and piled flesh to flesh and left over night.

7.3.6 **RELIMING:** Next day the sides shall be unhaired and relimed in the paddle using 10% lime, 300% water, 0.25% caustic soda. The paddle shall run for 15 minutes for every one hour from morning till evening. Then the goods are to be left in the lime liquor overnight. Next day the paddle shall run for 15 minutes and the sides are to be taken out for fleshing, scudding, weighing, washing,

7.3.7 **DELIMING & BATING IN DRUM:**

Water	100%	
Ammonium Sulphate	1.5%	10'
Water	20%	10'

Complete deliming is to be done by checking the pelt with phnolphthalene indicator. Then the sides are to be scudded and washed in the drum using 200% water for 10-15 minutes. In the deliming process, only water is optimised

7.3.8 **PICKLING:** The float is to be optimised

Water	80%	
Common Salt	8%	
The drum is run for 20'		
+ Formic Acid Water	0.5% 5%	10'
+ Sulphuric Acid Water	1% 10%	10' 10' 10'
The drum is run for 60'		
pH	2.8 - 3.0%	10'

The goods are to be left overnight in the pickle bath. Next day the drum shall run for 30 minutes. Then 50% of pickle liquor is to be drained.

7.3.9 **CHROME TANNING:**

Pickle liquor	50%	
BCS	3%	
The drum shall run for 1 hour		
+ BCS Cationic Fatliquor	3% 0.5%	
The drum shall run for 1 hour		
+ Sodium Formate Water	1% 10%	
The drum shall run for 30 minutes		
+ Sodium bicarbonate Water	1% 10%	40'

After the last feed of bicarb, run the drum for 1 hour. Sod. bicarbonate to be added gradually over a periodof 90 minutes. The final pH at cross-section should be 3.8 - 4.0.

7.4 POST IMPLEMENTATION

1. Monitoring the implementation of cleaner process technologies in all the three tanneries.

2. Practical demonstration on cleaner technologies for the benefit of other tanneries in one of the three selected tanneries.

8.0 IMPLEMENTATION OF CLEANER TECHNOLOGIES

8.1 PREAMBLE

Leather processing has remained an art evolved with individual skills. This has been a global trend in leather sector and Sri Lankan leather industry is no exception. There exists a perception that leather processing does not lend to a set of generic processes for the same end product. Variations exist not only in processing method but also in processing equipments and level of mechanisation from tannery to tannery. Given the variations in processing technology, it is not very uncommon to observe variations in quantity of water used for processing. Consequently load and concentration of pollutants in processing wastes may differ from unit to unit. It is therefore appropriate to review the traditional processes adopted by the industry in the wake of environmental criteria and adopt suitable measures. An integrated approach is essential to secure the leather industry from the anxiety of possible closures. The integrated approach to solve the environmental problem calls for a three tier strategy. This involves the use of

- Cleaner production methods
- Effective end of pipe treatment systems
- Secure management practices for disposal of treated wastes

Assessment of the present processing system

Based on the pre-operative study carried out by the survey team in the three selected tanneries, the following shortcomings are noticed in processing.

- Soaking in pits without prior removal of salt
- Lime-sulfide based hair-burning liming systems
- Inconsistent maintenance of process parameters in pre tanning & tanning operations.
- Less control over water usage in processing

such processing has lead to

- Presence of large quantities of chlorides in waste streams of liming and deliming
- High BOD & COD levels in liming sectional stream
- Presence of large amounts of chromium in spent tanning bath

- Relatively higher water discharges during processing
- Inconsistent quality of leather leading to higher percentage of inferior grades/rejections.

To obviate the above problems an action plan has been developed.

8.2 PLAN OF WORK

Based on the preliminary survey the following cleaner technologies have been chosen for implementation in the three identified tanneries at Sri Lanka.

- Mechanical Desalting & Efficient Soaking

The objective of this activity is to segregate chlorides even before soaking and ensure near complete removal of chlorides in soaking so that the spent liquors of liming and deliming operations would contain minimum of chlorides unlike the conventional processing systems.

- Enzyme assisted Low sulfide - hair saving liming system

The objective of this activity is to prevent / minimize dissolution of hair / keratinous wastes which leads to high BOD loads. The reduced sulfide levels have obvious advantages.

- Reuse of salt recovered in desalting in pickling

Nearly 80 kg of salt per tonne of hide is being used for pickling. The salt recovered from the wet salted hides during desalting can be effectively used for pickling with out adversely affecting the process or the substrate. Use of small quantities of preservative during such rense is, however, essential.

- Better chrome tanning practices

Enhancement of chromium uptake in tanning has both environmental & economical advantages. The system suggested in this programme is to modify the basification process from pulsed addition mode to continuous addition mode so as to enhance the chromium uptake without any additional sophisticated infrastructure.

- Water Management

The objective is to suggest methods for reduction in water consumption through process audit and rationalisation to overcome availability and treatment problems.

On implementation of these cleaner technologies the quality of the leathers and characteristics of effluent generated would be assessed.

8.3 Implementation of Cleaner Technology : Compendium

The Cleaner Technologies implementation has been carried out in the following tanneries at Rajagiriya, Sri Lanka.

1. M/s. Mubarak Leathers (P) Ltd.
2. M/s. NM Mohamed Mohideen Ltd.
3. M/s. MAM Abdul Cader & Company (P) Ltd.

On completion of the implementation work, a presentation describing salient features of the work was made at Sri Lankan Association of Tanners (SLAT) on 27.11.1997. Demonstration of cleaner technologies, for the benefit of other tanners was conducted on 29.11.1997 at M/s. Mubarak Leather Ltd, which was well attended. Recommendations for inplant pollution control and quality improvement has been provided to the above three tanners. Work instructions, for cleaner technologies (in English and Sinhala, copies enclosed) have been provided to the tanners through SLAT to facilitate implementation programme.

In order to assess the quality of the leathers and the characteristics of the effluent generated in the cleaner processing methods in a better way, simultaneous processing by both cleaner & conventional methods have been carried out. The quality of the tanned leathers have been assessed and the characteristics of the effluent generated in both the processes have been analysed and presented in this report.

8.3.1 Implementation of Cleaner Technologies at M/s. Mubarak Leathers (P) Ltd.,

The following technologies have been implemented

- Desalting before soaking (By manual beating and brushing off)
- Optimisation and counter current soaking (The third soak reused for first soak of next batch)
- Reduced Sulfide (50%) - enzyme assisted hair saving method in the place of hair burning method
- Reuse of salt recovered in desalting for pickling
- Controlled basification in chrome tanning.

The substrate used was wet salted cow hides. Batch sizes were 1500 & 2250 kgs. The conventional process and cleaner technology suggested is schematically shown in the Flow chart -1. The views of the tanner on assessment of the leathers is enclosed.

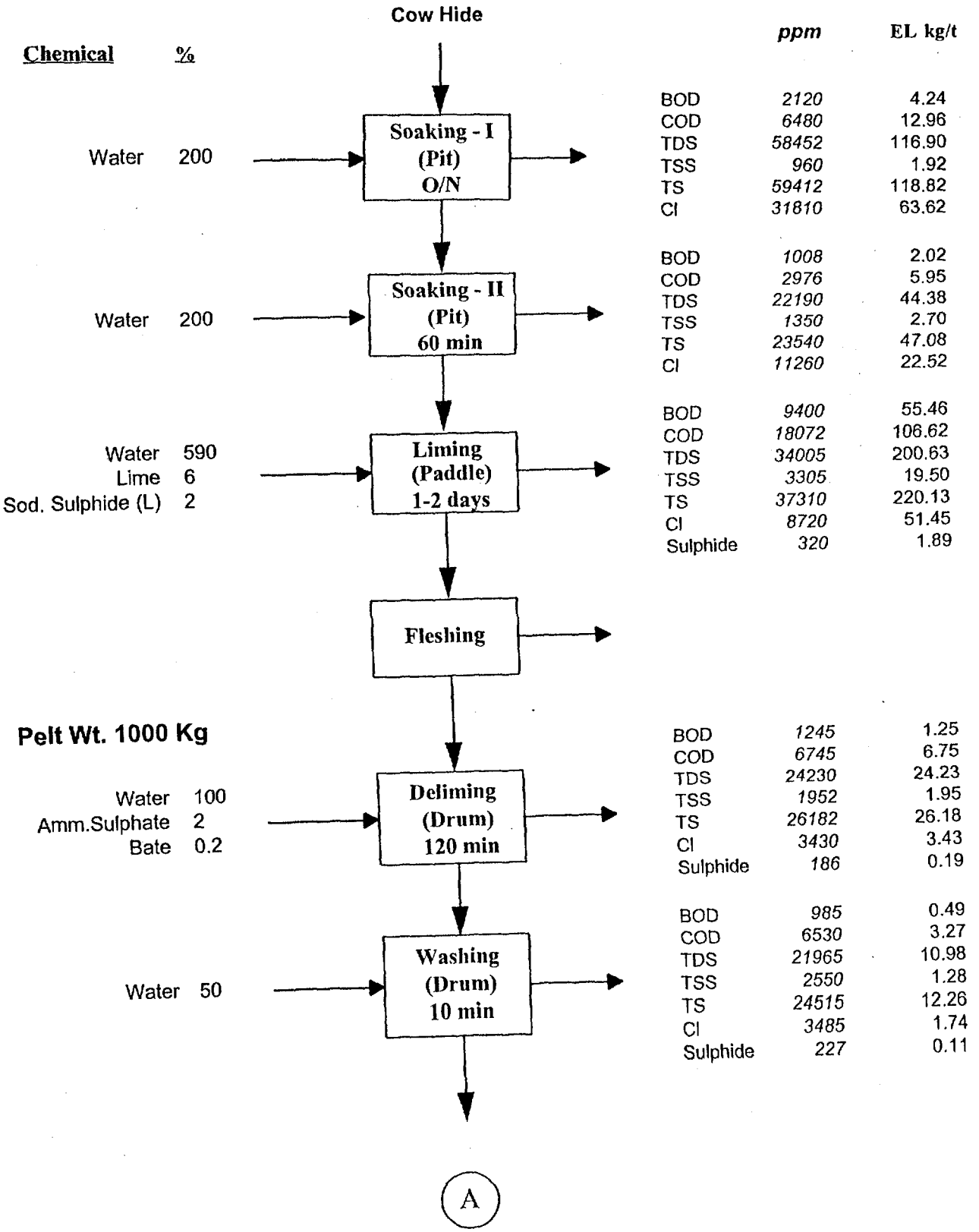
Significant results :-

- Nearly 5.5 - 7% of salt (on raw hide weight) is removed in desalting leading to salt pollution reduction at source to a level upto 70 kg / tonne of hide processed, as the recovered salt has been completely reused for pickling.
- Net water saving per kg of hides processed is 2.5 lts.
- Establishment of low sulfide hair saving methods, high exhaust chrome tanning methods leading to significant reduction in BOD, COD, TDS, Sulfides & Chromium in effluent.
- Uniform distribution of chromium leading to improved quality of wet blue and significant improvement in quality of finished leather with respect to feel and colour

MUB	CONVENTIONAL PROCESS AND EMISSION LOAD	3750 Kg/day

Process : Cow Hides Raw to Wet Blue

Batch :1000 Kg

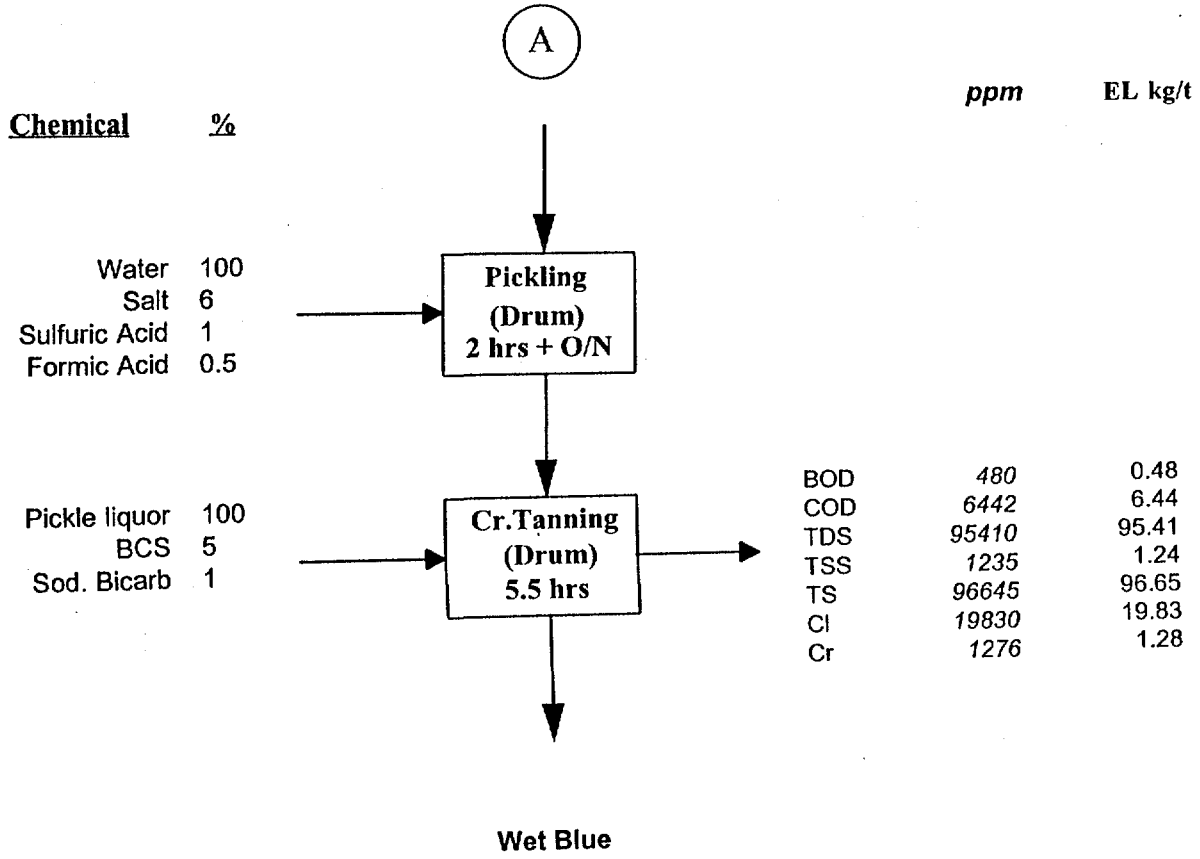


	ppm	EL kg/t
BOD	2120	4.24
COD	6480	12.96
TDS	58452	116.90
TSS	960	1.92
TS	59412	118.82
Cl	31810	63.62
BOD	1008	2.02
COD	2976	5.95
TDS	22190	44.38
TSS	1350	2.70
TS	23540	47.08
Cl	11260	22.52
BOD	9400	55.46
COD	18072	106.62
TDS	34005	200.63
TSS	3305	19.50
TS	37310	220.13
Cl	8720	51.45
Sulphide	320	1.89
BOD	1245	1.25
COD	6745	6.75
TDS	24230	24.23
TSS	1952	1.95
TS	26182	26.18
Cl	3430	3.43
Sulphide	186	0.19
BOD	985	0.49
COD	6530	3.27
TDS	21965	10.98
TSS	2550	1.28
TS	24515	12.26
Cl	3485	1.74
Sulphide	227	0.11

MUB	CONVENTIONAL PROCESS AND EMISSION LOAD	3750 Kg/day

Process : Cow Hides Raw to Wet Blue

Batch : 1000 Kg



COMPOSITE

BOD	*5824*	83.87
COD	*11348*	163.41
TDS	*33840*	487.30
TSS	*2045*	29.45
TS	*39664*	571.17
Cl	*10990*	158.26
Sulphide	*96*	1.38
Cr	*123*	1.77

Spillages & Other Washings : 470%

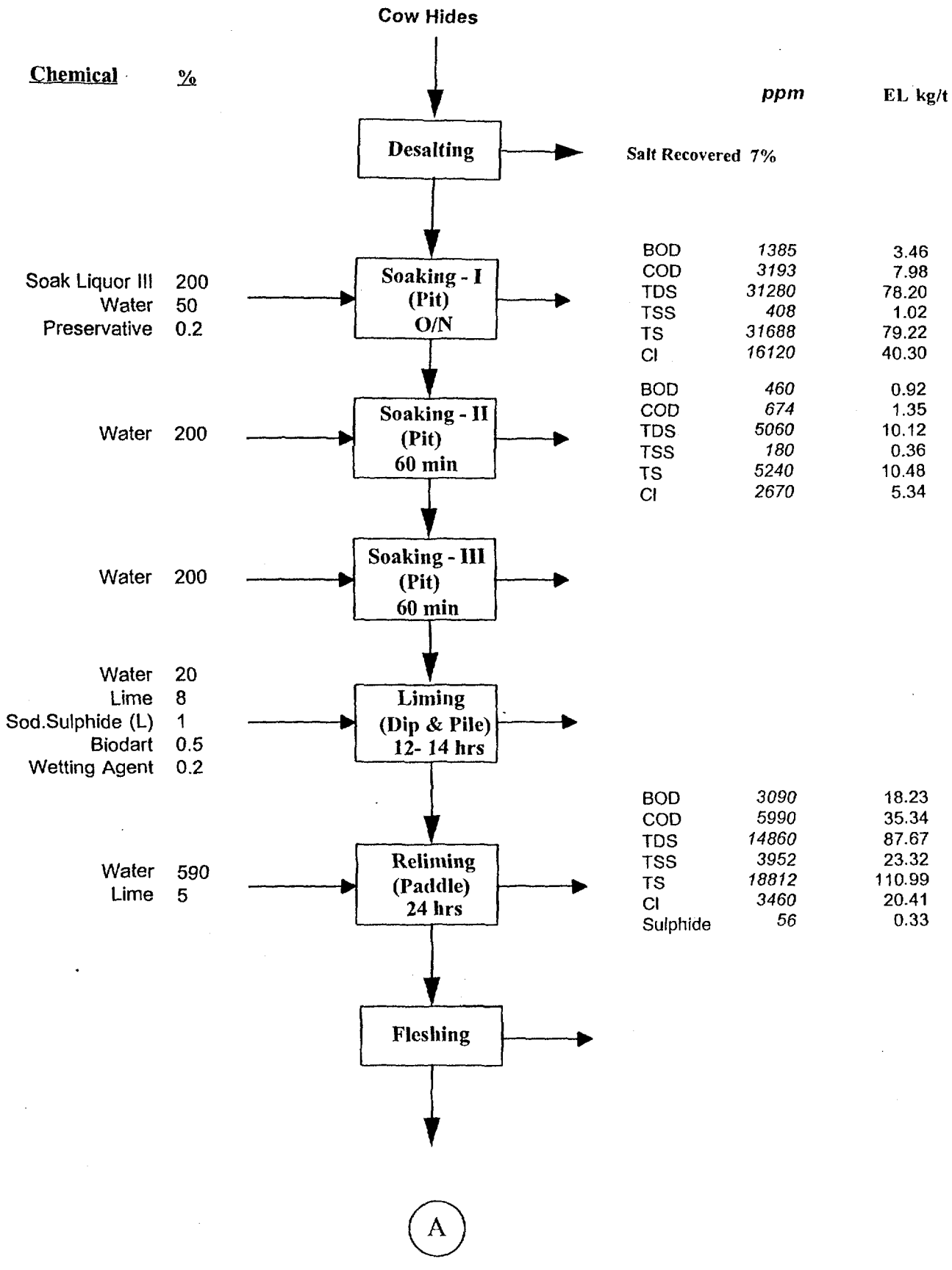
MUB

MODIFIED PROCESS AND EMISSION LOAD

3750Kg/day

Process : Cow Hides Raw to Wet Blue

Batch : 1000Kg

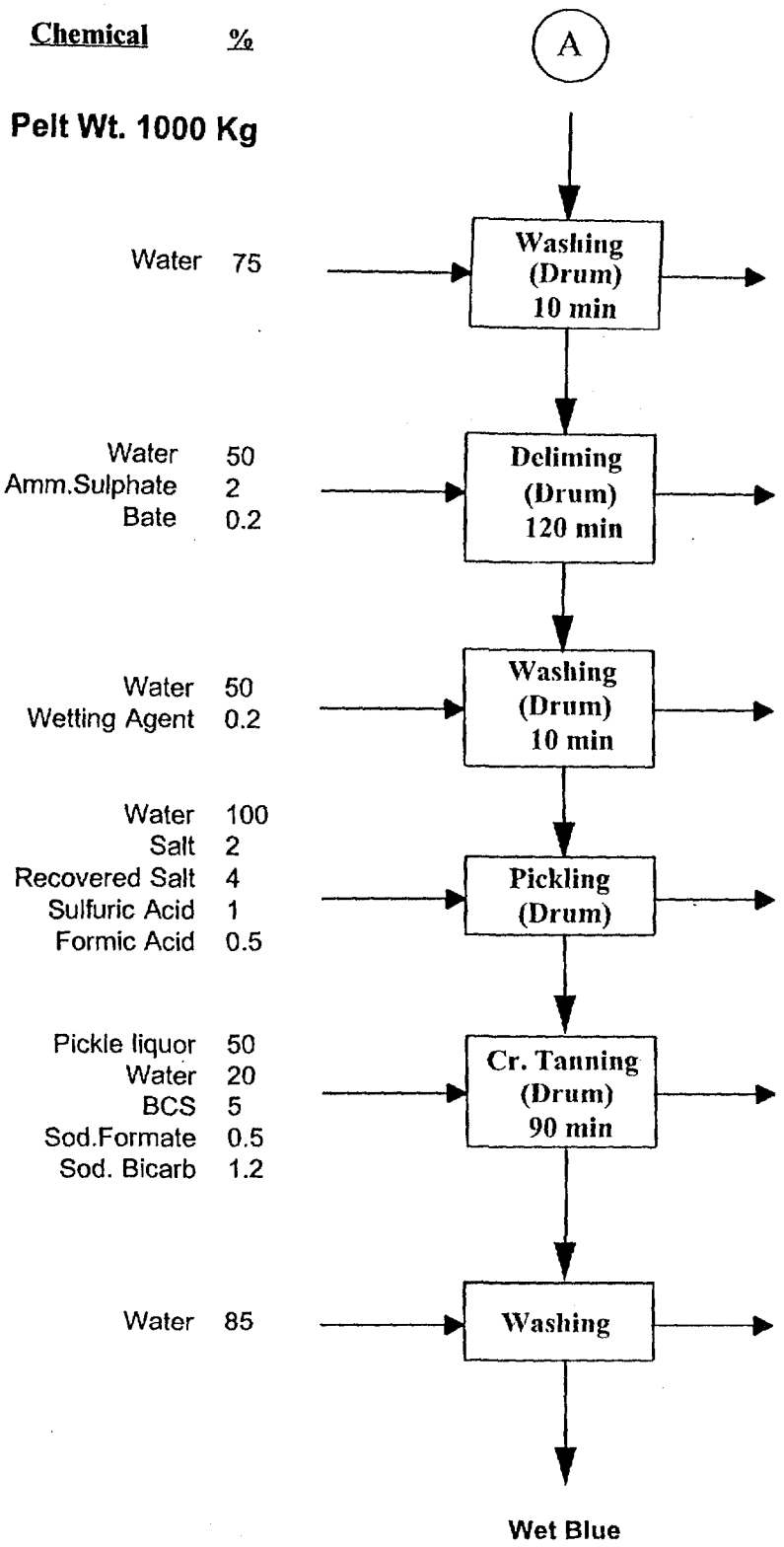


MUBWB.ppt

MUB | **MODIFIED PROCESS AND EMISSION LOAD** | **3750 Kg/day**

Process : Cow Hides Raw to Wet Blue

Batch : 1000 Kg



	ppm	EL kg/t
BOD	1055	0.79
COD	4075	3.06
TDS	6890	5.17
TSS	1105	0.83
TS	7995	6.00
Cl	1415	1.06
Sulphide	23	0.02
BOD	960	0.48
COD	5040	2.52
TDS	18405	9.20
TSS	2985	1.49
TS	21390	10.70
Cl	1280	0.64
Sulphide	50	0.03
BOD	540	0.27
COD	1395	0.70
TDS	5580	2.79
TSS	2065	1.03
TS	7645	3.82
Cl	865	0.43
Sulphide	12	0.01
BOD	315	0.38
COD	3720	4.46
TDS	55315	66.38
TSS	210	0.25
TS	55525	66.63
Cl	13225	15.87
Cr	564	0.68

COMPOSITE

BOD	1020	14.69
COD	3684	53.05
TDS	13750	198.00
TSS	3673	52.89
TS	17423	250.89
Cl	5360	77.18
Sulphide	64	0.92
Cr	34	0.49

Spillages & Other Washings : 100%

MUBWB.ppt

MUBARAK LEATHER (PVT) LTD.

ALL TYPES OF LEATHER PRODUCERS, TANNERS, IMPORTERS & EXPORTERS

10 November. 1997
THE DIRECTOR.
C.L.R.I.

SIR.

1.DESALTING :

THE SYSTEM SUGGESTED IS EASY TO ADOPT HELPS IN REDUCING POLLUTION. NEARLY 150 KG OF SALT COULD BE RECOVERED FROM 2250 KG OF SALTED HIDES. CONSEQUENTLY SOAK LIQUOR IS CLEAR THE AMOUNT OF SALT RECOVERED IN DE SALTING HAS BEEN RE USED FOR PICKLING. TANNING IS SATISFACTORY.

2. SOAKING :

PROPER HIDE TO WATER RATIO HAS BEEN SUGGESTED. THIRD SOAK IS BEING USED FOR 1st SOAK OF NEXT LOT. COMPARED TO NORMAL PROCESS THE HIDES ARE CLEANER AFTER SOAKING.

3. UNHAIRING :

ENZYME ASSISTED & REDUCED SULFIDE UNHAIRING BY DIP AND PILE METHOD HAS BEEN CARRIED OUT, ON TWO BATCHES OF 1500 KGS AND 2250 KGS. UNHAIRING IS SATISFACTORY AND THE PELTS ARE CLEANER.

4. DRUM OPERATION :

SUGGESTIONS FOR QUALITY IMPROVEMENT IN DELIMITING AND PICKLING ARE USEFUL , CONTROLLED BASIFICATION HELPS IN INCREASING THE EXHAUSTION. ~~EXACTION~~. WET BLUE LEATHERS ARE FULLER. SUGGESTIONS FOR POST TANNING IMPROVED THE QUALITY.

WE ARE THANKFUL TO C.L.R.I. AND UNIDO FOR HELPING US TO PRODUCE LEATHER IN CLEANER WAY WITH IMPROVED QUALITY. WE ASSURE WE WILL BE ADOPTING ALL THESE CLEANER METHODS REGULARLY.

FOR.
MUBARAK LEATHER (PVT) LTD

CC.: UNIDO OFFICE, CHENNAI.

Office : No. 119 2/11, PRINCE STREET, COLOMBO-11.
Tel : 328281 - 431870 Telex : 21974 MONTIEN CE M. T. Fax : 94-1-445559 & 328281
Factory : KOTUWAGODA, RAJAGIRIYA.

8.3.2 Implementation of Cleaner Technologies at M/s. NM Mohamed Mohideen Ltd.,

The following technologies were implemented at the above tannery

- Desalting before soaking by manual beating and brushing off
- Optimisation and counter current soaking (The third soak reused for first soak of next batch)
- Enzyme assisted one day hair saving unhairing in the place of 6 day hair burning pit method
- Optimisation of float and reuse of salt recovered from desalting in pickling

The substrates were cow (250 and 1500 kg batches); buffalo (1200 kg batch); goat (400 kg batch).

The conventional process and the cleaner technology implemented is given in Flow chart - 2. The views of the tanner is enclosed.

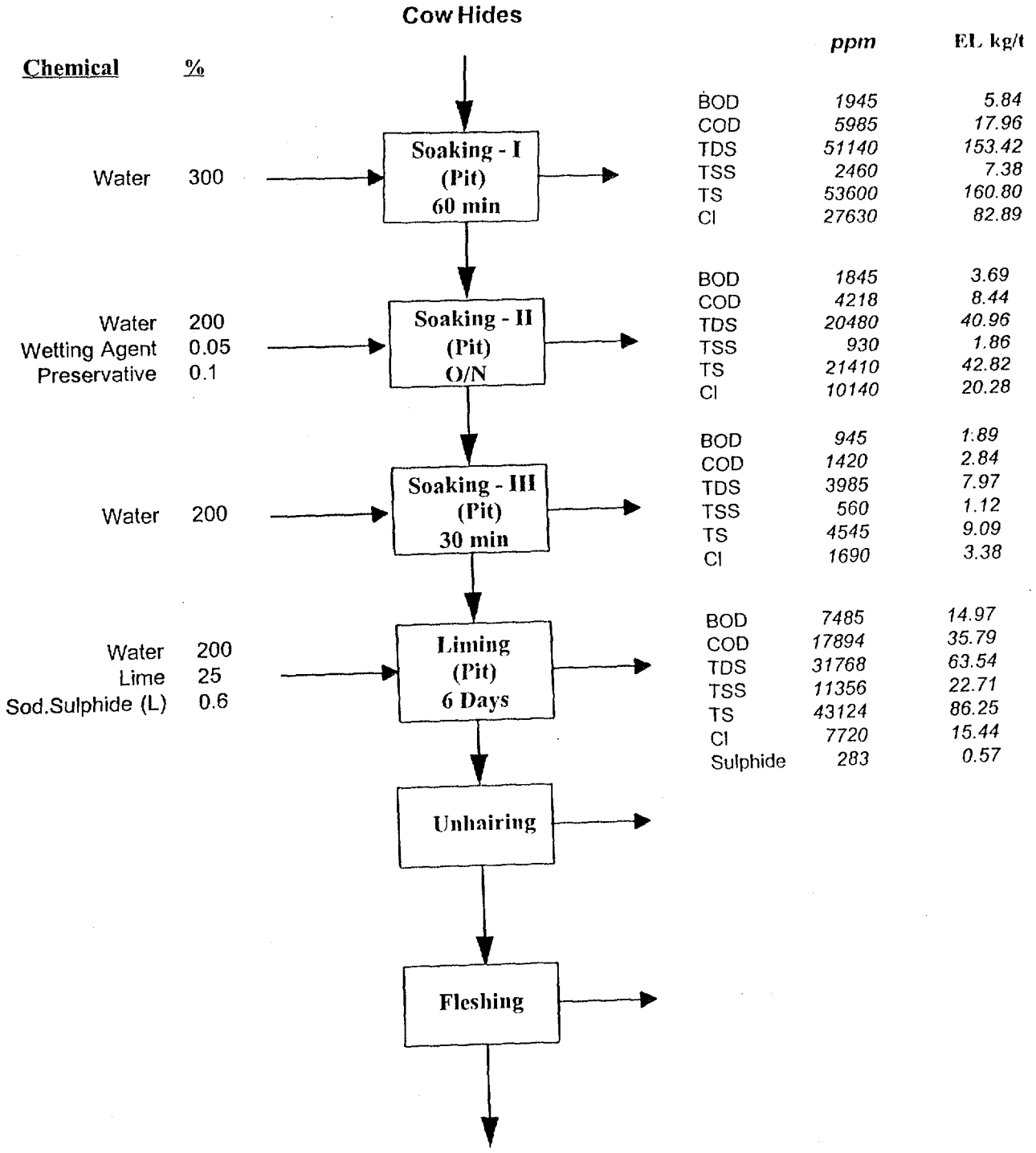
Significant Result:-

- Nearly 4 - 9% of salt (on raw hide weight) is removed in desalting leading to salt pollution reduction at source to a level of 60 kg / tonne (average) of hide processed, as the recovered salt has been completely reused for pickling.
- Net water saving per kg of hides processed is 5.5 lts.
- Establishment of low sulfide hair saving method and optimisation of unit operation has lead to significant reduction in BOD, COD & Sulfides level in effluent.

NMM	CONVENTIONAL PROCESS AND EMISSION LOAD	1500 Kg/day

Process : Cow Hides Raw to El

Batch :1000 Kg



	ppm	EL kg/t
BOD	1945	5.84
COD	5985	17.96
TDS	51140	153.42
TSS	2460	7.38
TS	53600	160.80
Cl	27630	82.89
BOD	1845	3.69
COD	4218	8.44
TDS	20480	40.96
TSS	930	1.86
TS	21410	42.82
Cl	10140	20.28
BOD	945	1.89
COD	1420	2.84
TDS	3985	7.97
TSS	560	1.12
TS	4545	9.09
Cl	1690	3.38
BOD	7485	14.97
COD	17894	35.79
TDS	31768	63.54
TSS	11356	22.71
TS	43124	86.25
Cl	7720	15.44
Sulphide	283	0.57

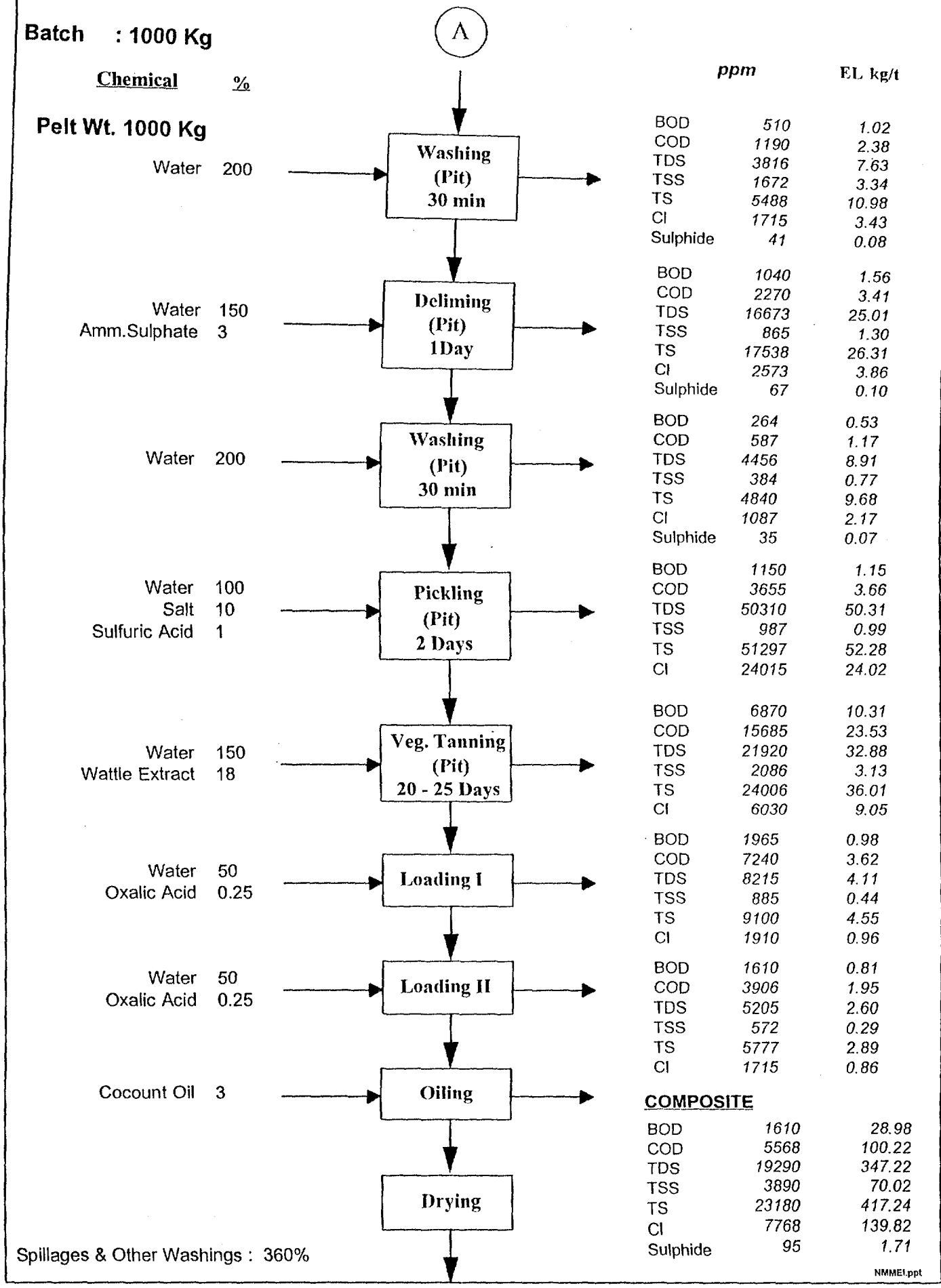
NMM

CONVENTIONAL PROCESS AND EMISSION LOAD

1500 Kg/day

Process : Cow Hides Raw to El

Batch : 1000 Kg



Spillages & Other Washings : 360%

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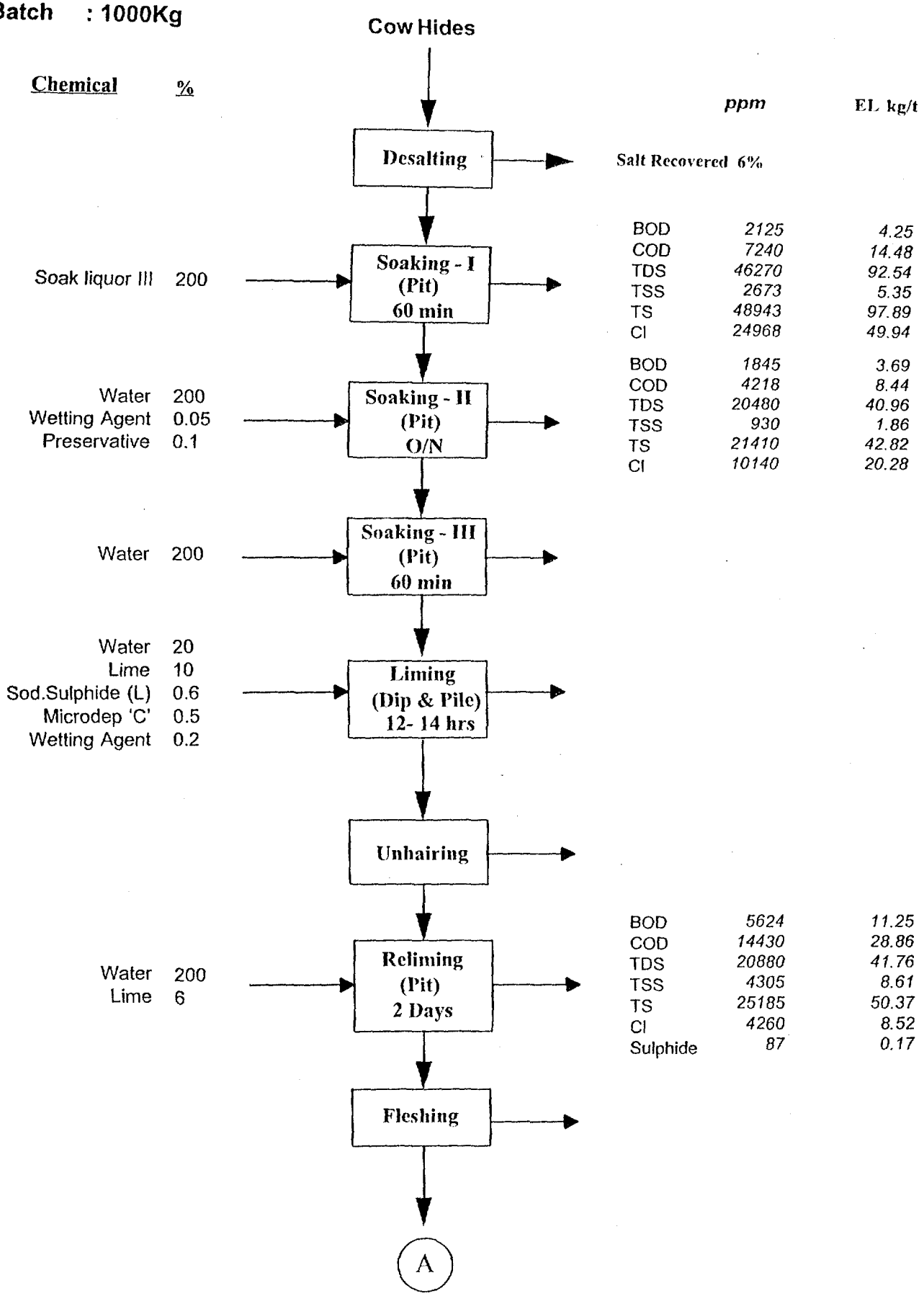
NMM

MODIFIED PROCESS AND EMISSION LOAD

1500Kg/day

Process : Cow Hides Raw to El

Batch : 1000Kg



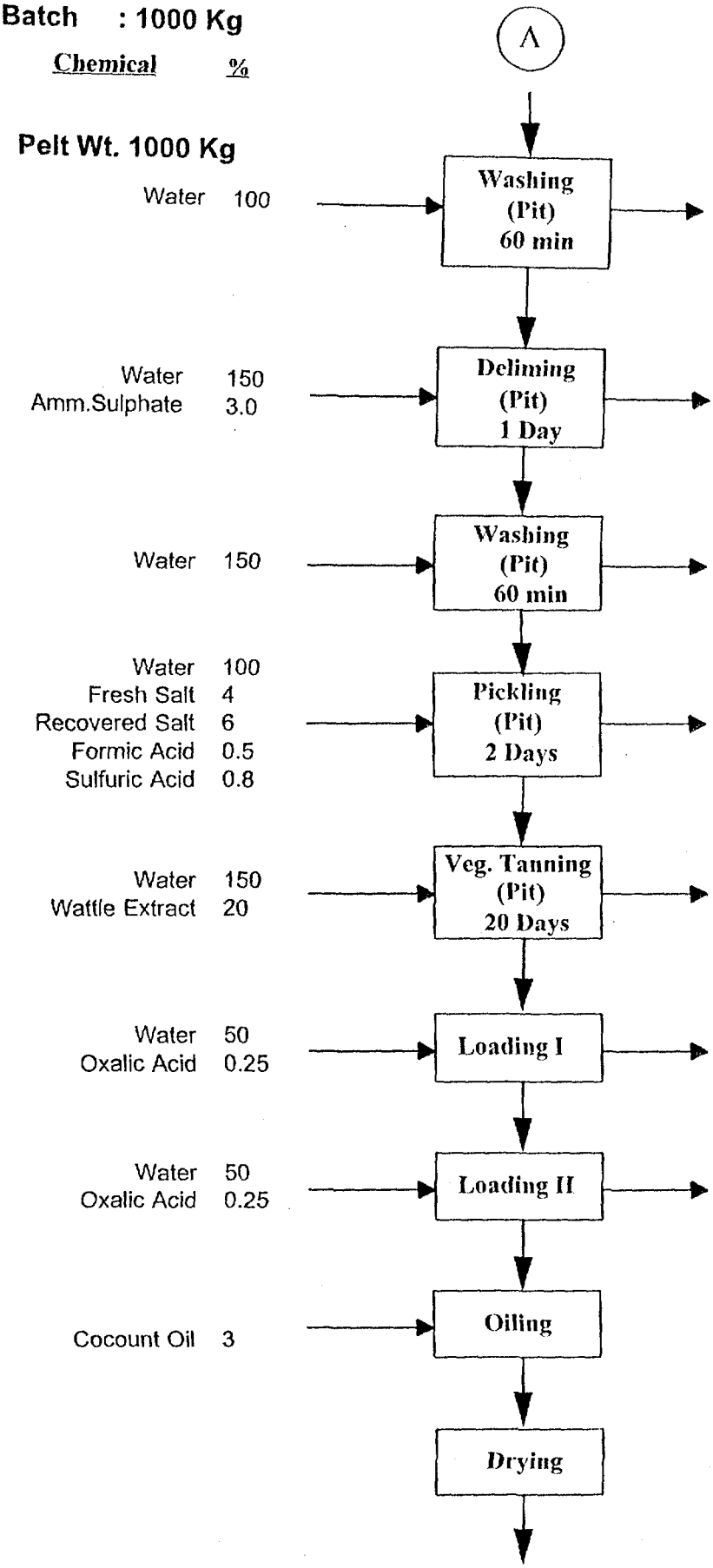
NMM

MODIFIED PROCESS AND EMISSION LOAD

1500 Kg/day

Process : Cow Hides Raw to El

Batch : 1000 Kg



	ppm	El, kg/t
BOD	280	0.28
COD	705	0.71
TDS	1985	1.99
TSS	630	0.63
TS	2615	2.62
Cl	860	0.86
Sulphide	8	0.01
BOD	640	0.96
COD	1565	2.35
TDS	11650	17.48
TSS	600	0.90
TS	12250	18.38
Cl	1287	1.93
Sulphide	21	0.03
BOD	185	0.28
COD	476	0.71
TDS	3480	5.22
TSS	78	0.12
TS	3558	5.34
Cl	437	0.66
Sulphide	14	0.02
BOD	580	0.58
COD	2316	2.32
TDS	37752	37.75
TSS	693	0.69
TS	38445	38.45
Cl	17580	17.58

COMPOSITE

BOD	1140	15.39
COD	3764	50.81
TDS	19360	261.36
TSS	4218	56.94
TS	23578	318.30
Cl	8040	108.54
Sulphide	80	1.08

Spillages & Other Washings : 150%

N. M. Mohamed Mohideen Ltd.
LEADING EXPORTERS, IMPORTERS, TANNERS
AND GENERAL MERCHANTS

Bankers: STANDARD CHARTERED BANK
Tannery: KOTUWEGODA, RAJAGIRIYA Phone: 8
Cable : "SHEEPSKIN" COLOMBO
TP'hone: 325794 & 329578

17, SECOND CROSS STREET
COLOMBO-11 SRI LANKA (Ceylon)

24th November, 1997

The Director,
Central Leather Research Institute,
Chennai,
India.

Dear Sir,

PROGRAMME ON CLEANER TECHNOLOGY

We take pleasure in hereby submitting our report on the above programme, implementation of which commenced at our tannery recently.

The following have been introduced to and are being implemented at our tannery in this respect.

1. **DESALTING BEFORE SOAKING.**
2. **OPTIMISATION AND COUNTERCURRENT SOAKING.**
3. **ENZYME ASSISTED HAIR SAVING LIMING METHOD.**
4. **FLOAT OPTIMISATION IN DELIMING AND PICKLING AND THE CONTROL OF PROCESS PARAMETERS.**
5. **REUSE OF SALT RECOVERED DURING DESALTING FOR PICKLING.**

We find the above technologies simple, practical, effective and most of all timely. We value their introduction to our tannery particularly because we have been consciously and voluntarily searching for such cleaner, eco - friendly and cost effective technologies. We would therefore be implementing the above on a continuous and regular basis with further improvements wherever possible.

In addition to above, trials are being made to rationalise the pit tanning method for quality enhancement and commercial benefit. The results however are yet to be achieved and evaluated. Further, trials of vegetable tannage in sample drums too were undertaken to demonstrate their benefits.

We are impressed by the competence and the approach taken by the team which is implementing this programme. Their commitment, flexibility and willingness to share knowledge and experience are commendable.

Thanking you,

Yours faithfully
N M Mohamed Mohideen Ltd.

Director

C. C. Mr C Batuwangala, Chairman, S L A T (Pvt.)

8.3.3 Implementation of Cleaner Technologies at M/s. MAM Abdul Cader & Company Pvt. Ltd.

Since the tannery is processing mostly green hides, only small scale demonstration, of desalting and reuse of recovered slat in pickling could be carried out. The other technologies implemented are ;

- Reuse of soak liquor for water conservation
- Enzyme assisted - reduced sulfide (50%) - hair saving unhairing in the place of hair burning method
- Optimisation of float in deliming and pickling
- Controlled basification in chrome tanning

Substrates were Cow (1400 Kg batch) - Buffalo (1300 & 1050 kg). The schematic representation of both conventional processing of cleaner processing is given in Flow chart 3. The views of the tanner is enclosed.

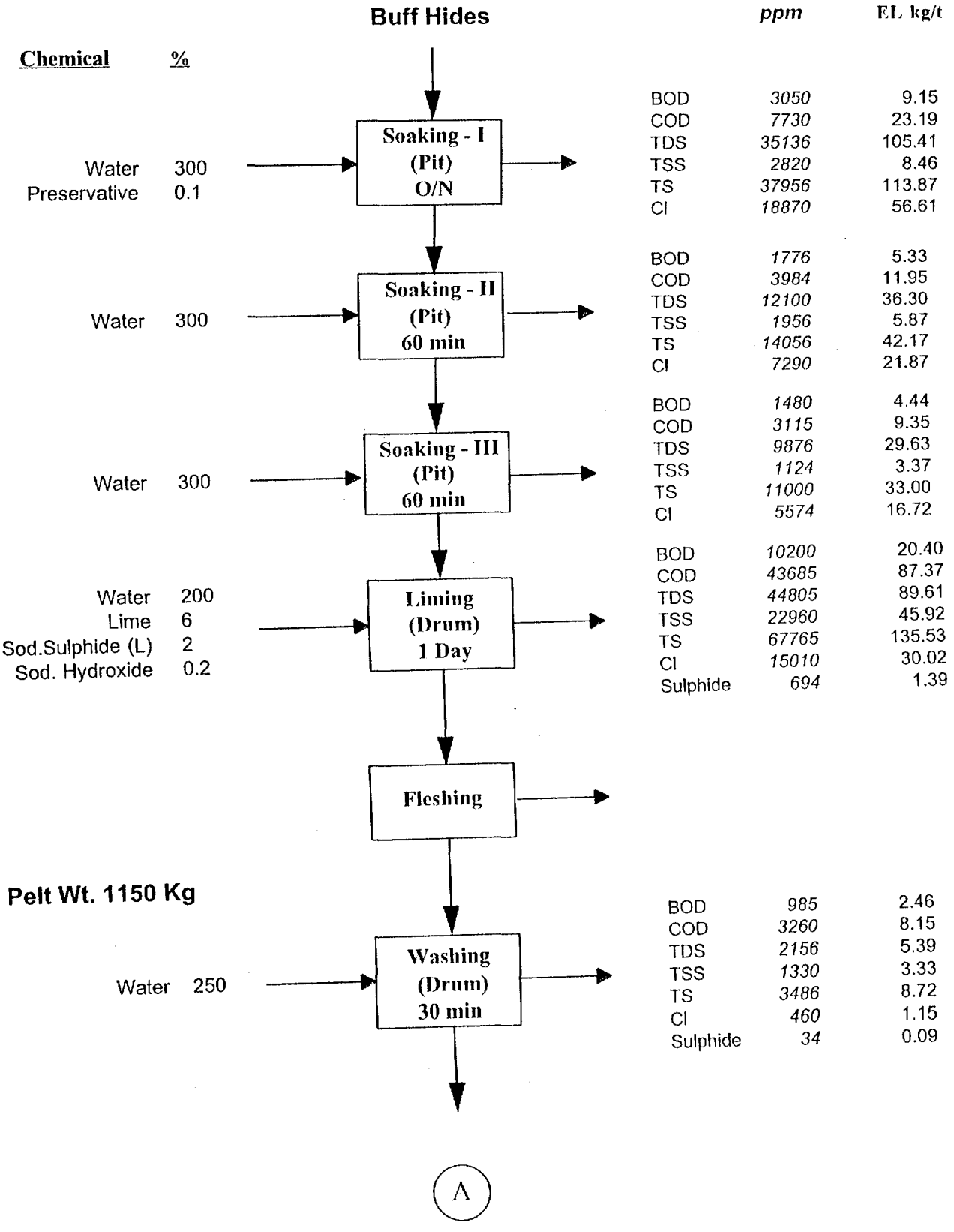
Significant results :-

- Net water saving per kg of hides processed is 10.2 lts.
- Establishment of low sulfide hair saving methods, high exhaust chrome tanning methods leading to significant reduction in BOD, COD, TDS, Sulfides & Chromium in effluent.
- Uniform distribution of chromium leading to improved quality of wet blue and significant improvement in quality of finished leather.

MAM	CONVENTIONAL PROCESS AND EMISSION LOAD	1500 Kg/day

Process : Buff Hides Raw to Wet Blue

Batch :1000 Kg

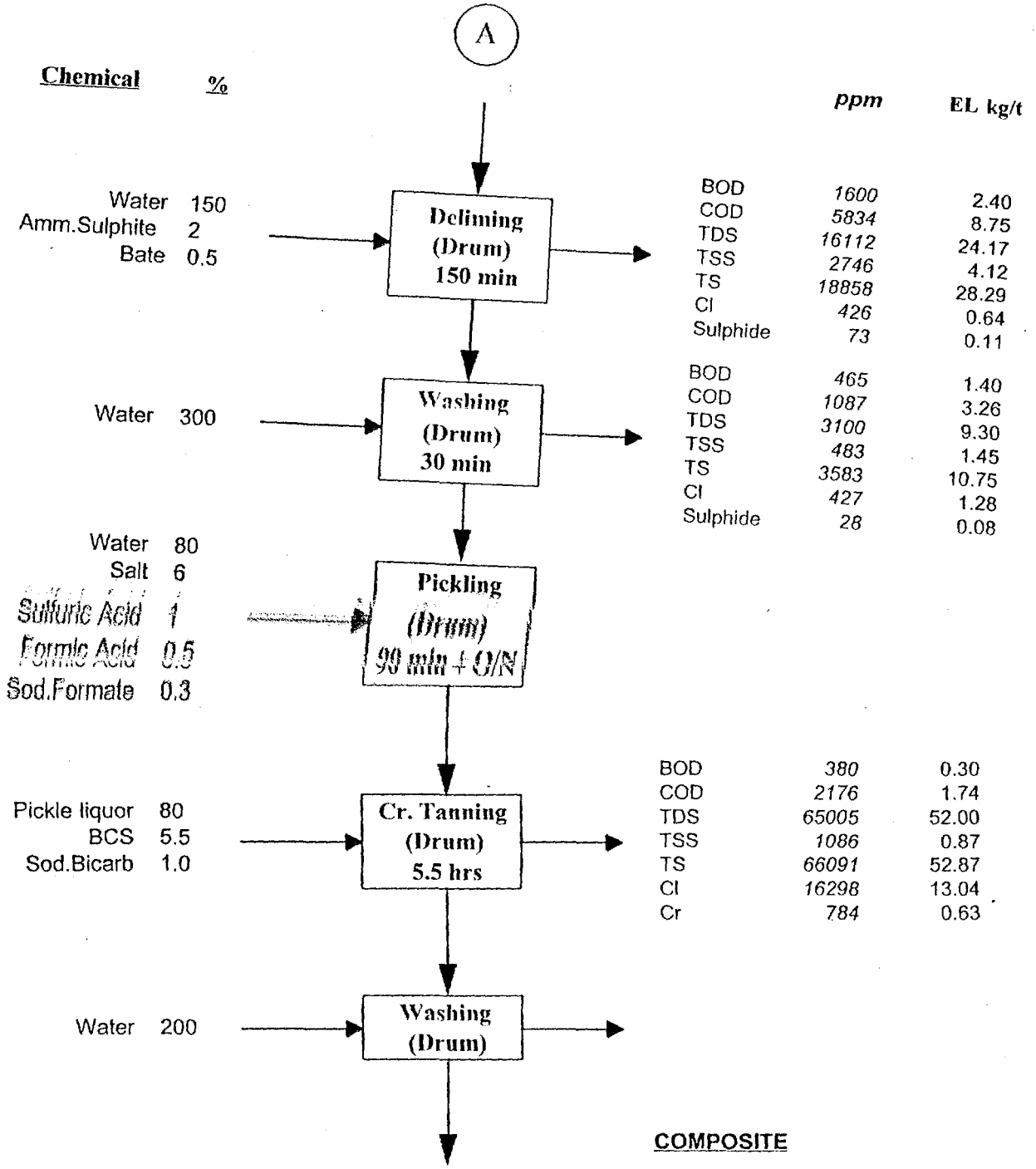


	ppm	EL kg/t
BOD	3050	9.15
COD	7730	23.19
TDS	35136	105.41
TSS	2820	8.46
TS	37956	113.87
Cl	18870	56.61
BOD	1776	5.33
COD	3984	11.95
TDS	12100	36.30
TSS	1956	5.87
TS	14056	42.17
Cl	7290	21.87
BOD	1480	4.44
COD	3115	9.35
TDS	9876	29.63
TSS	1124	3.37
TS	11000	33.00
Cl	5574	16.72
BOD	10200	20.40
COD	43685	87.37
TDS	44805	89.61
TSS	22960	45.92
TS	67765	135.53
Cl	15010	30.02
Sulphide	694	1.39
BOD	985	2.46
COD	3260	8.15
TDS	2156	5.39
TSS	1330	3.33
TS	3486	8.72
Cl	460	1.15
Sulphide	34	0.09

MAM | **CONVENTIONAL PROCESS AND EMISSION LOAD** | **1500 Kg/da**

Process : Buff Hides Raw to Wet Blue

Batch : 1000 Kg

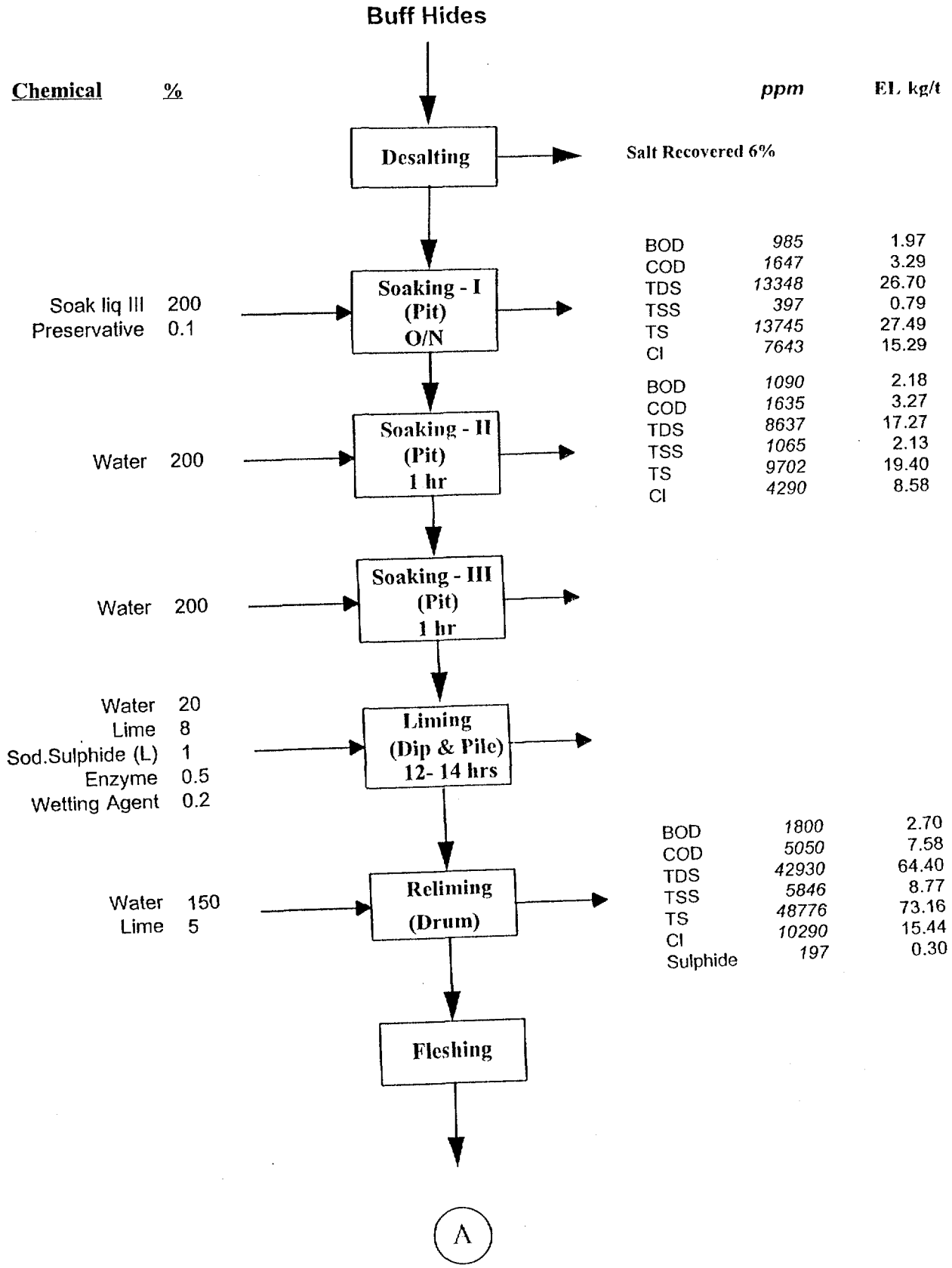


Spillages & Other Washings : 620 %

MAM	MODIFIED PROCESS AND EMISSION LOAD	1500Kg/day

Process : Buff Hides Raw to Wet Blue

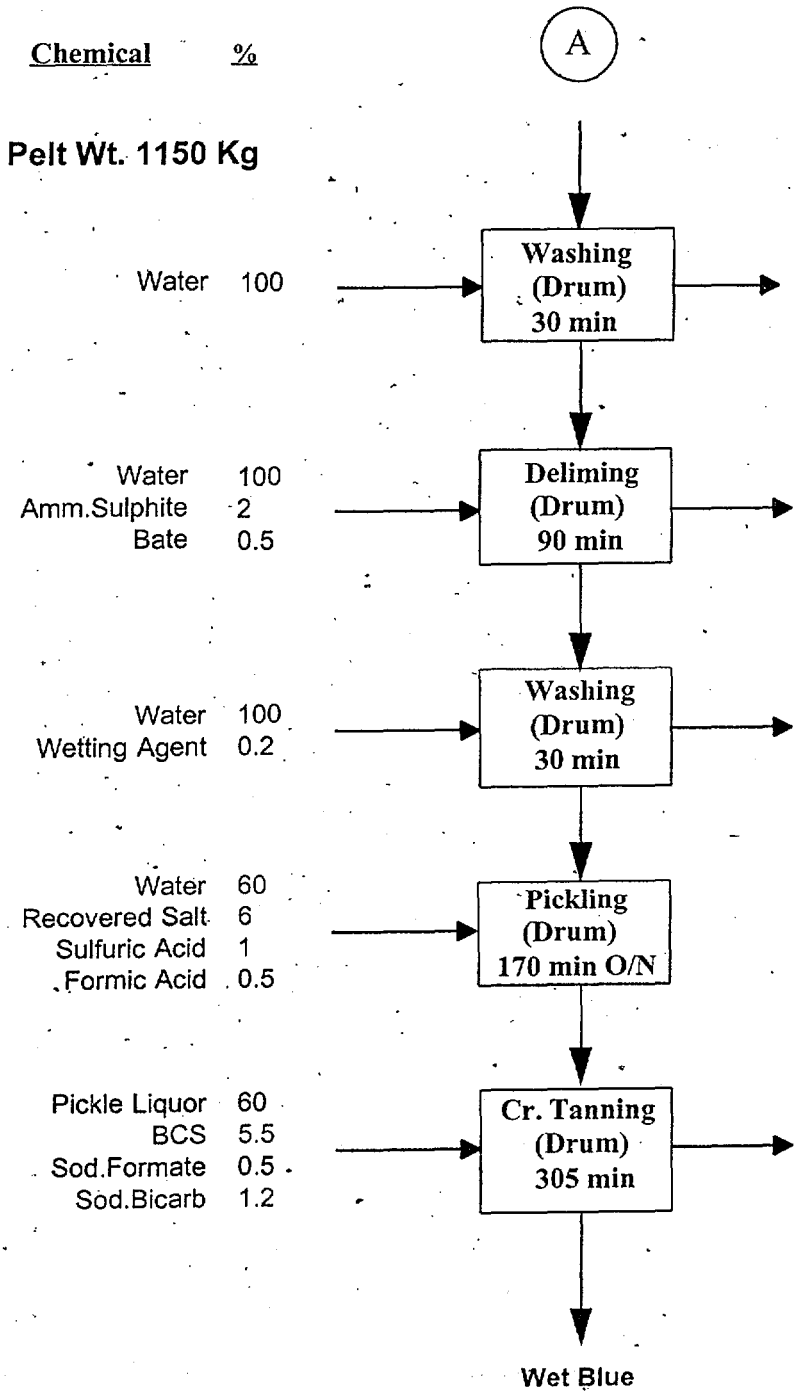
Batch : 1000Kg



MAM	MODIFIED PROCESS AND EMISSION LOAD	1500 Kg/day

Process : Buff Hides Raw to Wet Blue

Batch : 1000 Kg



	ppm	EL kg/t
BOD	620	0.62
COD	1587	1.59
TDS	2678	2.68
TSS	760	0.76
TS	3438	3.44
Cl	437	0.44
Sulphide	52	0.05
BOD	1720	1.72
COD	6780	6.78
TDS	19716	19.72
TSS	4314	4.31
TS	24030	24.03
Cl	1715	1.72
Sulphide	70	0.07
BOD	840	0.84
COD	2740	2.74
TDS	3426	3.43
TSS	670	0.67
TS	4096	4.10
Cl	857	0.86
Sulphide	40	0.04
BOD	785	0.47
COD	3840	2.30
TDS	78168	46.90
TSS	1020	0.61
TS	79188	47.51
Cl	21876	13.13
Cr	820	0.49

COMPOSITE

BOD	820	7.46
COD	2674	24.33
TDS	12910	117.48
TSS	1810	16.47
TS	14720	133.95
Cl	4290	39.04
Sulphide	102	0.93
Cr	74	0.67

Spillages & Other Washings : 290%

MAMWB.ppt

MAM
ESTABLISHED 1913
SUCCESSORS TO M.A.M. ABDUL CADER & CO.,
TANNERS, LEATHER MANUFACTURERS,
IMPORTERS & EXPORTERS

M. A. M. Abdul Cade
AND COMPANY (PTE) LTD

Tel: 94 1 866419/863158/874857-8 Fax: 94 1 825030

No. 54, Buthgamuwa Road,
Wellkada, Rajagiriya,
Sri Lanka

[redacted]
Telex 21974 Mantien CE MAM

28th November 1997

Dr.Ramasami,
Director - CLRI,
Adayar - Chennai.

Dear Sir,

IMPLEMENTATION OF CLEANER TECHNOLOGY PROGRAMME.

The following cleaner Technologies have been implemented at our tannery.

1. Desalting before Soaking - Observation & Comments

   This method has been now strictly enforced and we are satisfied with the salt saving method and also salt solution can be re-used for pickling thus saving very much on the salt pollution and subsequently treatment cost for future implementation for the CETP.

2. Re-use of 3rd Soak for First Soak of next Batch

   This method conserves and saves water which is an asset. Since the waste of water approximately 300% is saved which will bring down the cost of Treating Effluent.

3. Enzyme Assisted - Reduced Sulphide Hair Saving Process

   This process has reduced the odour to a very large extent and the hair saved after scudding is collected and dried and this waste has been reduced after drying to almost 20% which can be disposed off easily.

4. Improved Deliming, Pickling and Chrome Tanning Operations

   The processing adopted for above has shown a remarkable improvement in the quality of the Wet Blue and mostly the exhaustion of the Chrome too has improved considerably.

   The fleshing waste was almost free of sulphides comparision to what we were doing.

   The odour of the fleshing was significantly minimised and the waste liquor of this process was similar to lime solution in comparision to our method where the solution was blueish in colour.

Closing Remarks

We are thankful to UNIDO & CLRI for giving us the expertise to implement the cleaner Technology Programme. Which we consider an asset to our organisation and keeping in mind the current Environment Pollution. We have been taught the basic implementation of cleaner Technology which we value greatly.

We thank all those responsible for imparting their knowledge which we value with great respect.

All personnels from UNIDO & CLRI have been very courteous and very cooperative with our staffs and it had been a pleasant task to work with them.

On behalf of our organisation, I convey my sincere thanks to all those responsible.

Thanking you,
Yours faithfully,

M.ASHROFF RAZACK
CHAIRMAN/MANAGING DIRECTOR.

8.3.4 WORK INSTRUCTIONS (Provided to the tanners)

8.3.4.1 DESALTING

OBJECTIVE : To minimise salt content in the effluent streams

HIDES

1. Trim the hides
2. Hold the hide flat. One person to hold the front legs, the other to hold the hind legs of the hide
3. Beat the hide on a peg (wood/concrete) twice with grain side up (peg should not have sharp edges)
4. Cut the hide in to sides
5. Spread the side on floor (Preferably on a raised platform)
6. Brush off the salt on grain and flesh side with a brush having soft bristles, preferably made of coconut fibres.

SKINS

1. Rib open the skins

Do operations 2, 3, 5 and 6 as above.

8.3.4.2 REUSE OF SOAK LIQUOR

OBJECTIVE : To conserve water

Since desalting is done, most of the chlorides and other impurities are removed prior to soaking itself. Hence third soak would be relatively cleaner and can be reused for 1 soak of next batch.

INSTRUCTIONS

1. After third soak, remove only the hides/skins after piling on the walls of the pit, to drain
2. Determine the quantity of water remaining

3. Replenish with fresh water, to make it 200%, if required
4. Use this liquor as water for first soak of next batch

8.3.4.3 ENZYME ASSISTED HAIR SAVING UNHAIRING METHOD

OBJECTIVE :To reduce BOD, COD and Sulfide load in effluent

INSTRUCTIONS

1. Dip the soaked hides in the paste prepared by using

Water	15-20%
Sodium Sulphide	0.6-1.0%
Enzyme	1.0%
Wetting Agent	0.2%

2. Ensure complete penetration by leaving the hides for 30 - 60 seconds in paste
3. Pile the hides on floor (Max. 50 -60 hides/pile)
4. Cover with wet gunny bag
5. After 12-16 hours, unhair using blunt knife on beam and then take for reliming.

8.3.4.4 REUSE OF SALT OBTAINED FROM DESALTING FOR PICKLING

1. Dissolve the required quantity of salt in water (three times of water on the weight of salt)
2. Filter the salt solution
3. Weigh the insolubles / sediment
4. Add fresh salt equal to the weight of insolubles
5. It is preferable to use 0.1-2.0 % preservative along with such reused salt

8.3.4.5 GENERAL RECOMMENDATIONS

DELIMING

1. Washing before deliming helps in improving efficiency of deliming

   Water quantity can be 75-100% in Drum
   100-200% in Pit

This water can be reused for reliming if storing facilities are available.

2. For better chrome tanning complete deliming is necessary. For vegetable tanning, sometimes, partial deliming is preferred.

   Water quantity can be 50-75% in Drum
   100-150% in Pit

   Deliming Agent 1-1.5% for skins & medium hides (in drum)

   (Ammonium Sulphate / Chloride) 1.5-2.0% for thick hides (in drum)

   2.0-3.0% in Pit

   (Completion of deliming, checked with phenolphthalein at the cross section of hide. If lime is present, pink colour would be seen).

3. Washing (100% water in drum, 200% water in pit) after deliming, drumming preferably for 20 minutes with 0.2% wetting agent, helps in improving the quality of the leathers.

4. Use of bate (0.2-0.5%) helps in improving the grain characteristics of the leathers.

PICKLING

1. Recommended water : salt ratio
   10:1

2. Water quantity suggested : 60% for Drum
   100% for Pit

3. It is necessary to ensure salt penetration before addition of acid. This is done by drumming for 20 minutes with salt solution or trampling in pit for 30-45 minutes.

4. It is preferable to use formic acid (upto 0.5% dissolved in 5% water) before addition of sulfuric acid in order to have better quality leathers,

5. Sulfuric acid should be dissolved in water (Acid : water - 1 : 10), cooled and added in feeds (3 feeds of 1 hour intervals in pit, 8-10 feeds of 10 minutes interval in drum, pH should be uniform throughout the cross section of hide, at the end of pickling. Pickling pH for chrome tanning - 2.8-3.0. (sulphuric acid quantity 1-1.5%)

Pickling pH for vegetable tanning - around 4.5
(Sulfuric acid quantity 0.5 - 1.0%)

CHROME TANNING

1. Basic chromium sulfate (BCS, Chrome extract) should be preferably having 25 ± 2% chrome oxide.

2. Quantity required for tanning 6-8% (on pelt weight)

3. Quantity of water used for tanning

Initially	about 50%
Finally, at the end of tanning	about 100%

4. Before starting basification check, whether chromium has completely penetrated, by examining the cross section.

5. It is preferable to use 0.5-1.0% sodium formate (dissolved in about 10% water) initially, before adding sodium bicarbonate. Formate could be added in three feeds of 10 minutes intervals.

6. Quantity of sodium bicarbonate required varies from 0.8-1.4%, to attain a pH of 3.8-4.0 through out the cross section. This is essential for producing quality wet blue with good fixation of chromium.

7. It is preferable to add sodium bicarbonate (100% solution) in 8 to 10 feeds of 10 minutes intervals to improve fixation of chromium and obtain quality wet blue.

8.3.4.6 WORK INSTRUCTIONS (in Sinhalese)

හදුන්වා දීම.

ලුණු ඉවත්කිරීම

අරමුණ : පිටතට ගලා යන ලුණු ප්‍රමාණය අඩුකිරීම.

හේතු

1, හම් තපා සකස්කර ගන්න,

2. හම පැතලිව අල්ලා ගන්න. එක් අයෙක් හමෙහි ඉදිරිපාද අල්ලා ගන්න, තවත් අයෙක් පිටිපස්ස පාද අල්ලා ගන්න.

3. හම මවිල් උඩු අතට සිටිනසේ අල්ලා ලී හෝ කොන්ක්‍රීට් බංකුව මත ගසන්න. (බංකුවේ උල් සහිත ස්ථාන නොතිබිය යුතුයි.)

4. හම පැති වලට කපන්න.

5, හම බීම අතුරන්න (උස් ස්ථානයන් වඩාත් සුදුසුයි)

6. සියුම් කෙදි සහිත බුරුසුවකින් හමෙහි මවිල් සහිත පැත්ත හා මස් සහිත පැත්ත පිසදා දමන්න (පොල් කෙදි වලින් සාදූ බුරුසුවක් වඩාත් සුදුසුයි)

හමේ උඩ පැත්ත

1. රෝලි නොසිටින පරිදි දිග ඇරගන්න
ඉහතින් සඳහන් වන 2,3,5 සහ 6 ක්‍රම අනුගමනය කරන්න.

පොඟවන ජලය නැවත භාවිතය

අරමුණ : ජලය අපතේ යාම වලක්වා ගැනීම.

ලුණු ඉවත්කර ඇති නිසා පේඟවීමට පෙර -ක්ලෝරයිඩ් හා අනෙකුත් අපද්‍රව්‍ය වැඩි ප්‍රමාණයක් ඉවත්වී ඇත. මේ නිසා පොඟවාපු ජලය පිරිසිදුව පැවතීම අපේක්ෂා කරන අතර එම ජලය නැවත එක් වතාවක් පෙඟවීම සඳහා භාවිතා කල හැක.

උපදෙස්

1) තුන්වෙනි පෙඟවීමට පසු ගම් පමණක් ඉවත් කර ගන්න වතුර බැසීමට සලස්වන්න.

2) ඉතිරි වතුර ප්‍රමාණය නිශ්චල කරගන්න.

3) 200% දක්වා අලුත් වතුර දමා පුරවා ගන්න.

4) එක පෙඟවීමක් සඳහා මෙය පාවිච්චි කරන්න.

පස්වල ඇති එන්සයිම ආරක්ෂා වන පරිදි සයිල් ඉවක්කිරීමේ ක්‍රම

අරමුණ : පිටපතට යන සල්ෆයිඩ් සහ අනවශ්‍ය තෙල් ප්‍රමාණය අඩු කිරීම.

1. පොඟවා ගත් හරි පහත සඳහන් මිශ්‍රණයේ බස්සන්න.

වතුර	15 - 20 %
සෝ. සල්ෆයිඩ්	0.6 - 1.0 %
එන්සයිම	1.0 %
WETTING AGENT	0.2 %

2. තත්පර 30 - 60 කාලයක් හොඳින් මිශ්‍රණයේ ගිල්වා තබන්න.

3. හරි ටික බීම දිගා කරන්න (උපරිම 50 - 60)

4. පෙත ගණකම් කවරයකින් වසන්න

5. පැය 12 - 16 ට පසු මොට්ට පිහියකින් මවිල් ඉවත් කර නැවත හුණු ගැම සඳහා ගන්න.

ඉවත් කිරීමෙන් ඉතිරි වූ ලුනු , ලුණයි තැබීම සඳහා ගැනීම

1. අවශ්‍ය කරන ලුනු ප්‍රමාණය වතුරේ දිය කර ගන්නා (ලුනු වල බර මෙන් තුන් ගුණයක් වතුර)

2. ලුනු ද්‍රාවණය පෙරා ගන්න

3. දියකල නොහැකි ප්‍රමාණය කිරා ගන්න

4. එම බරට අලුත් ලුනු එකතු කරන්න

5. ලුනෙගි තැබීම ආරම්භ කරන්න

6. නැවත පෑවිච්චිය සඳහා ගන්නා ලුනු සමඟ කල් තබා ගැනීමේ .
ද්‍රව්‍ය 0.1 - 0.2 % ප්‍රමාණයක් පාවිච්චි කිරීම වඩාත් සුදුසුයි.

ප්‍රධාන සුදුසු බව රෙකමදාරු කිරීම

නැවත හුනු ගැල්වීම.

1) හුනු ගැල්වීමට පෙර සෝදා ගැනීම හොඳින් හුනු දැමීම සඳහා ප්‍රයෝජනවත් වේ.

වතුර ප්‍රමාණය 75 - 100% ඩ්‍රම් එකට
100 - 100% බල්ලේදී භාවිතා කරන්න.

ගබඩා කිරීමේ පහසුව ඇතිනම් එම වතුර නැවත හුනු ගැල්වීම සඳහා ප්‍රයෝජනයට ගත හැකියි.

2) CHROMS TANNING සඳහා සම්පූර්ණ හුනු ගැල්වීමක් සුදුසුයි
සඳහා සමහර අවස්ථාවලදී එක් කොටසක් හුනු ගැල්වීම ප්‍රමාණවත් වේ.

වතුර ප්‍රමාණය 50 - 75% ඩ්‍රම් එකට
100 - 150% වලකට

DELLMING AGENT 1 - 1.5 මධ්‍යම ප්‍රමාණයේ හම් සඳහා (ඩ්‍රම් එකේදී)
(ඇ.සල්ෆේට්/ක්ලෝරයිඩ් 1.5-2.0% ගහකම් හම් සඳහා (ඩ්‍රම් එකේදී)

හුනු ගල්වීම සම්පූර්ණ වීම සඳහා හුනු කලින් පිබ්‍ර රෝස පාටින් තිබෙනවාද කියා
PHEN LPHTHALEIN වලින් පරීක්ෂණ 0 කරන්න.

3) හුනු ඇල්ලීමනේ පසු සෝදා (වතුර 100% ඩ්‍රම් එකේ 200% බලේ) විනාඩි විස්සක් පමණ WETTING AGENT 0.2% සමග ඩ්‍රම් එකේ කරකැවීම හමේ උසස් තත්වය කෙරෙහි බලපායි.

4) BATE CO.2 - 0.5% භාවිතා කිරීම හමේ මතුපිට තොද තත්වයේ තබා ගැනීමට උපකාර වේ.

ලුනෙසි තැම්බීම

1. සුදුසු ජලය : ලුණු ප්‍රමාණය 10
   10 : 1

2. හිසට වතුර ප්‍රමාණය : 60% ඩ්‍රම් එකට
   100% බලකට

3. මිනිත්තු 20 ක් ඩ්‍රම් එකේ ලුණු සමඟ තැම්බීම හෝ මිනිත්තු 30 - 45 අතර කාලයක් බලේ ලුනු සමඟ තැම්බීම හොඳින් හමට ලුනු උරා ගැනීම සඳහා උපකාරී වේ. (ඇසිඩ් එකතු කිරීමට පෙර)

4. වඩා හොඳ හමක් ලබාගැනීම සඳහා ඕරිමික් ඇසිඩ් (0.5% දක්වා ප්‍රමාණයක් වතුර 5% ක දියකර) එකතු කරගන්න (ස. ඇසිඩ් එකතු කිරීමට පෙර)

5. ස. ඇසිඩ් වතුරේ දියකර (ඇසිඩ් : වතුර 1:10) සිසිල් කර එකතු කරන්න. (ප්‍රමාණ 3ක් පැයක කාලයක් වලක් තුල, අවශ්‍ය 8 - 10 මිනිත්තු 10 ක පමණ විවේතයක් ඩ්‍රම් එක තුල) තරස් කැපුමේදී දැනුලත හොඳින් තිබිය යුතුය. ලුනෙහි තැම්බීමේ අවසානයේදී CROME TANNING සඳහා PH 2. 8-30
   UESGITAVLE TANNING සඳහා ලුනෙහි තැම්බීමේදී - 4.5 ප්‍රමාණයක් (ස. ඇසිඩ් ප්‍රමාණය 0.5-1.0%)

CHROME TANNING

1. සාමාන්‍ය ක්‍රෝ. සල්ෆේට් බල 25 2% ක්‍රෝ ඔක්සයිඩ් අඩංගුවේ.

2. පදමි කිරීම සඳහා අවශ්‍ය ප්‍රමාණය
6 - 8% (යොදන බර)

3. පදමි කිරීම සඳහා වතුර ප්‍රමාණය
පළමුව 50% පමණ
පදමිකිරීම අවසානයේ 100% පමණ

4. BASIFICATION ආරම්භ කිරීමට පෙර හොඳින් උරාගෙන තිබේදැයි ගරඩ කැපුමකින් පරීක්ෂා කරන්න.

5. පළමුව SODIAM FORMAT 0.5-10% ප්‍රමාණයක් භාවිතය සුදුසුයි (10% ත පමණ වතුරේ දියකර ගන්න) සෝ. බයිකාබනේට් එකතු කිරීමට පෙර තුන් වතාවක් මිනිත්තු 10ක පරතරයක් FORMAT එකතු කල යුතුයි.

6. 0.8 - 1.4% දක්වා වෙනස් සෝ. බයිකාබනේට් ප්‍රමාණයක් PH 3.8.40ඳක්වා ගරස් කැපුමේ තිබිය යුතුය. මෙය හොඳ පෙත අරා ගැනීමක් ලබාදෙයි.

7. හෝ 10 දී චීනාඩි කාල පරතරයකදී සෝ. බයිකාබනේට් එකතු කිරීමෙන් හොඳ පෙත නිල් උරා ගැනීම සිදු වෙයි.

8.4 RECOMMENDATIONS FOR IMPROVING INPLANT ECOLOGY AND QUALITY IMPROVEMENT

1. M/s. Mubarak Leather (P) Ltd.

Raw material Storage:

The salted hides and skins are stored in heaps, on concrete floor laden with used salt. Roof of storage yard is not proper and leaks heavily during rainy season.

- It was been suggested to store the hides in pile on wooden platforms. Drains to be constructed around the yard. Roof to be repaired.

Beam House Operations:

The practice of the tannery is to trim the hides and soak in pits over night. Next day the hides would be washed in pit with fresh water for about 30 minutes and taken for liming in paddle. 6% lime, 2% sulfide and 500% water is used for liming. The paddle is run normally for one hour initially, thereafter for five minutes every hour, for about 6 hours. Next day fleshing would be done manually or by machine depending on the power availability.

- The following recommendations have been made and demonstrated at commercial level wherever applicable.

- Need to desalt the hides and skins before soaking.

- Need for maintaining proper hide - float ratio in soaking (presently the water used is not monitored. It varies from 1.2 litres to 2.2 litres per kg of hide. It was been recommended to use a minimum of 2 litres per kg of hide.

- Three soakings have been recommended with the possibility of reusing the third soak for first soak of next batch.

- Hair saving, dip and pile method for reduced sulfide enzyme assisted unhairing has been demonstrated in the place of hair burning paddle liming. Use of 20% water 6-8%, 1% sodium sulfide, 1% enzyme and 0.15% wetting agent has been suggested for making the paste, in which the soaked hides are immersed for 30-60 seconds and piled over night.

- Need for close monitoring of unhairing hides using blunt knife to avoid grain damage and hair / short hair being left out on the hide itself due

to improper unhairing. This could pose serious problem, as the hair / short hair may not get removed in reliming many times.

- Reliming in paddle using 5-6% lime for 8-12 hours had been suggested. Use of Soda ash, upto 1%, has also been recommended to adjust the opening up in reliming.

- Machine fleshing has been recommended for ensuring consistency and increased productivity.

- Though the management has provided hand gloves & boots for workers, for various reasons they were found not being used, use of these should become mandatory.

Drum operations (upto tanning)

The fleshed hides are delimed by drumming with 2% ammonium sulfate, 0.25% bate and 75% water (approx.), for a period of 2 hours. After draining the bath the pelts are washed in running water for a period of 10 minutes. Pickling is carried out with 6% salt, 100% water, 0.5% formic acid & 1.0% sulfuric acid. After checking the pH (2.8-3.0), chrome extract (5-6%) is added and drummed for 90 minutes. 1% sodium bicarbonate is then added in two feeds of 60 minutes interval. Drumming is then continued for 120-180 minutes. After checking the pH (3.5-3.7), the bath is drained and wet blue leathers are piled.

The following are the short - comings in the current practice.

- Proper hide - float ratio not being maintained water levels are fixed on visual observation only.

- For most of the operations, even for thick hides, attainment of required pH value is based on liquor (bath) pH only.

- Draining of the liquor from the drum at the end of unit operation is not adequate, more than 40% of the bath remains in the drum and carried over to the next operation.

- In pickling, salt is added initially and without giving time for its diffusion in to the hide, entire quantity of formic & sulfuric acid are added immediately in one feed. Addition of chemicals through axle is also improper. With nearly 15-20% being wasted in spilling over.

- Similarly in chrome tanning sodium bicarbonate is just given in two feeds. The end point is judged by attainment of 3.5-3.7 pH in the bath.

Following recommendation have been made and importance impressed up on by demonstrations at commercial level.

- Need for maintaining proper hide-float ration to improve efficiency of the operation and consistency (need for installation of flowmeters emphasised).
- Need for use of lattice door for draining. And necessity to ensure complete draining of spent bath of previous operations.
- Need to effect gradual changes in pH, resorting to controlled addition of acid / alkali, for improving the efficiency and quality. Need to have improved chemical addition system.

General Observations :

- The drains often get choked and the waste liquor found to stagnate or overflow in the work yard.

- Need for fixing screens to segregate solid wastes and periodical cleaning has been suggested.

- The electrical wiring and fittings of the wet yard to be improved as it is in very precarious conditions.

- The power supply system to be improved. It appears the entire unit is run by generators leading to frequent shut downs / stoppages due to load adjustments.

Recommendations are useful and will be followed

MUBARAK LEATHER (PVT) LTD.

2. M/s. NM Mohamed Mohideen Ltd.

RAW STORAGE

The wet salted hides/skins are at present stored in heaps. They should be kept in piles on wooden platforms and should be changed every day. A drain should be provided around the raw yard to collect the salt solution/blood oozing out of the hides/skins and should be taken to the effluent pond.

SOAKING

It is found that often the hide : float ratio is not maintained properly. Minimum of 200% water on the weight of the raw hide/skin should be used for soaking. Desalting before soaking, helps in reducing the salt content in the waste streams and the efficiency of soaking (For details kindly see work instructions). Since desalting removes significant quantities of salt, the third soak (second and third soaks also can be done with 200% water) can be reused as a medium for first soak of next batch of hide/skin (details given in the work instructions).

LIMING

It is recommended to adopt enzyme assisted hair saving unhairing method followed by reliming with lime (5-6%) in pit for 2 days in the place of 6 day pit liming (For details on enzyme assisted unhairing kindly see work instructions). It is recommended to carry out fleshing by machine instead of present manual system, in order to enhance the productivity and efficiency of the subsequent operations.

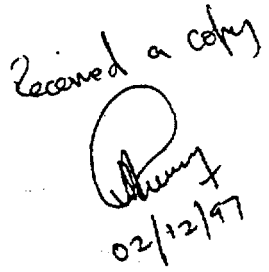
DELIMING & PICKLING

Presently the control of process parameters are not strictly adhered to. These are to be properly controlled as given in work instructions. The salt recovered in desalting can effectively be reused for pickling. For the details of reuse of salt kindly see work instructions.

GENERAL RECOMMENDATIONS

- Use of paddles/drums for deliming and pickling would improve the efficiency and productivity.

- There is a need to rationalise the present method of tanning in pits to improve the quality and reduce the process time.



3. M/S. M.A.M.ABDUL CADER & CO (PTE) LIMITED

Soaking

There is a strong need to minimise the water used for soaking. Three soaks with 200-250% water (on raw weight) is sufficient for the type of raw material processed in the tannery. The third soak is to be effectively re-used as First soak for the next batch of hide.

Unhairing

The present practice of hair-burning method of unhairing should be changed to enzyme assisted - Reduced Sulphide - hair saving unhairing system.

Reliming

Use of 150% water in drum or 300% water in paddle is sufficient for reliming with 5% lime with 0.2% caustic soda. Initially the drum/paddle could run for 60 minutes, thereafter 5 minutes for every one hour for a period of 6 hrs. After leaving the hides in bath overnight, the hides can be fleshed and taken for deliming.

Deliming & Bating

Presently large quantities of water is being used for this operation. The water level and the other process parameters to be strictly followed as given in Work Instructions. It is preferable to add the bate on completion of deliming instead of giving it along with the deliming agent as being done presently.

Pickling

The water: Salt ratio & mode of acid addition should be done as given in Work Instructions. It is preferable to use Formic Acid, prior to addition of Sulphuric Acid for quality-,improvement. It is necessary to ensure uniform cross-section pH of 2.8-3.0 at the end of pickling for an effective chrome tanning subsequently.

Chrome Tanning

Presently Sodium bi Carbonate for basification is given without ensuring penetration of chromium completely in the hide, in just two feeds. The basification pH (3.8-4.0 at cross-section)is not checked and it is found that tanning often is completed at pH of 3.4-3.6. This leads to poor fixation of chromium resulting in material loss and quality impairment.

The following are to be ensured in chrome tanning.

- Complete penetration of chromium before commencing basification
- Use of 0.5 ~ 1.0% of Sodium Formate before addition of Sodium bi Carbonate
- Gradual addition of Sodium bi Carbonate to achieve an equilibrium pH of 3.8~4.0 at the cross-section, at the end of chrome tanning.

(For details. see Work Instructions)

General Recommendations

- Large quantities of water is being used for washings & house keeping. Regulation of these are essential.
- The drum drives may be replaced to facilitate low Float/ Float less operations.
- There is an urgent need to make safe provisions for opening & closing the drum doors which are at 6 ft high from the ground level. The chemical addition systems are also to be improved.
- For desalting and reuse of salt for pickling, kindly follow the Work Instructions given.

will verify the above proposals and will implement.

02/12/97

8.5 Photographs of some of the operations including demonstration

8.5.1 Cleaner Technology Implementation

Fig: 1 View of desalting by beating
(M/s Mubarak Leather Pvt.Ltd.,)

Fig: 2 View of desalting by brushing
(M/s Mubarak Leather Pvt. Ltd.,)

Fig: 3 Picture showing cleanliness achieved after soaking by resorting to desalting.
(M/s Mubarak Leather Leather Pvt.Ltd.,)

Fig: 4A View of preparation of enzyme based lime paste
(M/s Mubarak Leather Pvt. Ltd.,)

Fig: 5 View of Cow hides kept in pile for unhairing
(M/s Mubarak Leather Pvt. Ltd.,)

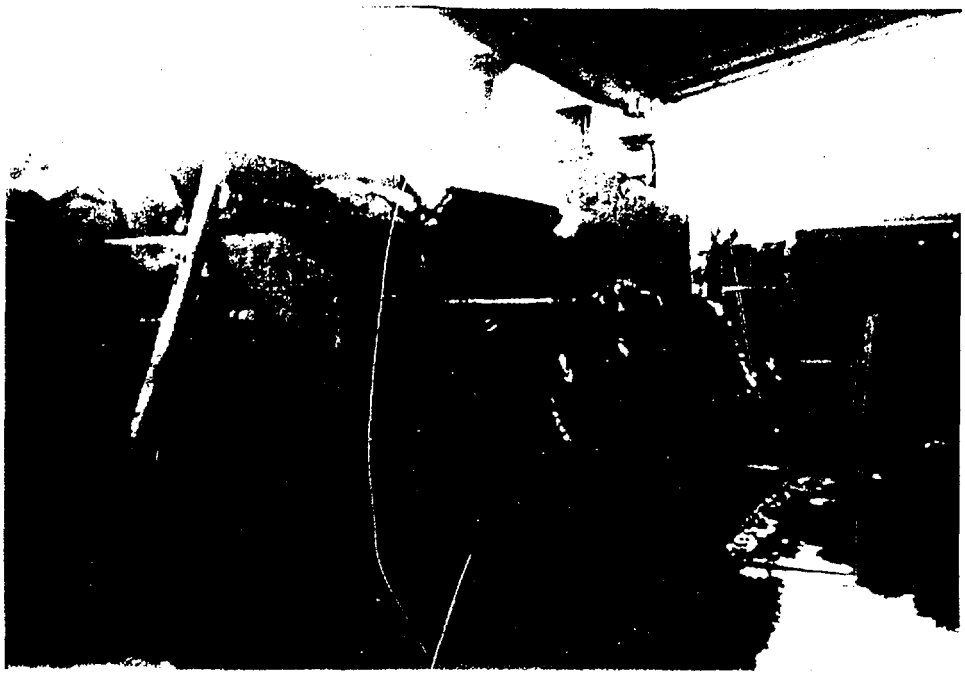
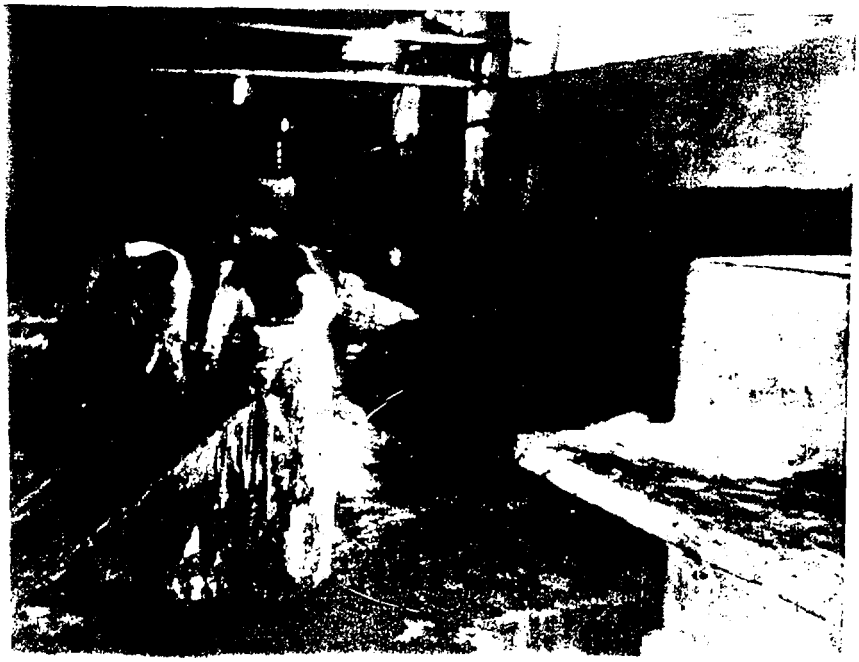


Fig:6 Picture indicating preparation for hair burning paddle liming - Conventional
(M/s Mubarak Leather Pvt.Ltd.,)



Fir: 7 View of hair saving unhairing method
(M/s Mubarak Leather Pvt. Ltd.,)

Fig: 8 View of desalting by beating
(M/s N.M.Mohamed Mohideen Limited)

Fig: 9 View of desalting by brushing
(M/s N.M. Mohamed Mohideen Limited)

Fig: 10 View of soaking desalted hides(lightly coloured liquor)
(M/s N.M.Mohamed Mohideen Limited)

Fig: 11 View of soaking hides without desalting(Dark coloured liquor)
(M/s N.M.Mohamed Mohideen Limited)

Fig:12 View of preparation of enzyme based lime paste
(M/s N.M.Mohammed Mohideen Limited)

Fig: 13 View of dipping in enzyme based liming system (M/s N.M.Mohammed Mohideen Ltd)

Fig: 14 View of piling of hides after dipping in enzyme based lime paste
(M/s N.M.Mohammed Mohideen Ltd)

Fig:15 View of unhairing by hair saving method
(M/s N.M.Mohammed Mohideen Limited)

Fig: 16 View of unhaired hide -dip-pile enzyme based unhairing
(M/s N.M. Mohammed Mohideen Ltd)

Fig: 17 View of hand fleshing adoption

Fig: 18 View of pit tanning method
(M/s N.M.Mohammed Mohideen Ltd)

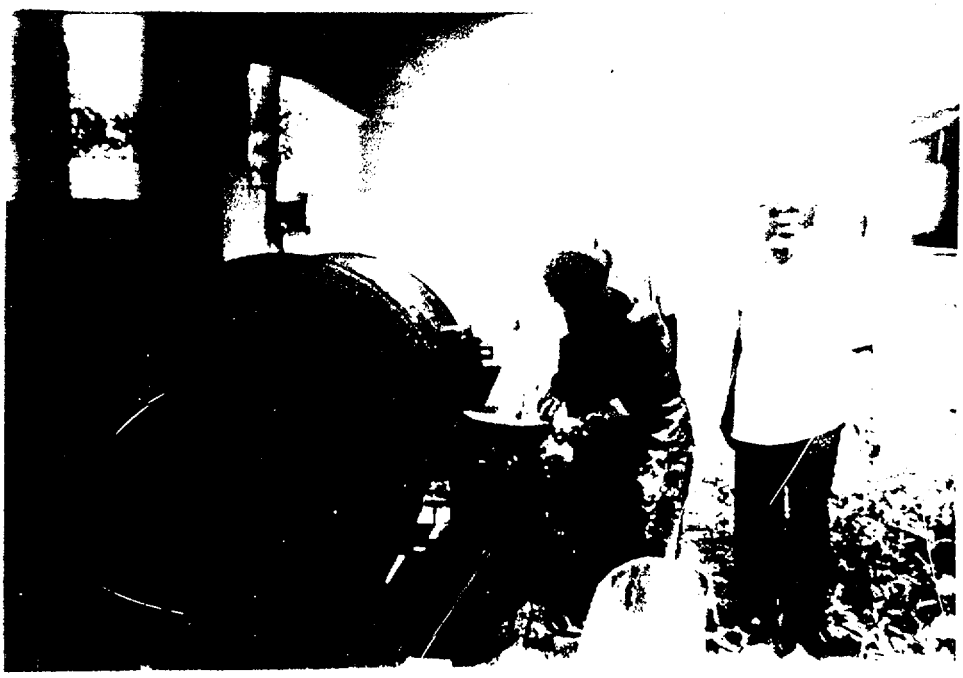


Fig: 19 View of trials conducted using drum for tanning
(M/s N.M.Mohammed Mohideen Ltd)

Fig: 20 View of desalting by brushing
(M/s M.A.M. Abdul Cader & Co, Pvt.Ltd.,)

Fig: 22 View of desalting by beating
(M/s M.A.M. Abdul Cader & Co.Pvt.Ltd.,)

Fig: 23 View of unhairing by hair saving method
(M/s M.A.M. Abdul Cader & Co.Pvt.Ltd.,)

8.5.2 Demonstration

Fig: 1 View of desalting being carried out on the newly erected desalting platform as a part of demonstration on 29.11.97

Fig:2 View of hair saving unhairing method demonstrated to tanners on 29.11.97

Fig:3 View of tanners watching the demonstration programme held at M/s Mubarak Leathers (P) Ltd on 29.11.97

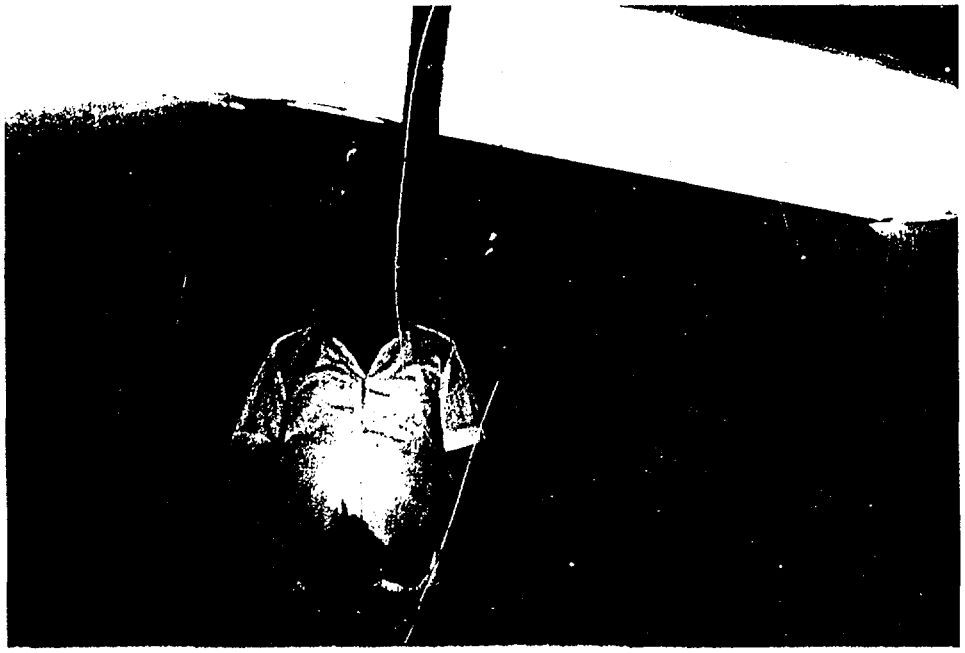


Fig:4 View of tanners watching the demonstration programme held at M/s Mubarak Leathers (P) Ltd on 29.11.97

8.5.3 Occupational Safety & Health

IMPROPER AND UNSAFE ELECTRICAL CONNECTIONS

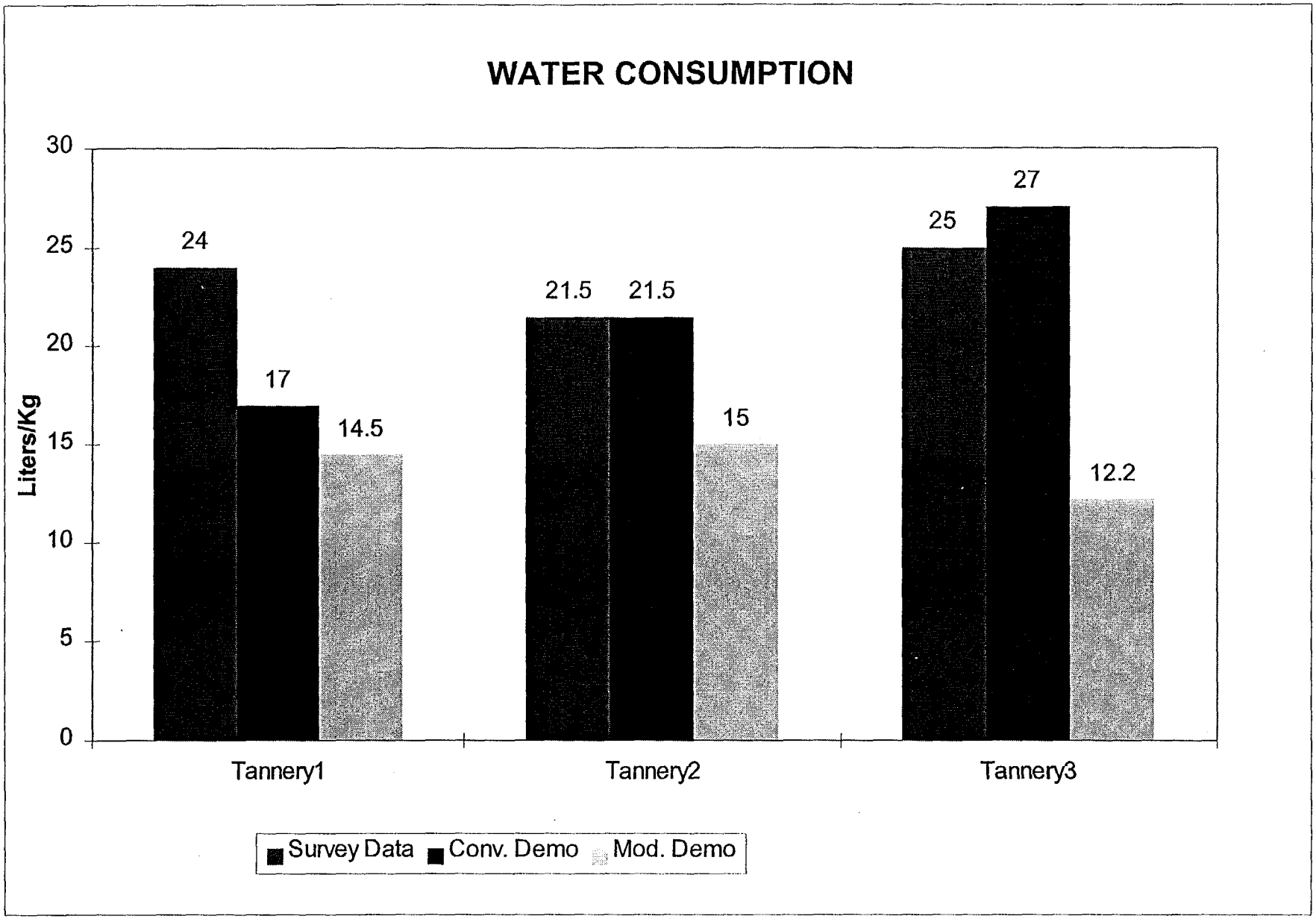
PLACES AS SHOWN IN THE PHOTOGRAPH BELOW THE PLATFORM INFRONT OF PADDLES HELP IN STAGNATION OF TRIMMINGS OR OTHER MATERIAL AND LEAD TO BAD ODOUR

A TANNERY WORKER WITH CHEMICALS SPILLED ALL OVER HIS BODY

A TANNERY WORKER WITH BARE FOOT IN PIT FILLED WITH PROCESS LIQUOR

8.6 Summary of Results

8.6.1 Water Consumption



Tannery 1 : M/s. Mubarak Leather Pvt. Ltd., Tannery
Tannery 2: M/s. MAM Abdul Cader & Co. Pvt. Ltd.
Tannery 3: M/s. NM Mohamed Mohideen Tannery

8.6.2 Emission Load

MUBARAK

COW HIDES RAW TO WET BLUE

Summary of Emission loads in effluents from individual processing operations

Operation	Process	Water	Emission load kg/t							
		M3/t	BOD	COD	TDS	TSS	TS	Cl^-	Sul	Cr
Soaking	**T**	**6.0 - 9.0**	**6.6 - 22.5**	**18 - 54**	**192 - 432**	**18 - 63**	**210 - 495**	**90 - 270**		
	C	4.00	6.26	18.91	161.28	4.62	165.90	86.14		
	M	4.50	4.38	9.33	88.32	1.38	89.70	45.64		
	D %	12.50	-29.95	-50.66	-45.24	-70.13	-45.93	-47.02		
Liming	**T**	**3.0 - 4.0**	**15 - 40**	**30 -100**	**72 -120**	**18 - 80**	**90 - 200**	**12.0 - 32**	**1.7 - 7.7**	
	C	5.90	55.46	106.62	200.63	19.50	220.13	51.45	1.89	
	M	5.90	18.23	35.34	87.67	23.32	110.99	20.41	0.33	
	D	0.00	-67.13	-66.85	-56.30	19.58	-49.58	-60.32	-82.50	
Deliming	**T**	**1.0 - 2.0**	**1.0 - 6.0**	**2.5 - 14**	**2.5 - 12**	**1.5 - 8.0**	**4 - 20.0**	**1.0 - 4.0**	**0.04 - 0.1**	
	C	1.50	1.74	10.01	35.21	3.23	38.44	5.17	0.30	
	M	1.75	1.54	6.27	17.16	3.35	20.51	2.13	0.05	
	D %	16.67	-11.29	-37.33	-51.27	3.93	-46.63	-58.75	-83.89	
Pickling	**T**	**0.5 - 1**	**0.2 - 0.7**	**0.5 - 3**	**17 - 67**	**0.5 - 3**	**17.5 -70**	**10.0 - 30.0**		
	C	0.00	0.00	0.00	0.00	0.00	0.00	0.00		
	M	0.00	0.00	0.00	0.00	0.00	0.00	0.00		
	D %									
Cr. Tan	**T**	**1.0 - 2.0**	**0.35 - 1.6**	**1.0 - 5.0**	**29 - 115**	**1.0 - 5.0**	**30 - 120**	**15 - 50**		**2 - 10**
	C	1.00	0.48	6.44	95.41	1.24	96.65	19.83		1.28
	M	1.20	0.38	4.46	66.38	0.25	66.63	15.87		0.68
	D	20.00	-21.25	-30.70	-30.43	-79.60	-31.06	-19.97		-46.96
Overall	**T**	**11.5-18.0**	**23.2-70.8**	**52-176**	**312.5-746**	**39-159**	**351.5-905**	**128-386**	**1.74 - 7.8**	**2 - 10**
(Including	C	17.10	63.93	141.99	492.54	28.58	521.12	162.59	2.19	1.28
Washings	M	14.55	24.53	55.41	259.53	28.30	287.83	84.06	0.38	0.68
& Spillage	D %	***-14.91***	***-61.63***	***-60.98***	***-47.31***	***-0.98***	***-44.77***	***-48.30***	***-82.69***	***-46.96***

MAM

BUFF HIDES RAW TO WET BLUE

Summary of Emission loads in effluents from individual processing operations

Operation	Process	Water	Emission load kg/t							
		M3/t	BOD	COD	TDS	TSS	TS	Cl^-	Sul	Cr
Soaking	**T**	**6.0 - 9.0**	**6.6 - 22.5**	**18 - 54**	**192 - 432**	**18 - 63**	**210 - 495**	**90 - 270**		
	C	9.00	18.92	44.49	171.34	17.70	189.04	95.20		
	M	4.00	4.15	6.56	43.97	2.92	46.89	23.87		
	D %	-55.56	-78.06	-85.25	-74.34	-83.48	-75.19	-74.93		
Liming	**T**	**3.0 - 4.0**	**15 - 40**	**30 -100**	**72 -120**	**18 - 80**	**90 - 200**	**12.0 - 32**	**1.7 - 7.7**	
	C	2.00	20.40	87.37	89.61	45.92	135.53	30.02	1.39	
	M	1.50	2.70	7.58	64.40	8.77	73.16	15.44	0.30	
	D	-25.00	-86.76	-91.33	-28.14	-80.90	-46.02	-48.58	-78.71	
Deliming	**T**	**1.0 - 2.0**	**1.0 - 6.0**	**2.5 - 14**	**2.5 - 12**	**1.5 - 8.0**	**4 - 20.0**	**1.0 - 4.0**	**0.04 - 0.1**	
	C	7.00	6.26	20.16	38.86	8.89	47.75	3.07	0.28	
	M	3.00	3.18	11.11	25.82	5.74	31.56	3.01	0.16	
	D %	-57.14	-49.18	-44.91	-33.55	-35.41	-33.90	-1.99	-41.83	
Pickling	**T**	**0.5 - 1**	**0.2 - 0.7**	**0.5 - 3**	**17 - 67**	**0.5 - 3**	**17.5 -70**	**10.0 - 30.0**		
	C	0.00	0.00	0.00	0.00	0.00	0.00	0.00		
	M	0.00	0.00	0.00	0.00	0.00	0.00	0.00		
	D %									
Cr. Tan	**T**	**1.0 - 2.0**	**0.35 - 1.6**	**1.0 - 5.0**	**29 - 115**	**1.0 - 5.0**	**30 - 120**	**15 - 50**		**2 - 10**
	C	0.80	0.30	1.74	52.00	0.87	52.87	13.04		0.63
	M	0.60	0.47	2.30	46.90	0.61	47.51	13.13		0.49
	D	-25.00	54.93	32.35	-9.81	-29.56	-10.14	0.67		-21.56
Overall	**T**	**11.5-18.0**	**23.2-70.8**	**52-176**	**312.5-746**	**39-159**	**351.5-905**	**128-386**	**1.74 - 7.8**	**2 - 10**
(Including	C	28.47	45.88	153.76	351.81	73.38	425.19	141.33	1.67	0.63
Washings	M	12.74	10.50	27.55	181.09	18.05	199.13	55.44	0.46	0.49
& Spillage	D %	***-55.25***	***-77.11***	***-82.08***	***-48.53***	***-75.40***	***-53.17***	***-60.78***	***-72.55***	***-21.56***

NMM

COW HIDES RAW TO EI

Summary of Emission loads in effluents from individual processing operations

Operation	Process	Water	Emission load kg/t						
		M3/t	BOD	COD	TDS	TSS	TS	Cl^-	Sul
Soaking	**T**	**6.0 - 9.0**	**6.6 - 22.5**	**18 - 54**	**192 - 432**	**18 - 63**	**210 - 495**	**90 - 270**	
	C	7.00	11.42	29.23	202.35	10.36	212.71	106.55	
	M	4.00	7.94	22.92	133.50	7.21	140.71	70.22	
	D %	-42.86	-30.44	-21.60	-34.03	-30.44	-33.85	-34.10	
Liming	**T**	**3.0 - 4.0**	**15 - 40**	**30 -100**	**72 -120**	**18 - 80**	**90 - 200**	**12.0 - 32**	**1.7 - 7.7**
	C	2.00	14.97	35.79	63.54	22.71	86.25	15.44	0.57
	M	2.00	11.25	28.86	41.76	8.61	50.37	8.52	0.17
	D	0.00	-24.86	-19.36	-34.27	-62.09	-41.60	-44.82	-69.26
Deliming	**T**	**1.0 - 2.0**	**1.0 - 6.0**	**2.5 - 14**	**2.5 - 12**	**1.5 - 8.0**	**4 - 20.0**	**1.0 - 4.0**	**0.04 - 0.1**
	C	5.50	3.11	6.96	41.55	5.41	46.96	9.46	0.25
	M	4.00	1.52	3.77	24.68	1.65	26.33	3.45	0.06
	D %	-27.27	-51.17	-45.88	-40.61	-69.55	-43.94	-63.59	-76.04
Pickling	**T**	**0.5 - 1**	**0.2 - 0.7**	**0.5 - 3**	**17 - 67**	**0.5 - 3**	**17.5 -70**	**10.0 - 30.0**	
	C	1.00	1.15	3.66	50.31	0.99	51.30	24.02	
	M	1.00	0.58	2.32	37.75	0.69	38.45	17.58	
	D	0.00	-49.57	-36.63	-24.96	-29.79	-25.05	-26.80	
Veg. Tan	**T**	**1.0 - 2.0**	**0.35 - 1.6**	**1.0 - 5.0**	**29 - 115**	**1.0 - 5.0**	**30 - 120**	**15 - 50**	
	C	2.00	12.09	29.10	39.59	3.86	43.45	10.86	
	M	0.00	0.00	0.00	0.00	0.00	0.00	0.00	
	D	-100.00	-100.00	-100.00	-100.00	-100.00	-100.00	-100.00	
Overall	**T**	**11.5-18.0**	**23.2-70.8**	**52-176**	**312.5-746**	**39-159**	**351.5-905**	**128-386**	**1.74 - 7.8**
(Including	C	21.60	42.74	104.73	397.34	43.33	440.67	166.33	0.82
Washings)	M	15.20	21.29	57.86	237.69	18.16	255.85	99.76	0.23
	D %	***-29.63***	***-50.19***	***-44.76***	***-40.18***	***-58.09***	***-41.94***	***-40.02***	***-71.35***

8.6.3 Cost benefit

STATUS OF SAVINGS IN MATERIAL CONSUMPTION AND ITS COST IMPLICATIONS

Name of Tannery : **M/s Mubarak Leathers Pvt. Ltd.**
Capacity : 3750 Kg/day
Material : W/S Cow hides.
Process : Raw to wetblue

S.No	Name of Chemical	Kgs/day			US$ Cost/Kg	Total Cost/day
		Conventional	Modified	Savings		
1.	Lime	225	487.5	-262.5	0.15	-39.40
2.	Sodium Sulfide	75	37.5	37.50	0.75	28.13
3.	Dehairing enzyme	-	18.75	-18.75	2.75	-51.56
4.	Wetting Agent	-	15.00	-15.00	1.00	-15.00
5.	Ammonium sulfate	75	75.00	0	0.25	0.00
6.	Bate	7.5	7.5	0	1.00	0.00
7.	Salt	225	75	150	0.05	7.50
8.	Formic Acid	18.75	18.75	0	1.00	0.00
9.	Sulfuric Acid	37.5	37.5	0	0.20	0.00
10.	BCS	187.5	168.75	20	0.75	15.00
11.	sodium Acid	-	18.75	-18.75	0.55	-10.30
12.	Sodium Bicarbonate	37.5	48.75	-11.25	0.20	-2.25
13.	Preservative	-	7.50	-7.50	2.50	-18.75
14.	Water	64125	54,562	9562	0.0005	4.78
				Total		-96.84
	Saving through Chrome Recovery					14.00
	(@ 10% recovery = 18.75 *0.75=14.00)					150.00
	Saving through increase in area					
	(@ 2% = 3750 *0.02 *US$ 1.0/Sq.ft.=150)					
	NET SAVINGS PER DAY, US$					**67.16**

Notes
- The cost benefit of pollution reduction and quality enhancement is not taken into consideration

STATUS OF SAVINGS IN MATERIAL CONSUMPTION AND ITS COST IMPLICATIONS

Name of Tannery : **M/s MAM ABDUL CADER & CO.**
Capacity : 1500Kgs/day
Material : w/s Buffalo hides.
Process : Raw to wet blue

S.No	Name of Chemical	Kgs/day			US$ Cost/Kg	Total Cost/day
		Conventional	Modified	Savings		
1.	Lime	90	195	-105	0.15	-15.75
2.	Sodium Sulfide	30	15	15	0.75	11.25
3.	Dehairing enzyme	-	7.5	-7.5	2.75	-20.63
4.	Wetting Agent	-	6.0	-6.0	1.00	-6.00
5.	Caustic Soda	3	3.0	0	0.20	0.00
6.	Ammonium sulfate	35	35.0	0	0.25	0.00
7.	Bate	9.0	9.0	0	1.00	0.00
8.	Salt	103.5	00.0	103.5	0.05	5.18
9.	Formic Acid	9.0	9.0	0	1.00	0.00
10.	Sulfuric Acid	17.0	17.0	0	0.20	0.00
11.	BCS	94.50	94.50	0.0	0.75	0.00
12.	Sod. Formate	5.15	8.60	-3.45	0.55	-1.90
13.	Sod. Bicarb	17.0	20.5	-3.5	0.30	-1.05
14.	Water	42705	19110	23595	0.0005	11.80
				Total		-17.10
	Saving through Chrome Recovery					7.09
	(@ 10% recovery = 9.45*0.75=7.09)					60.00
	Saving through area increase					
	(@ 2% = 1500&2*0.02*US$1.0/SQ.FT=60.00)					
	NET SAVINGS PER DAY, US$					**49.99**

Notes
- The cost benefit of pollution reduction and quality enhancement is not taken into consideration

STATUS OF SAVINGS IN MATERIAL CONSUMPTION AND ITS COST IMPLICATIONS

Name of Tannery : **M/s N M Mohamed Mohideen Limited**
Capacity : 1500Kgs/day
Material : w/s Cow hides.
Process : Raw to El

S.No	Name of Chemical	Kgs/day			US$ Cost/Kg	Total Cost/day
		Conventional	Modified	Savings		
1.	Lime	375	240	135	0.15	20.25
2.	Sodium Sulfide	9	9	0	0.75	0.00
3.	Dehairing enzyme	-	7.5	-7.5	2.75	-20.63
4.	Wetting Agent	-	3.5	-3.5	1.00	-3.50
5.	Ammonium sulfate	45	45	0	0.25	0.00
6.	Salt	150	60	90	0.05	4.50
7.	Preservative	0.00	0.00	0.00	2.50	0.00
8.	Formic Acid	-	8.60	-8.60	1.00	-8.60
9.	Sulfuric Acid	15	11.0	4.0	0.20	0.80
10.	Wattle extract	270	300	-30.0	0.50	-15.00
11.	Oxalic acid	7.5	7.5	0	0.53	0.00
12.	Oil	45	45	0	1.30	0.00
13.	Water	32,400	22,800	9600	0.0005	4.80
				Total		-17.38
	Saving through increase in yield					84.00
	(@ 10% = 1500*.35*.1 *US$ 1.6/Kg=84.00)					
	NET SAVINGS PER DAY, US$					66.62

Notes
- The cost benefit of pollution reduction and quality enhancement is not taken into consideration

9.0 WORKSHOP ON CLEANER TECHNOLOGY OPTIONS FOR THE TANNING INDUSTRY IN SRI LANKA

9.1 PROGRAMME OF WORKSHOP

Industrial Pollution Reduction Programme
Seminar/Workshop on
"CLEANER TECHNOLOGY OPTIONS FOR THE TANNING INDUSTRY IN SRI LANKA"
Organised by
Central Leather Research Institute, Chennai, India
&
Regional Programme Office, UNIDO, Chennai, India
at
HOTEL TAJ SAMUDRA, COLOMBO
on
15th DECEMBER 1997

PROGRAMME

8.30 a.m. - 8.45 a.m.	Registration
9.00 a.m.	Lighting the traditional Oil Lamp
9.05 a.m. - 9.15 a.m.	Welcome address - Mr C Batuwangala, National Expert, IPRP
9.15 a.m. - 9.25 a.m.	Address by Mr Richard Conroy, Deputy Resident Representative (Programme)
9.25 a.m. - 9.35 a.m.	Address by Mr Mahinda Bandusena, Secretary, Ministry of Industrial Development
9.35 a.m. - 9.50 a.m.	Pollution Reduction Programme - Dr V U Ratnayake, National Programme Manage, IPRP
9.50 a.m. - 10.30 a.m.	UNIDO Programme in Pollution Control for the tanning industry in Sri Lanka - Mr A Sahasranamam, Programme Co ordiantor UNIDO's RePO Presentation on the Project Document for Bata Atha - Mr Valentin Post, Associate Expert UNIDO's RePO
10.30 a.m. - 10.45 a.m.	TEA BREAK
10.45 a.m. - 11.05 a.m.	Common Chrome Recovery Unit technology transfer Dr S Rajamani, Technical Expert, UNIDO's RePO
11.05 a.m. - 11.25 a.m.	Investigation on Solid Waste in the tanning industry in Sri Lanka Dr Prakash Rao, UNIDO Expert
11.25 a.m. - 11.55 a.m.	Implementation of Cleaner Technologies in tanneries in Rajagiriya, Sri Lanka Mr K Parthasarathy, Senior Assistant Director, CLRI
11.55 a.m. - 12.30 p.m.	Experience of the tanners Representatives of the industry
12.35 p.m. - 1.40 p.m.	Panel discussion moderated by Prof. Tuley de Silva, UNIDO, Vienna

Panelists :

Mr W A D D Wijesuriya, Director (NRM), CEA ; Mrs Manel Jayamanne, UNDP ; Dr P G Rao, CLRI ; Mr D G P Silva, MD, Tan Lanka; Dr A Mubarak, CISIR ; Mr R V D Piyatilake, Director / MoID; Representatives of donor agency

LUNCH

9.2 LIST OF PARTICIPANTS

Participants Name	Designation	Organisation
Mr D J Percy Silva	MD	Sapco Group of Companies & TAN LANKA
Mr M Ashroff Razack	CMD	MAM Abdul Cader & Co.(P)Ltd
Mr R V Don Piyatilaka	Director	Ministry of Industrial Development
Mr C Batuwangala	Management Consultant	SLAT Office
Mr Shiranee E.Yasaratne	Director	Central Environmental Authority
Mr K A Dayarathne	Deputy Director	Ministry of Industrial Development
Mr A A M Ishaq	CMD	Mubarak Leather (P)Ltd
Mr S Sundaravel	Manager	Sultans Leather Co
Mr C Batuwangala	National Expert	IPRP
Mr Richard Conroy	Deputy Resident Rep	UNIDO
Dr V U Ratnayake	NPM	IPRP
Mr A Sahasranaman	Prog.coordiantor	UNIDO's RePo
Mr Valentin Post	Associate Expert	UNIDO's RePo
Dr S Rajamani	Technical Expert	UNIDO's RePo
Dr Prakash Rao	UNIDO Expert	
Mr K Parthasarathy	Sr Asst Director	CLRI
Prof Tuley de Silva		UNIDO,Vienna
Mr W A D D Wijiesuriya	Director (NRM)	CEA
Mrs Manuel Jayamanne		UNDP
Dr P G Rao	Sr Asst Director	CLRI
Ms Marie Jayawardhane		UNIDO
Dr A Mubarak		CISIR
Mr R V D Piyatilake	Director	Min. of Indus. Development
Mr MA Abdul Cader		

9.3 TEXT OF MATERIAL PRESENTED TO THE PARTICIPANTS

9.3.1 INAUGURAL ADDRESS OF RICHARD CONROY, DEPUTY RESIDENT REPRESENTATIVE OF UNDP AT THE WORKSHOP ON WASTE MINIMIZATION IN TANNERY

1. It is a pleasure to attend this inauguration. However, I am somewhat embarrassed when I am called upon to address a workshop on a subject that I have little acquaintance , except I like to wear leather shoes and looking at other leather goods. However, I had the privilege of doing little more than that recently. It was the opportunity that we joined together with another family member of the UN, i.e. UNIDO, who runs a successful programme in India for Pollution Control in the Tanning Industry.

2. The term Industry is looked at as a threat to the environment. It is in a way reasonable when you look at it from the global point of view, industry accounts for approximately one third of the world's greenhouse gas emissions and a large percentage of the hazardous waste generated. The humanity has reached a turning point. We can no longer continue with polices which are deepening economic divisions within and between countries, which increase poverty, hunger, and illiteracy and which cause the continuing deterioration of ecosystems on which life on earth depends.

3. Then what can we do? We have to change course. We have to improve living standards of those who are living far below the acceptable levels. We have to better manage and protect the ecosystem. The choice is ours.

4. UNDP, in this respect, being the development arm of the UN is committed to the principle of sustainable human development. UNDP therefore assists in development programmes in many areas with special emphasis on poverty eradication, employment creation and the protection and regeneration of the environment at the request of the governments.

5. Pollution, an issue closely linked with industry, is one such area that the Government of Sri Lanka sought our intervention as early as the beginning of this decade. Our intervention, although is moderate in scale, had gone reasonably a long way to promote the idea of "Cleaner Production", (CP) a preventive strategy which promotes the use of cleaner and more efficient production processes, products and services to reduce waste at source. UNDP assisted Industrial Pollution Reduction Programme (IPRP) has sown this seed of CP in a very fertile ground. I understand that many industries are rallying around to know more about it. Specially the "no cost options" for reducing the waste through out the process, not waiting until it comes to the **"end of pipe line"** which needs expensive treatment, are catching up. The benefits of preventive measures that reduce waste and consumption of energy and water and offer the prospect of utilising or recycling by-products, have become attractive to the industry. More importantly, the industry has started appreciating the environmental and financial benefits of these

preventive measures. However, still many industries are unaware of the benefits of these preventive measures.

6. In this context, this workshop which has brought together a very specific group of entrepreneurs, is a timely intervention. Although the leather industry in Sri Lanka is relatively small, it has great potentials. It needs to address the current constraints urgently to harness its potentials. Given the rapid expansion of the leather sector both in production and export in the neighbouring countries like India and Pakistan, Sri Lanka leather industry has the opportunity of learning from their experience. I trust that this workshop will provide you that opportunity.

9.3.2 PRESIDENTIAL ADDRESS BY MR. MAHINDA BANDUSENA, SECRETARY, MINISTRY OF INDUSTRIAL DEVELOPMENT

1) Leather tanning industry has been classified under the high polluting industry category as per the environmental regulations gazetted in I990. However tanneries became scattered in and around Colombo and they were not in a position to cope up with the requirements of the law due to many reasons such as limited land space, financial constraints, lack of technology etc.

2) Considering the above situation, National Environmental Task Force appreciated the proposal made by Sri Lanka Export Development Board to set up an Industrial Estate solely for the tanning industry, including proper waste water treatment plant and requested the Ministry of Industrial Development to identify a suitable land for this project.

3) Ministry of Industrial Development identified number of lands situated at various parts of the country i.e., St. Martin's Island, Bangadeniya, and a state land at Eluwankulame, both under the Puttalam district, a state land at Balangode in Badulla district and a state land at Bata Atha in Hambantota district.

4) Three (3) potentially best sites out of the above five (5) sites i.e. Eluwankulame, Balangoda and Bata-atha were further scrutinised by Metropolitan Environment Improvement Project (MEIP) and finally Bata Atha site was recommended as the most suitable one for the relocation of tanneries.

5) Subsequently officers of the Ministry of Industrial Development, Export Development Board, Central Environment Authority and Sri Lanka Tanners Association visited this site and agreed in whole to set up a industrial estate at Bata Atha.

6) Meanwhile a new company by the name of SLAT (PVT) Limited was established by the tanners with EDB and MID as co-partners to undertake the implementation of the above project.

7) At this stage the Cabinet of Ministers granted approval to establish four (04) new industrial estates which included Bata Atha.

8) Ministry of Industrial Development with the assistance of Natural Resources Environmental Policy Project (NAREPP - USAID) conducted the Initial Environmental Examination (IEE). Study for the above site and a report was submitted to Central Environment Authority (CEA) subsequently. The CEA having gone through the IEE report directed the Ministry of Industrial Development who is the project proponent to conduct a full Environmental Impact Assessment (EIA) study since the discharge of chrome in leather tanning is considered to be of a high polluting nature.

9) It was agreed upon that the Ministry of Industrial Development will be responsible for the provision of infrastructure facilities upto the perimeter of the industrial estate, whilst the internal development aspect would have to be borne by SLAT (Pvt) Ltd.

10) The project would consist of I50 acres, of which acres belonging to the Ambalantota Divisional Secretary's Division has already been handed over, whilst the balance 45 acres which belong to the Tangalle Divisional Secretary's area has been reserved.

11) Subsequent to the initiatives made by the Ministry of Industrial Development, SLAT (Pvt) Ltd., approached the National Development Bank to obtain assistance from the Pollution Control Abatement Fund for the work connected with the internal development of the site. NDB has assured assistance for this project.

12) Meanwhile Environmental Impact Assessment Study report was submitted to Central Environmental Authority and approval was granted, subject to two (2) conditions:

- regarding confirmation of the availability of water
- treatment and discharge of tannery effluent

13) The Ministry of Industrial Development on the advise of the Central Environmental Authority has entrusted to the Water Resources Board regarding (a) above and has also sought the assistance of the UNIDO project in relation to (b), UNIDO responded positively to the request made as they were already negotiating an Assistance Programme for the improvement of the Tanning Industry in Sri Lanka. Subsequently, the tanning sector was included as a sector to be given assistance by UNIDO through the Industrial Pollution Reduction Programme, in addition to the three sectors already receiving assistance.

14) The Ministry appreciated with gratitude the role played by the Regional Programme for Pollution Control in the Tanning Industry in South East Asia in Madras and also particularly the role played by Mr. A. Sahasranaman - Programme Co-ordinator and his staff for making this project a reality.

15) A main component of the assistance received was the supply of two Chrome Recovery Plants to prevent pollution at the existing sites. It was decided to commission these two plants, one at Hendala and the other at Rajagriya to prevent discharge of chrome to environment. These plants will be finally transferred to Bata Atha Site when the tanning operations are shifted to the site.

16) It should be mentioned that the re-location of tanneries project at Bata Atha has received highest patronage from the Government and has been included in the National Industrial Pollution Management Statement signed by three (3) Ministers and approved by the Cabinet. It has also been included in the Government's Public Investment Programme.

17) When we the UNIDO team in March I997 and also at subsequent meetings, Mr. Sahasranaman assured me that the provision of assistance from their package including improving of cleaner technology in tanning industry, preparation of project reports including designs and specification of machinery and equipment for effluent treatment plant for the project, installation of chrome recovery plant, would be complete before end of I997 and we are happy that Mr. Sahasranaman and the Regional staff have kept to their promise and delivered the foods within the given time frame.

9.3.3 POLLUTION REDUCTION WITH A NEW APPROACH
Dr. V U Ratnayake, National Project Manager, IPRP, Colombo

1) The term environment is a widely spoken subject today. The groups in the forefront showing much interests in this direction are environment enthusiasts, environment legislators and administrators, representatives of non-governmental organizations and the members of the general public. This interest to safeguard the environment has emerged largely during the latter part of this century and that too originated in a big way as a result of the earth summit decisions taken in Stockholm and elsewhere. Soon afterwards, a growing enthusiasm to safeguard the environment built up all over the world and as a result a large number of environmental movements began to emerge. These organizations later on forced their respective governments to introduce extensive legislation, notably laws regulating the quality of air, water, soil, noise, pesticides, toxic chemicals and laws to protect endangered species and ocean dumping.

2) Although, such legal frameworks came into force almost all over the world simultaneously and irrespective of the degree of development of the individual countries, the scientific understanding. of the mechanism of the distribution of environmental resources, their interactions and the coexistence of the key players of the eco system is yet to be fully understood. There are various types of explanations given by various groups working at different centres of the world, but still the theories put

forward by them remain opened. In fact, the definition of the word environment is yet to be evolved to suit the nature of the present day demand for it. So, are the complications created by the approaches to protect the environment.

3) My own experience during the past ten years or so in the administration of environmental pollution control tells that the environmentalists seem to worry more about solving matters arising from trivial risks while ignoring those generated from the vital few. Worries about the remote possibility of the presence of trihalomethaue in drinking water, chances of emission of methane gas from age old paddy fields, smoke emission from wood fired home kitchens, toxicity of ayurvedic medicaments etc. are a few examples. However, the vital areas of environmental pollution leading to serious health hazards such as vectorborne diseases arising from mosquito menace, pollution arising from burning mosquito coils, threats to well being of humans due to piling up of urban garbage etc. receive second class attention. A programme to detect colon cancer among young men and women may cost only a fraction of the would be cost of implementing regulations to reduce water borne exposure to trihalomethane. Likewise, to illustrate a programme to regulate air borne exposure to benzene may cost millions but may go through, whereas strengthening low cost environmental educational programmes or educating the industrialists ways of minimising wastes to achieve pollution control may remain under-funded or ignored.

4) The national approach to pollution control in Sri Lanka so far has been simply the attempts to implement the existing environmental regulations. The reason for this was that the legal profession strongly believed that providing provisions in the legal regime and enforcing such regulations can effectively solve pollution control problems. This method of approach, at least in this country, had not been so successful due to a variety of reasons. One major reason in the forefront is that the industry is totally ignorant of upgrading the quality of wastes although they are capable of transforming raw materials into value added products. The transfer of technology to control pollution or to upgrade the wastes into acceptable levels from the developed west has not been so effective.

5) During reviews of failure to effectively control the environmental pollution by enforcing environmental regulations the authorities introduced the age old nuisance control regulations provided under the penal code. These laws were promulgated during the British rule to grant a relief in the face of actual public nuisance created by the neighbours. In this situations the magistrates of the colonial regime used reasonable men such as the village headman, head master of the school or a person of such integrity to report back in the courts to the effect that such a nuisance actually exists before the court took action. Nowadays however such regulations cannot be practised because the reasonable men do not exist in our society today. However the activities of such reasonable men are now being replaced by sophisticated scientific instruments capable of reporting incidences of such nuisances at an utmost precision. Use of these instruments have been

encouraged by the National Environmental Act. However both these regulations, Environmental Act as well as the Nuisance Regulations exist alongside one another and that has created a certain amount of confusion created among the industrialists as to what regulation to follow for compliance.

6) This is the time when the Industrial Pollution Reduction Programme arrived in the country with a mass of experience specially in the area of waste minimisation possibilities to reduce pollution thereby reducing costs and increasing productivity. Clean technologies, recycling and good housekeeping can dramatically cut both the amount of consumption of raw materials and generation of wastes resulting in lesser impact on the environment, increased efficiency and quality at no or less cost. In fact some of the options practised during cleaner studies found that the majority of options practised had very short payback periods of less than one year and indeed some of the options were cost less. Waste minimisation in many industrial cases were found lot cheaper than the treatment of waste.

7) However, the Sri Lankan culture is such that the country does not have a good waste record. Sri. Lankans are generally used to waste at home, "Home raw materials" such as sugar, electricity, water, papers, vegetables, cooked and fresh foods, soaps etc. knowingly or unknowingly that it is a wastage of considerable amount of money annually. The workers used to waste a lot of their raw materials when performing light jobs such as repairing roads, stitching clothes, while selling grocers, and so forth.

8) With this syndrome, the shop floor workers in industrial facilities used to liandle materials without much care for the purpose of saving raw and finish material and increase productivity. This is mainly due to bad corporate cultures practised for good long years that the cost of such wastes are built into the company budget, so that the top management does not realise that the cost of their produce is more expensive, than for example, the imported due to this hidden cost of the wastes. The fellow local companies also practice the same procedure producing the competitive goods at the same price. The wastes are generally their own raw materials, energy, water, man hours, down time of machinery and equipment, late attendance and excessive holidays enjoyed by workers and so forth. All these add to the cost resulting in their inability to stay in the business.

9) The cleaner production theory is entirely a different story altogether. Any manufacturing organisations can easily adopt this technique to suit their organisation culture. Only exercise they should follow is to carry out a waste audit programme highlighting the Material balance in case of production process and energy balance for the purpose of seriously studying possibilities of saving energy sources such as saving gas, electricity, fuel oil and so forth.

10) During these studies it is very important for the staff of the production and other management groups to participate with the assistance of the external

auditor or a group of editors to enable the entire team to undertake a in depth study of the waste audit. This team needs a training in the methodology of the carrying out of the technique and then the team produces a complete and comprehensive report for the management to take decisions.

11) For example installation of a direct steam injection in a distillery, replacing faulty steam traps, insulation of bare steam pipes, control of excess air in the boiler flue gas, recovery of condensate, adjusting the main steam valves etc. can very easily save millions of Rupees worth fuel oil consumption annually. If these are not controlled properly the excess of the raw materials used represents a considerable amount of pollution in to the atmosphere.

12) The foregoing shows that the cleaner production is one of timing as far as the method of pollution control is concerned whereas all the other methods available involve treating the final effluent after it is generated whereas clean technology reduces the generation of the effluent or completely eliminates it at a very low or a no cost.

9.3.4 IMPLEMENTATION OF CLEANER TECHNOLOGIES IN TANNERIES IN SRI LANKA.

SHRI K PARTHASARATHY, Dr PG RAO

INDUSTRIAL POLLUTION REDUCTION PROGRAMME IN TANNERIES IN SRILANKA

UNIDO PROJECT : DG/SRL/91/019

IMMEDIATE OBJECTIVE

- TO APPLY COST EFFECTIVE POLLUTION PREVENTION AND ABATEMENT MEASURES IN TANNING INDUSTRY IN SRILANKA

OUTPUT ANTICIPATED

- TO IMPLEMENT CLEANER PROCESSES IN THREE VOLUNTEER TANNERIES SIGNIFICANTLY REDUCING INDUSTRIAL POLLUTION EMANATING FROM THESE TANNERIES
- SUCH IMPROVED PRACTICES WILL BE DEMONSTRATED TO OTHER TANNERIES IN THE TRAINING PROGRAMME FOR ALL TANNERIES IN SRILANKA

FOCUS OF THE STRATEGY

- TO REDUCE WATER CONSUMPTION
- TO REDUCE CHEMICAL CONSUMPTION
- TO REDUCE DISCHARGE OF OTHER CONTAMINANTS IN TH EFFLUENT BY REDUCTION AT SOURCE

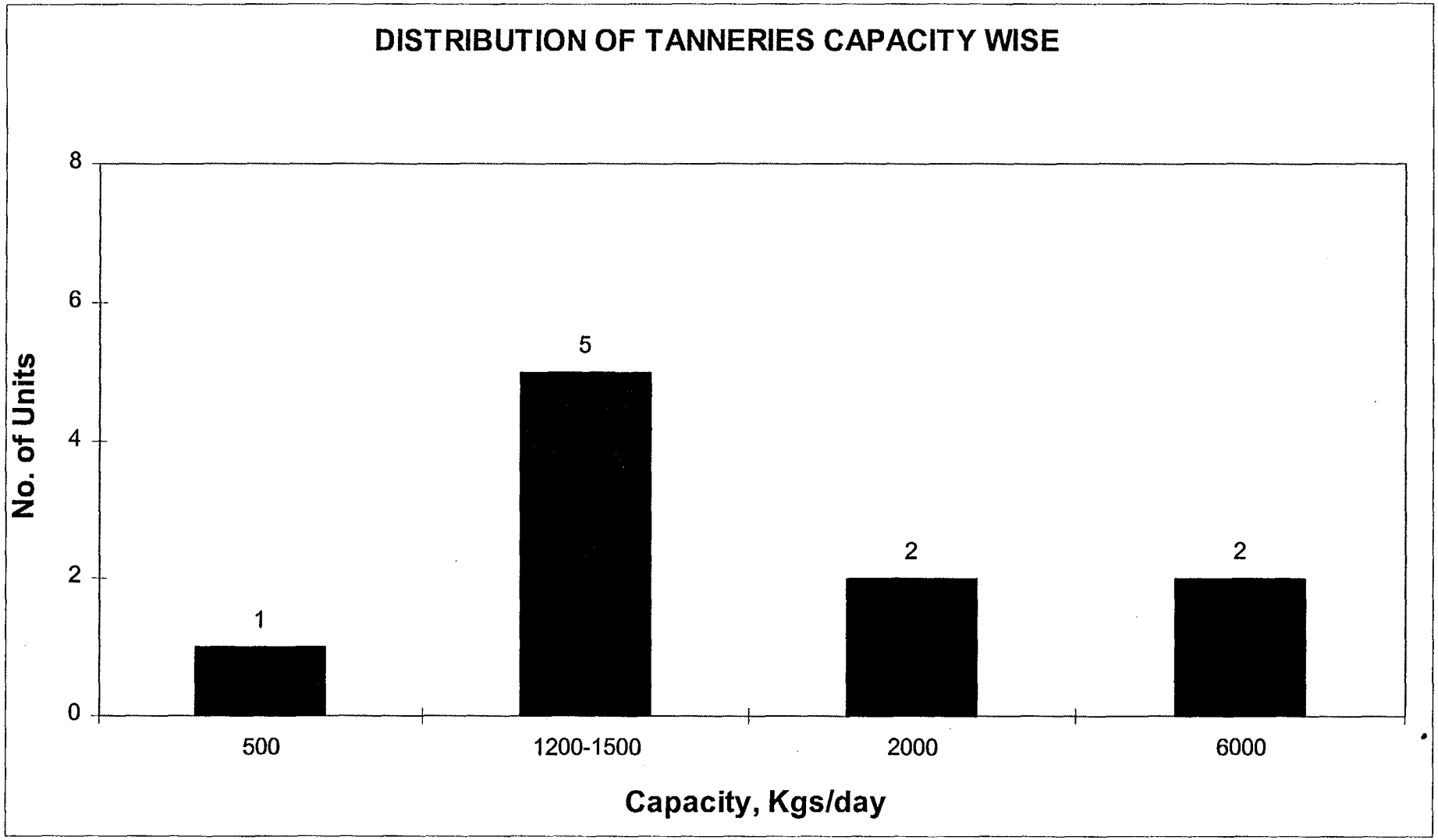
DIRECT TECHNICAL INPUTS

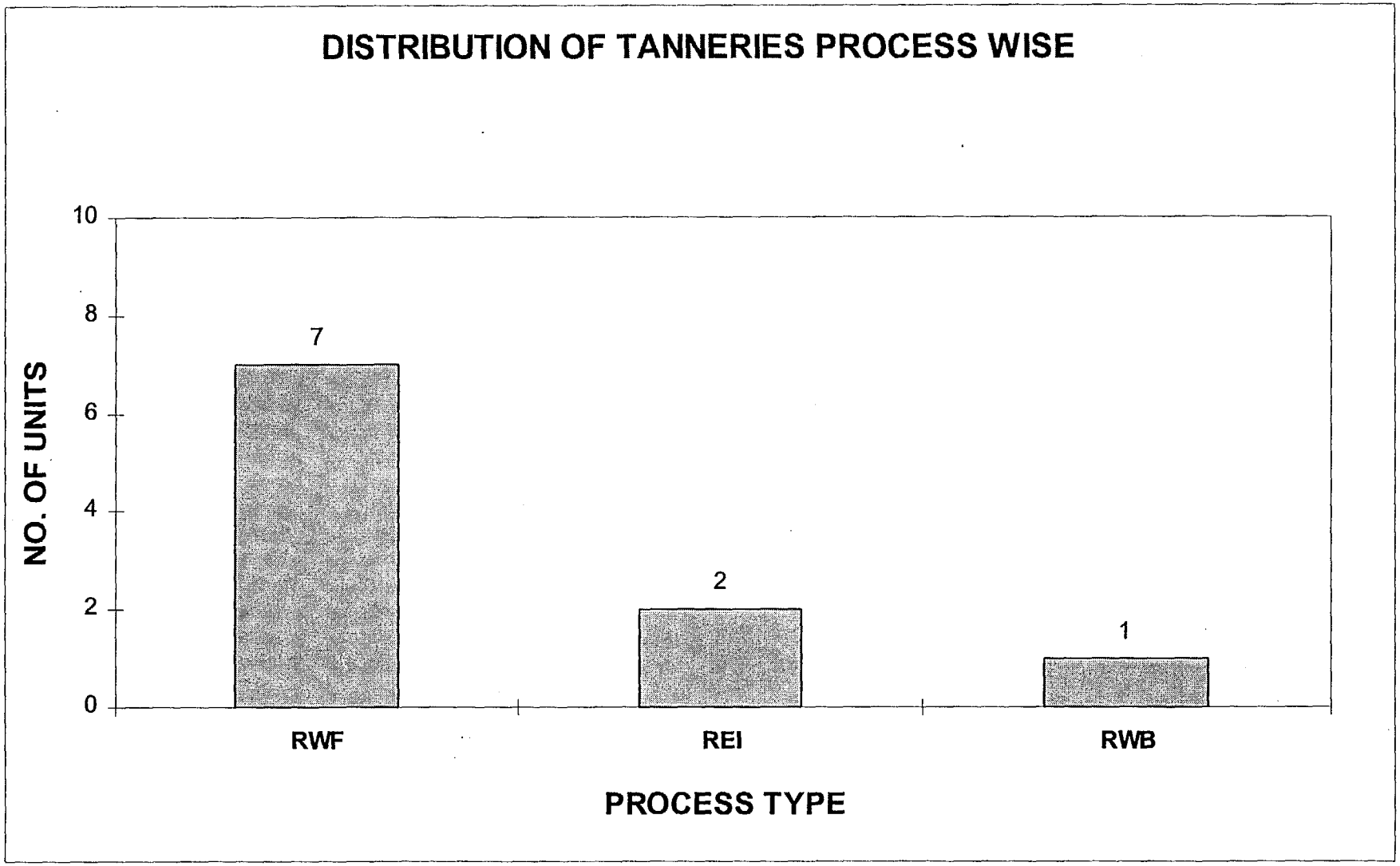
- SALT REMOVAL AND REUSE
- WATER MANAGEMENT
  - RECYCLING OF SOAK LIQUOR
  - REUSE OF RELIMING LIQUOR IN LIMING
- ENZYMATIC UNHAIRING
- SEGREGATION OF CHROME LIQUOR
- BETTER HOUSE KEEPING
- ADVICE ON OCCUPATIONAL SAFETY AND HEALTH ASPECTS FOR TANNERY WORKERS AND MANAGEMENT

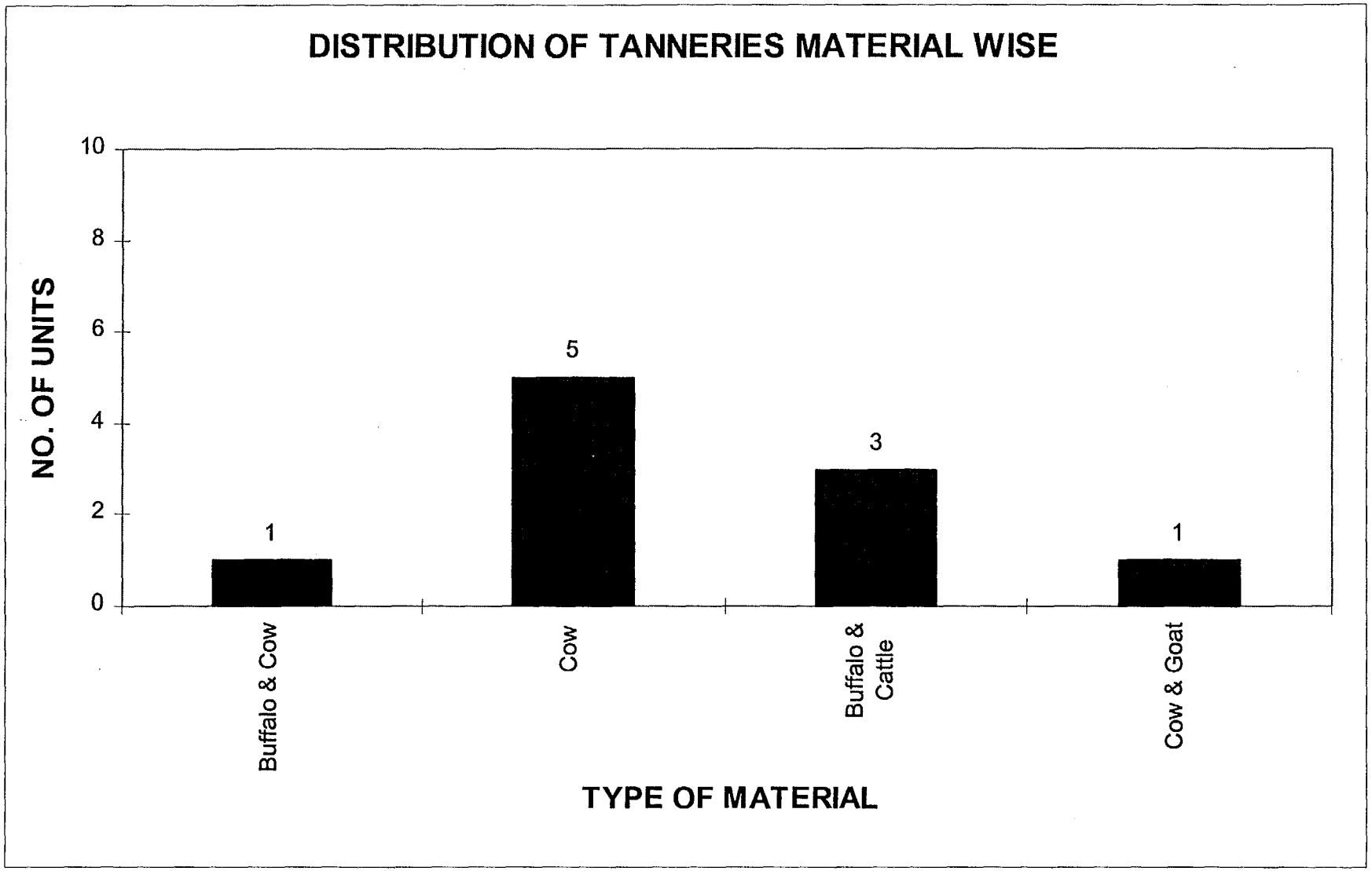
WORK ELEMENTS IDENTIFIED

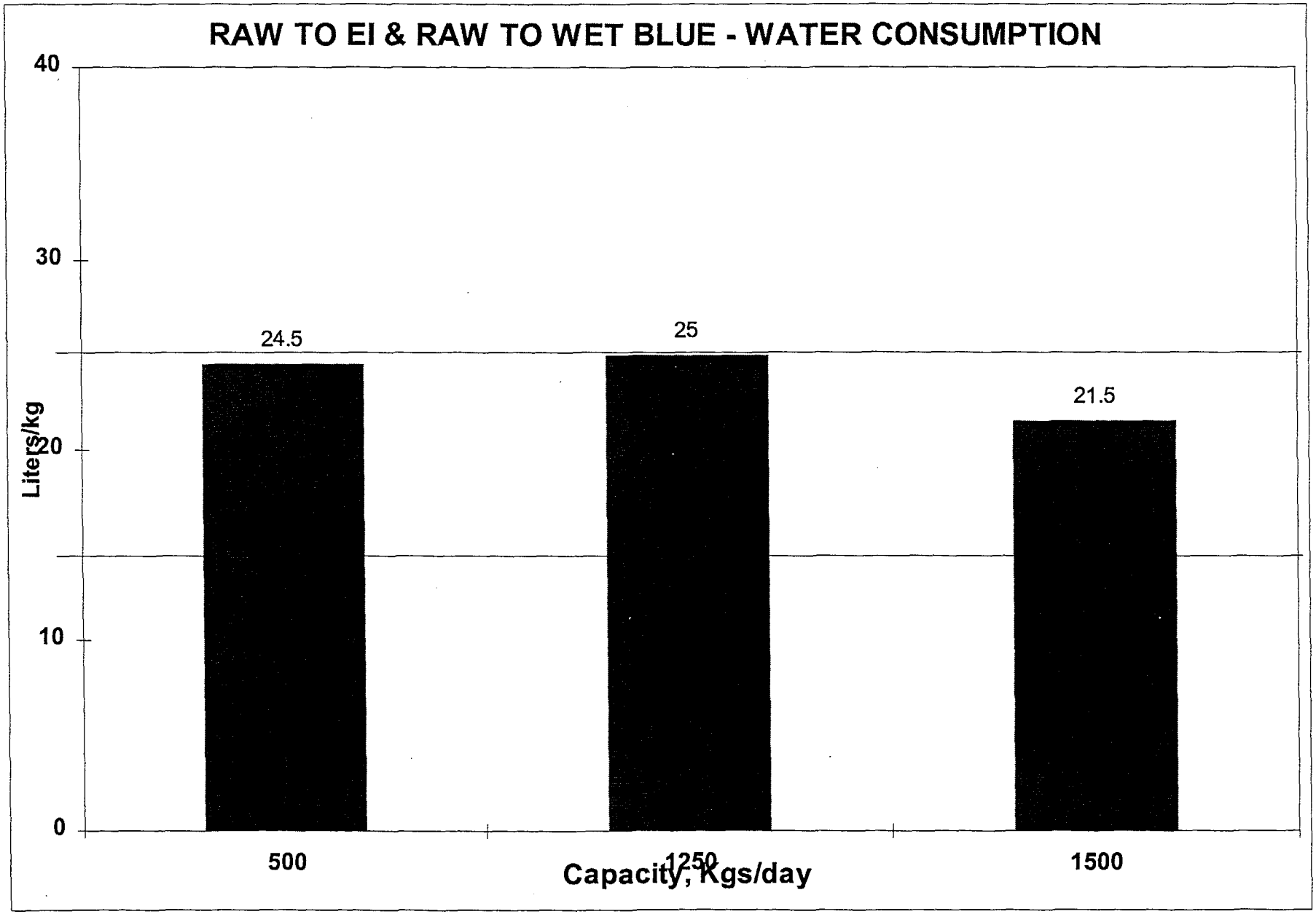
- INVENTORY SURVEY
- COLLECTION OF DATA
  - BASELINE DATA ON TANNERY SECTOR
  - WATER & CHEMICAL INPUTS
  - WASTE WATER GENERATED
- CHOICE OF CLEANER TECHNOLOGY ELEMENTS
- DEMONSTRATION OF CLEANER TECHNOLOGIES
- ESTABLISHMENT OF ENVIRONMENTAL AND OTHER BENEFITS OF CLEANER TECHNOLOGIES.
- TRAINING
- DOCUMENTATION

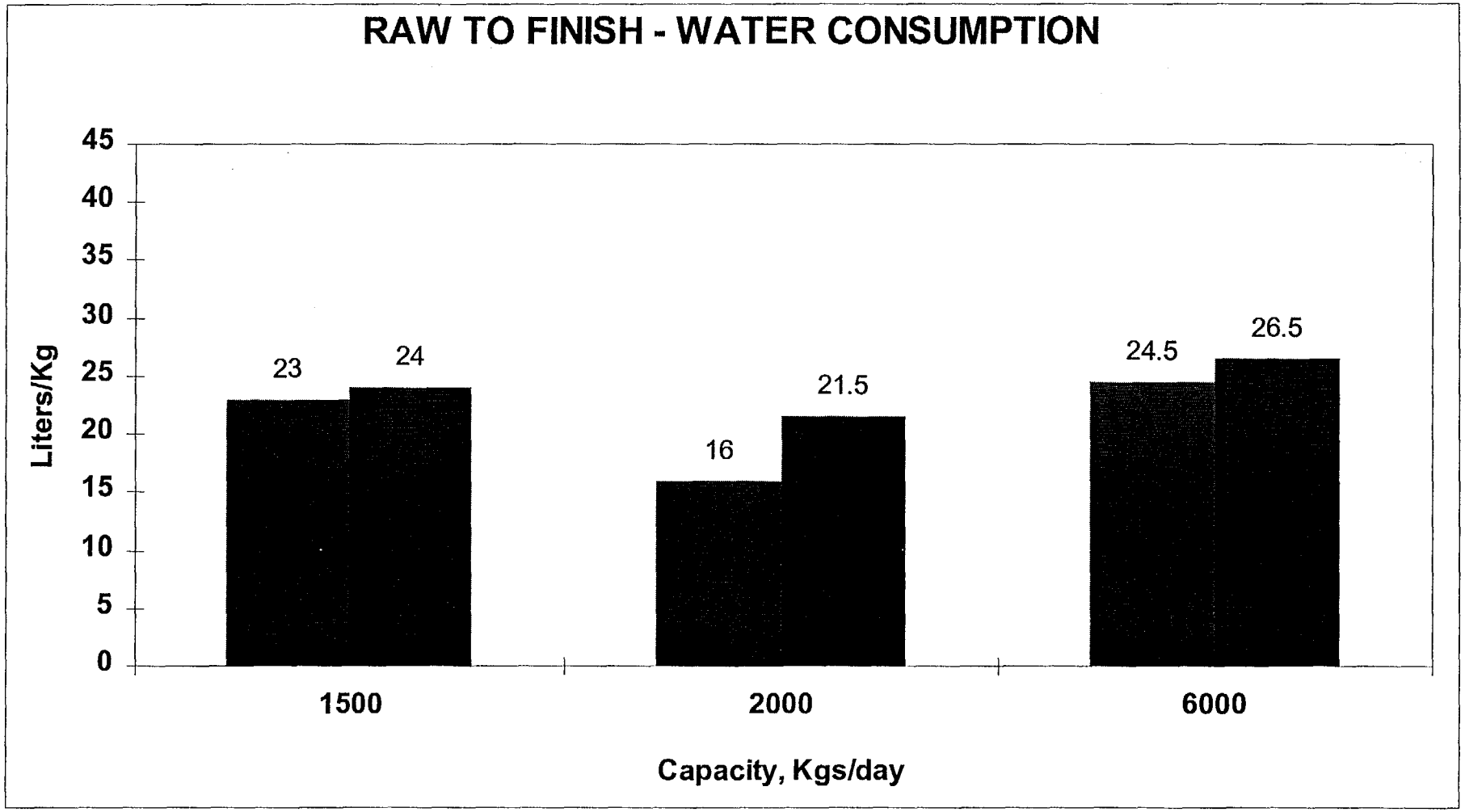
STATUS OF TANNING INDUSTRY IN COLOMBO


DISTRIBUTION OF TANNERIES CAPACITY WISE
No. of Units
8
6
4
2
0
1
5
2
2
500
1200-1500
2000
6000
Capacity, Kgs/day


DISTRIBUTION OF TANNERIES PROCESS WISE
NO. OF UNITS
10
8
6
4
2
0
7
2
1
RWF
REI
RWB
PROCESS TYPE


DISTRIBUTION OF TANNERIES MATERIAL WISE
NO. OF UNITS
10
8
6
4
2
0
1
5
3
1
Buffalo & Cow
Cow
Buffalo & Cattle
Cow & Goat
TYPE OF MATERIAL


RAW TO EI & RAW TO WET BLUE - WATER CONSUMPTION
40
30
20
10
0
Liters/kg
24.5
25
21.5
500
1250
1500
Capacity, Kgs/day

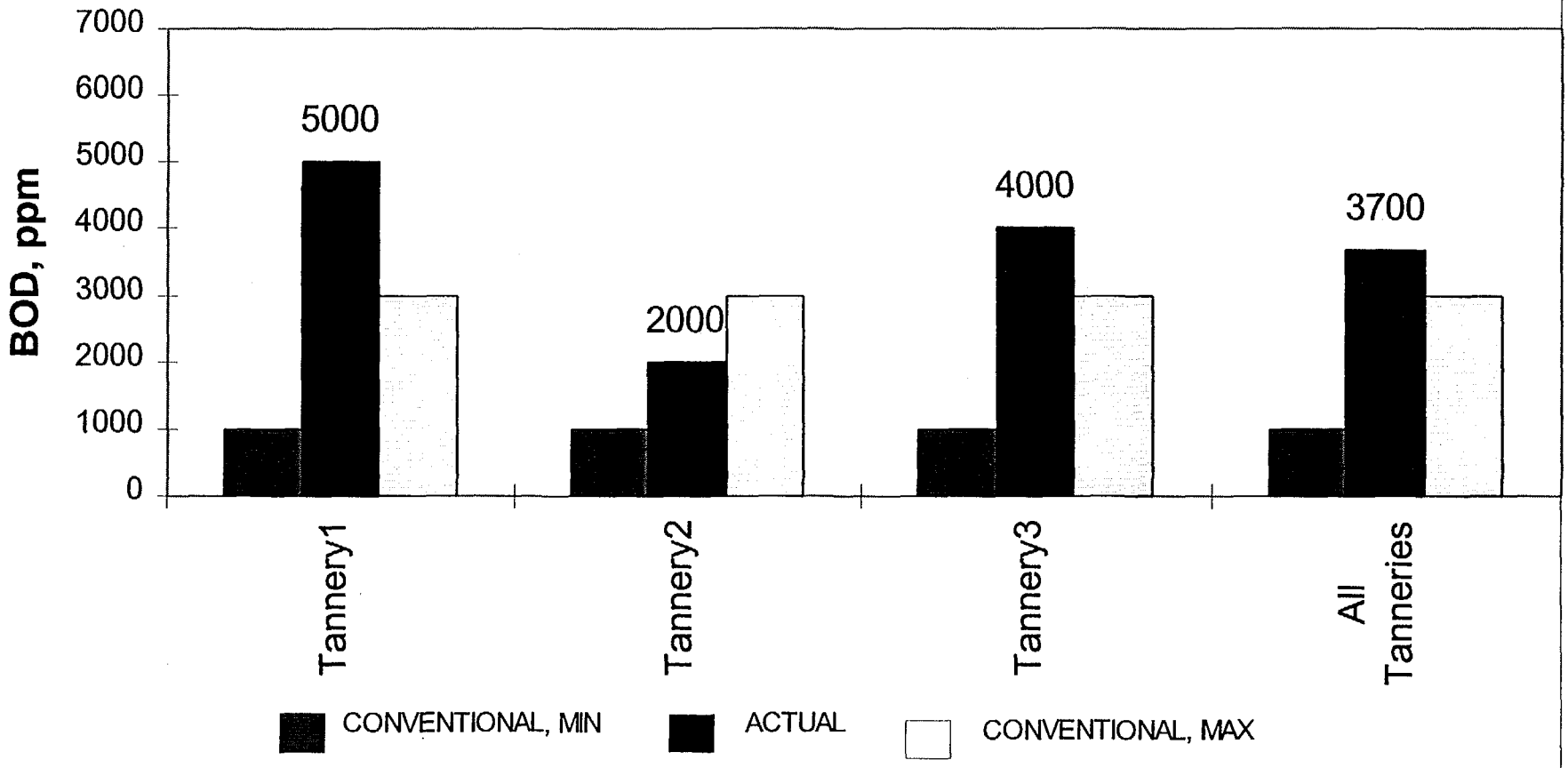

RAW TO FINISH - WATER CONSUMPTION
Liters/Kg
45
40
35
30
25
20
15
10
5
0
23
24
16
21.5
24.5
26.5
1500
2000
6000
Capacity, Kgs/day

IDENTIFIED TANNERIES FOR IMPLEMENTATION OF CLEANER TECHNOLOGIES

- M/S MAM ABDUL CADER & CO
- M/S MUBARAK LEATHER PRIVATE LIMITED
- NM MOHAMED MOHIDEEN TANNERY LIMITED

STATUS OF PARAMETERS IN SELECTED TANNERIES BEFORE IMPLEMENTATION

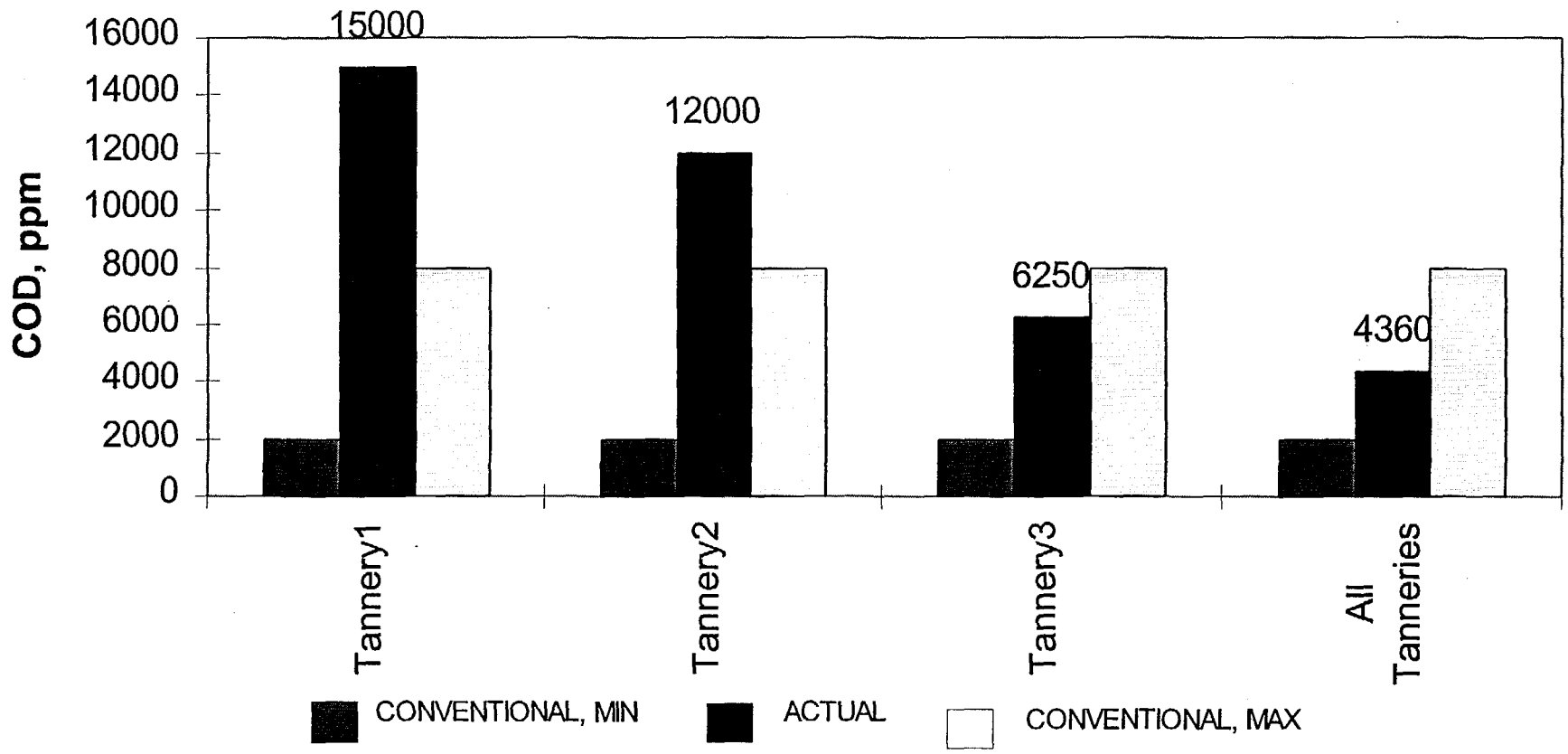
COMPARISION OF STATUS OF VARIOUS PARAMETERS OF COMPOSITE SAMPLES - BOD, ppm



Tannery 1 : M/s. Mubarak Leather Pvt. Ltd., Tannery
Tannery 2: M/s. MAM Abdul Cader & Co. Pvt. Ltd.
Tannery 3: M/s. NM Mohamed Mohideen Tannery

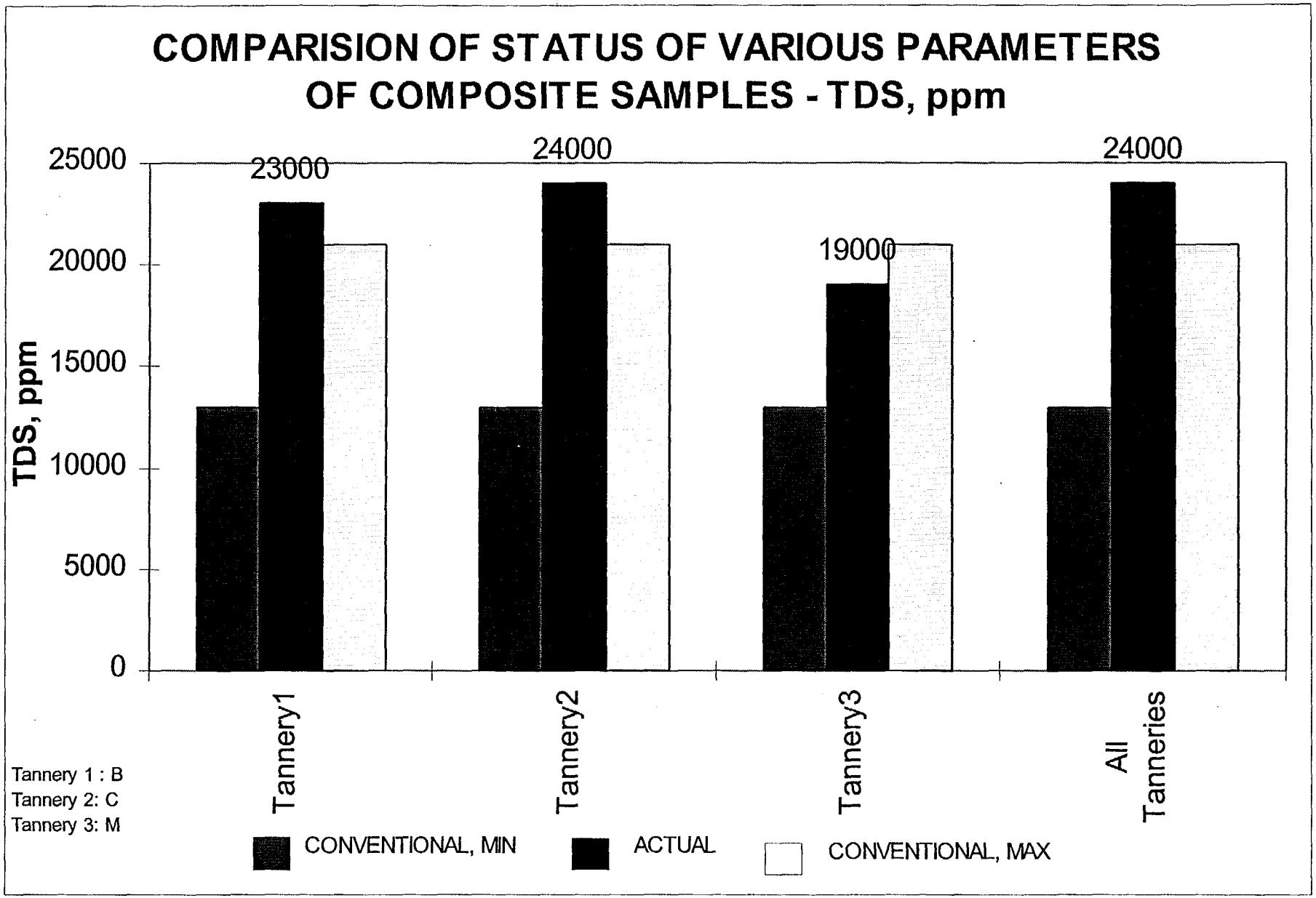
Note : Data collected during the survey

COMPARISION OF STATUS OF VARIOUS PARAMETERS OF COMPOSITE SAMPLES - COD, ppm

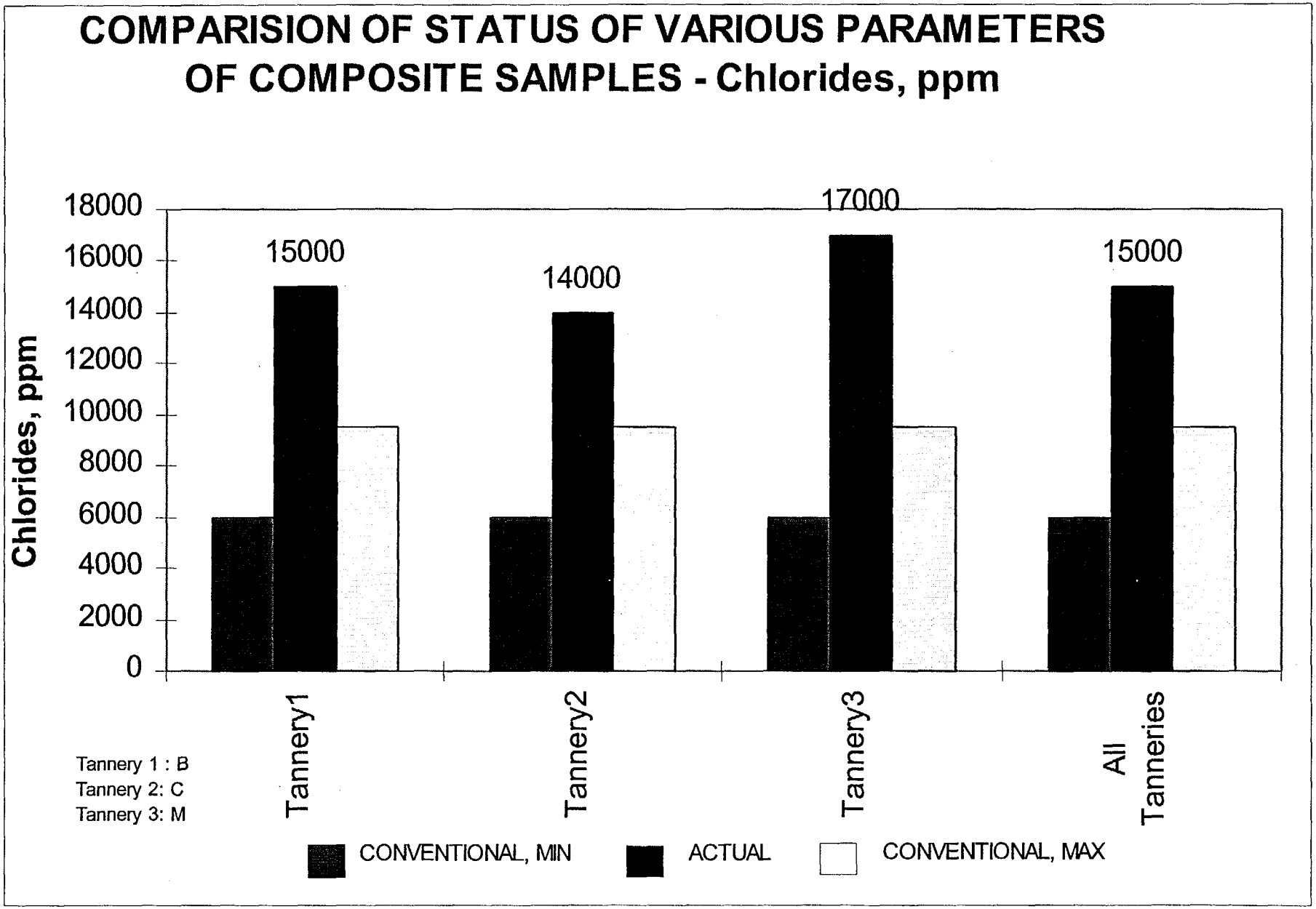


Tannery 1 : M/s. Mubarak Leather Pvt. Ltd., Tannery
Tannery 2: M/s. MAM Abdul Cader & Co. Pvt. Ltd.
Tannery 3: M/s. NM Mohamed Mohideen Tannery

Note : Data collected during the survey

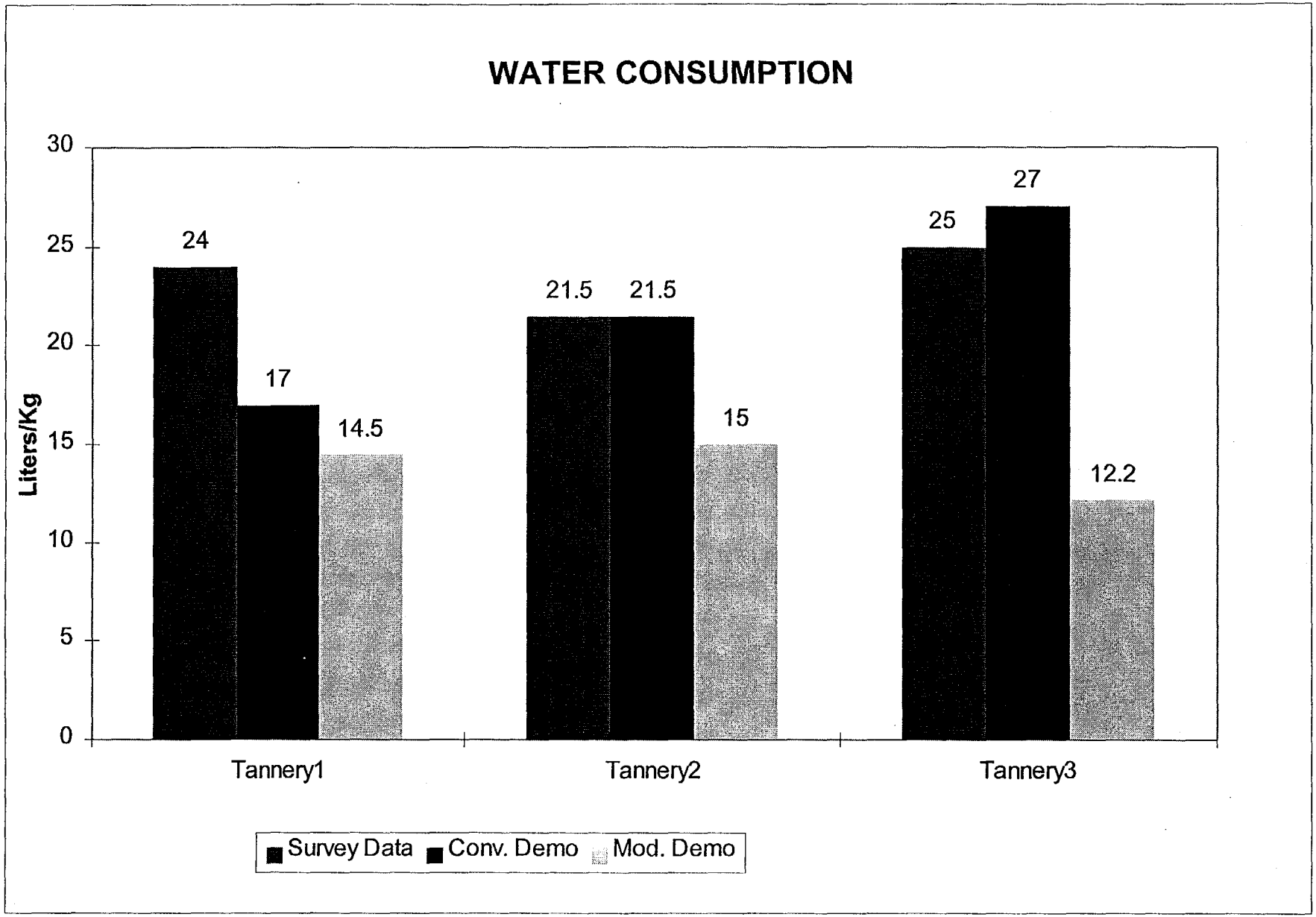


Note : Data collected during the survey



Note : Data collected during the survey

STATUS OF PARAMETERS IN SELECTED TANNERIES AFTER IMPLEMENTATION OF CLEANER TECHNOLOGIES



Tannery 1 : M/s. Mubarak Leather Pvt. Ltd., Tannery
Tannery 2: M/s. MAM Abdul Cader & Co. Pvt. Ltd.
Tannery 3: M/s. NM Mohamed Mohideen Tannery

MUBARAK **COW HIDES RAW TO WET BLUE**

Summary of Emission loads in effluents from individual processing operations

Operation	Process	Water	Emission load kg/t							
		M3/t	BOD	COD	TDS	TSS	TS	Cl^-	Sul	Cr
Soaking	**T**	**6.0 - 9.0**	**6.6 - 22.5**	**18 - 54**	**192 - 432**	**18 - 63**	**210 - 495**	**90 - 270**		
	C	4.00	6.26	18.91	161.28	4.62	165.90	86.14		
	M	4.50	4.38	9.33	88.32	1.38	89.70	45.64		
	D %	12.50	-29.95	-50.66	-45.24	-70.13	-45.93	-47.02		
Liming	**T**	**3.0 - 4.0**	**15 - 40**	**30 -100**	**72 -120**	**18 - 80**	**90 - 200**	**12.0 - 32**	**1.7 - 7.7**	
	C	5.90	55.46	106.62	200.63	19.50	220.13	51.45	1.89	
	M	5.90	18.23	35.34	87.67	23.32	110.99	20.41	0.33	
	D	0.00	-67.13	-66.85	-56.30	19.58	-49.58	-60.32	-82.50	
Deliming	**T**	**1.0 - 2.0**	**1.0 - 6.0**	**2.5 - 14**	**2.5 - 12**	**1.5 - 8.0**	**4 - 20.0**	**1.0 - 4.0**	**0.04 - 0.1**	
	C	1.50	1.74	10.01	35.21	3.23	38.44	5.17	0.30	
	M	1.75	1.54	6.27	17.16	3.35	20.51	2.13	0.05	
	D %	16.67	-11.29	-37.33	-51.27	3.93	-46.63	-58.75	-83.89	
Pickling	**T**	**0.5 - 1**	**0.2 - 0.7**	**0.5 - 3**	**17 - 67**	**0.5 - 3**	**17.5 -70**	**10.0 - 30.0**		
	C	0.00	0.00	0.00	0.00	0.00	0.00	0.00		
	M	0.00	0.00	0.00	0.00	0.00	0.00	0.00		
	D %									
Cr. Tan	**T**	**1.0 - 2.0**	**0.35 - 1.6**	**1.0 - 5.0**	**29 - 115**	**1.0 - 5.0**	**30 - 120**	**15 - 50**		**2 - 10**
	C	1.00	0.48	6.44	95.41	1.24	96.65	19.83		1.28
	M	1.20	0.38	4.46	66.38	0.25	66.63	15.87		0.68
	D	20.00	-21.25	-30.70	-30.43	-79.60	-31.06	-19.97		-46.96
Overall	**T**	**11.5-18.0**	**23.2-70.8**	**52-176**	**312.5-746**	**39-159**	**351.5-905**	**128-386**	**1.74 - 7.8**	**2 - 10**
(Including	C	17.10	63.93	141.99	492.54	28.58	521.12	162.59	2.19	1.28
Washings	M	14.55	24.53	55.41	259.53	28.30	287.83	84.06	0.38	0.68
& Spillage	D %	***-14.91***	***-61.63***	***-60.98***	***-47.31***	***-0.98***	***-44.77***	***-48.30***	***-82.69***	***-46.96***

MAM

BUFF HIDES RAW TO WET BLUE

Summary of Emission loads in effluents from individual processing operations

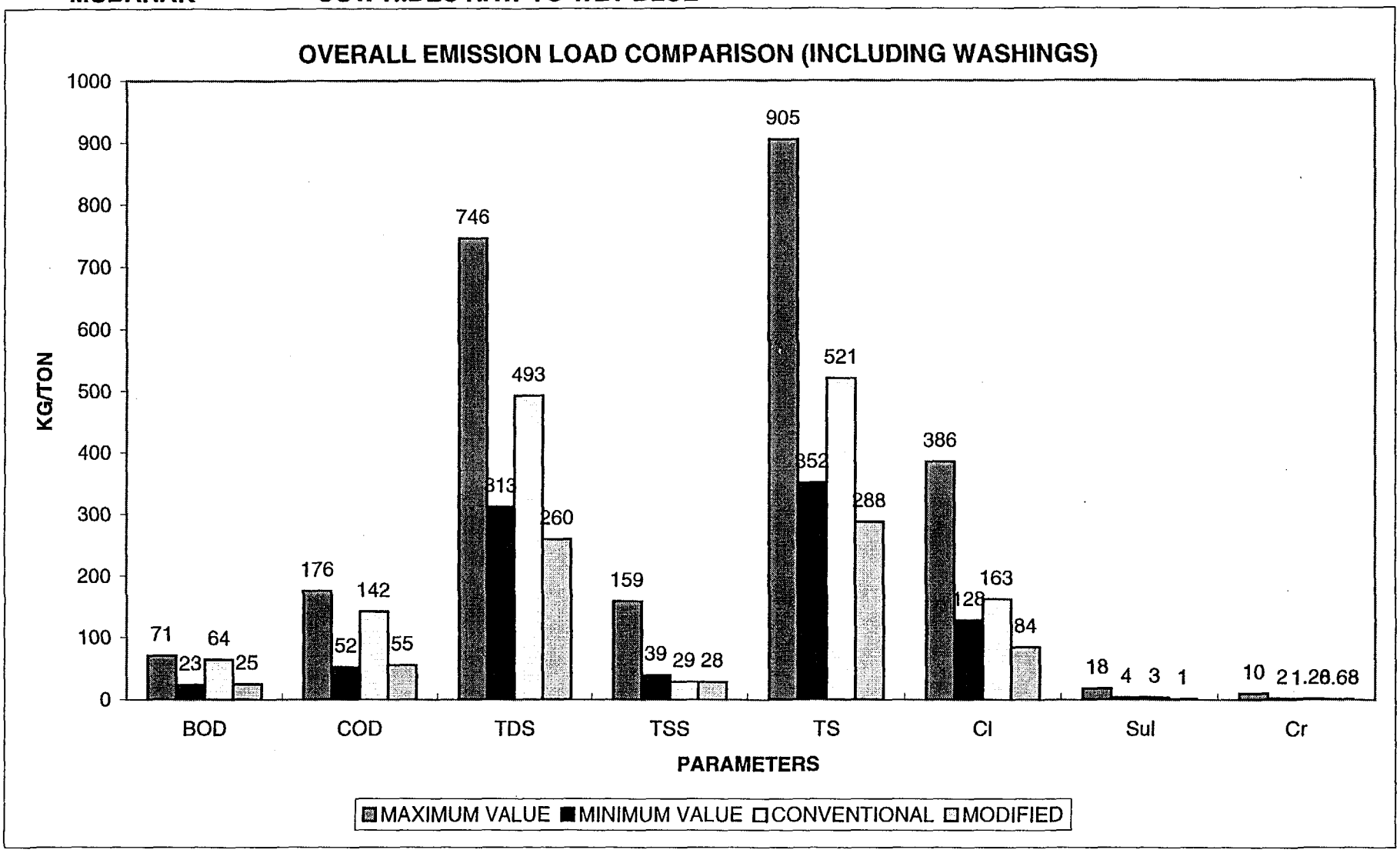
Operation	Process	Water	Emission load kg/t							
		M3/t	BOD	COD	TDS	TSS	TS	Cl^-	Sul	Cr
Soaking	**T**	**6.0 - 9.0**	**6.6 - 22.5**	**18 - 54**	**192 - 432**	**18 - 63**	**210 - 495**	**90 - 270**		
	C	9.00	18.92	44.49	171.34	17.70	189.04	95.20		
	M	4.00	4.15	6.56	43.97	2.92	46.89	23.87		
	D %	-55.56	-78.06	-85.25	-74.34	-83.48	-75.19	-74.93		
Liming	**T**	**3.0 - 4.0**	**15 - 40**	**30 -100**	**72 -120**	**18 - 80**	**90 - 200**	**12.0 - 32**	**1.7 - 7.7**	
	C	2.00	20.40	87.37	89.61	45.92	135.53	30.02	1.39	
	M	1.50	2.70	7.58	64.40	8.77	73.16	15.44	0.30	
	D	-25.00	-86.76	-91.33	-28.14	-80.90	-46.02	-48.58	-78.71	
Deliming	**T**	**1.0 - 2.0**	**1.0 - 6.0**	**2.5 - 14**	**2.5 - 12**	**1.5 - 8.0**	**4 - 20.0**	**1.0 - 4.0**	**0.04 - 0.1**	
	C	7.00	6.26	20.16	38.86	8.89	47.75	3.07	0.28	
	M	3.00	3.18	11.11	25.82	5.74	31.56	3.01	0.16	
	D %	-57.14	-49.18	-44.91	-33.55	-35.41	-33.90	-1.99	-41.83	
Pickling	**T**	**0.5 - 1**	**0.2 - 0.7**	**0.5 - 3**	**17 - 67**	**0.5 - 3**	**17.5 -70**	**10.0 - 30.0**		
	C	0.00	0.00	0.00	0.00	0.00	0.00	0.00		
	M	0.00	0.00	0.00	0.00	0.00	0.00	0.00		
	D %									
Cr. Tan	**T**	**1.0 - 2.0**	**0.35 - 1.6**	**1.0 - 5.0**	**29 - 115**	**1.0 - 5.0**	**30 - 120**	**15 - 50**		**2 - 10**
	C	0.80	0.30	1.74	52.00	0.87	52.87	13.04		0.63
	M	0.60	0.47	2.30	46.90	0.61	47.51	13.13		0.49
	D	-25.00	54.93	32.35	-9.81	-29.56	-10.14	0.67		-21.56
Overall	**T**	**11.5-18.0**	**23.2-70.8**	**52-176**	**312.5-746**	**39-159**	**351.5-905**	**128-386**	**1.74 - 7.8**	**2 - 10**
(Including	C	28.47	45.88	153.76	351.81	73.38	425.19	141.33	1.67	0.63
Washings	M	12.74	10.50	27.55	181.09	18.05	199.13	55.44	0.46	0.49
& Spillage	D %	***-55.25***	***-77.11***	***-82.08***	***-48.53***	***-75.40***	***-53.17***	***-60.78***	***-72.55***	***-21.56***

NMM COW HIDES RAW TO EI

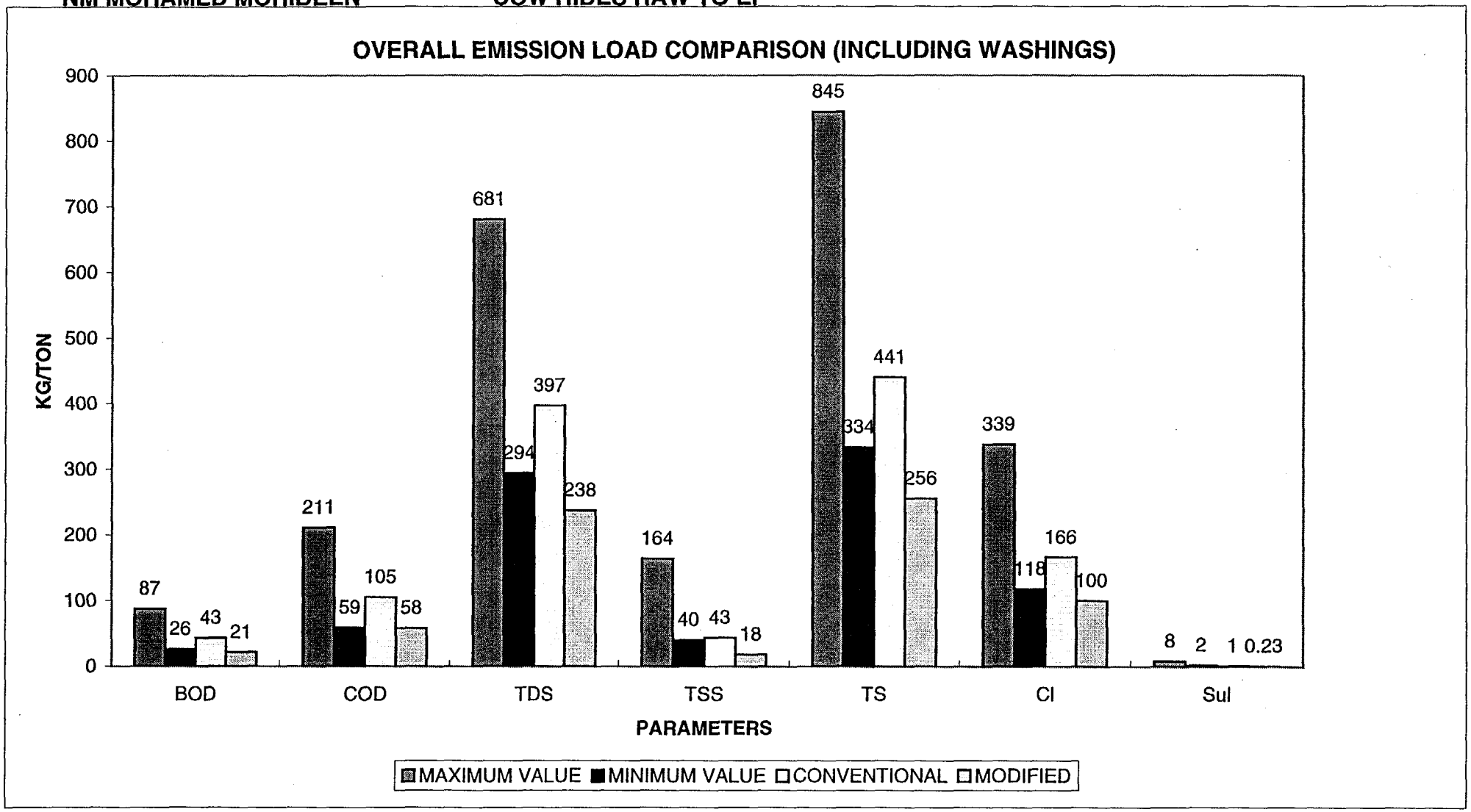
Summary of Emission loads in effluents from individual processing operations

Operation	Process	Water	Emission load kg/t						
		M3/t	BOD	COD	TDS	TSS	TS	Cl^-	Sul
Soaking	**T**	**6.0 - 9.0**	**6.6 - 22.5**	**18 - 54**	**192 - 432**	**18 - 63**	**210 - 495**	**90 - 270**	
	C	7.00	11.42	29.23	202.35	10.36	212.71	106.55	
	M	4.00	7.94	22.92	133.50	7.21	140.71	70.22	
	D %	-42.86	-30.44	-21.60	-34.03	-30.44	-33.85	-34.10	
Liming	**T**	**3.0 - 4.0**	**15 - 40**	**30 -100**	**72 -120**	**18 - 80**	**90 - 200**	**12.0 - 32**	**1.7 - 7.7**
	C	2.00	14.97	35.79	63.54	22.71	86.25	15.44	0.57
	M	2.00	11.25	28.86	41.76	8.61	50.37	8.52	0.17
	D	0.00	-24.86	-19.36	-34.27	-62.09	-41.60	-44.82	-69.26
Deliming	**T**	**1.0 - 2.0**	**1.0 - 6.0**	**2.5 - 14**	**2.5 - 12**	**1.5 - 8.0**	**4 - 20.0**	**1.0 - 4.0**	**0.04 - 0.1**
	C	5.50	3.11	6.96	41.55	5.41	46.96	9.46	0.25
	M	4.00	1.52	3.77	24.68	1.65	26.33	3.45	0.06
	D %	-27.27	-51.17	-45.88	-40.61	-69.55	-43.94	-63.59	-76.04
Pickling	**T**	**0.5 - 1**	**0.2 - 0.7**	**0.5 - 3**	**17 - 67**	**0.5 - 3**	**17.5 -70**	**10.0 - 30.0**	
	C	1.00	1.15	3.66	50.31	0.99	51.30	24.02	
	M	1.00	0.58	2.32	37.75	0.69	38.45	17.58	
	D	0.00	-49.57	-36.63	-24.96	-29.79	-25.05	-26.80	
Veg. Tan	**T**	**1.0 - 2.0**	**0.35 - 1.6**	**1.0 - 5.0**	**29 - 115**	**1.0 - 5.0**	**30 - 120**	**15 - 50**	
	C	2.00	12.09	29.10	39.59	3.86	43.45	10.86	
	M	0.00	0.00	0.00	0.00	0.00	0.00	0.00	
	D	-100.00	-100.00	-100.00	-100.00	-100.00	-100.00	-100.00	
Overall (Including Washings)	**T**	**11.5-18.0**	**23.2-70.8**	**52-176**	**312.5-746**	**39-159**	**351.5-905**	**128-386**	**1.74 - 7.8**
	C	21.60	42.74	104.73	397.34	43.33	440.67	166.33	0.82
	M	15.20	21.29	57.86	237.69	18.16	255.85	99.76	0.23
	D %	***-29.63***	***-50.19***	***-44.76***	***-40.18***	***-58.09***	***-41.94***	***-40.02***	***-71.35***

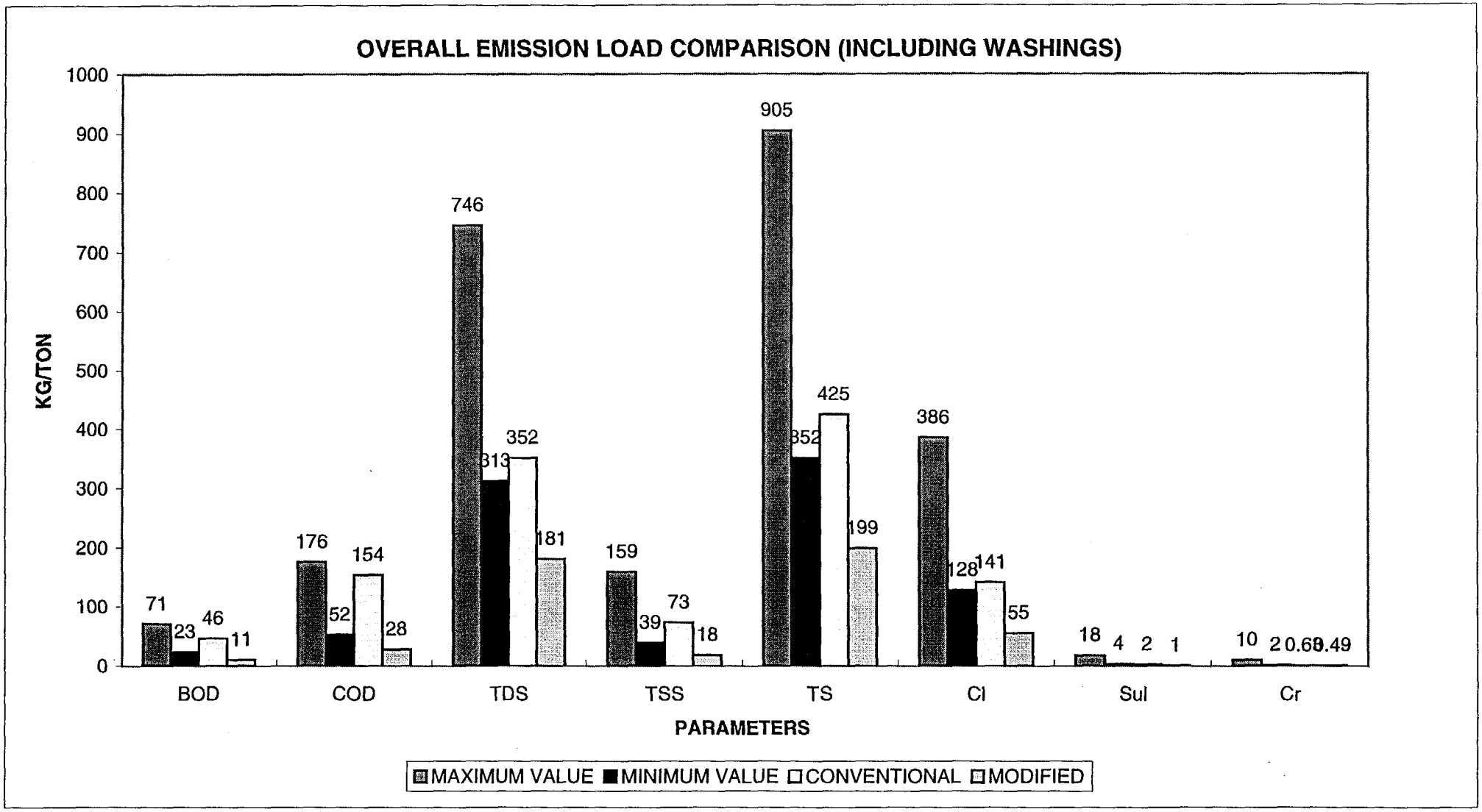
MUBARAK **COW HIDES RAW TO WET BLUE**



NM MOHAMED MOHIDEEN COW HIDES RAW TO EI



MAM ABDUL CADER **BUFF HIDES RAW TO WET BLUE**



STATUS OF SAVINGS IN MATERIAL CONSUMPTION AND ITS COST IMPLICATIONS

Name of Tannery : **M/s Mubarak Leathers Pvt. Ltd.**
Capacity : 3750 Kg/day
Material : W/S Cow hides.
Process : Raw to wetblue

S.No	Name of Chemical	Kgs/day			US$ Cost/Kg	Total Cost/day
		Conventional	Modified	Savings		
1.	Lime	225	487.5	-262.5	0.15	-39.40
2.	Sodium Sulfide	75	37.5	37.50	0.75	28.13
3.	Dehairing enzyme	-	18.75	-18.75	2.75	-51.56
4.	Wetting Agent	-	15.00	-15.00	1.00	-15.00
5.	Ammonium sulfate	75	75.00	0	0.25	0.00
6.	Bate	7.5	7.5	0	1.00	0.00
7.	Salt	225	75	150	0.05	7.50
8.	Formic Acid	18.75	18.75	0	1.00	0.00
9.	Sulfuric Acid	37.5	37.5	0	0.20	0.00
10.	BCS	187.5	168.75	20	0.75	15.00
11.	sodium Acid	-	18.75	-18.75	0.55	-10.30
12.	Sodium Bicarbonate	37.5	48.75	-11.25	0.20	-2.25
13.	Preservative	-	7.50	-7.50	2.50	-18.75
14.	Water	64125	54,562	9562	0.0005	4.78
				Total		-96.84

Saving through Chrome Recovery	14.00
(@ 10% recovery = 18.75 *0.75=14.00)	150.00
Saving through increase in area	
(@ 2% = 3750 *0.02 *US$ 1.0/Sq.ft.=150)	
NET SAVINGS PER DAY, US$	**67.16**

Notes
- The cost benefit of pollution reduction and quality enhancement is not taken into consideration

STATUS OF SAVINGS IN MATERIAL CONSUMPTION AND ITS COST IMPLICATIONS

Name of Tannery : **M/s MAM ABDUL CADER & CO.**
Capacity : 1500Kgs/day
Material : w/s Buffalo hides.
Process : Raw to wet blue

S.No	Name of Chemical	Kgs/day			US$ Cost/Kg	Total Cost/day
		Conventional	Modified	Savings		
1.	Lime	90	195	-105	0.15	-15.75
2.	Sodium Sulfide	30	15	15	0.75	11.25
3.	Dehairing enzyme	-	7.5	-7.5	2.75	-20.63
4.	Wetting Agent	-	6.0	-6.0	1.00	-6.00
5.	Caustic Soda	3	3.0	0	0.20	0.00
6.	Ammonium sulfate	35	35.0	0	0.25	0.00
7.	Bate	9.0	9.0	0	1.00	0.00
8.	Salt	103.5	00.0	103.5	0.05	5.18
9.	Formic Acid	9.0	9.0	0	1.00	0.00
10.	Sulfuric Acid	17.0	17.0	0	0.20	0.00
11.	BCS	94.50	94.50	0.0	0.75	0.00
12.	Sod. Formate	5.15	8.60	-3.45	0.55	-1.90
13.	Sod. Bicarb	17.0	20.5	-3.5	0.30	-1.05
14.	Water	42705	19110	23595	0.0005	11.80
				Total		-17.10
	Saving through Chrome Recovery					7.09
	(@ 10% recovery = 9.45*0.75=7.09)					60.00
	Saving through area increase					
	(@ 2% = 1500&2*0.02*US$1.0/SQ.FT=60.00)					
	NET SAVINGS PER DAY, US$					**49.99**

Notes
- The cost benefit of pollution reduction and quality enhancement is not taken into consideration

STATUS OF SAVINGS IN MATERIAL CONSUMPTION AND ITS COST IMPLICATIONS

Name of Tannery : **M/s N M Mohamed Mohideen Limited**
Capacity : 1500Kgs/day
Material : w/s Cow hides.
Process : Raw to EI

S.No	Name of Chemical	Kgs/day			US$ Cost/Kg	Total Cost/day
		Conventional	Modified	Savings		
1.	Lime	375	240	135	0.15	20.25
2.	Sodium Sulfide	9	9	0	0.75	0.00
3.	Dehairing enzyme	-	7.5	-7.5	2.75	-20.63
4.	Wetting Agent	-	3.5	-3.5	1.00	-3.50
5.	Ammonium sulfate	45	45	0	0.25	0.00
6.	Salt	150	60	90	0.05	4.50
7.	Preservative	0.00	0.00	0.00	2.50	0.00
8.	Formic Acid	-	8.60	-8.60	1.00	-8.60
9.	Sulfuric Acid	15	11.0	4.0	0.20	0.80
10.	Wattle extract	270	300	-30.0	0.50	-15.00
11.	Oxalic acid	7.5	7.5	0	0.53	0.00
12.	Oil	45	45	0	1.30	0.00
13.	Water	32,400	22,800	9600	0.0005	4.80
				Total		-17.38
	Saving through increase in yield					84.00
	(@ 10% = 1500*.35*.1 *US$ 1.6/Kg=84.00)					
	NET SAVINGS PER DAY, US$					66.62

Notes
- The cost benefit of pollution reduction and quality enhancement is not taken into consideration

9.3.5 PANEL DISCUSSION: FUTURE OF SRI LANKA LEATHER INDUSTRY AND BATA ATHA LEATHER COMPLEX

In case of environmental friendly of chemicals used in leather processing, can duties and taxes be lowered, so as to popularise their use and minimise damage to environment. A detailed justification may be sent to CEA, who in principle supports these on case by case basis for onward transmittal to highest authorities.

Is it feasible that the government financially supports relocation. The government through the Ministry of Industrial Development has acquired 105 acres and is in the process of undertaken development of infrastructure to the site at a cost of close to 50 million Rupees. An incentive scheme is also under development.

The cost of the new complex can be divided into three parts:

1) Infrastructure upto the site (water, electricity, roads)
2) Infrastructure within the site (common effluent treatment plant, internal roads, laboratory, sludge disposal site), building and discharge channels etc.
3) Cost of relocation, including transport of equipment, purchase of new machines

Part I will be covered by the MoID
Part 2 is partially covered by the project document for the CETP, laboratory and sludge disposal site. Part 3 The cost of new machines will be high. REPO offered to approach ASSOMAC for a deferred interest payment scheme and long term payment.
Environmental clearance of the site; the CEA has cleared the environmental impact assessment subject to two conditions, availability of sufficient water for processing and discharge of effluent in the sea meeting the standards for marine coastal discharge.

Chrome recovery and reuse system has been presented and implemented for minimal chrome discharge, however elsewhere other systems seem to be used. Other chrome management systems exist, for instance direct recycling, high chromium exhaustion, closed loop system. Which system is to be applied depends on many factors, one of the most important ones being the sophistication / technological advancement of the industry. In case of the tanning industry is not very advanced chrome recovery and reuse system may be the most suitable and this is one of the reasons this system has been selected for Sri Lanka.

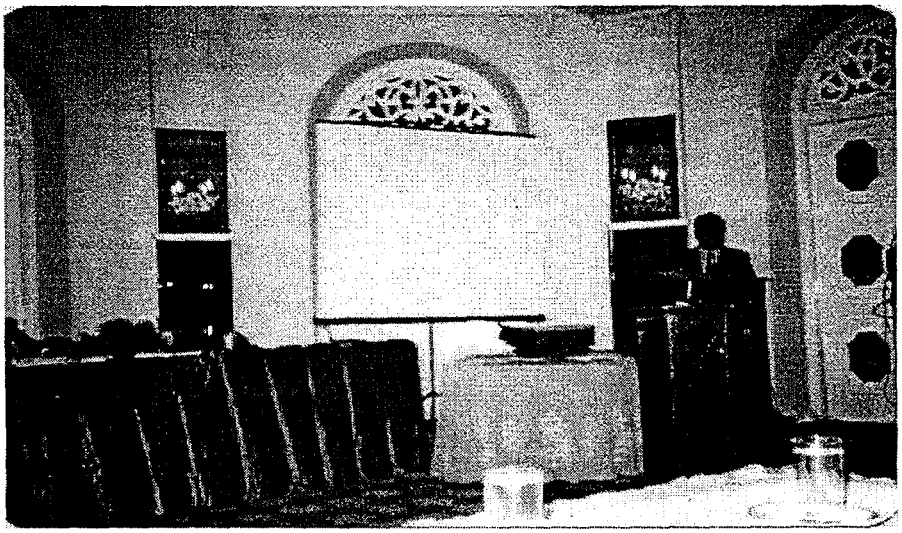
What is the sustainability of the cleaner technology programme for the banning industry ? This depends on many factor, including relocation of the industry, financial benefits of cleaner technologies etc. By and large CLRI has opted for introduction of basic cleaner tanning technologies which do not require large

investment, are easy to replicate and have a very positive effect on reduction of pollution emanating from the tanneries. This has been supplemented by the chrome recovery and reuse systems (two central systems taking care of most of the chromium pollution from the tanning industry). The chrome recovery system can be easily dismantled and be re-assembled in Bata Atha when the tanneries relocate,. Similarly some of the other technologies which have been introduced can be practised at Bata Atha as well.

Why are the standards for discharge of effluent different in different parts of the world? A paper prepared by UNIDO on pollutant discharge standards comparing standards for 41 countries revealed that standards small variation not withstanding are quite similar all across the world. This variations can be attributed to local conditions such as recipient source, nature volume etc., state of the technology etc. Sri Lanka does confirm by and large to these international standards except that certain standards for discharge into inland surface waters are not achievable or in certain cases the ration may not be correct (e.g. BOD / COD treated effluent).

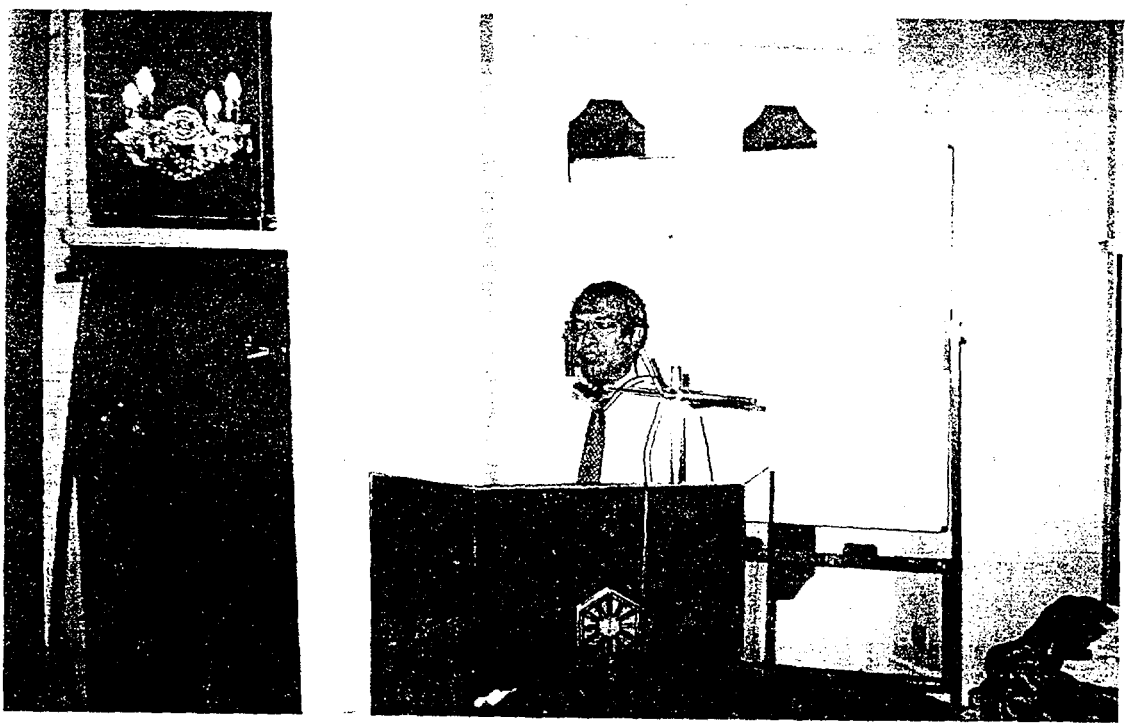
9.3.6 PHOTOGRAPHS

Shri K Parthasarathy, Sr. Asst. Director, CLRI, replies to the queries of participants, while Shri Batuwangala, Chairman SLAT, looks on



Dr S Rajamani, Technical Expert, RePO, UNIDO presenting on Chrome Recovery System

Mr Ashroff Razack of M/s. MAM Abdul Cader Tannery presenting his views on CLRI's Work

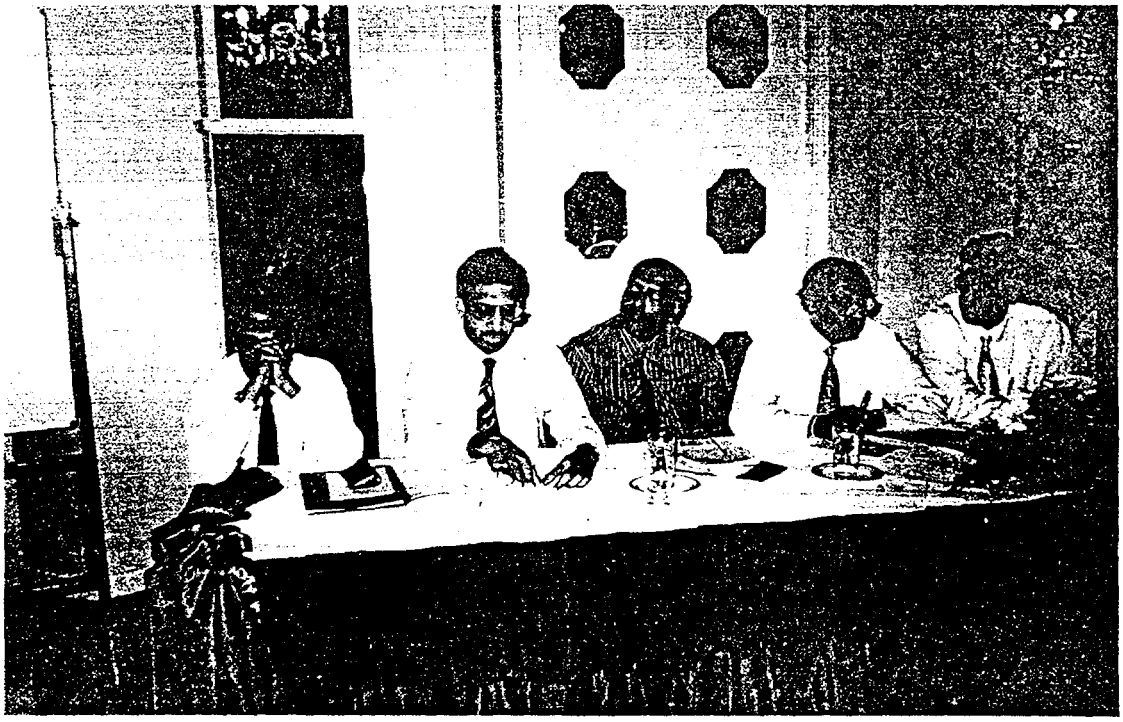


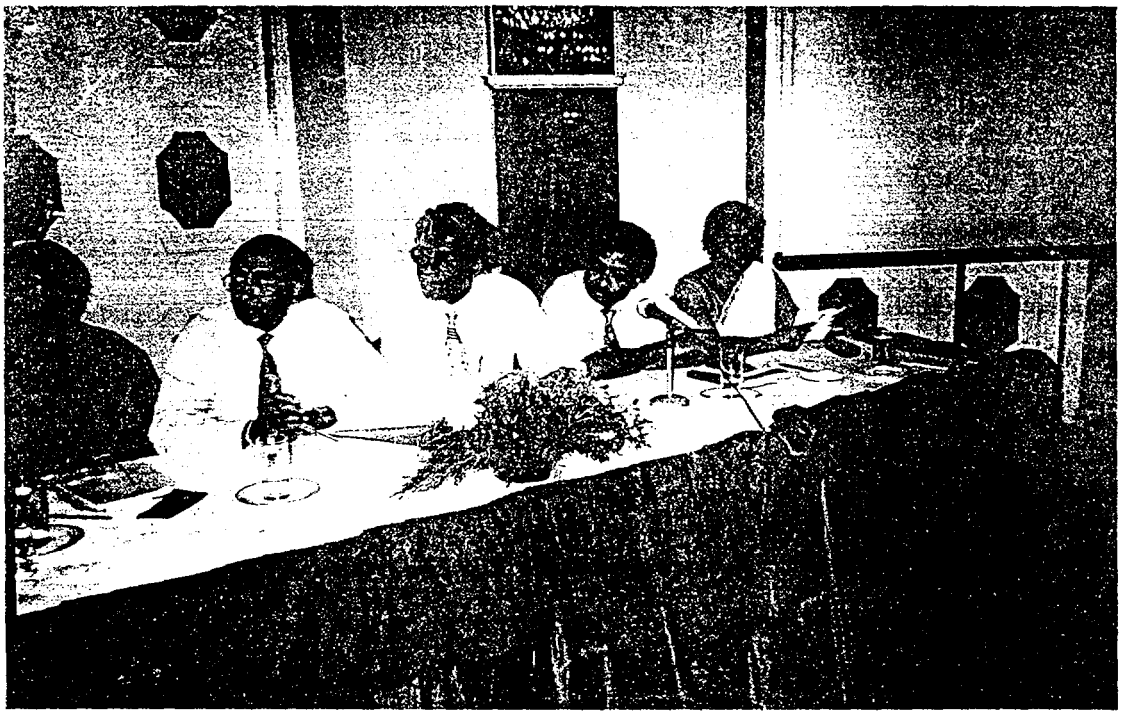
Mr Percy De Silva of M/s. SAPCO Group of Companies presenting his views on the pollution reduction programme in tanneries in Sri Lanka

Shri A Sahasranaman Speaking on UNIDO Program in Pollution Control for the tanning Industry in Sri Lanka

Dr S Rajamani presenting on Pollution Control in Sri Lanka Tanneries - Chrome Recovery and Reuse System

A View of Participants





A view of Panellists in Panel Discussion Session

9.4 FOLLOW UP WORK CARRIED OUT

After the workshop is completed, CLRI team visited the following tanneries.

1. M/s. Mubarak Leathers Pvt. Ltd
2. M/s. NM Mohammed Mohideen
3. M/s. MAM Abdul Cader & Co.
4. M/s. TAN Lanka
5. M/s. Sultans Leather Co.
6. M/s. SAPCO Group of Companies
7. M/s. PPK Velliappa Nadar (Pvt.) Ltd.

9.4.1 M/s. Mubarak Leathers Pvt. Ltd

The tannery was inspected and the quality of leathers prepared with cleaner technologies was assessed. The unit made by tanner for manual desalting was seen and advise for further improvement is provided

9.4.2 M/s. NM Mohammed Mohideen

The tannery was inspected and the quality of leathers made with cleaner technologies was assessed. Advise on upgradation of leathers was made and the party has accepted to visit CLRI for seeing demonstration of upgradation leathers.

9.4.3 M/s. MAM Abdul Cader & Co.

The tannery was inspected and the quality of leathers made with cleaner technologies was assessed. Advise on finishing of buffalo leathers was provided as a particular lot has grain cracking problem. Alternate receipes were provided.

9.4.4 M/s. TAN Lanka

The tannery was visited and participated in the inauguration programme of Chrome Recovery system.

9.4.5 M/s. Sultans Leather Co.

The tannery was visited and need for implementation of cleaner technologies was stressed.

9.4.6 M/s. SAPCO Group of Companies

The tannery of M/s. SAPCO was visited and the need for modernization was assessed and indicated to the firm.

9.4.7 M/s. PPK Velliappa Nadar (Pvt.) Ltd.

The tannery was asked to close by Environmental authorities as the unit was giving bad odour to the residents around. A representative of the unit has approached RePO, UNIDO and CLRI for advise. A visit was made to the tannery and situation was studied.

Material handling in the unit was not upto the mark. Due to improper handling of the raw material and trimmings, the material got putrefied and bad odour was emanating from the unit. Also, the general Occupational Safety and Health aspects in the unit are at low level. Advise provided to the representatives present in the unit for remedies to be carried out

10.0 SUMMARY

The implementation of cleaner technologies in selected tanneries in Sri Lanka has brought out the following points.

PARAMETERS	RESPONSE	REMARKS
1. Water Consumption	Reduced	Though no direct immediate economical benefit, it will help in reducing hydraulic load for CETP
2. Chemical Consumption	Cost Increased marginally	Marginal cost increase only
3. Pollution load reduction	Substantial reduction in all the parameters	Major benefit and reduction in effluent treatment cost
4. Operation time	Reduced	Substantial benefit for EI based tanneries
5. Overall Cost saving	Marginal reduction in cost	Even with no cost saving also cleaner technologies implementation will pay in long run

SUMMARY OF BENEFIT ACCURED DUE TO IMPLEMENTATION OF CLEANER TECHNOLOGIES

S.No.	PARAMETERS	REDUCTION / SAVING		
		1. M/s. Mubarak	2. M/s. Abdul Cader	3. M/s. NM Mohamed Mohideen
1.	Water, Litres / Kg of hide	2.5 (14.2%)	15.73(55.25%)	6.4(29.63%)
2.	Chemical, US $/Kg of hide	-0.026	-0.012	-0.012
	US $/Sq.ft	-0.013	-0.006	-
3.	Pollution load reduction, %			
	BOD	61.63	77.11	50.19
	COD	60.98	82.08	44.76
	TDS	47.31	48.53	40.18
	TSS	0.98	75.40	58.09
	Sulphide	82.69	72.55	71.35
	Cr	46.96	21.56	-
	Chloride	48.30	60.78	40.02
4.	Operation time, minutes/day	-0.5 (22%)	0.5 (18%)	9 (25%)
5.	Net cost saving US $	0.01/sqft	0.017/sqft	0.044/kg

Note : Tannery 1 & 2 are Chrome Tanning Units, while tannery 3 is Vegetable Tanning Unit

ANNEXURES

ANNEXURE 1

Annexure 1

GUIDANCE ON THE INVENTORY SAMPLING AND ANALYSIS

1. Carry out the inventory of the total activity on the various sectional operations (soaking, liming, deliming etc) volume of water usage/waste water discharge including the washings and wastage.

2. Collect samples from all the sectional waste discharges including washing and prepare composite sample by mixing all the sectional samples proportionately to the total volume of section waste water discharge from all the tanneries so as to have representative composite sample when all the tanneries are relocated in the new leather complex promoted by SLAT.

3. Analysis may be done for the composited sample for the following parameter.

    1. pH
    2. Total Solids
    3. S.S
    4. TDS
    5. Chloride as Cl
    6. Sulphate as SO_4
    7. Sulphide as S
    8. 5 day BOD (Total
    9. 5 day BOD (Filtrate or soluble)
    10. COD (Total)
    11. COD (Filtrate or soluble)
    12. Total Chromium as Cr or Cr_2O_3
    13. Total Nitrogen
    14. Oils & grease
    15. Phenolic Compounds (as Phenolic OH)

4. Analysis may be done atleast for 2 sets of samples composited during different period. Preferably 3rd set of analysis may also be done for confirmation.

5. In addition to the analysis of composited waste water samples, exhaust chrome liquor (main, wash and rechrome) samples may be collected form the chrome tanneries (likely from MAM Abdul Cader Tannery, Tan Lanka Ltd, Sultan Leather Co., and Mubarak Leather) and analysis may be carried out for the following parameters:
    - pH
    - Chromium as Cr or Cr_2O_3
    - Sulphate as SO_4
    - Chloride as Cl

6. Once the first set of analysis data is ready the same can be checked/ reviewed before the next batch of analysis.

7. Procedure as per "Standard Methods for analysis of water and waste waters may be adopted for sampling and analysis"

Calculate the total volume of sectional waste of all the 9 tanneries from the information collected in the questionnaire from the tanners. The procedure is given below for calculating.

1.	Soak liquor	100 lts
2.	Lime liquor	20 lts
3.	Delime liquor	8 lts
4.	Pickle liquor	8 lts
5.	Chrome liquor	8 lts
6.	Neutralisation	8 lts
7.	Retanning etc	8 lts
8.	Washing etc	20 lts
	Total	180 lts

This volume of waste liquor is to be taken from any one of the 3 identified tanneries processing Raw to Finish including Veg. Tanning. If the particular Tannery is not making Veg. Tanning, please take only that much of Veg. liquor from the tannery processing veg. tanned leathers and mix with this 360 litres of waste liquor. Also take the vegetable tan liquors discharge only from all the tanneries processing vegetable tanned leathers as per the procedure given above. After mixing the veg. liquor with 360 litres of mixture, 2.5 litres liquor is to be taken for composite. Please get the composite waste liquor analyzed for pH, total solids, suspended solids, total dissolved solids, chlorides as Cl, sulphate as SO_4, Sulphide as S, 5 day BOD (total), 5 day BOD (filtrate or soluble), COD (total), COD (filtrate or soluble), total chromium as Cr or Cr_2O_3, total nitrogen, oils and grease, Phenolic compounds (as phenolic OH).

In addition to the above mentioned analysis of effluent, also please collect the chrome liquor from chrome tanneries if MAM Abdul Cader Tanneries, Tan Lanka Ltd, Sultan Leather Co. and Mubarak Leather of Main Tanning, washing and rechrome liquor separately from each tannery for analysis of following parameter.

1. pH
2. Chromium as Cr or Cr_2O_3
3. Sulphate as SO_4
4. Chloride as Cl

ANNEXURE 2

SECTIONAL WASTE STREAM SAMPLES TO BE COLLECTED

FOR TANNERIES PROCESSING FROM RAW

⇒ Raw water

⇒ Spent Soak Liquor (I, II & III mixed in equal proportions)

⇒ Spent Lime Liquor

⇒ Spent Pickle Liquor

⇒ Spent Tan Liquor

⇒ Composite (For making of composite refer example 1 or 2)

* SAMPLE VOLUME - 2.5 Ltrs. Each.

FOR TANNERIES PROCESSING FROM EI OR WET BLUE

⇒ Raw water

⇒ Rechroming / Semi chroming liquor

⇒ Composite only (For making of composite refer example 3 or 4)

* SAMPLE VOLUME - 2.5 LTRS.

MAKING OF COMPOSITE

EXAMPLE - I : FOR RAW TO TANNING

WATER QUANTITY (LTRS)			SAMPLES (LTRS)
Soaking	-	9000	9
Liming	-	3000	3
Deliming	-	1500	1.5
Pickling	-	1000	1.0
Tanning	-	1500	1.5
Total washings	-	3000	3.0 (Plain water used for processing)
			19.0

A sample of 2.5 Ltrs taken after mixing well.

EXAMPLE - 2 : FOR RAW TO CRUST

WATER QUANTITY (Ltrs)			SAMPLES (Ltrs)
Soaking	-	9000	9
Liming	-	5000	5
Deliming	-	2000	2
Pickling	-	800	0.8
Tanning	-	1000	1.0
Rechroming	-	1500	1.5
Neutralisation	-	2000	2.0
Retanning Dyeing Fatliquoring	-	2000	2.0
Washings	-	3000	3.0 (plain water used for processing)
			26.3

A sample of 2.5 Ltrs. taken after mixing well

EXAMPLE - 3 : CHROME TANNED LEATHER TO CRUST

WATER QUANTITY (LTRS)			SAMPLES (LTRS)
Rechroming	-	1500	1.5
Neutralisation	-	2000	2.0
Retanning Dyeing Fatliquoring	-	3000	3.0
WASHINGS	-	4000	4.0 (Plain water used for processing)
			10.5

A sample of 2.5 Ltrs. taken after mixing well

EXAMPLE - 4 : EI TANNED LEATHER TO CRUST

WATER QUANTITY (Ltrs)			SAMPLES (Ltrs)
Stripping	-	3000	3.0
Souring	-	2000	2.0
Retanning	-	2000	2.0
Neutralisation	-	3000	3.0
Retanning, dyeing and fatliquoring	-	3000	3.0
Washings	-	10000	10.0 (Plain water)
			23.0

A sample of 2.5 Ltrs. taken after mixing well

PARAMETERS ANALYSED

	SAMPLE NATURE	PARAMETERS
1	Soak Liquor	- BOD, COD, TDS
2	Spent lime liquor	- BOD, COD, TDS, Sulfide
3	Spent pickle liquor	- BOD, COD, TDS
4	Spent tan liquor	- BOD, COD, TDS, Chromium (if applicable)
5	Composite and Raw water	- BOD, COD, TDS, Sulfide & Chromium (if applicable)

Sl.No.	Name of the Tannery	Soak Liquor	Lime Liquor	Delime Bating Liquor	Pickle Liquor	Chrome Liquor	Neutralisation	Retanning Fatliquor Dying Liquor	Washings & Wastages
1.		1,00,000	20,000	7,000	7,000	9,000	7,000	7,000	**20,000**
2.		2,00,000	20,000	8,000	8,000	10,000	8,000	8,000	**25,000**
3.		1,00,000	25,000	9,000	9,000	9,000	9,000	9,000	**30,000**
4.		1,00,000	20,000	8,000	8,000	9,000	9,000	9,000	**20,000**
5.		1,00,000	20,000	8,000	8,000	8,000	9,000	9,000	**25,000**
6.		1,00,000	30,000	10,000	10,000	9,000	10,000	10,000	**30,000**
7.		1,00,000	25,000	12,000	12,000	8,000	10,000	10,000	**25,000**
8.		1,00,000	20,000	10,000	10,000	9,000	8,000	8,000	**20,000**
9.		1,00,000	20,000	8,000	8,000	9,000	10,000	10,000	**25,000**
		10,00,000	**2,00,000**	**80,000**	**80,000**	**80,000**	**80,000**	**80,000**	**2,00,000**
		10,000	**10,000**	**10,000**	**10,000**	**10,000**	**10,000**	**10,000**	**10,000**
		= 100 lts	**= 20 lts**	**= 8 lts**	**= 8 lts**	**= 8 lts**	**= 8 lts**	**= 8 lts**	**= 20 lts**

DEFAULT EMISSION FACTORS FOR TRADITIONAL PROCESSING

	Soaking	Liming	Deliming	Pickling	Vegetable Tanning	Chrome Tanning	Dyeing & Fat liquoring	Composite
BOD_5	8.3 - 18.8	17.5 - 35.0	1.5 - 4.5	0.3 - 0.5	9 - 27	0.5 - 1.2	1.5 - 3.0	35 - 105
COD	22.5 - 45. 0	35 - 87.5	3.8 - 10.5	0.8 - 2.3	22.5 - 60	1.5 - 3.8	3.8 - 10.5	87.5 - 280
Total Solids	262.5 - 412.5	105 - 175	6 - 15	26.3 - 52 .6	37.5 - 90	45 - 90	6 - 15	525 - 875
Dissolved Solids	240 - 360	84 - 105	3.8 - 90	25.5 - 50.3	31.5 - 75	43.5 - 86.3	5.1 - 13.5	455 - 735
Suspended Solids	22.5 - 52.5	21 - 70	2.3 - 6.0	0.8 - 2.3	6 - 15	1.5 - 3.8	0.9 - 1.5	70 - 140
Chloride as Cl.	112.5 - 225.0	14 - 28	1.5 - 3.0	15 - 23	1.5 - 3.8	23 - 38	0.8 - 1.5	210 - 332.5
Total Chromium	-	-	-			3 - 7.5	-	3.0 - 7.0

(All values expressed in kg / Tonne of hide / skin processed)

ANNEXURE 3

INDUSTRIAL POLLUTION REDUCTION PROGRAMME IN TANNERIES IN SRI LANKA
(UNIDO PROJECT : DG/SRL/91/019)
CONDUCTED BY
(Central Leather Research Institute, Chennai)
Part - A
TANNERY PROCESS DETAILS

A. Tannery with ETP/connected to CETP* Nil

1. **Name and address of the tannery with Telephone, Fax Nos. & Name of the Contact Person** : KP001B
2. **Tannery Location and Land Area**
   (a) Total land area (in acres/sq.ft.) : 17.5 Acres
   (b) Open land available (in acres/sq.ft.) : Constructed Area : 8000 Sq. ft

   (c) Tannery boundary details :

Northern Side : Own land

Eastern Side : Own land (vacant)

Southern Side : Residence

Western Side : Own land

3. **Water**

   a) **Existing ground water Table-(feet) (within the tannery premises)** : 10'

   b) **Sources of water supply (If more than one source mention % share)** : **openwell** 100%

   c) **Characteristics of raw water (enclose water analysis report)** : **(pH,TSS,BOD,COD etc.)**

   d) **Residential Quarters (if any) within the campus** : **No. of quarters** Nil **No. of persons residing** Nil

4. **Sources of raw materials (mention centres of origin along with type of raw material i.e. cow/buff/goat/sheep etc.)** : **1.** Goat, **2.**. Buffalo, **3.** Cow → Colombo only

---

*** If connected to CETP, indicate the name :**

5. Actual processing/day (Strike out whichever is not applicable)

Stage of processing	Present Processing		Future Plans (next 5 years)	
A) Raw to Finish(via Wet Blue)	Pieces	Wt.(Kgs.)	Pieces	Wt.(Kgs)
i) Hides Cattle				
Cow	300 /month	1500		
Buffalo				
ii) Skins Cow calf				
Buff calf				
Goat skins				
Sheep skins				
iii) Split Leathers				
B. Raw to E.I./ Raw to Wet Blue				
i) Hides Cattle				
Buffalo				
ii) Skins Cow calf				
Buff calf				
Goat skins	5000/m	7800 Kg		
Sheep skins				
iii) Split Leathers				
C. Wet Blue to finish/ E.I to finish	(Finishing operation done by other tannery)			
i) Hides Cattle				
Buffalo				
ii) Skins Cow calf				
Buff calf				
Goat skins				
Sheep skins				
iii) Split Leathers				

6. Seasonal variation in processing (if any)

Job work

Season	Months	Processing/per day	
		Pieces	Wt (Kgs)
i) Peak season			
ii) Lean Season			

7. Production during last 3 years (in Sq. ft/pieces/Kgs)

Type of Leathers	1994	1995	1996
Wet blue			
E.I. to finish	60,000	60,000	60,000
Wet blue to finish	3600	3600	3600

8. List of equipments available (No.)

Pits	3
Paddles	one pair under construction (U.C)
Drums	2

9. Production pattern

Items	Present	Future plans (next 5 years)
i) Working hours/day	8	
ii) No. of shifts/day	1	
iii) No. of days in a week	6	
iv) Average working days/annum	280	

10. (a) Water and Chemical usage Chrome Tanning process

Raw to Wet Blue

Sl. No	Process	Pit/Paddle/ Drum	Water used (%)	Chemicals used	
				Name	%
1	Soaking I	Pit	200		
2	Soaking II	Drum	300		
3	Soaking III	-	-	-	-
4	Liming	Drum	150	Lime Sod.Sulphide	8 2
5	Washing	Drum	200		
6	Reliming	Pit	200	Lime	6
7	Fleshing	Manual			
8	Washing before Deliming	Pit	200		
9	Deliming	Drum	100	Amm. Sul	2
10	Washing after Deliming	Drum	200		
11	Pickling	Drum	100	Salt Sulfuric acid Formic acid	9 1.50. 5
12	Chrome Tanning	Drum	Pickle Bath	Chrome Sod.Bi.carb	6 0.5
13	Washing after Chrome Tanning	Drum	200		
	Wet Blue to Finish 0.5				
14	Washing before Rechroming	Drum	100	Formic acid	0.25
15	Rechroming	Drum	80	Chrome	2
16	Washing before Neutralisation	Drum	200		
17	Neutralisation	Drum	100	Sod. bicarb. Sod. formate.	1 1
18	Washing I after Neutralisation	Drum	200		
19	Washing II after Neutralisation	-	-	-	-
20	Retanning , Dyeing & Fatliquoring	Drum	100	Retan..Syn Dye Fat. Liq Fat.Lliq for Lining	2 2 2 6
21	Top Dyeing (if any)				
22	Final Wash				
23	Washing and Wastages		22,225		

(All washings are in running water)

10. (b) Water and Chemical usage Vegetable Tanning process

Raw to EI

Sl. No	Process	Pit/Paddle /Drum	Water used (%)	Chemicals used	
				Name	%
1	Soaking I	Pit	200		
2	Soaking II	Drum	300		
3	Soaking III	-	-	-	-
4	Liming	Drum	150	Lime Sod.Sulphide	8 2
5	Reliming				
6	Fleshing	Manual			
7	Washing before Deliming	Drum	200		
8	Deliming	Drum	100	Amm Sulphite.	1
9	Washing after Deliming	Drum	200		
10	Pickling	Drum	80	Salt Sulfuric acid Formic acid	5 1 0.25
11	Pre Tanning				
12	Vegetable Tanning	Pit/Drum	150	Extract	20
13	Bleaching	Pit/Drum	100	Oxalic.acid Preservative	1 0.05
14	Myrobing				
15	Oiling	Manual		Coconut oil	3
	E I to Finish				
16	Washing before Stripping				
17	Stripping				
18	Washing I after Stripping				
19	Washing II after Stripping				
20	Bleaching				
21	Washing I after Bleaching				
22	Washing II after Bleaching				
23	Souring				
24	Semichroming				
25	Washing after Semichroming				
26	Washing before Neutralisation				
27	Neutralisation				
28	Washing I after Neutralisation				
29	Washing II after Neutralisation				
30	Retanning, Dyeing & Fatliquoring				
31	Top Dyeing (if any)				
32	Final Wash				
33	Washing and Wastages				

11. Chrome Tanning Procedure

	Item	Wetblue		Rechroming	
1	No.of Drums	1		1	
2	Size of the Drums	8' x 8'		8' x 8'	
3	Average pelt weight(Kgs/Pcs/Drum)	1800		500	
4	Type of BCS used				
5	% of BCS used	6		2	
6	Water used (float) in %	100		80	
7	Other chemicals used in %	Chemical	%	Chemical	%
		Formate	Nil	Formate	Nil
		Sod.bicarb	0.5	Sod.bicarb	Nil

12. Water utilised/per day (quantity in liters)

a) Chrome tanning : 1800

b) Rechroming : 400

13. Drainage and disposal arrangements for waste water

a) Drainage system (Open/Closed) : Closed

b) Status of segregation system

YARD	SEPARATE	COMBINATION
Lime yard		Combined
Drum yard		Combined
Machine yard		Combined

c) Whether scope exists for mixing up rain water with tannery waste water : **Yes**

d) Whether scope exists for solid waste to mix with effluent : **No**

e) Type of problems faced in operating existing drains/sewer

1:

2:

3:

4:

f) Mode of final effluent disposal (CETP/ETP) : Discharged in to the own vacant land

14. Mode of solid waste management :

S.NO.	SOLID WASTE	DISPOSAL METHOD
1.	Dusted salt	Re used for raw
2.	Raw hide/skin trimmings	Dumped in own land
3.	Lime sludge	Dumped in own land
4.	Hair/wool	Dumped in own land
5.	Fleshings	Dumped in own land
6.	Wet blue trimmings	Dumped in own land
7.	Shaving/buffing dust	-
8.	Others	-

15. Total water used perday (litres) : 35475

16. Total Effluent discharged (litres approximate) :

17. Whether Chrome Recovery Plant is proposed / under construction / existing : No

18. Remarks.

Finishing operation is carried out by N P M Narayana Chettiyar & Co (as job work)

CONTACT PERSON.

Mr. Abdul Cader

Signature
Name
Date

INDUSTRIAL POLLUTION REDUCTION PROGRAMME IN TANNERIES IN SRI LANKA
(UNIDO PROJECT : DG/SRL/91/019)
CONDUCTED BY
(Central Leather Research Institute, Chennai)
Part - A
TANNERY PROCESS DETAILS

A. Tannery with ETP/connected to CETP* ETP (not functioning)

1. **Name and address of the tannery with Telephone, Fax Nos. & Name of the Contact Person** : KP002B
2. **Tannery Location and Land Area**
   (a) Total land area (in acres/sq.ft.) : 28 acres
   (b) Open land available (in acres/sq.ft.) : Constructed Area : 19,600 Sq,ft

   (c) Tannery boundary details :

Northern Side : Open land (own) **Eastern Side :** Open land (own)

Southern Side : Open land (own) **Western Side :** Open land

3. **Water**

   a) **Existing ground water Table-(feet) (within the tannery premises)** : 15'

   b) **Sources of water supply (If more than one source mention % share)** : **openwell** 100 %

   c) **Characteristics of raw water (enclose water analysis report)** : **(pH,TSS,BOD,COD etc.)**

   d) **Residential Quarters (if any) within the campus** : **No. of quarters** Nil **No. of persons residing** Nil

4. **Sources of raw materials (mention centres of origin along with type of raw material i.e. cow/buff/goat/sheep etc.)** : 1. Goat, 2. Cow, 3. Buffalo → Puttalam Dist.

*** If connected to CETP, indicate the name :**

5. **Actual processing/day (Strike out whichever is not applicable)**

Stage of processing		**Present Processing**		**Future Plans (next 5 years)**	
A) Raw to Finish(via Wet Blue)		Pieces	Wt.(Kgs.)	Pieces	Wt.(Kgs)
i) Hides	Cattle				
	Buffalo/ Cow	200	2000		
ii) Skins	Cow calf				
	Buff calf				
	Goat skins				
	Sheep skins				
iii) Split Leathers					
B. Raw to E.I./ Raw to Wet Blue					
i) Hides	Cattle				
	Buffalo				
ii) Skins	Cow calf				
	Buff calf				
	Goat skins				
	Sheep skins				
iii) Split Leathers					
C. Wet Blue to finish/ E.I to finish					
i) Hides	Cattle				
	Buffalo				
ii) Skins	Cow calf				
	Buff calf				
	Goat skins				
	Sheep skins				
iii) Split Leathers					

6. **Seasonal variation in processing (if any)**

Job work

Season	**Months**	**Processing/per day**	
		Pieces	**Wt (Kgs)**
i) Peak season			
ii) Lean Season			

✓

7. Production during last 3 years (in Sq. ft/pieces/Kgs)

Type of Leathers	1994	1995	1996
Wet blue			
E.I. to finish			
Finished	56, 000	56, 000	56,000

8. List of equipments available (No.)

Pits	6
Paddles	4 sets
Drums	7
Fleshing Machine	1
Sammying Machine	1
Splitting Machine	1
Shaving Machine	1
Setting Machine	1
Staking Machine	1
Buffing Machine	1
Hand Spray Machine	1
Embossing Machine	2
Measuring Machine	1

9. Production pattern

Items	Present	Future plans (next 5 years)
i) Working hours/day	8	
ii) No. of shifts/day	1	
iii) No. of days in a week	6	
iv) Average working days/annum	300	

10. (a) Water and Chemical usage Chrome Tanning process
Raw to Wet Blue

Sl. No	Process	Pit/Paddle/ Drum	Water used (%)	Chemicals used	
				Name	%
1	Soaking I	Pit	300	Preservative	0.1
2	Soaking II	Pit	300		
3	Soaking III	-	-		
4	Liming	Paddle	300	Lime Sod.Sulphide	9 2.5
5	Reliming				
6	Fleshing	Machine	100		
7	Washing before Deliming	Drum	200		
8	Deliming	Drum	100	Am Sulphite. Alk.Bate	2.5 0.2
9	Washing after Deliming	Drums	200		
10	Pickling	Drum	100	Salt Sulfuric acid	7.5 1
11	Chrome Tanning			Chrome MgO Formic acid Preservative	6 0.4 1 0.2
12	Washing after Chrome Tanning				
	Wet Blue to Finish				
13	Washing before Rechroming	Drums	100	Formic acid	0.5
14	Rechroming	Drums	100	Chrome	2
15	Washing before Neutralisation	Drum	200		
16	Neutralisation	Drum	100	Sod.Formate Neut. Syntan Sod.bicarb	1 0.5 0.5
17	Washing I after Neutralisation	Drum	200		
18	Washing II after Neutralisation				
19	Retanning , Dyeing & Fatliquoring	Drum	100	Extract Dye Resin syntan Fat liq	3 2.5 2 5
20	Top Dyeing (if any)				
21	Final Wash				
22	Washing and Wastages		16900 lit		

(All washings are in running water)

Raw to EI

Sl. No	Process	Pit/Paddle /Drum	Water used (%)	Chemicals used	
				Name	%
1	Soaking I				
2	Soaking II				
3	Soaking III				
4	Liming				
5	Reliming				
6	Fleshing				
7	Washing before Deliming				
8	Deliming				
9	Washing after Deliming				
10	Pickling				
11	Pre Tanning				
12	Vegetable Tanning				
13	Bleaching				
14	Myrobing				
15	Oiling				
E I to Finish					
16	Washing before Stripping				
17	Stripping				
18	Washing I after Stripping				
19	Washing II after Stripping				
20	Bleaching				
21	Washing I after Bleaching				
22	Washing II after Bleaching				
23	Souring				
24	Semichroming				
25	Washing after Semichroming				
26	Washing before Neutralisation				
27	Neutralisation				
28	Washing I after Neutralisation				
29	Washing II after Neutralisation				
30	Retanning, Dyeing & Fatliquoring				
31	Top Dyeing (if any)				
32	Final Wash				
33	Washing and Wastages				

11. Chrome Tanning Procedure

	Item	Wetblue		Rechroming	
1	No.of Drums	2		1	
2	Size of the Drums	8' x 6'		8' x 6'	
3	Average pelt weight(Kgs/Pcs/Drum)	1300/Drum		400	
4	Type of BCS used				
5	% of BCS used	6		2	
6	Water used (float) in %	100		100	
7	Other chemicals used in %	Chemical	%	Chemical	%
		Formate	-	Formate	-
		Sod.bicarb.	-	Sod.bicarb.	-
		MgO	0.4		
		Preservative	0.2		

12. Water utilised/per day (quantity in liters)

a) Chrome tanning : 3000

b) Rechroming : 1000

13. Drainage and disposal arrangements

a) Drainage system (Open/Closed) : Open

b) Status of segregation system

YARD	SEPARATE	COMBINATION
Lime yard		Combined
Drum yard		Combined
Machine yard		Combined

c) Whether scope exists for mixing up rain water with tannery waste water : **Yes**

d) Whether scope exists for solid waste to mix with effluent : **Yes**

e) Type of problems faced in operating existing drains/sewer

1:

2:

3:

4:

f) Mode of final effluent disposal (CETP/ETP) : Discharged in to the own vacant land

14. Mode of solid waste management :

S.NO.	SOLID WASTE	DISPOSAL METHOD
1.	Dusted salt	Dumped in the open ground
2.	Raw hide/skin trimmings	Dumped in the open ground
3.	Lime sludge	Dumped in the open ground
4.	Hair/wool	Dumped in the open ground
5.	Fleshings	Dumped in the open ground
6.	Wet blue trimmings	Dumped in the open ground
7.	Shaving/buffing dust	Dumped in the open ground
8.	Others	Dumped in the open ground

15. Total water used perday (litres) : 42900
16. Total Effluent discharged (litres approximate) :

17. Whether Chrome Recovery Plant is proposed / under construction / existing : Nil

18. Remarks. ETP - Not functioning.

CONTACT PERSON.
Mr Justin

Signature
Name
Date

INDUSTRIAL POLLUTION REDUCTION PROGRAMME IN TANNERIES IN SRI LANKA
(UNIDO PROJECT : DG/SRL/91/019)
CONDUCTED BY
(Central Leather Research Institute, Chennai)
Part - A
TANNERY PROCESS DETAILS

A. Tannery with ETP/connected to CETP* Nil

1. **Name and address of the tannery with Telephone, Fax Nos. & Name of the Contact Person** : KP003B

2. **Tannery Location and Land Area**
   (a) Total land area (in acres/sq.ft.) : 4 Acre
   (b) Open land available (in acres/sq.ft.) : Constructed Area : 60,000 Sq. ft

   (c) Tannery boundary details :

Northern Side : Residence

Eastern Side : Residence

Southern Side : Residence

Western Side : Residence

3. **Water**

   a) **Existing ground water Table-(feet) (within the tannery premises)** : Nil

   b) **Sources of water supply (If more than one source mention % share)** : 90% from river&10% from Colombo Water Board

   c) **Characteristics of raw water (enclose water analysis report)** : **(pH,TSS,BOD,COD etc.)**

   d) **Residential Quarters (if any) within the campus** : **No. of quarters** Nil **No. of persons residing** Nil

4. **Sources of raw materials (mention centres of origin along with type of raw material i.e. cow/buff/goat/sheep etc.)** : 1. Cow, 2.. Buff, 3. Goat → From Tanzania , Sri Lanka and Kenya

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*** If connected to CETP, indicate the name :**

5. Actual processing/day (Strike out whichever is not applicable)

Stage of processing	Present Processing		Future Plans (next 5 years)	
A) Raw to Finish(via Wet Blue)	Pieces	Wt.(Kgs.)	Pieces	Wt.(Kgs)
i) Hides Cattle, Cow /Buffalo	600	6000		
ii) Skins				
Goat Skins				
Sheep skins				
iii) Split Leathers				
B. Raw to E.I.				
i) Hides Cattle				
Buffalo				
ii) Skins				
Goat skins	2500	3000		
Sheep skins				
iii) Split Leathers				
C. Wet Blue to finish/ E.I to finish				
i) Hides Cattle				
Buffalo				
ii) Skins Cow calf				
Buff calf				
Goat skins				
Sheep skins				
iii) Split Leathers				

6. Seasonal variation in processing (if any)

Job work

Season	Months	Processing/per day	
		Pieces	Wt (Kgs)
i) Peak season			
ii) Lean Season			

14. Mode of solid waste management :

S.NO.	SOLID WASTE	DISPOSAL METHOD
1.	Dusted salt	Dumped in the open ground
2.	Raw hide/skin trimmings	Dumped in the open ground
3.	Lime sludge	Dumped in the open ground
4.	Hair/wool	Dumped in the open ground
5.	Fleshings	Dumped in the open ground
6.	Wet blue trimmings	Dumped in the open ground
7.	Shaving/buffing dust	Dumped in the open ground
8.	Others	Dumped in the open ground

15. Total water used perday (litres) : 42900
16. Total Effluent discharged (litres approximate) :

17. Whether Chrome Recovery Plant is proposed / under construction / existing : Nil

18. Remarks. ETP - Not functioning.

CONTACT PERSON.
Mr Justin

Signature
Name
Date

✓

7. Production during last 3 years (in Sq. ft/pieces/Kgs)

Type of Leathers	1994	1995	1996
Wet blue			
E.I. to finish	625,000	625,000	625,000
Finished	175,000	175,000	175,000

8. List of equipments available (No.)

Pits	12
Paddles	3 sets
Drums	9
Fleshing Machine	1
Sammying Machine	1
Splitting Machine	1
Shaving Machine	2
Setting Machine	1
Staking Machine	1
Buffing Machine	1
Hand Spray Machine	1
Auto Spray Machine	1
Embossing Machine	2
Steam Dryer	1
Vacuum Dryer	1

9. Production pattern

Items	Present	Future plans (next 5 years)
i) Working hours/day	9 ½	
ii) No. of shifts/day	1	
iii) No. of days in a week	5	
iv) Average working days/annum	250	

10. (a) Water and Chemical usage Chrome Tanning process
Raw to Wet Blue

Sl. No	Process	Pit/Paddle/ Drum	Water used (%)	Chemicals used	
				Name	%
1	Soaking I	Drum	300	W.A Sod.bicarb.	0.1 0.5
2	Soaking II	Drum	300		
3	Soaking III				
4	Liming	Drum	150	Lime Sod.Sulphide	8 2
5	Washing	Drum	300		
6	Fleshing	Machine	100		
7	Washing before Deliming	Drum	300		
8	Deliming	Drum	100	Amm.Sulphite Alk.Bate	3 0.75
9	Washing after Deliming	Drum	300		
10	Pickling	Drum	50	Salt Sufuric acid	6 1.25
11	Chrome Tanning	Drum	Pickle Bath	Chrome MgO Formic acid	6 0.4 0.5
12	Washing after Chrome Tanning	Drum	300		
		Wet Blue to Finish			
13	Washing before Rechroming	Drum	200	Formic acid W A	0.1 0.3
14	Rechroming	Drum	100	Chrome ChromeSyntan	3 3
15	Washing before Neutralisation				
16	Neutralisation	Drum	100	Sod. Formate Sod. bicarb Neut. Syntan	1.5 1 1
17	Washing I after Neutralisation	Drum	200		
18	Washing II after Neutralisation				
19	Retanning , Dyeing & Fatliquoring	Drum	100	Retan Syntan Extract Dye Fat liq Acrylic Binder Formic acid Cat fat liq	3 4 3 5 3 1 0.5
20	Top Dyeing (if any)				
21	Final Wash				
22	Washing and Wastages		89,270 Lt.		

(All washings are in running water)

10. (b) Water and Chemical usage Vegetable Tanning process

Raw to EI

Sl. No	Process	Pit/Paddle /Drum	Water used (%)	Chemicals used	
				Name	%
1	Soaking I	Paddle/ Drum	300		
2	Soaking II	Paddle/ Drum	300		
3	Soaking III				
4	Liming	Paddle/ Drum	300	Lime Sod.Sulphide	8 2
5	Washing	Drum	300		
6	Fleshing	Machine	100		
7	Washing before Deliming	Drum	300		
8	Deliming	Drum	100	Amm.Sulphite Alk.Bate	3 0.75
9	Washing after Deliming	Drum	300		
10	Pickling	Drum	50	Salt Sulfuric acid Formic acid	6 1.25 0.3
11	Pre Tanning				
12	Vegetable Tanning	Pit	200	Pre tan syntan Extract oxalic acid	0.5 30 0.1
13	Bleaching	Pit	100	Bleaching. syn	1
14	Myrobing			Presrvative	0.3
15	Oiling	Manual		Oil	4
	E I to Finish				
16	Washing before Stripping				
17	Stripping				
18	Washing I after Stripping				
19	Washing II after Stripping				
20	Bleaching				
21	Washing I after Bleaching				
22	Washing II after Bleaching				
23	Souring				
24	Semichroming				
25	Washing after Semichroming				
26	Washing before Neutralisation				
27	Neutralisation				
28	Washing I after Neutralisation				
29	Washing II after Neutralisation				
30	Retanning, Dyeing & Fatliquoring				
31	Top Dyeing (if any)				
32	Final Wash				
33	Washing and Wastages		40,050 lit		

11. Chrome Tanning Procedure

Item		Wetblue		Rechroming	
1	No.of Drums	2		3	
2	Size of the Drums	2.8 x 2.5m 3.5 x 3.0m		2.2 x 1.8m, 2.5 x 2m, 2.5 x 2m.	
3	Average pelt weight(Kgs)	7200		400,500,600	
4	Type of BCS used				
5	% of BCS used	6		3	
6	Water used (float) in %	50		100	
7	Other chemicals used in %	Chemical	%	Chemical	%
		Formate	Nil	Formate	Nil
		Sod.bicarb	Nil	Sod.bicarb	Nil
		MgO	0.4	Syntan	3
		Formic acid	0.5		

12. Water utilised/per day (quantity in liters)

a) Chrome tanning : 2500

b) Rechroming : 1400

13. Drainage and disposal arrangements

a) Drainage system (Open/Closed) : Partly open & partly closed

b) Status of segregation system

YARD	SEPARATE	COMBINATION
Lime yard		Combined
Drum yard		Combined
Machine yard		Combined

c) Whether scope exists for mixing up rain water with tannery waste water : **Yes**

d) Whether scope exists for solid waste to mix with effluent : **No**

e) Type of problems faced in operating existing drains/sewer

1:

2:

3:

4:

f) Mode of final effluent disposal (CETP/ETP) :Effluent Discharged to own vacant land

14. Mode of solid waste management :

S.NO.	SOLID WASTE	DISPOSAL METHOD
1.	Dusted salt	Dumping
2.	Raw hide/skin trimmings	Dumping
3.	Lime sludge	Dumping
4.	Hair/wool	Dumping
5.	Fleshings	Dumping
6.	Wet blue trimmings	Dumping
7.	Shaving/buffing dust	Dumping
8.	Others	-

15. Total water used perday (litres) : 145970
16. Total Effluent discharged (litres approximate) : -

17. Whether Chrome Recovery Plant is proposed / under construction / existing : No

18. Remarks.

CONTACT PERSON.
Mr Peru Silva
Mr Sanath de Silva

Signature
Name
Date

INDUSTRIAL POLLUTION REDUCTION PROGRAMME IN TANNERIES IN SRI LANKA
(UNIDO PROJECT : DG/SRL/91/019)
CONDUCTED BY
(Central Leather Research Institute, Chennai)
Part - A
TANNERY PROCESS DETAILS

A. Tannery with ETP/connected to CETP* Nil

1. **Name and address of the tannery with Telephone, Fax Nos. &** : KP004B
   Name of the Contact Person :
2. **Tannery Location and Land Area**
   (a) Total land area (in acres/sq.ft.) : 3 Acres
   (b) Open land available (in acres/sq.ft.) : Constructed Area :1 Acre

   (c) Tannery boundary details :

Northern Side : Residence **Eastern Side :** Residence

Southern Side : Residence **Western Side :** River

3. **Water**

   a) **Existing ground water Table-(feet) (within the tannery premises)** : 10'

   b) **Sources of water supply (If more than one source mention % share)** : **openwell/river** 10% / 90%

   c) **Characteristics of raw water (enclose water analysis report)** : **(pH,TSS,BOD,COD etc.)**

   d) **Residential Quarters (if any) within the campus** : **No. of quarters** Nil **No. of persons residing** Nil

4. **Sources of raw materials (mention centres of origin along with type of raw material i.e. cow/buff/goat/sheep etc.)** : 1. Cow, 2.. Buff → Kandy & Galle

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*** If connected to CETP, indicate the name :**

5. Actual processing/day (Strike out whichever is not applicable)

Stage of processing	Present Processing		Future Plans (next 5 years)	
A) Raw to Finish(via Wet Blue)	Pieces	Wt.(Kgs.)	Pieces	Wt.(Kgs)
i) Hides Cattle				
Cow	100 - 150	1500		
ii) Skins Cow calf				
Buff calf				
Goat skins	200	350		
Sheep skins				
iii) Split Leathers				
B. Raw to E.I./ Raw to Wet Blue				
i) Hides Cattle				
Buffalo				
ii) Skins Cow calf				
Buff calf				
Goat skins				
Sheep skins				
iii) Split Leathers				
C. Wet Blue to finish/ E.I to finish				
i) Hides Cattle				
Buffalo				
ii) Skins Cow calf				
Buff calf				
Goat skins				
Sheep skins				
iii) Split Leathers				

6. Seasonal variation in processing (if any)

Job work

Season	Months	Processing/per day	
		Pieces	Wt (Kgs)
i) Peak season			
ii) Lean Season			

✓

7. Production during last 3 years (in Sq. ft/pieces/Kgs)

Type of Leathers	1994	1995	1996
Wet blue			
E.I. to finish			
Finished Hides	48750	48750	48750
Goat	65,000	65,000	65, 000

8. List of equipments available (No.)

Pits	7
Paddles	2 (1 set)
Drums	3
Fleshing Machine	1
Scudding Machine	1
Sammying Machine	1
Splitting Machine	1
Hand Spray Machine	1
Embossing Machine	1
Measuring Machine	1

9. Production pattern

Items	Present	Future plans (next 5 years)
i) Working hours/day	8	
ii) No. of shifts/day	1	
iii) No. of days in a week	6	
iv) Average working days/annum	300	

10. (a) Water and Chemical usage Chrome Tanning process
Raw to Wet Blue

Sl. No	Process	Pit/Paddle/ Drum	Water used (%)	Chemicals used	
				Name	%
1	Soaking I	Drum / Pit	300		
2	Soaking II	Drum / Pit	300		
3	Soaking III				
4	Liming	Paddle / Drum	150	Lime Sod.Sulphide	10 2
5	Reliming				
6	Fleshing	M/c or Manual			
7	Washing before Deliming 2 (times)	Drum	200 +200		
8	Deliming	Drum	100	Amm. Sul	2.5
9	Washing after Deliming	Drum	200		
10	Pickling	Drum	100	Salt Sulfuric acid Formic acid	7 1.8 0.25
11	Chrome Tanning	Drum	Pickle Bath	Chrome Sod.bicarb Preservative Formic acid	6 1 0.2 0.3
12	Washing after Chrome Tanning	Drum	200		
		Wet Blue to Finish			
13	Washing before Rechroming	Drum	200		
14	Rechroming	Drum	50	Chrome	3
15	Washing before Neutralisation	Drum	200		
16	Neutralisation	Drum	100	Sod. Format Sod.bicarb.	1% 0.25%
17	Washing I after Neutralisation	Drum	200		
18	Washing II after Neutralisation				
19	Retanning , Dyeing & Fatliquoring	Drum	100	Extract Retan Syntan Fat liq Dye Formic acid Preservative	6 3 4.5 1 0.5 0.2
20	Top Dyeing (if any)				
21	Final Wash				
22	Washing and Wastages		19,150 lit		

(All washings are in running water)

10. (b) Water and Chemical usage Vegetable Tanning process

Raw to EI

Sl. No	Process	Pit/Paddle /Drum	Water used (%)	Chemicals used	
				Name	%
1	Soaking I				
2	Soaking II				
3	Soaking III				
4	Liming				
5	Reliming				
6	Fleshing				
7	Washing before Deliming				
8	Deliming				
9	Washing after Deliming				
10	Pickling				
11	Pre Tanning				
12	Vegetable Tanning				
13	Bleaching				
14	Myrobing				
15	Oiling				
E I to Finish					
16	Washing before Stripping				
17	Stripping				
18	Washing I after Stripping				
19	Washing II after Stripping				
20	Bleaching				
21	Washing I after Bleaching				
22	Washing II after Bleaching				
23	Souring				
24	Semichroming				
25	Washing after Semichroming				
26	Washing before Neutralisation				
27	Neutralisation				
28	Washing I after Neutralisation				
29	Washing II after Neutralisation				
30	Retanning, Dyeing & Fatliquoring				
31	Top Dyeing (if any)				
32	Final Wash				
33	Washing and Wastages				

11. Chrome Tanning Procedure

	Item	Wetblue		Rechroming	
1	No.of Drums	1		1	
2	Size of the Drums	8' x 8'		8' x 8'	
3	Average pelt weight(Kgs/Pcs/Drum)	1800		500	
4	Type of BCS used				
5	% of BCS used	6		3	
6	Water used (float) in %	100		50	
7	Other chemicals used in %	Chemical	%	Chemical	%
		Formate	Nil	Formate	Nil
		Sod.bicarb	1	Sod.bicarb	Nil
		Preservative	0.2		

12. Water utilised/per day (quantity in liters)

a) Chrome tanning : 1500

b) Rechroming : 250

13. Drainage and disposal arrangements

a) Drainage system (Open/Closed) : **Open**

b) Status of segregation system

YARD	SEPARATE	COMBINATION
Lime yard	-	Combined
Drum yard	-	Combined
Machine yard	Separate	-

c) Whether scope exists for mixing up rain water with tannery waste water : **Yes**

d) Whether scope exists for solid waste to mix with effluent : **No**

e) Type of problems faced in operating existing drains/sewer

1:

2:

3:

4:

f) Mode of final effluent disposal (CETP/ETP) : Discharged in to the river

14. Mode of solid waste management :

S.NO.	SOLID WASTE	DISPOSAL METHOD
1.	Dusted salt	Disposed to CMC
2.	Raw hide/skin trimmings	Disposed to CMC
3.	Lime sludge	Disposed to CMC
4.	Hair/wool	Disposed to CMC
5.	Fleshings	Disposed to CMC
6.	Wet blue trimmings	Disposed to CMC
7.	Shaving/buffing dust	Disposed to CMC
8.	Others	-

15. Total water used perday (litres) : 34,650

16. Total Effluent discharged (litres approximate) :

17. Whether Chrome Recovery Plant is proposed / under construction / existing : Nil

18. Remarks.

CONTACT PERSON.
Mr. Thirupathi

Signature
Name
Date

INDUSTRIAL POLLUTION REDUCTION PROGRAMME IN TANNERIES IN SRI LANKA
(UNIDO PROJECT : DG/SRL/91/019)
CONDUCTED BY
(Central Leather Research Institute, Chennai)
Part - A
TANNERY PROCESS DETAILS

A. Tannery with ETP/connected to CETP* Nil

1. Name and address of the tannery with Telephone, Fax Nos. & Name of the Contact Person : KP005B

2. Tannery Location and Land Area

(a) Total land area (in acres/sq.ft.) : 1.5 Acres

(b) Open land available (in acres/sq.ft.) : 0.75 Acre

(c) Tannery boundary details :

Northern Side : Rajagiriya Road

Eastern Side : River

Southern Side : Residence

Western Side : Residence

3. Water

a) Existing ground water Table-(feet) (within the tannery premises) : 10'

b) Sources of water supply (If more than one source mention % share) : Bore well 60'

c) Characteristics of raw water (enclose water analysis report) : **(pH,TSS,BOD,COD etc.)**

d) Residential Quarters (if any) within the campus : **No. of quarters** Nil **No. of Persons residing** Nil

4. Sources of raw materials (mention centres of origin along with type of raw material i.e. cow/buff/goat/sheep etc.) :

1. Goat
2.. Buffalo
3. Cow

→ All Islands

*** If connected to CETP, indicate the name :**

5. **Actual processing/day (Strike out whichever is not applicable)**

Stage of processing	**Present Processing**		**Future Plans (next 5 years)**	
A) Raw to Finish (via Wet Blue)	Pieces	Wt.(Kgs.)	Pieces	Wt.(Kgs)
i) Hides Buffalo /Cow	120	2200		
ii) Skins Cow calf				
Buff calf				
Goat skins				
Sheep skins				
iii) Split Leathers				
B. Raw to E.I./ Raw to Wet Blue				
i) Hides Cattle				
Buffalo				
ii) Skins Cow calf				
Buff calf				
Goat skins	2000	2500		
Sheep skins				
iii) Split Leathers				
C. Wet Blue to finish/ E.I to finish				
i) Hides Cattle				
Buffalo				
ii) Skins Cow calf				
Buff calf				
Goat skins				
Sheep skins				
iii) Split Leathers				

6. **Seasonal variation in processing (if any)** Nil

Job work

Season	**Months**	**Processing/per day**	
		Pieces	**Wt (Kgs)**
i) Peak season			
ii) Lean Season			

✓

7. Production during last 3 years (in Sq. ft/pieces/Kgs)

Type of Leathers	1994	1995	1996
Wet blue			
E.I. to finish			
Raw Finish (Cow) Raw Finish (Buff) Raw Finish (Skins)	72,000 30,000 1,20,000	72,000 30,000 1,20,000	72,000 30,000 1,20,000

8. List of equipments available (No.)

Pits	26
Paddles	4 Nos - (2 not working & 1 under construction)
Drums	5
Sammying Machine	1
Splitting Machine	2
Shaving Machine	2
Setting Machine	1
Staking Machine	1
Buffing Machine	1
Spraying Machine	1
Embossing Machine	1
Grinding Machine	1
Measuring Machine	1
Fleshing Machine	1
Drum Setting	1

9. Production pattern

Items	Present	Future plans (next 5 years)
i) Working hours/day	8	
ii) No. of shifts/day	1	
iii) No. of days in a week	6	
iv) Average working days/annum	280	

10. (a) Water and Chemical usage Chrome Tanning process
Raw to Wet Blue

Sl. No	Process	Pit/Paddle/ Drum	Water used (%)	Chemicals used	
				Name	%
1	Soaking I	Pit	125	Preservative	0.02
2	Soaking II	Pit	125		
3	Soaking III				
4	Liming	Paddle	300	Lime Sod.Sulphide	6 2.5
5	Washing	Drum	125		
6	Reliming	-			
7	Fleshing	Manual			
8	Washing before Deliming				
9	Deliming	Drum	100	Am.Sulphite Al.Bate	2 0.5
10	Washing after Deliming	Drum	125		
11	Pickling	Drum	100	Salt Sulfuric acid Formic Acid	6 1 0.5
12	Chrome Tanning	Drum	Pickle Bath	Chrome Sod.Formate Sod.bicarb	6 0.3 0.5
13	Washing after Chrome Tanning (running water)	Drum	125		
Wet Blue to Finish0.5					
14	Washing before Rechroming	Drum	200		
15	Rechroming	Drum	100	Formic Acid Chrome Sod.formate Cat.fat.Liq Sod.bicarb	0.3 3 0.3 0.5 0.5
16	Washing before Neutralisation (running water)	Drum	200		
17	Neutralisation	Drum	100	Neut syntan. Sod.bicarb	1.5 0.75
18	Washing I after Neutralisation	Drum	200		
19	Washing II after Neutralisation	-			
20	Retanning , Dyeing & Fatliquoring	Drum	100	Extract Retan syn. Dye Formic acid Fat Liq.	3 6 1 1 4
21	Top Dyeing (if any)				
22	Final Wash				
23	Washing and Wastages		16,215		

(All washings are in running water)

10. (b) Water and Chemical usage Vegetable Tanning process

Raw to EI

Sl. No	Process	Pit/Paddle /Drum	Water used (%)	Chemicals used	
				Name	%
1	Soaking I				
2	Soaking II				
3	Soaking III				
4	Liming				
5	Reliming				
6	Fleshing				
7	Washing before Deliming				
8	Deliming				
9	Washing after Deliming				
10	Pickling				
11	Pre Tanning				
12	Vegetable Tanning				
13	Bleaching				
14	Myrobing				
15	Oiling				
E I to Finish					
16	Washing before Stripping				
17	Stripping				
18	Washing I after Stripping				
19	Washing II after Stripping				
20	Bleaching				
21	Washing I after Bleaching				
22	Washing II after Bleaching				
23	Souring				
24	Semichroming				
25	Washing after Semichroming				
26	Washing before Neutralisation				
27	Neutralisation				
28	Washing I after Neutralisation				
29	Washing II after Neutralisation				
30	Retanning, Dyeing & Fatliquoring				
31	Top Dyeing (if any)				
32	Final Wash				
33	Washing and Wastages				

11. Chrome Tanning Procedure

	Item	Wetblue		Rechroming	
1	No.of Drums	2		1	
2	Size of the Drums	8' x 8'		6' x 8'	
3	Average pelt weight(Kgs/Pcs/Drum)	1200		750	
4	Type of BCS used				
5	% of BCS used	6		3	
6	Water used (float) in %	100		100	
7	Other chemicals used in %	Chemical	%	Chemical	%
		Formate	0.3	Sod.formate	0.3
		Sod.bicarb	0.5	Formic acid	0.3
				Cat fat Liq.	0.5
				Sod.bicarb	0.5

12. Water utilised/per day (quantity in liters)

a) Chrome tanning : 2400

b) Rechroming : 750

13. Drainage and disposal arrangements for waste water

a) Drainage system (Open/Closed) : Open

b) Status of segregation system

YARD	SEPARATE	COMBINATION
Lime yard	''	
Drum yard	''	
Machine yard	''	

c) Whether scope exists for mixing up rain water with tannery waste water : Yes

d) Whether scope exists for solid waste to mix with effluent : Yes

e) Type of problems faced in operating existing drains/sewer

1:

2:

3:

4:

f) Mode of final effluent disposal (CETP/ETP) : Discharged into the own vacant land

14. Mode of solid waste management :

S.NO.	SOLID WASTE	DISPOSAL METHOD
1.	Dusted salt	Dumping into the own land
2.	Raw hide/skin trimmings	Dumping into the own land
3.	Lime sludge	Dumping into the own land
4.	Hair/wool	Dumping into the own land
5.	Fleshings	Dumping into the own land
6.	Wet blue trimmings	Dumping into the own land
7.	Shaving/buffing dust	Dumping into the own land
8.	Others	-

15. Total water used per day (litres) : 29,865

16. Total Effluent discharged (litres approximate) :

17. Whether Chrome Recovery Plant is proposed / under construction / existing :
Proposed

18. Remarks.

CONTACT PERSON.

Signature
Name
Date

INDUSTRIAL POLLUTION REDUCTION PROGRAMME IN TANNERIES IN SRI LANKA
(UNIDO PROJECT : DG/SRL/91/019)
CONDUCTED BY
(Central Leather Research Institute, Chennai)
Part - A
TANNERY PROCESS DETAILS

A. Tannery with ETP/connected to CETP* Nil

1. Name and address of the tannery with Telephone, Fax Nos. & Name of the Contact Person : KP006B

2. Tannery Location and Land Area

(a) Total land area (in acres/sq.ft.) : 1.5 Acres

(b) Open land available (in acres/sq.ft.) : Constructed area : 0.5 Acre

(c) Tannery boundary details :

Northern Side : River

Eastern Side : River

Southern Side : Residence

Western Side : River

3. Water

a) Existing ground water Table-(feet) (within the tannery premises) : 10'

b) Sources of water supply (If more than one source mention % share) : **openwell** 100%

c) Characteristics of raw water (enclose water analysis report) : **(pH,TSS,BOD,COD etc.)**

d) Residential Quarters (if any) within the campus : **No. of quarters** Nil **No. of persons residing** Nil

4. Sources of raw materials (mention centres of origin along with type of raw material i.e. cow/buff/goat/sheep etc.) :

1. Goat
2. Buffalo
3. Cow

→ Colombo only

*** If connected to CETP, indicate the name :**

5. **Actual processing/day (Strike out whichever is not applicable)**

Stage of processing	**Present Processing**		**Future Plans (next 5 years)**	
A) Raw to Finish(via Wet Blue)	Pieces Wt.(Kgs.)		Pieces	Wt.(Kgs)
i) Hides Cattle				
Buffalo, Cow	100-300	1500		
ii) Skins Cow calf				
Buff calf				
Goat skins				
Sheep skins				
iii) Split Leathers				
B. Raw to E.I./ Raw to Wet Blue				
i) Hides Cattle				
Buffalo				
ii) Skins Cow calf				
Buff calf				
Goat skins				
Sheep skins				
iii) Split Leathers				
C. Wet Blue to finish/ E.I to finish				
i) Hides Cattle				
Buffalo				
ii) Skins Cow calf				
Buff calf				
Goat skins				
Sheep skins				
iii) Split Leathers				

6. **Seasonal variation in processing (if any)** **Nil**

Job work

Season	**Months**	**Processing/per day**	
		Pieces	**Wt (Kgs)**
i) Peak season			
ii) Lean Season			

✓

7. Production during last 3 years (in Sq. ft/pieces/Kgs)

Type of Leathers	1994	1995	1996
Wet blue			
E.I. to finish			
Raw Finished	45,000	33,600	47,000

8. List of equipments available (No.)

Pits	11
Paddles	2 sets (5 Nos)
Drums	6
Fleshing Machine	1
Sammying	1
Splitting	2
Shaving	1
Staking	1
Setting	1
Buffing	1
Hydraulic Press	1
Polishing Machine	1
Measuring Machine	1
Sample Drum	1
Machines under repair	
Fleshing Machine	1
Polishing	1
Vacuum Drier	1
Dust Cleaner	1
Measuring	1
Paddle	2

9. Production pattern

Items	Present	Future plans (next 5 years)
i) Working hours/day	8	
ii) No. of shifts/day	1	
iii) No. of days in a week	6	
iv) Average working days/annum	285	

10. (a) Water and Chemical usage Chrome Tanning process Nil

Raw to Wet Blue

No	Process	Pit/Paddle/ Drum	Water used (%)	Chemicals used	
				Name	%
1	Soaking I (running water)	Pit	300		
2	Soaking II (running water)	Pit	300		
3	Soaking III				
4	Liming	Paddle	300	Lime Sod Sulphide. Soda ash	6 2 1
5	Washing	Pit	300		
6	Reliming (Some times only for Buffalo)	-			
7	Fleshing	Manual			
8	Washing before Deliming				
9	Deliming	Drum	75	Amm.Chloride Alk.Bate Sod.bi.Sulphite	2 1 1.5
10	Washing after Deliming	Drum	200		
11	Pickling	Drum	100	Sulphuric acid Salt	1.5 6
12	Chrome Tanning	Drum	Pickle bath	Chrome Sod.bicarb	5 1
13	Washing after Chrome Tanning	Drum	100		
	Wet Blue to Finish0.5				
14	Washing before Rechroming	Drum	200		
15	Rechroming	Drum	60	Chrome Sod. bicarb.	1 0.5
16	Washing before Neutralisation	Drum	200		
17	Neutralisation	Drum	100	Sod. Formate Sod. bicarb.	1 0.2
18	Washing I after Neutralisation	Drum	200		
19	Washing II after Neutralisation				
20	Retanning , Dyeing & Fatliquoring	Drum	100	Extract Retan syn. Fat liq Formic acid Dye	1.5 3 2.25 0.5 0.25
21	Top Dyeing (if any)				
22	Final Wash				
23	Washing and Wastages		17,331		

Note : All washings are in running water

10. (b) Water and Chemical usage Vegetable Tanning process

Raw to EI

Sl. No	Process	Pit/Paddle /Drum	Water used (%)	Chemicals used	
				Name	%
1	Soaking I (Running water)				
2	Soaking II				
3	Soaking III				
4	Liming				
5	Reliming				
6	Fleshing				
7	Washing before Deliming				
8	Deliming				
9	Washing after Deliming				
10	Pickling				
11	Pre Tanning				
12	Vegetable Tanning				
13	Bleaching				
14	Myrobing				
15	Oiling				
E I to Finish					
16	Washing before Stripping				
17	Stripping				
18	Washing I after Stripping				
19	Washing II after Stripping				
20	Bleaching				
21	Washing I after Bleaching				
22	Washing II after Bleaching				
23	Souring				
24	Semichroming				
25	Washing after Semichroming				
26	Washing before Neutralisation				
27	Neutralisation				
28	Washing I after Neutralisation				
29	Washing II after Neutralisation				
30	Retanning, Dyeing & Fatliquoring				
31	Top Dyeing (if any)				
32	Final Wash				
33	Washing and Wastages				

11. Chrome Tanning Procedure

	Item	Wetblue		Rechroming	
1	No.of Drums	1		2	
2	Size of the Drums	8' x 8		9' x 9'	
3	Average pelt weight(Kgs/Pcs/Drum)	1500		1000	
4	Type of BCS used				
5	% of BCS used	5		3	
6	Water used (float) in %	100		60	
7	Other chemicals used in %	Chemical	%	Chemical	%
		Sod.bicarb	1	Sod.bicarb	0.5

12. Water utilised/per day (quantity in liters)

a) Chrome tanning : 1800

b) Rechroming : 360

13. Drainage and disposal arrangements for waste water

a) Drainage system (Open/Closed) : Open

b) Status of segregation system

YARD	SEPARATE	COMBINATION
Lime yard	"	
Drum yard	"	
Machine yard	"	

c) Whether scope exists for mixing up rain water with tannery waste water : Yes

d) Whether scope exists for solid waste to mix with effluent : Yes

e) Type of problems faced in operating existing drains/sewer

1:

2:

3:

4:

f) Mode of final effluent disposal (CETP/ETP) : (To River) Discharged into the river

14. Mode of solid waste management :

S.NO.	SOLID WASTE	DISPOSAL METHOD
1.	Dusted salt	Re used for Raw
2.	Raw hide/skin trimmings	Dumped into the own land
3.	Lime sludge	”
4.	Hair/wool	”
5.	Fleshings	Disposed to CMC
6.	Wet blue trimmings	”
7.	Shaving/buffing dust	Dumping in to the own land
8.	Others	

15. Total water used perday (litres) : 35,541

16. Total Effluent discharged (litres approximate) :

17. Whether Chrome Recovery Plant is proposed / under construction / existing :
Proposed

18. Remarks.

CONTACT PERSON.
Mr Hilmy

Signature
Name
Date

INDUSTRIAL POLLUTION REDUCTION PROGRAMME IN TANNERIES IN SRI LANKA
(UNIDO PROJECT : DG/SRL/91/019)
CONDUCTED BY
(Central Leather Research Institute, Chennai)
Part - A
TANNERY PROCESS DETAILS

A. Tannery with ETP/connected to CETP* Nil

1. Name and address of the tannery with Telephone, Fax Nos. & Name of the Contact Person : KP007B

2. Tannery Location and Land Area

(a) Total land area (in acres/sq.ft.) : 2.5 Acres

(b) Open land available (in acres/sq.ft.) : Constructed Area : 5000 m^2

(c) Tannery boundary details :

Northern Side : Buth gamuwa Road **Eastern Side :** Residence

Southern Side : Own Land **Western Side :** River

3. Water

a) Existing ground water Table-(feet) (within the tannery premises) : 10'

b) Sources of water supply (If more than one source mention % share) : **openwell :**10%
River Water : 90%

c) Characteristics of raw water (enclose water analysis report) : **(pH,TSS,BOD,COD etc.)**

d) Residential Quarters (if any) within the campus : **No. of quarters** Nil **No of persons residing** Nil

4. Sources of raw materials (mention centres of origin along with type of raw material i.e. cow/buff/goat/sheep etc.) :
1. Goat
2. Buffalo
3. Cow
4. Sheep

→ in Colombo only

*** If connected to CETP, indicate the name :**

5. Actual processing/day (Strike out whichever is not applicable)

Stage of processing		Present Processing		Future Plans (next 5 years)	
A) Raw to Finish(via Wet Blue)		Pieces	Wt.(Kgs.)	Pieces	Wt.(Kgs)
i) Hides	Cattle				
	Buffalo, Cow				
ii) Skins	Cow calf				
	Buff calf				
	Goat skins				
	Sheep skins				
iii) Split Leathers					
B. Raw to E.I./					
i) Hides	Cow	180	1500		
	or Buffalo	120	1500		
ii) Skins	Cow calf				
	Buff calf				
	Goat skins	300	450		
	Sheep skins				
iii) Split Leathers					
C. Wet Blue to finish/ E.I to finish					
i) Hides	Cattle				
	Buffalo				
ii) Skins	Cow calf				
	Buff calf				
	Goat skins				
	Sheep skins				
iii) Split Leathers					

6. Seasonal variation in processing (if any) Nil

Job work

Season	Months	Processing/per day	
		Pieces	Wt (Kgs)
i) Peak season			
ii) Lean Season			

✓

7. Production during last 3 years (in Sq. ft/pieces/Kgs)

Type of Leathers	1994	1995	1996
Wet blue			
Raw & E.I. (Buff)	54,000	56,000	50,000
Raw to E.I. (goat)	90,000	90,000	90,000

8. List of equipments available (No.)

Pits	71
Paddles	2 (not working)
Drums	2

9. Production pattern

Items	Present	Future plans (next 5 years)
i) Working hours/day	8	
ii) No. of shifts/day	one	
iii) No. of days in a week	6	
iv) Average working days/annum	300	

10. (a) Water and Chemical usage Chrome Tanning process

Raw to Wet Blue

Sl. No	Process	Pit/Paddle/ Drum	Water used (%)	Chemicals used	
				Name	%
1	Soaking I				
2	Soaking II				
3	Soaking III				
4	Liming				
	Washing				
5	Reliming (Some times only for Buffalo)				
6	Fleshing				
7	Washing before Deliming				
8	Deliming				
9	Washing after Deliming				
10	Pickling				
11	Chrome Tanning				
12	Washing after Chrome Tanning				
Wet Blue to Finish0.5					
13	Washing before Rechroming				
14	Rechroming				
15	Washing before Neutralisation				
16	Neutralisation				
17	Washing I after Neutralisation				
18	Washing II after Neutralisation				
19	Retanning , Dyeing & Fatliquoring				
20	Top Dyeing (if any)				
21	Final Wash				
22	Washing and Wastages				

10. (b) Water and Chemical usage Vegetable Tanning process

Raw to EI

Sl. No	Process	Pit/Paddle /Drum	Water used (%)	Chemicals used	
				Name	%
1	Soaking I	Pit	125%		
2	Soaking II	Pit	125%	Presrvative W.Agent	0.1 0.05
3	Soaking III	Pit	125%		
4	Liming	Pit	200	Lime Sod.Sulphide	40 0.5
5	Reliming	Pit	200	Lime	12
6	Fleshing	Manual			
7	Washing before Deliming	Pit	200		
8	Deliming	Pit	150	Am.Chloride	2
9	Washing after Deliming	Pit	200		
10	Pickling	Pit	150	Salt Sulfuric acid	12 1.2
11	Pre Tanning	-	-		
12	Vegetable Tanning	Pit	125	Extract	25
13	Bleaching	Pit	125	Oxalic acid Preservative	0.1% 0.05
14	Myrobing	Nil	-		
15	Oiling	Manual	-	Oil	3
	E I to Finish				
16	Washing before Stripping				
17	Stripping				
18	Washing I after Stripping				
19	Washing II after Stripping				
20	Bleaching				
21	Washing I after Bleaching				
22	Washing II after Bleaching				
23	Souring				
24	Semichroming				
25	Washing after Semichroming				
26	Washing before Neutralisation				
27	Neutralisation				
28	Washing I after Neutralisation				
29	Washing II after Neutralisation				
30	Retanning, Dyeing & Fatliquoring				
31	Top Dyeing (if any)				
32	Final Wash				
33	Washing and Wastages				

Note : All washings are in running water

11. Chrome Tanning Procedure Nil

	Item	Wetblue		Rechroming	
1	No.of Drums				
2	Size of the Drums				
3	Average pelt weight(Kgs/Pcs/Drum)				
4	Type of BCS used				
5	% of BCS used				
6	Water used (float) in %				
7	Other chemicals used in %	Chemical	%	Chemical	%

12. Water utilised/per day (quantity in liters)

a) Chrome tanning : Nil

b) Rechroming : -

13. Drainage and disposal arrangements for waste water

a) Drainage system (Open/Closed) : Open

b) Status of segregation system

YARD	SEPARATE	COMBINATION
Lime yard		”
Drum yard		”
Machine yard		”

c) Whether scope exists for mixing up rain water with tannery waste water : Yes

d) Whether scope exists for solid waste to mix with effluent : Yes

e) Type of problems faced in operating existing drains/sewer

1:

2:

3:

4:

f) Mode of final effluent disposal (CETP/ETP) : Discharged into the River

14. Mode of solid waste management :

S.NO.	SOLID WASTE	DISPOSAL METHOD
1.	Dusted salt	Re used for raw
2.	Raw hide/skin trimmings	Dumped in the own land
3.	Lime sludge	Dumped in the own land
4.	Hair/wool	Dumped in the own land
5.	Fleshings	Dumped in the own land
6.	Wet blue trimmings	Nil
7.	Shaving/buffing dust	Nil
8.	Others	-

15. Total water used perday (litres) : 31,927

16. Total Effluent discharged (litres approximate) :

17. Whether Chrome Recovery Plant is proposed / under construction / existing : Nil

18. Remarks.

CONTACT PERSON.

Signature

Name

Date

INDUSTRIAL POLLUTION REDUCTION PROGRAMME IN TANNERIES IN SRI LANKA

(UNIDO PROJECT : DG/SRL/91/019)

CONDUCTED BY

(Central Leather Research Institute, Chennai)

Part - A

TANNERY PROCESS DETAILS

A. Tannery with ETP/connected to CETP* Nil

1. **Name and address of the tannery with Telephone, Fax Nos. & Name of the Contact Person** : KP008B
2. **Tannery Location and Land Area**
   - **(a) Total land area (In acres/sq.ft.)** : 5 Acres
   - **(b) Open land available (in acres/sq.ft.)** : Constructed Area : 0.5 Acre
   - **(c) Tannery boundary details :**

Northern Side : Rubber Estate

Eastern Side : Rubber Estate with less residence area

Southern Side : Rubber Estate

Western Side : Rubber Estate

3. **Water**
   - **a) Existing ground water Table-(feet) (within the tannery premises)** : 10'
   - **b) Sources of water supply (If more than one source mention % share)** : **openwell**
   - **c) Characteristics of raw water (enclose water analysis report)** : **(pH,TSS,BOD,COD etc.)**
   - **d) Residential Quarters (if any) within the campus** : **No. of quarters** Nil **No. of persons residing** Nil
4. **Sources of raw materials (mention centres of origin along with type of raw material i.e. cow/buff/goat/sheep etc.)** :
   1. Goat
   2. Buffalo
   3. Cow Hide

   → all are in Colombo

*** If connected to CETP, indicate the name :**

5. **Actual processing/day (Strike out whichever is not applicable)**

Stage of processing	**Present Processing**		**Future Plans (next 5 years)**	
A) Raw to Finish(via Wet Blue)	Pieces	Wt.(Kgs.)	Pieces	Wt.(Kgs)
Raw to Finish (via EI)				
i) Hides Cattle				
Buffalo, Cow				
ii) Skins Cow calf				
Buff calf				
Goat skins				
Sheep skins				
iii) Split Leathers				
B. Raw to E.I./ Raw to Wet Blue				
i) Hides Cattle				
or Buffalo	100-120	500		
ii) Skins Cow calf				
Buff calf				
or Goat skins				
Sheep skins				
iii) Split Leathers				
C. Wet Blue to finish/ E.I to finish				
i) Hides Cattle				
Buffalo				
ii) Skins Cow calf				
Buff calf				
Goat skins				
Sheep skins				
iii) Split Leathers				

6. **Seasonal variation in processing (if any)**

Job work

Season	**Months**	**Processing/per day**	
		Pieces	**Wt (Kgs)**
i) Peak season			
ii) Lean Season			

7. Production during last 3 years (in pieces)

Type of Leathers	1994	1995	1996
Wet blue			
Raw toE.I.	36,000	36,000	36,000
Finished			

8. List of equipments available (No.)

Pits	21
Paddles	-
Drums	-

9. Production pattern

Items	Present	Future plans (next 5 years)
i) Working hours/day	8	
ii) No. of shifts/day	1	
iii) No. of days in a week	6	
iv) Average working days/annum	280	

10. (a) Water and Chemical usage Chrome Tanning process

Raw to Wet Blue

Sl. No	Process	Pit/Paddle/ Drum	Water used (%)	Chemicals used	
				Name	%
1	Soaking I				
2	Soaking II				
3	Soaking III				
4	Liming				
5	Reliming				
6	Fleshing				
7	Washing before Deliming				
8	Deliming				
9	Washing after Deliming				
10	Pickling				
11	Chrome Tanning				
12	Washing after Chrome Tanning				
Wet Blue to Finish					
13	Washing before Rechroming				
14	Rechroming				
15	Washing before Neutralisation				
16	Neutralisation				
17	Washing I after Neutralisation				
18	Washing II after Neutralisation				
19	Retanning , Dyeing & Fatliquoring				
20	Top Dyeing (if any)				
21	Final Wash				
22	Washing and Wastages				

10. (b) Water and Chemical usage Vegetable Tanning process

Raw to EI

Sl. No	Process	Pit/Paddle /Drum	Water used (%)	Chemicals used	
				Name	%
1	Soaking I	Drum	300		
2	Soaking II	Drum	300		
3	Soaking III				
4	Liming	Drum	150	Lime Sod.Sulphide	10 2.0
5	Reliming				
6	Fleshing	Manual			
7	Washing before Deliming	Drum	200		
8	Deliming	Drum	100	Amm. Sulphite	2.5
9	Washing after Deliming -2 Times	Drum	200 + 200		
10	Pickling	Drum	80	Salt Sulfuric acid Formic Acid	10 2 0.3
11	Pre Tanning			.	
12	Vegetable Tanning	Pit	280	Pre tan Syn Extract Oxalic. acid	0.5 20 1
13	Bleaching	Pit	200	Bl. Syntan Preservative.	0.5 0.05
14	Myrobing				
15	Oiling	Manual		Oil	3
	E I to Finish				
16	Washing before Stripping				
17	Stripping				
18	Washing I after Stripping				
19	Washing II after Stripping				
20	Bleaching				
21	Washing I after Bleaching				
22	Washing II after Bleaching				
23	Souring				
24	Semichroming				
25	Washing after Semichroming				
26	Washing before Neutralisation				
27	Neutralisation				
28	Washing I after Neutralisation				
29	Washing II after Neutralisation				
30	Retanning, Dyeing & Fatliquoring				
31	Top Dyeing (if any)				
32	Final Wash				
33	Washing and Wastages		6,105		

Note: All washings are in running water

11. Chrome Tanning Procedure - Nil

	Item	Wetblue		Rechroming	
1	No.of Drums				
2	Size of the Drums				
3	Average pelt weight(Kgs/Pcs/Drum)				
4	Type of BCS used				
5	% of BCS used				
6	Water used (float) in %				
7	Other chemicals used in %	Chemical	%	Chemical	%
		Formate		Formate	
		Sod.bicarb		Sod.bicarb	

12. Water utilised/per day (quantity in liters)

a) Chrome tanning : Nil

b) Rechroming :

13. Drainage and disposal arrangements

a) Drainage system (Open/Closed) : Open

b) Status of segregation system

YARD	SEPARATE	COMBINATION
Lime yard	-	Combined
Drum yard	-	Combined
Machine yard	-	Combined

c) Whether scope exists for mixing up rain water with tannery waste water : **Yes**

d) Whether scope exists for solid waste to mix with effluent : **Yes**

e) Type of problems faced in operating existing drains/sewer

1:

2:

3:

4:

f) Mode of final effluent disposal (CETP/ETP) :Discharged in to the own land

14. Mode of solid waste management :

S.NO.	SOLID WASTE	DISPOSAL METHOD
1.	Dusted salt	Disposed to CMC
2.	Raw hide/skin trimmings	Disposed to CMC
3.	Lime sludge	Disposed to CMC
4.	Hair/wool	Disposed to CMC
5.	Fleshings	Disposed to CMC
6.	Wet blue trimmings	-
7.	Shaving/buffing dust	-
8.	Others	-

15. Total water used perday (litres) : 12,155
16. Total Effluent discharged (litres approximate) :

17. Whether Chrome Recovery Plant is proposed / under construction / existing : Nil

18. Remarks. Up to pickle stage the hides are processed in Indo-Ceylone Tannery. Veg.Tanning only processed in Standard Leather Co.

CONTACT PERSON.
Mr Balakrishnan

Signature
Name
Date

INDUSTRIAL POLLUTION REDUCTION PROGRAMME IN TANNERIES IN SRI LANKA

(UNIDO PROJECT : DG/SRL/91/019)

CONDUCTED BY

(Central Leather Research Institute, Chennai)

Part - A

TANNERY PROCESS DETAILS

A. Tannery with ETP/connected to CETP* Connected with TAN Lanka ETP

1. Name and address of the tannery with Telephone, Fax Nos. & Name of the Contact Person : KP009B

2. Tannery Location and Land Area

(a) Total land area (in acres/sq.ft.) : 0.3 Acre

(b) Open land available (in acres/sq.ft.) : Constructed Area : 0.29 Acre

(c) Tannery boundary details :

Northern Side : Residence

Eastern Side : Residence

Southern Side : Tan Lanka tannery

Western Side : Lake

3. Water

a) Existing ground water Table-(feet) (within the tannery premises) : 10'

b) Sources of water supply (If more than one source mention % share) : **openwell / river 25% / 75%**

c) Characteristics of raw water (enclose water analysis report) : **(pH,TSS,BOD,COD etc.)**

d) Residential Quarters (if any) within the campus : **No. of quarters** Nil **No. of persons residing** Nil

4. Sources of raw materials (mention centres of origin along with type of raw material i.e. cow/buff/goat/sheep etc.) :

1. Goat
2. cow
3. Buffalo

→ Colombo Only

*** If connected to CETP, indicate the name :**

5. Actual processing/day (Strike out whichever is not applicable)

Stage of processing	Present Processing		Future Plans (next 5 years)	
A) Raw to Finish(via Wet Blue)	Pieces	Wt.(Kgs.)	Pieces	Wt.(Kgs)
i) Hides Cattle or Buffalo/Cow	200	2000		
ii) Skins Cow calf				
Buff calf or				
Goat skins				
Sheep skins				
iii) Split Leathers				
B. Raw to E.I./ Raw to Wet Blue				
i) Hides Cattle				
Buffalo				
ii) Skins Cow calf				
Buff calf				
Goat skins	650	700		
Sheep skins				
iii) Split Leathers				
C. Wet Blue to finish/ E.I to finish				
i) Hides Cattle				
Buffalo				
ii) Skins Cow calf				
Buff calf				
Goat skins				
Sheep skins				
iii) Split Leathers				

6. Seasonal variation in processing (if any)

Job work

Season	Months	Processing/per day	
		Pieces	Wt (Kgs)
i) Peak season			
ii) Lean Season			

7. Production during last 3 years (in pieces)

Type of Leathers	1994	1995	1996
Wet blue	-	-	-
E.I. to finish	-	-	-
Finished	506595	583871	384230

8. List of equipments available (No.)

Pits	4
Paddles	2 pairs
Drums	3
Fleshing Machine	1
Sammying Machine	1
Splitting Machine	1
Shaving Machine	1
Setting Machine	1
Buffing Machine	1
Hand Spray Machine	1
Embossing Machine	1
Measuring Machine	1

9. Production pattern

Items	Present	Future plans (next 5 years)
i) Working hours/day	8	
ii) No. of shifts/day	1	
iii) No. of days in a week	6	
iv) Average working days/annum	275 days	

10. (a) Water and Chemical usage Chrome Tanning process
Raw to Wet Blue

Sl. No	Process	Pit/Paddle/ Drum	Water used (%)	Chemicals used	
				Name	%
1	Soaking I	Pit	200	Soda Ash Bleaching Powder	0.1 0.1
2	Soaking II	-	-		
3	Soaking III	-	-		
4	Liming	Paddle	250	Lime Sod. Sulphide	6 2.5
5	Reliming				
6	Fleshing	Machine	200		
7	Washing before Deliming	Pit	100		
8	Deliming	Drum	100	Am. Sulphite Alk.Bate	2 0.7
9	Washing after Deliming	Drum	200		
10	Pickling	Drum	50	Salt Sulfuric acid	6 1.2
11	Chrome Tanning	Drum	Pickle bath	Chrome MgO Formic acid	6 0.2 0.6
12	Washing after Chrome Tanning	Drum	200		
		Wet Blue to Finish			
13	Washing before Rechroming				
14	Rechroming	Drum	100	Chrome Chrome syn. Dispersing. Syn.	2 1 1
15	Washing before Neutralisation				
16	Neutralisation	Drum	100	Sod.formate Neut synt Sod.bi carb	1 1 0.5
17	Washing I after Neutralisation	Drum	200		
18	Washing II after Neutralisation				
19	Retanning , Dyeing & Fatliquoring	Drum	100	Filling syn Filling (selecting - filler) Multi filling Extract Dye Fish oil Synthetic oil Formic acid	1 2 1 2 0.25 2 2 0.5
20	Top Dyeing (if any)				
21	Final Wash				
22	Washing and Wastages	18,100 litr			

Note: All washings are in running water

10. (b) Water and Chemical usage Vegetable Tanning process

Raw to EI

Sl. No	Process	Pit/Paddle /Drum	Water used (%)	Chemicals used	
				Name	%
1	Soaking I	Pit	300	Bleach'g -Powder	0.1
2	Soaking II				
3	Soaking III				
4	Liming	Paddle	250	Lime Sod.Sulphide.	11 3.5
5	Reliming				
6	Fleshing	Machine	100		
7	Washing before Deliming	Pit	200		
8	Deliming	Drum	100	Amm. sulphite Alk.Bate	2 0.7
9	Washing after Deliming	Drum	300		
10	Pickling	Drum	50	Salt Sulphuric acid Formic acid	6 0.6 0.3
11	Pre Tanning				
12	Vegetable Tanning	Drum	100	Pretan -syn Fish oil Extract Sod. Meta. bi.Sul Preservative	2 2 15 1.6 0.05
13	Bleaching	Drum	100	Bl. Syntan	1.5
14	Myrobing				
15	Oiling	Manual		Oil	2.5
	E I to Finish				
16	Washing before Stripping				
17	Stripping				
18	Washing I after Stripping				
19	Washing II after Stripping				
20	Bleaching				
21	Washing I after Bleaching				
22	Washing II after Bleaching				
23	Souring				
24	Semichroming				
25	Washing after Semichroming				
26	Washing before Neutralisation				
27	Neutralisation				
28	Washing I after Neutralisation				
29	Washing II after Neutralisation				
30	Retanning, Dyeing & Fatliquoring				
31	Top Dyeing (if any)				
32	Final Wash				
33	Washing and Wastages				

11. Chrome Tanning Procedure

	Item	Wetblue		Rechroming	
1	No.of Drums	1		1	
2	Size of the Drums	8' x 6' : 8' x 4'		4' x 3'	
3	Average pelt weight(Kgs/Pcs/Drum)	1100 Kg/drum		600 Kg	
4	Type of BCS used				
5	% of BCS used	6		2	
6	Water used (float) in %	50		100	
7	Other chemicals used in %	Chemical	%	Chemical	%
		Formate	Nil	Formate	
		Sod bicarb	Nil	Sod bicarb	
		MgO	0.2	Chrome syn	1
				Dispersing syntan	1

12. Water utilised/per day (quantity in liters)

a) Chrome tanning : 1000

b) Rechroming : 600

13. Drainage and disposal arrangements

a) Drainage system (Open/Closed) : Open

b) Status of segregation system

YARD	SEPARATE	COMBINATION
Lime yard		Combined
Drum yard		Combined
Machine yard		Combined

c) Whether scope exists for mixing up rain water with tannery waste water : **Yes**

d) Whether scope exists for solid waste to mix with effluent : **No**

e) Type of problems faced in operating existing drains/sewer

1:

2:

3:

4:

f) Mode of final effluent disposal (CETP/ETP) : Connected with Tan Lanka ETP

14. Mode of solid waste management :

S.NO.	SOLID WASTE	DISPOSAL METHOD
1.	Dusted salt	Disposal to CMC
2.	Raw hide/skin trimmings	Disposal to CMC
3.	Lime sludge	Disposal to CMC
4.	Hair/wool	Disposal to CMC
5.	Fleshings	Disposal to CMC
6.	Wet blue trimmings	Disposal to CMC
7.	Shaving/buffing dust	Disposal to CMC
8.	Others	-

15. Total water used perday (litres) : 31900
16. Total Effluent discharged (litres approximate) :

17. Whether Chrome Recovery Plant is proposed / under construction / existing :
Proposed

18. Remarks.

CONTACT PERSON.
Mr R Sundaram

Signature
Name
Date

INDUSTRIAL POLLUTION REDUCTION PROGRAMME IN TANNERIES IN SRI LANKA

(UNIDO PROJECT : DG/SRL/91/019)

CONDUCTED BY

(Central Leather Research Institute, Chennai)

Part - A

TANNERY PROCESS DETAILS

A. **Tannery with ETP/connected to CETP*** ETP

1. **Name and address of the tannery with Telephone, Fax Nos. & Name of the Contact Person** : KP0010B

2. **Tannery Location and Land Area**
   (a) **Total land area (in acres/sq.ft.)** : 86229 Sq.ft
   (b) **Open land available (in acres/sq.ft.)** : Constructed Area : 17601 Sq.ft
   ETP - 4627 sq.ft.

   (c) **Tannery boundary details :**

Northern Side : Sultan Leather Co. **Eastern Side :** Residence

Southern Side : Residence **Western Side :**River

3. **Water**

   a) **Existing ground water Table-(feet) (within the tannery premises)** : Nil

   b) **Sources of water supply (If more than one source mention % share)** : river/ Colombo water supply 78% / 22%

   c) **Characteristics of raw water (enclose water analysis report)** : **(pH,TSS,BOD,COD etc.)**

   d) **Residential Quarters (if any) within the campus** : **No. of quarters** Nil **No. of persons residing** Nil

4. **Sources of raw materials (mention centres of origin along with type of raw material i.e. cow/buff/goat/sheep etc.)** : **1.** Buffalo Hide, **2.** Cow Hide → Sri Lanka only

---

*** If connected to CETP, indicate the name :**

5. **Actual processing/day (Strike out whichever is not applicable)**

Stage of processing	Present Processing		Future Plans (next 5 years)	
A) Raw to Finish(via Wet Blue)	Pieces	Wt.(Kgs.)	Pieces	Wt.(Kgs)
Raw to Finish (via EI)				
i) Hides Cattle				
Cow	600	6000		
ii) Skins Cow calf				
Buff calf				
Goat skins				
Sheep skins				
iii) Split Leathers				
B. Raw to E.I./ Raw to Wet Blue				
i) Hides Cattle				
Buffalo				
ii) Skins Cow calf				
Buff calf				
Goat skins				
Sheep skins				
iii) Split Leathers				
C. Wet Blue to finish/ E.I to finish				
i) Hides Cattle				
Buffalo				
ii) Skins Cow calf				
Buff calf				
Goat skins				
Sheep skins				
iii) Split Leathers				

6. **Seasonal variation in processing (if any)**

Job work

Season	Months	Processing/per day	
		Pieces	Wt (Kgs)
i) Peak season			
ii) Lean Season			

7. **Production during last 3 years (in Sq. ft/pieces/Kgs)**

Type of Leathers	1994	1995	1996
Wet blue			
E.I. to finish			
Finished	168000	165000	174000

8. **List of equipments available (No.)**

Pits	-
Paddles	-
Drums	4

9. **Production pattern**

Items	Present	Future plans (next 5 years)
i) Working hours/day	9	
ii) No. of shifts/day	1	
iii) No. of days in a week	6	
iv) Average working days/annum	280	

10. (a) Water and Chemical usage Chrome Tanning process

Raw to Wet Blue

Sl. No	Process	Pit/Paddle/ Drum	Water used (%)	Chemicals used	
				Name	%
1	Soaking I	Drum	200	W Agent Sod.bicarb.	0.3 0.5
2	Soaking II	Drum	200		
3	Soaking III	Drum	200		
4	Soaking IV	Drum	200		
5	Liming	Drum	150	Lime Sod.Sulphide Caustic Soda	2 1.3 0.6
6	Reliming (Wash) - 1 (Wash) - 2	Drum Drum	200 200		
7	Fleshing	Machine	100		
8	Washing before Deliming	Drum	100		
9	Deliming	Drum	200	Amm. Sul Alk.Bate	2 0.8
10	Washing after Deliming				
11	Pickling	Drum	50	Salt Formic acid Sulfuric acid	6 0.3 0.9
12	Chrome Tanning	Drum	Pickle bath	Chrome MgO	6 0.38
13	Washing after Chrome Tanning	Drum (Twice)	200+200		
		Wet Blue to Finish			
14	Washing before Rechroming	(2 Times) Drum	200+200	Acetic acid	0.3
15	Rechroming	Drum	100	Chrome Cat. Fat liq Sod.bicarb.	2 0.5 0.5
16	Washing before Neutralisation	Drum	100		
17	Neutralisation	Drum	100	Format Neut syn Sod.bicarb.	1 1 0.5
18	Washing I after Neutralisation	Drum	200		
19	Washing II after Neutralisation				
20	Retanning Water Addition (Fixing)	Drum Drum	100 100	Retan Syntan Formic acid Extract Fat liq. Formic acid	5.0 0.25 5.5 1 0.25
21	Washing	Drum	200		
22	Dyeing and Fat. Liq.	Drum	100	Dye Fat liq Formic acid Preservative	0.4 4.5 0.5 0.5
23	Wash in running water	Drum	100		
24	Final Wash				
25	Washing and Wastages		81,825 lit		

Note: All washings are in running water

10. (b) Water and Chemical usage Vegetable Tanning process

Raw to EI

Sl. No	Process	Pit/Paddle /Drum	Water used (%)	Chemicals used	
				Name	%
1	Soaking I				
2	Soaking II				
3	Soaking III				
4	Liming				
5	Reliming				
6	Fleshing				
7	Washing before Deliming				
8	Deliming				
9	Washing after Deliming				
10	Pickling				
11	Pre Tanning				
12	Vegetable Tanning				
13	Bleaching				
14	Myrobing				
15	Oiling				
E I to Finish					
16	Washing before Stripping				
17	Stripping				
18	Washing I after Stripping				
19	Washing II after Stripping				
20	Bleaching				
21	Washing I after Bleaching				
22	Washing II after Bleaching				
23	Souring				
24	Semichroming				
25	Washing after Semichroming				
26	Washing before Neutralisation				
27	Neutralisation				
28	Washing I after Neutralisation				
29	Washing II after Neutralisation				
30	Retanning, Dyeing & Fatliquoring				
31	Top Dyeing (if any)				
32	Final Wash				
33	Washing and Wastages				

11. Chrome Tanning Procedure

Item		Wetblue		Rechroming	
1	No.of Drums	1		2	
2	Size of the Drums	3.5m x 3.5m		2.5 x 2m, 2.5 x 1.67m	
3	Average pelt weight(Kgs/Pcs/Drum)	7000		750 and 600	
4	Type of BCS used				
5	% of BCS used	6		2	
6	Water used (float) in %	50		100	
7	Other chemicals used in %	Chemical	%	Chemical	%
		Formate		Formate	
		Sod.bicarb.		Sod.bicarb.	0.5
		MgO	.38	Cat. fat liq	0.5
		Formic acid	0.9		

12. Water utilised/per day (quantity in liters)

a) Chrome tanning : 3000

b) Rechroming : 750

13. Drainage and disposal arrangements

a) Drainage system (Open/Closed) : **Closed**

b) Status of segregation system

YARD	SEPARATE	COMBINATION
Lime yard	-	-
Drum yard	Separate	-
Machine yard	Separate	-

c) Whether scope exists for mixing up rain water with tannery waste water :No

d) Whether scope exists for mixing up solid water with tannery waste water : No

e) Type of problems faced in operating existing drains/sewer

1:

2:

3:

4:

f) Mode of final effluent disposal (CETP/ETP) : ETP (Cap =150 m^3)

14. Mode of solid waste management :

S.NO.	SOLID WASTE	DISPOSAL METHOD
1.	Dusted salt	Reused for Raw
2.	Raw hide/skin trimmings	Disposed to CMC
3.	Lime sludge	Disposed to CMC
4.	Hair/wool	Disposed to CMC
5.	Fleshings	Disposed to CMC
6.	Wet blue trimmings	Disposed to CMC
7.	Shaving/buffing dust	Disposed to CMC
8.	Others	-

15. Total water used perday (litres) : 15,7575
16. Total Effluent discharged (litres approximate) :

17. Whether Chrome Recovery Plant is proposed / under construction / existing :
Proposed

18. Remarks.

CONTACT PERSON.

Mr Perara De Silva

Signature
Name
Date