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United Nations Industrial Development Organisation

June 2001

US/RAS/97/137

FINAL REPORT (PHASE – I &II)
(Revised)

ON

PROMOTION AND DEMONSTRATION OF CLEANER TANNING TECHNOLOGIES IN THE TANNERY CLUSTER AT HAZARIBAGH, DHAKA, BANGLADESH

(CONTRACT NO: 99/016)

Prepared by

CENTRAL LEATHER RESEARCH INSTITUTE,
(Council of Scientific & Industrial Research)
Adyar, Chennai, India

Project Manager

JAKOV BULJAN
AGRO-INDUSTRIES AND SECTORAL SUPPORT BRANCH

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CONTENTS

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 Organisation (UNIDO) has launched a landmark initiative to catalyse 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 Bangladesh for implementation of Cleaner Production methods.

Central Leather Research Institute has gained considerable visibility in the implementation of cleaner technologies in tanning sector in this Region. UNIDO has assigned a contract No. 99/016 to implement a choice of cleaner production technologies in 6 tanneries in Bangladesh. UNIDO has identified the 6 tanneries Viz., M/s. Bay Tanneries limited, M/s Chowdhury Leather & Co Ltd., M/s Dhaka Hide & Skins, M/s Helena Enterprises Limited, M/s Paramount Tanneries, M/s Ruma Leather Industries for implementation of cleaner technologies.

The list of these tanneries has been reconfirmed by the survey carried out in the Phase-I by CLRI and the scope for a reduction of BOD and COD by 30±5%, TDS by 15-20% and sulphide by 40-60%.

This report presents the out come of the survey carried out in the Phase-I , the work carried out in the implementation phase (Phase-II) and work on Occupational Safety & Health (OSH) of the project. The cleaner tanning technologies were implemented in four tanneries, namely M/s. Bay Tanneries limited, M/s Chowdhury Leather & Co Ltd., M/s Dhaka Hide & Skins and M/s Ruma Leather Industries. During the implementation in each of the tannery, unit operation wise numbers of samples were collected for the conventional & modified process and analysed. The implementation of cleaner technologies have lead to the reduction of emission load for BOD & COD by 30-40%, TDS by 20-30%, Sulfide by 30-

40% and the overall water reduction by 25-40%. The detailed information's like tannery details collected in Phase-I, process demonstrated, emission load reduction by the implementation of cleaner technologies and Occupational Safety & Health (OSH) promoting good housekeeping practices of each tannery are presented in the separate annexure of individual tannery.

A seminar-cum-demonstration was organised for the benefit of the other tanneries in the tanning cluster. The team submitted the " Working Manual for Cleaner Processing Methods Demonstrated " to each tannery.

I thank the collaborating tanners in Bangladesh, Regional Programme Office of UNIDO, Leather unit in UNIDO, Ministry of Industry, Bangladesh and my colleagues who have made important contributions in the work carried out so far.

We had an important and interesting assignment in Bangladesh through this project.

Chennai
April, 2001

Dr T Ramasami
Director, CLRI

ABBREVIATIONS USED

BCS	:	Basic Chromium Sulphate
BOD	:	Biochemical Oxygen Demand
CETP	:	Common Effluent Treatment Plant
Cl^-	:	Chloride
COD	:	Chemical Oxygen Demand
Cr	:	Chromium
EL	:	Emission Load
ETP	:	Effluent Treatment Plant
ft^2	:	Square Feet (Foot)
HP	:	Horse Power
hr	:	Hours
i.e.	:	That is
kg	:	Kilo gram (s)
kg/t	:	Kilo gram (s) / tonne
kW	:	Kilo Watt
l	:	Litre (s)
l/kg	:	Litre (s) / Kilogram (s)
MEA	:	Mono Ethanol Amine
m	:	Metre (s)
m^2	:	Square Meter (s)
m^3	:	Cubic Meter (s)
N	:	Ammonia Nitrogen
NA	:	Not Applicable
OSH		Occupational Safety & Health
pcs	:	Pieces
ppm	:	Parts per million
SO_4^-	:	Sulfate
Sq.ft	:	Square Feet (foot)
SS	:	Stainless Steel
S^-	:	Sulfide
t	:	Tonne
TDS	:	Total Dissolved Solids
TS	:	Total Solids
TSS	:	Total Suspended Solids
Viz.	:	Namely

EXECUTIVE SUMMARY

A. CRITICAL EVALUATION OF LEATHER PROCESSING METHODS PREVAILING IN TANNERIES OF THE HAZARIBAGH AREA, DHAKA.

A1. Appraise And Evaluate General Leather Manufacturing Practice And Specific Processing Methods.

The technologies followed conventionally in six selected tanneries in Hazaribagh, Dhaka, were studied along with analysis of sectional wastewater streams in each tannery. The information has been presented for each tannery as a) process information , b) water usage and c) Emission load data in this report.

The technologies followed at the time of survey in all the six representative tanneries were traditional. The water consumption levels were in the range of 40-55 litres.

The emission load, in particular for the sulphide, TDS and chromium content, was either greater or close to the highest value of conventional processing streams, i.e. 7.7. kg/ton for sulphide 115 kg/ton and 18 kg/ton for TDS in chrome tanning and wet finishing respectively, while the chromium in effluent was higher than 10 kg/ton level.

A2 Simple House Keeping/Cleanliness In Plant Measures.

There was little awareness and knowledge about good housekeeping options among the tanners and floor supervisors. After the survey, simple house keeping/ cleanlinies in-plant measures involving nil or very limited investment/operation cost leading to reduction of waste genrated were identified. An implementation method, through providing information material, on site demonstration and training was adopted.

A3 Identification Of Process/Operation Suitable To Be Modified And/Or Replaced By Reliable, Proven, Cleaner Methods.

The strategy for in-process control measures for pollution reduction was made by attempting to integrate cleaner process option with the water management practices, as the volume of effluent has a direct influence on the cost of treatment. The pollutants that have come under main focus are neutral salts, both sodium chloride and sulfate, which are discharged in soaking, pickling and chrome tanning, sulfide used in liming and chrome used in tanning. Accordingly, the identified and implemented processes are a) recycling methods in soaking process, b) enzyme assisted less-sulphide unhairing methods, c) recycling of wash lime as float in liming, d) recycling of pickle floats, e) chrome tanning and f) pickle-chrome closed loop recycle involving high exhaust aids.

A4 Planning of Implementation

To implement the measures suggested above, the inputs required from various agencies were identified and specifications of the inputs required were drawn.

A5 Detailed Requirements For Implementation, Costing And Selection.

The detailed specifications of the equipment, chemicals etc. required for the implementation of identified cleaner technologies were prepared. UNIDO, RePo obtained quotations based on the tender specifications. Orders of supply of materials for the selected items were placed. The list of equipment identified is given in Table 1.

A report based on the work done in Phase-I and mentioned above was prepared and submitted. The information is presented in chapters 1 to11.

B. INSTALLATION, COMMISSIONING, STARTUP TESTS AND FINE TUNING.

B1 Monitoring And Advice On Installation And Testing .

The team made a visit to site after the required materials were delivered at the site and preliminary instructions and advice for installing & testing of the equipment were provided.

B2 Draft Manual

A draft manual covering the modified processes, operations to be followed during demonstration and implementation of cleaner tanning technologies was prepared for the use of tanners and provided to them.

B3 Implementation And Demonstration.

The cleaner tanning technologies identified earlier were demonstrated in the selected tanneries. During the implementation in each of the tannery, a number of samples were collected for each unit operations for the conventional & modified process and analyzed. The implementation of cleaner technologies has lead to the reduction of emission load for BOD & COD by 30-40% and the overall water reduction by 25-40%, TDS by 20-30% and Sulfide by 30-40%. A comparative average chart of emission load reduction is presented in **Fig 1**.

Data on good house keeping practices and occupational safety prevailing in the tanneries was collected and an action plan for improving the present status was drawn up.

A demonstration of the selected process was carried out for the benefit of the tanners, who were not part of the implementation and for the Tanners Associations.

B4 Workshop Organized

In both the phases, workshops were organised to disseminate the information to a wider selection of tanning community in the Hazaribagh area.

The details of implementation, demonstration, training and workshop carried out in Phase-II are presented in chapters 12 & 13.

B5 Impact of Implementation of Cleaner Tanning Technologies on Quality of Leather

The hides/skins from the same lot were processed in each tannery by employing conventional process method for the first part of the lot (Conventional) and cleaner tanning technology methods for the other part of the lot (Experimental). The intermediate pelt (Wet Blue) and the finished leathers from both the lots were qualitatively assessed.

The wet blue processed through cleaner tanning technology was found to be

a) free from wrinkles
b) has high exhaustion of chrome
c) increase in area by 2.0 - 2.5%

The Dyed Crust leather were

a) Fuller and Softer with free from wrinkles
b) has improved dyeability
c) All other properties were comparable

B6 Cost Benefit Analysis

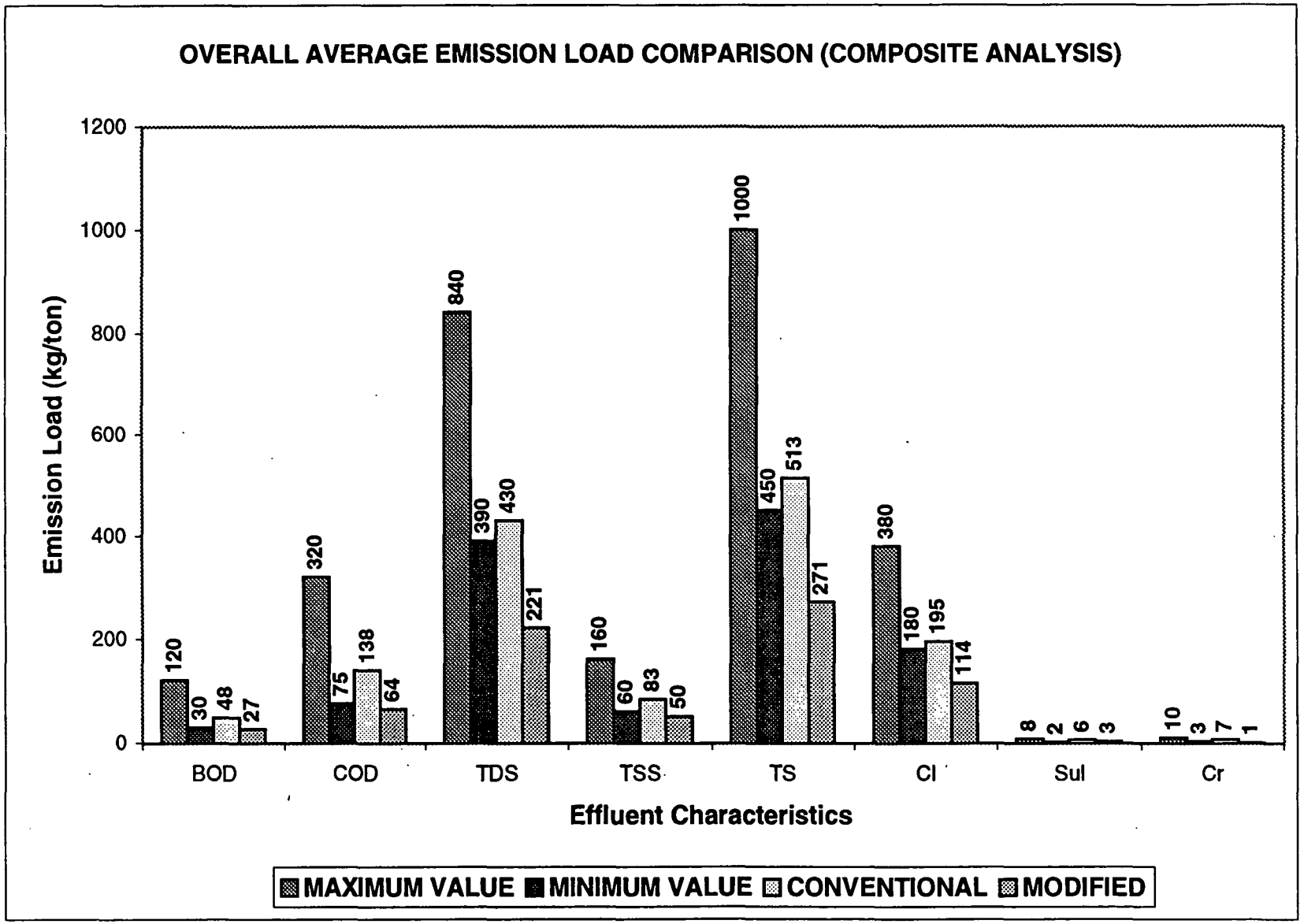
The cost benefit analysis of the of cleaner tanning technologies in the selected tanneries in the Hazaribagh area was carried out and is presented in chapter 9.

Table -1: SUMMARY OF EQUIPMENT REQUIRED

Sl No	Equipment	Quantity	Unit Cost (approx) Taka	Total cost (approx) Taka	Total cost (approx) in US $
1.	Liquor Collection Tanks (10,000 Lts)	12 Nos	38750	310000 (Tanner contribution) 155000 (UNIDO contribution)	6200 (Tanner contribution) 3100 (UNIDO contribution)
2.	Pumps	8 Nos	80625	645000	12900
3.	Water Meter	16 Nos	17190	275000	5500
4.	Modified Door for Drums	8 Nos	50875	407000	8140
5.	pH Meter	6 Nos	9100	54600	1092
6.	Baume Meter	6 Nos	210	1250	25
7.	Pipeline strainer, 2"lines (ss)	16 Nos	*	*	*
8.	Hair filtering sieve (basket type)	4 Nos	22100	88400	1768
9.	PVC hose of 2"	400 Mts (Approx)	400	160000	3200
10.	Noise Meter	1 No	87850	87850	1757
11.	Light Meter	1 No	4000	4000	80
12.	Sign Boards	Lumpsum		60000	1200
13.	Electrical wiring & accessories	Lumpsum		130000	2600
	Total			**1783100**	**35662**

Note : Taka – Bangladesh Taka
*** Cost included in the water meters**

Fig 1.Comparitive Average Emission Load Reduction Chart



1. INTRODUCTION

Despite considerable oscillation in the size of livestock population, insufficient veterinary care, poor flaying and conservation technique, the raw material base in the country is large enough to support a strong tanning industry. Goat skins from some areas are especially appreciated for their fullness and fine grain structure; these have been traditionally exported to be processed into high quality glaze kid-leather (chevreau) for luxury evening shoes.

The tanning sector in Bangladesh consists of more than 200 tanneries in the private sector, most of them of medium and small size, with a number of cottage level tanneries too. The main tannery area is at Hazaribagh in Dhaka. The other areas are in Kalurghat and Chittagong. Approximately, 85% of the hides and skins available in Bangladesh are processed in the Hazaribagh area of Dhaka. It is estimated that the tanneries in this area produce 150 - 175 million square feet of leather per year of which 70% is cow, 20% is goat and 10% buffalo and sheep leather.

About 30 tanneries have a wide range of machinery and equipment for the production of crust and finished leather acceptable to international markets. Some 10 tanneries are semi-mechanised with some machinery of unbalanced capacity and these are engaged in the production of low grade finished leather. Most of the smaller tanners are working with drums, paddles and pits but with very limited equipment. Most of the equipment installed in the tanneries is old and not in good shape because of poor maintenance.

The technical know-how presently available in the tanning industry is, generally speaking, inadequate. Only some twenty percent of the tanneries have qualified technicians in charge of the production process. The management of water, chemical usage and wastewater discharge requires improvement.

The environment condition in the Hazaribagh tannery area is deteriorating. It is hampering the development of the industry. An urgent environmental protection in this location is, therefore, considered to have high priority.

Considering these aspects, United Nations Development Organization (UNIDO) has launched a project for the introduction of proven cleaner and waste minimization technologies, like chrome recovery and reuse system, in the tanneries in Hazaribagh cluster and also facilitating feasibility study for setting up a CETP.

UNIDO has assigned the task of promotion and demonstration of cleaner tanning technologies in the tannery cluster at Hazaribagh, Dhaka to Central Leather Research Institute (CLRI), India as subcontract II, under its project US/RAS/97/137, with the objective of improving general awareness concerning more efficient use of water, chemicals and energy and of protection of the environment.

A CLRI team visited the tanneries in the Hazaribagh area and collected necessary information on the general leather manufacturing practices, pollution loads etc in Phase-I. Based on the analysis of the information, the

processes/operations which require to be modified to take in cleaner methods were identified and cleaner technologies have been accordingly suggested. The CLRI team had organized a workshop on "Cleaner Tanning Technologies" and addressed the senior representatives of the six tanneries and other professionals in the trade who can contribute in the decision making. The details of the workshop (Phase-I) are presented in **Annexure -1.**

As part of the implementation phase (Phase-II) on-the-spot evaluation of process was carried out and implemented the cleaner process technologies in the selected four tanneries.

The equipment and chemicals required for implementing these cleaner technologies and their specifications etc has been prepared.

This report has been prepared as final report of the work carried out by CLRI team, contains the information on **a)** information on technology status of identified tanneries **b)** proposed cleaner tanning technologies **c)** suggestions for inplant measures for proposed house keeping d) details of inputs required for each tannery **e)** Implementation and demonstration of cleaner technologies and **f)** Occupational Safety & Health (OSH). The report also contains information on the status of leather industry in Bangladesh, list of tanneries identified for promotion, details of workshop organized and action plan proposed. Details & impact of implementation of cleaner technologies and OSH on the individual tannery.

2. PRESENT STATUS OF THE LEATHER INDUSTRY IN BANGLADESH

2.1 Introduction

The migration of leather tanning activity from developed to developing countries over the past four decades has helped the leather industry in Bangladesh register an impressive growth rate in the last two decades. From being an exporter of wet blue in the seventies, now the accent is on the export of crust and finished leathers and leather products. Currently, leather Industry is the fourth largest foreign exchange earner for the country. Special attention is given to development of infrastructure aimed at modernization and self-sustenance and for maximizing the foreign exchange earning potential of the Bangladesh Leather industry.

2.2 History of the Bangladesh Leather Industry

Before the birth of Bangladesh in 1971, the leather industry in the erstwhile East Pakistan consisted of only about 35 medium to large and 25 cottage to small-scale tanneries and they were mainly engaged in the production of wet blue for export. The cottage and small-scale units were also making some kind of low grade finished leathers for domestic consumption. With the emergence of Bangladesh in 1971, the non-Bengali tanners disappeared as a result of which the leather making activity in the country came to a virtual stand still. The Government came to the rescue and formed Tanneries Corporation under which all the existing tanneries were nationalized. Later on, the nationalized tanneries were disinvested to private entrepreneurs during the late seventies and early eighties.

Wet blue remained the main exported commodity until the Government imposed an export duty on wet blue in 1977-78. To encourage the export of crust and finished leather, Government introduced in 1980-81 many incentives in the form of duty drawback, export performance benefit, income tax holiday including reduced import duty on leather machinery. Further, to promote rapid development of leather sector, Government imposed a ban on export of wet blue leather in 1990. Simultaneously, efforts were initiated by the Government for modernizing the leather industry through upgradation of infrastructure for making finished leather through BMRE(Balancing, Modernization, Rehabilitation and Expansion) and offering fiscal and non-fiscal assistance. This has really enabled many units to upgrade their leather processing facility and for the installation of modern machinery for the production of crust and finished leather of international quality.

In early nineties, some firms have taken the step in the right direction and ventured into producing some types of leather goods like wallets, belts, ladies' hand bags and gloves and started exporting them in a limited way. In the middle of nineties, leather shoe manufacturing with modern machinery began export of quality shoes.

2.3 Current Status

Leather industry is one of the leading export earning sectors of the country. Export earning of the sector was US$ 233.75 million in 1997-98 and the main importers were countries in European Union, USA, Japan, Taiwan, Korea, Brazil, Australia, Hong Kong, Mexico, China, Russia, India, Singapore, Malaysia, South Africa etc. The leather sector provides direct employment to about 50,000 people.

Bangladesh being a beef consuming agricultural country, have a sizable livestock population and hence assured supply of hides and skins, to sustain the leather industry in the country. The main raw materials are cow hides and goat skins. The average weight (kg) & area (sq.ft) per piece of the raw materials are given below.

	Weight/ piece (kg)	Area/piece (sq.ft)
Cow hide light-side	6.5-7.5	13-15
Cow hide	15-20	20-25
Buffalo hide	20-25	35-40
Skins	1-1.5	3-3.5

The general mode of preservation is wet salting. Only about 20% of the leathers are consumed locally and large surplus is exported in the form of crust and finished leathers and leather products. The export performance of the leather industry during 1990-97 has been shown in **Table 1.**

TABLE – 1
EXPORT OF LEATHER AND LEATHER PRODUCTS
(1990-91 TO 1997-98, In Million US Dollars)

Year	Leather	Leather bags and purse	Leather Footwear	Total
1990-91	131.29			137.13
1991-92	144.46			148.85
1993-94	168.17	4.33	14.94	187.14
1994-95	202.08	6.33	12.54	220.95
1995-96	211.70	6.96	19.13	237.79
1996-97	195.26	3.81	17.78	216.85
1997-98	190.26	5.47	38.02	233.75

Source: Export promotion Bureau of Bangladesh

Hides and skins available in Bangladesh, though smaller in size and thinner in substance, enjoy a good demand in the international market for their fine fiber structure and good grain pattern. The leathers produced from them are used mainly for making high quality leather shoes and other goods. Kushtia and Dhaka Goat skins are well known in leather world for their tight fibre structure and unique grain pattern and are considered the ideal material for the famous glace kid leathers. Apart from goat skins and cow hides, small quantities of sheep skins and buffalo hides are also processed by the Bangladesh leather industry.

About 30 units are well equipped for processing crust and finished leather and their total processing capacity is about 85.5 million square feet. Though the Bangladesh leather industry enjoys sufficient capacity to produce good quality crust

leather, capacity to produce export quality finished leather are still to be improved. It is to be noted that only 3 or 4 tanneries are exporting finished leather on a regular basis. There exists a need to increase the range of finished leather made in the country to make a greater impact in the global leather market.

Many of the chemicals needed for leather processing are imported from other countries and there are many multinational companies offering their entire range of chemicals/auxiliaries. These companies act as the main source of technologies for the processing of crust and finished leathers.

The development of leather product industry has been given due importance in the last couple of years. The leather goods industry has registered satisfactory progress in recent years and is expected to make greater contribution to foreign exchange earning capacity of the leather sector in the years to come. Some firms mainly catering to developed countries produce high quality leather jackets. Leather footwear industry came into being with the setting up of a few modern shoe units in the middle of this decade. Now, there are approximately about 15 export oriented shoe manufacturing units located in and around Dhaka city and these units are making men's and ladies' shoes, shoe uppers, moccasins etc. There are many small footwear units spread all over the country catering to domestic market.

2.4 Environmental preparedness of the Bangladesh Leather Industry

Though, Bangladesh Leather industry has contributed significantly to the country's economy, there are concerns raised about the environmental sustainability of leather making activity. There has been an increased public awareness about the pollution associated with the tanning activity especially in Hazaribagh tanning cluster, which is situated in the heart of Dhaka city. There is a serious concern expressed about the fast deterioration of the environmental condition in Hazaribagh tanning area. The Ministry of Environment has categorized the leather industry as more hazardous than textile, pharmaceutical, fertilizer and paper industries.

It has been estimated that in Hazaribagh tanning cluster alone, about 240 tons of raw material is processed every day, which results in about 15000 cubic meters of effluent. It has to be noted here that there is no separate drain for rainwater, which gets mixed up with process water and discharged. This is significant considering the fact that it rains for 6-7 months in a year in Dhaka. In the main tanning cluster of Hazaribagh, no tannery has got any system for treatment of effluent generated. There is also not much space available in many units for even pretreatment of effluent, not to talk about its complete treatment. Open space is scarce, the fleshing and in some tanneries even raw skin/hide trimmings are dumped into the sewerage canals indiscriminately. The tanneries are discharging the untreated wastewater, which through open drains reach the river, Buriganga, flowing closely.

The leather processing methods need closer scrutiny to assess their effect on the environment. No efforts are made to shake off the excess salt from the salted skins/hides before soaking process which might result in increased levels of chlorides in the effluent contributing to portion of total dissolved solids not easy to treat. No effort is made to segregate the soak liquor either and the same is

discharged mixed with the other sectional waste streams into the open drainage. The tanning units follow hair-pulping method of liming which is carried out in drums and paddles and which makes use of a high percentage of toxic sodium sulfide. Drum method of liming is very popular in many tanneries and this generates effluent rich in organic matter with high degree of BOD/COD loads. Many tanneries make use of stone lime with low purity, which pose handling problems during processing apart from leading to creation of huge volumes of sludge which ultimately end up in the drainage. This, along with other solid wastes such as fleshing, trimming, shaving etc often leads to blockage of the open drainage preventing the free flow of effluent in many parts of Hazaribagh. The garbage trucks belonging to City Corporation remove the solid waste, especially fleshing and dump the same in the outskirts leading to pollution problems in those places as well. There are some cottage and small-scale glue manufacturers operating in Hazaribagh area but they are not able to consume the huge volumes of fleshing and raw hide trimmings generated in the area. The poor quality of the fleshing due to machine fleshing also results in poor yield of glue on the other hand.

The main tanning system followed in Hazaribagh tanning cluster is chrome tanning. Though many units are making use of good quality basic chrome tanning salts of international standard, due to insufficient control of process parameters, a good proportion of tanning salt is discharged with effluent. No organized system of chrome recovery and reuse or direct recycling of spent liquors is being attempted, though, some tiny scale tanners collect spent chrome liquor discharged by big tanneries and reuse it directly for tanning of splits and other poor quality raw material. Chrome shavings are dumped in big piles close to the embankment of river Buriganga. Chrome shavings are also incinerated in the open land at the dumping site (as used by tanners) to dispose them off.

In wet finishing area, there is a tendency to use high percentage of retanning and fatliquoring agents for many types of leather, which lead to discharge of these material into effluent.

The volume of water used in tanneries per tons of raw material is much higher than the global average resulting in generation large volumes of wastewater. High float volumes employed might also result in poor uptake of chemicals leading to higher pollution loads in the effluent. General water management concepts are yet to take roots in the leather industry.

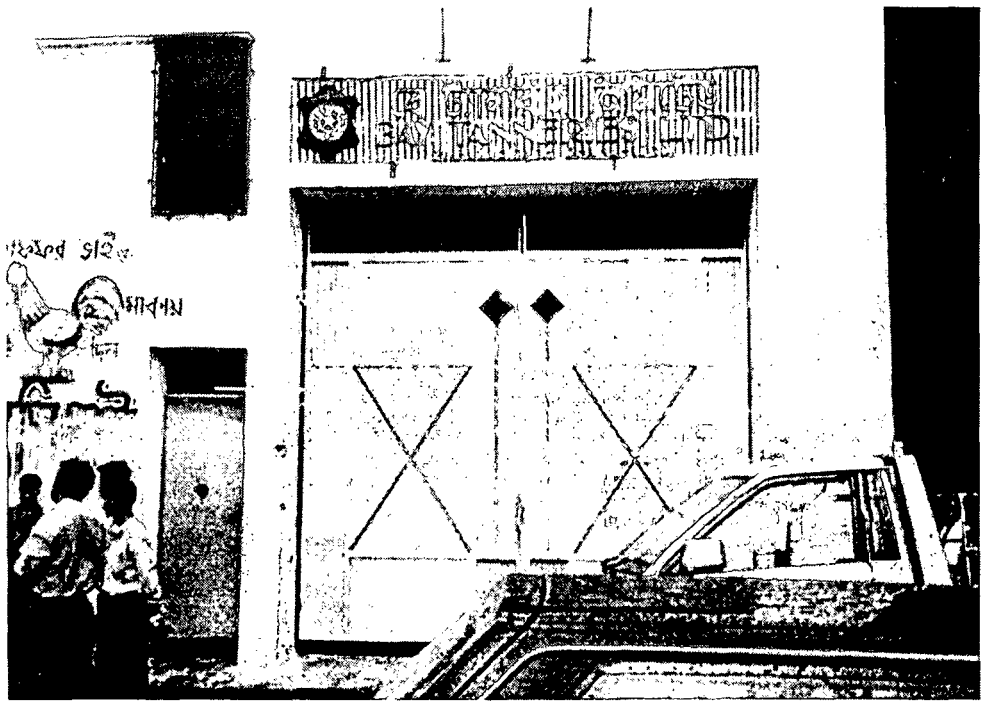
There have been many studies carried out on the pollution caused by the leather industry in Bangladesh and methods of containing the same by various international agencies. There have been abortive moves to establish a common effluent treatment plant in Hazaribagh cluster and there has also been a proposal to relocate the leather industry from this important center. However, in 1998, the government decided that a Common Effluent Treatment Plant would be set up with the technical assistance from UNIDO at the current location to prevent further environmental deterioration of the locality. It was felt even if it is decided to relocate tanneries now, it will take not less than 10 years before the exercise comes to fructification. Dhaka WASA has been identified to play a pivotal role in the exercise.

3. IDENTIFICATION OF TANNERIES FOR PROMOTION AND DEMONSTRATION OF CLEANER TANNING TECHNOLOGIES

RePo, UNIDO, Chennai has identified the tanneries listed below for promotion and demonstration of cleaner tanning technologies in the tanning cluster of Hazaribagh, Dhaka and has given the list to CLRI. The CLRI team accordingly visited these and other tanneries to identify and demonstrate cleaner tanning technologies, based on the technologies they are adopting presently and the facilities they have.

1. BAY TANNERIES LTD.		
Address	:	**Manufacturer of Crust Finished Leather** 21, Hazaribagh Dhaka-1209
City	:	Bangladesh
Nation	:	Bangladesh
Phone (Off)	:	00-880-2-811445, 811466
(Tan)	:	00-880-2-861468, 862335
(Res)	:	00-880-2-9660285 of Mr S M Abdul Baten
Telex	:	671133 BTL BJ
Fax	:	00-880-2-813581, 868716
Email	:	Baytann@citecho.net
Contact Persons & Designation	:	i) Mr Shamsur Rahman, Managing Director ii) Mr S. M Abdul Baten Technical Director
2. CHOWDHURY LEATHER & CO. LTD.		
		Head Off 59/60, Gazamahal, Hazaribagh,
City	:	Dhaka - 1209
Nation	:	Bangladesh
Phone (Off)	:	00-800-2-504475, 9660754
(Hand)	:	841137 700049
(Res)	:	00-800-2-863684
Fax	:	00-800-2-866348
Pager	:	834722-7420
Contact Persons & Designation	:	i. Mr Md. Mizan, Managing Director ii. Mr Md. Harun, Chief Executive
3. DACCA HIDE & SKINS		
Address	:	147, Hazaribagh,
City	:	Dhaka – 1209
Nation	:	Bangladesh
Phone (Off)	:	00-880-2-9660754/504475
Fax	:	00-880-2-866348
Contact Person & Designation	:	
4. HELENA ENTERPRISE LTD.		
		Head Off
Address	:	59/60, Gazamahal, Hazaribagh
City	:	Dhaka – 1209

Nation	:	Bangladesh
Phone (Off)	:	00-800-2-504475, 9660754
(Hand)	:	841137 700049
(Res)	:	834722-7420 of Md. Mizan
Pager	:	00-880-2-866348
Fax	:	834722-7420 of Md. Mizan
Contact Persons & Designation	:	i. Mr Md. Mizan, Managing Director ii. Mr Md. Harun, Chief Executive
5. PARAMOUNT TANNERIES		
Address	:	**Office** 94, Water Works Road, Postha
City	:	Dhaka – 1211
Nation	:	Bangladesh
Phone (Off)	:	00-800-2-9669788, 9666060
(Tan)	:	00-880-2-50 26 12, 50 53 66
Fax	:	00-880-2-860548
Contact Person & Designation	:	i) Akbar Hossan Partner/Chief Executive
Address	:	**Tannery** 181/2, Sher-E-Bangla Road Hazaribagh
City	:	Dhaka - 1209
Nation	:	Bangladesh
Phone (Off)	:	00-880-2-50 26 12, 50 53 66
(Tan)	:	00-880-2-9669788, 9666060
Fax	:	00-880-2-860548
Email	:	Paramount@bdmail.net
Contact Person & Designation	:	ii) Akbar Hossan Partner/Chief Executive
6. RUMA LEATHER INDUSTRIES		
Address	:	**Office** 131, HAZARIBAGH
City	:	Dhaka - 1209
Nation	:	Bangladesh
Phone (Off)	:	00-800-2-9664317, 506428
Fax	:	00-880-2-9803134-5, 9664317
Contact Person & Designation	:	i) Engr M Abdul Taher Managing Director ii) Mohammed Abdul Kaddus Miah Asst. Leather Tehcnologist



A FRONT VIEW OF BAY TANNERIES LTD.

A FRONT VIEW OF DHAKA HIDE & SKIN LIMITED

4. ACTION PLAN

Based on the terms of reference given by UNIDO vide their contract, a work plan was proposed and discussed with RePo UNIDO. The approved action plan (Work Plan) is enclosed at **Annexure-2**

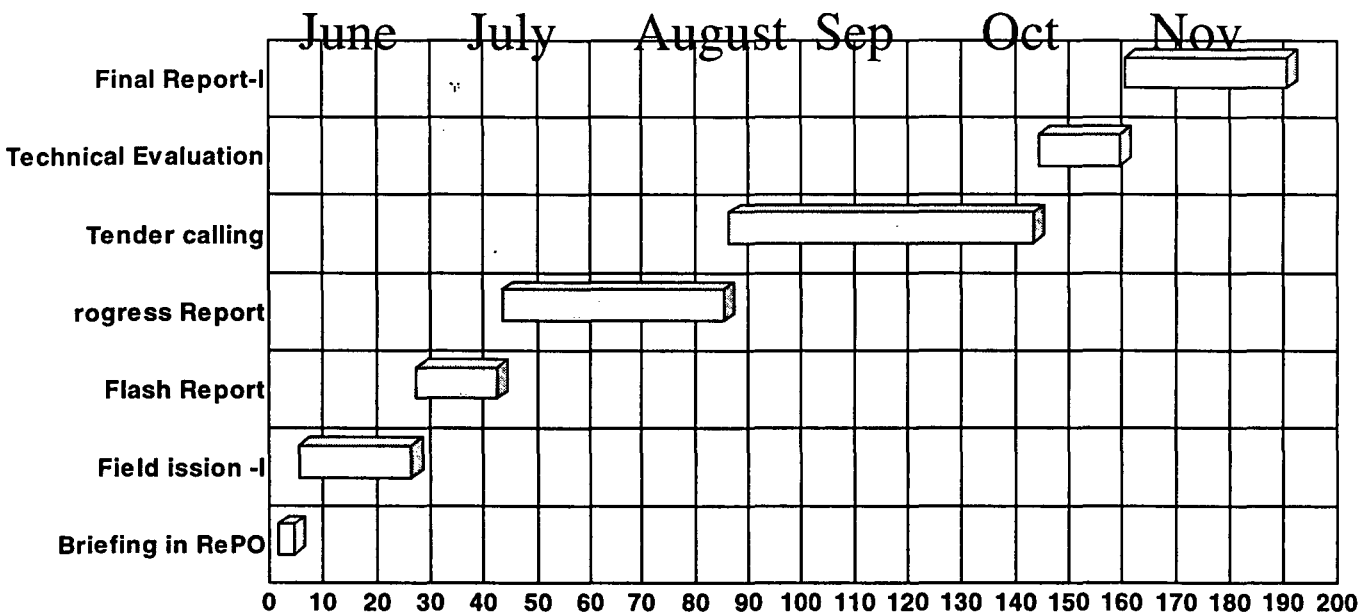
Accordingly a CLRI team visited Dhaka (Phase-I) from 08.06.99 to 14.06.99 and made thorough study of the Six identified tanneries where cleaner technologies had to be demonstrated. A flash report was submitted to UNIDO, Vienna on 13.08.99.

As part of the implementation phase (IInd Phase), a CLRI team comprising of 5 scientists was deputed to Bangladesh for carrying out demonstartion of cleaner processing elements in the selected four tanneries from 15th September to 2nd October 2000. Dr.Jurgen Hannak , a CIM expert at CLRI on Occupational Safety & Health joined the team on 27th September for carrying out OSH related studies. The final progress report (Phase-II) was submitted to UNIDO on January 2001.

It is foreseen that further activities will be carried out in accordance with the action plan. The time schedule chart as proposed in the beginning of this project is given in the next page.

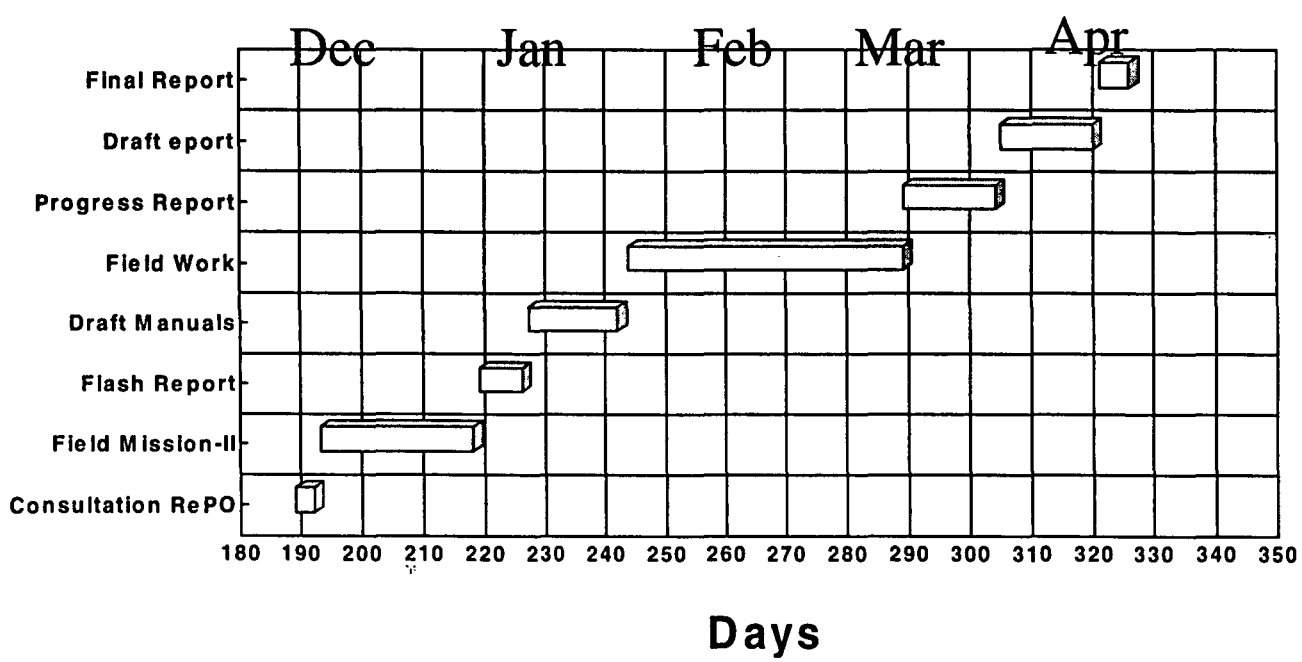
TIME SCHEDULE: PHASE - I

(Effective starting date: 24 May 1999)



TIME SCHEDULE: PHASE-II

(Effective starting date: 1ST Dec 1999)



5. INFORMATION ON TECHNOLOGY STATUS OF IDENTIFIED TANNERIES

The technology status of each of the six identified tanneries is presented in the following form.

- Filled in Questionnaire
- Process Flow Sheet with Emission Loads
- Bar Charts of Emission Load.

The tanneries are code numbered with BD001 to BD006, to ensure confidentiality of the information of individual tanneries. However the key to the code numbers will be provided on request.

Information on the present status of each tannery BD001 to BD006 proposed cleaner tanning technologies and the inputs required / demonstrated and promoting housekeeping practices are presented in the **Annexures – 6 to 11** respectively.

The summary of the information of all the six tanneries based on the data collected is provided in the Tables 5.1 to 5.3 as detailed below.

5.1 Summary of Process Information of Each Tannery
5.2 Distribution of Water Usage Based on Capacity
5.3 Summary of Emission Load Data.

Table 5.1

Summary of Process Information

Sl. No.	Tannery ID	Name & Address of Tannery	Capacity (kg/day)		Process	Raw Material	Species	Water Consumption (l / kg)
			Designed	Operating				
1	BD001		7500	5000	RWF	Mix	Cow hides (80%) Buff hides (10%) Goat skins (10%)	53#
2	BD002		10000	6000	RWF	Mix	Cow hides (70%) Goat skins (30%)	53
3	BD003		40000	40000	RWF	Mix	Cow hides (70%) Goat skins (30%)	55
4	BD004		3000	3000	RWB	Mix	Cow hides (70%) Goat skins (30%)	42
5	BD005		***Raw Wt.*** 5000 *Shaved wt.* 2500	2500 1000	RWB * WBF	Mix Mix	Cow hides (70%) Goat skins (30%)	21 37
6	BD006		6000	4000	RWF	Mix	Cow hides (70%) Goat skins (30%)	55

* Carried out at different tanneries as **job work** & the firm has full control over the process. The water usage for Raw to Wetblue operations is calculated based on the reported water percentage values.

Legend : RWF - Raw to Finish (via Wet Blue), RWB - Raw to Wet Blue, WBF - Wet Blue to Finish, Mix - Processing hide and skin

\# The water consumed per day in BD001 is 264000 liters (*page no. 129*) for processing 5000 kgs (*page No. 122*), i.e. the water used per kg of hide is 264000/5000=**52.8**. The value indicated is rounded off figure. Similarly, the data for other tanneries are provided.

Table – 5.2

Distribution of Water Usage based on Capacity

Sl. No.	Name	Process Mix	Capacity (kg/day)	Water Usage (kilo litres)					l/kg of raw material
				Soaking to Fleshing	Deliming to Tanning	Post Tanning	Other Washings	Total	
1	BD001	RWF	5000	118.75	51.50	57.50	36.25	264.00	53$
2	BD002	RWF	6000	133.50	73.50	69.00	43.50	319.50	53
3	BD003	RWF	40000	830.00	602.00	460.00	290.00	2182.00	55
4	BD004	RWB	3000	66.75	36.75	-	21.75	125.25	42
5	BD005	WBF	1000	48.50 *	4.00 *	29.50	7.25	89.25	37 #
6	BD006	RWF	4000	93.00	48.13	48.50	29.00	218.63	55
Total			**59000**	**1290.50**	**815.88**	**664.50**	**427.75**	**3198.63**	**54**

* ***For BD005***, Raw to Wet Blue is being carried out as **JOB WORK** in other tanneries. The firm has full control over the process. The water usage for Soaking to Tanning operations is calculated based on the reported water percentage values.

\# litres / shaved weight in kg

Legend: RWF – Raw to Finish (via Wet Blue), RWB – Raw to Wet Blue, WBF – Wet Blue to Finish

$ The water consumed per day in BD001 is 264000 liters (*page no. 129*) for processing 5000 kgs (*page No. 122*), i.e. the water used per kg of hide is 264000/5000=**52.8**. The value indicated is rounded off figure. Similarly, the data for other tanneries are provided.

TABLE – 5.3 A

Characteristics of Composite Tannery Waste Water of Selected Tanneries in Hazaribagh in terms of Emission Load

Tan ID / Parameter	BD001	BD002	BD003	BD004	BD005	BD006	Traditional Process
	(kg/ton of raw material processed)						
BOD	80.84	112.73	92.13	88.38	42.52	74.99	30-120
COD	193.83	284.83	239.20	223.32	91.00	173.33	75-320
Dissolved Solids	480.37	668.34	635.83	524.00	255.65	487.62	390-840
Suspended Solids	86.43	106.34	96.28	83.37	49.12	77.34	60-160
Total Solids	566.81	774.68	732.12	607.38	304.74	564.97	450-1000
Chloride as Cl	152.06	226.74	209.96	177.77	78.25	189.67	180-380
Sulfide as S	10.88	11.40	8.78	8.93	6.53	7.93	
Sulfate as SO4	69.85	82.11	89.08	64.38	44.55	47.01	
Chromium as Cr	8.34	12.46	7.31	9.77	5.43	5.79	3-10
Ammonia Nitrogen as N	3.27	4.74	5.73	3.72	2.36	1.15	

TABLE – 5.3B

Characteristics of Composite Tannery Waste Water of Selected Tanneries in Hazaribagh

Tan ID / Parameter	BD001	BD002	BD003	BD004@	BD005	BD006	Traditional Process
	(ppm) *						
pH	7.80	7.98	8.39	7.98	8.44	7.93	7.0-9.0
Alkalinity as $CaCO_3$	880	1150	1350	1150	1250	920	
BOD	1531	2117	1689	2117	1191	1372	1000-3000
COD	3671	5349	4385	5349	2549	3171	2500-8000
Total Solids	10735	14548	13421	14548	8536	10336	15000-25000
Dissolved Solids	9098	12551	11656	12551	7161	8921	13000-21000
Suspended Solids	1637	1997	1765	1997	1376	1415	2000-4000
Chloride as CL	2880	4258	3849	4258	2192	3470	6000-9500
Sulfate as SO_4	1323	1542	1633	1542	1248	860	
Sulfide as S	206	214	161	214	183	145	
Ammonia Nitrogen as N	62	89	105	89	66	21	
Chromium as Cr	158	234	134	234	152	106	100-250

*Except pH @ Sisters Concern. Similar Process Carried out as in BD002

6. CLEANER TANNING TECHNOLOGIES PROPOSED FOR INTRODUCTION IN THE IDENTIFIED TANNERIES

6.1 Need for cleaner tanning technologies

Excess use of water in process: An assessment of the water consumption in the six tanneries has indicated that that the tanneries are using water for processing at the rate of 40-55 cubic meters per ton of hide/skin processed. This figure is much higher than what is being practiced in tanneries in Tamil Nadu, India, where cleaner tanning technologies has been implemented. The excess use of water will ultimately increase the hydraulic load for the effluent treatment plant.

To reduce the hydraulic load and water consumption, measuring the quantity of water used, recycling and /or reuse of floats at different stages of process are a need of the hour.

High sulfide content in the lime liquors: Except in one tannery, the sulfide content in the effluent from the liming operation is higher than the high value norm of conventional processing, i.e. higher than 7.7 kg/ton of effluent.

A cleaner technology intervention is needed to reduce the sulfide content in the effluent from liming operation. A less sulfide enzyme assisted unhairing process would help to bring down the sulfide content in the effluent.

High TDS: In five of the tanneries, the TDS and chloride content in the pickling and composite effluents are higher than the high value of conventional processing streams. 115 kg/ton and 18 kg/ton in chrome tanning and wet finishing respectively.

Cleaner technologies like pickle recycle and direct recycle of spent chrome liquor would help in reducing the TDS content in the effluent.

High Chromium content in effluent: The chromium content in the composite effluent is higher or very close to the high value of conventional processing, i.e. 10kg/ton

To improve the exhaustion of chrome in leather and reduce the chrome content in effluent, the cleaner tanning technologies like, pickle-chrome closed loop recycle tanning method involving chrome exhaust aids would help.

Based on the needs indicated above, the following cleaner tanning technologies were proposed and implemented in the selected tanneries.

1. Enzyme assisted soaking
2. Recycling in soaking
3. Enzyme assisted less sulphide unhairing process with provision for hair filtration wherever possible
4. Recycling of wash liquor obtaining after liming as float for liming
5. Pickle recycle (for D006)
6. Pickle-chrome closed loop recycle tanning method involving chrome exhaust- aid like ethanolamine and Balsyn AL (an aluminum based syntan from Balmer Lawrie Co Ltd)

7. Employment of measured and optimum float volumes in processing

While the technologies proposed to be adopted in each tannery are indicated in the flowcharts given under section, the details and benefits of using these technologies are highlighted below.

6.2 Technical information about the cleaner processing options proposed to be implemented in selected Bangladesh tanneries

Any strategy for in-process control measures for pollution reduction should attempt to integrate cleaner process options with the water management practices as the volume of effluent has a direct influence on the cost of treatment. Hence, the cleaner technologies selected for demonstration and implementation in six selected Bangladesh tanneries aim to reduce pollution load on one hand and reducing hydraulic load, i.e., the volume of effluent generated in processing on the other. The pollutants that have come under main focus are neutral salts, both sodium chloride and sulfate which are discharged in soaking, pickling and chrome tanning, sulfide used in liming and chrome used for tanning. The general information about the options chosen for demonstration is outlined as follows.

6.2.1 Recycling methods in soaking process.

Soaking, as it is practised in Bangladesh tanneries, involves atleast three changes of water with more than 300% water on the weight of the material each time. To reduce the discharge of waste soak liquor, recycling of soak liquor is appropriate. The method proposed is to recycle the waste liquor from the IIIrd soaking in the dirt soaking of the subsequent lot. By adopting the counter current soaking system, it is possible to reduce water used in soaking operation per batch by as high as 35%.

In the main soaking operation, use of a soaking enzyme is recommended to minimize the amount of wetting agents many of which may not be biodegradable and may pose problems in the form of foaming during effluent treatment. Soaking enzymes also help in better washing of salts in soaking

liquor and reduce salt carry over into liming bath. They also improve the efficiency of enzyme assisted less-sulfide unhairing methods. The choice of enzyme is critical and an important criterion is that the enzyme should not have any collagenolytic activity. There are such enzymes available now which can be profitably used for pollution abatement.

6.2.2 Enzyme assisted less-sulfide unhairing methods

There is a need for reducing the amount of sulfide used in liming, as it is toxic. Moreover, high proportions of sulfide used currently in the hair burning process of liming in paddles or drums in Bangladesh tanneries tends to give rise to increased chemical and biochemical oxygen demand on account of dissolved hair protein in the effluent. Experience in Indian tanneries has shown that by proper choice of enzyme, it is possible to control the pollution load considerably by resorting to enzyme assisted less-sulfide unhairing methods.

Many commercially available enzymatic unhairing agents offer a possibility of reducing the amount of sulfide used in liming. Enzymes work by the attack on the proteoglycon, which is holding the hair and hence helps in the removal of the hair with the root. Enzymes work reasonably well along on skins but with thicker hides, the unhairing is not satisfactory. This calls for a judicial combination of enzymes with sulfide. Moreover, enzymes are quite expensive compared to sulfide and cannot be employed in higher concentration. Hence, the cleaner option recommended for Bangladesh tanneries is an enzyme assisted less-sulfide unhairing process. However, mention should be made about the fact that drum liming is the popular method followed in many tanneries in Bangladesh. Hence, it may not be possible to recover the hair efficiently unless or otherwise a suitable hair-filtering device is built into the process, to segregate the hair as it is removed from skin or hide. But such an on-line hair filtration systems is quite expensive.

Wherever paddle-liming methods are in vogue, simple basket like hair-filtering devices are recommended. In other tanneries, where only drum liming method is followed, the main focus has been to reduce the sulfide used in liming process.

6.2.3 Recycling of lime wash liquors as float in liming

Soaking and liming processes account for more than 50% of the total volume of water used in leather processing. Moreover, large volumes of water are used during fleshing and subsequent washing of the pelt prior to deliming. In many tanneries in Bangladesh, washing prior to fleshing is also carried out. There is a good scope for recycling of these wash liquors after filtration as float for liming. This option apart from reducing the volume of effluent

generated in processing would also ultimately result in use of reduced offer of lime and sulfide and subsequently lead to reduced pollution load per ton of material processed.

6.2.4 Recycling of pickle floats

It is normally a commercial practice to retain 50% of the pickle float for tanning. The remaining 50% is discharged in the effluent. There exists a possibility for reusing this pickle liquor for the pickling of a fresh lot. After removal of the fibrous materials by filtration, and after replenishment with salt and water the liquor can be used. This would considerably reduce the pollution load as well as the volume of water discharged, which is rich in salt content.

This option is recommended for implementation in Ruma Leather Ltd., where it has been proposed to implement the chrome recovery and reuse method by UNIDO separately.

6.2.5 Chrome tanning

The in-process control of pollution assumes greater significance in tanning not only to eliminate the pollution load due to chromium but also to help increase the efficiency of biological treatment of tannery effluent on the whole. The negative influence of chrome and sulfate bearing streams on the efficiency of biological treatment of composite effluents has already been proved. Any cleaner processing option should also address the need for reducing discharge of neutral salts, especially sulfate. Options available are direct recycling of chrome liquor preferably in pickling or closed pickle-tan loop recycling methods, which include a high-exhaust, less-chrome tanning procedure.

6.2.6 Pickle-chrome closed loop recycle involving high exhaust aids.

Direct recycling of the spent liquor generated in the conventional chrome tanning operation posed problems such as inferior and inconsistent quality of leathers and the build-up of neutral salts on each recycle especially when the chrome offer is high. Hence, in the recent times, efforts are made to standardize closed pickle-tan loop involving the less chrome and high exhaust tanning methods. Two such tanning methods have been standardized and field-tested in Indian tanneries. One method involves pickling to pH of 3.5-4.0 followed by a pretreatment with 1% ethanolamine prior to tanning with 5 to 6% basic chromium sulfate. The other method is based on the combination of alutan-chrome combination methods. Alutan is a CLRI developed product, which contains aluminum in the well stabilized form and in addition, a syntan component, which carries functional groups for fixing chromium. This product is being marketed in the Brand Name, Balsyn

AL by Balmer Lawrie, a Government of India undertaking. Both the tanning systems afford spent liquors with very low chrome content as low as 1.0 – 2.0 g/l. Hence, the spent liquor can easily be recycled as pickle liquor for the next batch without the fear of surface deposition.

6.2.7 Employment of measured and optimum float volumes in processing

The rationalization of float volumes employed in leather processing is an important step in the pollution abatement. The survey conducted in selected Bangladesh tanneries indicates that the water consumption in processing is much above the global average. This mainly happens due to the absence of reliable metering devices for the measurement of float volume. Hence, it is proposed to install flow meters in all the tanneries to ensure that optimum float volumes are employed in critical processing stages. The optimum amount of water would ensure better uptake of chemicals resulting in improved process efficiency on one had and reduced pollution load on the other.

In wet finishing also, it is proposed to introduce flow meters to ensure optimum concentrations of post tanning chemicals thereby increasing the uptake of chemicals/auxiliaries which could ultimately lead to optimized use of very expensive chemicals/auxiliaries. This would result in cost saving on the one hand & reduction in pollution load on the other. Simple process control devices such as pH meter and Baume meters are recommended so that better control of the processes can be obtained to reduce pollution and also to enhance quality consistency.

6.3 Cleaner processing options: An avenue for pollution reduction and cost saving

Through the application of cleaner processing technologies recommended for implementation in Bangladesh tanneries, it is possible to reduce process wastes, save on chemicals as well treatment costs. It is estimated that a reduction of BOD/COD levels by 25-40%, TDS load by about 20 – 40%, sulfide load by 40 – 60% and discharge of chrome by about 90% is possible by adopting these cleaner processing options. These could lead to sufficient saving in the cost of end-of-pipe treatment in CETP.

6.4 Modified processes

Modified processes demonstrated in each tannery and with all technologies recommended in respect of each tannery are given in **Annexures –6 to 11**.

7. SUGGESTIONS ON INPLANT MEASURES FOR SIMPLE HOUSEKEEPING / CLEANLINESS

7.1 Introduction

The prevailing operating practices were assessed against following points:

1. Cleanliness of store, production area and passageways
2. Adequacy of layout and spacing between production facilities, passageways, stores
3. Storage and handling practices (size and layout of storage areas, use of trolleys for transfer of material)
4. Adequacy of ventilation to control temperature and humidity in the work areas (use of natural and technical ventilation, insulation)
5. Adequacy of illumination (light intensity, use of natural and artificial illumination, avoidance of glare)
6. Availability of personnel on-site trained in proper operation of all equipment (machines, drums, devices, etc.), handling of chemicals, application of mixtures;
7. Condition and maintenance of machinery, production equipment and installations (availability of active and passive safety devices, siting and positioning of machines, electrical installations, operating controls, maintenance provisions, control of emissions such as air-borne contaminants, heat and noise)
8. Control of quality of chemicals used in processes (chemical hazard information and communication, storage and handling practices, disposal of chemical waste)
9. Availability and use of personal protective equipment (selection, maintenance, promotion and training)
10. Emergency prevention and preparedness (control of fire and explosions, medical emergencies)

1 The recommendations are made based on the preliminary observation made during the visit of the team in Phase-I. Specific recommendations would be made based on the data to be collected by the team in their visit to site during Phase-II

7.2 Recommendations

As there is little awareness and knowledge about good housekeeping options among the tanners and the shop floor supervisors, the focus of further activities in this regard needs to be on providing the tanners with access to such information.

In this connection a three-prong approach is recommended:

1. **Information material**: Provisions of one publications (written guidelines or full manual) on good housekeeping practices in English and Bengali language.
2. **On-site demonstration** of good housekeeping practices in two selected tanneries in the Hazaribagh cluster
3. **One training** seminar on good housekeeping, cleaner technologies and occupational safety & health.

Ad 1: Information material

- The OSH reference manual of UNIDO, published in March 1999, jointly by RePO-UNIDO and Council for Leather Exports and the safety manual on Leather Processing, published in Feb'99, by Leather Technology Mission, India should be translated into Bengali and made available to (1) the tanners in the Hazaribagh cluster, (2) the College of Leather Technology and (3) the tanners' association.
- A separate small pocket handbook with brief practical guidelines on good housekeeping in tanneries should be prepared in English and Bengali language and distributed to tanners and shop-floor supervisors.
- Copies of the OSH video produced by RePO-UNIDO could be dubbed in Bengali and distributed to the tanner's association.

Ad 2.: On-site demonstration of good housekeeping

- Two tanneries, preferably those in which cleaner technologies are demonstrated, should be selected and assisted in practically implement simple low-cost housekeeping measures.
- The measures taken and their benefits as perceived by the tanners should be adequately documented as readily referable case study.

Ad 3: Training

- As part of the planned dissemination workshop or as a separate training activity, one seminar on good housekeeping and occupational safety & health should be organized with participation by tanners and shop floor supervisors.

- Through the national project authorities in Bangladesh, additional workshops should be organized at a smaller level at the tannery level. Tanners or supervisors in whose tanneries cleaner technology and good housekeeping measures have been implemented should participate as facilitators, possibly on an honorarium basis as incentive.

The main areas of good housekeeping measures which should be dealt with under all the three components described above should include:

1. General cleanliness of stores and work areas
2. Organisation of stores and work areas (workflow, layout)
3. Basic work place ecology (illumination, climate control, noise control)
4. Reduction of general water consumption
5. Use of basic process controls
6. Regular maintenance of structure and equipment
7. Simple ways of reducing workers exposure to potential hazards
8. Disposal of solid and liquid waste from the work area

The basic emphasis needs to be on showing the positive impact of these measures on workers productivity, cost reduction and improvement of environmental performance of tannery.

Good housekeeping practices about criteria, finding & proposal follow-up action and results of noise & light measurements of individual tanneries are given in the **Annexures –6 to 11.**

8. DETAILS OF INPUTS REQUIRED

The inputs required for implementing identified cleaner technologies in each of the tannery are identified and the following are identified as required apart from technology and manpower

1) Chemicals
2) Hardware

The details of chemicals and hardware required for each tannery are indicated in the respective **Annexures –6 to 11.** The specification of the chemicals and major hardware is also included in this chapter. For items like piping, the details like length etc., need to be fixed at the site during implementation, hence the details are not provided for piping.

8.1 Chemicals

8.1.1 Soaking Enzyme:

Specification:

Appearance : Fine powder preferable

Shelf life: Minimum 10 months when kept dry and under shade at ambient Conditions

Other features : Should be active at pH 7.5 – 9.5 and temperature 25-40° C
Should be compatible with most alkalies, wetting agents and Preservatives used in tanneries

Likely Suppliers:

1. M/s Southern Petrochemical Industries Corporation Limited
   SPIC Bio-Products, Agro Idustrial Complex
   Chettiar Agram Road, Gandhi Nagar
   Porur, Chennai 600 116
   Tel : 91 – 44- 4828064
   Fax: 91 – 44 –4827
2. M/s Textan Chemicals (P) limited\
   Textan House
   47, Fourth Avenue, Ashok nagar
   Chennai– 600 083
   Tel : 91 –44 - 4821302, 4821684
   Fax: 91 –44 – 4821285

3. M/S BASF Limited
   Rhone Poulenc House
   Sudam Kalu Ahire Marg
   MUMBAI-400 025
   Tel:00 91 22 493 0703
   Fax: 00 91 22 495 0512

8.1.2 Unhairing Enzyme*:

Specification:
Nature : Unhairing agent based on Enzyme
Appearance : Powder of 60 mesh

** Alkaline proteolytic enzyme with unhairing specificity without keratinolytic and collagenolytic activity and having good activity even at pH 12 and above*

Likely Suppliers:
1. M/s Southern Petrochemical Industries Corporation Limited
   SPIC Bio-Products, Agro Idustrial Complex
   Chettiar Agram Road, Gandhi Nagar
   Porur, Chennai 600 116
   Tel : 91 – 44- 4828064
   Fax: 91 – 44 –4827
2. M/s Textan Chemicals (P) limited\
   Textan House
   47, Fourth Avenue, Ashok nagar
   Chennai– 600 083
   Tel : 91 –44 - 4821302, 4821684
   Fax: 91 –44 – 4821285
3. M/S BASF Limited
   Rhone Poulenc House
   Sudam Kalu Ahire Marg
   MUMBAI-400 025
   Tel:00 91 22 493 0703
   Fax: 00 91 22 495 0512

8.1.3 Ethanolamine:

Specification: Commercial grade
Likely Suppliers: Any chemical supplier firm

8.1.4 Aluminium Syntan:

Specification:
Form : Aluminum salt complexed with syntan in a homogeneous form
pH (10% solution) : 3.0 – 4.0
Moisture (Free) : 5% (Max)
Appearance and solubility: White powder easily soluble in cold or hot water.

Likely Suppliers:

1. M/s Balmer & Lawrie & Co Ltd.
   Balmer Lawrie House
   502, Anna Salai
   Chennai – 600 018
   Tel : 00 91 44 4349680/4349640
   Fax: 00 91 44 4341075

2. M/s Quinn India Limited
   Quinn House
   Road No: 2, Banjara Hills
   Hyderabad – 500 034
   Tel : 00 91 40 3746255/ 3743155
   Fax: 00 91 40 3747841

8.2 HARDWARE

The list of equipment required for each tannery are typically

1. Hair filtering sieves
2. Collection tanks of 10 cubic meters capacity (4 to 5 number) with suitable inlet and outlet nozzles, made of concrete.
3. Pumps of $9m^3/hr$ capacity (4 to 5 number)
4. Water meters suitable to the main water line size of each tannery
5. Modified door drum for collecting liquors
6. Piping and electrical accessories as required
7. pH meter
8. Strainers in pipeline(for recirculation water line)

The tannery has to make suitable arrangements by providing proper separate drain or by providing suitable pipes for collecting the liquors in the tanks and or sump. The specifications of major equipment of the list given above are provided in the next sections

In addition one luxmeter and noise meter are recommended (specifications enclosed). These units would be help to assess and monitor some of the OSH parameter in the Tanneries.

8.2.1 Specification of Collection Tank

Type	: Vertical
No. of Units/tannery	: 4 to 5
Service	: Process liquor
Capacity	: 10 m^3
Operating Temperature	: 25 to 60^0 C
Material of Construction	: Concrete with non corrosive paint/FRP with PVC lining
Dimension	: As suitable at the site
Lines and nozzles	: Made of Polypropylene of suitable size for inlet, outlet, etc.

Likely Suppliers: To be fabricated/ constructed at site or purchased locally

8.2.2 Specification of Pumps

Type	: Helical Rotor Pump
No. of Units/tannery	: 3
Service	: Process liquor
Pipe size (inlet/outlet)	: 50/50 mm (as per manufacturing standard)
Capacity	: 150 l/min
Head	: 6 meter
Motor H.P	: > 2.5
Power	: 3 ph, 50 Hz, 415 V
Temperature	: 25 to 50^0 C
Casing & Impeller	: SS-316
Shaft	: SS316

Likely Suppliers :

1. Roto Pumps Ltd.
   Akshaya Plaza, No: 1-A, first Floor
   55/56, Harris Road, Pudupet,
   Chennai – 600 002
   Tel: 044-854 6606, 851 002
   Fax: 04 – 8591365
   Email : rotochn@satyam.net.in

8.2.3 Lux Meter

- Hand held instant read out instrument
- Range at least upto 50,000, battery operated
- Estimated cost : US$ 100

Likely Suppliers:

1. Sri Rudran Instruments Co.
   129, Kodambakkam High Road
   Nungambakkam
   Chennai – 600 034, India
   (Product : Luxmeter LX 101-3200 Taka)
   Ph : +91 44 8257003
   Fax : +91 44 8255843

2. M/s Helmut Hund GmbH
   Wilhelm Will Strasse 7
   P.O Box 1669
   35580 Wetzlar-Nauborn, Germany
   Ph : ++49 6441 2004-0
   Fax : ++49 6441 200444
   Email : hundwetzlar@hud.de

3. LMT Lichtmesstechnik GmbH
   Helmholzstrasse 9
   10587 berlin, Germany
   Ph : ++49 30 3934028
   Fax : ++49 30 3918001

8.2.4 Noise dose meter

- Portable direct read out combined noise dose and sound level meter
- A or C weighing, Slow & Fast response option
- Selectable criteria level: 80, 85, 85, 90 dB
- User selectable thresholds 3,4,5 & 6 dB exchange rates
- Averaging L_{eq}, L_{avg}, Present dose 0-1999%, Time weighted average (TWA)
- Measuring range : 70-140dBA, resolution : 0.1dB
- Microphone (consisting of shoulder mount, cable and connector)
- Sound level Calibrator
- Operating temperature and humidity range : at least 0 to 50^0C; 0-955, non-condensing
- Memory capacity : at least 120 hours
- Optional : Print out capability (serial or parallel interface, summary data, time history, supporting software suitable for MS Windows)
- Estimated cost : US$ 1,900

Likely Suppliers :

1. TES Electrical Electronic Corp.
   No. 57 Jen-Ai Road Sec. 2
   Taipei, Taiwan
   Ph : ++886-2-2393-9142
   Fax : ++886-2-2395-9146
   Email : tes@ms9.hinet.net

2. Quest Technologies Inc.
   510 S. Worthington Street
   Oconomowoc
   WI 53066, USA
   Ph : ++1 414 5679157
   Fax : ++1 414 567404
   Http://quest-technologies.com

3. Bruel & Kjaer
   Ambachtelijke Zone de Vunt 17
   3220 Holsbeek, Belgium
   Ph : ++32 16 449225
   Fax : ++32 16 449230

8.2.5 pH Meter

Readout / Display	:	31/2 Digit LED
Range pH	:	0 – 14 pH continuous
mV	:	0 – 1999 mV
Resolution / pH	:	0 – 01 pH
mV	:	+ or – 1mV
Repeatability pH	:	0 – 01 pH
mV	:	+ or –1mV
Accuracy pH	:	0.01 pH + or – 1 Digit
mV	:	+1mV +or –1 Digit
Slope correction	:	85% to 105%
Temp.Compensation	:	0 –100°C (Manual)
Input Impedance	:	10 ^{12}Ohms
Power Supply	:	240V, + or – 10%, 50 Hz with in built in voltage stabilizer
Standard Supply	:	Combination electrode, electrode stand instruction manual, dust preventive cover.
Optional Facility	:	Auto temp-comp, Recorder output temp, measurement 0 – 200°C with a resolution of 0.1°C with pt 100 probe

Likely Suppliers:

1. M/s Sri Mahaalakshmi Scientific Compnay
   Post Box No. 8595
   7, Mahatma Gandhi Road
   Thiruvanmiyur
   Chennai- 600 041
   Ph:4415535

8.2.6 Specifications for water meter

WATER (BULK TYPE) ENCLOSED AND INTERCHANGEABLE TYPE FULL FLOW

	Size of Meter		
	50mm	**80mm**	**100mm**
	Million	Million	Million
Maximum Recording Capacity in Litres	100	100	1000
Minimum Reading Capacity in Litres	10	10	100
Nominal Capacity of Water Meter Discharge Litres per hour at 3m Loss of head	50000	125000	200000
Intermediate Capacity of Water Meter Discharge Litres per hour At 1m loss of head	20000	62000	100000
Metering Accuracy	±2%	±2%	±2%
Minimum Starting Flow Litres per hour	500	1000	1500
Permissible Loading Litres per day (8 hour)	200000	620000	1000000

Likely Suppliers:

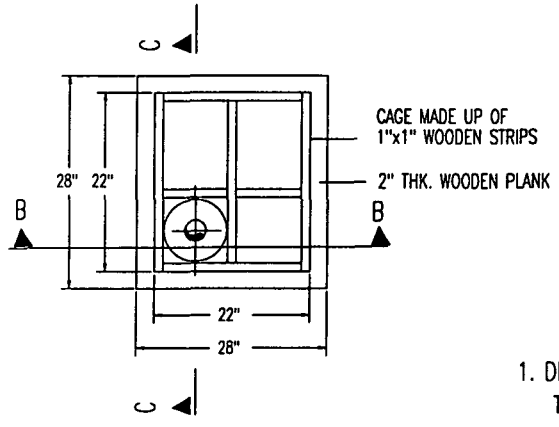
1 M/s M G Enterprises
3, Singanna Naicken Street
II floor, Chennai-600 001
Tel: 525 0456

2 M/s S R Govardhandas Agencies P Ltd
43, Sembudoss Street
Chennai- 600 001
Ph: 522 7317, 522 2425

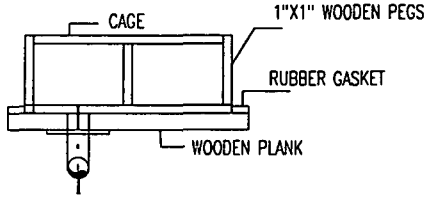
3 M/s Kalanjiam Engineering Co
101, Broadway
Chennai – 600 108
Tel: 522 5523, 522 1622

9.2.8 DETAILS OF DOOR FOR DRUM FOR WITHDRAWING WASTE LIQUOR

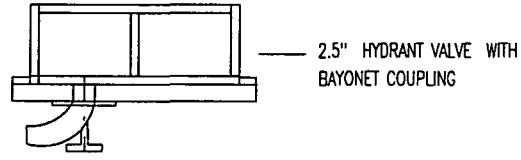
SCALE : NTS



DOOR PLAN



SECTION B–B



SECTION C–C

1. DRUM DOOR

   This shall be made of 2" thick wooden planks with 8" high cage made of 1"x1" wooden battens protruding inside. The door shall have a dia 3" hole as shown in drawing. The hole in the door shall be fitted with hydrant valve from outside.

2. HYDRANT VALVE

   Hydrant valve(dia 2.5") shall be made of gunmetal & shall confirm to IS specification. It shall have a bayonut type coupling arrangement.

3. HOSE PIPE

   Hose pipe shall have dia of 2.5" and shall be a cotton hose lined with rubber coating from inside with male-female bayonut coupling system. Altenatively the hose can be of braidep PVC material.

NOTE: The basic dimensions of the door may vary from tannery to tannery. The door may be fabricated according to the local needs.

VRL/LTM008

8.3 Summary

The list of chemicals and equipment required for all the six tanneries and their approximate cost is indicated in Tables 8.1 & 8.2

Table. 8.1 CHEMICAL REQUIREMENTS FOR IMPLEMENTATION / DEMONSTRATION OF CLEANER TECHNOLOGIES IN THE TANNERY CLUSTERAT HAZARIBAGH, DHAKA, BANGLADESH

Sl.No	Name	Requirement for 1000 kg lot size (kg)	Total Requirements (kg)	Suggested denomination of package	Cost/Unit (approx) Taka	Total cost Taka (approx)
1.	Soaking Enzyme	2	60	Six bags of 10kgs	80	4800
2.	Unhairing Enzyme *	10	300	Six bags of 50 kgs	135	40500
3.	Ethanolamine	10	150	Three carboy of 50 kgs	160	24000
4.	Balsyn AL/ HITAN-AL	5	25	One Bag of 25 kgs	60	1500
					Total	70800
						Approx: **1464 US$**

Table -8.2: SUMMARY OF EQUIPMENT REQUIRED

Sl No	Equipment	Quantity	Unit Cost (approx) Taka	Total cost (approx) Taka	Total cost (approx) in US $
1.	Liquor Collection Tanks (10,000 Lts)	12 Nos	38750	310000 (Tanner contribution) 155000 (UNIDO contribution)	6200 (Tanner contribution) 3100 (UNIDO contribution)
2.	Pumps	8 Nos	80625	645000	12900
3.	Water Meter	16 Nos	17190	275000	5500
4.	Modified Door for Drums	8 Nos	50875	407000	8140
5.	pH Meter	6 Nos	9100	54600	1092
6.	Baume Meter	6 Nos	210	1250	25
7.	Pipeline strainer, 2"lines (ss)	16 Nos	*	*	*
8.	Hair filtering sieve (basket type)	4 Nos	22100	88400	1768
9.	PVC hose of 2"	400 Mts (Approx)	400	160000	3200
10.	Noise Meter	1 No	87850	87850	1757
11.	Light Meter	1 No	4000	4000	80
12.	Sign Boards	Lumpsum		60000	1200
13.	**Electrical wiring & accessories**	Lumpsum		130000	2600
	Total			**1783100**	**35662**

Note : Taka – Bangladesh Taka

*** Cost included in the water meters**

9. FINANCIAL ANALYSIS OF IMPLEMENTATION OF ENVIRONMENTALLY CLEANER TECHNOLOGIES

9.1 INTRODUCTION

Cost projection have been made for the selected cleaner technologies to demonstrate its techno-economic viability for typical capacity.

9.2 ECONOMIC ANALYSIS OF RECYCLING METHOD IN SOAKING

Process: Raw to Wet Blue (Hides)

1	Total processing capacity of the tannery	:	3000 kgs pr day
2	Total number of working days	:	300
3	Use of water(in conventional tech)	:	About 27 cu. meters per day
4	Capital cost of the counter current soaking system	:	NIL if existing pump and tanks are used, or else 100000 Taka

Annual operating cost Taka

	Description	Conventional Tech	Suggested Tech
	• Water	82000	57700
	Total annual cost	**82000**	**57700**

5 Benefits

Reduction in Hydraulic load @ 35% : 3950 Taka

6 Profit or (loss) per year : 24300Taka

Note:

- Salaries & wages and miscellaneous expenditure is same for both the technologies
- Financial gains, that would accrue due to reduction in hydraulic load in the ETP/CETP is not considered in the above estimations
- Profit indicated above based on water charges.

9.3 ECONOMIC ANALYSIS OF SULFIDE REDUCED LIMING SYSTEM

Process: Raw to Wet Blue (Hides)

1 Total processing capacity of the tannery : 3000 kgs pr day

2 Total number of working days : 300

3 Use of Sodium Sulfide (in con.tech) : About 4%

4

Description	Conventional pit Technology	Dip & Pile Tech
Capital Investment	225000 Taka	135000 Taka
Annual operating cost		
• Chemicals		
Lime	135000	67500
Sodium sulfide	810000	405000
Enzyme	NIL	759375
• Repairs & Maintenance	4500	2700
• Miscellaneous expenditure	6750	4050
• Financial charges	40500	29925
• Depreciation	22500	13500
Total annual cost(in Taka)	**1019250**	**1282050**

5 Benefits

Area (at least 1%) increased in terms of final leather (45 Taka/- per Sq.ft) : 810000 Taka

6 Profit or (loss) per year : **547200 Taka**

NB:

- The financial gains that would accrue due to reduction of sulphide content in ETP/CETP is not considered in the estimations
- Leather area for the conventional process is 2.07 sq. ft per kg. Leather area, where cleaner technologies are implemented is 2.14 sq. ft per kg. i.e. the area increase is more than 3%. But the economical calculations based on the minimum area increase of 1% only.

9.4 ECONOMIC ANALYSIS OF HIGH EXHAUSTION CHROME (MEA) SYSTEM

Process: Raw to Wet Blue (Hides)

1 Total processing capacity of the tannery : 3000 kg pr day

2 Total number of working days : 300

3

Description	Conventional Process	Modified Process
Annual operating cost		
• Chemicals		
MEA	-	5,06,250
BCS	24,30,000	18,22,500
Salt	1,01,250	90,000
Sodium Bicarbonate	2,02,500	33,750
Sulphuric Acid	2,02,500	1,35,000
Total annual cost(in Taka)	**29,36,250**	**25,87,500**

4 Benefits

Increase of chrome exhaustion above 80% and reduction of chromium content in the effluent with financial benefits.

5 Profit or (loss) per year : **3,48,750Taka**

NB:

- Some of the common chemicals used in the conventional & modified process are not shown in this economical analysis.

9.5 ECONOMIC ANALYSIS OF HIGH EXHAUSTION CHROME (ALUTAN) SYSTEM CLOSED LOOP

Process: Raw to Wet Blue (Hides)

1 Total processing capacity of the tannery : 3000 kg pr day

2 Total number of working days : 300

3

Description	Conventional Process	Modified Process
Annual operating cost		
• Chemicals		
Alutan	-	2,34,000
BCS	24,30,000	18,22,500
Salt	1,01,250	90,000
Sulphuric Acid	2,02,500	1,35,000
Total annual cost(in Taka)	**2733750**	**2281500**

4 Benefits

Increase of chrome exhaustion above 80% and reduction of chromium content in the effluent with financial benefits.

5 Profit or (loss) per year : **4,52,250 Taka**

NB:

- Some of the common chemicals used in the conventional & modified process are not shown in this economical analysis.

9.6 ECONOMIC ANALYSIS OF CLEANER TECHNOLOGIES IN LEATHER PROCESSING (IMPLEMENTED UNDER THE PROJECT)

Capacity: 3000 kg per day

Process: Raw to Wet Blue (Hides)

Sl No	Description of cleaner technologies	New / Additional investment (in Taka.)	Profit or Loss per Year* (in Taka)
1	Recycling of Soak Liquor	118125	24300
2	Sulfide reduced liming	398500	547200
3	High exhaustion chrome **(MEA)** system (OR)	112500	348750
	High exhaustion chrome **Alutan** closed loop system	112500	452250
	TOTAL	**629125 / 629125**	**920250 / 1023750**

* By implementing the technology

9.6.1 Direct savings through cleaner technologies:

	Description	Savings per Sq.ft of finished leather (in Taka)
	1st Year	0.40
	2nd Year onwards	0.63

Note:

- **Savings will be relatively higher, if the production capacity increases.**
- The savings that would accrue due to reduction in salt, sulphide, hydraulic load in ETP/CETP is not considered in the estimations given above.

9.7 Summary

The investment requirement for implementing the cleaner technologies is estimated at 980000 Taka.. Item 9.6.1 gives the anticipated income per sq.ft of finished leather by implementing the cleaner technologies in leather processing is at 0.5 Taka for 1st year and 0.82 Taka from 2nd year onwards. The technologies suggested in this report have multiple benefits in-terms of environmental clean up, improved labor productivity, material quality consistency and better international image. Benefits will also accrue for the people living in the vicinity of the beneficiary tannery units and the working peronnel. In addition, reduction in land and water pollution, better work environment and improved occupational safety are the other major benefits to accrue.

9.8 Basis for profitability:

1) Cost of utilities
   - Water : 10 Taka per cubic meter
   - Power : 2.8 Taka per kwh

2) Cost of Chemicals
   - Preservative : 90 Taka per kg
   - Sodium sulphide : 22.5 Taka per kg
   - Enzyme : 120 Taka per kg
   - Lime : 1.12 Taka per kg

3) Repair & Maintenance
   - Plant & Machinery : @4%
   - Buildings : @ 2%

4) Interest charges on loans : 18% per year
5) Depreciation : 7.42% plant & Machinery
   : 3.34% of buildings
6)Insurance & taxes : 2 % of plant & machinery

7) Approximate cost of final leather : 45 Taka per Sq.ft

9.9 INVESTMENT BENEFIT ANALYSIS

(Preliminary-based on expected results)

I Average investment proposed to be made in a tannery for implementing cleaner tanning technologies (2700000 Taka/6) — Approx: 450000 Taka

II Minimum capacity of the tanneries being considered (Equivalent to 15,00,000Sq.ft of leather per annum), the expected gains are — 2500 kg / day

	Expected gains
Savings for Sq.ft of leather	Taka 0.50
Total expected savings per annum	750000 Taka

Hence the investment made in the cleaner technologies can be recovered in a year.

10. Consent of Tanneries for the Modification Suggested

Tel. Off : 604475, 9660754
Res : 8614584
Fax No. : 880-2-8616348

C.L.D

CHOWDHURY LEATHER & CO. LTD.

IMPORTER, EXPORTER & MANUFACTURER OF ALL KINDS LEATHER
95/7, GAZMAHAL, HAZARIBAGH, DHAKA—1209, BANGLADESH.

Ref : . .

Date 17/01/2000

To,
The Director,
Central Leather Research Institute
Adyar,Chennai-600 020.
INDIA.

Sub:Provision of services relating to the promotion and demonstration of cleaner tanning technologies in the tannery cluster at Hazaribagh,Dhaka,Bangladesh, UNIDO Project No.US/RAS/97/137

Dear Sir,

With reference to the above mentioned project,we are in receipt of the copy of the progress report(Phase-1) and we agree for the suggestions/proposals made in the report for implementing and demonostration of cleaner tanning technologies.

We understand that apart from providing facilitiesfor installing the proposed equipment procured by UNIDO and supply of hides/skins,chemicals(regular)for the demonstration batches,we need to provide 1 or 2 tanks for float liquor collection and pipes if needed. We agree to construct and provide the same.

Through this letter we are giving our consent to CLRI to implement and demonstrate the cleaner tanning technologies in our tannery.

Thanking You,

Yours sincerely
CHOWDHURY LEATHER & CO. LTD.
CHAIRMAN

Telephone { Office : 504475
Factory : 9660754
Res : 863684
Mobile : 011-850390
Fax : 880-2-866348.

HELENA ENTERPRISE LIMITED

MANUFACTURER, IMPORTER & EXPORTER OF ALL KINDS OF LEATHER, LEATHER FOOTWEAR, LEATHER GARMENTS, LEATHER GOODS ETC.

59/60, GAZMAHAL, HAZARIBAGH TANNERY AREA, DHAKA-1209, BANGLADESH.

Ref : *Date :* 17/01/2000

To,
The Director,
Central Leather Research Institute
Adyar,Chennai-600 020.
INDIA.

Sub:Provision of services relating to the promotion and demonostratrion of cleaner tanning technologies,in the tannery cluster at Hazaribagh,Dhaka,Sangladesh, UNIDO Project No.US/BAS/97/137.

Dear sir,

With reference to the above mentioned project,we are in receipt of the copy of the progress report(Phase-1) and we agree for the suggestions/proposals made in the report for implementing anad demonostration of cleaner tanning technologies.

We understand that apart from providing facilities for installing the proposed equip ent procured by UNIDO and supply of hides/skins,chemicals(regular) for the demonostration batch.s,we need to provide 1 or 2 tanks for float liquor collection and pipes if needed.We agree to construct and provide the same.

Through this letter we are giving our consent to CLRI to implement and demonostrate the cleaner tanning technologies in our tannery.

Thanking you,

Yours sincerely

M/s. Helena Enterprise Ltd.

Managing Director

DHAKA HIDE & SKINS LIMITED
Manufacturer And Exporters of Finest Leather In Bangladesh.
Regd. Office : 88 Sher-E-Bangla Road, Hazaribagh, Dhaka 1209, Bangladesh
Mailing Address : 147, Hazaribagh Tannery Area, Dhaka 1209, Bangladesh
Tel : (02) 504987, 501874, 861263 Telex : 632153 DHS BJ Fax : (02) 863515

DATE : 30-12-99.

TO,
Director
Central Leather Research Institute
Adyer
Chennai- 600 020
INDIA.

Sub : Provision of services relating to the promotion and demonstration of cleaner tanning technologies in the tannery cluster at Hazaribagh, Dhaka, Bangladesh, UNIDO Project No : US/RAS/97/137.

With reference to the above mentioned project, we are in receipt of the copy of the progress report (Phase- 1) and we agree for the suggestions/ proposals made in the report for implementing and demonstration of cleaner tanning technologies.

We understand that, apart from providing facilities for installing the proposed equipment procured by UNIDO and supply of hides/skins, chemicals (regular) for the demonstration batches, we need to provide 1 or 2 tanks for float liquor collection and pipes if needed. We agree to construct and provide the same.

Through this letter we are giving our consent to CLRI to implement and demonstrate the cleaner tanning technologies in our tannery.

Thanking you,

Yours sincerely,
DHAKA HIDE AND SKINS LTD.

(M. N. Haque)
General Manger

RUMA LEATHER INDUSTRIES LTD.
(An enterprise of Fortuna Group)

131 Hazaribagh,
Dhaka 1209, Bangladesh.
Tel : 9664317, 506428
Fax : 880-2-9803134-5

04.01.2000

TO
THE DIRECTOR
CENTRAL LEATHER RESEARCH INSTITUTE
ADYAR
CHENNAI-600 020

SUBJECT: Provision of services relating to the promotion and demonstration of cleaner tanning technologies in the tannery cluster at Hazaribagh, Dhaka, Bangladesh, UNIDO Project No: US/RAS/97/137.

Dear Sir
With reference to the above mentioned project, we are in receipt of the copy of the progress report (Phase-1) and we agree for the suggestion/proposals made in the report for implementing and demonstration of cleaner tanning technologies.

We understand that, apart from providing facilities for installing the proposed equipment procured by UNIDO and supply of hides/skins, chemicals (regular) for the demonstration batches, we need to provide 1 or 2 tanks for float liquor collection and pipes if needed. We agree to construct and provide the same.

Through this letter we are giving consent to CLRI to implement and demonstrate the cleaner tanning technologies in our tannery.

Thanking you

Yours sincerely

Engr. M. Abu Taher
(Managing Director)

বে ট্যানারীজ লিমিটেড
BAY TANNERIES LTD.

Mailing Address :
21, HAZARIBAGH
DHAKA-1209, BANGLADESH
PHONE : 861468, 862335
FAX : 880-2-868716, 880-2-813581
EMAIL : baytann@citechco.net

Ref : BTL/UNDP/001/00

Date 25-01-00

To.
National Expert
UNIDO
Local Project Office
Dhaka.

Subject: Provision of services relating to the promotion and demonstration of cleaner tanning technologies in the tannery cluster at Hazaribagh, Dhaka, Bangladesh, UNIDO Project No. US/RAS/97/137.

Dear Sir,

With reference to the above mentioned project, we are in receipt of the copy of the progress report (Phase-1) and we agree for the suggestions/proposals made in the report for implementing and demonstration of cleaner tanning technologies.

We understand that, apart from providing facilities for installing the proposed equipment procured by UNIDO and supply of hides/skins, chemicals (regular) for the demonstration batches, we need to provide 1 or 2 tanks for float liquor collection and pipes if needed. We agree to construct and provide the same.

Through this letter we are giving our consent to CLRI to implement and demonstrate the cleaner tanning technologies in our tannery.

Thanking you,

Yours sincerely,

S. Rahman
Managing Director

Cable : GOODBLUE
Code : TANNER'S COUNCIL

প্যারামাউন্ট ট্যানারীজ
PARAMOUNT TANNERIES

Tels : Off : 9666060
9669788
Tannery : 502612
505366
Fax No : 880-2-860548
E-mail : paramont@bdmail.net

Tannery :
181/2, SHER-E-BANGLA ROAD,
HAZARIBAGH, DHAKA-1209

Office
94, WATER WORKS ROAD,
POSTHA, DHAKA-1211

Ref : PMT 1025 2000 5562

Date : 19-01-2000

To,
NATIONAL EXPERT
UNIDO,
DHAKA,
BANGLADESH

SUB: Provision of services relating to the promotion and demonstration of cleaner tanning tecnologies in the tannery cluster at Hazaribagh, DHAKA, Bangladesh, UNIDO Project No: US RAS 97 137.

Dear Sir,

With reference to the above mentioned project, we are in receipt of the copy of the progress report(phase-1) and we agree for the suggestions proposals made in the report for implementing and demonstration of cleaner tanning technologies.

We understand that, apart from providing facilities for installing the proposed equipment procured by UNIDO and supply of hides skins, chemicals(reguler) for the demonstration batches, we need to provide 1 or 2 tanks for float liquor collection and pipes if needed. Weeagree to constsuct and provide the same.

Through this letter we are giving our consent to CLRI to implement and demonstrate the cleaner tanning technologies in our tannery.

Thanking you,

YOURS sincerely,

(Name, Signature & Designation)
For PARAMOUNT TANNERIES

(MD. DELOWER HOSSAIN)
(LEATHER TECHNOLOGIST)

11.Technical Evaluation of Offers Received from Suppliers

11.1. Pumps – 8 Nos.

11.1.1. Offers received from:

a. S.S. Engineers, Dhaka
b. Pubali Traders, Dhaka
c. Meem Trade International, Dhaka
d. Ahsan & Associates, Dhaka
e. Sigma & Co, Dhaka

11.1.2. Specifications:

Type	: Helical rotor pump
Pipe size (inlet/outlet)	: 50/50 mm (as per manufacturing standard)
Capacity	: 150 l/min
Head	: 6 meter
Motor rating	: > 2.5 HP
Power	: 3 ph, 50 Hz, 415 V
Casing & Impeller	: SS-316
Shaft	: SS-316

11.1.3. Technical evaluation:

All the companies have quoted for supply installation and commissioning.

a. The offer of Meem Trade International includes accessories (a) flexible PVC pipeline of 6m long 50mm dia including flange and clamp, (b) Base frame of SS channel, angle and SS nut bolts and (c) Electromagnetic starter. The offer is technically acceptable.

b. Sigma & Co. and Ahsan & Associates have quoted for pump with 5 HP motor with accessories (a) flexible PVC pipeline of 6m long 50mm dia including flange and clamp and (b) Base frame of MS channel with epoxy coating and SS nut bolts and (c) Electromagnetic starter. These offers are technically acceptable.

c. S.S. Engineers have quoted for 3 HP motor with accessories (a) Starter KEC/Crompton/GEC/equivalent make. The offer is technically acceptable.

d. The offer from Pubali Engineers is for motor of more than 2.5 HP. Accessories are not included in this offer. The offer is technically acceptable.

11.1.4. Financial evaluation

Sl No	Supplier	Unit price		No of pieces	Amount in US $		
		In Taka	in US$		Cost of equipment	Other costs	Total cost
1.	S.S. Engineers	81,800	1,608	8	12864	-	12864
2.	Pubali Traders*	93,900	1,846	8	14768	-	14768
3.	Meem Trade International	99,750	1,961	8	15688	-	15688
4.	Ahsan & Associates	120,000	2,359	8	18872	-	18872
5.	Sigma & Co	125,000	2,458	8	19664	-	19664

* Payment terms - by irrevocable letter of credit.

11.1.5. Recommendation

The order may be placed with S.S. Engineers, as it is the lowest, technically acceptable offer.

11.2. Modified doors for drums – 8 Nos.

11.2.1. Offers received from

Meem Trade international, Dhaka

11.2.2. Specifications

As per drawing supplied by CT subcontractor.

11.2.3. Technical evaluation

The offer received is technically acceptable.

11.2.4. Recommendation

The only offer received is from Meem Trade International. The supplier has done a similar job when one of the tanning drums in Ruma Leather Industry Ltd. was modified for demonstration of PDU/12. The quality of work was quite satisfactory. Therefore, order may be placed with Meem Trade International. We will mention that the hydrant valve should be made of brass.

Unit price of a modified drum door = Tk. 20,500
= US $ 403
Cost of 8 Nos. of modified drum doors = US $ 3224

11.3. Hair filtering sieves – 4 Nos.

11.3.1. Offers received from

a. Meem trade International, Dhaka
b. Sigma & Co, Dhaka
c. Ahsan & Associates, Dhaka

11.3.2. Technical evaluation

All the offers are technically acceptable.

11.3.3. Financial Evaluation

#	Supplier	Unit price		No of pieces	Amount in US $		
		In Taka	in US$		Cost of equipment	Other costs	Total cost
1.	Meem Trade International	22,500	442	4	1768	-	1768
2.	Sigma & Co	24,500	482	4	1928	-	1928
3.	Ahsan & Associates	25,500	501	4	2004	-	2004

11.3.4. Recommendation

The order may be placed with Meem Trade International, as it is the lowest, technically acceptable offer.

Unit price of a hair filtering sieve = Tk. 22,500
= US $ 442
Cost of 4 Nos. of hair filtering sieves = US $ 1768

11.4. PVC Hose pipe – 400 metres

11.4.1. Offers received from

a. Meem trade International, Dhaka
b. Sigma & Co, Dhaka
c. Ahsan & Associates, Dhaka

11.4.2 Specifications

50 mm dia.

11.4.3. Technical evaluation

All the offers are technically acceptable.

11.4.4. Financial Evaluation

#	Supplier	Unit price		Qty. Length	Amount in US $		
		In Taka	in US$		Cost of equipment	Other costs	Total cost
1.	Meem Trade International	400	8	400 m	3200	-	3200
2.	Sigma & Co	425	8	400 m	3200	-	3200
3.	Ahsan & Associates	450	9	400 m	3600	-	3600

11.4.5. Recommendation

The order may be placed with Meem Trade International, as it is the lowest technically acceptable offer with previous satisfactory performance against UNIDO orders.

11.5. Water meters - 6+4+6 = 16 Nos.

11.5.1. Offers received from

a. Meem Trade International, Dhaka
b. Sigma & Co., Dhaka
c. Ahsan & Associates, Dhaka
d. Kalanjiam Sofitel, Chennai

11.5.2. Specification

Feature	Size of meter		
	50mm	80mm	100mm
Maximum recording capacity in litres	100 Million	100 Million	1000 million
Minimum reading capacity in litres	10	10	100
Nominal capacity of water meter discharge: litres per hour at 3m loss of head	50,000	125,000	200,000
Intermediate capacity of water meter discharge: litres per hour at 1m loss of head	20,000	62,000	100,000
Metering accuracy	±2%	±2%	±2%
Minimum starting flow: litres per hour	500	1,000	1,500
Permissible loading: litres per day (8 hour)	200,000	620,000	1,000,000

11.5.3. Technical evaluation

a. Meem Trade International, Sigma & Co and Ahsan & Associates have quoted for supply, erection and installation of water meters. Offers are technically acceptable.
b. Kalanjiam Sofitel has quoted for supply (at Dhaka) but not erection. The offer includes supply of pipeline strainer. This offer is technically acceptable.

11.5.4. Financial Evaluation

#	Supplier	Size	Unit Price		No. of pieces	Cost US $	Total cost US $	Other details
			Tk	US $				
1.	Meem Trade International	50 mm	22500	442	6	2652		Offer includes erection
		80 mm	33500	659	4	2636		
		100 mm	45500	895	6	5370	10658	
2.	Sigma & Co	50 mm	24500	482	6	2892		Offer includes erection
		80 mm	36500	718	4	2872		
		100 mm	46500	914	6	5484	11248	
3.	Ahsan & Associates	50 mm	25000	492	6	2952		Offer includes erection
		80 mm	35000	688	4	2752		
		100 mm	48000	944	6	5664	11368	
4.	Kalanjiam Sofitel	50 mm	-	277	6	1662		Offer includes a strainer for each meter and cost of transport from Chennai, India to Dhaka, Bangladesh. Offer does not include erection.
		80 mm	-	335	4	1340		
		100 mm	-	415	6	2490	5492	

11.5.5. Recommendation

The offer of Kalanjiam Sofitel is the lowest. The water meter "Zenner" brand is said to be imported from Germany by the Indian agent "Anand" and supplied together with dirt box strainer "Anand Zenner". The strainer is fabricated in India. Hence the order may be placed with Kalanjiam Sofitel. The beneficiary units may be asked to install the equipment under the guidance of the subcontractor. The erection of this equipment can be carried out by the beneficiaries.

11.6. pH meters - 6 Nos.

11.6.1. Offers received from

a. Meem trade International, Dhaka
b. Sigma & Co, Dhaka
c. Ahsan & associates, Dhaka
d. Sri Rudran Instruments Co., Chennai
e. Hitech Equipments (India), Chennai

11.6.2. Specification

Read out / display		: 3 ½ digit LED
Range	pH	: 0-14 continuous,
	mV	: 0-1999 mV
Resolution	pH	: 0-01 pH
	mV	: ±1 mV
Repeatability	pH	: 001 pH
	mV	: ±1 mV
Accuracy	pH	: 0.01 pH ±1 digit
	mV	: +1 mV ±1 digit
Slope correction		: 85% to 105%
Temp. Compensation		: 0-100^{0}C (manual)
Input impedance		: 10^{12} ohms
Power supply		: 240 V, ±10%, 50 Hz with in built voltage stabiliser
Standard supply		: combination electrode, electrode stand instruction manual, dust preventive cover

11.6.3. Technical evaluation

a. Meem Trade International has quoted for portable pH cum temperature meter of HANNA make and the offer is technically acceptable.
b. Sigma & Co. and Ahsan Associates have quoted for pH cum temperature meter. The country of origin is EC country. These offers are technically acceptable.
c. Rudran Instruments Co. and Hitech instruments have quoted for pH meter with an option of temperature. These offers are technically acceptable.

11.6.4. Financial Evaluation

#	Supplier	Unit price		Qty.	Amount in US $		
		In Taka	in US$		Cost of eqpt.	Other costs	Total cost
1.	Meem Trade International	55000	1081	6	6486	-	6486
2.	Ahsan & Associates	65000	1278	6	7668	-	7668
3.	Sigma & Co	62500	1229	6	7374	-	7374
4.	Rudran Instruments	9060	209	6	1254	288*	1542
5.	Hitech Equipments (India)	5800	134	6	804	288*	1092

**** Cost of transportation***

11.6.5. Recommendation

The order may be placed with Hitech Equipments, which is lowest among the technically acceptable offers.

11.7. Beaume meters – 6 Nos.

11.7.1. Offers received from

a. Meem trade International, Dhaka
b. Sigma & Co, Dhaka
c. Ahsan & associates, Dhaka
d. Sri Rudran Instruments Co., Chennai

11.7.2. Specifications

Range 0 – 20 at 20^0C

11.7.3. Technical evaluation

a. Meem Trade International, Sigma & Co, Ahsan & Associates have quoted without range of the instrument.
b. Sri Rudran Instruments have quoted for different range of the instrument including 0 to 20 Beaume. The offer is technically acceptable.

11.7.4. Financial Evaluation

#	Supplier	Unit price		Qty.	Amount in US $		
		In Taka	in US$		Cost of equipment	Other costs	Total cost
1.	Meem Trade International	2850	56	6	336	-	336
2.	Ahsan & Associates	3000	59	6	354	-	354
3.	Sigma & Co	3425	67	6	402	-	402
4.	Rudran Instruments	Rs. 119	3	6	18	2	20*

**** Sales Tax @ 11% included; the instrument being small in size, can be hand-carried to Dhaka. Hence no cost towards transport has been added.***

11.7.5. Recommendation

The order may be placed with Sri Rudran Instruments, as it is the lowest, technically acceptable offer.

11.8. Light meter – 1 No.

11.8.1. Offers received from

Sri Rudran Instruments Co., Chennai

11.8.2. Specifications

a. Hand held instant read out instrument
b. Range at least upto 50,000, battery operated

11.8.3. Technical Evaluation and recommendation

The only offer received for this item is technically acceptable and hence the order may be placed with Sri Rudran Instruments Co.

Unit price of Light meter = Rs. 3100
= US $ 72
Cost of 1 No. Light meter= US $ 80*

**** Sales Tax @ 11% included; the instrument, being small in size, can be hand-carried to Dhaka. Hence no cost towards transport has been added.***

11.9 Suppliers On Whom Purchase Orders Were Placed For Supply Of Cleaner Technology Equipment

S.No.	Equipment	Supplier	Cost	Cost in US$
1.	Noise meter	SIBATA SCIENTIFIC TECHNOLOGY LTD	US$ 1,757	1,757
2.	pH meter	Hitech Equipments (India)	Rs. 47,300	1,092
3.	Water flow meter	Kalanjiam Sofitel	Rs. 238,000	5,494
4.	Pumps	S.S. Engineers	Tk. 654,400	12,866
5.	Modified doors, hair filtering sieves and PVC pipes	Meem Trade International	Tk. 414,000	8,140
6.	Lux meter and Hydrometers	Sri Rudran Instruments Company	Rs. 4,120	95
			Total	29,444

Note: Technical evaluation is carried out by UNIDO team.

11.10 Address Of The Suppliers From Whom Offers For Supply Of Cleaner Technology Equipment Were Received

1. **S.S. ENGINEERS - FOR PUMPS**

   C-415, KHILGAON
   CHOWDHURY PARA
   DHAKA - 1219

2. **PUBALI TRADERS - FOR PUMPS**

   148/2, MALIBAGH
   BAZAR ROAD
   DHAKA

3. **MEEM TRADE INTERNATIONAL - FOR ALL ITEMS**

   68/1/C, KHAIRUNNESA ROAD, ZIGATALA
   DHAKA – 1209.
   TEL: 02-861 0017
   FAX: 02-966 2442
   EMAIL: mti@bol-online.com
   BANGLADESH

4. **AHSAN & ASSOCIATES**
   – FOR PUMPS, WATER METERS, PH METERS, HYDRO METERS, PIPELINE STRAINER, HAIR FILTERING SIEVE AND HOSE PIPE

   218, ELEPHNAT ROAD
   DHAKA-1205
   BANGLADESH
   TEL: 02-966 5282
   FAX: 02- 861 4544

5. **SIGMA & CO.**
   - FOR PUMPS, WATER METERS, PH METERS, HYDRO METERS, PIPELINE STRAINER, HAIR FILTERING SIEVE AND HOSE PIPE

   130/2, KOHINUR TANNERY BLOCK
   HAZARIBAGH
   DHAKA-1209.
   TEL: 02- 861 0547
   TELEFAX: 02-811 8901

6. **KALANJIAM SOFITEL**
   – FOR WATER METERS AND PIPELINE STRAINERS

   109, BROADWAY
   CHENNAI – 600 108
   TEL: 91-44-522 5023/4510
   FAX: 91-44-524 4510

7. **SRI RUDRAN IINSTRUMENTS CO**
   - FOR PH METERS, LUX METER AND HYDROMETER

   129, KODAMBAKKAM HIGH ROAD
   NUNGAMBAKKAM, CHENNAI – 34.
   PH: 91-44-825 7003
   FAX: 91-44- 823 5843

8. **HITECH EQUIPMENTS (INDIA)**
   - FOR PH METERS

   MAHAALAKSHMI SRI VENKETA PERUMAL RAJA BUILDING, LEO INDUSTRIAL ESTATE, NARYANAPURAM, PALLIKARANI
   CHENNAI – 601 302, FAX: 245 2592

9. **QUEST TECHNOLOGIES, INC**
   - FOR NOISE METER

   1060 CORPORATE CENTRE DRIVE
   OCONOMOWOC
   WI 53066 USA
   TEL: 262/567-9157
   FAX: 262/567-4047
   EMAIL: lcouper@quest-technologies.com

10. **SIBATA SCIENTIFIC TECHNOLOGY LTD**
    - FOR NOISE METER

    1-25, IKENOHATA
    3-CHOME
    TAITO-KU
    TOKYO 110
    JAPAN
    TEL: 81-3-3822-2112
    FAX: 81-3-5685-1394
    EMAIL: furukawa@sibata.co.jp

11. **CASELLA-CEL LTD, LEEDS** – FOR NOISE METER

11.11 Cleaner Technology Chemicals

Though names of a few Indian suppliers of chemicals have been mentioned in the Progress Report (Phase-1), for enzymes (soaking and liming) and aluminum syntan, CLRI prefered to use enzymes of Southern Petrochemical Industries Corporation Limited (SPIC) and Balsyn AL (aluminum syntan) of Balmer Lawrie & Co. Ltd. based on the performance of these chemicals. These companies do not have agents at Dhaka. Therefore, efforts to be made to procure the required quantity of these chemicals from Calcutta based dealers.

12. Demonstration of Cleaner Tanning Technologies in the Tannery Cluster at Hazaribagh, Dhaka, Bangladesh

12.1 Introduction

A subcontract was awarded to Central Leather Research Institute(CLRI), India by UNIDO, Vienna for the Promotion and Demonstration of Cleaner Tanning Technologies in the Tannery Cluster at Hazaribagh, Dhaka, Bangladesh. In the first phase of the project, the CLRI scientists studied and evaluated the leather processing methods currently followed in the six selected tanneries in Hazaribagh tanning cluster in terms of pollution loads generated in processing. Based on this study, CLRI had submitted a work plan in the form of preliminary report describing specific recommendations of the cleaner processing technologies proposed to be demonstrated in each tannery. This also included a list of chemicals, other equipment, civil construction and other inputs needed for smooth implementation of the cleaner processing options identified in the tanneries chosen for the demonstration.

Subsequently, the work plan was explained to the individual tanneries and their consent for participation in the project and providing necessary inputs obtained. As a part of the implementation phase (II^{nd} phase), on-the-spot evaluation was carried out to assess the quality and completeness of the equipment and chemicals supplied in all selected tanneries and to see if the civil work which the tanneries had agreed to do, had been completed, before the implementation of the cleaner process technologies. A CLRI team comprising the scientists, Mr. N.K.Chandra Babu, Mr. P.Sambasiva Rao, Mr. V.Rathinasamy, Mr. R.Suthantharajan and Mr. K.C.Velappan was deputed to Bangladesh for carrying out the demonstration of cleaner processing elements in the

selected tanneries during the period 15th September to 2nd October, 2000. Dr.Jurgen Hannak, a CIM expert at CLRI on Occupational Safety & Health joined the team on 27th for carrying out the Occupational Safety and Health (OSH) related studies. This progress report describes the work carried out by the CLRI team during this important mission.

12.2 Briefing at UNIDO Re PO, Chennai prior to the Field Mission

Before the field mission, the CLRI project co-ordinator for this UNIDO subcontract, Dr. P.G.Rao met Mr. A.Sahasranaman, the Programme Co-ordinator and his team at Re PO, UNIDO, Chennai. After a brief review of the progress of the project, Dr. P.G.Rao has submitted the proposed schedule of the field demonstration of cleaner processing technologies for all the four selected tanneries to be carried out during this mission. A copy of the same is enclosed as **Annexure -I**. Mr. Sahasranaman assured all assistance from the UNIDO side, for the smooth implementation of the project through the local office at Dhaka.

12.3 Summary of the work carried out by the CLRI scientists during the field mission at Hazaribagh tanning cluster, Dhaka

The CLRI team on arrival at Dhaka had a brief meeting with the UNIDO National Expert, Mr. S.D.M. Quamrul Alam Chowdhury. The team discussed with him the status regarding the preparedness of the tanneries for the smooth implementation of the cleaner processing measures and the proposed schedule of the work to be carried out in each tannery. It was decided to initially visit all the four tanneries to inspect the arrangements and also to discuss the work schedule with the management.

The CLRI scientists accompanied by Mr. Chowdhury visited all the four tanneries and inspected the facilities provided for the demonstration of the cleaner processing

methods. The work schedule was also discussed with the technical personnel in all the tanneries. The management in each tannery assured the CLRI team to provide necessary raw material and other assistance needed for the demonstration of chosen cleaner process elements. The team also met Mr. Fakrul Alam, the Managing Director of Dhaka Leather Chem Ltd., who has been identified by UNIDO for the supply of the chemicals/auxiliaries and got a copy of the chemicals procured and supplied to Ruma Leathers. Arrangements have been made to supply the chemicals to other tanneries from Ruma Leathers.

The CLRI team commenced the demonstration work from 17th September. After the conclusion of the implementation, a seminar-cum-demonstration was organised on 30th September at Conference Hall in the Tanners' Association Building for the benefit of the other tanneries in the tanning cluster. The diary of events during this period is enclosed as **Annexure - 4**. The list of the participants in the seminar is enclosed as **Annexure - 5**. The flow diagrams for the processes demonstrated and the detailed process data sheets in all the tanneries are included as **Annexure 6 to 11**. The analytical results for the pollution load parameters were scrutinised and the same is included in this final report.

The CLRI team has organised a seminar-cum-demonstration after completion of cleaner technology demonstration. During the seminar, the CLRI team requested the Management of the individual tannery to maintain a record of regular practice of cleaner technology process and chemical usage. And also during the submission of draft "Working Manual for Cleaner processing Methods" to the technical personnel in each tannery, the team requested to maintain a process record. The details of samples collected

from each tannery & the parameters to be analysed and details of personnel who are trained during the cleaner technology demonstration are given in **Section 12. 6.**

The CLRI team requested the UNIDO National Expert, Mr. S.D.M. Quamrul Alam Chowdhury to monitor the regular practice / continuation of cleaner technologies implemented in the selected four tanneries.

12.4 Cleaner Technologies: Working Instruction

As an integral part of the project, UNIDO awarded a sub-contract to Central Leather Research Institute (CLRI), India for the demonstration of cleaner tanning technologies in selected tanneries at Hazaribagh tannery cluster, Dhaka, Bangladesh in May, 1999.

CLRI, after a careful assessment of the technologies currently in use in Hazaribagh tanneries, had identified the following cleaner technologies for the demonstration and implementation in four selected tanneries.

- Enzyme assisted soaking
- Volume reduction in Soaking
- Recycling in Soaking
- Enzyme assisted less sulfide unhairing
- Recycling of lime wash liquor
- Close loop High exhaust Chrome Tanning Systems based on

  Monoethanolamine Pretreatment
  Alutan-BCS combination Tanning

These options fall under two major approaches, viz., the reduction in the volume of water used in processing and reducing pollution load through interventions in the process technologies followed.

This particular manual deals with the selected cleaner processing options in detail and also includes the instructions and tips for the smooth adoption of the technologies in each tannery selected for demonstration.

12.4.1 Enzyme Assisted Soaking Process

There are many soaking enzymes marketed by various multinational companies for use in soaking. They increase the rate of soaking and reduce the duration of soaking process considerably. The wetting agents used in soaking process can be considerably reduced by the use of soaking enzyme. This aspect may be prove to be very useful as the excessive use of wetting agents (as high as 1% wetting agent based on the salt weight is used in Bangladesh tanneries even for fresh salted hides) will lead to problems in aerobic lagoons during the treatment of effluent by way of excessive foaming. Moreover, many of the nonionic wetting agents used are hard biodegradable materials and may be difficult to treat. The use of soaking enzyme results in cleaner pelt and also enhances the efficiency of unhairing in enzyme assisted less-sulfide liming process since they open up the fiber structure well.

0.2% of soaking enzyme is recommended for use in main soaking in place of equal quantity of nonionic wetting agent.

12.4.2 Optimisation Of Water Usage in Soaking Operation

There is a general tendency to use excessively large volumes of water in Bangladesh tanneries, as water is available in plenty. It is a common observation here that running water wash for long time, some time for about 4 hrs is resorted to prior to main soaking

process. It has also been observed that this running water washes are many times not effective at all as the water is drained completely within a few rotations of the drum.

Hence, it has been demonstrated to the tanneries that the closed door washing with 300-400 % water for 15-20 minutes is far more effective than washing continuously with running water for long time. This will considerably reduce the huge volume of spent liquor discharged in this unit operation.

12.4.3 Recycling Of Wash Soak Liquor

After the main soaking is over, washing is given before the hides are taken for liming. Though, running water wash in many tanneries does this, it has been recommended to carry out a closed door washing with 300% water. This wash liquor can be collected and reused as float in presoaking for the next lot. This particular option has been demonstrated by the collection of the spent liquor using the special drum door and hose pipe provided for the purpose by UNIDO into a pit/reservoir built by the tannery. This liquor was pumped back into the drum for reuse as float for the presoaking of the subsequent lot of hides employing the roto-pump provided.

12.4.4 Enzyme Assisted Less Sulfide Liming Process

In all tanneries at Hazaribagh, a hair burning/pulping process of unhairing is carried out in drum / paddle irrespective of the raw material being processed. There is a tendency to use high percentage of sulfide especially for goat skins. Using unhairing enzyme, it is possible to reduce the sulfide used in liming to as low as 2-2.5%. For any less-sulfide process, the float volume is very critical in the early phase of liming process. It is better to operate with 100-150% water for about 6-7 hrs in drum for liming process and then 50-100% may be flooded to complete the liming process. The enzyme used at

0.5% level with 2-2.5% sulfide and 4-5% lime will ensure very efficient unhairing of even thicker hides. The pelts obtained will be clean and with less wrinkles. The fleshing and scud removal is also easier. There is a possibility of improved area yield in leather with this enzyme assisted less sulfide liming process. The resultant leather will have improved grain characteristics.

12.4.5 Recycling Of Lime Wash Liquor in Liming

The washing of the fleshed pelts prior to deliming is a common practice in tanneries worldwide. This wash liquor contains considerable quantity of lime and the percentage of wash liquor is usually in the range of 200-250%. This liquor can be profitably reused / recycled as float in liming process of next lot.

The liquor after washing is drained with the collection tank using the drain door and the same may be used as float for liming of next lot by pumping back into the drum.

12.4.6 Closed Loop Pickle-Tan Chrome Tanning Methods

It is usual practice to use 7-8% BCS (~ 25% Cr_2O_3 content) in chrome tanning. Chromium is slow reacting and hence usually leads to a poor exhaustion of only about 50-60% at the above offer levels. This results in material loss on one hand and pollution problem on the other, due to high concentration of chrome (about 5 gm/lit) and salt (6-7%) in the spent liquor discharged. Chrome recovery and reuse method is recommended for the removal of chrome for reuse and is a commercially attractive proposition. This process produces supernatant liquor rich in salt concentrations with potential to contribute to large total dissolved solids (TDS) in the effluent. Other alternatives include chrome management practices based on high exhaust less chrome tanning methods.

Two such technologies were selected for implementation in Bangladesh tanneries after a careful screening. They are

- Alutan-BCS combination tanning method
- Chrome tanning method based on ethanolamine pretreatment

Usually an offer of 5.5-6% BCS is recommended in these methods. With an exhaustion characteristic ranging from 85-90%, it is possible to fix same or more amount of chrome in the leather as compared to offer levels of 7-8%, leading to a large reduction in the concentration of the chrome discharged in the effluent. Another attractive possibility is that the spent chrome liquor can be recycled as pickle float for subsequent batch without affecting the quality of leather, as the chrome concentration in the spent liquor is considerably low. The salt (NaCl) in the spent liquor is also recycled consequently and there will be less discharge of salt in the effluent as well. This pickle-tan recycling can be repeatedly performed at least 10 times and this recycling procedure is termed as closed loop pickle-tan recycling method as there is no discharge of either salt or chrome.

12.4.7 Alutan-BCS combination tanning method

Alutan is a CLRI developed aluminium syntan, which is marketed by Balmer Lawrie, India in the trade name Balsyn AL. In contrast to many aluminium based tanning salts, aluminium is in well stabilised state in the syntan and hence not leached out even at higher pH condition from the leather. Aluminium is a tanning material by itself and can serve as a chrome saver or a partial replacement of chrome in tanning. Aluminium has

been proved to improve the uptake of chrome by pelt and as a result, the exhaustion of chrome is considerably improved when used in combination. Moreover, the syntan component has additional sites for chrome fixation thus further enhancing the exhaustion characteristics of the tanning system.

After ensuring complete deliming of the pelts, pickling to a uniform cross section pH of 3-3.2 is performed. Since the tanning method is a high exhaustion system, uniform cross sectional pH in all layers is essential for uniform fixation of chrome as well. The pH gradient may be in the range of 3-3.5 in the case of pieces with thickness of 2.5-3.0 mm but for pieces with thickness more than 3.0 mm, it is better to have a pH range of 3-3.2 and in no case, pH should exceed 3.5. After obtaining a uniform pickling pH, 3% BCS with 0.5% Alutan is added and the drum run for 30-45 minutes. The second feed of 3% BCS is added and the drum is run for 2-3 hours by which time, the chrome will have penetrated very well into the interstices. After flooding to make the float volume 100%, basification is commenced and a final pH of 3.8-4.0 (cross section) is achieved. After that the drum is run for at least 2 hours for the completion of the tanning.

Usually chrome exhaustion levels exceeding 85% is possible provided all the process parameters are controlled as discussed in the last paragraph. Chrome concentration in the spent liquor is usually in the vicinity of about 2.0 gm/liters (as Cr_2O_3) and hence can be recycled as a pickle float after acidification and adjustment of concentration of salt to about 11-12 ^{o}Be by the addition of required quantities of salt.

The wet blue leathers produced have good fullness with reduced wrinkles. The color of the wet blue is also relatively lighter. The leather has improved dyeing characteristics.

The step-wise procedure to be followed is as follows:

- Ensure complete deliming by checking the thick compact regions of the hides with phenolphthalein. Complete deliming is a requisite for uniform fixation of chrome in chrome tanning and more so in the case of high exhaust tanning methods.
- Measure a float volume of 60% water into the drum using flow meter. Add 8-9% salt and run the drum for 15 minutes. Stop the drum and check the salt concentration using Baume meter. Be° reading should be 7. If not adjust with required quantities of salt.
- Add 0.2% formic acid in one feed and 1-1.2% sulfuric acid (sufficiently diluted in water) added in 3 feeds at 20 minutes intervals. Finally the drum is run for 2 hours. Check the pH; should be 3.0-3.2 in the cross section. If not, adjust with sulfuric acid and leave overnight. Ensure uniform cross sectional pH of 3.0-3.2.
- Add 3% BCS and 0.5% Aluatn and run the drum for 30 minutes and then add 2.5-3.0% BCS and drum for 2-3 hrs. Completion of penetration is checked. Basification is performed with sodium bicarbonate (1.2-1.3%) to a pH of 3.7-3.8; if not adjust with 0.1% Sodiumbicarbonate to 3.8. Finally run the drum for 2-3 hours.
- Collect the spent chrome liquor using the drain door into the collection tank. Add 0.2% of formic acid. Adjust the Be° of the solution to 11-12 Be° by adding required quantity of salt (usually 4-5%). Age the liquor overnight and reuse as pickle float for the next batch.

- Rest of the process for recycling is as for main tanning, except that chrome offer is reduced to 5.5% on pelt weight in recycling.

12.4.8 Chrome Tanning Method Based on Monoethanol Pretreatment

Monoethanolamine is a base having surface-active properties. When used for pretreatment of the pickled pelt prior to chrome tanning, it helps in uniform penetration and fixation of chrome in the leather without the need for basification. The wet blue leathers produced are fuller and the resultant finished leather is soft with improved grain characteristics. After complete deliming of the pelt (the cross section neutral to phenolphthalein in butt and other compact and thick portions of the hide), pickling with 60-75% water to a pH of 3.5-3.8 (cross section) is performed. For thicker hides exceeding 3.5 mm, a pH of 3.3-3.5 may be ideal. After ensuring uniform cross sectional pH, 1% ethanolamine is added and the drum run for 90 minutes. The bath pH is checked and if the bath pH is more than 8.0, add a spot of (0.1%) formic acid and run the drum for 10 minutes and 6% BCS is added. The penetration is completed in 2-3 hours depending on the thickness. The final pH is in the range of 3.7-3.8 and if needed 0.1% Sodium bicarbonate is added to get a pH of 3.8 and the drum finally run for 2 hours. The spent liquor usually contains chrome concentration of about 2 gm/lit and can be recycled as pickle liquor for the next lot after acidification and adjustment of the salt concentration to 11-12 Be^{o} by the required quantity of common salt.

Step-wise procedure for this technology is as follows:

- Ensure complete deliming by checking the thick compact regions of the hides with phenolphthalein. Complete deliming is a requisite for uniform fixation of

chrome in chrome tanning and more so in the case of high exhaust tanning methods.

- Measure a float volume of 60% water into the drum using flow meter. Add 8-9% salt and run the drum for 15 minutes. Stop the drum and check the salt concentration using Baume meter. Be^{o} reading should be 7. If not adjust with required quantities of salt.
- Add 0.2% formic acid in one feed and 0.7% sulfuric acid (sufficiently diluted in water) added in 2 feeds at 20 minutes intervals. Finally the drum is run for 2 hours. Check the pH, should be 3.5-3.7 in the cross section. If not, add sulfuric acid and leave overnight. Ensure uniform cross sectional pH of 3.5-3.7.
- Add 1% Monoethanolamine and run the drum for 90 minutes. Check the bath pH. If the pH is more than 8.0, add 0.1% formic acid and run the drum for 10 minutes and add 6% BCS in one feed and continue running the drum for 2-3 hours. Completion of penetration is checked. pH is usually in the range of 3.7-3.8; if not adjust with 0.1% Sodium bicarbonate to 3.8. Finally run the drum for 2-3 hours.
- Collect the spent chrome liquor using the drain door into the collection tank. Add 0.2% of formic acid. Adjust the Be^{o} of the solution to 11-12 Be^{o} adding required quantity of salt (usually 4-5%). Age the liquor overnight and reuse as pickle float for the next batch.
- Rest of the process for recycling is the same as for main tanning, except that the ethanolamine offer is limited to 0.75% and chrome offer reduced to 5.5% on pelt weight in recycling.

12.4.9 Usage of Flow Meters for the Measurement of Float Volumes

You have been provided with flow meters for measuring float volumes for processing. Before the water enters the flow meter, any solid particles or suspended matter get filtered by the on-line strainer provided. This strainer has to be periodically cleaned to ensure that there is no blockage (For instructions, please see the manual for the strainer)

There are two circular dials and one digital reading device in the flow meter. The main digital reading device shows 1000 liters per unit. The second circular dial (smallest) has been calibrated to indicate the volumes in 100 liters/unit and 1000 liters for one full rotation. The bigger circular dial is graduated to measure 10 liters per unit & and for one full rotation of the needle in this dial, you measure 100 liters.

Using this flow meter, the float volumes for all unit operations can be measured and used. Use of flow meter will reduce subjectivity and variation of floats from lot to lot. This will serve as a good process control system especially in critical operations, where the concentration rather than the percentage of chemicals matter. Use of float volumes will also lead to improved quality consistency.

For measuring water, initial reading on all three dials is noted. The volume to be measured is calculated and based on that the final reading on all three dials arrived at before the inlet valve is opened.

12.5 Details of Samples Collected from tanneries (Phase -II) and the Parameters to be Analysed

Sl No.	Effluent Stream	Tannery *				Parameters to be Analysed *(Proposed to analyse in CLRI)*	Total No. Samples
		B	C	D	R		
1.	Soak Liquor	5	9	10	4	pH, alkalinity, BOD,COD, TDS, TSS, TS, Cl, Sulfate	28
2.	Lime liquor	2	3	4	2	pH, BOD, COD, TDS, TSS, TS, Cl, Sulfide, Sulfate	11
3.	Deliming	1	2	2	2	pH, BOD, COD, TDS, TSS, TS, Cl, Sulfate	7
4.	Pickling		2			pH, Acidity, BOD, COD, TDS, TSS, TS, Cl, Sulfate	2
5.	Chrome Tanning	2	4	4	2	pH, BOD,COD, TDS, TSS, TS, Cr, Cl, Sulfate, acidity	12
6.	Post tanning	1	1	1	1	pH, BOD,COD, TDS, TSS, TS, Cl, Sulfide, Sulfate, Cr	4
Total		**11**	**21**	**21**	**11**		**64**

* B- Bay Tannery
C- Chowdhury Leather
D- Dhaks Hides & Skins
R- Ruma Leathers

12.6 Details of Personnel who were trained during the Cleaner Technology Demonstration at Hazaribagh Tanning Cluster, Dhaka, Bangladesh.

Sl.No	Tannery Name	Name of the Personnel	Designation
1.	M/s Bay Tannery	Mr. Shamsur Rahman	Managing Director
		Mr. Batan	Chief Leather Technologist
2.	M/s Chowdhury Leather	Mr. Mohmood-ul-Hussain	Production Manager
		Mr. Tutul	Production-in-Charge
		Mr. Ashad	Chrome Tanning-in-Charge
		Mr. Supno	Beam House-in-Charge
3.	M/s Dhaka Hides & Skins	Mr. B.N.Haque	General Manager
		Mr. Rafiqual Islam	Chief Technician
		Mr. Sirajul Huque	Production-in-Charge
		Mr. Sipon Khan	Wet Blue Technician
4.	M/s Ruma Leathers M/s	Mr. Abdul Taher	Managing Director
		Mr. Mohammad Abdul Kaddusmiah	Leather Technologist
		Mr. Kuddus Miah	Chief Technician

13. PROMOTING GOOD HOUSEKEEPING PRACTICES IN BANGLADESH'S TANNERY SECTOR

13.1 Introduction and Mission Objectives

This report documents the discussions and findings of a mission to Bangladesh undertaken for UNIDO's Regional Programme for Pollution Control in the Tanning Industry in South East Asia - US/RAS/92/120 by Jurgen Hannak during 26 September – 1 October 2000.

Mr Hannak's activities formed part of the subcontracted tasks to be carried out by the team from Central Leather Research Institute (CLRI) on cleaner technologies in the Bangladesh tannery sector. The focal point for this mission was Mr Alam Chowdhury, National Expert, RePO-UNIDO in Bangladesh.

The aim of this mission was to (1) assess the current safety and health practices and conditions prevailing in the tannery sector in the Hazaribagh cluster, Dhaka and (2) to disseminate sector-specific Good Housekeeping practices to owners, managers, technicians and workers. The primary focus of discussions and visits of the Bangladesh mission was on Good Housekeeping, particularly in terms of safety & health, with the objective of exploring the following issues:

- Assess the prevalent health and safety hazards at work in the tanneries of Hazaribagh
- Assess selected workplace parameters such as worker's exposure to noise and levels of illumination using monitoring instruments available in the UNIDO project office
- Propose measures to tanneries to control existing health and safety hazards as identified during safety survey
- Identify local organisations which can provide and guide the tannery industry in Bangladesh on Good Housekeeping and safety & health

13.2. Visits to Tanneries

13.2.1 List of tanneries visited

In following four tanneries in Hazaribagh safety surveys - in form of walk-through audits - and measurement of noise and illumination levels have been carried out.

- Chowdhury Leather
- Bay Tannery
- Ruma Leathers
- Dacca Hides & Skins (raw to wet-blue skins & hides unit)

Mr Hannak and Mr. K C Velappan carried out the safety surveys using a standard safety checklist prepared by Mr Hannak in collaboration with GTZ funded project on Good Housekeeping. The survey covered the aspects of (1) material storage and handling, (2) energy, (3) safety and health, working conditions.

Using an industrial light meter and a sound level meter, provided to the UNIDO project office by RePO-UNIDO, the team took light and noise exposure measurements at various points in the four tanneries. With regard to light levels, the general light levels and light levels at the point of work at different process stages were measured and recorded. With regard to noise levels, the team took grab-samples and readings on the maximum and average noise levels in different work areas.

The recordings have been compiled on separate sheets for each tannery.

13.2.2 Findings

The commons observations made:

(I) Safety of machinery and equipment

- The newly imported machinery, mostly used in the finishing processes, by and large meet international safety requirements in terms of proper positioning, availability of passive and active guards, placement and labelling of control buttons, dials and switches.
- Local machinery (drums, paddles, fleshing machine) and some second-hand machinery, mostly used in raw-to-semi finished production, are without passive

and active guards. Control buttons are not in reach of operator. There are no proper starter switches for many drums.

- ⇨ *For example mostly mechanical-type fleshing machines without safety devices are in use. Starter boxes and control buttons are located out of reach of operator and helper. Emergency-off buttons are missing.*
- ⇨ *Commonly one motor is used to drive two to three drums, using a flat-belt transmission system. While the motor is running all the time, the flat-belts are shifted mechanically to activate drum rotation. During this procedure, workers are working close to motor and immediate transmission system. The transmission mechanisms are not covered or fenced. Access to rotating drums is not specifically prevented, though float catchment areas in front of the drums, reduce risk of accidental contact with or hit rotating drums.*

- Elevated platforms are available on most machines to allow good worker-operating point interface. In a few cases the platform may need to be raised to improve work posture. Facilities for stacking material in process need to be adjusted in height to prevent body strain due to low bending, full turning of body or high lifting of material in process.
- The general maintenance and cleanliness of machines is very poor with waste and dust covering machine and electric installations. A system of preventive maintenance seems to be absent. Most maintenance activities related to breakdown maintenance and repair. With regard to the newly imported machines, it appears that sophisticated repair facilities for the same are not available in Dhaka - except for some minor items, all other spare parts need to be imported. One tannery has taken initiative to introduce regular pre-and post-operation routine checks.

(II) Safety of electrical installations

- ***Motors***: Most electrical motors in use in the wet-processing areas to not conform to IP55 (or equivalent) level of protection as required for conditions prevailing in such work areas. Though some motors may have IP55 rating (according motor rating labels are missing or not legible), poor maintenance and condition of these motors have reduced the actual level of protection. Terminal boxes on many motors are missing. Most motors and outer motor parts are heavily corroded.

- ***Wiring and earthing***: Wiring on (local and second-hand) machines is unsafe; electric cables are not connected to the motors through cable glands. Wire connections are poorly insulated (even blank wires) using even simple adhesive tape. Earthing wires are missing or are loose on most electric motors in the wet-processing areas. Circuit breakers and overload relays are usually available on the imported machinery only. Electrical cables for minor tools and lighting in the work areas have been placed across passageways and immediate work areas around machines, obstructing free movement.
- ***Switchboards and panels***: The electrical connection on and around imported machinery conforms to international standards in terms of colour coding, overload and short-circuit protection. Local switchboards and panels are placed next to the machine in convenient reach of operators and helpers. All switches, dials and controls are clearly labelled in English (no labelling in Bengali). Most switches and starters on drums, paddles and local machinery in wet-processing areas are located away from the machinery out of reach the workers of the respective machines. Instead of adequate panels or boards, wooden boards are used for mounting switches, starter buttons and other controls. Due to humidity and poor maintenance practices, these boards are either soaked (high risk of becoming live!) or covered with dust (fire risk!). Labels, allowing clear identification of switches and buttons, are usually missing. Sample tests, asking workers to switch on or off a particular machine, resulted in trial and error exercises, switching on wrong machinery or light fittings.
- ***Main electrical controls***: Access to transformers units is not properly prevented by fence-type of other enclosure. In three tanneries waste/scrap material and chemical containers (both full and empty) were kept close to the main electrical controls and the transformer. Protective measures such as insulation rubber matting, high voltage and other warning signs, rubber gloves (with voltage rating) were absent.

(III) Prevention of falls and slips

- General floor conditions in the tanneries visited are acceptable. Floor openings such as drains, wells or pits are covered. Passageways are of adequate width

and flooring allowing easy movement of material and persons. Ramps are available to connected areas with different floor levels.

- In most wet-processing areas, floats from drums and paddles as well as wastewater from fleshing and sammying machines is properly drained. In some sections of wet-processing areas, lower and sloped areas are covered with stagnant puddles of wastewater; together with built-up of sludge and spilled chemicals these sections are very slippery.
- Due to the limited space in the clusters, many tanneries are located over several floors. Staircases and mezzanine floors, except in one tannery, are provided with railings.

(IV) Safety in use of chemicals

- ***Availability of information on hazardous chemicals***: Most chemicals used in the tanneries are imported. Chemical containers from European suppliers are labelled and marked as per international standards. However, in many cases these labels are partly torn or have become hardly readable. Safety labelling and marking on containers of chemicals imported from other Asian countries does not conform to international standards. Material Safety Data Sheets (MSDS) are not available in the tanneries. As per information of the leather technicians, the chemical suppliers do allegedly not provide these. Except in one tannery, floor level supervisors/technicians and workers had little to no awareness about the potential health hazards of the hazardous chemicals in use and first aid measures.
- ***Storage of chemicals***: Most tanneries have provisions for central and temporary storage of chemicals. Due to the general space constraint the central store is often located outside and away from the main tannery. Considerable storage space is wasted due to keeping spare parts, empty chemical containers and waste material in the same stores. Removal of these materials will immediately increase the available space. In a few cases, chemical containers and bags are placed on pallets or elevated wooden platforms.
- ***Transfer and handling of chemicals***: Powered chemicals (BCS, salt, lime) are usually carried in the original bags to the respective processing areas, where they are emptied into barrels for further preparation. Liquid chemicals (fatliquors,

acids) are usually transferred using small measuring cups from the large containers to open buckets. The buckets are manually carried to the process areas.

- ⇨ *Concentrated acids are carried in the similar way (as explained above) and diluted in open barrels next to the drums. Mixing is done manually, using a wooden stick. The concerned workers are inhaling vapours, fumes and aerosols generated during these processes. Workers do not use any personal protective equipment such*
- ⇨ *Most tanneries use limestone, which needs to be crushed and hydrated in an open barrel. During the latter process, lime splashes occur. Workers protect themselves by quickly stepping away from the barrel. The workers do not use any personal protective equipment such as full body apron, gloves, boots, dust masks or splash goggles.*

- ***Control of airborne emissions at source***: Any vapours, fumes, gases generated during the processes in the drums are diluted by venting the drums for a short period of time before removing material inside.
  - ⇨ *Shaving dusting and dedusting machines - mostly imported - are equipped with extraction facilities. In several cases, the extraction fans of the shaving machines are not connected to exhaust ducts and dust collectors.*
  - ⇨ *Buffing and dedusting machines are provided with proper dust extraction and collection facilities. In a few cases, exhaust fans were not switched on or were out of order.*
  - ⇨ *Most tanneries use hand spray booths for trial and testing and rotary spraying machines for regular production. In all cases, only the spraying chambers are connected to an exhaust duct. No such connections are provided for the exhausts on the drying tunnels. Exhaust ducts are not connected to scrubber or other collection/treatment devices but lead to the outside. This practices creates a public health hazards as well as pollutes the tannery itself as the exhausted air re-enters through wall openings.*
  - ⇨ *No air quality monitoring has been carried out so far in any tannery in Bangladesh.*
- ***Disposal of chemical waste and containers***: Empty chemical containers and carboys are collected and sold to special agents. These sell the containers for reuse to chemical manufacturers or to private persons for storage of water of food. Chrome containing solid waste (e.g. small wet-blue trimmings, shaving dust, buffing dust) is disposed by burning in the tannery's own boiler oven,

resulting in the release of hexavalent chrome containing particles into the air. At present, wastewater is discharged into drains to the outside of the tannery without treatment.

(V) Illumination

- Measurements conducted on-site using an industrial light meter showed that the general illumination levels in almost all work areas of the tanneries visited are inadequate. The general light levels in the tanneries are around 10 - 30 lux. Apart from poor use of natural (day) light due to the given structures of the buildings, the tanneries do not have sufficient number of light fittings. Walls and ceilings have poor reflection values due to poor cleanliness and lack of whitewashing.
- The quality of local lighting of point of operations, particularly on machines with hazardous operations and moving machine parts are inadequate. Poor lighting does not only result in strain and impairment of eyesight, but results in worker's fast fatigue and dizziness. These factors in turn lead to low quality and increase risk of accidents.

(VI) Noise

- As per the measurements conducted on-site noise levels were within safe limits of 85 dB(A) for a eight hour exposure. Generally the noise levels in drum areas is around 80...85 dB(A). Replacement of iron pinion with ones made of Nylon will reduce the general noise levels.
- No hearing protection (ear muff, ear plugs) was available or used by workers in operation with high noise levels.

(VII) Ventilation and ambient air quality

- Most production facilities are placed in wide and open halls. However, limited number of wall openings e.g. windows, gates, louvers do not allow good natural cross-ventilation.
- Ceiling fans are available work areas to provide airflow for operators. In many cases ceilings fans and work areas are not aligned.
- Indoor ambient air quality, temperature and humidity are not being monitored. As per information from Bangladesh Institute of Labour Studies, air sampling and monitoring instruments are only available with the Office of Chief Inspector of Factories.

(VIII) Handling and movement of material and loads

- Though flooring and general arrangements are of good quality, materials are intensively transported manually from stores to production areas and between different production areas. The available trolleys are of poor quality requiring several workers for moving of trolley and material. The workers use tools such as tongs and long clamps when handling rawhides in the beam house.
- In several tanneries, process and input materials are stored on wooden pallets. When required the material is moved manually. Hydraulic pallet trucks are not in use for moving stacks of material on the pallets.
- Areas for work, storage and movement are not clearly segregated e.g. such as by floor markings. Accordingly, the current storage arrangements, particularly for wet-blue leather, appear to be haphazard and wasting storage space. The stacked material prevents smooth movement of persons and material as well as fast shifting of material when required.
- Tanneries, which are located on several floors, do have provisions for elevators for moving material from floor to floor. One tannery did have provision for installation of an elevator, but preferred to move material manually.

(IX) Emergency management

- ***Emergency planning***: None of the tanneries had a written emergency plan to list actions required for different emergency scenarios. Only one tannery had implemented measures as preparation for possible fire and medical emergencies.
- ***Fire fighting***: No systematic fire audit has been conducted in the tanneries to identify potential sources of ignition and potentially flammable material and to take preventive and preparedness measures. Workers in the tanneries are aware of what to do in case of a fire. There are no signs or boards, which prohibit smoking or open fire, particularly, in areas such as chemical stores, spraying, buffing, main electrical control room. In several tanneries fire-fighting equipment is completely missing or insufficient for the size of production. In some instances the fire fighting equipment is wrongly distributed. For example, fire-fighting equipment is not available in areas with a high fire risk e.g. spraying areas or chemical store while being available in areas such as beam house/tan yard. Fire extinguisher, where available, were found to be properly maintained and refilled.

Their location is easily accessible, though not clearly marked. None of the tannery had clearly marked emergency exits.

- ***Medical emergencies***: Only one tannery had medical emergency provisions. In the other tanneries no first-medical aid facilities were available. Number of nearest doctor or hospital was not displayed on or next to the telephones with outside connection.

(X) Personal protection and welfare

- ***Personal hygiene***: In most tanneries, workers were seen frequently washing exposed skins after handling raw material or work in wet-processing yard. No separate washing facilities are available. Usually workers use water from the water taps in the production areas.
- ***Working and protective clothing***: No separate working uniforms are provided to the workers, who use the same clothes at work and at home. Most workers wear open sandals. Only a few workers in the wet processing wear boots.
- Workers usually take food outside the factory.

(XI) Promotion of safety and health at work

- ***Safety and health awareness***: Gathering from the discussions with technicians and workers the general awareness about prevalent health and safety hazards at work is poor. Workers know of accidents having happened and complain about various ailments. Though they are not able to relate the latter to a specific substance they are handling or are exposed to, they are convinced that the occupational environment causes these. In those few cases, where workers knew about hazards, they were trying to take protective measures, with local means available. As per the information of the workers, safety orientation or training is not part of the job induction. It is understood that the Bangladesh Institute of Labour Studies has taken an initiative in collaboration with trade unions to conduct awareness and training activities for the workers in the tanneries.
- ***Safety promotion at work***: Safety or cautionary signs and boards are not displayed in the workplaces. Imported machines usually bear safety and cautionary labels. As the awareness on safety & health among supervisors is also very low, increase of general awareness by means of close supervision and

on-the spot guidance is limited. At present, outside support and guidance is still limited.

- The findings in the different tanneries can be seen in the annexes 2 - 5.

There is large scope for implementation of energy conservation measures. In may cases the technical staff was not aware of information such as electricity consumption, the motor power rating e.g. of drum motors.

13.3 Potential Partners for Disseminating Good Housekeeping

13.3.1 Bangladesh Institute of Labour Studies (BILS)

Having been established in 1995 and being supported by DANIDA, the institute as an autonomous institution focuses on strengthening the trade union movement, developing democratic functioning, self-reliance & unity and brightening the image of trade unions as a social partner.

The various activities can be grouped into:

1. Education and training
2. Publications and information dissemination
3. Research & studies

One of the various objectives of the organisation is the improvement of occupational health and safety condition and workers' welfare as a whole. BILS has conducted a number of studies on health, safety and welfare conditions in various industrial sectors of Bangladesh. The institute has completed a study on safety, health and environment in tanneries of the Hazaribagh cluster in 1999.

Feedback for BILS	• Interested in activities focusing on improvement of health & safety conditions in the tanning and leather industry as a follow-up of the BILS's initiative
Areas suggested for collaboration	1. Dissemination of information on health & safety at work in tanneries as prepared by outside agencies 2. Organisation and provision of training on health & safety aspects in tanneries for workers and their representatives
Key contacts	Mr. Syed Sultan Uddin Ahammed, Assistant Director Mr. A R Chowdhury Repon, Research Officer

Contact address Bangladesh Institute of Labour Studies

House 2, Road 13, Dhanmondi, Dhaka 1209, Bangladesh

Tel: 00880 2 8123869, Fax: 00880 2 8123868

Email: bils@agni.com

13.3.2 Bangladesh College of Leather Technology

Located in the Hazaribagh cluster, the Bangladesh College of Leather Technology is the institute catering to the tanning and leather industry in Bangladesh. Prof. Principal-in-charge participated in the tanner's workshop

Feedback for BCLT

- Interested in activities focusing on improvement of health & safety conditions in the tanning and leather industry as initiated by CLRI

Areas suggested for collaboration

1. Inclusion of information and training material on health & safety at work in tanneries into BCLT's syllabus
2. Training of faculty on health & safety issues in leather industry to assist local leather industry in upgrading working conditions
3. Organisation and provision of training on health & safety aspects in tanneries for managers and technicians

Key contacts Prof. Md. Fazlul Karim, Principal (incharge)

13.3.3 Bangladesh Finished Leather, Product Manufacturing Association

Feedback for P3U

- Found the activities on OSH as part of CLRI's ongoing on-site activities very useful
- Workshop held a first step to raise awareness among tannery community on health & safety issues; further activities in this direction required.

Areas suggested for collaboration

1. Assist in the organisation of training and workshops and mobilize support through their connections

Key contact Mr. Md. Nazrul Haque, Secretary

13.4 Workshop on Cleaner Technology and OSH

Mr Hannak made a comprehensive presentation to representatives of tanneries in the Hazaribagh clusters, briefing the audience about the common observations and findings in the tanneries visited. In view of the present conditions in the tanneries, the focus of the presentation was on raising awareness on the present prevalent hazards and their impacts on the safety, health & environment and their cost implications.

The presentation also included an introduction of possible simple improvement measures, which could be taken by the tanneries. Mr. Hannak's presentation concluded with the screening of the safety & health video prepared under the RePO-Programme.

13.5 Conclusions and Next Steps

The objective of this mission to Dhaka was to assess the present health & safety hazards prevalent in the tanneries and to suggest action to be taken by the concerned tanneries to improve the conditions in their tanneries.

13.5.1 Access to information on OSH

- Except for the studies conducted by Bangladesh Institute of Labour Studies not concerted efforts have been undertaken to deal with the issue of safety & health at work in the local leather industry. Furthermore, apart from the information provided through the CLRI team no other information or training material is presently available with the local tanneries.
  - ⇨ *To widen the information and database on environment, safety & health issues in the tanning industry, RePO-UNIDO should arrange for the establishment of an information database and reading library with a suitable counterpart organisation in Bangladesh (e.g. UNIDO project office, office of leather association).*

1. Provide copies of publications of RePO-UNIDO and other organizations involved in the Regional Programme to the UNIDO project office in Dhaka and the office of BFLMEA. RePO-UNIDO should consider funding the translation of the OSH manual into Bengali.

2. A copy of the training video on OSH in tanneries has been handed over to the UNIDO project office. The project office should consider the translation of the video into Bengali and the distribution of the video to potential counterpart organizations (e.g. BILS, BCLT, BFLMEA)

3. Include the UNIDO project office and BFLMEA into the mailing list of the ILIFO brochure

- Good Housekeeping is definitely a concept that is relevant for Bangladesh enterprises, especially given the recent push to establish itself industrial competitiveness. The nature of Good Housekeeping measures (see according guide prepared by GTZ/P3U) will help to create interest and achieve first gains in improving the working conditions in the tanneries.

  ⇨ *To facilitate a broad dissemination of the concept and realise action on the part of companies, some local knowledge and capacities in the area of Good Housekeeping and use of GTZ/P3U's Guides will need to be developed. In this respect, a training of trainers is recommended.*

  1. Eventually, translation of the Guides and information material into the local language (Bengali) will be required to facilitate a broader implementation of Good Housekeeping in the regions where tanneries are clustered across Bangladesh (Chittagong, Dhaka).

  2. The question of who will fund this activity needs to be addressed.

13.5.2 Safety & health support services and training

- The local tanners are interested in the productivity angle of Good Housekeeping measures. They require guidance and assistance in effectively implementing these measures on-site. At present, no organisation has been identified or has come forward to provide the support services such as in form of (1) conducting safety surveys, (2) monitoring exposure, (3) provide on-site guidance in the implementation of measures and (4) training. As per information from BILS, only the office of the chief inspector of factories has monitoring instruments at its disposal. Whether these are actually used could not be verified.

⇨ *To promote the dissemination of Good Housekeeping and the use of its tools, UNIDO/CLRI could partner with several potential organisations, whose capabilities could be increased through concerted training activities. CLRI would be the logical choice for the technical side due to its national coverage and its specific focus on and existing work (e.g. OHS walk-through audits, identification of local champions, creation of demonstration sites) with small- and medium-sized enterprises.*

1. Organise a 3-day training programme on Good Housekeeping, safety & health for tannery representatives from all over Bangladesh. This can be organised as a collaborative effort of P3U-GTZ, CLRI, BCLT and BFLMEA.
2. Arrange a 3-day training of Trainers workshop with representatives from BILS, BLC, BCSIR to specifically acquaint these with the various GH tools as well as technologies under IH and safety management
3. Funding may be obtained from embassies, bi- and multi-lateral organisations in Dhaka by BFLMEA.

- At present, no proper framework is available through which a sustained dissemination of Good Housekeeping and good work practices can be achieved. The focus of the project office has been more on administrative than technical guidance, the latter being provided through the subcontractors such as CLRI.

⇨ *To foster the establishment a framework supporting endeavors*

1. Sign a Memorandum of Understanding with BCLT on CLRI assisting BCLT in disseminating cleaner technology and OSH in the local leather industry.
2. Prepare a proposal of a long-term project to be presented for funding/implementation through bi- or multi-lateral organisations.

The report on the study and findings of promoting good housekeeping practices in each tannery is given in **Annexures – 6 to 11.**

ANNEXURE - 1

Details on Workshop organized

Date	Sl. No	Activity	Remarks
12.6.99	1.	An awareness workshop on "Cleaner Tanning Technologies" was planned to address the senior representatives of the six tanneries and other professionals in the trade who can contribute in the decision making. The venue for the meeting was selected and arrangements were made	
13.6.99	2.	Invitations were prepared (24 in number) and sent to the concerned persons. The list of invitees is enclosed as Annexure - 6.1	* The day was declared as Hartal day in Dhaka, with transport facilities limited from 6am to 6pm. * Mr Fakhrul Alam, MD, Dhaka Leather Chem Ltd., has provided the facilities and also helped in extending the invitations to the VIP's
	3.	The following tanneries were personally visited and invitations to attend the awareness workshop were extended . M/S Bay Tanneries Limited M/S Ruma Leathers Limited M/S Paramount Tanneries M/S Chowdhury Leather & Co. Ltd	Mr Fakhrul Alam, Mr Quamrul Alam Chowdhury and Mr Mohammed Haneef have helped in extending other invitations and in organising the venue and other arrangements
	4.	Visited the Indian High Commission in Dhaka and met Mr Kulbhushan Sharma, Attach (E&C) and apprised him of the UNIDO project being executed in Dhaka and the CLRI role. He also invited to attend the Workshop.	Mr Kulbhushan Sharma has shown interest and requested CLRI to keep him appraised of the progress in this Project.
	5.	In all 20 persons representing the leather industry, research, chemical suppliers and education in the field of leather attended the workshop including Mr Kamal Uddin Ahmad, Joint Chief, Ministry of Industry, Govt. of Bangladesh and Project coordinator on Bangladesh side. The list of people who attended the workshop is enclosed as Annexure-6.2. The following presentations were made.	In spite of severe constraints, the participation in the workshop by tanners has been enthusiastic and reflects the prevailing opportunity for the implementation of cleaner tanning technologies in the region.

		* Sharing of experience in implementation of cleaner tanning technologies in India and SriLanka by Dr PG Rao, Sc. * Technical aspects of cleaner tanning technologies by Mr NK Chandra Babu, Sc. * Objectives and scope of UNIDO project by Dr PG Rao After the presentations, the floor was open to discussions. A number of clarifications and enquiries came up from the participants, for which necessary and appropriate information was provided by Mr N Samivelu, Sc. Mr Suthanthrarajan, Sc. has assisted in coordination in the workshop. The workshop was concluded by the remarks of Mr Kamal Uddin Ahamed, wherein he requested the tanners from Bangladesh to adopt the cleaner tanning technologies, as this was going to be the order of the day in future even in Bangladesh. Dinner followed the workshop.	

BRIEFING MEETING ON CLEANER TANNING TECHNOLOGIES IN TANNERIES IN HAZARIBAGH, DHAKA UNDER UNDIO PROGRAMME.
LIST OF INVITEES

Date : 13/06/99
Venue : Hotel Lavinci, Dhaka

1. Engr. M.Abdul Taher
   Managing Director
   Ruma Leather Industries Ltd
   131, Hazaribagh, Dhaka 1209, Bangladesh
   Tel: 00-880-2-96 4317
   Fax: 00-880-2-9803134
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    Bangladesh Finished Leather and Leather Good Association
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APEX Consultant
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23. Mr Md. Mozahar Ali
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BRIEFING MEETING ON CLEANER TANNING TECHNOLOGIES IN TANNERIES IN HAZARIBAGH, DHAKA UNDER UNIDO PROGRAMME

Date: 13.06.99 Venue: Hotel la Vinci, Dhaka

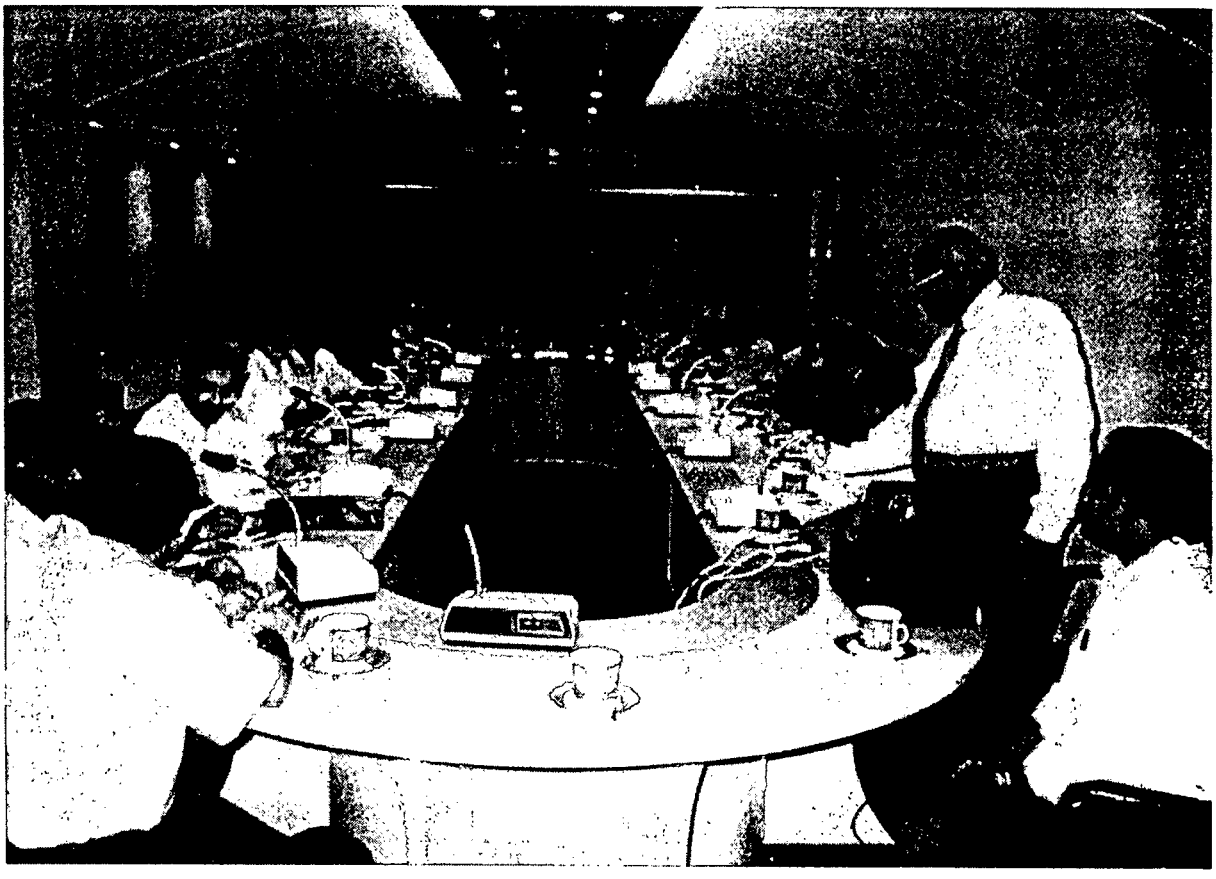
SL NO	Name and Address	Signature
1.	Kamal Uddin Ahmad, Joint Chief, Ministry of Industries	[signature] 13/6/99
2.	Abdul Hamid Bhal - H.B. Tannery, Dhaka	[signature] 13/6/99
3.	Shamsuddin Ahmad. Ruma Leather Industries	[signature] 13/6/99
4	K. Mohamed Haneef, G.M. Rupsa Leather	[signature]
~~5~~		
5	S.M.A. BATEN, Bay Tanneries Ltd.	[signature]
6.	REZAUR RAHMAN, BAY TANNERIES LTD	[signature]
7.	SHUAIB KHAN - PRODIGY INTERNATIONAL	[signature]
8.	DR. MD. FAZLUL KARIM BANGLADESH COLLEGE OF LEATHER TECH.	[signature] 13/06/99
9.	QUAMRUL ALAM CHOWDHURY, Nation Expert UNIDO	
10	Tariqul Islam Khan Bangladesh college of Leather Tech	[signature]
11	N. Samivelu C.L.R.I CHENNAI	[signature]
12	R. Suthantharayarajan, CLRI, Chennai	[signature]
13.	P. G. Rao	[signature]
14.	N.K. CHANDRA BABU, CLRI, Chennai	[signature]

EXPERT'S MEETING ON CLEANER TANNING TECHNOLOGIES IN TANNERIES AT HAZARIBAGH, DHAKA UNDER UNIDO PROGRAMME

Date: 03.03.99 Venue: Hotel Ia Vinci, Dhaka

SL NO	Name and Address	Signature
1.	Dr. Karam Ali Ahmed	
2	M. Fakhrul Alam	
3.	Md. Mozahar Ali	Mozaher
4.	Dilip Lal Roy.	
5.	A. F. M. Rahmat Ullah.	
6	Akbar Hossain	
7.	MD. ABDUL KADDUS MIAH	
8	Md. Delowar Hossain	
9	MD. Monirul Islam Khiyan	
10.	SYED SHAFIUDDIN CLARIANT (BANGLADESH) LTD.	

SOME PHOTOGRAPHIC VIEWS OF WORKSHOP



UNIDO PROJECT: Provision Of Services Relating to the Promotion and Demonstration of Cleaner Tanning Technologies in the Tannery Cluster at Hazaribagh, Dhaka in BANGLADESH

UNIDO Project No: US/RAS/97/137

UNIDO Contract No: 99/016

DETAILED WORKPLAN

AIM OF CONTRACT

- TO PROVIDE SERVICES FOR THE DEVELOPMENT AND ASSISSTANCE IN IMPLEMENTING THE PROGRAMME OF INTRODUCTION OF CLEANER PROCESSING METHODS IN SELECTED TANNERIES AND IN THE INSTALLATION, COMMISSIONING, START-UP TESTS AND FINE TUNING OF THE COMMON EFFLUENT TREATMENT PLANT

SERVICES TO BE PROVIDED

- Critically evaluate the leather processing methods prevailing in tanneries of the Hazaribagh area, Dhaka, primarily from the environment point of view, i.e on the basis of pollution load generated in the manufacturing process. The attention to be focussed on the beamhouse and tanyard operations.
- Subsequently in close cooperation with the CTA and other international and national experts of the project team, develop and assisst in implementing the programme of introduction of cleaner processing methods in selected tanneries.

BOUNDARIES OF OPERATION

- Social, technical and economic conditions of the country should be taken into consideration
- Cost of the new, low-waste technologies and in-plant measures should not be prohibitive. A favorable cost/benefit ratio to be maintained.
- Present leather quality should not deteriorate

Some suggestions for considering cleaner processing methods and/or in-plant control measures

- General (Water) house keeping/cleanliness measures
- Desalting before soak-normal / mechanical
- Sulfide reduced liming
- Recycling of floats
- Improved deliming of hides/skins
- Chrome management systems other than chrome recovery and reuse through precipitation
- Any other pollution reducing process, primarily in the beam house

PHASE-I ACTIVITIES

(Programme development, formulations, design and equipment specification)

1 Appraise and evaluate general leather manufacturing practice and specific processing meyhods/formulations (Soaking, unhairing, deliming, pickling, tanning, retanning) followed by tanners of the area, particularly, focusing on the tanneries selected for introduction of cleaner technologies. Make estimates of the resulting pollution loads.

2 Define simple housekeeping/cleanliness in-plant measures involving nil or very limited investment/operation cost leading to reduction of wastes generated.

3 Identify processes/operations suitable to be modified and/or replaced by reliable, proven, cleaner methods; this includes recycling of chrome floats and other chrome management systems. Elaborate details of the cost of implementing such concepts.

PHASE-I ACTIVITIES

(Programme development, formulations, design and equipment specification)

4 **Implement such measures which, understandbly, require certain inputs from their side as well, in selected tanneries and any other volunteer tanneries.**

5 **Prepare a study setting out a programme with specific reccommendations, area/buildings/construction works requirements, chemicals, local and imported equipment specification and cost breakdown including a work plan timetable.**

6 **Follow and help to ensure that any construction/modification work undertaken is in line with subcontractor's proposals.**

PHASE-II ACTIVITIES

(Installation, commissioning, start-up tests, "fine tuning")

1 Closely follow the progress of the construction and piping, wiring and other related work and timely intervention to ensure adherence to the accepted design.

2 Scrutinize the quality and completeness of both the local and imported equipment and chemicals supplied for the project for the cleaner technology component.

3 Assist in the installation, testing and commissioning of the equipment as applicable. Provide guidance to tanners in testing the new and/or modified formulations (receipes) ideally first on small lots, and following the fine tuning, on full industrial scale packs. Organize the necessary laboratory process and quality control.

4 Prepare a concise manual to be used by tanners (e.g. for improved deliming or high chrome exhaustion tannage) or personnel operating a special unit, if required.

PHASE-II ACTIVITIES

(Installation, commissioning, start-up tests, "fine tuning")

5 **Ensure that users are fully trained and able to continue using the method or the unit independantly, I.e. without further assistance.**

6 **In cooperation with the local establishments like tannery associations and others, organize a demonstration of the methods and processes introduced/installed.**

7 **Hold atleast one workshop in Hazirabagh area during each field visit to disseminate the improved technologies demonstrated, to cover as large number of tanneries as possible, in cooperation with Bangladesh Tanners Association and Bangladesh Finished Leather & Leather Goods Exporters Association.**

Annexures – III

PROPOSED SCHEDULE FOR THE FIELD DEMONSTRATION OF CLEANER PROCESS TECHNOLOGIES AT HAZARIBAGH TANNING CLUSTER, DHAKA, BANGLADESH

14.09.2000 (THU) Departure of team from **Chennai to Calcutta**

15.09.2000 (FRI) Departure of team from **Calcutta to Dhaka**

Date	**Bay** **BD001**	**Ruma** **BD006**	**Chowdhury** **BD002**	**Dacca** **BD003**	**Paramount** **BD004**	**Helana** **BD005**
16.09.2000 (SAT)	Inspection of facilities and testing of Pumps & Flow meter	Inspection of facilities and testing of Pumps & Flow meter	Inspection of facilities and testing of Pumps & Flow meter	Inspection of facilities and testing of Pumps & Flow meter	Inspection of facilities and testing of Pumps & Flow meter	Inspection of facilities and testing of Pumps & Flow meter
17.09.2000 (SUN)			**LOT - 1** ☞ Float Measurement ☞ Soaking -I ☞ Soaking - II with enzyme	**LOT - 1** ☞ Float Measurement ☞ Soaking -I ☞ Soaking - II with enzyme	-	-
18.09.2000 (MON)	**LOT - 1** ☞ Float Measurement ☞ Soaking -I ☞ Soaking - II with enzyme	**LOT - 1** ☞ Float Measurement ☞ Soaking -I ☞ Soaking - II with enzyme	**LOT - 1** ☞ Soaking -III ☞ SK-3 Liquor Collection -CT1 ☞ Recycle to SK1 of next lot **LOT - 1** ☞ LM1-Enzyme assisted paddle / drum unhairing	**LOT - 1** ☞ Soaking -III ☞ SK-3 Liquor Collection -CT1 ☞ Recycle to SK1 of next lot **LOT - 1** ☞ LM1-Enzyme assisted paddle / drum unhairing	-	-

19.09.2000 (TUE)	**LOT - 1** ☞ Soaking -III ☞ SK-3 Liquor Collection -CT1 ☞ Recycle to SK1 of next lot ☞ LM1-Enzyme assisted paddle / drum unhairing	**LOT - 1** ☞ Soaking -III ☞ SK-3 Liquor Collection -CT1 ☞ Recycle to SK1 of next lot ☞ LM1-Enzyme assisted paddle / drum unhairing	**LOT - 1** ☞ Collection of wash lime liq. to CT-2 ☞ Start next operations Washing, Deliming, Pickling	**LOT - 1** ☞ Collection of wash lime liq. to CT-2 ☞ Start next operations Washing, Deliming, Pickling	-	☞ Float Measurement
20.09.2000 (WED)	**LOT - 1** ☞ Collection of wash lime liq. to CT-2 ☞ Start next operations Washing, Deliming, Pickling ☞ Collection of Pickle Liquor to (CT-3)	**LOT - 1** ☞ Collection of wash lime liq. to CT-2 ☞ Start next operations Washing, Deliming, Pickling ☞ Collection of Pickle Liquor to (CT-3)	**LOT - 1** ☞ Recycling of wash lime liq. from CT-2 to Liming - LOT 2 ☞ High exhaust Chrome tanning ☞ Collection of spent chrome liquor to CT-3	**LOT - 1** ☞ Recycling of wash lime liq. from CT-2 to Liming - LOT 2 ☞ High exhaust Chrome tanning ☞ Collection of spent chrome liquor to CT-3	-	☞ Float Measurement
21.09.2000 (THU)	**LOT - 1** ☞ Recycling of wash lime liq. from CT-2 to Liming - LOT 2 ☞ High exhaust Chrome tanning ☞ Collection of spent chrome liquor to CT-3	**LOT - 1** ☞ Recycling of wash lime liq. from CT-2 to Liming - LOT 2 ☞ Chrome tanning	☞ Recycling of spent chrome liquor from CT-3 for Pickling of - LOT 2	☞ Recycling of spent chrome liquor from CT-3 for Pickling of - LOT 2	-	☞ Float Measurement

(FRI)						
23.09.2000 (SAT)	☞ Recycling of spent chrome liquor from CT-3 for Pickling of - LOT 2	☞ Recycling of spent pickle liquor for LOT 2	**LOT - 2** ☞ High exhaust Chrome tanning ☞ Collection of spent liquor to CT-3	**LOT - 2** ☞ High exhaust Chrome tanning ☞ Collection of spent liquor to CT-3	-	-
24.09.2000 (SUN)	**LOT - 2** ☞ High exhaust Chrome tanning ☞ Collection of spent liquor to CT-3	**LOT - 2** ☞ Chrome tanning	☞ Measurement of float in the Wet Finishing Operation ☞ Occupational Health & Safety (OHS) studies	☞ Measurement of float in the Wet Finishing Operation ☞ Occupational Health & Safety (OHS) studies	-	-
25.09.2000 (MON)	☞ Measurement of float in the Wet Finishing Operation ☞ Occupational Health & Safety (OHS) studies	☞ Measurement of float in the Wet Finishing Operation ☞ Occupational Health & Safety (OHS) studies	☞ Inspection of Wet Blue produced by the Process Demonstrated.	☞ Inspection of Wet Blue produced by the Process Demonstrated.	-	-
26.09.2000 (TUE)	☞ Inspection of Wet Blue produced by the Process Demonstrated.	☞ Inspection of Wet Blue produced by the Process Demonstrated.			☞ Measurement of float in the Wet Finishing Operation	☞ Occupational Health & Safety (OHS) studies
27.09.2000 (WED)	☞ Feedback on the process ☞ Compilation of data for the Work Shop	☞ Feedback on the process ☞ Compilation of data for the Work Shop	☞ Feedback on the process ☞ Compilation of data for the Work Shop	☞ Feedback on the process ☞ Compilation of data for the Work Shop	☞ Occupational Health & Safety (OHS) studies	

28.09.2000 (THU)	☞ Feedback on the process ☞ Compilation of data for the Work Shop
29.09.2000 (FRI)	
30.09.2000 (SAT)	Work Shop
01.10.2000 (SUN) and 02.10.2000 (MON)	Demonstration of technologies to all participants in the selected tannery and follow up. Feedback from the tanners on the quality of final leather produced. Summing Up
03.10.2000 (TUE)	Departure from Dhaka
04.10.2000 (WED)	Departure from Calcutta

ANNEXURES – IV

PROMOTION AND DEMONSTRATION OF CLEANER TANNING TECHNOLOGIES IN THE TANNERY CLUSTER AT HAZARIBAGH, DHAKA, BANGLADESH

DIARY OF EVENTS DURING THE VISIT OF CLRI TEAM TO HAZARIBAGH, DHAKA DURING THE PERIOD 15th September - 2nd October, 2000(Phase -II)

DATE		ACTIVITY	REMARKS
15.09.2K	1.	Arrived at Dhaka by Indian Air Lines flight.	Received at the airport by Mr. Q. A. Chowdhury, National Expert, UNIDO
	2.	After checking in at the Guest House, Mr.Chowdhury briefed the CLRI team about the progress of the work.	
16.09.2K	3.	Visited all four tanneries where the demonstration of cleaner processing methods to be carried out. Met Mr Shamsur Rahman, Managing Director of M/s Bay Leathers and discussed with him the schedule of the work to be carried out. CLRI team requested Mr.Rahman to provide three lots on a three successive days starting from 18.09.2000 onwards for demonstration. Mr Rahman assured CLRI team of all co-operation and instructed his tannery personnel to extend full co-operation to CLRI team. After the discussion, the team made a visit to the plant and supervised the arrangements that have been made for the demonstration. Two paddles have been set aside to serve as collection tank and the pumps were also fixed to the paddles. The flow meters have also been installed near the soaking /liming and tanning drums to enable the measurement of float volumes in these critical processes. The tannery personnel briefed CLRI team about the beam house and tanning processes currently being followed in the tannery. The raw material being processed is cowhides.	Since the paddles (Collection tanks) are not sufficiently at lower level compared to the drum yard to enable draining of liquor from the drum to the paddle the tannery has provided submersible pumps for the collection of the spent liquors from the drum to the paddles. The Team requested the tannery personnel to clean the paddles very well before the commencement of demonstration on 18.09.2000 as per the schedule.
	4.	CLRI team met Mr.Kuddus Miah , the Chief Technician at M/s Ruma Leathers and discussed with him about the work plan for the field demonstration. The tannery is currently processing goat skins only and often, there is a shortage of raw material due to soaring raw material price. He promised to make at least 2 lots of goat skins (1000 kg each) available for the demonstration starting from 18.09.2000. The process currently followed for goatskins has been reviewed. A Collection pit has been provided near the beam house and flow meter has also been installed.	The pumps have yet to be supplied to this tannery. CLRI team met the supplier of the pump at M/s Ruma Leathers.

	5.	The CLRI team visited M/s Chowdhury Leathers and met Mr.Haroon , the Managing Director and Production Manager Mr. Mohmood-ul-Hussain, of the company. At the moment , the tannery is processing only buff hides and the recipes for the beam house and tanning processes have been reviewed. In main chrome tanning, only 4% BCS is used and hence, it has been decided to carry out a direct recycle of spent chrome liquor as pickle liquor for the next lot. The CLRI team requested the tannery management to clean the sump provided for the collection of the soak and lime liquors.	The Production manager promised to provide cow hides next week for the demonstration of high exhaust chrome tanning method based on Mono Ethanolamine pretreatment.
	6.	The Team met Mr Sipon Khan at M/s Dhaka Hides & Skins and assessed the facilities provided for the demonstration. The flow meters and pumps have been installed and the collection tank(a sump) for soak liquor is ready. The collection tank for the chrome liquor has been constructed but as the capacity is too large for the scale of demonstration, it has been decided to use 200 lit carbouys for the collection. The process to be followed has been discussed with Mr.Sipon and it has been decided to start soaking at 12.00 noon tomorrow.	
	7.	Met Mr. Fakrul Alam, MD of Dhaka Leather Chem Ltd, who has been identified for the supply of the chemicals required for the demonstration. He informed the CLRI team that all the chemicals except unharing enzyme have been delivered to M/s Ruma leathers in required quantities. So far , only 100 kg of unhairing enzyme has been supplied and Mr Fakrul Alam assured the team that the remaining 200 kg of the enzyme will be supplied in 2-3 days.	
	8.	Fixed an appointment for meeting Dr.Fazlul Karim , the Principal , College of Leather Technology at 11.a.m tomorrow for discussing about the analysis of the spent liquor samples.	

17.09.2K	9.	Visited BCSIR to enquire about the possibility of carrying out analysis of the waste liquors discharged during the demonstration of process technologies. Met Dr.Akram Hossain, the Project Director, Leather Research Institute and discussed with him about packaging a deal for the analysis rather than specific charges for each parameter like BOD or COD. Dr.Akram Hossain arranged for a meeting with the Chairman of BCSIR, Prof.M. Mosihuzzaman immediately.	
	10.	The CLRI scientists accompanied by UNIDO National expert, Mr.Chowdhury met the Chairman in his office and briefed him about the UNIDO subcontract and also sought assistance from his organisation for carrying out the analysis of the spent liquors. Prof. M.Mosihuzzaman has promised all help and asked Dr.Akram Hossain to send a proposal after discussion with the CLRI team, for his approval.	
	11.	CLRI scientists again met Dr.Akram Hossian in his chamber. Finally Dr.Akram Hossian has come out with an offer to carry out the important parameters for a lump sum per sample of waste liquor. This offer after the formal approval from the Chairman, BCSIR is to be sent to CLRI for an approval by Director, CLRI.	The charges are high and at the moment there may not be facility (BOD bottles in sufficient quantities and COD digestion units) and hence it may not be possible to complete the analysis before the departure of the CLRI team from Dhaka.
	12.	After discussion at BCSIR HQs the CLRI scientists visited Bangladesh College of Leather Technology (BCLT) and held a discussion with Dr.Fazlul Karim, the Principal, and BCLT regarding the analysis of the effluent samples. He informed CLRI team that he has already sent his proposal to CLRI. He assured CLRI scientists that the flexibility exists as far as the charges for the analysis are concerned. However many of the instruments/equipment received by BCLT are yet to be commissioned and proper training imparted to BCLT personnel for the operation of the facilities.	It may not be possible for BCLT to carry out the analysis in time due to this fact.

	13.	Difficulties experienced with the collection of spent soak liquor at M/s Dhaka Hides & skins, as there was leakage in the drum door supplied by M/s Meen Trade International for the collection of liquors as well as due to the fact that the collection pit is not sufficiently at lower level to facilitate gravitational flow. However the task has been completed by manually shifting the stock from one drum to another. The use of flow meters for measuring the float volume in soaking process demonstrated.	The progress of the work has been discussed telephonically with Dr.P.G.Rao, the Co-ordinator for the UNIDO subcontract.
	14.	At M/s Chowdhury Leather & co Ltd, the electrical connection to the pump is yet to be completed and there may be difficulties with respect to collection of spent soak liquor and recycling of the same which is expected to be completed tomorrow.	
	15.	The pH meters and Baume meters have been brought from UNIDO Regional office at WASA building for distribution to individual tanneries tomorrow.	
18.09.2K	16.	At Dhaka Hides & Skins, the recycling of soak wash liquor for the Pre-Soaking of the next lot demonstrated. Enzyme reduced sulfide liming process has been started. Use of measured float volumes in liming demonstrated.	The drum door is yet to be repaired by the supplier. Request has been made to Mr.Chowdhury to make arrangements for supply of two flexible hose pipes of 50 m length for the collection of the spent liquor.
	17.	At Chowdhury Leather & Co Ltd. the soak wash liquor recycling has been demonstrated using the drain door and pump provided for the purpose. The enzyme assisted reduced sulfide liming process commenced.	Liming process could be started only at 12 noon and there will be delay with the subsequent lot.
	18.	At Ruma Leather Industries Ltd and Bay Tanneries Ltd., discussions were held with the respective leather technologists and the process for implementation/ demonstration finalised. The experiments in the soaking process commenced in both the tanneries.	

	19.	Met Dr.Akram Hussain , the Project Director , LRI, and made arrangements to send a fax message regarding the quotation for the analysis of waste water samples to CLRI for approval by Director.	
	20.	Made a visit to Meem Trade International, the supplier of the drum doors and urged Mr Rahman to expedite the work regarding the plugging of leakage in the door supplied to M/s Dhaka Hides and Skins so that the collection and recycling of the wash lime liquor and spent chrome liquor can be smoothly completed there.	Mr. Rahman informed that the hose pipes to M/s Chowdhury Leather & Co Ltd. already delivered and carpenter with hose pipes will be sent to Dhaka Hides and Skins shortly.
19.09.2K	21.	At Ruma Leather Industries Ltd. and Bay Tanneries, the use of flow meters for measuring the float volumes demonstrated. The recycling of Soak wash liquor for the dirt Soaking (Pre-Soaking) for the next lot demonstrated. The enzyme assisted less sulfide unhairing process in both the tanneries initiated and the unhairing continued for 24 hrs	Since, the pumps have yet to be supplied to M/s Ruma Leather Industries Ltd, the rotary pump available at the tannery has been used for pumping the wash liquor for recycling.
	22.	At M/s Dhaka Hide & Skins, The unhairing of the first lot was completed and the lots taken for further processing. The reuse of lime wash liquor as a float for liming has been demonstrated. The pickling process suitable for high exhaust tanning started and Chrome tanning to be completed tomorrow.	Unhairing was complete and flesh removal easier according to the leather technologist in-charge. The grain was more relaxed and flat and smooth and less wrinkles were seen.
20.09.2K	23.	At M/s Chowdhury Leather & Co Ltd., liming completed and fleshing operation performed and the lot taken for reliming in soft lime (usual practice in this tannery).	
	24.	At M/S Ruma Leather Industries Ltd, the less sulfide liming for IInd lot commenced. Liming for the Ist lot completed & taken for further processing.	The Pelt was clean and scud removal was easier than the normal lots.
	25.	At, M/s Dhaka Hides & Skins, the Alutan-BCS tanning completed and the spent liquor recycled as pickle liquor for the subsequent lot.	

	26.	At Bay Leathers, liming of the II lot commenced. The deliming and Pickling of the first lot started to carry out high exhaust tanning based on Ethanolamine pretreatment (Pickle pH 3.7-3.8)	Unhairing was completed. the pelt was clean. The leather technologist opined that better area yield may be possible.
21.09.2K	27.	At Bay Leathers, high exhaust ethanolamine based tanning method has been demonstrated. The unhairing of the lot-2 completed and further processing continued.	Met Mr.Batan, the Chief Leather Technologist and appraised him about the work carried out. Convinced him about the need for carrying out chrome recycle.
	28.	At Ruma Leather Industries Ltd., the chrome tanning was completed for the first lot and unhairing was completed for the second lot. The pelt taken for deliming & pickling.	
	29.	At Ruma Leather Industries Ltd., the chrome tanning commenced for lot-2	
	30.	At Dhaka Hides & Skins, the chrome tanning for the lot-2 was completed.	
	31.	On the request of the leather Technologist in-charge it has been decided to carry out high exhaust tanning based on ethanolamine pretreatment and pickling process started and tanning to be continued tomorrow.	
	32.	At Chowdhury Leather & Co Ltd., chrome tanning for the Ist lot commenced. Deliming and Pickling carried out for the lot-2.	
22.09.2K	33.	At Dhaka Hides & Skins, the high exhaust tanning based on Ethanolamine completed.	
	34.	At Chowdhury Leather & Co Ltd., chrome tanning for the lot-1 completed	
	35.	At Ruma Leather Industries Ltd., the chrome tanning completed for the lot-2	

23.9.2K	36.	Visited Ruma Leather Industries Ltd to meet Dr.S.Nagarajan of Voice Magazine who has come as an UNIDO observer. After the inspection of Chrome recovery plant and subsequent discussion, took him to Dhaka Hides and Skins (Wet Blue Unit) and appraised him about the work being carried out under the subcontract awarded to CLRI for the demonstration of cleaner tanning technologies. Dr.Nagarajan is slated to visit Bay Tanneries Ltd. tomorrow. Visited Bay Tanneries Ltd and informed the Chief Leather Technologist, Mr.Batan about the visit of Dr.Nagarajan. Also discussed with Mr.Batan about the progress of the work in the tannery.	
	37.	At Chowdhury Leather & Co Ltd., Chrome tanning for the lot-2 completed	
24.9.2K	38.	Decided to send waste water samples to CLRI, Chennai and accordingly arrangements have been made.	
	39.	At Dhaka Hides & Skins, Dip & Pile method of unhairing process (Enzyme Assisted) with goat skin was started. Chrome recovery using MgO has been initiated and the precipitation completed and left overnight for settling.	This work was undertaken at the request of the Leather Technologist.
	40.	At Bay Tanneries Ltd. and Chowdhury Leathers, the pickling (pH 3.7-3.8) for the demonstration of closed loop chrome tanning method based on ethanolamine pretreatment commenced and the tanning to be completed tomorrow.	
25.09.2K	41.	At Bay Tanneries Ltd. and Chowdhury Leathers, the chrome tanning completed and the spent liquor collected for recycling as pickle liquor tomorrow.	
	42.	Met the Production Manager of Chowdhury Leather & Co Ltd. and discussed with him about the technologies demonstrated.	Since there is no stock of Cow hides, it has been decided to do the recycling experiments with buffalo hides.

	43.	At Dhaka hides & Skins , the unhairing of goat skins completed and the pieces taken for further processing. The chromium hydroxide precipitate was separated from the supernatant by siphoning and dissolved in calculated quantity of sulfuric acid.	
	44.	Visited Bangladesh Finished Leather, Leather Goods and Footwear Exporters Association (BFLLFEA), with Mr..Chowdhury, National Expert, UNIDO. Discussed with Mr .Md. Nazrul Haque, the Secretary of the association about the seminar cum demonstration to be held in connection with the UNIDO subcontract and a request to use the conference room in the Association building for holding the seminar. Mr Haque readily agreed to extend the facility and also assured all help from the association for the success of the programme.	Arranged for multimedia facility for the seminar with a private firm.
26.9.2K	45.	At Chowdhury Leathers and Bay Tanneries, deliming and bating of the lots for demonstration of closed loop pickle-tan recycling completed and the recycling of spent chrome liquor as pickle liquor commenced in both the tanneries.	
	46.	Visited Paramount Leathers and met Mr.Akbar Hossain, Managing Director of the company and discussed with him about the progress of the work.	There is no production in the tannery. The flow meters have yet to be installed and the CLRI team urged the tannery personnel to expedite the work.
27.9.2K	47.	Pickling completed at Chowdhury Leather & Co. but chrome tanning could not be completed as the drum door started leaking.	
	48.	At Bay Tanneries Ltd., the chrome tanning (ethanolamine) completed for the recycling lot. Discussed with Mr. Shamsudhu, the Leather Technologist about the intricacies of the high exhaust tanning based on monoethanolamine pretreatment.	

	49.	Visited the local UNIDO office and prepared an invitaion for the seminar to be held on 30/9/2k at the Association building.	
	50.	Met Mr Haque, Secretary of the Association and handed over 50 invitations to be distributed to the Association members.	CLRI team on its own distributed more than 25 invitations to the important tanneries and people connected with the Leather industry.
	51.	Dr. Hannak joined the CLRI team and after a brief discussion with the CLRI team visited Chowdhury Leathers & Co and Bay tanneries and completed OSH studies in both the places.	
	52.	Handed over and installed the pH meter at Paramount Leathers.	
28.9.2K	53.	Chrome tanning (ethanolamine) for the recycle lot completed at Chowdhury Leather & Co.	
	54.	Visited BCSIR and extended invitation to Dr. Akram Hossain, the project Director, LRI for the seminar to be held on 30/9/2k.	
	55.	At Dhaka Hides & Skins, three pieces from each experiment selected for wet finishing to assess the final quality of leathers and the same has been sent to their Finishing unit.	
29.9.2K	56.	Compiled data for the presentation in the seminar. Prepared a manual on cleaner tanning technologies demonstrated under the subcontract for circulation to the beneficiary tanneries.	
	57.	Visited the Association and finalised the arrangements for tomorrow's seminar.	
	58.	OSH studies completed at Ruma Leather Industries Ltd.	

30.9.2K	59.	The seminar-cum-demonstration commenced in the conference room in Association Building at 10.30 AM. The meeting was chaired by Mr. Akbar Hossain, the Treasurer of the Association. After a welcome address by Mr. Q.A.Chowdhury, the technical session started. Mr.N.K.Chandra Babu made a presentation on the cleaner tanning technologies demonstrated in the four tanneries followed by a lecture by Dr. Hannak on the OSH related issues. The Leather Technologists from all four tanneries gave their feed back on the technologies demonstrated in their tanneries. After a lively discussion, a vote of thanks was proposed by Mr. P.Sambasiva Rao. The interested technologists were taken to the tanneries for further discussion and demonstration of the technologies.	
	60.	At Dhaka Hides & Skins, the leathers in control and experimental lots were quantitatively measured. The experimental leathers were found to have about 2.5% more area compared to control leathers.	
01.10.2K	61.	Went around all the tanneries and obtained feed back about the quality of the wet blue leathers produced.	
	62.	Handed over the " **Draft Working Manual for Cleaner Processing Methods Demonstrated** " to the technical personnel in each tannery.	
	63.	Demonstrated the use of pH meter at Paramount Leathers.	
02.10.2K	64.	At Dhaka Hides & Skins, the dyed crust leathers were assessed in comparison with leathers from regular lots by the Leather Technologists in the tannery. The quality improvement in the case of experimental leathers was reported.	
03.10.2K	65.	Left Dhaka by Biman Airways.	

ANNEXURE - V

Seminar-cum- Demonstration on "Cleaner Tanning Technologies" in Tanneries in Hazaribagh, Dhaka (Under UNIDO Programme)

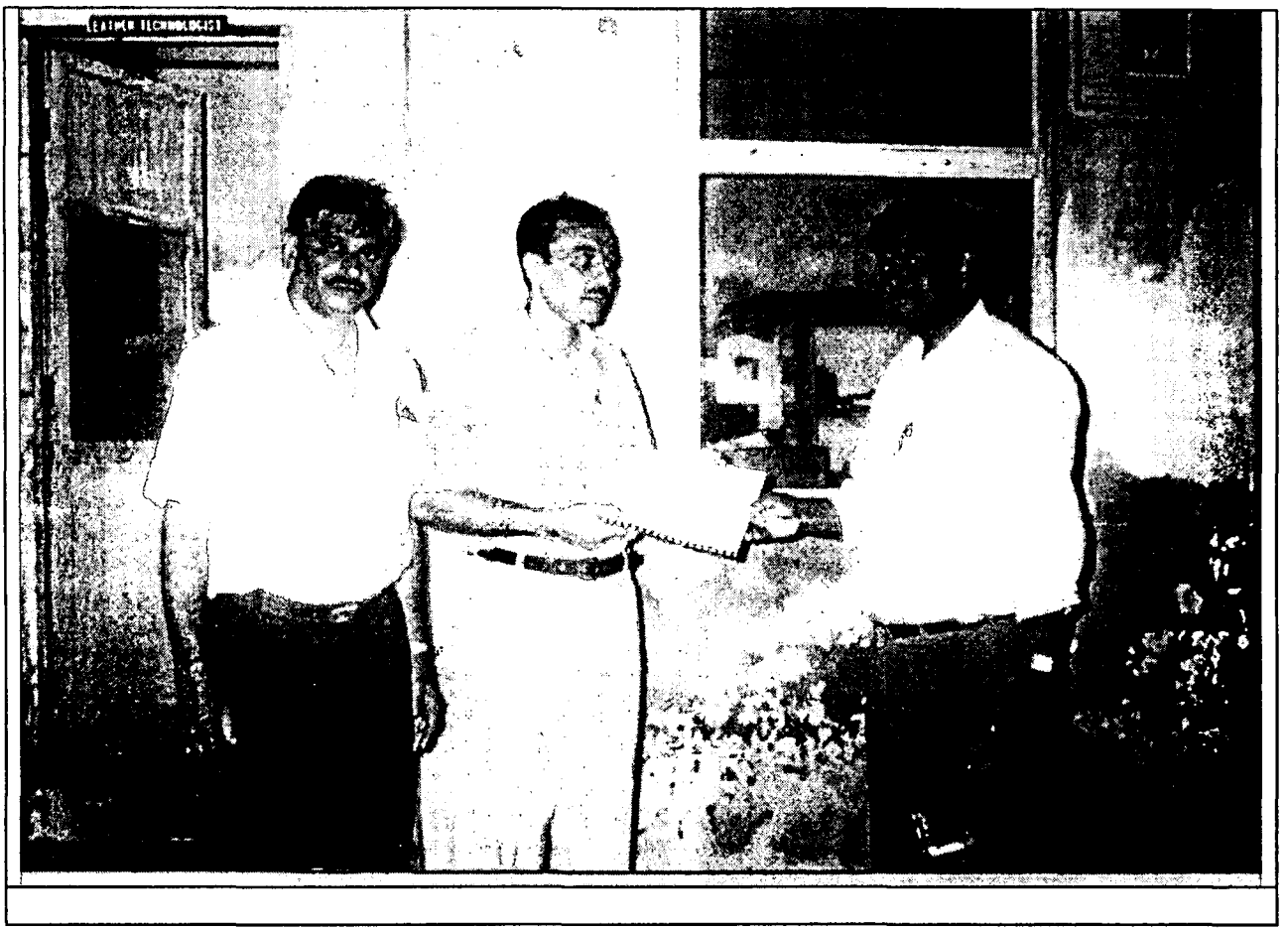
Date: 30.09.2000 (Saturday)
Venue: Bangladesh Finished Leather, Leather Goods and Footwear Exporters Association (BFLLFEA), Dhaka

Sl. No.	Name and Address	Signature
1.	[illegible]	[illegible] 30/9/1
2.	[illegible]	[illegible] 30/9
3.	MD. SHAFIKUL AZAM KHAN. DHAKA HIDE & SKIN'S LTD.	30TH SEPT.00
4.	FAZLUL HOQUE TUTUL CHOWDHURY LEATHER.	[illegible] 30/9
5.	M/s. Helal Tannery.	[illegible]
6.	K. HAMID HANEEF APEX INTERNATIONAL	[illegible]
7.	Mahmud-ul-Hassan CHOWDHURY LEATHER & Co.	[illegible]
8.	MD. MOZIBUR RAHMAN APEX TANNERY LTD.	[illegible]
9.	Md. Parvez Ahmed. BESIR	[illegible]
10.	A.K.M. Asad. Chowdhury 30/9/00	[illegible]
11.	Md. Zahal Hossain. Siddique.	Zahal.

12.	Md. Zahangir Alam Amin Tannery Ltd.	
13.	M Nurul Haque. Secy. BFLFEA	
14.	Shahanul Karim Khan PUBALI TANNERY	
15.	Md Ear Hossain Al Madina Tannery.	
16.	Akbar Hossain Paramount Tanneries	
17.	MOHAMMAD DELOWER HOSSAIN	
18.	MD. Abdul Kaddus Miah (Rumia Leather)	
19.	Md. Zahirul Kabir (Bay Tannery)	
20.	S.D.M. QUAMRUL ALAM CHOWDHURY UNIDO	
21.	MD, SHAMSUZZOHA (BAY	
22.	DR. MD. FAZLUL KARIM	
23.	MD Saiful Azam Kasem	
24.	Md Monirul Islam Apex Tanneries Ltd.	
25.	K. C. VELAPPAN, Sct. CLRI.	
26.	P. SAMBASIVA RAO, Sct. CLRI	

27. N.K. CHANDRA BABU - Sct. CLRI

28. V. RATHINA SAMY - Sct. CLRI



ANNEXURE-VI

TANNERY PROCESS DETAILS

1. Tannery Name : **BD001**

2. Tannery Location and Land area

a) Total land area (in acres/sq.ft.)	:	1.55 acre total landarea
b) Open land available (in acres/sq.ft.)	:	49,000 sq.ft / 4 Floors (49000x4)
c) Tannery boundary details:	:	15,000 sq.ft / Floor tin sheet
Northern side:		Eastern side:
Southern side:		Western side:

3. Water

a) Sources of water supply (If more than one source mention % share)	:	Tube well, WASA (Drinking Only)
b) Characteristics of raw water (enclose water analysis report)	:	Not Available
c) Residential Quarters (if any) Within the campus	:	No. of quarters: Nil — No. of persons residing: Nil

4. Raw Material

Sl. No.	Source/ Origin	Species	Preservation Mode dried/ sod. chloride/ biocide (if so, which)
1	Local	Goat	Wet Salted (NaCl)
2	Local	Cow	Wet Salted (NaCl)
3	Local	Buff	Wet Salted (NaCl)

5. Tannery Processing Capacity

Tannery Design Capacity : 7500 kg/day (1500 pieces)

Normal Operating Capacity : 5000 kg/day (1000 pieces)

Actual Processing/day

Process Mix		Present Processing			Future Plan		
		Species	Pieces*	Weight (kg)	Species	Pieces	Weight (kg)
i)	**Raw to Finish (via Wet Blue)**	Cow	800	4000	Cow	1200	6000
		Buff	25-35	500	Buff	40-50	750
		Goat	500	500	Goat	750	750

* Average weight per piece wet salted Cow - 5kg, Buff-15-20 kg, Goat-1kg
Production Cow - 80%, Buff – 10%, Goat – 10%

6. Seasonal variation in processing (if any) : Data not Available

7. Production during last 3 years 6 – 7 lakh sq.ft (1998)

8. List of equipments available

Sl. No.	Equipment	No. of Equip.	Man power	Size/ Specification	Operating Capacity (kg)	Vol. (lit)	Power (HP)
1.	Desalting Machine	-					
2.	Pits	-					
3.	Paddles	6					
4.	Drums						
	Soaking & Liming						
	Big	6	-	-	1800		
	Small	4	-	-	1200		
	Tanning	21	-	7'x8'	1000		
	Wet Finish						
	Imported	3	-	2.5mx3m	1000		
	Local	2	-	-	300		
5.	Unhairing Machine	1					
6.	Fleshing Machine	3+2 Goat					
7.	Splitting Machine	1					
8.	Shaving Machine	2+1 Goat					
9.	Sammying Machine	2					
10.	Setting Machine						
	i) Ordinary						
	ii) Reversible	4					
11.	Vacuum Drier	2					
12.	Staking Machine						
	i) Slow Comb	2					
	ii) Mollisa	1					
13.	Buffing Machine						
	i) Single Width	1					
	ii) Feed Through	2					
14.	Dedusting Machine						
15.	Spraying Machine	-					
	i) Hand Spray	2					
	ii) Auto Spray	3					
16.	Polishing Machine	1+1 Goat					
17.	Embossing Machine	3					
18.	Finiflex Machine						
19.	Area Measuring Machine	3		Electronics			
20.	Boiler	1					
21.	Generator	1					
22.	Others						
	Roto Press	2					
	Glazing	2					

	Toggling	2					
	Roller Coater	1					

Power Source [√] **Electricity Board** [√] **Generator** [ ] **Oil Engine**

9. Production Pattern

Items			Present	Future plans (next 5 years)
i)	Working hours/day		8 hrs	
ii)	Number of shifts/day		1+ Overtime	
iii)	Number of working days in a week		7	
iv)	Average working days/annum		350	
v)	Total Manpower shift	1	350	
		2		
		3		

10. (a) Water and Chemical usage Chrome Tanning Process - Raw to Finish (via Wet Blue) COW

Raw to Wet Blue

Lot Size ☐☐☐☐ **kg** **pieces** ☐☐☐☐

Sl. No.	Process	No. of Pit/ Paddle/Drum	Size	Water used (%)	Chemicals used		Dura-tion	Tempa rature	pH
					Name	(%)			
1	Pre Soaking	Drum		500%			30'		
2	Main Soaking	Drum		500% ***Run 10'***	Preservative Wetting Agent, Non-ionic Soda ash ***Every one hour for 16-20 hrs***	0.1-0.15% 0.5% 0.25%			
3	Washing	Drum		500%	Running water		15'		
4	Liming	Drum		450% ***Run 10'***	Sodium Sulfide Lime Liming Auxiliary ***Every one hour for 25-30 hrs***	3-5% 3-5% 1-2%			
5	Washing	Drum		300%			15'		
6	Fleshing	Machine		125%					
Pelt Weight ☐☐☐☐ **Kg**									
7	Washing before Deliming	Drum		300%			15'		

125

125

8	Deliming	Drum		50%	Amm. Sulfate Sod. Meta bisulfite Batting Agent Wetting Agent, Non-ionic	2-3% 0.5-1% 0.5-1% 0.3%	2 hrs		
9	Washing after Deliming	Drum		500%	Running water		15'		
10	Pickling			80% **No Drain**	Salt Formic acid Sulfuric acid	8-10% 0.25-0.5% 1-1.5%	2-3 hrs		pH 2.8
11	Chrome Tanning	Drum		Pickle bath +100% Water	BCS Tanbae (Hodgson) Preservative **Drain and Pile**	8% 0.3-0.4% 0.05-0.1%	2-3 hrs 4-6 hrs		PH 3.8 to 4.0

Shaved Weight ☐☐☐☐ **kg** **Wet Blue to Finish** **Pieces** ☐☐☐☐

12	Washing	Drum		150% **Drain**	Wetting Agent, Non-ionic	0.1%	20'		
13	Acid wash	Drum		250%	Formic Acid / Acetic Acid	0.25-0.5%			
14	Rechroming	Drum		250%	Chrome (Chromosl B, Bayer) Sod. Formate Sod. Bicarbonate	6% 1% 1%	60'		pH 3.8-4.0
15	Washing before Neutralisation	Drum		400%	Running water		10'		

16	Neutralisation	Drum		250%	Neutralizing Syntan Sod. Formate Sod. Bicarbonate	1% 1% 1%	60'		pH 5-6
17	Washing I after Neutralisation	Drum		400%	Running water		10'		
18	Washing II after Neutralisation	Drum		400%	Running water		10'		
19	Retanning, Dyeing & Fatliquoring	Drum		225%	Acrylic Resin (Relugan RE,BASF) Syntan, Phenolic Syntan, Melamine Mimosa Dye Fatliquor (mixture) Formic Acid	 2-3% 5-8% 4-6% 4-16% 2-3% 10-20% 1%			
20	Rinse	Drum		350%					
21	Top Dyeing (optional)	Drum		200%					
22	Other Washings & Wastages			725%					

11. Chrome Tanning Procedure

Item		Wetblue		Rechroming	
1.	Number of Drums	21 Drums			
2.	Size of the Drums	7' x 8'		7' x 8'	
3.	Average pelt weight(Kgs or Pieces/Drum)	1000		1000	
4.	Type of BCS used	Chromosol (BASF)		Chromosol (BASF)	
5.	% of BCS used	8%		6%	
6.	Basification and chrome uptake	75 % Uptake			
7.	Washings : Number	-		2	
8.	Washings : amount of water for each washing	-		150 +100%	
9.	Water used (float) in %	80% Pickle bath + 100%		250%	
10.	Other chemicals used in %	**Chemical**	**%**	**Chemical**	**%**
		Tanbase	0.3 -0.4%	Formate	1%
		Preservative	0.05 -0.1%	Bicarb	1%

12. Water and chemical usage of leather manufacturing processes

Imported Chemicals Mainly from Italy

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

Process	Water m^3/ day	Water/ton m^3/ ton	Material
Chrome tanning	5	1.0	Cow, Buff, Goat
Rechroming	5	2.0	Cow, Buff, Goat

14. Drainage and disposal arrangements

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/~~No~~

d) Whether scope exists for mixing up solid waste with tannery waste water : Yes/~~No~~

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

1. Chocking of drains with solid waste
2. Sludge Settling leads to over flow / back flow

f) Mode of final effluent disposal (CETP/ETP) : -

g)

Solid Disposal	Type of Disposal	Mode of Disposal
Salt containing material	-	Dumped Outside
Chrome containing material	-	Dumped Outside

15. Mode of solid waste management

Sl.No.	Solid Waste	Amount per kg of Raw Material	Disposal Method
1.	Dusted salt		Partly Reused + Soaked + Drain
2.	Raw hide/skin trimmings		-
3.	Lime sludge		Drain
4.	Hair/Wool		Pulping
5.	Fleshings		Glue, Drain & Open land
6.	Wet Blue / EI trimmings		Open land
7.	Shaving/buffing dust		Open land
8.	Others		-

16. Total water used perday) : 264 cubic meters

17. Total Effluent discharged (approximate) : 264 cubic meters

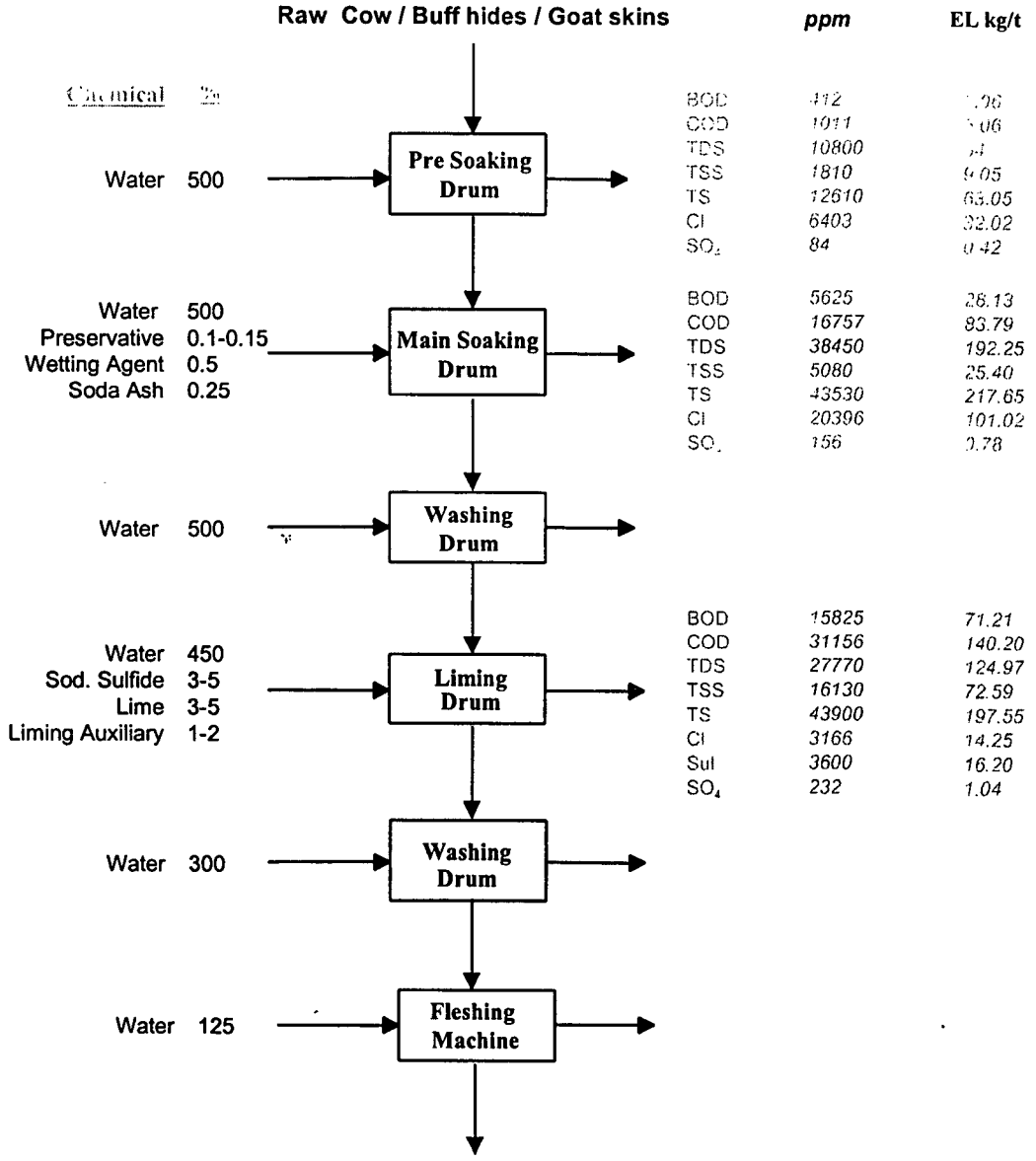
18. Whether Chrome Recovery Plant is proposed / under construction / existing : Nil

19. Remarks : It is one of the biggest tanneries, using imported drums (RDF) of three numbers. Wet Blue stock is also very high.

BD001	CONVENTIONAL PROCESS AND EMISSION LOAD	5000 Kg/day

Process : Cow/Buff hides/Goat skins Raw to Wet Blue - Finish

Batch : 1000 Kg



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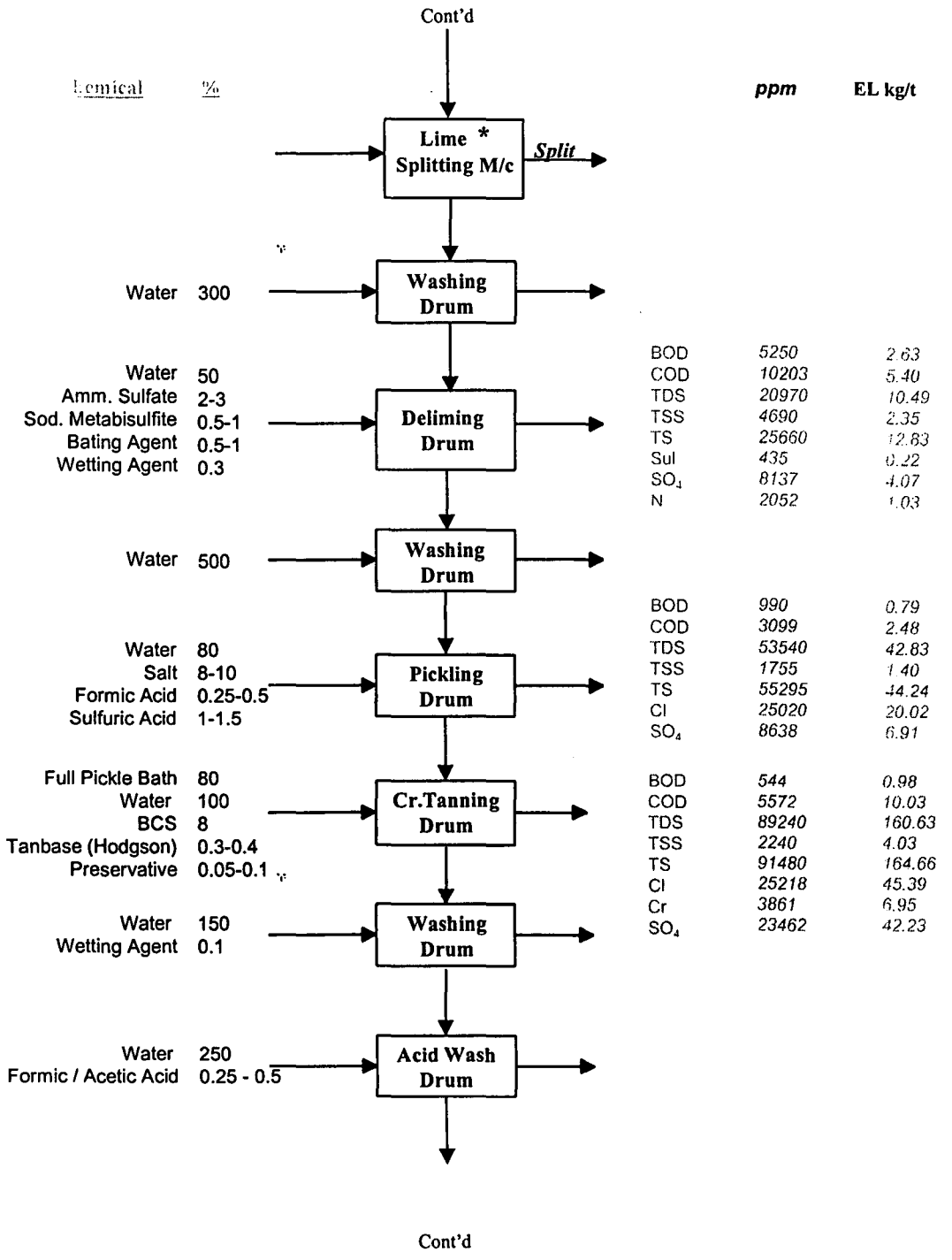
BD001

BD001	CONVENTIONAL PROCESS AND EMISSION LOAD	5000 Kg/day

Process : Cow/Buff hides/Goat skins Raw to Wet Blue - Finish

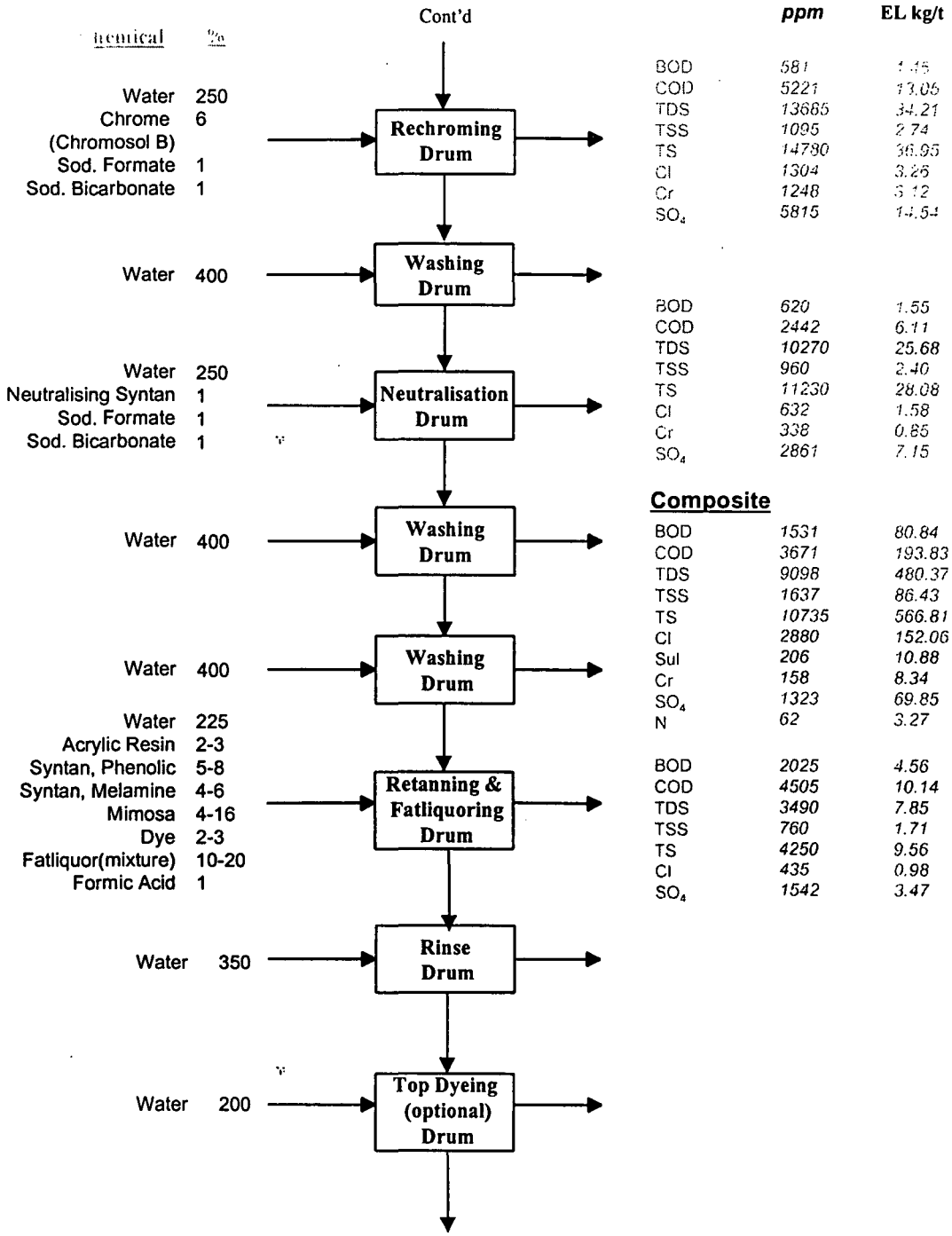
Batch : 1000 Kg



BD001	CONVENTIONAL PROCESS AND EMISSION LOAD	5000 Kg/day

Process : Cow/Buff hides/Goat skins Raw to Wet Blue - Finish

Batch : 1000 Kg

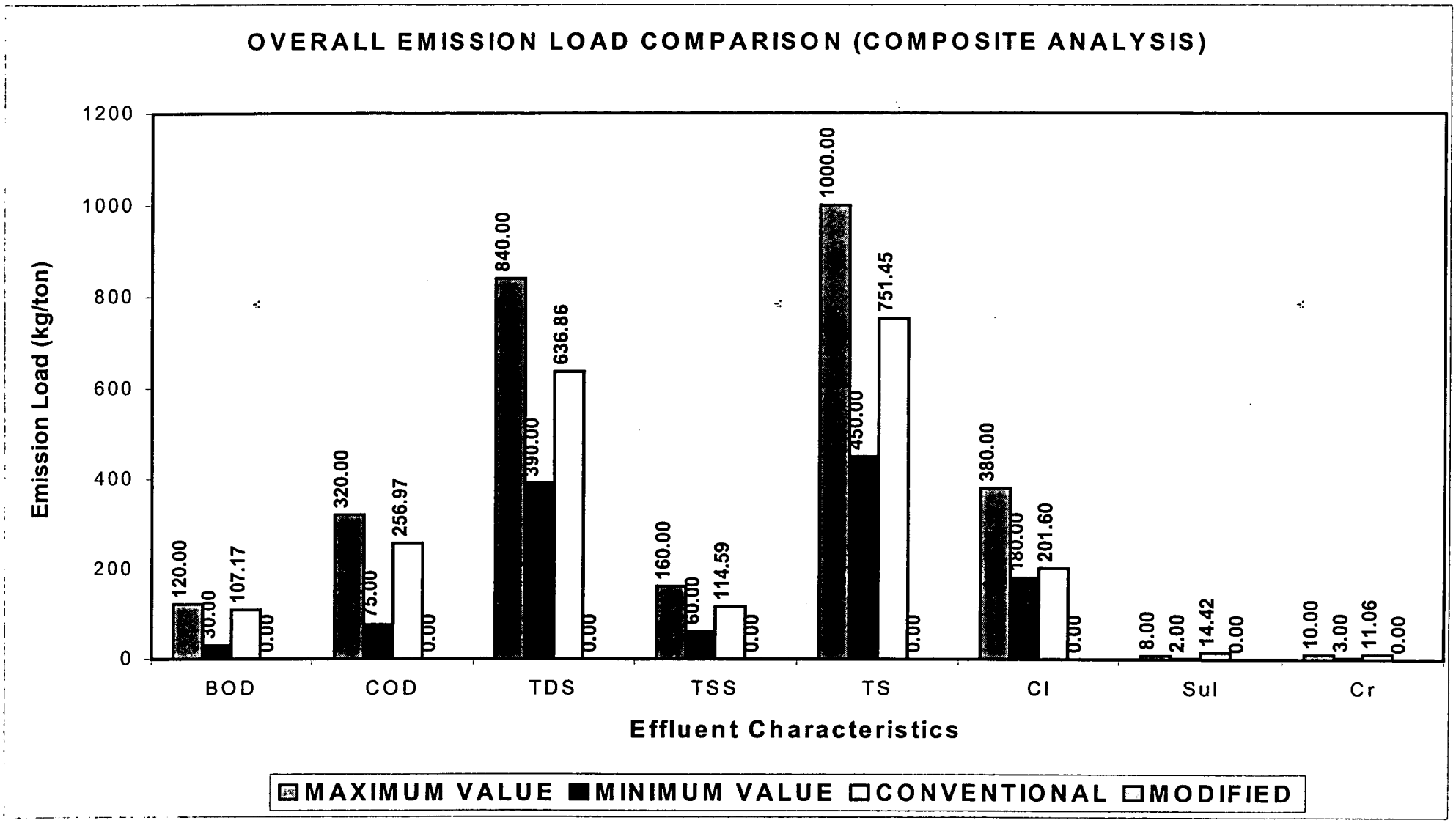


	ppm	EL kg/t
BOD	581	1.45
COD	5221	13.05
TDS	13665	34.21
TSS	1095	2.74
TS	14780	36.95
Cl	1304	3.26
Cr	1248	3.12
SO_4	5815	14.54
BOD	620	1.55
COD	2442	6.11
TDS	10270	25.68
TSS	960	2.40
TS	11230	28.08
Cl	632	1.58
Cr	338	0.85
SO_4	2861	7.15

Composite

BOD	1531	80.84
COD	3671	193.83
TDS	9098	480.37
TSS	1637	86.43
TS	10735	566.81
Cl	2880	152.06
Sul	206	10.88
Cr	158	8.34
SO_4	1323	69.85
N	62	3.27
BOD	2025	4.56
COD	4505	10.14
TDS	3490	7.85
TSS	760	1.71
TS	4250	9.56
Cl	435	0.98
SO_4	1542	3.47

BD001

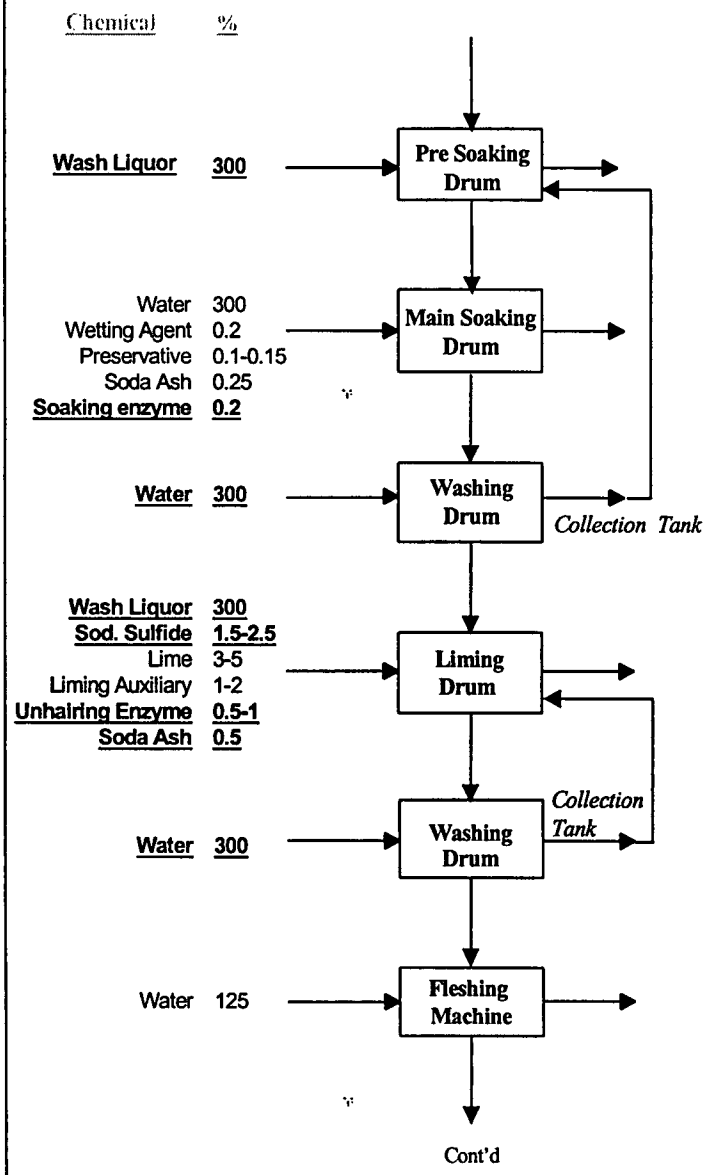

OVERALL EMISSION LOAD COMPARISON (COMPOSITE ANALYSIS)
Emission Load (kg/ton)
1200
1000
800
600
400
200
0
120.00
30.00
107.17
0.00
320.00
75.00
256.97
0.00
840.00
390.00
636.86
0.00
160.00
60.00
114.59
0.00
1000.00
450.00
751.45
0.00
380.00
180.00
201.60
0.00
8.00
2.00
14.42
0.00
10.00
3.00
11.06
0.00
BOD
COD
TDS
TSS
TS
Cl
Sul
Cr
Effluent Characteristics
MAXIMUM VALUE
MINIMUM VALUE
CONVENTIONAL
MODIFIED

BD001	MODIFIED PROCESS FOR IMPLEMENTATION / DEMONSTRATION	5000 Kg/day

Process : Cow/Buff hides/Goat skins Raw to Wet Blue - Finish

Batch : 1000 Kg

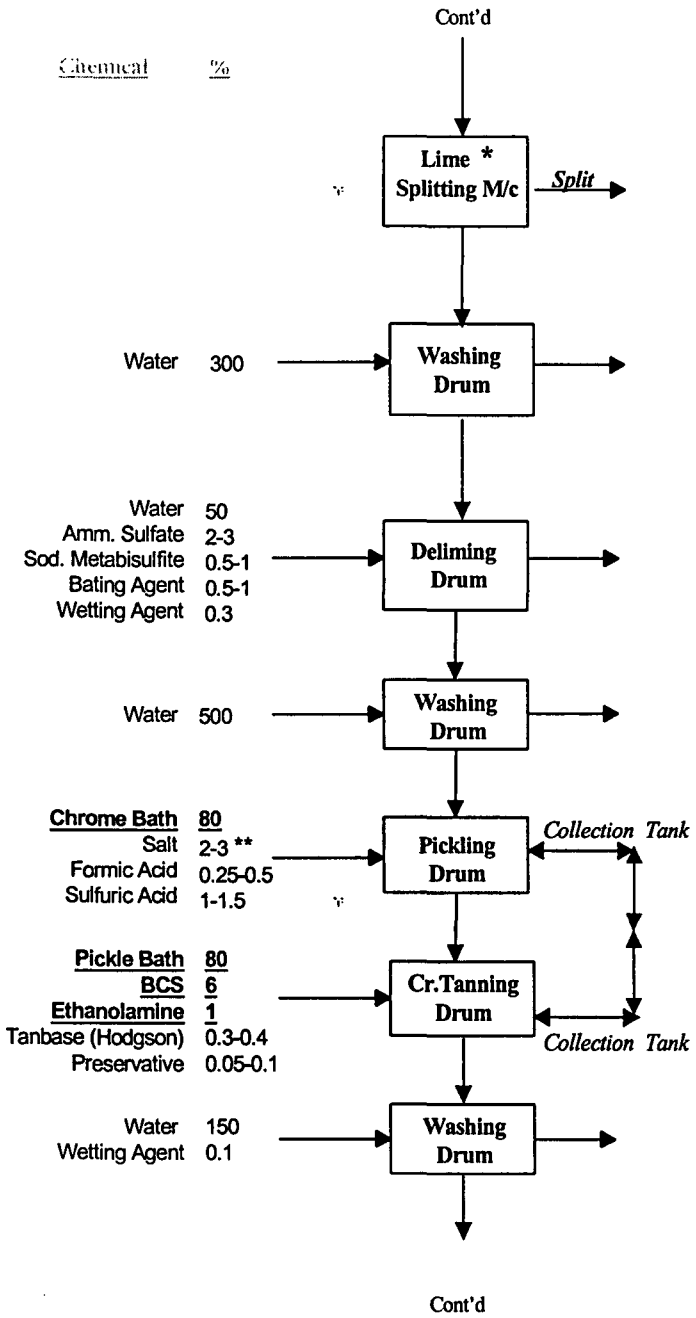
Raw Cow / Buff hides / Goat skins



BD001	MODIFIED PROCESS FOR IMPLEMENTATION / DEMONSTRATION/	5000 Kg/day

Process : Cow/Buff hides/Goat skins Raw to Wet Blue - Finish

Batch : 1000 Kg



** *Only to adjust salt content*

* *Only for cow hides*

BD001

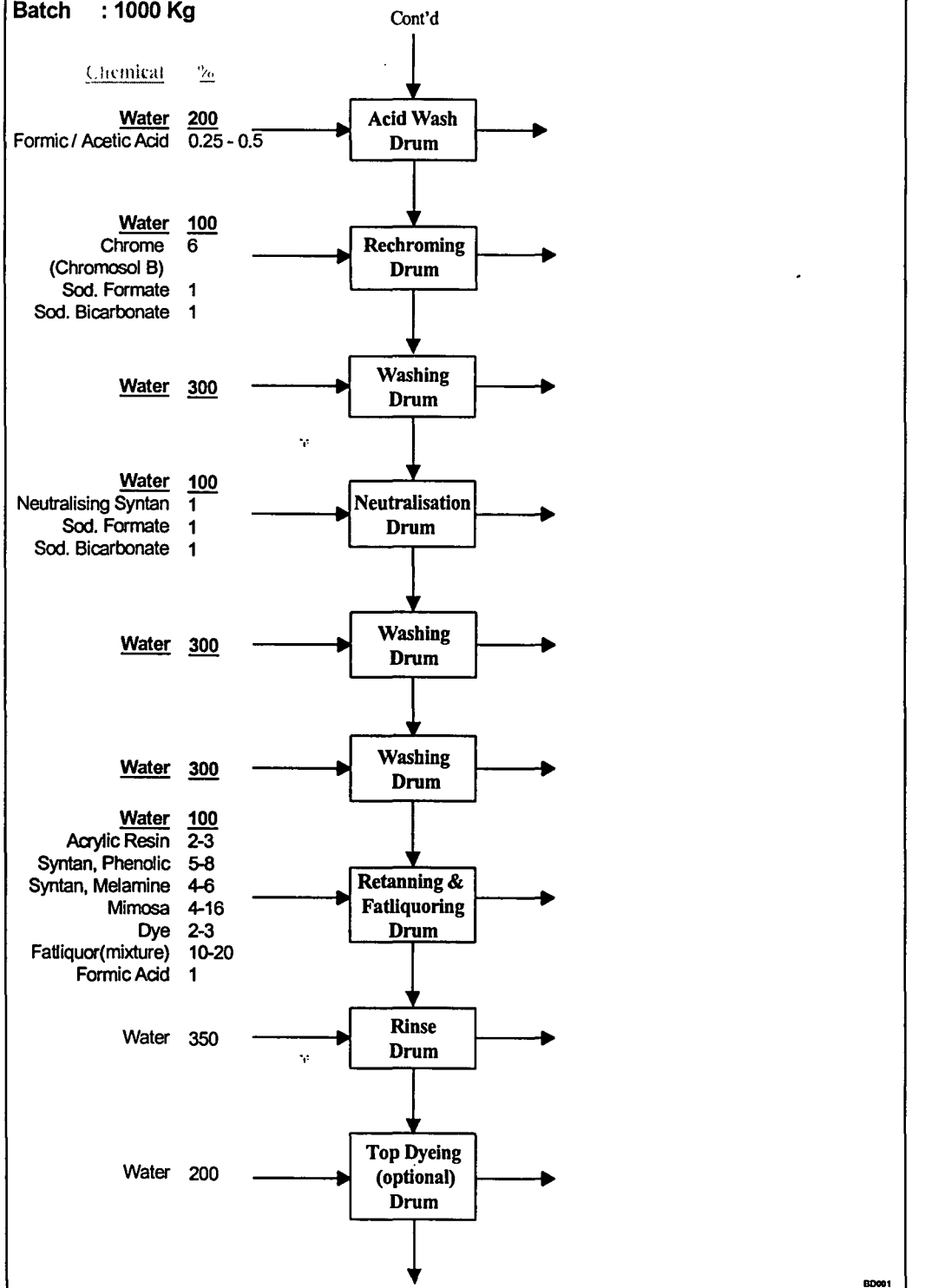
BD001

MODIFIED PROCESS FOR IMPLEMENTATION / DEMONSTRATION

5000 Kg/day

Process : Cow/Buff hides/Goat skins Raw to Wet Blue - Finish

Batch : 1000 Kg



BD001

MODIFIED PROCESS FOR IMPLEMENTATION / DEMONSTRATION

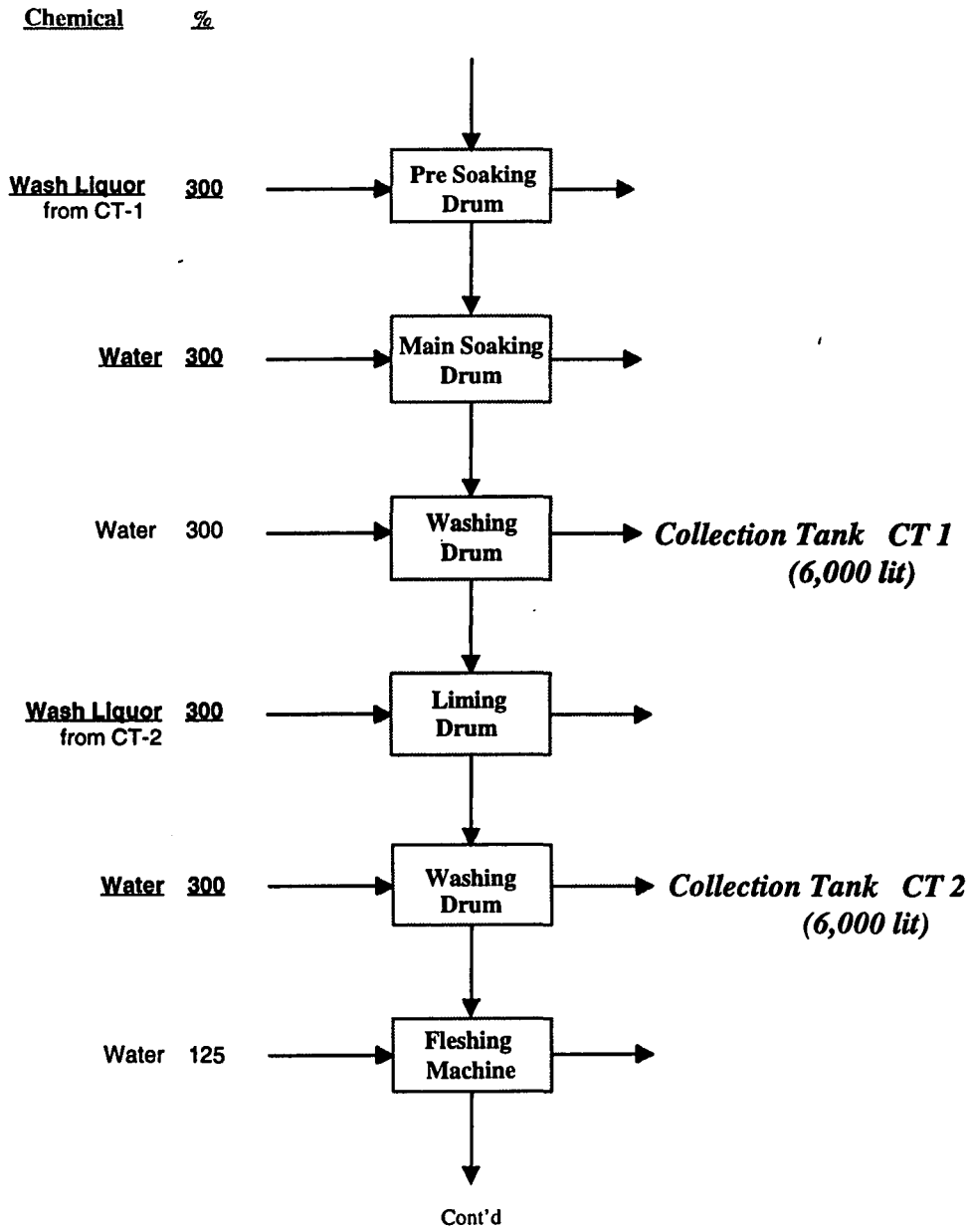
5000 Kg/day

Process : Cow/Buff hides/Goat skins Raw to Wet Blue - Finish

Batch : 1000 Kg

Water Flow Scheme / Recycle Scheme

Raw Cow / Buff hides / Goat skins

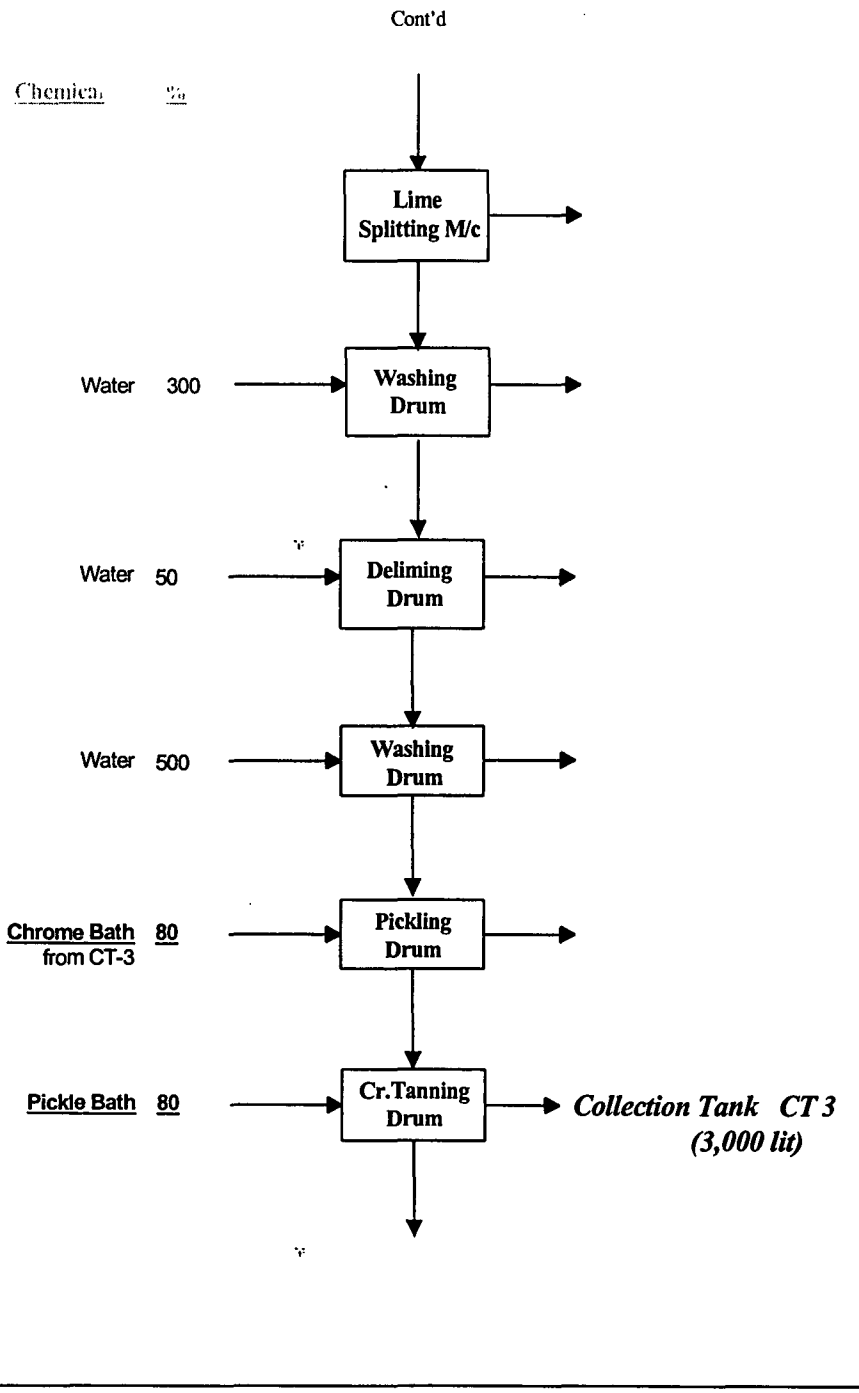


BD001

BD001	MODIFIED PROCESS FOR IMPLEMENTATION / DEMONSTRATION/	5000 Kg/day

Process : Cow/Buff hides/Goat skins Raw to Wet Blue - Finish

Batch : 1000 Kg



CHEMICAL REQUIREMENT FOR IMPLEMENTATION / DEMONSTRATION OF CLEANER TECHNOLOGIES IN THE TANNERY CLUSTER , AT HAZARIBAGH, DHAKA, BANGLADESH

BD001

Sl.No	Name	**Requirement for 1000 kg lot size (kg)**	**Total Requirements (kg)**	**Suggested denomination of package**
1.	Soaking Enzyme	2	10	
2.	Unhairing Enzyme	10	50	One bag of 50 kgs
3.	Ethanolamine	10	50	One carboy of 50 kgs

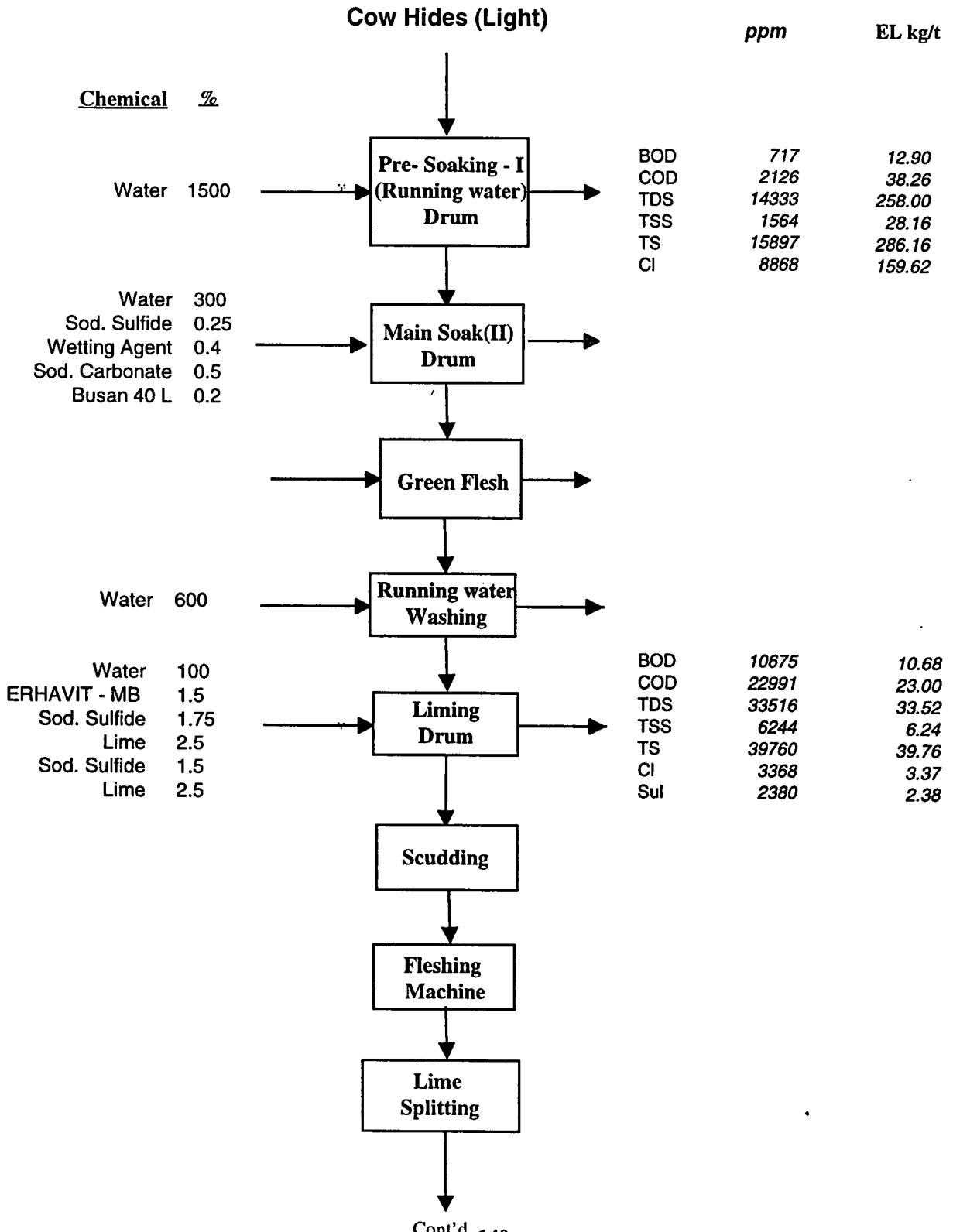
LIST OF EQUIPMENTS REQUIRED

Sl.No	Tannery	Hardware Proposed	Qty- Nos	Technical specification	Expected Benefits
1.	BD001	Liquor Collection Tanks for Soak Liquor for Lime Liquor for Chrome Liquor	 1 No. 1 No. 1 No.	Concrete. 6,000 lit capacity, 6,000 lit capacity, 3,000 lit capacity,	Reduction in hydraulic load to effluent
		Pumps	2 Nos		-do-
		Water Meter	3 Nos		-do-
		Modified Door for Drum	1 Nos		-do-
		Strainer in pipeline	5 Nos		
		Enzyme applicator	1 No		Reduction in sulfide load

BD001	CONVENTIONAL PROCESS AND EMISSION LOAD	5000 Kg/day

Process : Cow Hides Raw to Wet Blue

Batch : 1000 Kg / 250 - 300 Pcs

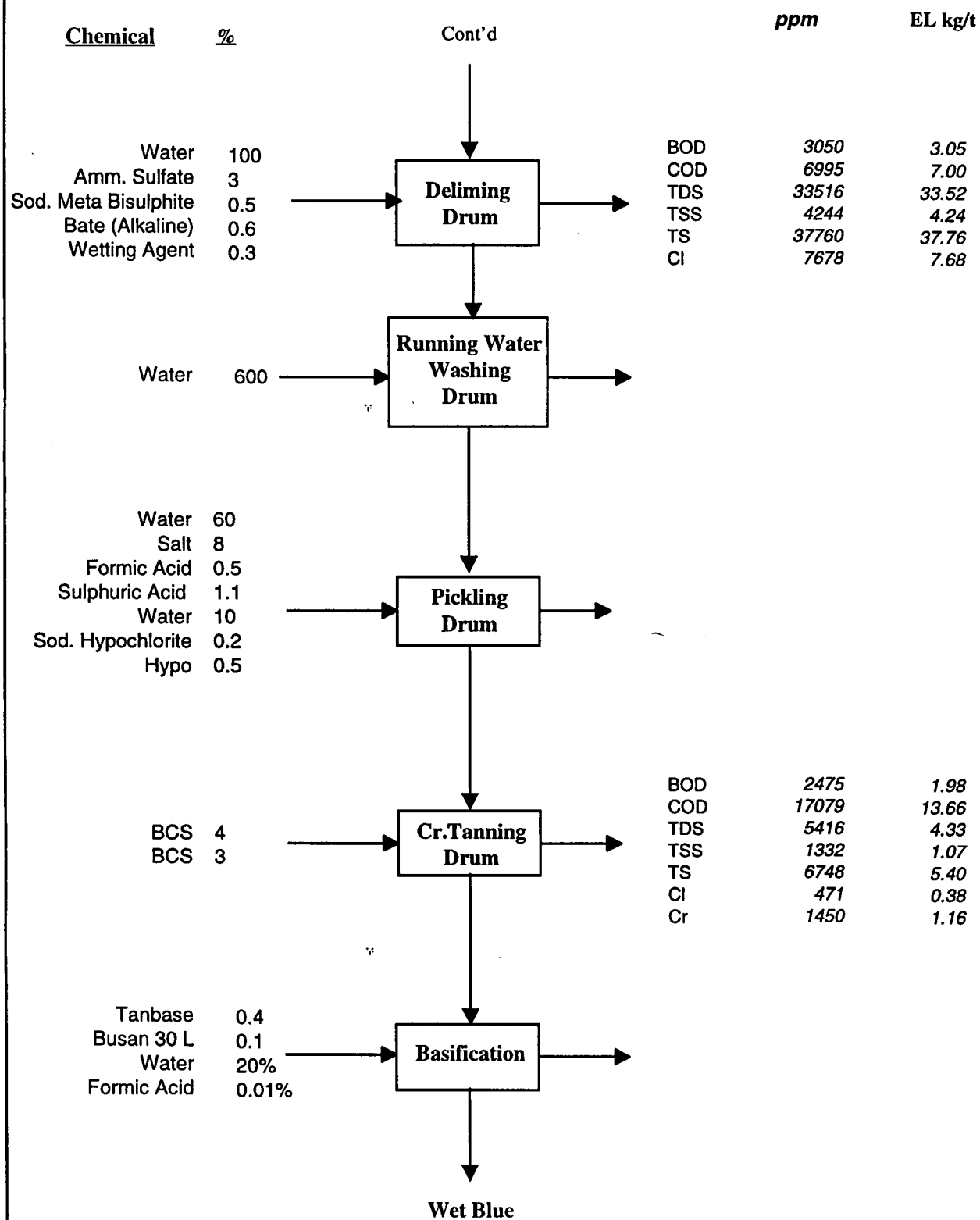


Phase - II

BD001_con

Process : Cow Hides Raw to Wet Blue

Batch : 1000 Kg / 250 - 300 Pcs



THE CLEANER TANNING PROCESS TECHNOLOGIES DEMONSTRAED AT HAZARIB AGH TANNING CLUSTER, DHAKA, BANGLADESH

Tannery Name: **BAY TANNERIES Ltd.**
Process: Raw to Wet Blue **(Conventional Process)**

Raw Material: Cow hides (light)
Lot Size/ No. Pieces: 1000 kg / 250-300 pieces

Operation	Water/ Chemical	%	Run Time	Remarks
Pre-Soaking-I (Running Water)	Water	15000	150 min	Measured with Flow meter
Main Soak (II)	Water	300		
	Sodium Sulfide	0.25		
	Wetting agent	0.4		
	Sodium Carbonate	0.5		
	Busan 40L	0.2	30 min	Rest 60 min
				Run 5 min/hr. Up to next day.
Green flesh				
Running water Washing	Water	600	30 min	Drain
Liming	Water	100		
	Erhavit MB	1.5	15 min	
	Sodium Sulfide	1.75		
	Lime	2.5	60 min	Run 5 min/hr for 6 hrs.
	Sodium Sulfide	1.5		
	Lime	2.5	60 min	Run 5 min/hr; Total duration 24 hrs.
Scudding				
Fleshing				
Lime Splitting				Note the weight

Deliming	Water	100		
	Ammonium Sulfate	3		
	Sodium Meta Bisulphite	0.5	90 min	
	Bate (Alkaline)	0.6		
	Wetting Agent	0.3	90 min	Drain
Running Water Wash	Water	600	1 hr	Drain
Pickling	Water	60		
	Salt	8	20 min	Check Be'; should be 7; if not adjust with salt.
	Formic Acid -Water 25 lits.	0.5	20 min	
	Sulphuric Acid -Water 100 lits	1.1		3 feeds at 20 min interval. After 3rd feed run for 2 hrs.
	Sodium hypochlorite	0.2	40 min	
	Hypo	0.5	30 min	Leave o/n.
Chrome Tanning	BCS	4	30 min	
	BCS	3	2 hrs	Check penetration
Basification	Tanbase	0.4	5 hrs	Check pH; 3.8; if not adjust with 0.1-0.2% bicarbonate
	Busan 30 L	0.1	1 hr	
	Water	20%		
	Formic acid	0.01 %	15 min	Drain out. Pile o/n.

BD001

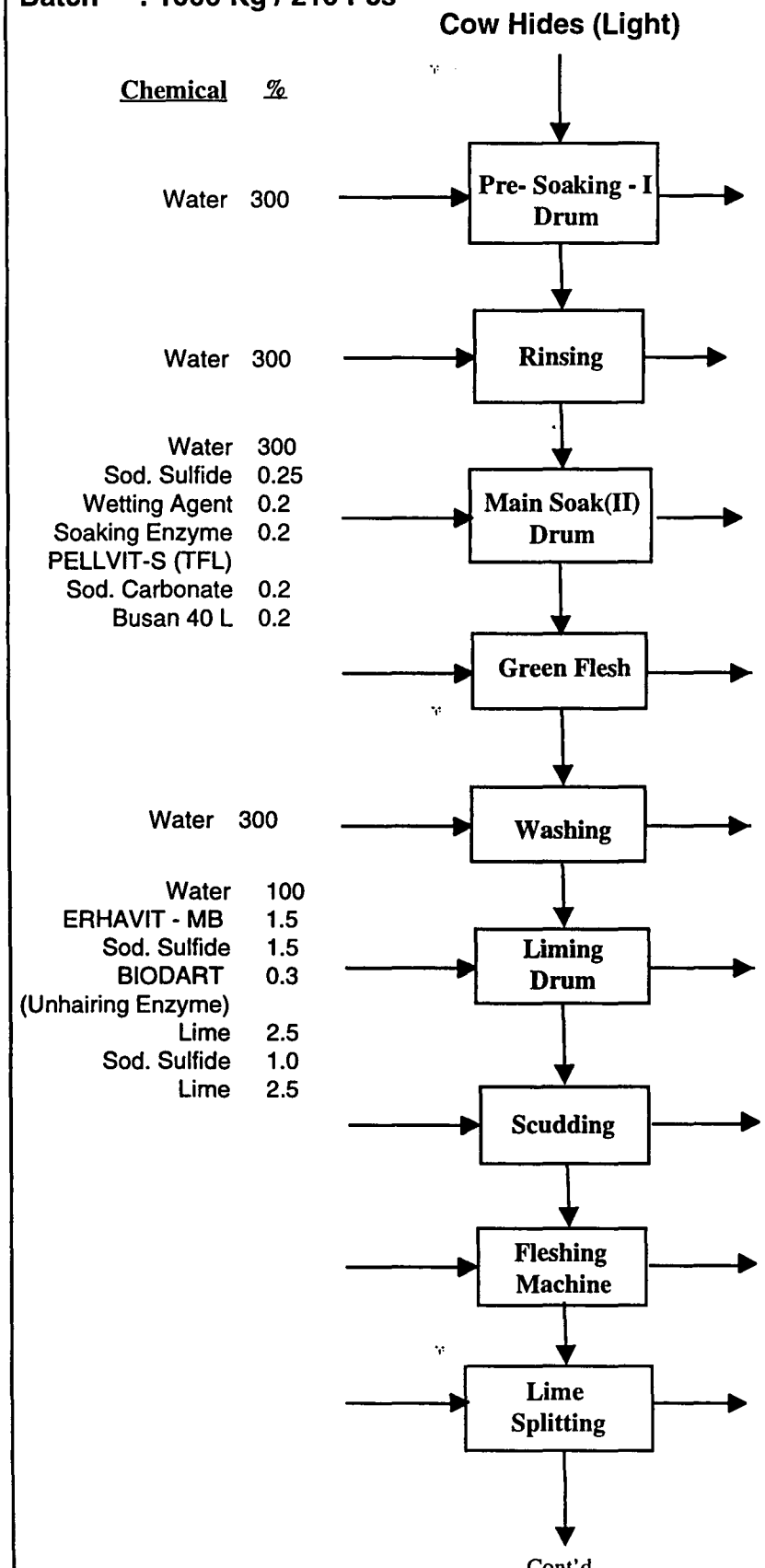
MODIFIED PROCESS FOR IMPLEMENTATION / DEMONSTRATION

5000 Kg/day

Process : Cow Hides Raw to Wet Blue

Lot-1

Batch : 1000 Kg / 210 Pcs



Phase - II

BD001_mod 1

BD001

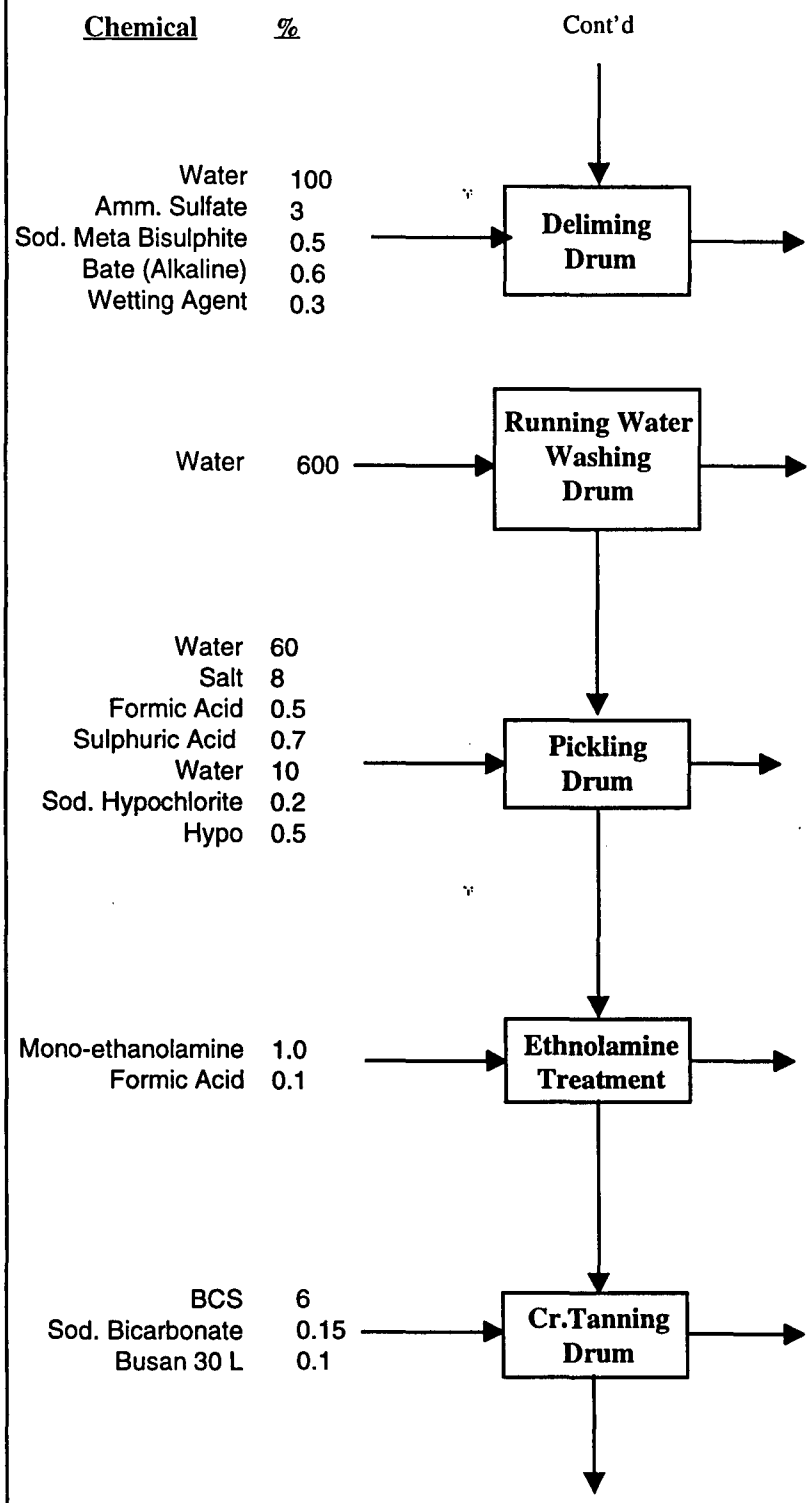
MODIFIED PROCESS FOR IMPLEMENTATION / DEMONSTRATION

5000 Kg/day

Process : Cow Hides Raw to Wet Blue

Batch : 1000 Kg / 210 Pcs

Lot-1



THE CLEANER TANNING PROCESS TECHNOLOGIES DEMONSTRAED AT HAZARIB AGH TANNING CLUSTER, DHAKA, BANGLADESH

Tannery Name: **BAY TANNERIES Ltd.**
Process: Raw to Wet Blue **(Experiment – I Lot)**

Raw Material: Cow hides (light)
Lot Size/ No. Pieces: 1000 kg / 210 pieces

Operation	Water/ Chemical	%	Run Time	Remarks
Pre-Soaking-I	Water	300	30 min	Measured with Flow meter
Rinsing	Water	300	15 min	
Main Soak (II)	Water	300		
	Sodium Sulfide	0.25		
	Wetting agent Soaking Enzyme (TFL)	0.2 0.2		
	Sodium Carbonate	0.2		
	Busan 40L	0.2	30 min	Rest 60 min
				Run 5 min/hr. Up to next day.
Green flesh				
Washing	Water	300	15 min	Collect the liquor into collection tank for recycling; add 0.1% preservative.
Liming	Water	100		
	Erhavit MB	1.5	15 min	
	Sodium Sulfide	1.5		
	Lime	2.5	60 min	Run 5 min/hr for 6 hrs.
	Sodium Sulfide Unhairing Enzyme- BIODART (SPIC product)	1.0 0.3		
	Lime	2.5	60 min	Run 5 min/hr; Total duration 24 hrs.
Scudding				
Fleshing				
Lime Splitting				Pelt weight(1100 Kg)

Deliming	Water	100		
	Ammonium Sulfate	3		
	Sodium Meta Bisulphite	0.5	90 min	Check completion of deliming
	Bate (Alkaline)	0.6		
	Wetting Agent	0.3	90 min	Drain
Running Water Wash	Water	600	1 hr	Drain
Pickling	Water	60		
	Salt	8	20 min	Check Be'; should be 7; if not adjust with salt.
	Formic Acid -Water 25 lits.	0.5	20 min	
	Sulphuric Acid -Water 100 lits	0.7		2 feeds at 20 min interval. After 2nd feed, run for 2 hrs.
	Sodium hypochlorite	0.2	40 min	
	Hypo	0.5	30 min	Leave o/n. Next day check pH; 3.7-3.8.
Ethanolamine Treatment	Monoethanolamine	1.0	90 min	Check pH; 8.7
	Formic acid	0.1	10 min	
Chrome Tanning	BCS	6	180 min	Check penetration. Check pH; pH 3.6
	Sodium bicarbonate	0.15	45	Check pH; 3.8
	Busan 30 L	0.1	1 hr	Collect spent liquor for recycling. Pile

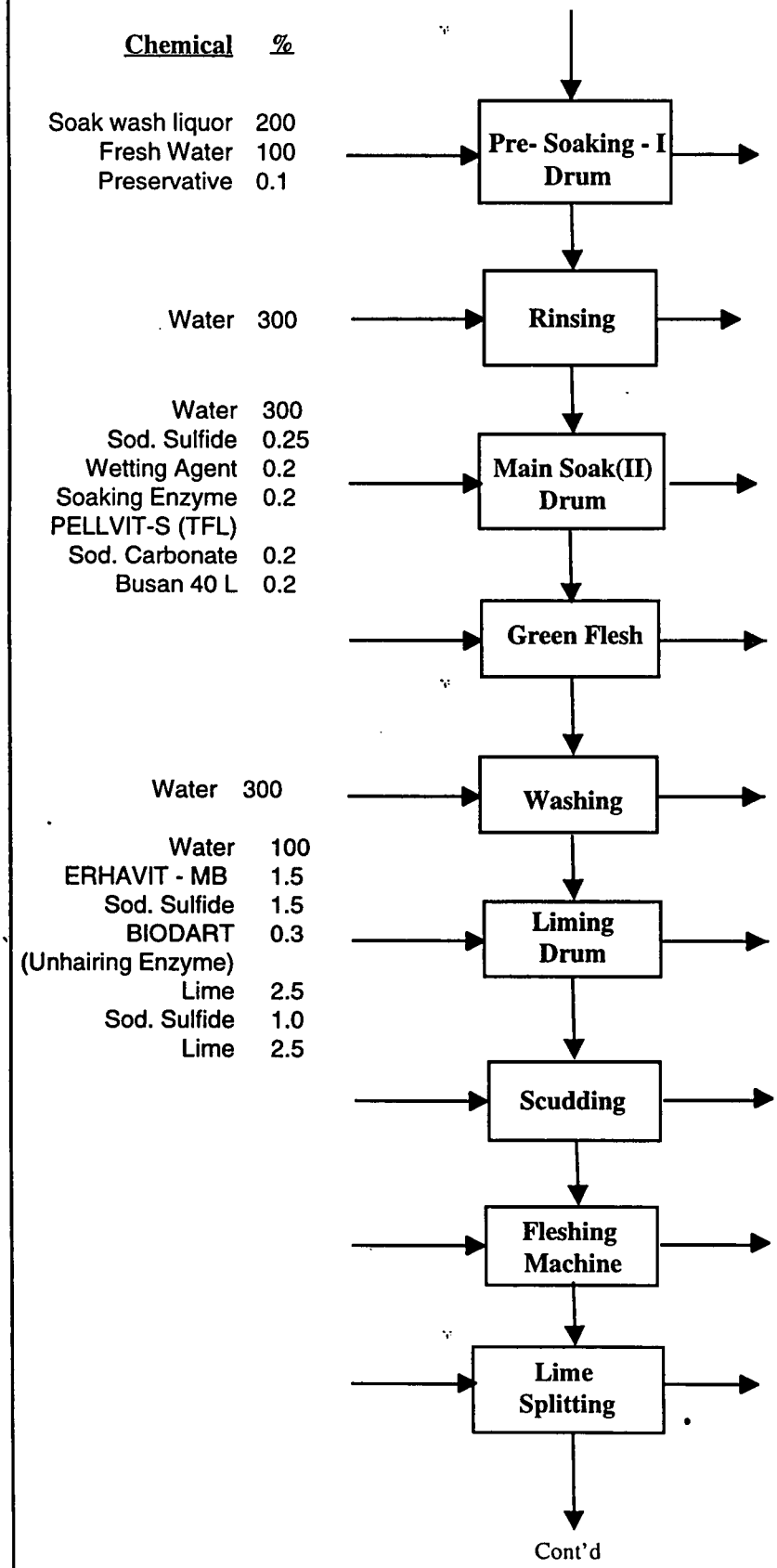
MODIFIED PROCESS FOR IMPLEMENTATION / DEMONSTRATION

Process : Cow Hides Raw to Wet Blue

Lot-2

Batch : 1000 Kg

Cow Hides (Light)



Cont'd

BD001

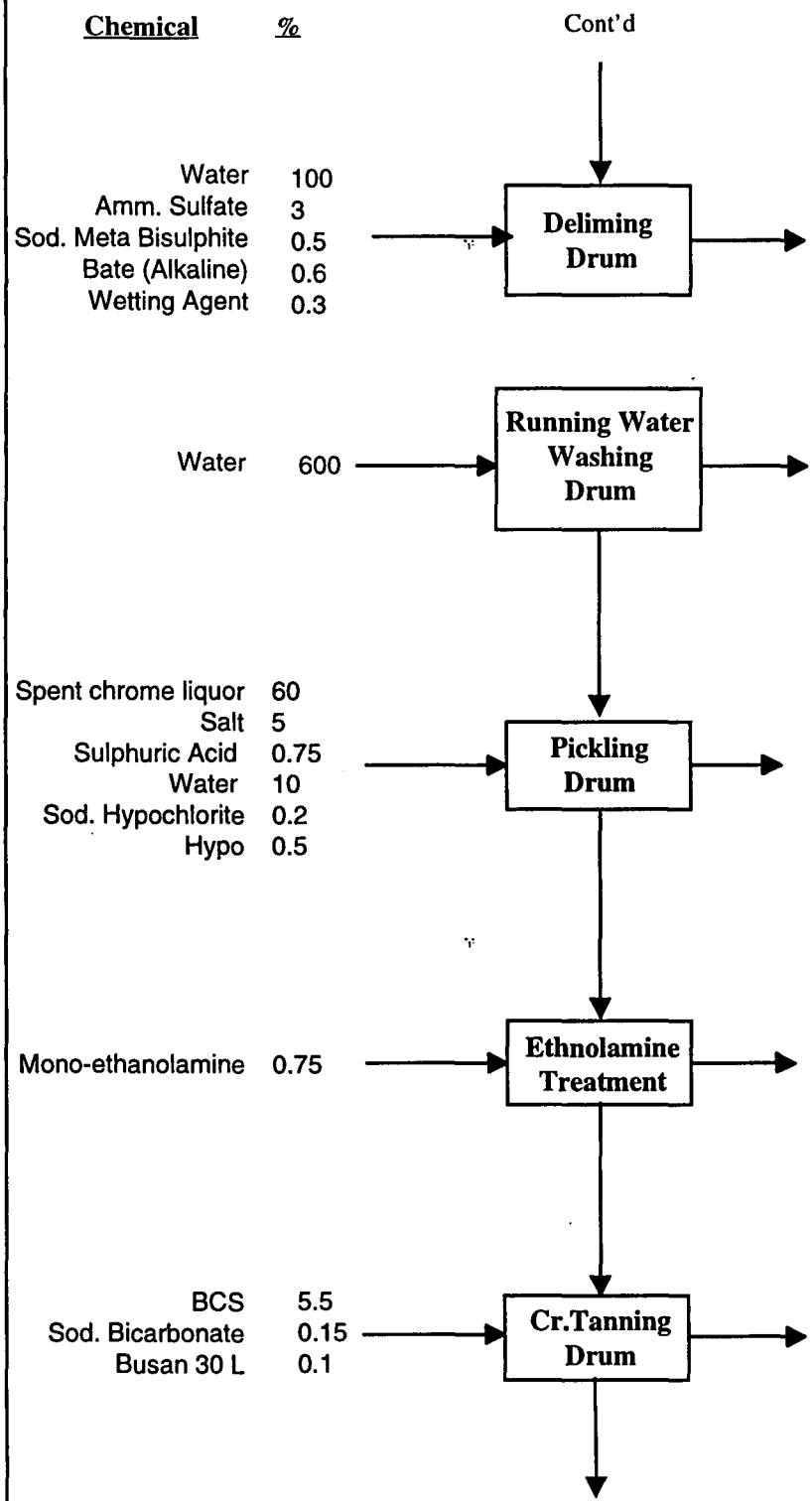
MODIFIED PROCESS FOR IMPLEMENTATION / DEMONSTRATION

5000 Kg/day

Process : Cow Hides Raw to Wet Blue

Lot-2

Batch : 1000 Kg



THE CLEANER TANNING PROCESS TECHNOLOGIES DEMONSTRAED AT HAZARIB AGH TANNING CLUSTER, DHAKA, BANGLADESH

Tannery Name: **BAY TANNERIES Ltd.**
Process: Raw to Wet Blue **(Experiment – II Lot)**

Raw Material: Cow hides(light)
Lot Size/ No. Pieces: 1000 kg

Operation	Water/ Chemical	%	Run Time	Remarks
Pre-Soaking-I	Soak wash liquor from collection tank	200		Measured with Flow meter
	Fresh water	100	30 min	Drain
Rinsing	Water	300	15 min	
Main Soak (II)	Water	300		
	Sodium Sulfide	0.25		
	Wetting agent Soaking Enzyme (TFL)	0.4 0.2		
	Sodium Carbonate	0.2		
	Busan 40L	0.2	30 min	Rest 60 min
				Run 5 min/hr. Up to next day.
Green flesh				
Washing	Water	300	15 min	Collect the liquor into collection tank for recycling; add 0.1% preservative.
Liming	Water	100		
	Erhavit MB	1.5	15 min	
	Sodium Sulfide	1.5		
	Lime	2.5	60 min	Run 5 min/hr for 6 hrs.
	Sodium Sulfide Unhairing Enzyme- BIODART (SPIC product)	1.0 0.5		
	Lime	2.5	60 min	Run 5 min/hr; Total duration 24 hrs.

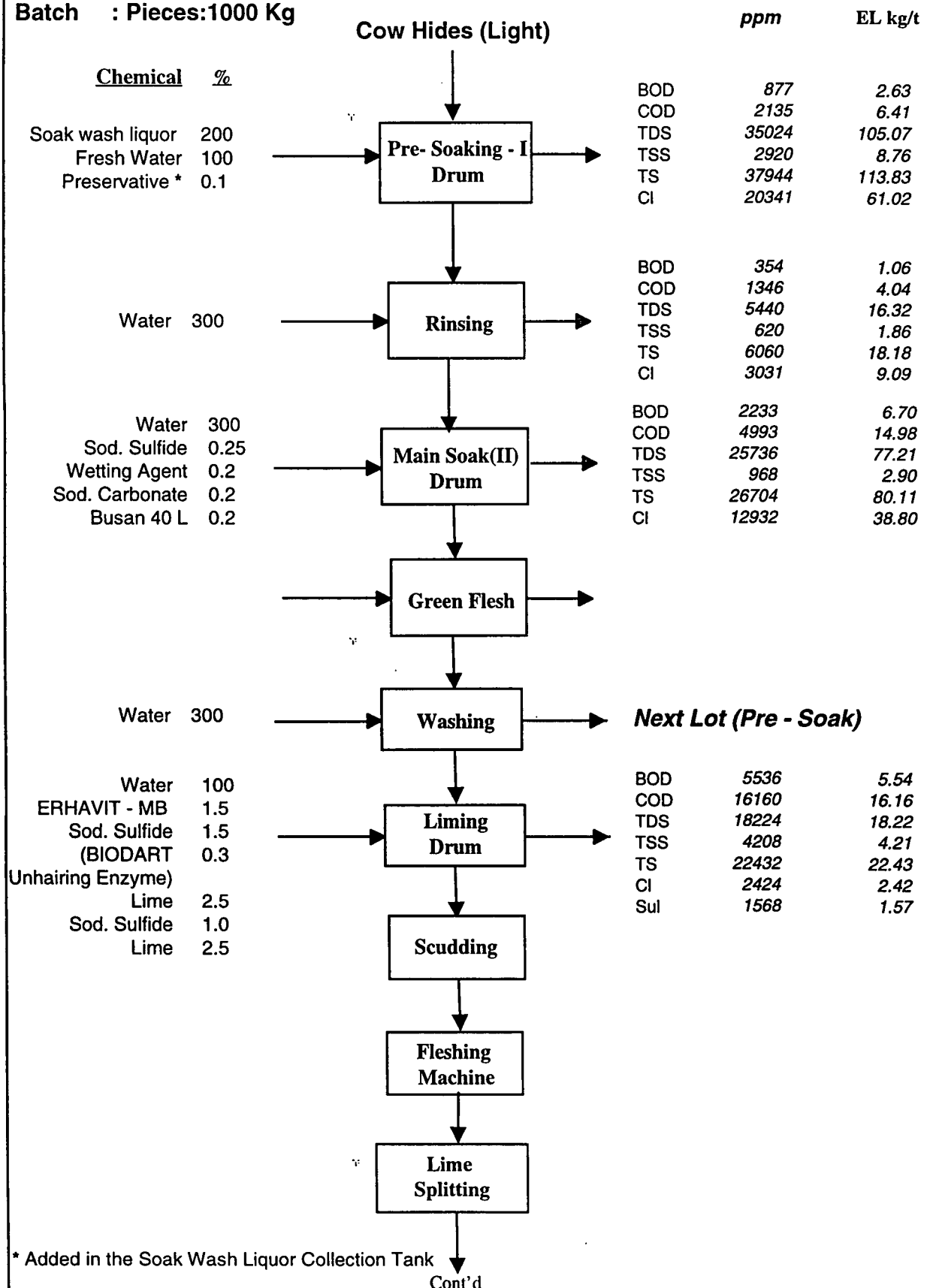
Scudding				
Fleshing				
Lime Splitting				Note the weight(1100 Kg)
Deliming	Water	100		
	Ammonium Sulfate	3		
	Sodium Meta Bisulphite	0.5	90 min	Check completion of deliming
	Bate (Alkaline)	0.6		
	Wetting Agent	0.3	90 min	Drain
Running Water Wash	Water	600	1 hr	Drain
Pickling	Spent chrome liquor acidified with 0.2% formic acid	60		
	Salt	5	10 min	Check Be'; should be 7; if not adjust with salt.
	Sulphuric Acid -Water 100 lits	0.7		2 feeds at 20 min interval. After 2nd feed, run for 2 hrs.
	Sodium hypochlorite	0.2	40 min	
	Hypo	0.5	30 min	Leave o/n. Next day check pH; 4.0-4.1
	Sulphuric acid	0.05	15 min	
Ethanolamine Treatment	Monoethanolamine	0.75	90 min	Check pH; 6.5
Chrome Tanning	BCS	5.6	180 min	Check penetration. Check pH; pH 3.6
	Sodium bicarbonate	0.15	45	Check pH; 3.8
	Busan 30 L	0.1	1 hr	Collect liquor for recycling. Pile

BD001	MODIFIED / IMPLEMENTED PROCESS AND EMISSION LOAD	5000 Kg/day

Process : Cow Hides Raw to Wet Blue

ALL TECHNOLOGY

Batch : Pieces:1000 Kg



	ppm	EL kg/t

Phase - II

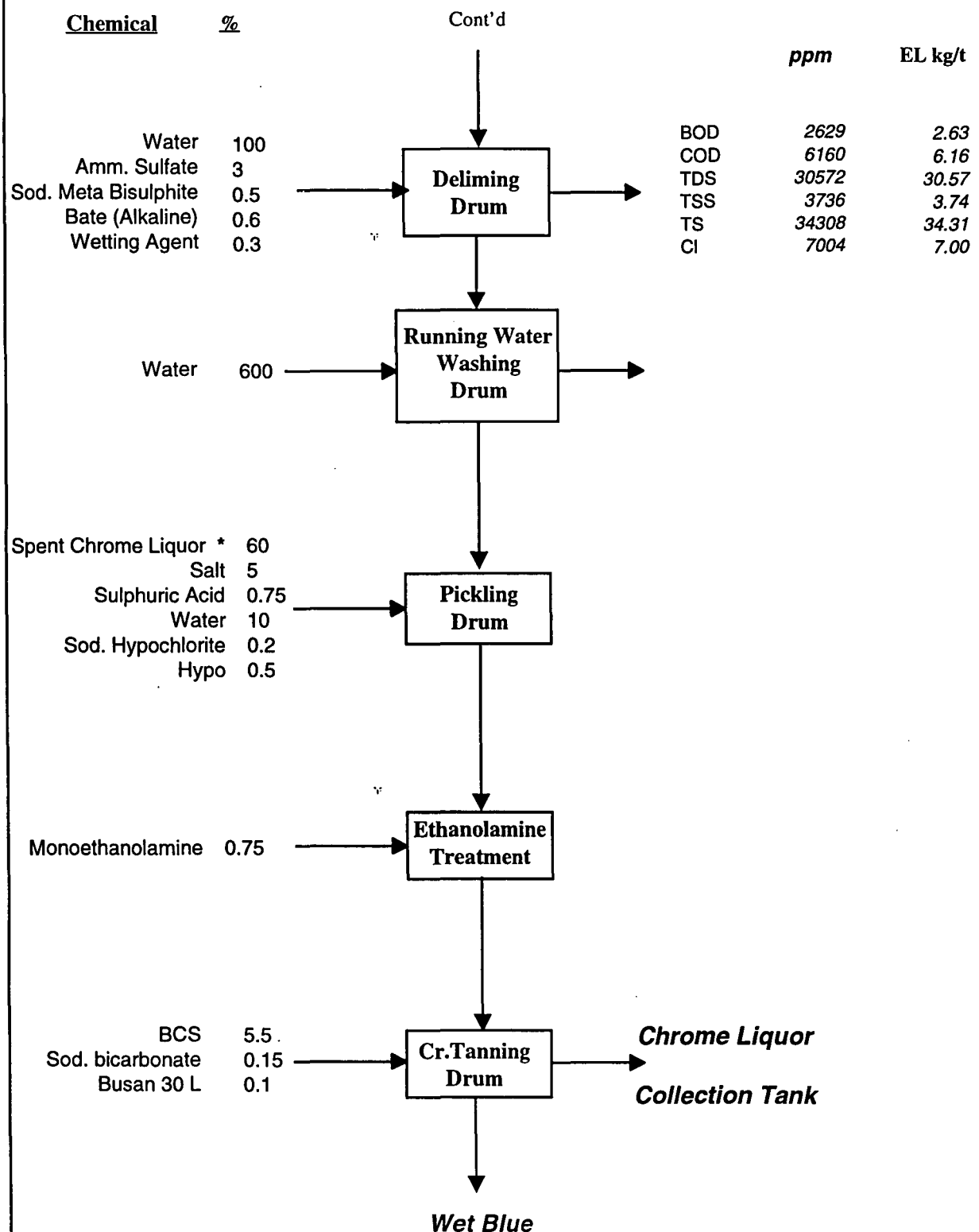
BD001_all

BD001	MODIFIED / IMPLEMENTED PROCESS AND EMISSION LOAD	5000 Kg/day

ALL TECHNOLOGY

Process : Cow Hides Raw to Wet Blue

Batch : Pieces:1000 Kg



* Acidified with 0.2% Formic Acid

THE CLEANER TANNING PROCESS TECHNOLOGIES DEMONSTRAED AT HAZARIBAGH TANNING CLUSTER, DHAKA, BANGLADESH

Tannery Name: **BAY TANNERIES Ltd.**
Process: Raw to Wet Blue **(Experiment – SK reuse, MEA treatment)**

Raw Material: Cow hides(light)
Lot Size/ No. Pieces: 1000 kg

Operation	Water/ Chemical	%	Run Time	Remarks
Pre-Soaking-I	Soak wash liquor from collection tank	200		Measured with Flow meter
	Fresh water	100	30 min	Drain
Rinsing	Water	300	15 min	
Main Soak (II)	Water	300		
	Sodium Sulfide	0.25		
	Wetting agent	0.4		
	Sodium Carbonate	0.2		
	Busan 40L	0.2	30 min	Rest 60 min
				Run 5 min/hr. Up to next day.
Green flesh				
Washing	Water	300	15 min	Collect the liquor into collection tank for recycling; add 0.1% preservative.
Liming	Water	100		
	Erhavit MB	1.5	15 min	
	Sodium Sulfide	1.5		
	Lime	2.5	60 min	Run 5 min/hr for 6 hrs.
	Sodium Sulfide	1.0		
	Lime	2.5	60 min	Run 5 min/hr; Total duration 24 hrs.
Scudding				
Fleshing				
Lime Splitting				Note the weight(1100 Kg)
Deliming	Water	100		

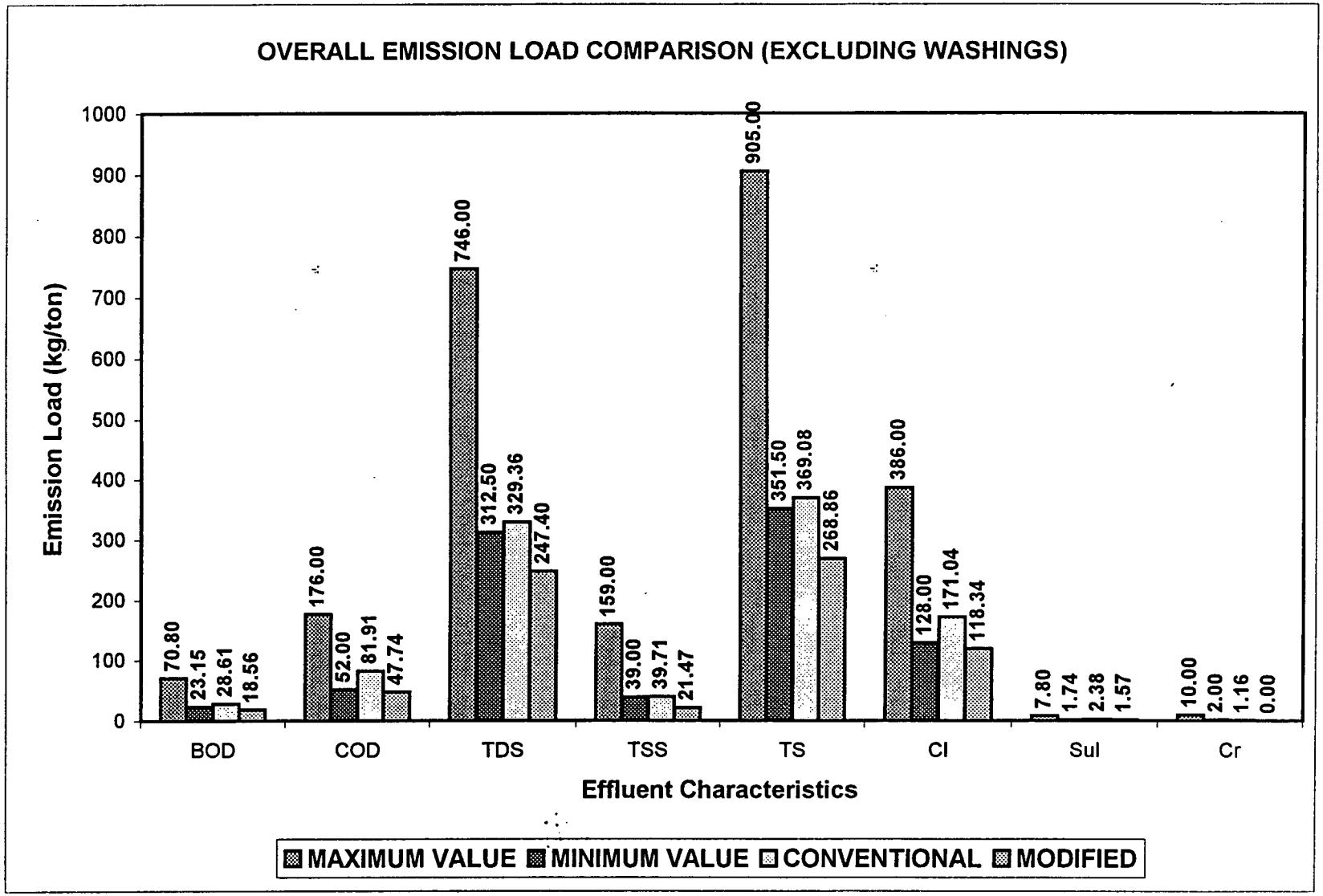
	Ammonium Sulfate	3		
	Sodium Meta Bisulphite	0.5	90 min	Check completion of deliming
	Bate (Alkaline)	0.6		
	Wetting Agent	0.3	90 min	Drain
Running Water Wash	Water	600	1 hr	Drain
Pickling	Spent chrome liquor acidified with 0.2% formic acid	60		
	Salt	5	10 min	Check Be'; should be 7; if not adjust with salt.
	Sulphuric Acid -Water 100 lits	0.7		2 feeds at 20 min interval. After 2nd feed, run for 2 hrs.
	Sodium hypochlorite	0.2	40 min	
	Hypo	0.5	30 min	Leave o/n. Next day check pH; 4.0-4.1
	Sulphuric acid	0.05	15 min	
Ethanolamine Treatment	Monoethanolamine	0.75	90 min	Check pH; 6.5
Chrome Tanning	BCS	5.6	180 min	Check penetration. Check pH; pH 3.6
	Sodium bicarbonate	0.15	45	Check pH; 3.8
	Busan 30 L	0.1	1 hr	Collect liquor for recycling. Pile

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	18.00	12.90	38.26	258.00	28.16	286.16	159.62		
	M	9.00	10.39	25.42	198.60	13.52	212.12	108.91		
	D %	-50.00	-19.44	-33.55	-23.02	-51.97	-25.87	-31.77		
Liming	**T**	**3.0 - 4.0**	**15 - 40**	**30 -100**	**72 -120**	**18 - 80**	**90 - 200**	**12.0 - 32**	**1.7 - 7.7**	
	C	1.00	10.68	22.99	33.52	6.24	39.76	3.37	2.38	
	M	1.00	5.54	16.16	18.22	4.21	22.43	2.42	1.57	
	D %	0.00	-48.14	-29.71	-45.63	-32.61	-43.58	-28.03	-34.12	
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**		
	C	1.00	3.05	7.00	33.52	4.24	37.76	7.68		
	M	1.00	2.63	6.16	30.57	3.74	34.31	7.00		
	D %	0.00	-13.80	-11.94	-8.78	-11.97	-9.14	-8.78		
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 %	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!		
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	1.98	13.66	4.33	1.07	5.40	0.38		1.16
	M*	0.00	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		-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**	**2 - 10**
(Excluding	C	20.80	28.61	81.91	329.36	39.71	369.08	171.04	2.38	1.16
Washings)	M	11.00	18.56	47.74	247.40	21.47	268.86	118.34	1.57	0.00
	D %	***-47.12***	***-35.13***	***-41.71***	***-24.89***	***-45.94***	***-27.15***	***-30.81***	***-34.12***	***-100.00***

T: Traditional C : Conventional M : Modified D : Difference

* Pickling & Chrome Tanning Close Loop,


OVERALL EMISSION LOAD COMPARISON (EXCLUDING WASHINGS)
Emission Load (kg/ton)
1000
900
800
700
600
500
400
300
200
100
0
70.80
23.15
28.61
18.56
176.00
52.00
81.91
47.74
746.00
312.50
329.36
247.40
159.00
39.00
39.71
21.47
905.00
351.50
369.08
268.86
386.00
128.00
171.04
118.34
7.80
1.74
2.38
1.57
10.00
2.00
1.16
0.00
BOD
COD
TDS
TSS
TS
Cl
Sul
Cr
Effluent Characteristics
MAXIMUM VALUE
MINIMUM VALUE
CONVENTIONAL
MODIFIED

Good housekeeping practices at Bay Tannery

1. Walk-through survey

Criteria	Finding	Proposed follow-up action
1. Safety of machinery and equipment		
1.1 Placement and access to machines	All machines are easily accessible at the loading and unloading side.	
1.2 Guarding of moving and hazardous machine parts	The newly imported machinery, mostly used in the finishing processes, by and large meet international safety requirements in terms of proper positioning, availability of passive and active guards, placement and labelling of control buttons, dials and switches.	
	Local machinery (drums, paddles fleshing machine) mostly used in raw-to-semi finished production, do not have passive and active guards.	Install fence type covers and guards around motors, drive and gear mechanisms of drums, paddles and fleshing machines.
	Commonly one motor is used to drive two to three drums or paddles, using a flat-belt transmission system. While the motor is running all the time, the flat-belts are shifted mechanically to activate drum rotation. During this procedure, workers are working close to motor and immediate transmission system. The transmission mechanisms are not covered or fenced.	Consider replacement of current drive system with more energy-efficient individual motors with IP 55 rating. Replace flat-belt drives with V-belt drives, which ensure better transmission even when wet.
1.3. Control of machines	Control buttons on local machinery are not in reach of operator. Emergency-off switches are not available or not in reach of operator.	Install and relocate starters and emergency-off buttons to be in convenient reach of operator and helper. Clearly label all controls and buttons to allow their easy identification.
	There are no proper starter switches for many drums.	See replacement of motors
	Elevated platforms are available on most machines to allow good worker-operating point interface.	Provide a working platform on the unloading side of the lime splitting.
1.4 Maintenance practices	The general maintenance and cleanliness of machines is adequate.	
	A basic system of preventive maintenance has been implemented.	Number all machines so to allow easy and clear identification in the maintenance schedule or in case of breakdown.
	Workers have been instructed to follow limited pre- and post-operation checking routine.	Place boards containing checklist type instructions (in Bengali) at each machine, listing points to be checked before and after production.
2. Safety of electrical installations		
2.1 Protection rating of motors	Most electrical motors in use in the wet-processing areas do not conform to IP55 (or equivalent) level of protection as required for conditions prevailing in such work areas. Though some motors may have IP55 rating (according motor rating labels are missing or not legible), poor maintenance and condition of these motors have reduced the actual level of protection.	Consider replacement of motors with inadequate protection rating.
	Terminal boxes on many motors of paddles and drums are missing.	Fix terminal boxes and connect cables through cable glands.

Criteria	Finding	Proposed follow-up action
	Fan covers on a few motors are missing or broken, which reduces the cooling capacity and thus motor performance, particularly during the hot months.	Fix fan covers.
2.2 Wiring and earthing:	Wiring on (local and second-hand) machines is unsafe; electric cables are not connected to the motors through cable glands.	Connect cable through glands to reduce loss of energy in transmission.
	Wire connections are poorly insulated (even blank wires) and not protected by cable ducts.	Replace all cut wires and replace with new and properly rated wires.
		Place all wires in protective cable ducts and locate cable ducts along the wall and ceiling.
	Earthing wires are missing or are loose on several electric motors in the wet-processing areas.	Check earthing connections on all motors and metal panel boards. There should be at least to earthing connections.
	Circuit breakers and overload relays are available on the imported machinery only. In some places fuses are missing and have been replaced by wire pieces.	Replace missing fuses.
		Consider installation of circuit breakers and overload relays to prevent damage to electronic parts of newly imported machines.
2.3 Switch boards and panels:	The condition of electrical connection on and around imported machinery conforms to international standards in terms of colour coding, overload and short-circuit protection.	Use same colour coding for other electric connections in the tannery.
	Switchboards and panels of imported machines are placed next to the machine in convenient reach of operators and helpers.	
	Most switches and starters on drums and local machinery in wet-processing areas are located away from the machinery, out of reach the workers of the respective machines.	Shift starters closer to the machines.
		Clearly label the starter boxes indicating the corresponding machine or motor.
	Several of the panels or local distribution boards in the wet-processing areas are affected by corrosion.	Consider replacement of existing panels and distribution boards with ones made of corrosion proof material.
	Labels, allowing clear identification of switches and buttons, are missing on panels, switch and distribution boards. Sample tests, asking workers to switch on or off a particular machine, resulted in trial and error exercises, switching on wrong machinery or light fittings.	Use labels for all switches and buttons to allow clear identification of corresponding fixtures and fittings by all workers.
	All switches, dials and controls on imported machines are clearly labelled in English but not in Bengali. Workers were not able to explain the meaning if the different controls from the labels.	Provide additional labels in Bengali on all imported machines.
2.4 Main electrical controls	There is separate main electrical control room. Access is being prevented by lockable door.	
	The DG set is placed inside the main electrical control room. Access to the DG set is not prevented by fence or guard.	Consider shifting the DG set to a separate location, shielded by a wall from the production areas.
	Protective measures such as insulation rubber matting and rubber gloves (with voltage rating) are absent. High voltage and similar safety warning signs are affixed at entrance and inside the control room.	Provide for insulation matting in front of the panels in main electrical control room and DG set as well as local distribution panels.
	Fire fighting equipment is available out- and inside the control room.	

Criteria	Finding	Proposed follow-up action
3. Safety in use of chemicals		
3.1 Availability of information on hazardous chemicals	Most chemicals used in the tanneries are imported. Chemical containers from European suppliers are labelled and marked as per international standards. However, in some cases these labels are partly torn or have become hardly readable. Safety labelling and marking on containers of chemicals imported from other Asian countries does not conform to international standards.	Check labels before using chemicals in the tannery. In case labels are missing use no erasable marker pen to clearly mark content of respective chemical containers.
	Material Safety Data Sheets (MSDS) are not available in the tannery.	Prepare an inventory of chemical in use. Obtain MSDS from the suppliers and keep on record with in-charge of chemical store and production manager.
	Most floor level supervisors/technicians and workers had little to no awareness about the potential health hazards of the hazardous chemicals in use and first aid measures.	Inform supervisors about the content of MSDS for hazardous chemicals used in their areas.
3.2 Storage of chemicals	The tannery has separate chemical stores. The capacity is not sufficient for the number of chemicals in stock. Large quantities of chemical containers, including those containing acids, are stored outside in the work areas.	
	The access corridor to one chemical store is narrow and does not allow use of trolleys for movement of chemicals.	
	There are no separate temporary chemical storage areas. Chemicals are kept next to the concerned process areas. Spraying chemicals are stored in the R&D section.	Provide for temporary storage areas. Fix sign board clearly indicating area as "chemical storage area".
3.3 Transfer and handling of chemicals	Powered chemicals (BCS, salt, lime) are usually carried in the original bags to the respective processing areas, where they are emptied into barrels for further preparation.	Use trolley for moving chemicals to reduce manual strain.
	Liquid chemicals (fatliquors, acids) are usually transferred using small measuring cups from the large containers to open (unmarked) buckets.	When moving liquid chemicals, use closed containers to prevent spill. Make sure that all containers and buckets are also clearly marked or labelled to allow easy identification all the time.
	The buckets are manually carried to the process areas.	Avoid manual carrying of concentrated acids or alkalis. Use small trolley to move such material, even only for short distances.
	Concentrated acids are carried in the similar way (as explained above) and diluted in open barrels next to the drums.. Mixing is done manually, using a wooden stick. The concerned workers are inhaling vapours, fumes and aerosols generated during these processes. Workers do not use any personal protective equipment	Consider use of a corrosion protected hand-piston pump for transferring liquid chemicals from large to small containers. Workers should use protective gloves, boots, apron and proper respirator against acid vapours when manually mixing and diluting acid.
3.4 Control of emissions at source	No air quality monitoring has been carried out so far in the tannery.	

Criteria	Finding	Proposed follow-up action
	Any vapours, fumes, gases generated during the processes in the drums are diluted by venting the drums for a short period of time before removing material inside.	
	The hand spray booth exhaust is not connected to a scrubbing device. Spraying vapour is directly exhausted to the outside air.	Consider the installation of an scrubber system.
	The spraying chambers on the rotary spraying machines are connected to an exhaust duct. No such connections are provided for the exhausts on the drying tunnels. Exhaust ducts are not connected to scrubber or other collection/treatment devices but lead to the outside.	Connect the exhaust fans of the drying tunnel to the existing ducting system. Consider installation of a scrubber system to clean exhausted air from the spraying machines.
3.5 Disposal of chemical waste and containers:	Empty chemical containers and carboys are collected and sold to special agents.	Rinse chemical containers in work area and use chemical residuals in the process. Make sure the wash water is also discharged to the effluent treatment plant once installed.
	At present, wastewater is discharged into drains to the outside of the tannery without treatment.	
4. Safe condition of floors and structures		
4.1 Flooring and passageways	General floor conditions are acceptable. Floor openings such as drains, wells or pits are covered.	
	Passageways are of adequate width and flooring allowing easy movement of material and persons.	Carefully store material in process to remain passageways free at all times.
4.2 Railing of stairs	Railings are available on all staircases and mezzanine floors.	
5. Illumination		
5.1 Light quality	Measurements conducted on-site using an industrial light meter showed that the general illumination levels in almost all work areas are inadequate. The general light levels in the tanneries are around 10 - 30 lux. For detailed results, refer to enclose annex.	
5.2 Use of day light	Apart from poor use of natural (day) light due to the given structures of the buildings, the tannery does not have sufficient number of light fittings.	
	There is scope for more intensive use of natural light at the upper floor.	
	Walls and ceilings have poor reflection values due to poor cleanliness and lack of whitewashing.	Whitewashing and good cleanliness of ceiling, floors and column will increase the light reflection.
5.3. Local lighting	The quality of local lighting of point of operations, particularly on machines with hazardous operations and moving machine parts are inadequate. Poor lighting does not only result in strain and impairment of eyesight, but results in worker's fast fatigue and dizziness. These factors in turn lead to low quality and increase risk of accidents.	
6. Noise		
6.1 Noise levels	As per the measurements conducted on-site noise levels were within safe limits of 85 dB(A) for a eight hour exposure. This has been the first noise measurement in this tannery.	

Criteria	Finding	Proposed follow-up action
6.2. Hearing protection	No hearing protection (ear muff, ear plugs) was available or used by workers in operation with high noise levels.	
7. Ventilation and ambient air quality		
7.1 Natural ventilation	Most production facilities are placed in wide and open halls. However, limited number of wall openings e.g. windows, gates, louvers do not allow good natural cross-ventilation, particularly on the ground floor.	Install louvers on the ground floor to allow for better horizontal airflow.
7.2 Ventilation	Ceiling fans are available work areas to provide airflow for operators, but these do not contribute to sufficient air change in the work areas.	Install wall mounted exhaust fans on the ground floor.
7.3 Temperature and humidity	Indoor ambient air quality, temperature and humidity have not been monitored. There is no provision for dry-bulb and wet-bulb thermometers.	
8. Handling and movement of material and loads		
8.1 Use of trolleys	Though flooring and general arrangements are of good quality, materials are intensively transported manually from stores to production areas and between different production areas. Tools such as tongs and long clamps are partly used by the workers when handling raw material in beam house. The tannery has an elevator to transport material between ground and first floor.	
8.2 Storage of material	Process and input materials are mostly stored on the floor. When required the material is moved manually. Hydraulic pallet trucks are not in use for moving stacks of material on the pallets.	
8.3. Organisation and management of workspace	Areas for work, storage and movement are not clearly segregated e.g. such as by floor markings.	Make plan to distribute available floor area, providing for separate areas for machine operation, storage of material and movement. Apply clearly visible floor markings and make sure that all workers adhere to these.
	Accordingly, the current storage arrangements, particularly for wet-blue and finished leather, appear to be haphazard and wasting storage space. The stacked material prevents smooth movement of persons and material as well as fast shifting of material when required.	See above
9. Emergency management and control		
9.1 Emergency planning	No written emergency plan listing actions required for different emergency scenarios is available.	
9.2 Dealing with fire and explosion	Workers in the tanneries are aware of what to do in case of a fire. Emergency exits and routes are not clearly marked or indicated.	

Criteria	Finding	Proposed follow-up action
	There are no signs or boards, which prohibit smoking or open fire, particularly, in areas such as chemical stores, spraying, buffing, main electrical control room.	
	Fire-fighting equipment is sufficient for the size of production	
	Fire extinguisher were found to be properly maintained and refilled. Their location is easily accessible, though not clearly marked.	
9.3 Dealing with medical emergencies	Basic first-medical-aid facilities are available.	
	The phone number of nearest doctor or hospital is not displayed on or next to the telephones with outside connection.	
	The name and location of the first-aiders are not displayed in the tannery.	Train at least two workers of the tannery as certified first aiders. One certified first aider should be available on each shift.
		Consider organising a basic first aid training for all workers.
10. Personal protection and welfare		
10.1 Personal hygiene	Workers frequently wash exposed skin after handling raw material or work in wet-processing yard.	
	No separate washing facilities are available. Usually workers use water from the water taps in the production areas.	
	Workers usually take food outside the factory.	
10.2 Working and protective clothing	No separate working uniforms are provided to the workers, who use the same clothes at work and at home. Most workers wear open sandals. Only a few workers in the wet-processing wear boots.	
10.3 Access to drinking water	No provision of clean drinking water is available in the tannery.	
10.4 Conditions of toilets	A number of toilets are available on several floors. There is no provision of separate toilets from the female workers.	
11. Promotion of safety and health at work	The tannery does not have a written safety policy.	
11.1 Safety signs	Safety or cautionary signs and boards are not displayed in the workplaces. Imported machines usually bear safety and cautionary labels.	
11.2 Safety training	As the awareness on safety & health among supervisors is also very low, increase of general awareness by means of close supervision and on-the spot guidance is limited.	

2. Results of noise measurements

Following measurements have been carried out by means of an industrial sound level meter. The threshold limit level for safe noise exposure over an eight-hour shift is between 85 to 90 dB(A). Internationally continuous noise levels of around 75 to 80 dB(A) are recommended. Measurements have been done in A rating. Measurements have been taken at the place of the respective operator(s).

LA grab measurements
LAeq Equalised sound pressure level
LaMax Maximum sound pressure level recorded
All measurements are recorced in dB(A):

Operation	L_A	L_{Aeq}	L_{Amax}
Splitting m/c (lime)	**78...82**	**83.7**	**92.5**
Setting m/c (mechanical)	**85...87**	**94.4**	**105.2**
Shaving m/c (Flamar)	**83...87**	**84.4**	**94.5**
Slo-comb staking	**80...84**	**83.3**	**87.3**
Buffing m/c	**84...88**	**88.8**	**96.2**

3. Results of light measurements at Bay Tannery

4.

Following measurements have been made at Bay Tannery on 27092K by means of an industrial light meter. The measurements have been taken at the point of operation at the respective machines/operations. The general light level in all work areas is inadequate.

Operation	Lux (measured)	Recommended minimum level	Remarks
Desk (tanyard supervisor)	44	150...300	
Lime splitting m/c (front)	37	300...500	
Lime splitting m/c (rear)	90...95	300...500	
Wet-blue splitting m/c	65...70	300...500	Stroboscopic effect from fan
Shaving m/c I (Flamar)	52	300...500	
Shaving m/c II	23	300...500	Stroboscopic effect from fan
Shaving m/c III (Rizzi)	64...70	300...500	Stroboscopic effect from fan
Embossing m/c I (front)	15	500...750	
Embossing m/c I (rear)	11	500..750	
Embossing m/c II (front)	10	500...750	
Embossing m/c II (rear)	28	500..750	
Setting m/c (mechanical)	240	300...500	
Setting m/c (Rizzi)	125	300...500	
Sammying m/c 3H	32...35	300...500	Stroboscopic effect from fan
Vacuum dryer I	7...32	300...500	
Vacuum dryer II	2...30	300...500	
Slo-comb staking m/c	78	300...500	
Through feed ironing m/c (feeding)	65	300...500	
Through feed ironing m/c (rear)	46	300...500	Stroboscopic effect from fan
Roller coater m/c (front)	105	300...500	
Roller coater m/c (rear)	111	300...500	
Sorting table	690	750...1000	
Quality control I	284	750...1000	
Quality control II	133	750...1000	
Quality control III	294	750...1000	With inclination 550
R&D dye - desk	45	150...300	
R&D dye - laboratory	42	300...500	
R&D dye - checking	2600	1000	Daylight!

ANNEXURE-VII

TANNERY PROCESS DETAILS

1. Tannery Name : **BD002**

2. Tannery Location and Land area
   a) Total land area (in acres/sq.ft.) : 13122 sq.ft
   b) Open land available (in acres/sq.ft.) : Building 58,910 sq.ft (11782 sq.ft / floor - 5 floors)
   c) Tannery boundary details: :
      Northern side: Road — Eastern side: Fancy Leather
      Southern side: Residence — Western side: Road

3. Water
   a) Existing ground water Table -(feet) (within the tannery premises) : 60'
   b) Sources of water supply (If more than one source mention % share) : Tube well , water from WASA
   c) Characteristics of raw water (enclose water analysis report) : Not Available
   d) Residential Quarters (if any) Within the campus : No. of quarters: Nil — No. of persons residing: Nil

4. Raw Material

Sl. No.	Source/ Origin	Species	Preservation Mode Dried/ sod. chloride/ biocide (if so, which)
1	Local	Goat	Wet Salted
2	Local	Sheep	Wet Salted
3	Local	Cow & Buff	Wet Salted

5. Tannery Processing Capacity

Tannery Design Capacity : 10 tons / day
Normal Operating Capacity : 5 – 6 tons / day

Actual Processing/day

Process Mix		Present Processing			Future Plan		
		Species	Pieces	Weight (kg)	Species	Pieces	Weight (kg)
i)	**Raw to Finish (via Wet Blue)** √	Cow	280	4200	Cow	300	7000
		Goat	1800	1800	Goat	3000	3000
		Tannery also processes Sheep skin & Buff hides occasionally on demand					

Average weight per piece (Wet salted) : Goat & Wool Sheep – 1 kg ; Cow – 15 kg; Buff – 20-25 kg
Major production Cow (70%), Goat (30%)

6. Seasonal variation in processing (if any)

Season	Months	Processing / per year	
		Pieces	Weight (kg)
i) Peak season	Mar – July	800 – 900	9000
ii) Lean Season	Aug – Oct	500	5000

7. Production during last 3 years : Not Available

8. List of equipments available

Sl. No.	Equipment	No. of Equip.	Man Power	Size/ Specification	Operating Capacity (kg)	Vol. (lit)	Power (HP)
1.	Drums						
(a)	Soaking & Liming						
	Large	2	-	10' x 10'	1500		
	Small	2	-	8' x 10'	1200		
(b)	Wet Finishing						
	Stainless Steel	3	-	6' x 6'	1000 600 – 700 (Operating)		
(c)	Tanning						
	Small	3	-	1.6m(l) x 2.4m(d)	800 – 100		
	Large	2	-	1.6m(l) x 2.7m(d)	1000 – 1200		
2.	Fleshing Machine	1					2
3.	Unhairing Machine	-					1
4.	Splitting Machine	1					
5.	Shaving Machine						
	Wide width	2					
	Mechanical	1					
6.	Sammying Machine	1	(Feed through EMC, Italy)				
7.	Setting Machine						
	i) Ordinary						
	ii) Reversible	2					

8. List of equipments available (Contd.)

Sl. No.	Equipment	No. of Equip.	Man power	Size/ Specification	Operating Capacity (kg)	Vol. (lit)	Power (HP)
11.	Vacuum Drier	2					
12.	Staking Machine	-					
	i) Slow Comb	2					
	ii) Mollisa	2					
13.	Buffing Machine						
	i) Single Width						
	ii) Feed Through	1					
14.	Dedusting Machine	1					
15.	Spraying Machine						
	i) Hand Spray	1					
	ii) Auto Spray	2		Poletto & Tambani			

16.	Polishing Machine	1					
17.	Embossing Press	1		Italy			
18.	Finiflex Machine	1					
19.	Area Measuring Machine	2					
20.	Boiler	2					
21.	Generator	1					630KW
22.	Others						
23	Roto Press	1					
24	Glazing Machine	5					
25	Toggling	2					
26	Roller Coater	1					

Power Source [√] **Electricity Board** [√] **Generator** [ ] **Oil Engine**

9. Production Pattern

Items			Present	Future plans (next 5 years)
i)	Working hours/day		8 hrs	16 hrs (2 shift)
ii)	Number of shifts/day		One	Two
iii)	Number of working days in a week		Six days	
iv)	Average working days/annum		300 days	
v)	Total Manpower shift	1	250-300	
		2	-	
		3		

10. (a) Water and Chemical usage Chrome Tanning Process - Raw to Finish (via Wet Blue) COW HIDES

Lot Size ☐☐☐☐ **kg** **pieces** ☐☐☐☐

Sl. No.	Process	No. of Pit/ Paddle/Drum	Size	Water used (%)	Chemicals used		Dura-Tion	Tempa rature	pH
					Name	(%)			
1	Pre Soaking	Drum		500%	Wetting Agent, Non-Ionic (Detergent) Optional	0.2 - 0.3%	10'	-	
2	Washing	Drum		500%	Running Water		15'		
3	Main Soaking	Drum		550% **50% Drain**	Soda Ash Preservative (Erhavit LBH– TFL) Wetting Agent, Non-Ionic	0.5% 0.2 - 0.5% 0.3 - 0.5%	12 – 14 hrs		
4	Liming	Drum		150% Soak bath + 300%	Lime Sod. Sulfide ***- Run for 10' every 1 hr for 24 hrs***	4.5% 4 %	3 feeds at 30' interval		
5	Washing	Drum		500%			30'		
6	Fleshing	Machine		125%					
Pelt Weight ☐☐☐☐☐ **Kg**									
7	Washing before Deliming	Drum		500%			15'		

8	Deliming	Drum		50%	Degreasing Agent Amm. Sulfate Sod. Metabisulfite Bating Agent	0.3% 1-1.5% 0.25% 0.5%	60' 60'		
				Drain	**for Goat** Bating Agent	1.5 – 2%			
9	Washing after Deliming	Drum		500%					
10	Pickling	Drum		75% **No Drain**	Salt Preservative Formic Acid Sulfuric Acid	8% 0.15% 0.3% 0.8%	10' 10' 15' 3 feeds at 30' Interval Total Duration 3 hrs.		pH 2.8-3.0
11	Chrome Tanning	Drum		Pickle bath + 100%	Sod. Formate Chrome Chrome Sod. Bicarb Tanbase	0.25% 4% 4% 1.5% 0.2 – 0.3%	30' 90' 7.5 – 8 hrs.		pH 3.6-3.7

No Wash

Shaved Weight					**Kg**	**Wet Blue to Finish**		**Pieces**					
12	Wetting back	Drum		200%	Wetting Agent, Non Ionic	0.2 - 0.3%	30'		
13	Acid Wash (If it is old)	Drum		250%	Formic Acid	0.15%			
14	Washing	Drum		300%			15'		

15	Rechroming	Drum		225%	Chrome Chrome Syntan Relugan RF Sod. Bicarb	3% 2.5-3% 2% 0.5%	added in feeds – 45'		pH 3.8 – 3.9
16	Washing before Neutralisation	Drum		300%			15'		
17	Neutralisation	Drum		250% **Drain**	Neutralising Syntan Sod. Formate Sod. Bicarb	1.5% 0.3% 0.2%	added in feeds – 30'		pH 4.7-4.9
18	Washing I after Neutralisation	Drum		300%			15'		
19	Washing II after Neutralisation	Drum		300%			15'		
20	Retanning Dyeing & Fatliquoring	Drum		200%@ 45°C	Relugan RE (Polymeric) Melamine Syntan (Venalan R7/Relugan D) Mimosa Quebracho Tanigon OS + Dye + Fatliquor, Syntheic Fatliquor, Lanoline Fatliquor, Other Semi Synthetic Formic Acid	3% 3% 3% 3% 3% 2-5% 4% 1-1.5% 2.5 – 3% 1.5 -2%	30' 60-90' 30-40' Run for 60'	45°C	

21	Top Dyeing (if necessary)	Drum		250%	Anionic Dyes (Black)				
22	Final Wash	Drum		300% Cold Water					

Pile

23 Other washings & Wastage 725%

11. Chrome Tanning Procedure

Item		Wetblue		Rechroming	
1.	Number of Drums	5 for both operations			
2.	Size of the Drums	1.6m x 2.4m & 1.6m x 2.7m			
3.	Average pelt weight(Kgs or Pieces/Drum)	800 – 1000 kg & 1000 – 2000 kg			
4.	Type of BCS used	Imported			
5.	% of BCS used	8%		3%	
6.	Basification and chrome uptake	75% Uptake			
7.	Washings : Number	-		Two	
8.	Washings : amount of water for each washing	-		200% + 300%	
9.	Water used (float) in %	75%Pickle bath+100%		125%	
10.	Other chemicals used in %	**Chemical**	**%**	**Chemical**	**%**
		Sod. Formate	0.25%	Chrome Syntan	2.5-3%
		Sod. Bicarb	1.5%	Relugan RF	2%
		Tanbase	0.2-0.3%	Sod. Bicarb	0.5%

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

Process	Water m^3/ day	Water/ton m^3/ ton	Material
Chrome tanning	6	1	Cow hide& Goat skin
Rechroming	5.4	2.25	Cow hide & Goat skin

13. Drainage and disposal arrangements

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/~~No~~

d) Whether scope exists for mixing up solid waste with tannery waste water : Yes/~~No~~ Lime

e) Type of problems faced in operating existing drains/sewer : 1. Chocking of drains with solid waste

f) Mode of final effluent disposal (CETP/ETP) : Drain

g) Solar Evaporation Pan available : ~~Yes~~/ No

If yes, Surface Area : -

h)

Solid Disposal	Type of Disposal	Mode of Disposal
Salt containing material	-	Dumped outside
Chrome containing material	-	Dumped outside

14. Mode of solid waste management

Sl.No.	Solid Waste	Amount per kg of Raw Material	Disposal Method
1.	Dusted salt		Mixed with solid waste & dumped outside
2.	Raw hide/skin trimmings		Glue
3.	Lime sludge		-

4.	Hair/Wool		No hair shaving process
5.	Fleshings		Municipal Corporation
6.	Wet Blue / EI trimmings		Dumped outside
7.	Shaving/buffing dust		Dumped outside
8.	Others		-

15. Total water used perday: 319.5 cubic meters

16. Total Effluent discharged (approximate) : 319.5 cubic meters

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

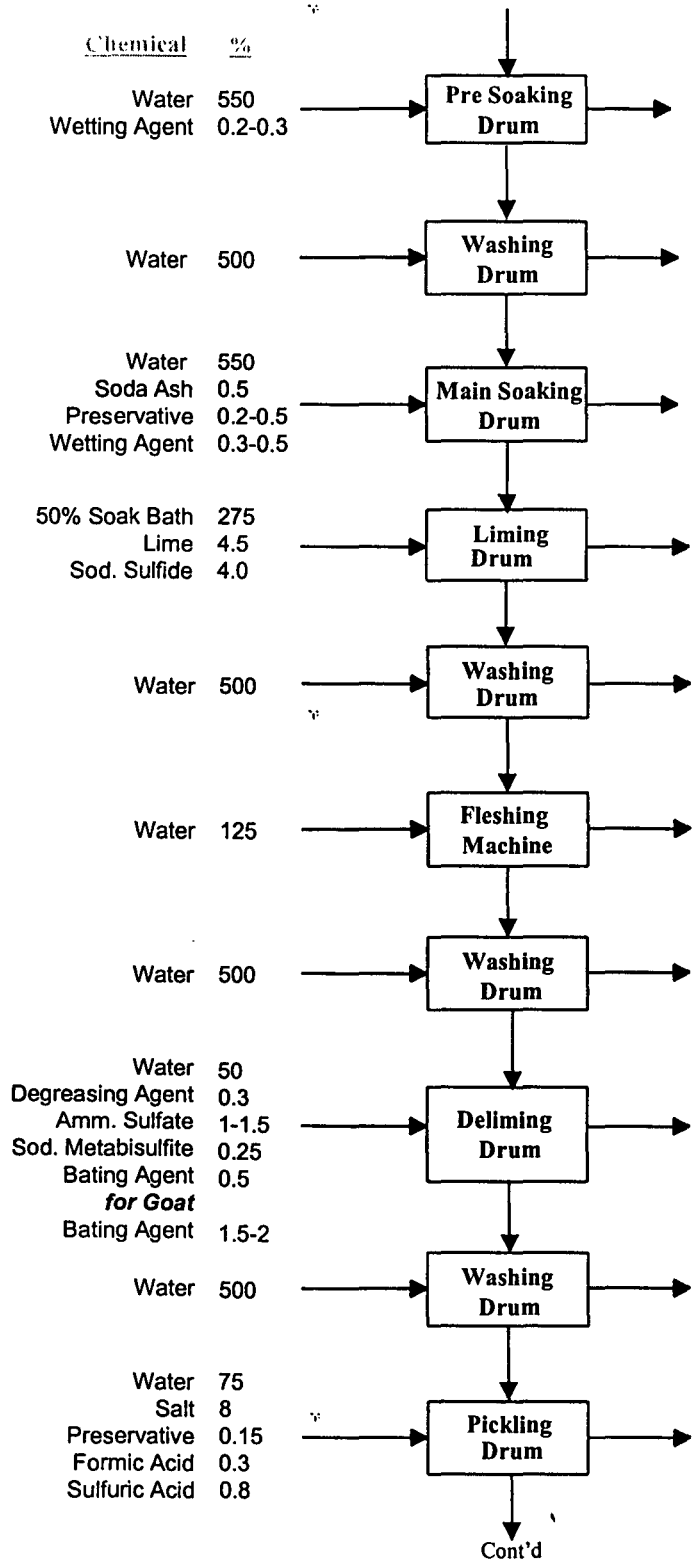
18. Remarks : Salt used for curing is minimum and pure .
Cost of Sod.Chloride is 10 takas per kg
Quantity used is also very less compared to India.
Quality of dusted salt from Raw material is also better compared to India.
Raw materials are purchased during Qurbani season and stored in tannery.

BD002	CONVENTIONAL PROCESS AND EMISSION LOAD	6000 kg/day

Process : Cow hides/Goat skins Raw to Wet Blue - Finish

Batch : 1000 Kg

Raw Cow hides / Goat skins



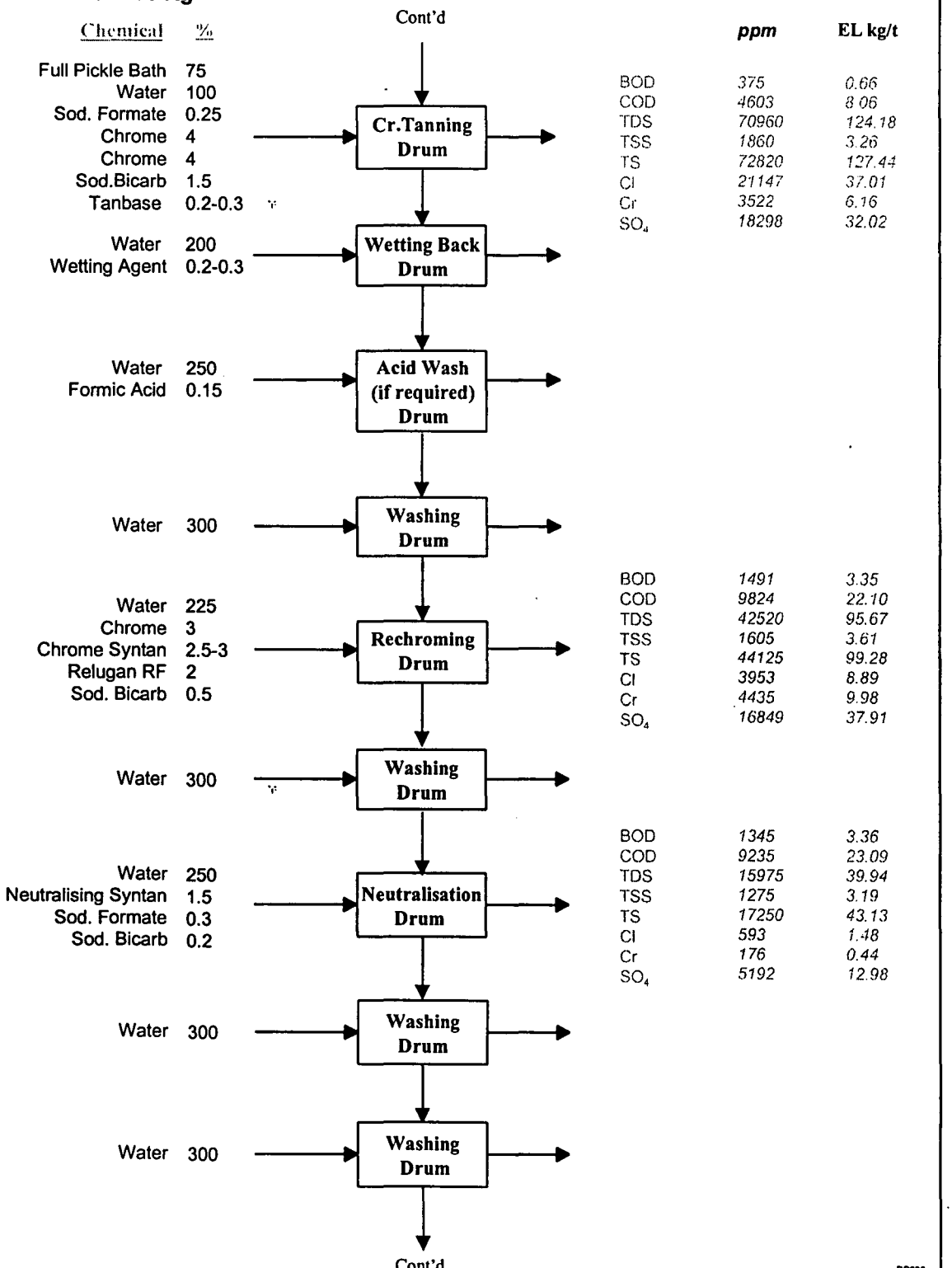
	ppm	EL kg/t
BOD	2250	[illegible]
COD	5962	[illegible]
TDS	66550	[illegible]
TSS	3320	[illegible]
TS	69870	[illegible]
Cl	39289	[illegible]
SO_4	302	[illegible]
BOD	2675	14.71
COD	5460	30.03
TDS	10510	57.81
TSS	1300	7.15
TS	11810	64.96
Cl	4743	26.09
SO_4	180	0.99
BOD	19275	53.01
COD	40068	110.09
TDS	29500	81.13
TSS	20010	55.03
TS	49510	136.15
Cl	2075	5.71
Sul	3740	10.29
SO_4	46	0.13
BOD	6975	3.49
COD	16420	8.21
TDS	25945	12.97
TSS	9685	4.84
TS	35630	17.82
Cl	1423	0.71
SO_4	8303	4.15
N	2951	1.48
BOD	1320	0.99
COD	1965	1.47
TDS	51110	38.33
TSS	1250	0.94
TS	52360	39.27
Cl	24151	18.11
SO_4	5926	4.44

BD002

BD002	CONVENTIONAL PROCESS AND EMISSION LOAD	6000 kg/day

Process : Cow hides/Goat skins Raw to Wet Blue - Finish

Batch : 1000 Kg



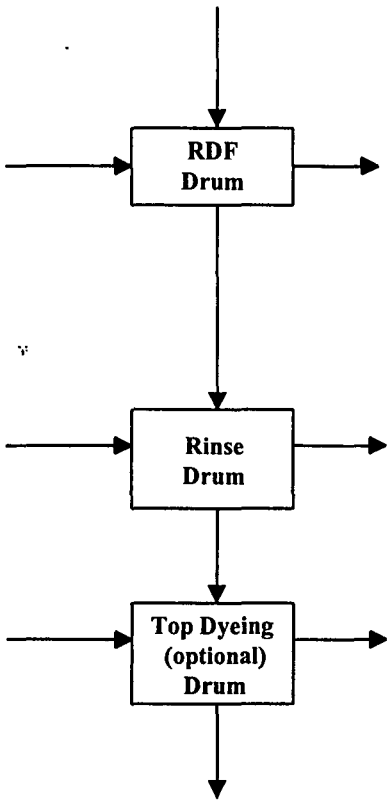
BD002	CONVENTIONAL PROCESS AND EMISSION LOAD	6000 kg/day

Process : Cow hides/Goat skins Raw to Wet Blue - Finish

Batch : 1000 Kg

Cont'd

Chemical	%
Hot Water	200
Relugan RE	3
Melamine Syntan	3
Mimosa	3
Quebracho	3
Tanigon OS	3
Dye	2-5
Fatliquor, Synthetic	4
Fatliquor, Lanoline	1-1.5
Fatliquor, Semi -Synthetic	2.5-3
Formic Acid	1.5-2
Water	300
Water	250
Anionic Dyes	



	ppm	EL kg/t
BOD	10500	21
COD	29220	58.44
TDS	12780	25.56
TSS	3610	7.22
TS	16390	32.78
Cl	751	1.50
SO_4	1189	2.38

Pile O/N

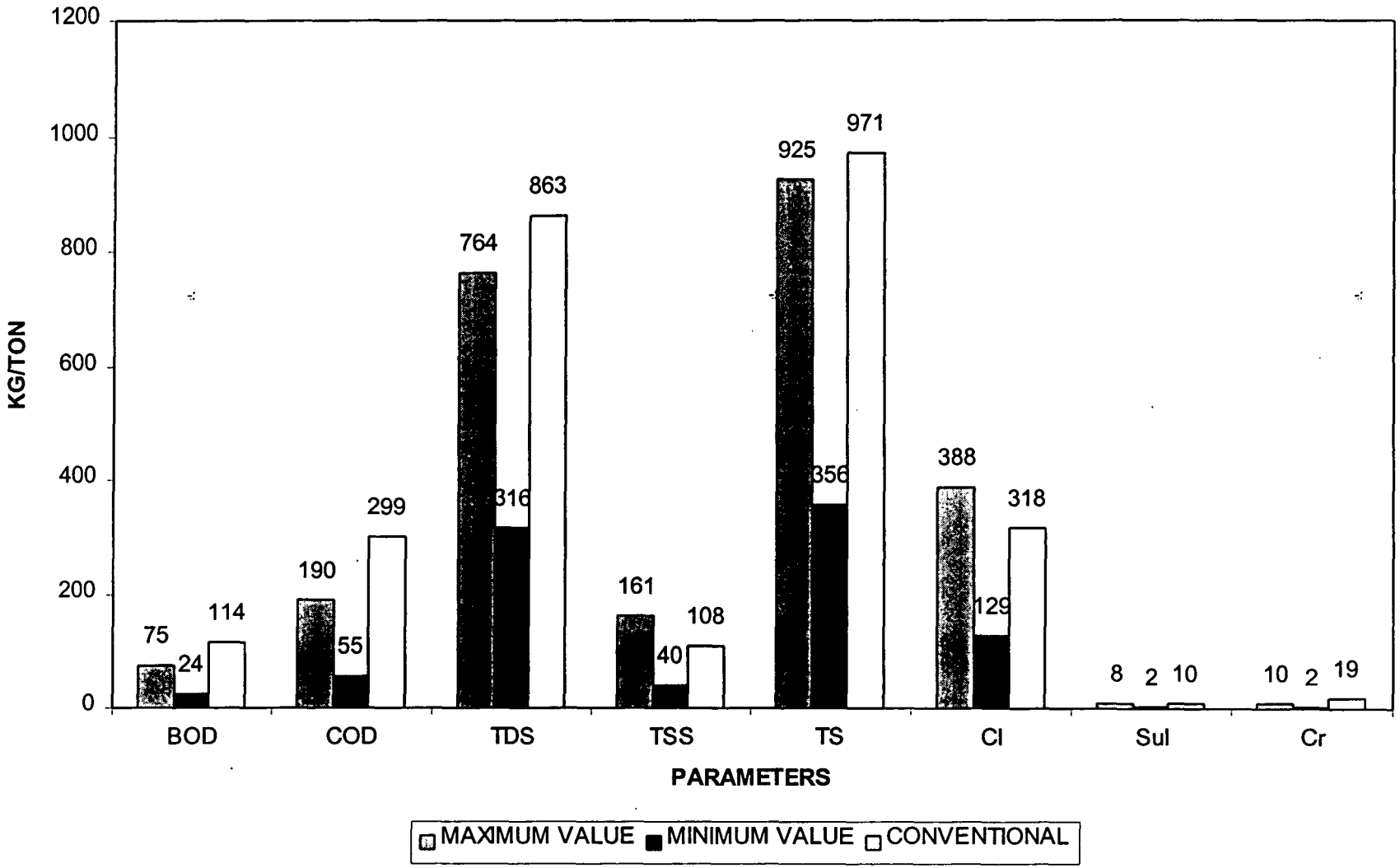
Other washings & wastages - 725%

Composite

BOD	2117	112.73
COD	5349	284.83
TDS	12551	668.34
TSS	1997	106.34
TS	14548	774.68
Cl	4258	226.74
Sul	214	11.40
Cr	234	12.46
SO_4	1542	82.11
N	89	4.74

BD002

COMPOSITE EMISSION LOAD FOR CONVENTIONAL PROCESS AS PRACTICED



BD002

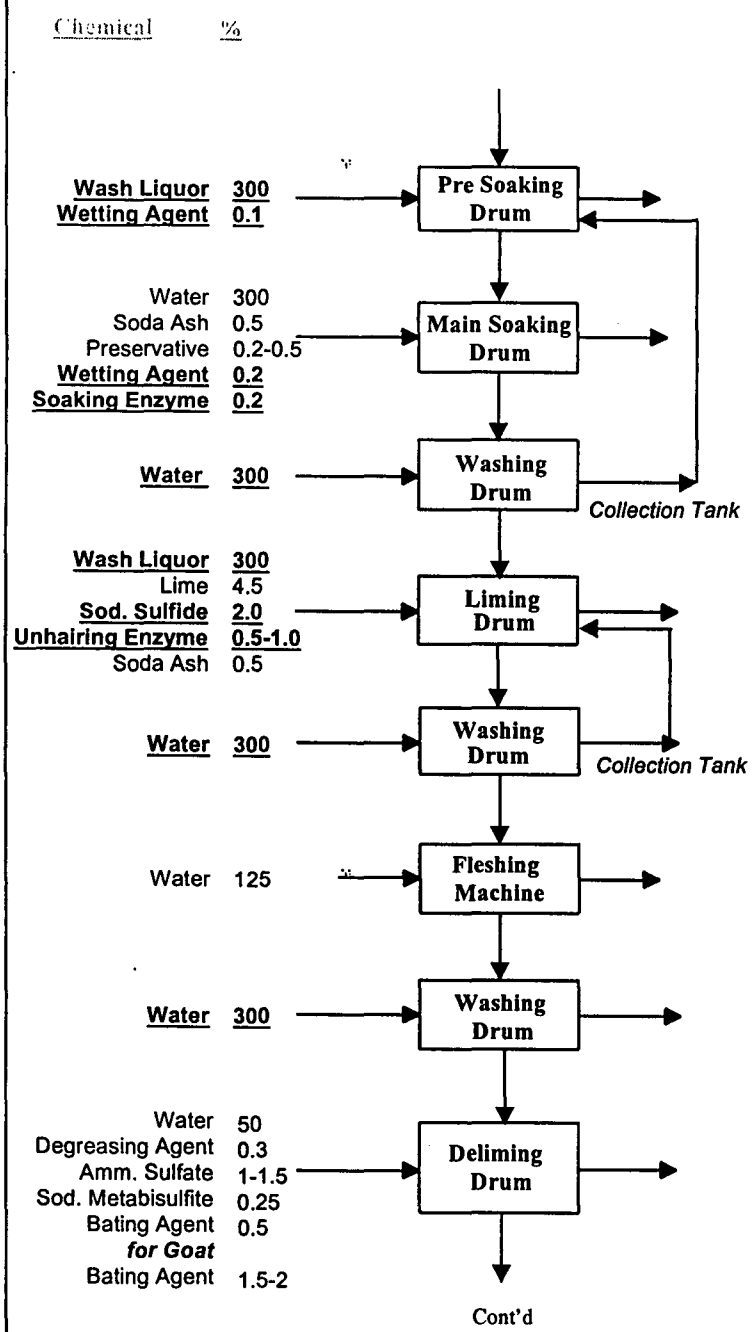
MODIFIED PROCESS FOR IMPLEMENTATION / DEMONSTRATION

6000 kg/day

Process : Cow hides/Goat skins Raw to Wet Blue - Finish

Batch : 1000 Kg

Raw Cow hides / Goat skins

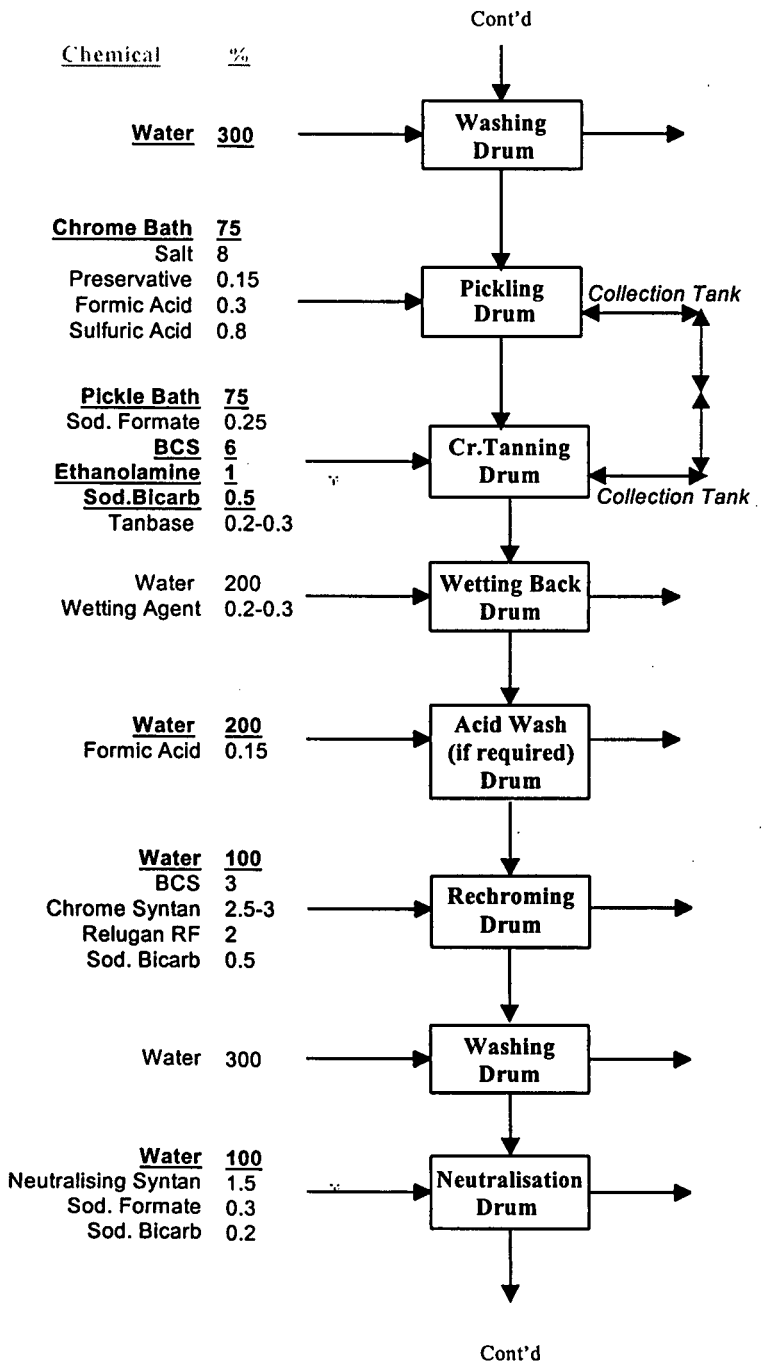


BD002

BD002	MODIFIED PROCESS FOR IMPLEMENTATION / DEMONSTRATION	6000 kg/day

Process : Cow hides/Goat skins Raw to Wet Blue - Finish

Batch : 1000 Kg



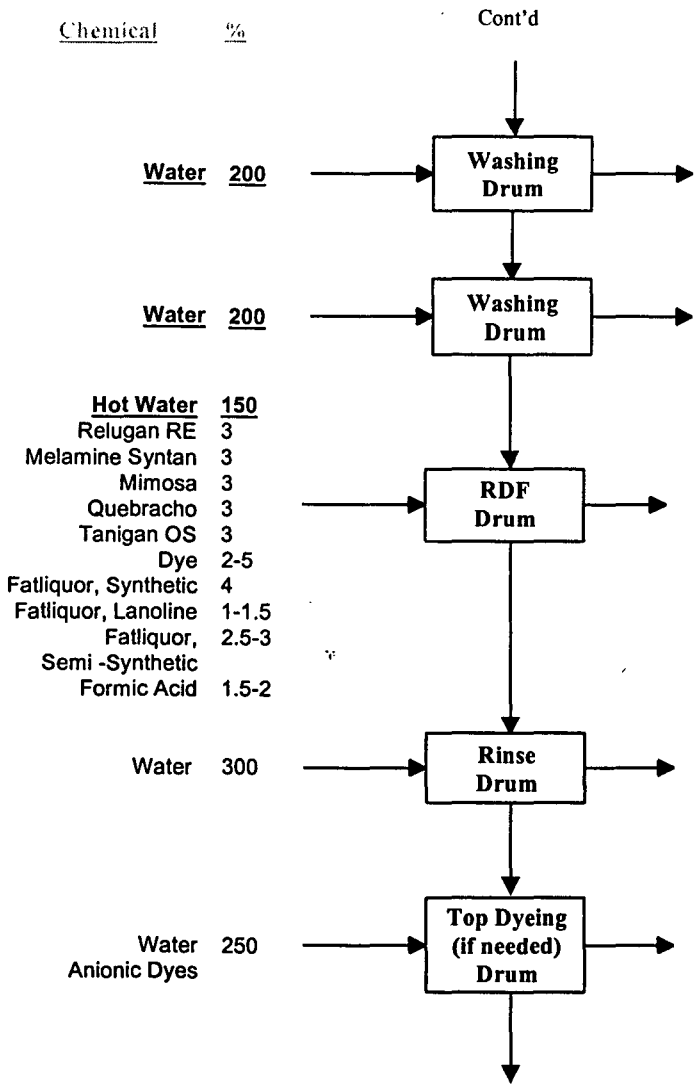
BD002

MODIFIED PROCESS FOR IMPLEMENTATION / DEMONSTRATION

6000 kg/day

Process : Cow hides/Goat skins Raw to Wet Blue - Finish

Batch : 1000 Kg



BD002

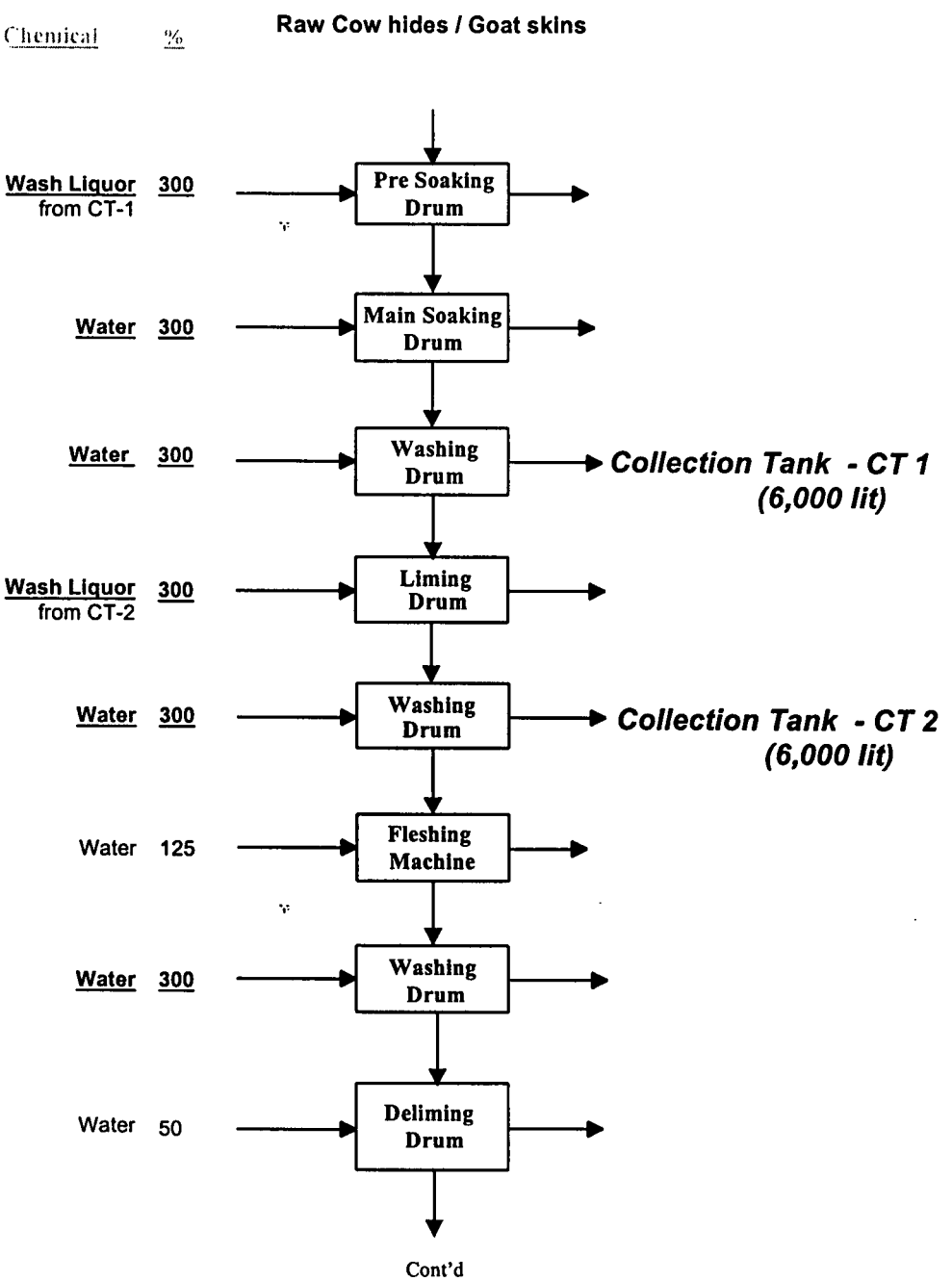
MODIFIED PROCESS FOR IMPLEMENTATION / DEMONSTRATION

6000 kg/day

Process : Cow hides / Goat skins Raw to Wet Blue - Finish

Batch : 1000 Kg

Water Flow Scheme / Recycle Scheme



BD002

BD002

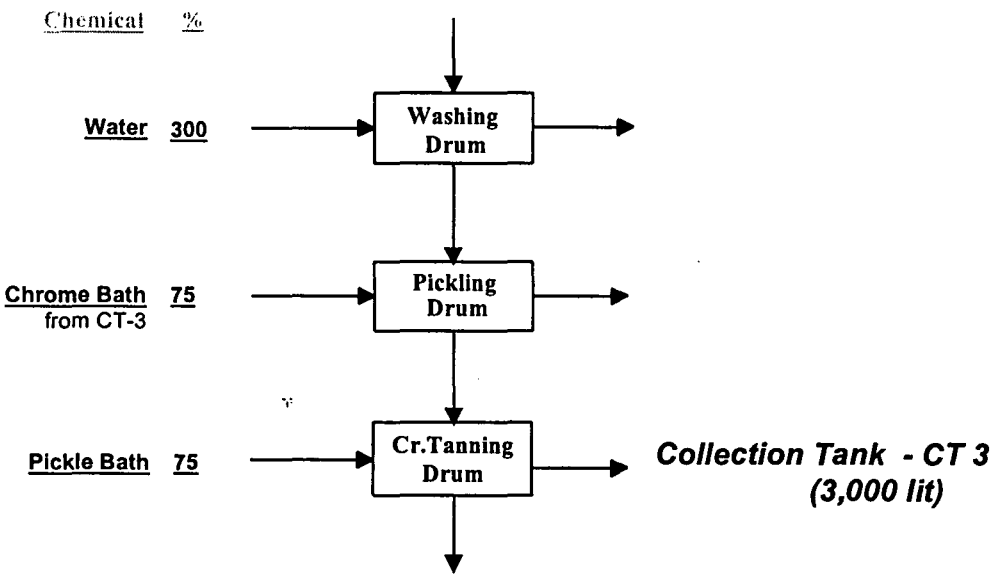
MODIFIED PROCESS FOR IMPLEMENTATION / DEMONSTRATION

6000 kg/day

Process : Cow hides / Goat skins Raw to Wet Blue - Finish

Batch : 1000 Kg

Cont'd



BD002

CHEMICAL REQUIREMENT FOR IMPLEMENTATION / DEMONSTRATION OF CLEANER TECHNOLOGIES IN THE TANNERY CLUSTER , AT HAZARIBAGH, DHAKA, BANGLADESH

BD002

LIST OF CHEMICALS CHEMICALS REQUIRED

Sl.No	Name	Requirement for 1000 kg lot size (kg)	Total Requirements (kg)	Suggested denomination of package
1.	Soaking Enzyme	2	10	
2.	Unhairing Enzyme	10	50	One bag of 50 kgs
3.	Ethanolamine	10	50	One carboy of 50 kgs

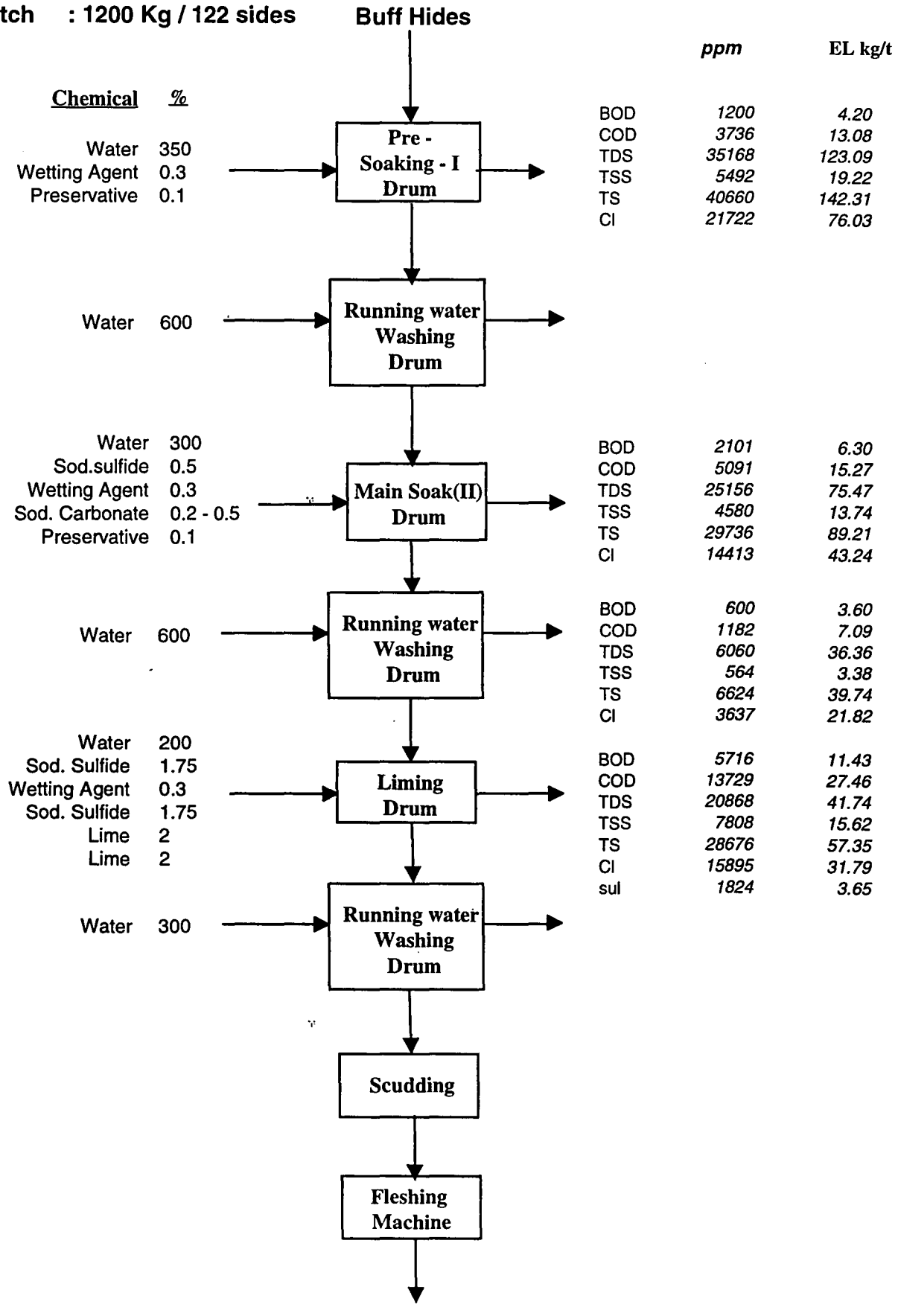
LIST OF EQUIPMENTS REQUIRED

Sl.No	Tannery	Hardware Proposed	Qty- Nos	Technical specification	Expected Benefits
1.	BD002	Liquor Collection Tanks for Soak Liquor for Lime Liquor for Chrome Liquor	 1 No. 1 No. 1 No.	Concrete. 6,000 lit capacity, 6,000 lit capacity, 3,000 lit capacity,	Reduction in hydraulic load to effluent
		Pumps	2 Nos		-do-
		Water Meter	3 Nos		-do-
		Modified Door for Drum	1 Nos		-do-
		Strainer in pipeline	5 Nos		
		Enzyme applicator	1 No		Reduction in sulfide load

BD002	CONVENTIONAL PROCESS AND EMISSION LOAD	6000 kg/day

Process : Buff Hides Raw to Wet Blue

Batch : 1200 Kg / 122 sides



Cont'd

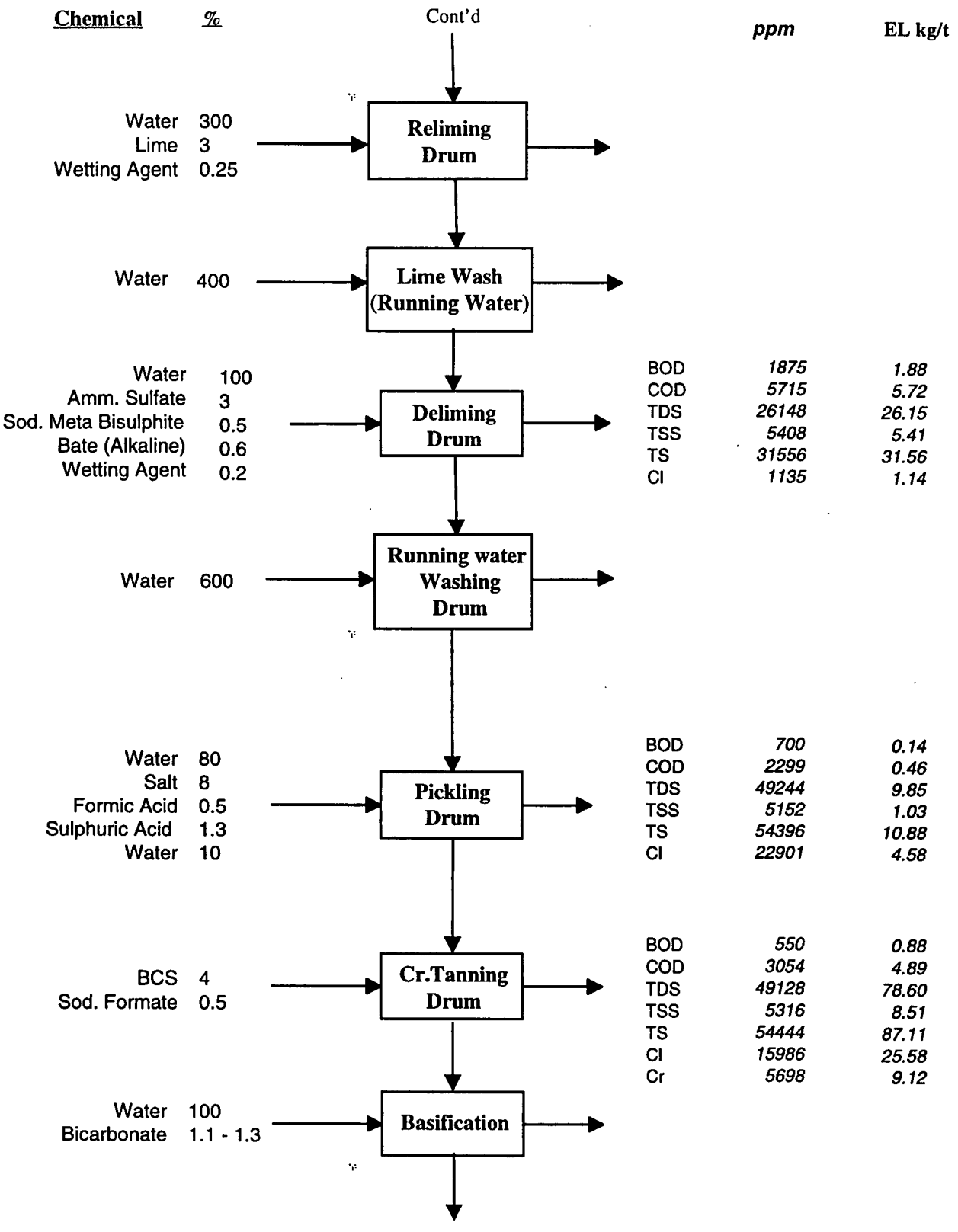
Phase - II

BD002_con

BD002	CONVENTIONAL PROCESS AND EMISSION LOAD	6000 kg/day

Process : Buff Hides Raw to Wet Blue

Batch : 1200 Kg / 122 sides



THE CLEANER TANNING PROCESS TECHNOLOGIES DEMONSTRAED AT HAZARIBAGH TANNING CLUSTER, DHAKA, BANGLADESH

Tannery Name: **CHOWDHURY LEATHER & CO LTD..**
Process: Raw to Wet Blue *(Conventional Process)*

Raw Material: Buff Hides
Lot Size/ No. Pieces: 1200 kg / 122 sides

Operation	Water/ Chemical	%	Run Time	Remarks
Pre-Soaking-I	Water	350		Measured using Flow meter
	Wetting Agent	0.3		
	Preservative	0.1	60 min	Rest 60 min
			30 min	Rest 30 min
Running Water Wash	Water	600	30 min	Flow rate of 240lit/min
Main Soak (II)	Water	300		
	Sodium Sulfide	0.5		
	Wetting agent	0.3		
	Sodium Carbonate	0.2/0.5		
	Preservative	0.1	60 min	Rest 60 min
				Run 5 min/hr. Up to next day Liming. (12 hrs) Ph 9.2-9.5
				Next day, run 30' Drain
Running Water Wash	Water	600	30 min	Drain
Liming	Water	200		
	Sodium Sulfide	1.75		
	Wetting Agent	0.3	60 min	Rest 30 min
	Sodium Sulfide	1.75	60 min	Rest 30 min
	Lime	2	30 min	Rest 30 min
	Lime	2	30 min	Rest 30 min
				Run 5 min/hr. Up to next day . Total 24 hrs. Drain
Running Water Wash	Water	300	30 min	120lit/min

Scudding				
Fleshing				Note the Pelt wt.
Reliming	Water	300		
	Lime	3		
	Wetting Agent	0.25		
			60 min	Rest 30 min. Run 5 min/hr. Up to next day. Total 12 hrs. Drain
Lime Wash (Running water)				
	Water	400	30 min	
Deliming	Water	100		
	Ammonium Sulfate	3		
	Sodium Meta Bisulphite	0.5	3 hrs	Check completion of Deliming. Drain 20%
	Bate (Alkaline)	0.6		
	Wetting Agent	0.2	90 min	Drain
Running Water Wash	Water	600	1 hr	120lit/min. Drain
Pickling	Water	80		
	Salt	8	20 min	
	Formic Acid - Water 25 lits.	0.5	30 min	
	Sulphuric Acid -Water 100 lits	1.3		3 feed at 30 min interval. After 3rd feed run for 2 hrs. Rest O/N. Next day, check pH; cross section pH 2.5-3.0.
				Drain 20%
Chrome Tanning	BCS	4		
	Sodium Formate	0.5	2 hrs	
Basification	+ Water	100		
	Bicarbonate -Water 50 lits	1.1-1.3		Add in 3 feeds at 30 minutes interval. Then run the drum for 2 hrs. Total duration 6 hrs.. pH 3.8.Drain &Pile

BD002

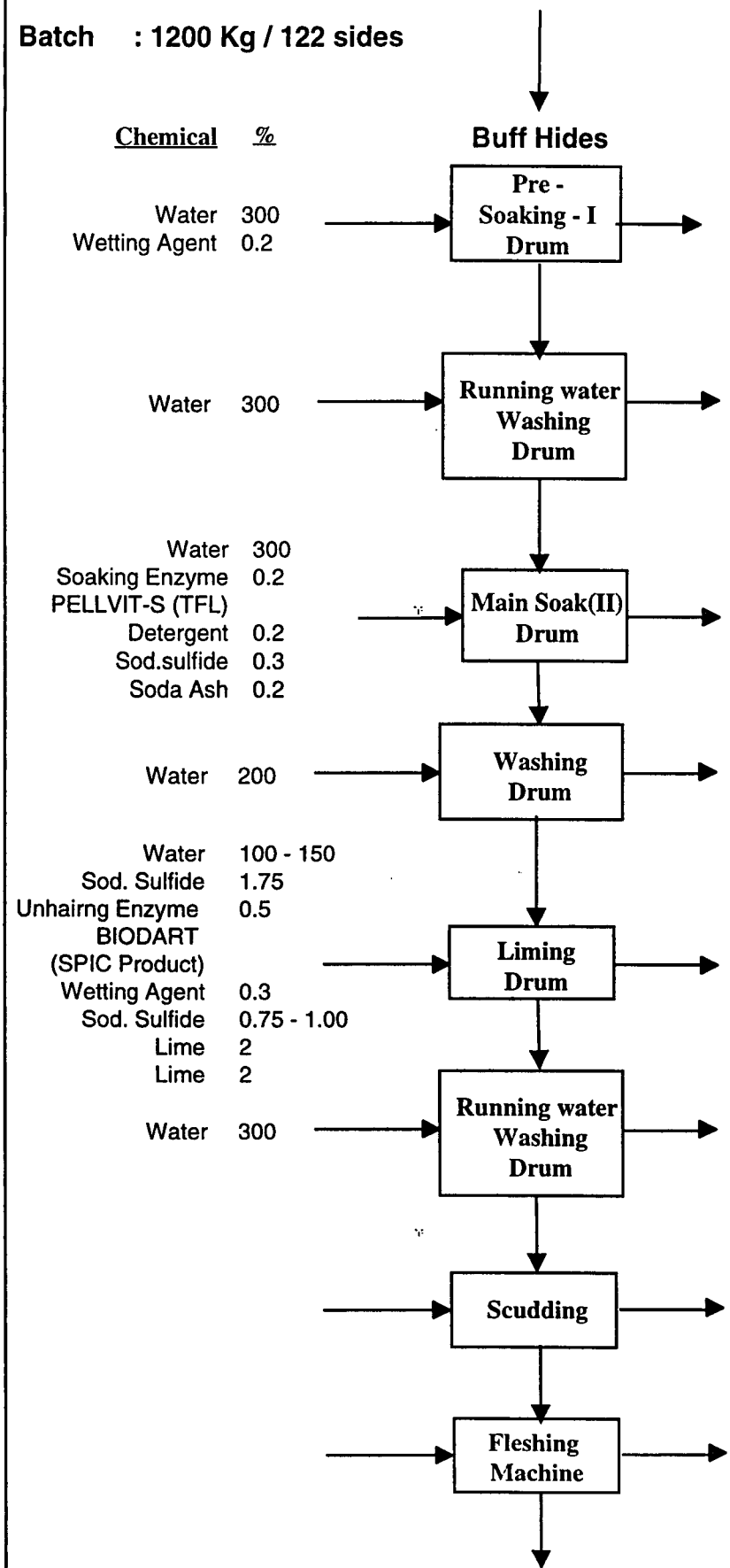
MODIFIED PROCESS FOR IMPLEMENTATION / DEMONSTRATION

6000 kg/day

Process : Buff Hides Raw to Wet Blue

Lot-1

Batch : 1200 Kg / 122 sides



Cont'd

Phase - II

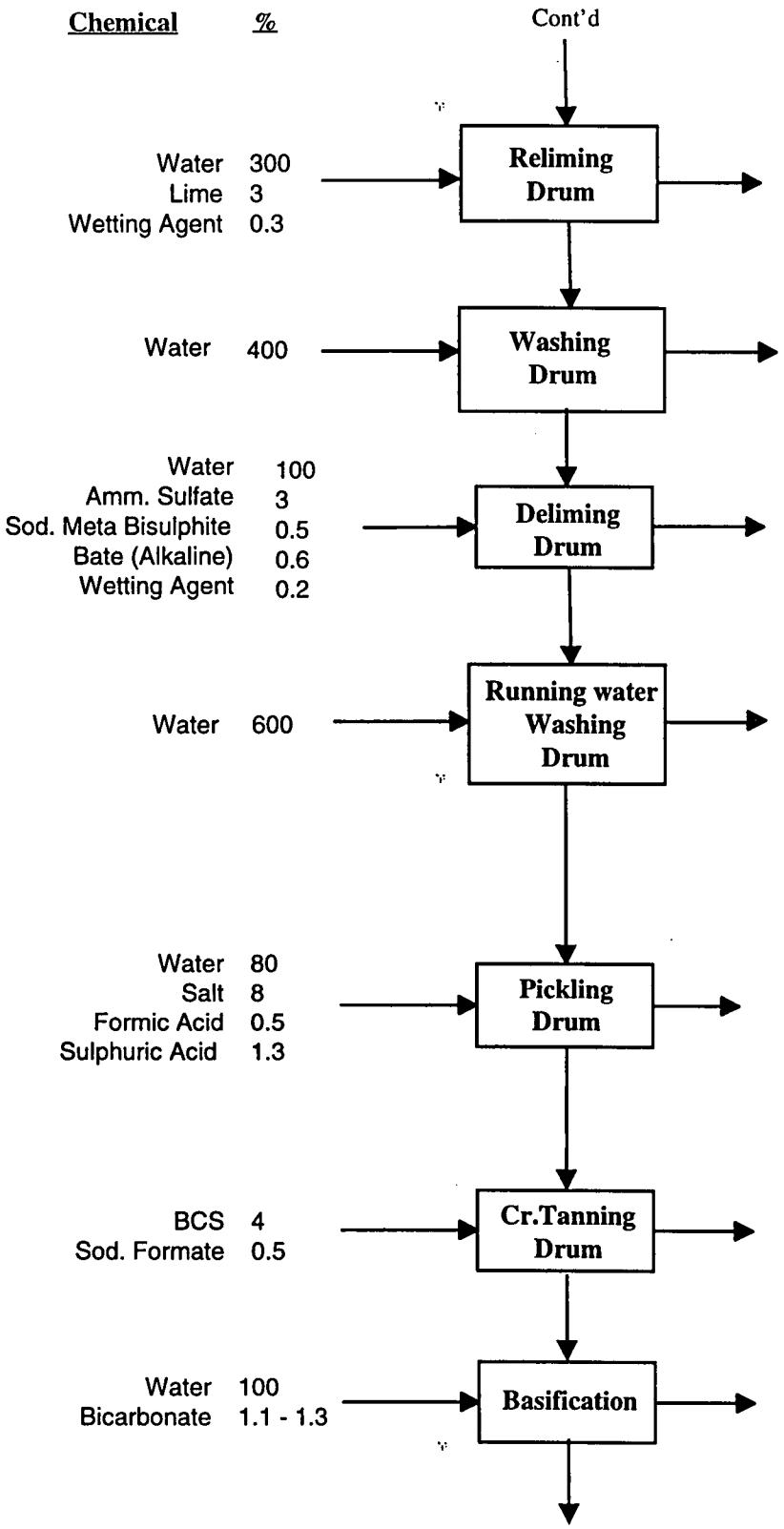
BD002_mod 1

MODIFIED PROCESS FOR IMPLEMENTATION / DEMONSTRATION

Process : Buff Hides Raw to Wet Blue

Batch : 1200 Kg / 122 sides

Lot-1



THE CLEANER TANNING PROCESS TECHNOLOGIES DEMONSTRAED AT HAZARIBAGH TANNING CLUSTER, DHAKA, BANGLADESH

Tannery Name: **CHOWDHURY LEATHER & CO LTD..**
Process: Buff Hides Raw to Wet Blue

Raw Material: Buff Hides ***(Experiment Lot 1)***
Lot Size/ No. Pieces: 1200 kg / 122 sides

Operation	Water/ Chemical	%	Run Time	Remarks
Pre-Soaking-I	Water	300		Measured. using flow meter.
	Wetting Agent	0.2	60 min	Rest 1hr, Run 30 min Drain.
Running Water Wash	Water	300	15 min	Flow rate of 240lit/min
Main Soak (III)	Water	300		
	Soaking Enzyme (TFL)	0.2		
	Detergent	0.2		
	Sodium Sulfide	0.3		
	Soda Ash	0.2	60 min	Rest 60 min . Run 5 min/hr. Up to next day Liming (Total 12 hrs)
				Next day run 5'. Drain
Washing	Water	200	15 min	Collect the liquor for recycling
Liming	Water	100-150		
	Sodium Sulfide	1.75		
	Unhairing Enzyme-BIODART (SPIC product)	0.5		
	Wetting Agent	0.3	60 min	Rest 30 min
	Sodium Sulfide	0.75-1.0	60 min	Rest 30 min
	Lime	2	30 min	Rest 30 min
	Lime	2	30 min	Rest 30 min
				Run 5 min/hr. Up to next day. Total 24 hrs. Drain

Running Water Wash	Water	300	30 min	120lit/min
Scudding				
Fleshing				Note the Pelt wt.
Reliming	Water	300		
	Lime	3		
	Wetting Agent	0.3	60 min	Rest 30 min. Run 5 min/hr. Up to next day. Total 12 hrs. Drain
Wash	Water	400	20 min	Collect the Liquor into the tank for reuse in Liming of next lot..
Deliming	Water	100		Measured
	Ammonium Sulfate	3		
	Sodium Meta Bisulphite	0.5	3 hrs	Check completion of deliming. Cut neutral to phenolphthalein. Drain 20%
	Bate (Alkaline)	0.6		
	Wetting Agent	0.2	90 min	Drain
Running Water Wash	Water	600	30 min	Drain; Repeat washing once more.
Pickling	Water	80		
	Salt	8	20 min	
	Formic Acid - Water 25 lits.	0.5	30 min	
	Sulphuric Acid -Water 100 lits	1.3	30 min	3 feed at 30 min interval. After 3rd feed run for 2 hrs. Rest O/N
				Next day check pH 2.8-3.0 Drain 20%
Chrome Tanning	BCS	4		
	Sodium Formate	0.5	2 hrs	
Basification	Water	100		
	Bicarbonate -Water 50 lits	1.1-1.3		Add in 3 feeds at 30 minutes interval. Then run the drum for 2 hrs. Total duration 6 hrs. pH 3.8-4.Drain &Pile

BD002

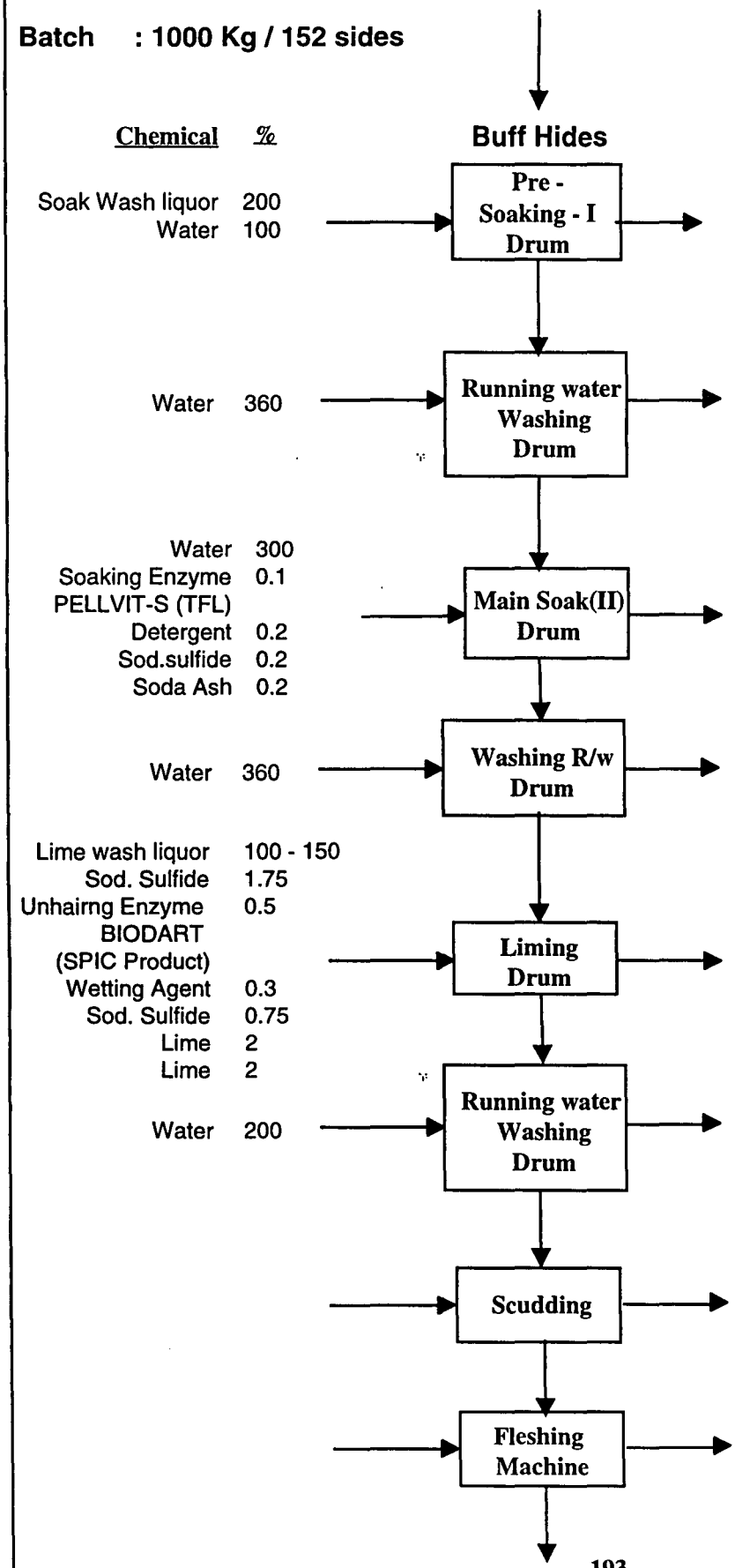
MODIFIED PROCESS FOR IMPLEMENTATION / DEMONSTRATION

6000 kg/day

Process : Buff Hides Raw to Wet Blue

Lot-2

Batch : 1000 Kg / 152 sides



Cont'd

Phase - II

BD002

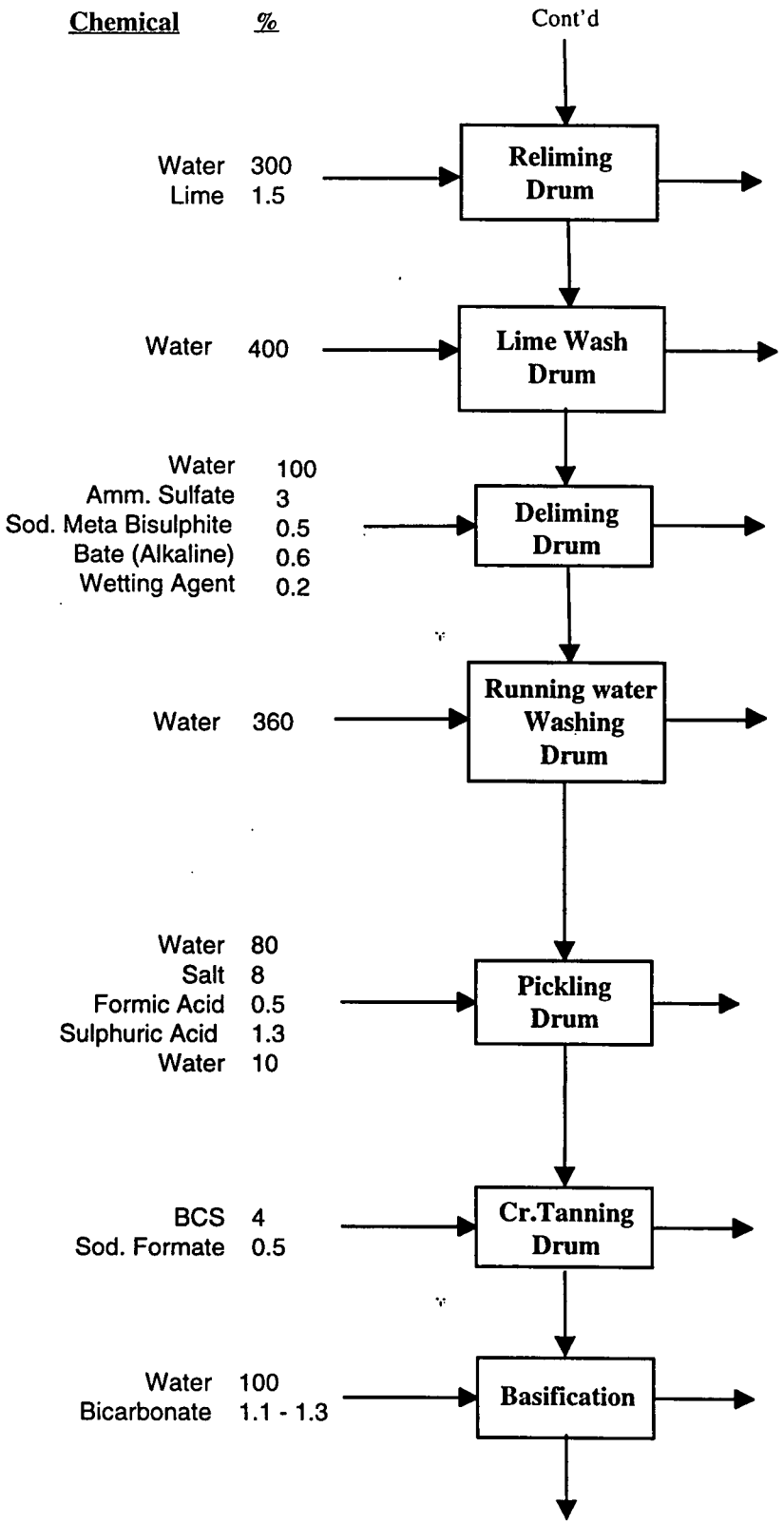
MODIFIED PROCESS FOR IMPLEMENTATION / DEMONSTRATION

6000 kg/day

Process : Buff Hides Raw to Wet Blue

Batch : 1000 Kg / 152 sides

Lot-2



Phase - II

BD002_mod 2

THE CLEANER TANNING PROCESS TECHNOLOGIES DEMONSTRAED AT HAZARIBAGH TANNING CLUSTER, DHAKA, BANGLADESH

Tannery Name: **CHOWDHURY LEATHER & CO LTD..**
Process: Buff Hides Raw to Wet Blue

Raw Material: Buff Hides ***(Experiment Lot 2)***
Lot Size/ No. Pieces: 1000 kg / 152 sides

Operation	Water/ Chemical	%	Run Time	**Remarks**
Pre-Soaking-I	Soak Wash Liquor from experiment 1.	200		Pumped from the collection tank.
	Water	100	60 min	Drain.
Running Water Wash	Water	360	15 min	240lit/min
Main Soak (II)	Water	300		
	Soaking Enzyme (TFL)	0.1		
	Detergent	0.2		
	Sodium Sulfide	0.2		
	Soda Ash	0.2	60 min	Stop 60 min . Run 5 min/hr. Up to next day Liming. (12 hrs)
				Next day Run 30' Drain
Washing R/w	Water	360	15 min	Drain. Can be collected for use in Presoaking
Liming	Lime wash Liquor	100-150		
	Sodium Sulfide	1.75		
	Unhairing Enzyme-BIODART (SPIC product)	0.5		
	Wetting Agent	0.3	60 min	Rest 30 min
	Sodium Sulfide	0.75	60 min	Rest 30 min
	Lime	2	30 min	Rest 30 min
	Lime	2	30 min	Rest 30 min
				Run 5 min/hr. Up to next day. Total 30 hrs. Drain

Running Water Wash	Water	200	15 min	120lit/min
Scudding				
Fleshing				Note the Pelt wt.
Reliming	Water	300		
	Lime	1.5		
			60 min	Total 12 hrs. Drain
Lime Wash	Water	400	20 min	Collect the Liquor for use in Liming.
Deliming	Water	100		Measured using flow meter
	Ammonium Sulfate	3		
	Sodium Meta Bisulphite	0.5	3 hrs	Check completion of deliming. Cut section neutral to phenolphthalein. Drain 20%
	Bate (Alkaline)	0.6		
	Wetting Agent	0.2	90 min	Drain
Running Water Wash	Water	360	30 min	Drain and wash once more.
Pickling	Water	80		Measured using flow meter.
	Salt	8	20 min	
	Formic Acid -Water 25 lits.	0.5	30 min	
	Sulphuric Acid -Water 100 lits	1.3		3 feeds at 30 min interval. After 3rd feed run for 2 hrs. Rest O/N.
				Next day, check pH. 2.8-3 Drain 20%
Chrome Tanning	BCS	4		
	Sodium Formate	0.5	2 hrs	
Basification	+ Water	100		
	Bicarbonate -Water 50 lits	1.1-1.3		Add in 3 feeds at 30 minutes interval. Then run the drum for 2 hr hrs. Total duration 6 hrs. pH 3.8-4. Drain &Pile

BD002

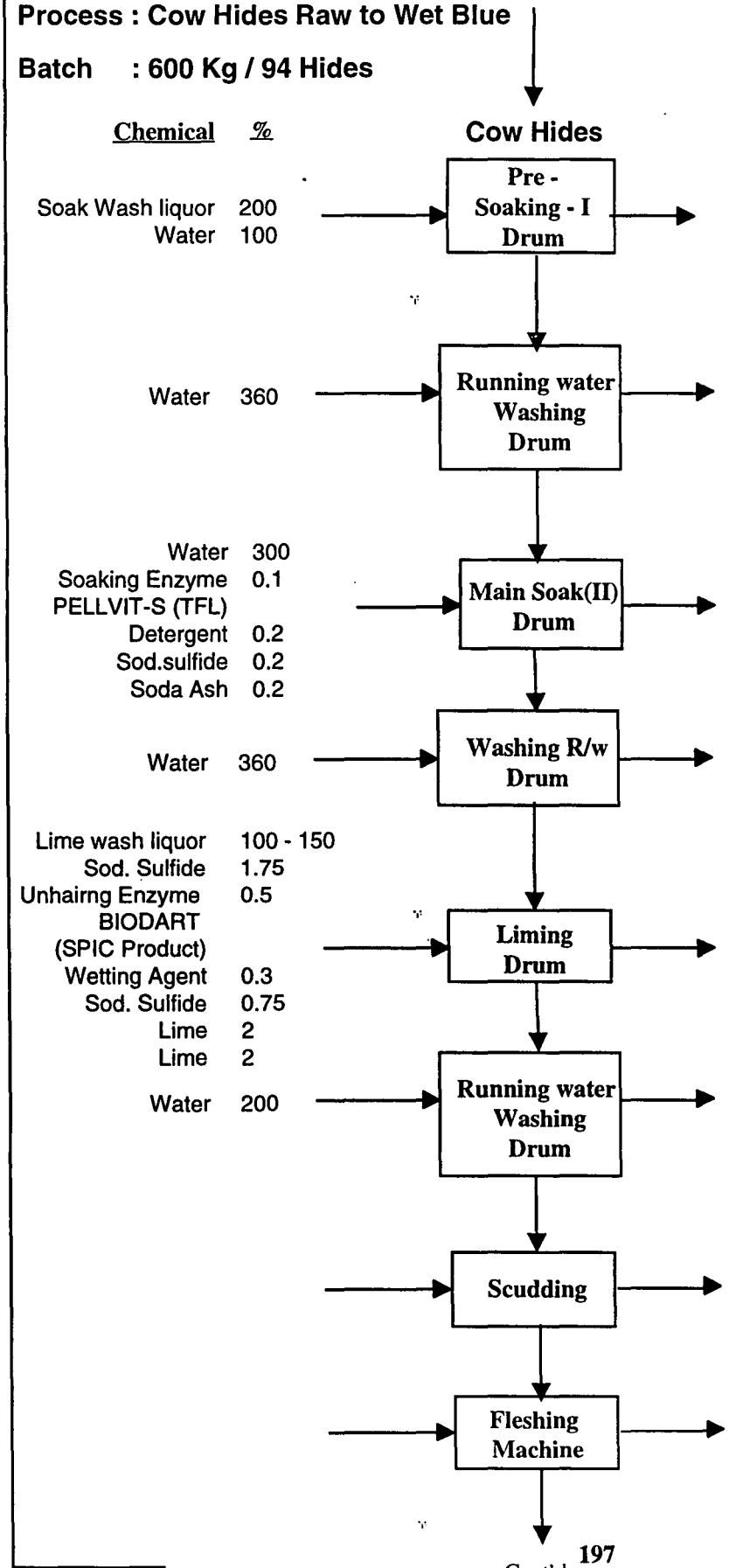
HIGH EXHAUST CHROME TANNING
MODIFIED PROCESS FOR IMPLEMENTATION / DEMONSTRATION

6000 kg/day

Lot-3

Process : Cow Hides Raw to Wet Blue

Batch : 600 Kg / 94 Hides



Cont'd

Phase - II

BD002_mod 3

BD002

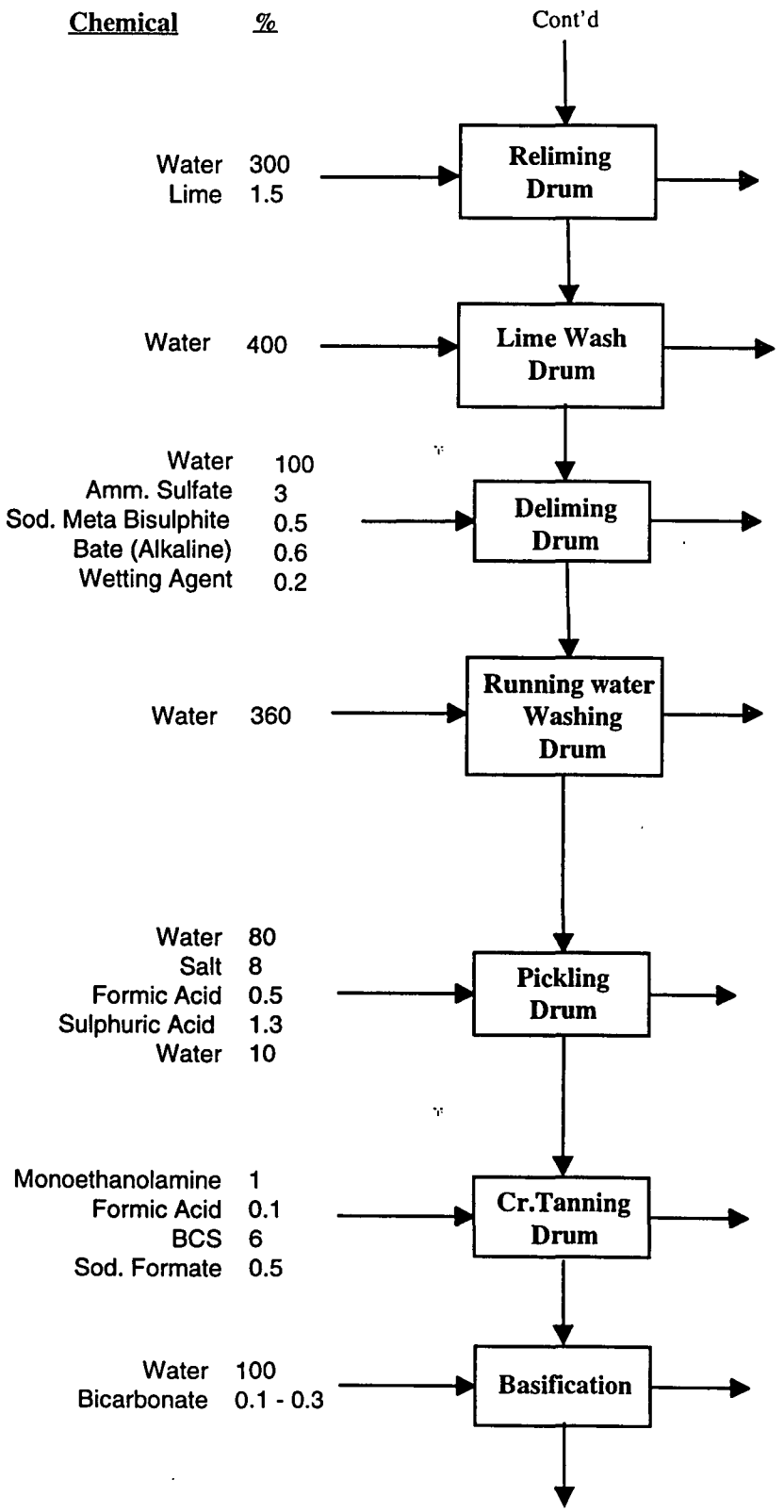
HIGH EXHAUST CHROME TANNING MODIFIED PROCESS FOR IMPLEMENTATION / DEMONSTRATION

6000 kg/day

Lot-3

Process : Cow Hides Raw to Wet Blue

Batch : 600 Kg / 94 Hides



Phase - II

THE CLEANER TANNING PROCESS TECHNOLOGIES DEMONSTRAED AT HAZARIBAGH TANNING CLUSTER, DHAKA, BANGLADESH

Tannery Name: **CHOWDHURY LEATHER & CO LTD..**
Process: Buff Hides Raw to Wet Blue
(High Exhaust chrome tanning with Monoethanolamine with Chrome Liquor Recycle Process)
(Upto Deliming and bating, processed in the conventional way as is done in the tannery)

Operation	Water/ Chemical	%	Run Time	**Remarks**
Pre-Soaking-I	Water	350		Measured using flow meter
	Wetting Agent	0.3		
	Preservative	0.1	60 min	Rest 60 min
			30 min	Rest 30 min. Drain
Running Water Wash	Water	600	30 min	240lit/min. Drain
Main Soak (II)	Water	300		
	Sodium Sulfide	0.5		
	Wetting agent	0.3		
	Sodium Carbonate	0.2/0.5		
	Preservative	0.1	60 min	Rest 60 min
				Run 5 min/hr. Up to next day Liming. (12 hrs) Ph 9.2-9.5
				next day run 30' Drain
Washing R/w	Water	300	30 min	Drain
Liming	Water	200		
	Sodium Sulfide	1.75		
	Wetting Agent	0.3	60 min	Rest 30 min
	Sodium Sulfide	1.75	60 min	Rest 30 min
	Lime	2	30 min	Rest 30 min
	Lime	2	30 min	Rest 30 min
				Run 5 min/hr. Up to next day Total 24 hrs. Drain
Running Water Wash	Water	300	30 min	120lit/min. Drain
Scudding				
Fleshing				Note the Pelt wt.

Reliming	Water	300		
	Lime	3		
	Wetting Agent	0.25		
			60 min	Rest 30 min. Run 5 min/hr. Up to next day. Total 12 hrs. Drain
Lime Wash R/w	Water	400	30 min	Drain
Deliming	Water	100		
	Ammónium Sulfate	3		
	Sodium Meta Bisulphite	**0.5**	**3 hrs**	**Check completion of deliming. Cut section neutral to phenolphthalein in even thick and compact regions of the hides. Drain 20%**
	Bate (Alkaline)	0.6		
	Wetting Agent	0.2	90 min	Drain
Running Water Wash	Water	200	1 hr	Drain
Pickling	Spent Chrome Liquor from high exhaust tanning using monoethanolamine.	70		
	Formic Acid	0.25		Already mixed and aged O/N
	Salt	6	10 min	Be° 7
	Sulphuric Acid Spent Chrome Liquor 12%	1.2	15 min	3 feed at 15 min interval. After 3rd feed run for 4 hrs. Check pH 3.2-3.4 in even thick and compact regions of the hides. Leave O/N
				Next day . . Check pH 3.2-3.4
	Monoethanolamine	0.7	90 min	
	Formic Acid	0.1	5 min	pH 3.6
Chrome Tanning	BCS	6	4-5 hrs	Up to complete penetration. pH 3.3-3.4
	Bicarbonate	0.35	60 min	2 Feeds at 30 min interval. Finally run for 2 hrs. Total duration 6 hrs. Check pH 3.8
				Collect the liquor for pickling of next lot.

BD002

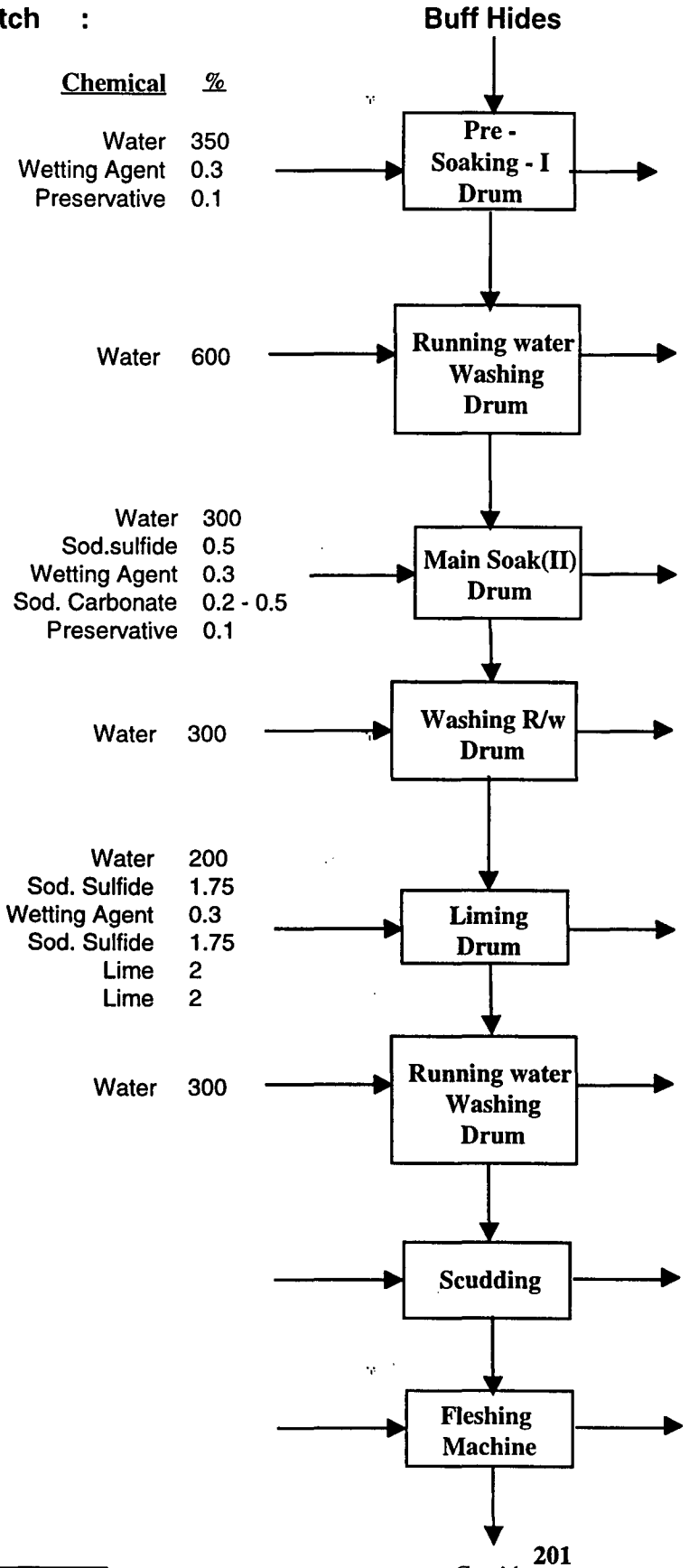
HIGH EXHAUST CHROME TANNING MODIFIED PROCESS FOR IMPLEMENTATION / DEMONSTRATION

6000 kg/day

Lot-4

Process : Buff Hides Raw to Wet Blue

Batch :



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Phase - II

BD002

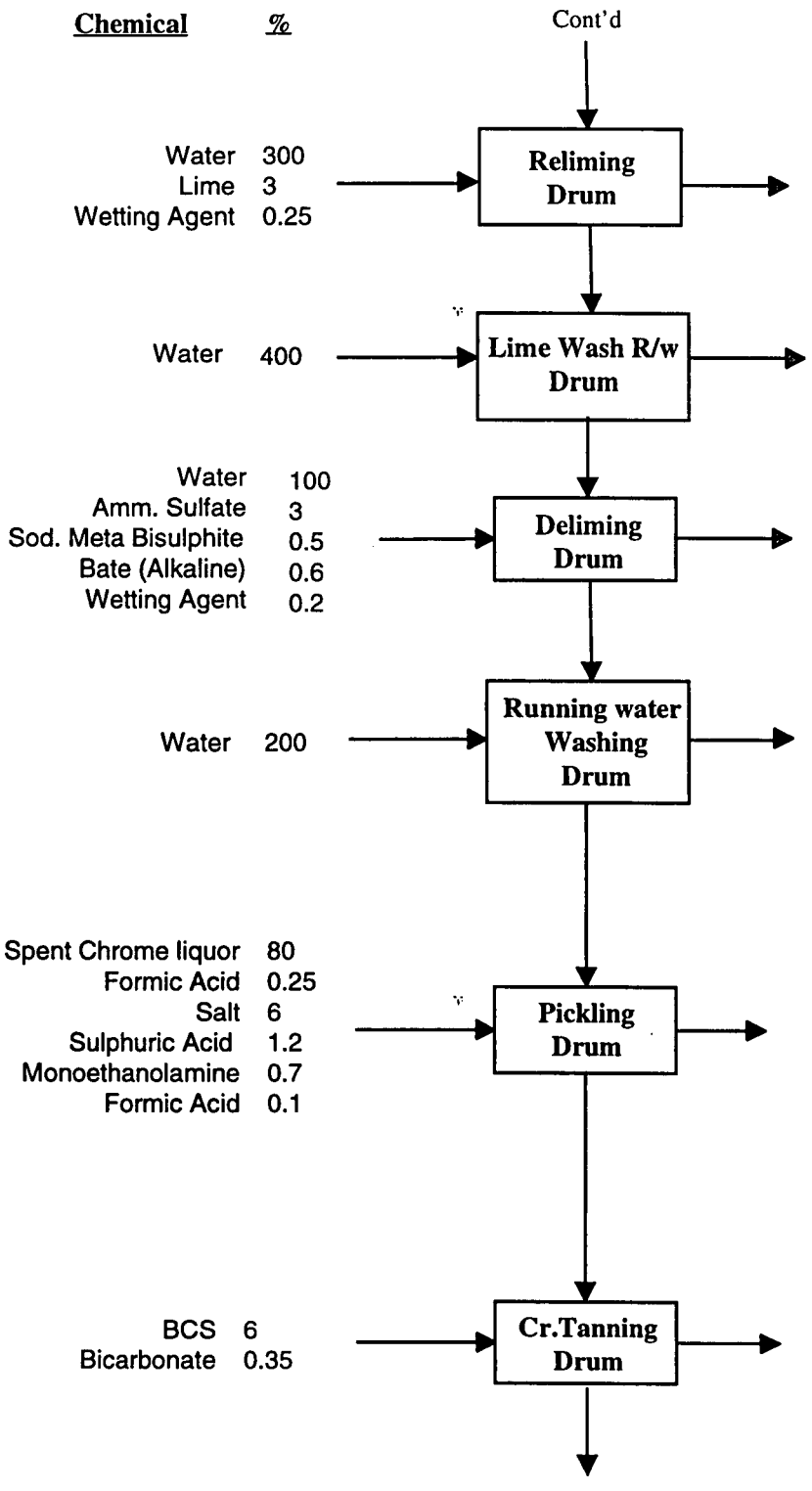
HIGH EXHAUST CHROME TANNING MODIFIED PROCESS FOR IMPLEMENTATION / DEMONSTRATION

6000 kg/day

Lot-4

Process : Buff Hides Raw to Wet Blue

Batch :



THE CLEANER TANNING PROCESS TECHNOLOGIES DEMONSTRAED AT HAZARIBAGH TANNING CLUSTER, DHAKA, BANGLADESH

Tannery Name: **CHOWDHURY LEATHER & CO LTD..**
Process: Buff Hides Raw to Wet Blue

Raw Material: Buff Hides ***(High Exhaust Chrome tanning using Monoethanolamine)***
Lot Size/ No. Pieces: 600 Kg/94 Hides

(Upto deliming and bating, the process is the same as is being done in the conventional processing)

Operation	Water/ Chemical	%	Run Time	**Remarks**
Pre-Soaking-I	Soak Wash Liquor from experiment 1.	200		Pumped from the collection tank.
	Water	100	60 min	Drain.
Running Water Wash	Water	360	15 min	240lit/min
Main Soak (II)	Water	300		
	Soaking Enzyme (TFL)	0.1		
	Detergent	0.2		
	Sodium Sulfide	0.2		
	Soda Ash	0.2	60 min	Stop 60 min . Run 5 min/hr. Up to next day Liming. (12 hrs)
				Next day Run 30' Drain
Washing R/w	Water	360	15 min	Drain. Can be collected for use in Presoaking
Liming	Lime wash Liquor	100-150		
	Sodium Sulfide	1.75		
	Unhairing Enzyme-BIODART (SPIC product)	0.5		
	Wetting Agent	0.3	60 min	Rest 30 min
	Sodium Sulfide	0.75	60 min	Rest 30 min
	Lime	2	30 min	Rest 30 min

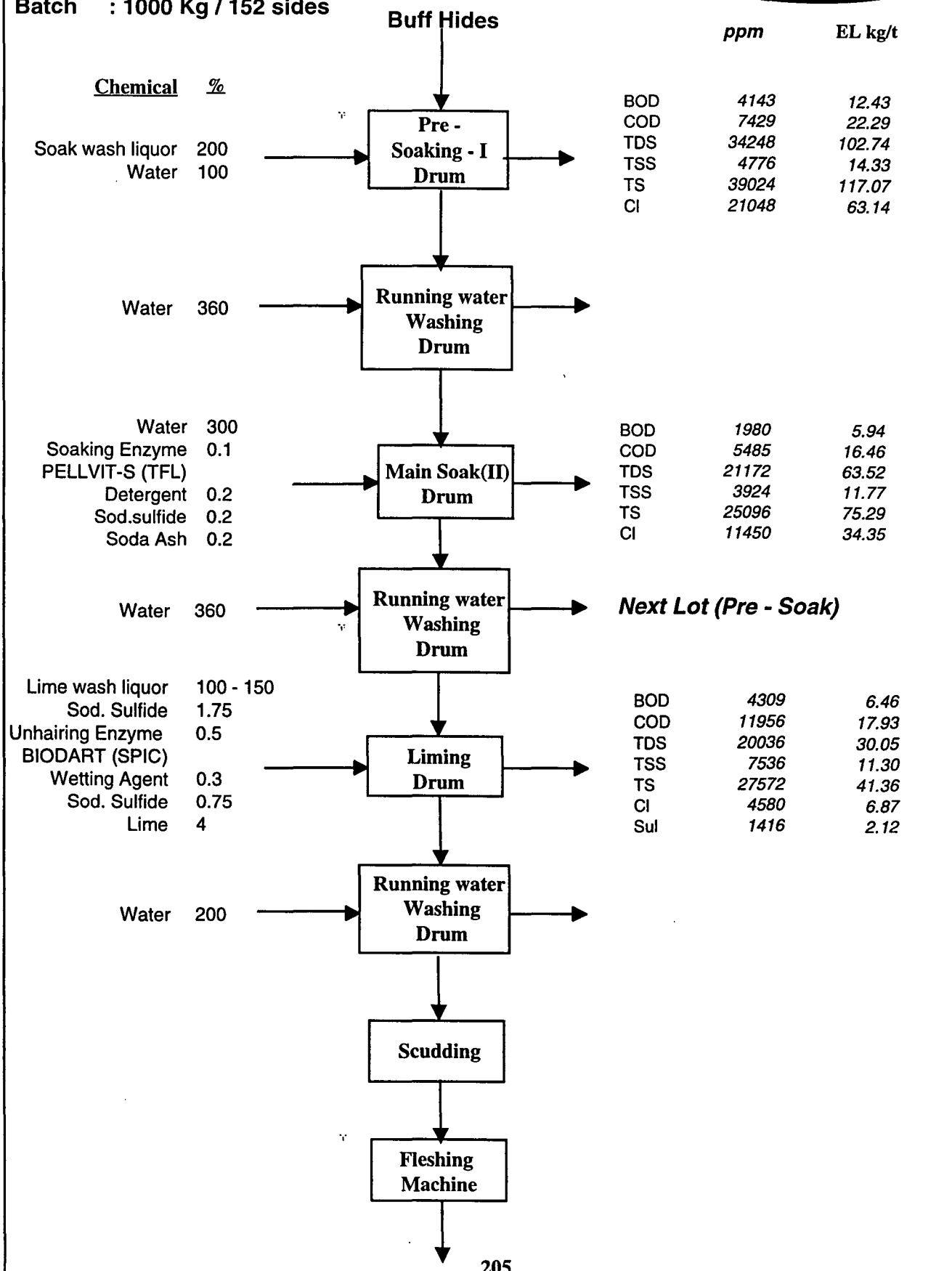
	Lime	2	30 min	Rest 30 min
				Run 5 min/hr. Up to next day. Total 30 hrs. Drain
Running Water Wash	Water	200	15 min	120lit/min
Scudding				
Fleshing				Note the Pelt wt.
Reliming	Water	300		
	Lime	1.5		
			60 min	Total 12 hrs. Drain
Lime Wash	Water	400	20 min	Collect the Liquor for use in Liming.
Deliming	Water	100		Measured using flow meter
	Ammonium Sulfate	3		
	Sodium Meta Bisulphite	0.5	3 hrs	Check completion of deliming. Cut section neutral to phenolphthalein. Drain 20%
	Bate (Alkaline)	0.6		
	Wetting Agent	0.2	90 min	Drain
Running Water Wash	Water	360	30 min	Drain and wash once more.
Pickling	Water	80		Measured using flow meter.
	Salt	8	20 min	
	Formic Acid -Water 25 lits.	0.5	30 min	
	Sulphuric Acid -Water 100 lits	1.3		3 feeds at 30 min interval. After 3rd feed run for 2 hrs. Rest O/N.
				Next day, check pH. 2.8-3 Drain 20%
Chrome Tanning	BCS	4		
	Sodium Formate	0.5	2 hrs	
Basification	+ Water	100		
	Bicarbonate -Water 50 lits	1.1-1.3		Add in 3 feeds at 30 minutes interval. Then run the drum for 2 hr hrs. Total duration 6 hrs. pH 3.8-4. Drain &Pile

BD002	MODIFIED / IMPLEMENTED PROCESS AND EMISSION LOAD	6000 kg/day

Process : Buff Hides Raw to Wet Blue

ALL TECHNOLOGY

Batch : 1000 Kg / 152 sides



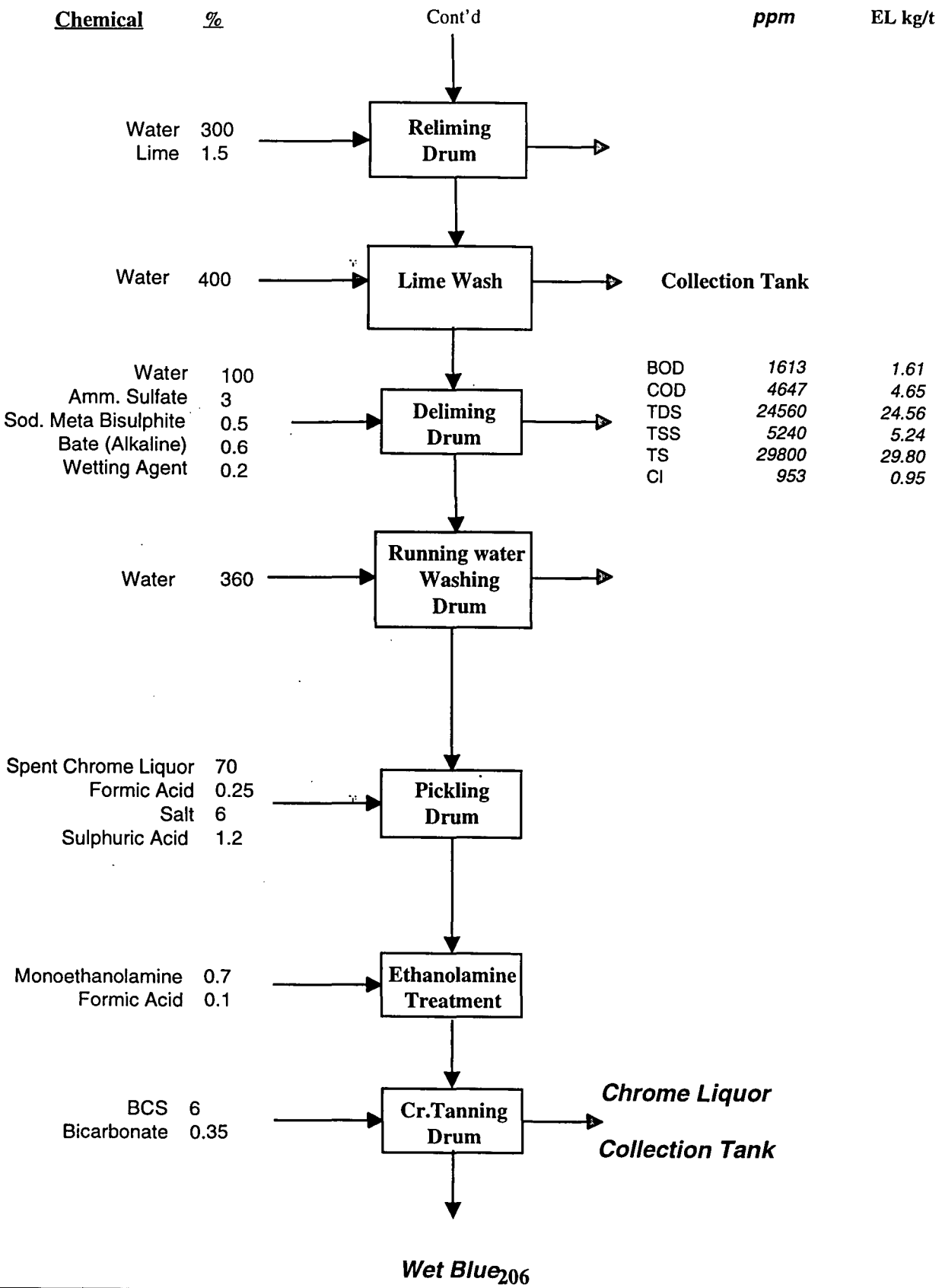
Phase - II

BD002 | MODIFIED / IMPLEMENTED PROCESS AND EMISSION LOAD | 6000 kg/day

Process : Buff Hides Raw to Wet Blue

Batch : 1200 Kg / 122 sides

ALL TECHNOLOGY



Phase - II

BD002_all

THE CLEANER TANNING PROCESS TECHNOLOGIES DEMONSTRAED AT HAZARIBAGH TANNING CLUSTER, DHAKA, BANGLADESH

Tannery Name: **CHOWDHURY LEATHER & CO LTD..**
Process: Buff Hides Raw to Wet Blue

Raw Material: Buff Hides***(SK , LM reuse & Enzyme, PK -CT Liq. & CT with MEA)***
Lot Size/ No. Pieces: 1000 kg / 152 sides

Operation	Water/ Chemical	%	Run Time	**Remarks**
Pre-Soaking-I	Soak Wash Liquor from experiment 1.	200		Pumped from the collection tank.
	Water	100	60 min	Drain.
Running Water Wash	Water	360	15 min	240lit/min
Main Soak (II)	Water	300		
	Soaking Enzyme (TFL)	0.1		
	Detergent	0.2		
	Sodium Sulfide	0.2		
	Soda Ash	0.2	60 min	Stop 60 min . Run 5 min/hr. Up to next day Liming. (12 hrs)
				Next day Run 30' Drain
Washing R/w	Water	360	15 min	Drain. Can be collected for use in Presoaking
Liming	Lime wash Liquor	100-150		
	Sodium Sulfide	1.75		
	Unhairing Enzyme-BIODART (SPIC product)	0.5		
	Wetting Agent	0.3	60 min	Rest 30 min
	Sodium Sulfide	0.75	60 min	Rest 30 min
	Lime	2	30 min	Rest 30 min
	Lime	2	30 min	Rest 30 min
				Run 5 min/hr. Up to next day. Total 30 hrs. Drain

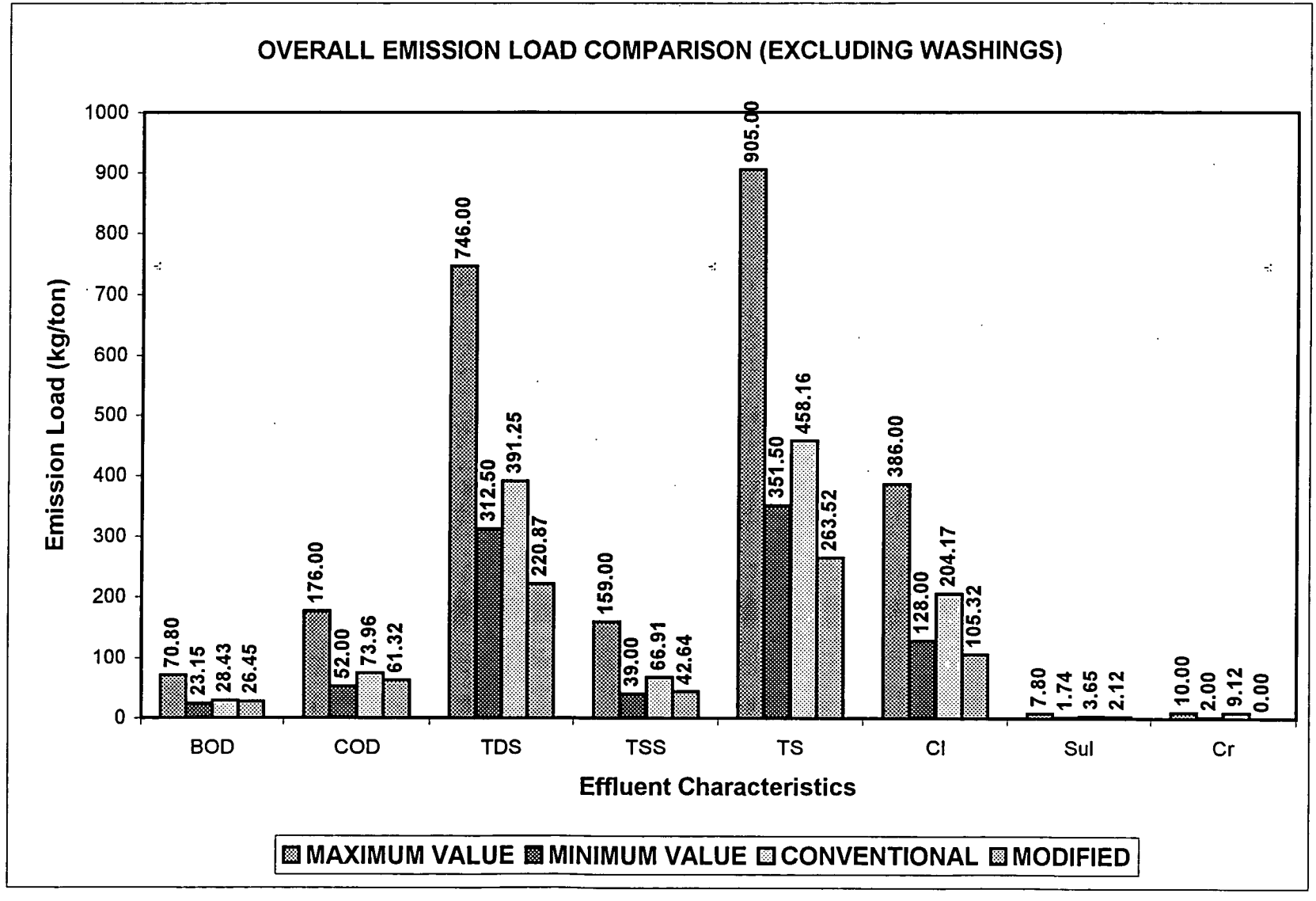
Running Water Wash	Water	200	15 min	120lit/min
Scudding				
Fleshing				Note the Pelt wt.
Reliming	Water	300		
	Lime	1.5		
			60 min	Total 12 hrs. Drain
Lime Wash	Water	400	20 min	Collect the Liquor for use in Liming.
Deliming	Water	100		Measured using flow meter
	Ammonium Sulfate	3		
	Sodium Meta Bisulphite	0.5	3 hrs	Check completion of deliming. Cut section neutral to phenolphthalein. Drain 20%
	Bate (Alkaline)	0.6		
	Wetting Agent	0.2	90 min	Drain
Running Water Wash	Water	360	30 min	Drain and wash once more.
Pickling	Spent Chrome Liquor from high exhaust tanning using monoethanolamine.	70		
	Formic Acid	0.25		Already mixed and aged O/N
	Salt	6	10 min	Be° 7
	Sulphuric Acid Spent Chrome Liquor 12%	1.2	15 min	3 feed at 15 min interval. After 3rd feed run for 4 hrs. Check pH 3.2-3.4 in even thick and compact regions of the hides. Leave O/N
				Next day . . Check pH 3.2-3.4
	Monoethanolamine	0.7	90 min	
	Formic Acid	0.1	5 min	pH 3.6
Chrome Tanning	BCS	6	4-5 hrs	Up to complete penetration. pH 3.3-3.4
	Bicarbonate	0.35	60 min	2 Feeds at 30 min interval. Finally run for 2 hrs. Total duration 6 hrs. Check pH 3.8
				Collect the liquor for pickling of next lot.

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	12.50	14.10	35.44	234.92	36.35	271.26	141.09		
	M	6.00	18.37	38.74	166.26	26.10	192.36	97.49		
	D %	-52.00	30.25	9.31	-29.23	-28.19	-29.09	-30.90		
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	11.43	27.46	41.74	15.62	57.35	31.79	3.65	
	M	1.50	6.46	17.93	30.05	11.30	41.36	6.87	2.12	
	D %	-25.00	-43.46	-34.69	-27.99	-27.61	-27.89	-78.39	-41.78	
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**		
	C	1.00	1.88	5.72	26.15	5.41	31.56	1.14		
	M	1.00	1.61	4.65	24.56	5.24	29.80	0.95		
	D %	0.00	-13.97	-18.69	-6.07	-3.11	-5.56	-16.04		
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	0.20	0.14	0.46	9.85	1.03	10.88	4.58		
	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		
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	1.60	0.88	4.89	78.60	8.51	87.11	25.58		9.12
	M*	0.00	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		-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**	**2 - 10**
(Excluding	C	17.30	28.43	73.96	391.25	66.91	458.16	204.17	3.65	9.12
Washings)	M	8.50	26.45	61.32	220.87	42.64	263.52	105.32	2.12	0.00
	D %	***-50.87***	***-6.98***	***-17.09***	***-43.55***	***-36.26***	***-42.48***	***-48.42***	***-41.78***	***-100.00***

T: Traditional C : Conventional M : Modified D : Difference

* Pickling & Chrome Tanning Close Loop ,


OVERALL EMISSION LOAD COMPARISON (EXCLUDING WASHINGS)
Emission Load (kg/ton)
1000
900
800
700
600
500
400
300
200
100
0
70.80
23.15
28.43
26.45
176.00
52.00
73.96
61.32
746.00
312.50
391.25
220.87
159.00
39.00
66.91
42.64
905.00
351.50
458.16
263.52
386.00
128.00
204.17
105.32
7.80
1.74
3.65
2.12
10.00
2.00
9.12
0.00
BOD
COD
TDS
TSS
TS
Cl
Sul
Cr
Effluent Characteristics
MAXIMUM VALUE
MINIMUM VALUE
CONVENTIONAL
MODIFIED

Good housekeeping practices at Chowdhury Leather

1. Walk-through survey

Criteria	Finding	Proposed follow-up action
1. Safety of machinery and equipment		
1.1 Placement and access to machines	High walls of catchment areas obstruct easy access to drums in the beamhouse.	Provide better steps on both sides of the wall.
	Machines in the semi-finished to finished production are easily accessible.	
	One pneumatic mount of vibration staking machine is broken and has been replaced by a rubber ring. As this makeshift does not absorb vibration effectively, both concrete floor and machine will be damaged after some time.	Replace and reconnect broken pneumatic vibration mount.
1.2 Guarding of moving and hazardous machine parts	The newly imported machinery, mostly used in the finishing processes, by and large meet international safety requirements in terms of proper positioning, availability of passive and active guards, placement and labelling of control buttons, dials and switches.	
	Local machinery (drums, fleshing machine) mostly used in raw-to-semi finished production, are without passive and active guards.	Install fence type covers and guards around motors, drive and gear mechanisms of drums and fleshing machines.
	Commonly one motor is used to drive two to three drums, using a flat-belt transmission system. While the motor is running all the time, the flat-belts are shifted mechanically to activate drum rotation. During this procedure, workers are working close to motor and immediate transmission system. The transmission mechanisms are not covered or fenced.	Consider replacement of current drive system with more energy-efficient individual motors with IP 55 rating. Replace flat-belt drives with V-belt drives, which ensure better transmission even when wet.
1.3. Control of machines	Control buttons on local machinery are not in reach of operator. Emergency-off switches are not available or not in reach of operator.	Install and relocate starters and emergency-off buttons to be in convenient reach of operator and helper. Clearly label all controls and buttons to allow their easy identification.
	There are no proper starter switches for many drums.	See replacement of motors
	Elevated platforms are available on most machines to allow good worker-operating point interface.	Provide a working platform on the unloading side of the lime splitting.
1.4 Maintenance practices	The general maintenance and cleanliness of machines is very poor with waste and dust covering machine and electric installations	Clearly place responsibility for condition of machine with concerned supervisor.
	A system of preventive maintenance seems to be absent. Most maintenance activities related to breakdown maintenance and repair.	Assist the maintenance team to prepare an inventory of all machines and to draw up an monthly and annual maintenance schedule (also based on the recommendations given in the machine manuals)

Criteria	Finding	Proposed follow-up action
		Number all machines so to allow easy and clear identification in the maintenance schedule or in case of breakdown.
	No pre- and post-operation checking routine is being followed.	Place boards containing checklist type instructions (in Bengali) at each machine, listing points to be checked before and after production.
2. Safety of electrical installations		
2.1 Protection rating of motors	Most electrical motors in use in the wet-processing areas to not conform to IP55 (or equivalent) level of protection as required for conditions prevailing in such work areas. Though some motors may have IP55 rating (according motor rating labels are missing or not legible), poor maintenance and condition of these motors have reduced the actual level of protection.	Consider replacement of motors with inadequate protection rating.
	Terminal boxes on many motors are missing.	Fix terminal boxes and connect cables through cable glands.
	Most motors and outer motor parts are heavily corroded.	De-rust motors and provide corrosion protective coating.
	Fan covers on several motors are missing, which reduces the cooling capacity and thus motor performance, particularly during the hot months.	Fix fan covers.
2.2 Wiring and earthing:	Wiring on (local and second-hand) machines is unsafe; electric cables are not connected to the motors through cable glands	Connect cable through glands to reduce loss of energy in transmission.
	Wire connections are poorly insulated (even blank wires) using even simple adhesive tape.	Replace all cut wires and replace with new and properly rated wires.
		Place all wires in protective cable ducts and locate cable ducts along the wall and ceiling.
	Earthing wires are missing or are loose on most electric motors in the wet-processing areas.	Check earthing connections on all motors and metal panel boards. There should be at least to earthing connections.
	Circuit breakers and overload relays are usually available on the imported machinery only. In many places fuse are missing and have been replaced by wire pieces.	Replace missing fuses.
		Consider installation of circuit breakers and overload relays to prevent damage to electronic parts of newly imported machines.
	Electrical cables for minor tools and lighting in the work areas have been placed across passageways and immediate work areas around machines, obstructing free movement.	Place cables in cable ducts and locate along wall and ceiling.
2.3 Switch boards and panels:	The electrical connection on and around imported machinery conforms to international standards in terms of colour coding, overload and short-circuit protection.	Use same colour coding for other electric connections in the tannery.
	Switchboards and panels of imported machines are placed next to the machine in convenient reach of operators and helpers.	

Criteria	Finding	Proposed follow-up action
	Most switches and starters on drums and local machinery in wet-processing areas are located away from the machinery, out of reach the workers of the respective machines.	Shift starters closer to the machines. Clearly label the starter boxes indicating the corresponding machine or motor.
	Instead of adequate panels or boards, wooden boards are used for mounting switches, starter buttons and other controls. Due to humidity and poor maintenance practices, these boards are either soaked (high risk of becoming live!) or covered with dust (fire risk!).	Consider replacement of wooden panels with proper switchboards and distribution panels made of corrosion proof material.
	Labels, allowing clear identification of switches and buttons, are usually missing. Sample tests, asking workers to switch on or off a particular machine, resulted in trial and error exercises, switching on wrong machinery or light fittings.	Use labels for all switches and buttons to allow clear identification of corresponding fixtures and fittings by all workers.
	All switches, dials and controls on imported machines are clearly labelled in English but not in Bengali. Workers were not able to explain the meaning if the different controls from the labels.	Provide additional labels in Bengali on all imported machines.
2.4 Main electrical controls	There is no separate main electrical control room.	
	The DG set is placed near the side entrance of the tannery. Access to the DG set is not prevented by fence or guard.	Consider shifting the DG set to a separate location, shielded by a wall from the production areas.
	Protective measures such as insulation rubber matting, high voltage and other warning signs, rubber gloves (with voltage rating) are absent.	
3. Safety in use of chemicals		
3.1 Availability of information on hazardous chemicals	Most chemicals used in the tanneries are imported. Chemical containers from European suppliers are labelled and marked as per international standards. However, in many cases these labels are partly torn or have become hardly readable. Safety labelling and marking on containers of chemicals imported from other Asian countries does not conform to international standards.	Check labels before using chemicals in the tannery. In case labels are missing use no erasable marker pen to clearly mark content of respective chemical containers.
	Material Safety Data Sheets (MSDS) are not available in the tanneries.	Prepare an inventory of chemical in use. Obtain MSDS from the suppliers and keep on record with in-charge of chemical store and production manager.
	Floor level supervisors/technicians and workers had little to no awareness about the potential health hazards of the hazardous chemicals in use and first aid measures.	Inform supervisors about the content of MSDS for hazardous chemicals used in their areas.
3.2 Storage of chemicals	The central chemical store is entirely clogged with empty chemical containers.	

Criteria	Finding	Proposed follow-up action
	There are separate temporary chemical storage areas on each floor. However, these are not efficiently used. Empty containers block available space. The floor is covered with spilled chemicals.	Clean temporary storage areas. Fix sign board clearly indicating area as "chemical storage area".
	Presently, the tannery wastes a considerable amount of powdered chemicals as the bags are kept on the wet floor.	Provide sturdy wooden pallets in each storage area. The respective floor supervisor should be made responsible to properly place all chemicals on these pallets.
	The scales have not been recalibrated, resulting in a considerable error reading and waste of chemicals,	In view of the humid and corrosive conditions in the beam house and tan yard, consider recalibration of scales on a monthly basis.
3.3 Transfer and handling of chemicals	Powered chemicals (BCS, salt, lime) are usually carried in the original bags to the respective processing areas, where they are emptied into barrels for further preparation.	Use trolley for moving chemicals to reduce manual strain.
	Liquid chemicals (fatliquors, acids) are usually transferred using small measuring cups from the large containers to open (unmarked) buckets.	When moving liquid chemicals, use closed containers to prevent spill. Make sure that all containers and buckets are also clearly marked or labelled to allow easy identification all the time.
	The buckets are manually carried to the process areas.	Avoid manual carrying of concentrated acids or alkalis. Use small trolley to move such material, even only for short distances.
	Concentrated acids are carried in the similar way (as explained above) and diluted in open barrels next to the drums.. Mixing is done manually, using a wooden stick. The concerned workers are inhaling vapours, fumes and aerosols generated during these processes. Workers do not use any personal protective equipment	Consider use of a corrosion protected hand-piston pump for transferring liquid chemicals from large to small containers. Workers should use protective gloves, boots, apron and proper respirator against acid vapours when manually mixing and diluting acid.
3.4 Control of emissions at source	No air quality monitoring has been carried out so far in the tannery.	
	Any vapours, fumes, gases generated during the processes in the drums are diluted by venting the drums for a short period of time before removing material inside. Poor general ventilation in the beam house and tan yard leads to accumulation contaminated air.	Provide stand-fans to improve horizontal airflow in the drum areas.
	Buffing and dedusting machines are provided with proper dust extraction and collection facilities. There is escape of dust from holes in the exhaust ducting.	Repair holes and broken exhaust fan. The functioning of exhaust fans should be checked on a daily basis before actual starting of operation.
	Dedusting operation is ineffective as part of the exhaust fans is not in operation.	
	The hand spray booth exhaust is not connected to a scrubbing device. Spraying vapour is directly exhausted to the outside air.	Consider the installation of a scrubber system.

Criteria	Finding	Proposed follow-up action
	The spraying chambers on the rotary spraying machines are connected to an exhaust duct. No such connections are provided for the exhausts on the drying tunnels. Exhaust ducts are not connected to scrubber or other collection/treatment devices but lead to the outside. This practices creates a public health hazards as well as pollutes the tannery itself as the exhausted air re-enters through wall openings.	Connect the exhaust fans of the drying tunnel to the existing ducting system. Consider installation of a scrubber system to clean exhausted air from the spraying machines.
3.5 Disposal of chemical waste and containers:	Empty chemical containers and carboys are collected, rudimentary cleaned in one part of the main chemical store and sold to special agents.	Rinse chemical containers in work area and use chemical residuals in the process. Make sure the wash water is also discharged to the effluent treatment plant once installed.
	These sell the containers for reuse to chemical manufacturers or to private persons for storage of water of food.	Reuse of old chemical containers for storage of water and food is to be discouraged. Chemical residuals may enter the food chain!
	Chrome containing solid waste (e.g. small wet-blue trimmings, shaving dust, buffing dust) is disposed by burning in the tannery's own boiler oven on the roof, resulting in the release CrVI containing particles into the air.	Do not burn chrome-containing waste in the boiler oven, but consider their reuse and conversion into by-products.
	At present, wastewater is discharged into drains to the outside of the tannery without treatment.	
4. Safe condition of floors and structures		
4.1 Flooring and passageways	General floor conditions are acceptable. Floor openings such as drains, wells or pits are covered. At a few points there are holes.	Cover remaining holes to avoid falls and trips.
	Passageways are of adequate width and flooring allowing easy movement of material and persons.	Carefully store material in process to remain passageways free at all times.
4.2 Railing of stairs	Railings are missing on all staircases.	Fix detachable railings on stairs (so to allow movement of machinery when necessary)
5. Illumination		
5.1 Light quality	Measurements conducted on-site using an industrial light meter showed that the general illumination levels in almost all work areas are inadequate. The general light levels in the tanneries are around 10 - 30 lux, being lowest on the ground floor. For detailed results, refer to enclose annex.	
5.2 Use of day light	Apart from poor use of natural (day) light due to the given structures of the buildings, the tannery does not have sufficient number of light fittings.	
	There is scope for more intensive use of natural light at the upper floors.	
	Walls and ceilings have poor reflection values due to poor cleanliness and lack of whitewashing.	Whitewashing and good cleanliness of ceiling, floors and column will increase the light reflection.

Criteria	Finding	Proposed follow-up action
5.3. Local lighting	The quality of local lighting of point of operations, particularly on machines with hazardous operations and moving machine parts are inadequate. Poor lighting does not only result in strain and impairment of eyesight, but results in worker's fast fatigue and dizziness. These factors in turn lead to low quality and increase risk of accidents.	
6. Noise		
6.1 Noise levels	As per the measurements conducted on-site noise levels were within safe limits of 85 dB(A) for a eight hour exposure. This has been the first noise measurement in this tannery.	
6.2 Control measures	The DG set on the round floor poses a major source of noise pollution when in operation. As the DG set was not in use during the time of the survey, no measurements are available.	Contact Mr Alam Chowdhury to carry out separate measurements.
6.3. Hearing protection	No hearing protection (ear muff, ear plugs) was available or used by workers in operation with high noise levels.	
7. Ventilation and ambient air quality		
7.1 Natural ventilation	Most production facilities are placed in wide and open halls. However, limited number of wall openings e.g. windows, gates, louvers do not allow good natural cross-ventilation, particularly on ground and first floor. Windows on the Northern side of the building cannot be opened.	Install louvers on the ground floor to allow for better horizontal air flow. Ensure that staff opens windows on the other floors to increase natural cross-ventilation.
7.2 Ventilation	Ceiling fans are available work areas to provide airflow for operators, but these do not contribute to sufficient air change in the work areas.	Install wall mounted exhaust fans on the ground floor.
7.3 Temperature and humidity	Indoor ambient air quality, temperature and humidity have not been monitored. There is no provision for dry-bulb and wet-bulb thermometers.	
8. Handling and movement of material and loads		
8.1 Use of trolleys	Though flooring and general arrangements are of good quality, materials are intensively transported manually from stores to production areas and between different production areas. Tools such as tongs and long clamps are partly used by the workers when handling rawhides in beam house. Material is manually carried between different floors. Though there is a provision of an elevator, no elevator has been installed to date.	

Criteria	Finding	Proposed follow-up action
8.2 Storage of material	Process and input materials are mostly stored on the floor. When required the material is moved manually. Hydraulic pallet trucks are not in use for moving stacks of material on the pallets.	
8.3. Organisation and management of workspace	Areas for work, storage and movement are not clearly segregated e.g. such as by floor markings.	Make plan to distribute available floor area, providing for separate areas for machine operation, storage of material and movement. Apply clearly visible floor markings and make sure that all workers adhere to these.
	Accordingly, the current storage arrangements, particularly for wet-blue and finished leather, appear to be haphazard and wasting storage space. The stacked material prevents smooth movement of persons and material as well as fast shifting of material when required.	See above
	Material, being dried on hooks, does not leave any space for movement on the respective floors. Wooden sticks used for hanging leather are haphazardly stored all over the place.	Allow for passageways between the hanging materials.
9. Emergency management and control		
9.1 Emergency planning	No written emergency plan listing actions required for different emergency scenarios is available.	
9.2 Dealing with fire and explosion	No systematic fire audit has been conducted in the tanneries to identify potential sources of ignition and potentially flammable material and to take preventive and preparedness measures. Workers in the tanneries are aware of what to do in case of a fire. Emergency exits and routes are not clearly marked or indicated. There are no signs or boards, which prohibit smoking or open fire, particularly, in areas such as chemical stores, spraying, buffing, main electrical control room. Fire-fighting equipment is insufficient for the size of production. In some instances the fire fighting equipment is wrongly distributed. For example, fire-fighting equipment is not available in areas with a high fire risk e.g. spraying areas or chemical store while being available in areas such as beam house/ tan yard. Fire extinguisher, where available, were found to be properly maintained and refilled. Their location is easily accessible, though not clearly marked.	

Criteria	Finding	Proposed follow-up action
9.3 Dealing with medical emergencies	No first-medical-aid facility is available.	Provide for separate first-aid kits on each floor. Mark their location. Make the respective floor supervisor responsible for the maintenance and good condition of the first aid kit.
	The phone number of nearest doctor or hospital was not displayed on or next to the telephones with outside connection.	
	There not trained first-aiders available in the tannery.	Train at least two workers of the tannery as certified first aiders. One certified first aider should be available on each shift. Consider organising a basic first aid training for all workers.
10. Personal protection and welfare		
10.1 Personal hygiene	Workers frequently wash exposed skin after handling raw material or work in wet-processing yard.	
	No separate washing facilities are available. Usually workers use water from the water taps in the production areas.	
	Workers usually take food outside the factory.	
10.2 Working and protective clothing	No separate working uniforms are provided to the workers, who use the same clothes at work and at home. Most workers wear open sandals. Only a few workers in the wet-processing wear boots.	
10.3 Access to drinking water	No provision of clean drinking water is available in the tannery.	
10.4 Conditions of toilets	A number of toilets are available on several floors. There is no provision of separate toilets from the female workers.	
11. Promotion of safety and health at work	The tannery does not have a written safety policy.	
11.1 Safety signs	Safety or cautionary signs and boards are not displayed in the workplaces. Imported machines usually bear safety and cautionary labels.	
11.2 Safety training	As the awareness on safety & health among supervisors is also very low, increase of general awareness by means of close supervision and on-the spot guidance is limited.	

2. Results of noise measurements

Following measurements have been carried out by means of an industrial sound level meter. The threshold limit level for safe noise exposure over an eight-hour shift is between 85 to 90 dB(A). Internationally continuous noise levels of around 75 to 80 dB(A) are recommended. Measurements have been done in A rating. Measurements have been taken at the place of the respective operator(s).

L grab measurements
LAeq Equalised sound pressure level
LaMax Maximum sound pressure level recorded
All measurements are recorded in dB(A):

Operation	L_A	L_{Aeq}	L_{Amax}
Fleshing machine	**84...90**	**89.6**	**94.4**
Desk (tanyard supervisor)	**81..85**	**81.5**	**86.1**
Deliming drum (chemical mixing area)	**86...89**	**87.1**	**93.0**
Setting machine (Rizzi)	**85...94**	**89.5**	**99.7**
Buffing machine (Ficini) - Operator	**83...85**	**84.1**	**88.9**
Buffing machine (Ficini) - Unloading	**84...86**	**85.6**	**87.5**
Through-feed staking machine	**78...85**	**77.3**	**82.4**

3. Results of light measurements

Following measurements have been made by means of an industrial light meter. The measurements have been taken at the point of operation at the respective machines/operations. The general light level in all work areas is inadequate.

Operation	Lux (measured)	Recommended minimum level
Fleshing machine (mechanical)	10	150...300
Desk (tanyard supervisor)	15...20	150...300
Deliming drum (chemical mixing area)	7...13	150...300
Sammying machine	80...100	300...500
Splitting machine	78...130	300...500
Wet-blue sorting	218	500...750
Shaving machine I (Poletto)	33	300...500
Shaving machine II	64	300...500
Skin shaving machine	30	300...500
Embossing machine (front)	61	500...750
Embossing machine (rear)	63	500..750
Setting machine II	56...80	300...500
Buffing machine (Ficini)	53...77	300...500
Trimming table (Finished) - near pathway	260...277	300...500
Trimming table (finished) - near window	850...1200	300...500
Auto-toggling (clamp fixing)	2...3	300...500
Through feed staking	10...14	300...500
Hand-spray booth	380	300...500
Through feed ironing machine (feeding)	194	300...500
Through feed ironing machine (controls)	750	300...500
Glazing jack I	390	750...1000
Glazing jack II	245	750...1000

ANNEXURE - VIII

TANNERY PROCESS DETAILS

1. Tannery Name : **BD003**

2. Tannery Location and Land area

   a) Total land area (in acres/sq.ft.) : Raw to Wet blue 86,000 sq.ft (Separate Unit)

   b) Open land available (in acres/sq.ft.) : Wet to Finish 30,000 sq.ft / Floor (Finish unit)
   3rd & 4th Floor 15,000 sq.ft

   c) Tannery boundary details: :

   Northern side: Bengal Leather Complex (Tannery) — Eastern side: Road

   Southern side: Taz Tannery — Western side: Bengal Tannery

3. Water

   a) Existing ground water Table -(feet) (within the tannery premises) : 60'

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

   c) Characteristics of raw water (enclose water analysis report) : Not Available

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

4. Raw Material

Sl. No.	Source/ Origin	Species	Preservation Mode dried/ sod. chloride/ biocide (if so, which)
1	Local	Cow hide	Wet Salted with Preservative
2	Local	Goat skin	Wet Salted with Preservative
3			

5. Tannery Processing Capacity

Tannery Design Capacity : 40 tons/day

Normal Operating Capacity : 30 - 40 tons/day

Actual Processing/day

Process Mix		Present Processing			Future Plan		
		Species	Pieces *	Weight (kg)	Species	Pieces	Weight (kg)
i)	**Raw to Finish (via Wet Blue)**	Cow	3200	32000	Working to full capacity		
	Unit I – Raw to Wet Blue	Goat	8000	8000			
	Unit II – Wet Blue to Finish						
ii)	**Raw to Finish (via EI)**	Some times based on demand upto 30% of total production may be upto vegetable tanned leather for leather goods.					

* Average weight per piece (Wet Salted) for Cow hide 10 kg, Goat skin 1 kg

6. Seasonal variation in processing (if any)

Season	Months	Processing / per year	
		Pieces	Weight (kg)
i) Peak season	Mar - June		
ii) Lean Season	Nov - Dec		

7. Production during last 3 years :

Type of Leather	1996			1997			1998		
	Pieces	Weight (kg)	Area m^2/ft^2	Pieces	Weight (kg)	Area m^2/ft^2	Pieces	Weight (kg)	Area $/ft^2$
Wet Blue							Cow	-	14.4 million
E.I.							Goat		4.8 million
Finished									

8. List of equipments available

Sl. No.	Equipment	No. of Equip.	Man Power	Size/ Specification	Operating Capacity (kg)	Vol. (lit)	Power (HP)
1.	Desalting Machine	-	-				
2.	Pits	-	-				
3.	Paddles	16	-	3.05m (l) x 2.7m (d) x 1.3m (h)	1000 kgs		
4.	Drums						
	Soaking & Liming	26	-	2.35(l)x22.75(d)	1000		
	Tanning						
	Big	25	-	2.35 (l)x2.9(d)	1500		
	Small	25	-	2.3 (l)x2.7(d)	1200		
	Retanning						
	Big	2	-	2.35 (l)x2.9(d)	1500		
	Small	8	-	2.3 (l)x2.7(d)	1200		
	Others	21	-	8' x 8'	1000-1500		
5.	Fleshing Machine	5+	Manual also				
6.	Unhairing Machine	-					
7.	Splitting Machine	4					
8.	Shaving Machine	3					
9.	Sammying Machine	2	(Feed through)				
10.	Setting Machine						
	i) Ordinary						
	ii) Reversible	8					
11.	Vacuum Drier	3					
12.	Staking Machine						
	i) Slow Comb						
	ii) Mollisa	3					
13.	Buffing Machine						
	i) Single Width	1					

	ii) Feed Through	1					
14.	Dedusting Machine	2					
15.	Spraying Machine						
	i) Hand Spray	1					
	ii) Auto Spray	2					
16.	Polishing Machine	2					
17.	Embossing Machine	3					
18.	Finiflex Machine	1					
19.	Area Measuring Machine	3 Electro nic					
20.	Boiler	3					
21.	Generator	2	(Full capacity)			App 500 KW	
22.	Roto Press	1					

Power Source [√] **Electricity Board** [√] **Generator** [ ] **Oil Engine**

9. Production Pattern

Items			Present	Future plans (next 5 years)
i)	Working hours/day		8 hrs	Finishing Unit & Shoe Upper
ii)	Number of shifts/day		3	
iii)	Number of working days in a week		7 days	
iv)	Average working days/annum			
v)	Total Manpower shift	1	350	
		2	350	
		3	350	No – Raw Production

10. (a) Water and Chemical usage Chrome Tanning Process - Raw to Finish (via Wet Blue) COW HIDES
Raw to Wet Blue

Lot Size [ ][ ][ ][ ] **kg** **Pieces** [ ][ ][ ][ ]

Sl. No.	Process	No. of Pit/ Paddle/Drum	Size	Water Used (%)	Chemicals used		Dura-tion	Tempa rature	pH
					Name	(%)			
1	Pre Soaking	Drum/Paddle		525%	Wetting Agent, Non-Ionic (Detergent)	0.1 – 0.2%	30'	-	
2	Main Soaking	Drum/Paddle		525%	Soda Ash (Alkali) Preservative	0.7 – 0.8% 0.1 – 0.2%	16 – 18 hrs		
3	Washing	Drum/Paddle		500%	Running Water				
4	Liming	Drum		400%	Lime (Stone) Sod. Sulfide Liming Auxiliary (Aravit MB-TFL)	4 – 5% 3.5 – 4.5% 0.7 – 1.0%	20 hrs		
5	Fleshing	Machine	-	125%	Running Water				
Pelt Weight [ ][ ][ ][ ][ ] **Kg**									
6	Washing before Deliming	Drum		500%			20'		

7	Deliming & Bating	Drum	-	125%	Amm. Sulphate Amm. Chloride Wetting Agent, Non-ionic Bating Agent (Hudson) for **Goat** Bating Agent	1.5 – 2% 0.5% 0.5% 0.5% 2%			
8	Washing I after Deliming	Drum		200%	Closed Door wash		30'		
9	Washing II after Deliming	Drum		500%	Running Water		30'		
10	Pickling	Drum		80%	Salt Formic acid Sulphuric acid Sod.Formate Hypo Sod.Chloride	1.2% 0.3 – 0.4% 8 – 9% 0.5% 1.2% 0.1%	O/N		pH 2.5 – 3.0
11	Chrome Tanning	Drum		Same Float + 100% **NO WASH**	BCS (Chromosol B BASF) [1st Feed] BCS (Chromosol B) [2nd Feed] Mag. Oxide Preservative (Busan 30L)	3% 5% 0.3% 0.01%	30' 2hrs 5 hrs 30'		pH 3.8 – 4.0

Shaved Weight			**kg**	**Wet Blue to Finish**	**Pieces**				
12	Acid Washing	Drum		250%	Acetic acid Formic acid	0.2% 0.2%	30'		
13	Rechroming	Drum		225%	BCS Relugan – GTW Sod.Formate Sod.Bicarb Relugan RF Fatliquor , Non-ionic	4% 1.5% 0.5% 1% 1% 1%	90' 90' 40'		pH 3.8 – 4.0
14	Washing before Neutralisation	Drum		300%					
15	Neutralisation	Drum		250%	Sod. Formate Sod. Bicarb Neutralising Syntan for **Goat** Sod. Formate	1% 0.3% 2.0% 1%	5' 5' 5' & run 45'		pH 4.8 – 5.0 pH 4.2-4.5
16	Washing I after Neutralisation	Drum		300%	(Closed wash)		20'		
17	Washing II after Neutralisation	Drum		500%	(Running water)		20'		

18	Retanning, & Fatliquoring	Drum		150% + 50% water	Fatliquor (Lanoline based TFL) Polymer Resin (Syntan RS3) Malamine Resin (Relugan D BASF) Phenolic Syntan Vegetable tannin (Mimosa / chestnut) Syntan Formic acid 30% less chemicals used for **Goat** Skins	1.5% 3.0% 3 – 4% 6% 3 – 4% 3 – 4% 0.2%	15' 60' 90' 30'		
19	Dyeing & Fatliquoring	Drum +		50% Cold water + 200% Hot water Finally add 300%	Powder Dye Fatliquor (Combination of synthetic, lenoline and other types) Formic acid (in feeds) 30% less chemicals used for **Goat** Skins	2.5 –3.0% 8 – 14% 2.5% run for	30' 45' 30' 10'		
20	Top Deying option	Drum		**Pile O/N** 300%					
21	Other washings & wastages			725%					

11. Chrome Tanning Procedure

	Item	Wetblue		Rechroming	
1.	Number of Drums	Total 50 Drums			
2.	Size of the Drums	2.35 m (l) x 2.9m (d) and 2.3m (l) x 2.7m (d)			
3.	Average pelt weight(Kgs or Pieces/Drum)	1200 – 1500 kg			
4.	Type of BCS used	Imported			
5.	% of BCS used	8%		4%	
6.	Basification and chrome uptake	75% uptake			
7.	Washings : Number	-		1 (Acid wash)	
8.	Washings : amount of water for each washing	-		200%	
9.	Water used (float) in %	Pickle bath + 50%		100%	
10.	Other chemicals used in %	**Chemical**	**%**	**Chemical**	**%**
		Mag. Oxide	0.3	Relugan GTW	1.5
		Preservative (Buson 30L)	0.01	Sod.Formate	0.5
				Sod.Bicarb	1
				Relugan RF	1
				Fatliquor Non-ionic	1

12. Water and chemical usage of leather manufacturing processes

All Imported Chemicals from Italy.

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

Process	Water m^3/ day	Water/ton m^3/ ton	Material
Chrome tanning	40	1.0	Cow hides & Goat skins
Rechroming	36	2.25	Cow hides & Goat skins

14. Drainage and disposal arrangements

a) Drainage system (Open / Closed) : Open

b) Status of segregation system - No -

YARD	SEPARATE	COMBINATION
Lime yard		√
Drum yard		√
Machine yard		√

c) Whether scope exists for mixing up rain water with tannery waste water : Yes/~~No~~

d) Whether scope exists for mixing up solid water with tannery waste water : Yes/~~No~~

e) Type of problems faced in operating existing drains/sewer
1. Chocking of drains with solid wastage
2. Settling of sludge leads to backflow
3. Overflow due to settling of sludge

f) Mode of final effluent disposal (CETP/ETP) : Open Land / River

g) Solar Evaporation Pan available : ~~Yes~~/ No
If yes, Surface Area : Not available

h)

Solid Disposal	Type of Disposal	Mode of Disposal
Salt containing material	-	Glue (Trimmings)
Chrome containing material	-	-

15. Mode of solid waste management

Sl.No.	Solid Waste	Amount per kg of Raw Material	Disposal Method
1.	Dusted salt		Partly Reused (or) Soaked alongwith Raw Material
2.	Raw hide/skin trimmings		Glue
3.	Lime sludge		Drain
4.	Hair/Wool		Pulping Process
5.	Fleshings		Glue, Drain & Open land
6.	Wet Blue / EI trimmings		Dumped outside
7.	Shaving/buffing dust		Dumped outside
8.	Others		Dumped outside

16. Total water used perday : 218.2 cubic meters

17. Total Effluent discharged (approximate) : 218.2cubic meters

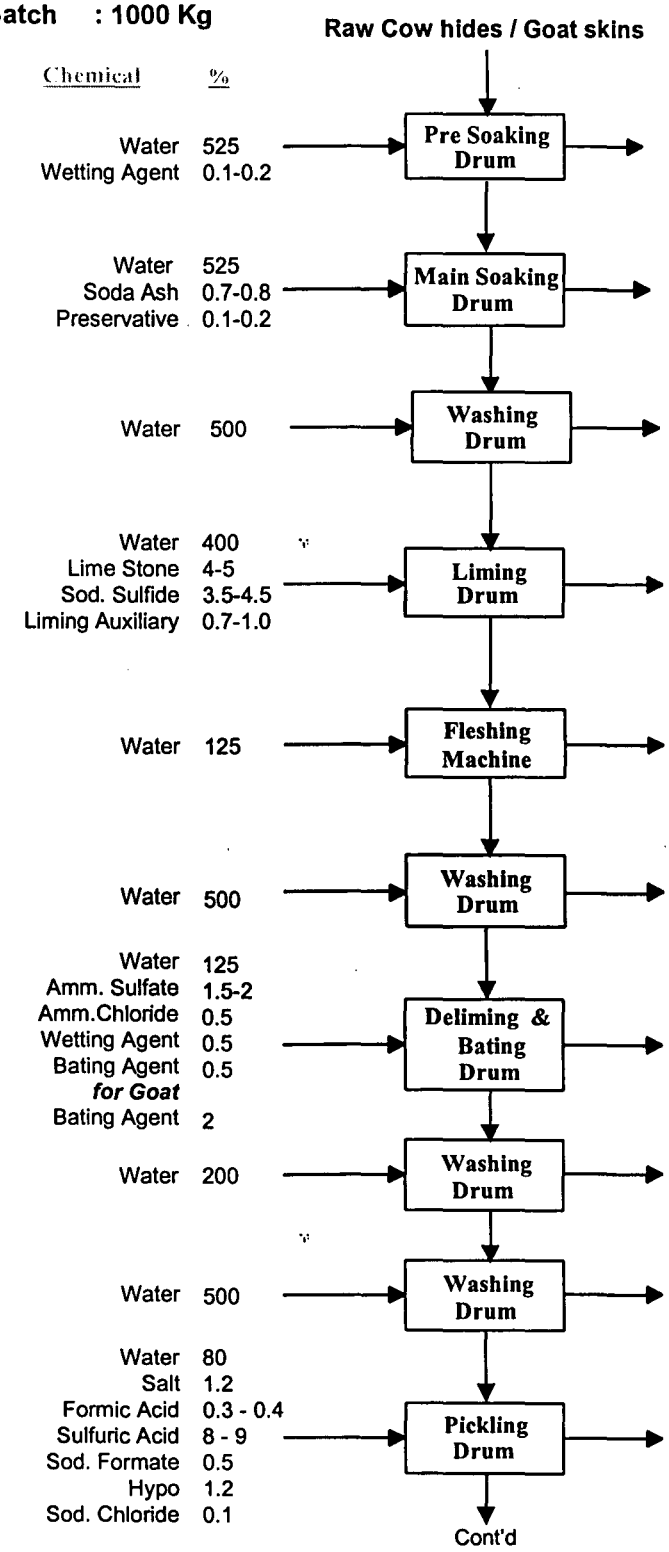
18. Whether Chrome Recovery Plant is proposed / under construction / existing : No

19. Remarks : It is the second largest tannery in Bangladesh in terms of production and has more than 105 drums.

BD003 | **CONVENTIONAL PROCESS AND EMISSION LOAD** | **40 tons/day**

Process : Cow hides / Goat skins Raw to Wet Blue - Finish

Batch : 1000 Kg



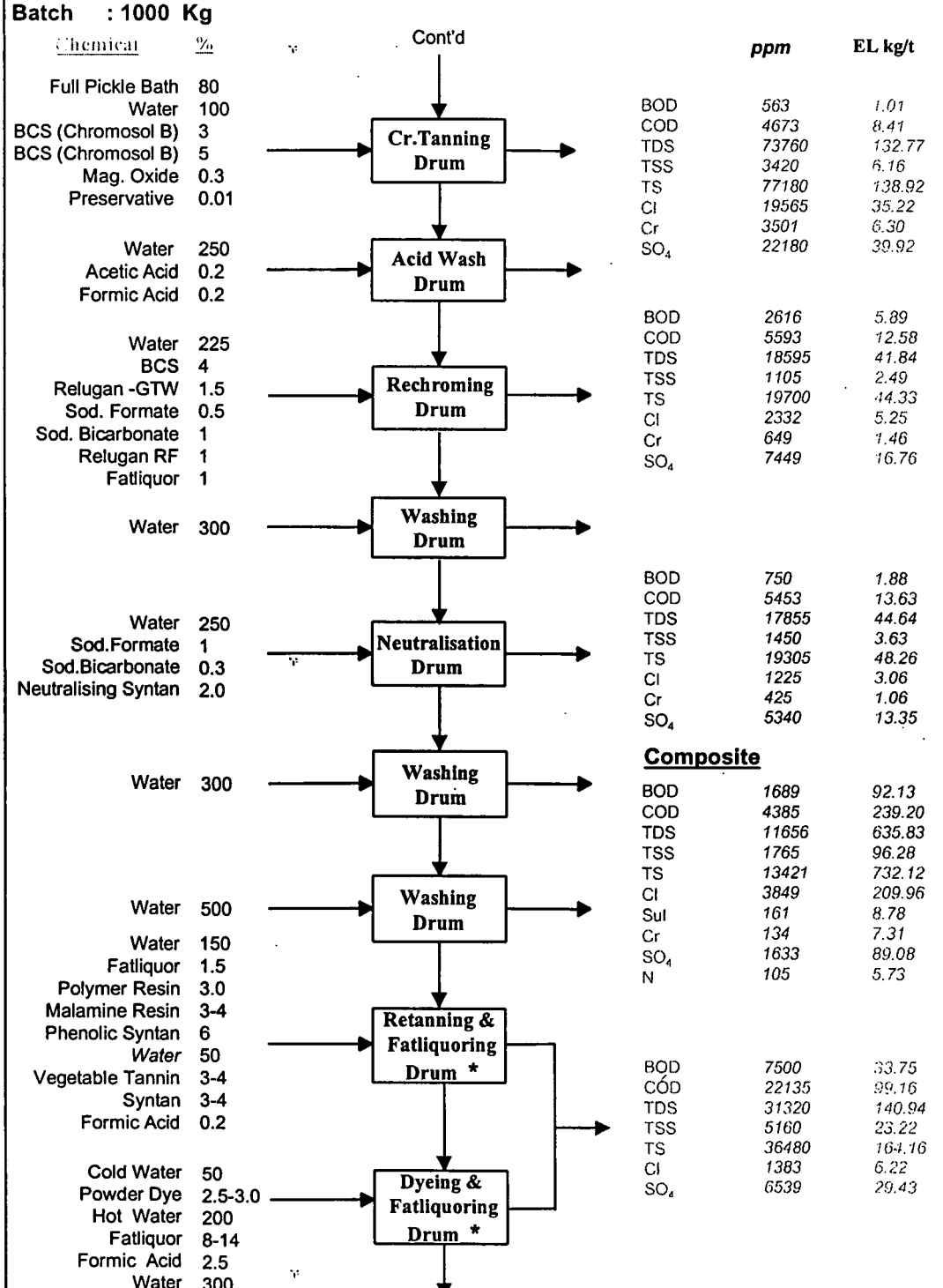
	ppm	EL kg/t
BOD	4650	14.41
COD	11705	36.28
TDS	37920	117.55
TSS	1570	4.87
TS	39490	122.41
Cl	22214	68.86
SO_4	241	0.75
BOD	8000	42
COD	21472	112.73
TDS	38360	201.39
TSS	6910	36.28
TS	45270	237.67
Cl	20396	107.08
SO_4	30	0.16
BOD	6825	27.30
COD	13543	54.17
TDS	14180	56.72
TSS	12100	48.40
TS	26280	105.12
Cl	988	3.95
Sul	2820	11.28
SO_4	193	0.77
BOD	3195	3.99
COD	5993	7.49
TDS	28030	35.04
TSS	6580	8.23
TS	34610	43.26
Cl	474	0.59
SO_4	7728	9.66
N	3490	4.36
BOD	1673	1.34
COD	3775	3.02
TDS	68845	55.08
TSS	1690	1.35
TS	70535	56.43
Cl	28420	22.74
SO_4	10783	8.63

BD003

BD003	CONVENTIONAL PROCESS AND EMISSION LOAD	40 tons/day

Process : Cow hides / Goat skins Raw to Wet Blue - Finish

Batch : 1000 Kg



	ppm	EL kg/t
BOD	563	1.01
COD	4673	8.41
TDS	73760	132.77
TSS	3420	6.16
TS	77180	138.92
Cl	19565	35.22
Cr	3501	6.30
SO_4	22180	39.92
BOD	2616	5.89
COD	5593	12.58
TDS	18595	41.84
TSS	1105	2.49
TS	19700	44.33
Cl	2332	5.25
Cr	649	1.46
SO_4	7449	16.76
BOD	750	1.88
COD	5453	13.63
TDS	17855	44.64
TSS	1450	3.63
TS	19305	48.26
Cl	1225	3.06
Cr	425	1.06
SO_4	5340	13.35

Composite

BOD	1689	92.13
COD	4385	239.20
TDS	11656	635.83
TSS	1765	96.28
TS	13421	732.12
Cl	3849	209.96
Sul	161	8.78
Cr	134	7.31
SO_4	1633	89.08
N	105	5.73
BOD	7500	33.75
COD	22135	99.16
TDS	31320	140.94
TSS	5160	23.22
TS	36480	164.16
Cl	1383	6.22
SO_4	6539	29.43

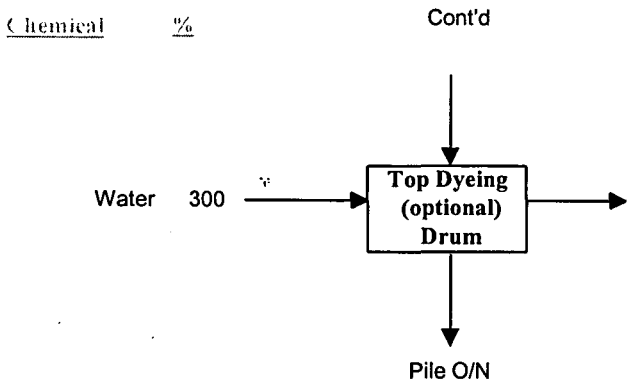
**** for Goat 30% less Chemicals***

BD003

BD003	CONVENTIONAL PROCESS AND EMISSION LOAD	40 tons/day

Process : Cow hides / Goat skins Raw to Wet Blue - Finish

Batch : 1000 Kg

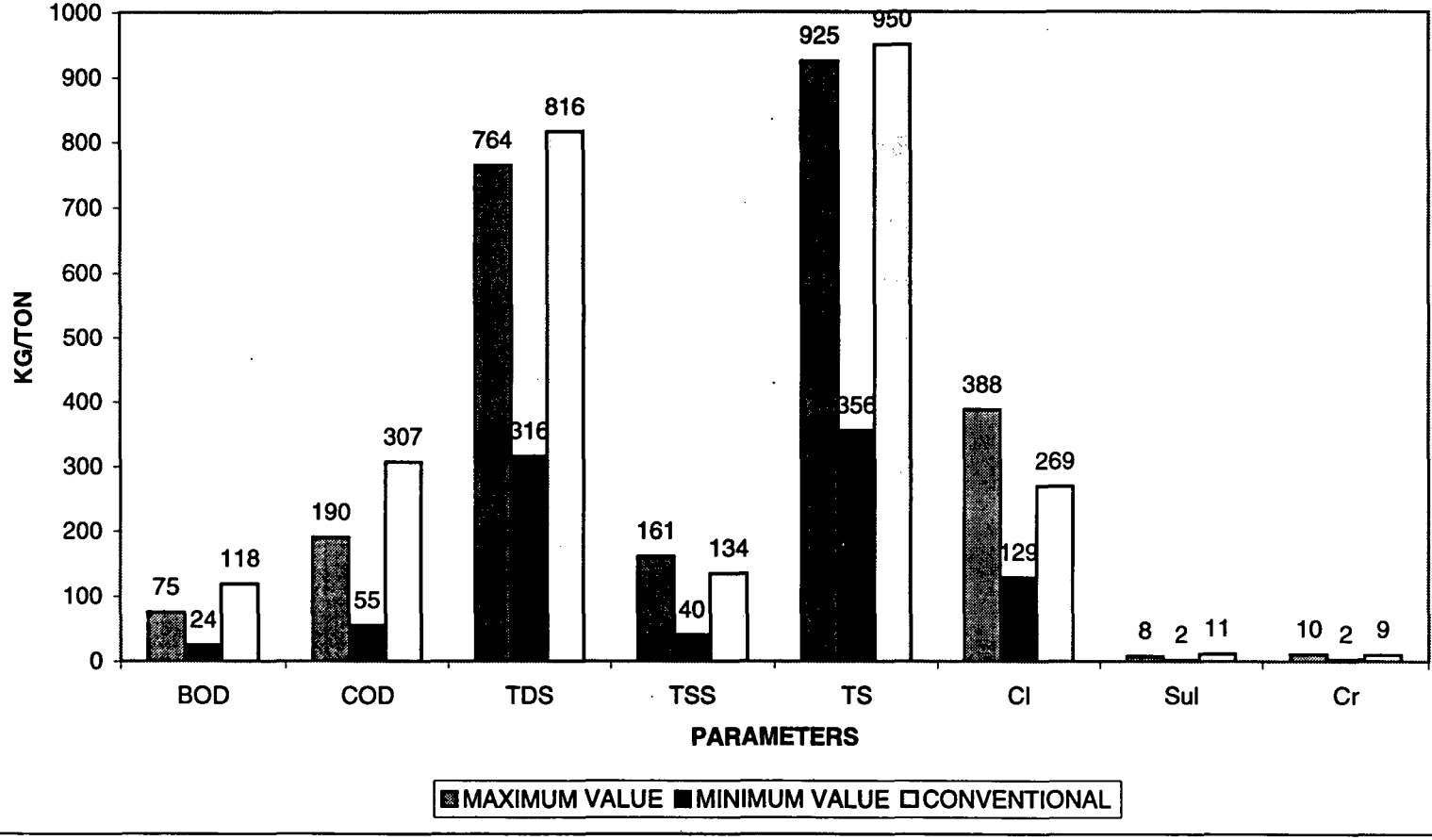


Other washings & wastages - 725%

BD003

BD003 COW HIDES / GOAT SKINS RAW TO WET BLUE - FINISH

COMPOSITE EMISSION LOAD FOR CONVENTIONAL PROCESS AS PRACTICED

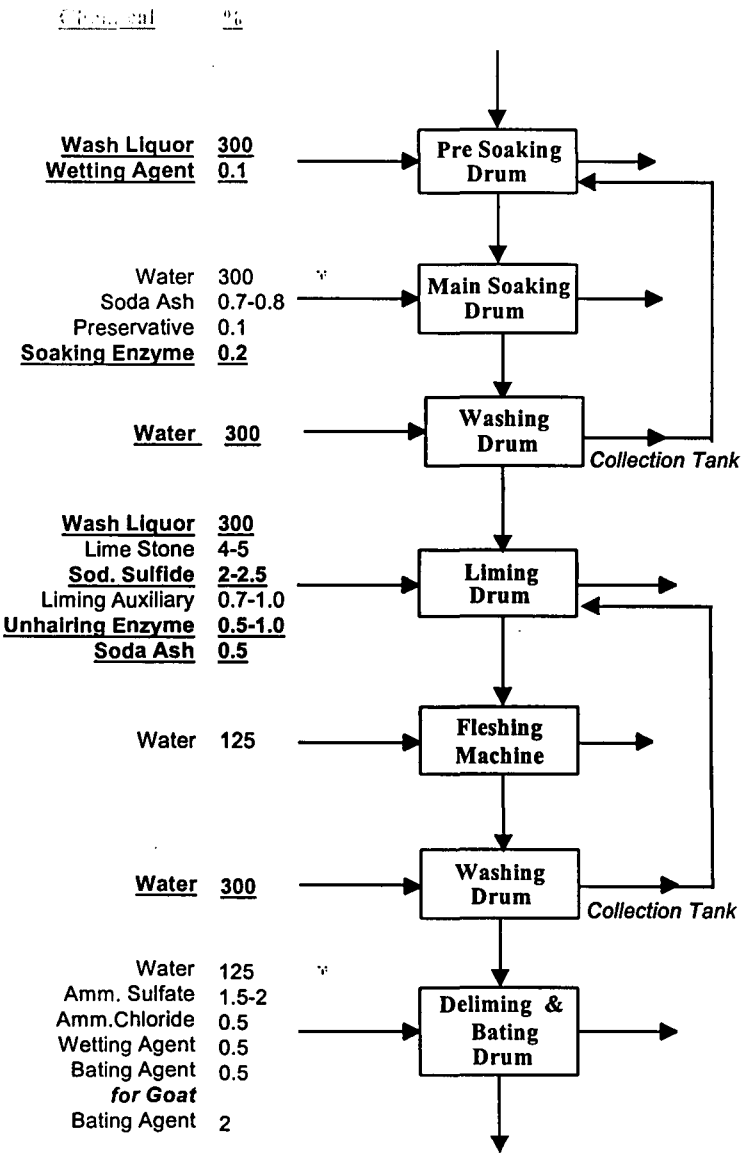


BD003	MODIFIED PROCESS FOR IMPLEMENTATION / DEMONSTRATION	40 tons/day

Process : Cow hides / Goat skins Raw to Wet Blue - Finish

Batch : 1000 Kg

Raw Cow hides / Goat skins



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BD003

BD003	MODIFIED PROCESS FOR IMPLEMENTATION / DEMONSTRATION	40 tons/day

Process : Cow hides / Goat skins Raw to Wet Blue - Finish

Batch : 1000 Kg

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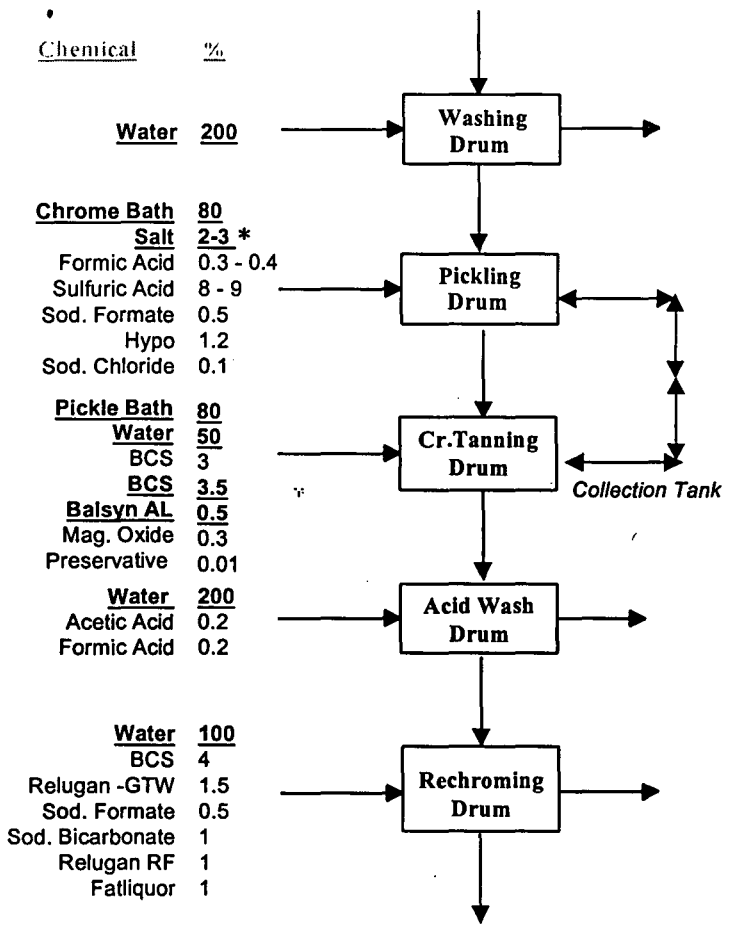

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* *to adjust salt content*

BD003

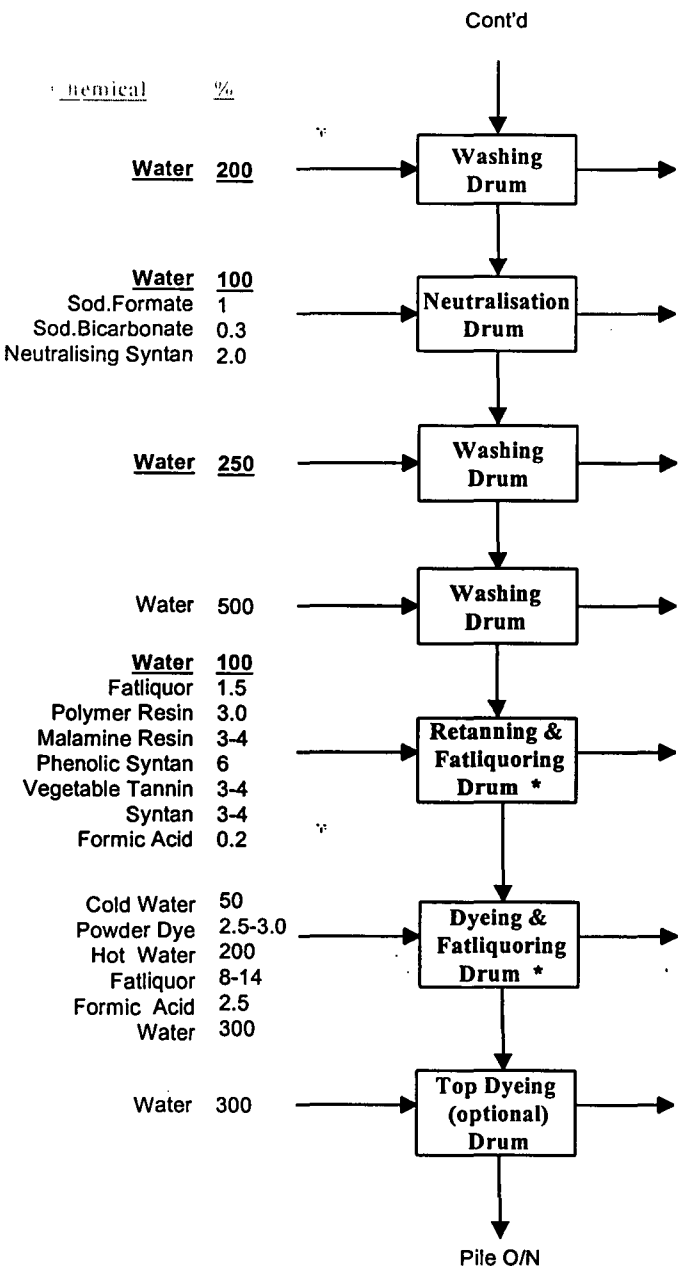
BD003

MODIFIED PROCESS FOR IMPLEMENTATION / DEMONSTRATIION

40 tons/day

Process : Cow hides / Goat skins Raw to Wet Blue - Finish

Batch : 1000 Kg



** for Goat 30% less Chemicals*

BD003

BD003

MODIFIED PROCESS FOR IMPLEMENTATION / DEMONSTRATION

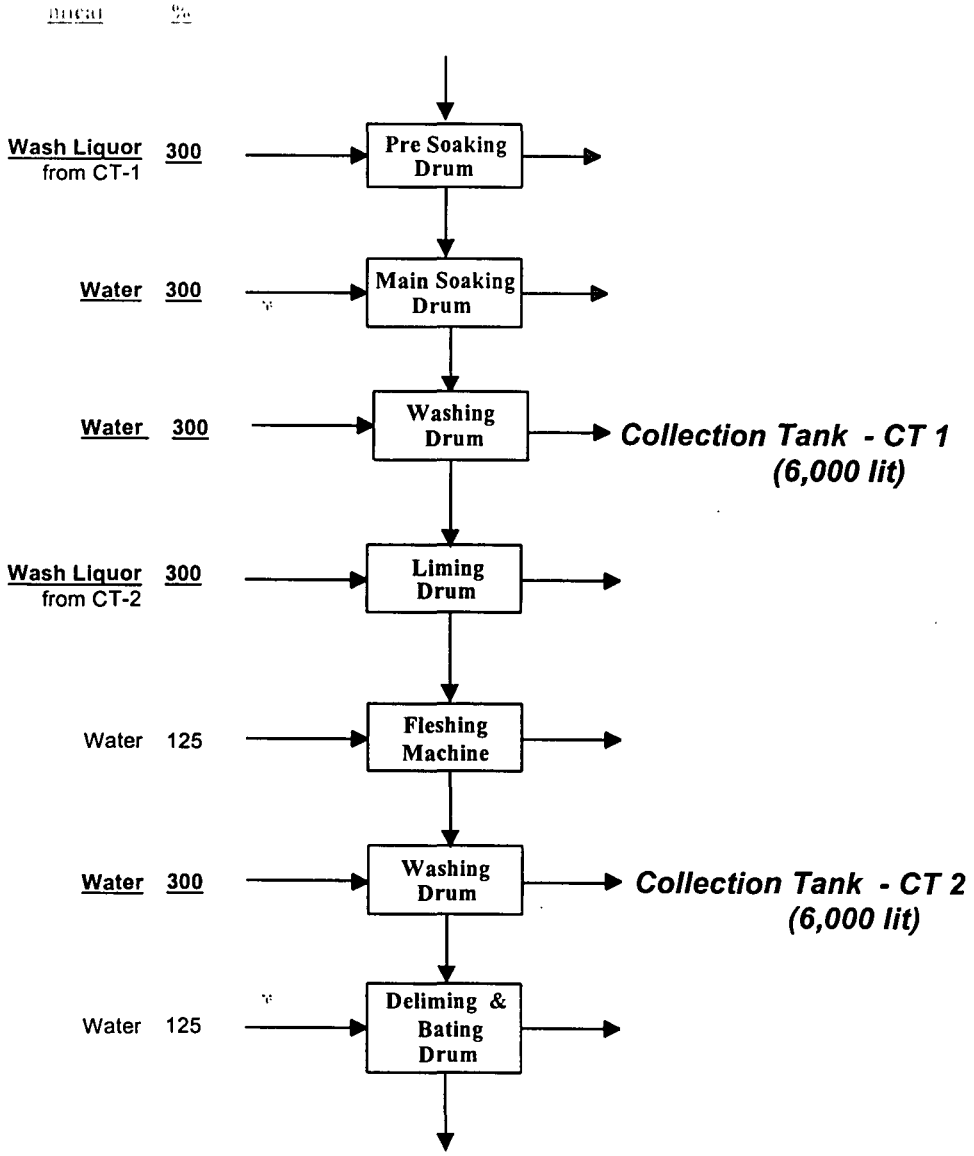
40 tons/day

Process : Cow hides / Goat skins Raw to Wet Blue - Finish

Batch : 1000 Kg

Water Flow Scheme / Recycle Scheme

Raw Cow hides / Goat skins



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BD003

BD003

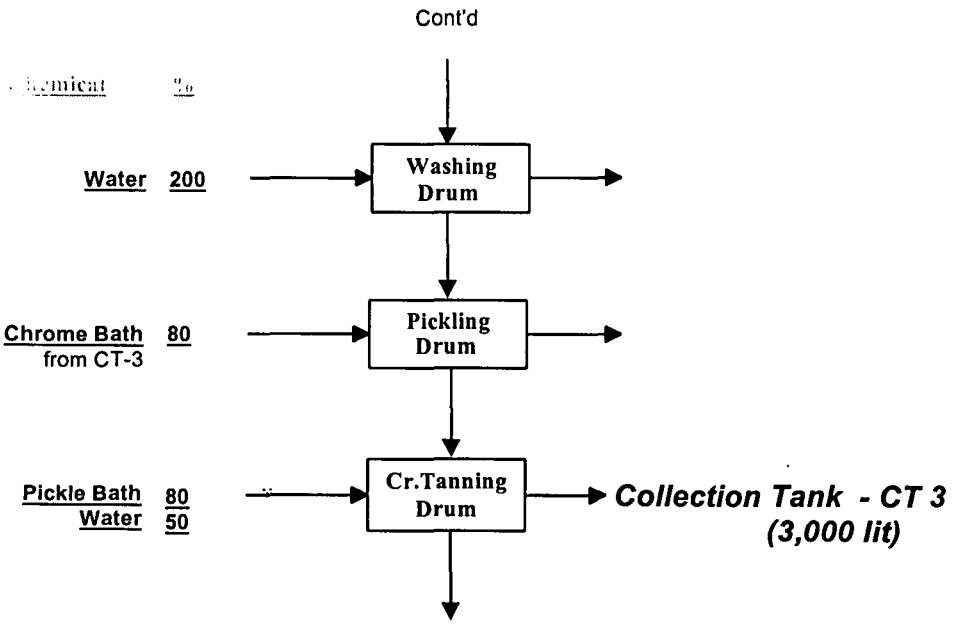
MODIFIED PROCESS FOR IMPLEMENTATION / DEMONSTRATION

40 tons/day

Process : Cow hides / Goat skins Raw to Wet Blue - Finish

Batch : 1000 Kg

Water Flow Scheme / Recycle Scheme



BD003

CHEMICAL REQUIREMENT FOR IMPLEMENTATION / DEMONSTRATION OF CLEANER TECHNOLOGIES IN THE TANNERY CLUSTER , AT HAZARIBAGH, DHAKA, BANGLADESH

BD003

LIST OF CHEMICALS REQUIRED

Sl.No	Name	Requirement for 1000 kg lot size (kg)	Total Requirements (kg)	Suggested denomination of package
1.	Soaking Enzyme	2	10	
2.	Unhairing Enzyme	10	50	One bag of 50 kgs
3.	Balsyn AL	5	25	One bag of 25 kgs

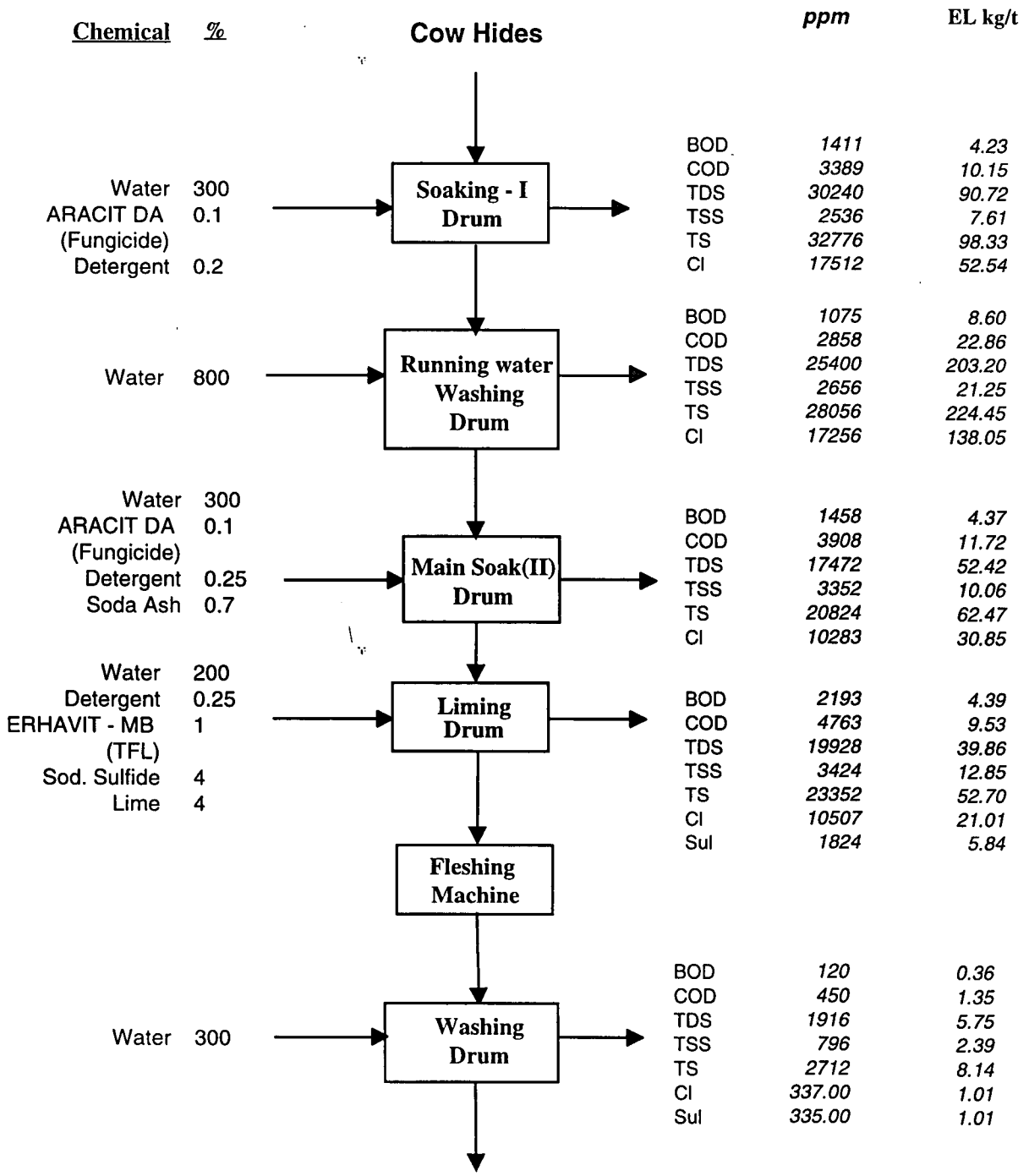
LIST OF EQUIPMENTS REQUIRED

Sl.No	Tannery	Hardware Proposed	Qty- Nos	Technical specification	Expected Benefits
1.	BD003	Liquor Collection Tanks for Soak Liquor for Lime Liquor for Chrome Liquor	 1 No. 1 No. 1 No.	Concrete. 6,000 lit capacity, 6,000 lit capacity, 3,000 lit capacity,	Reduction in hydraulic load to effluent
		Pumps	2 Nos		-do-
		Water Meter	3 Nos		-do-
		Modified Door for Drum	1 Nos		-do-
		Strainer in pipeline	5 Nos		
		Enzyme applicator	1 No		Reduction in sulfide load

BD003	CONVENTIONAL PROCESS AND EMISSION LOAD	40 tons/day

Process : Cow Hides Raw to Wet Blue

Batch : 1000 Kg / 110 Pcs



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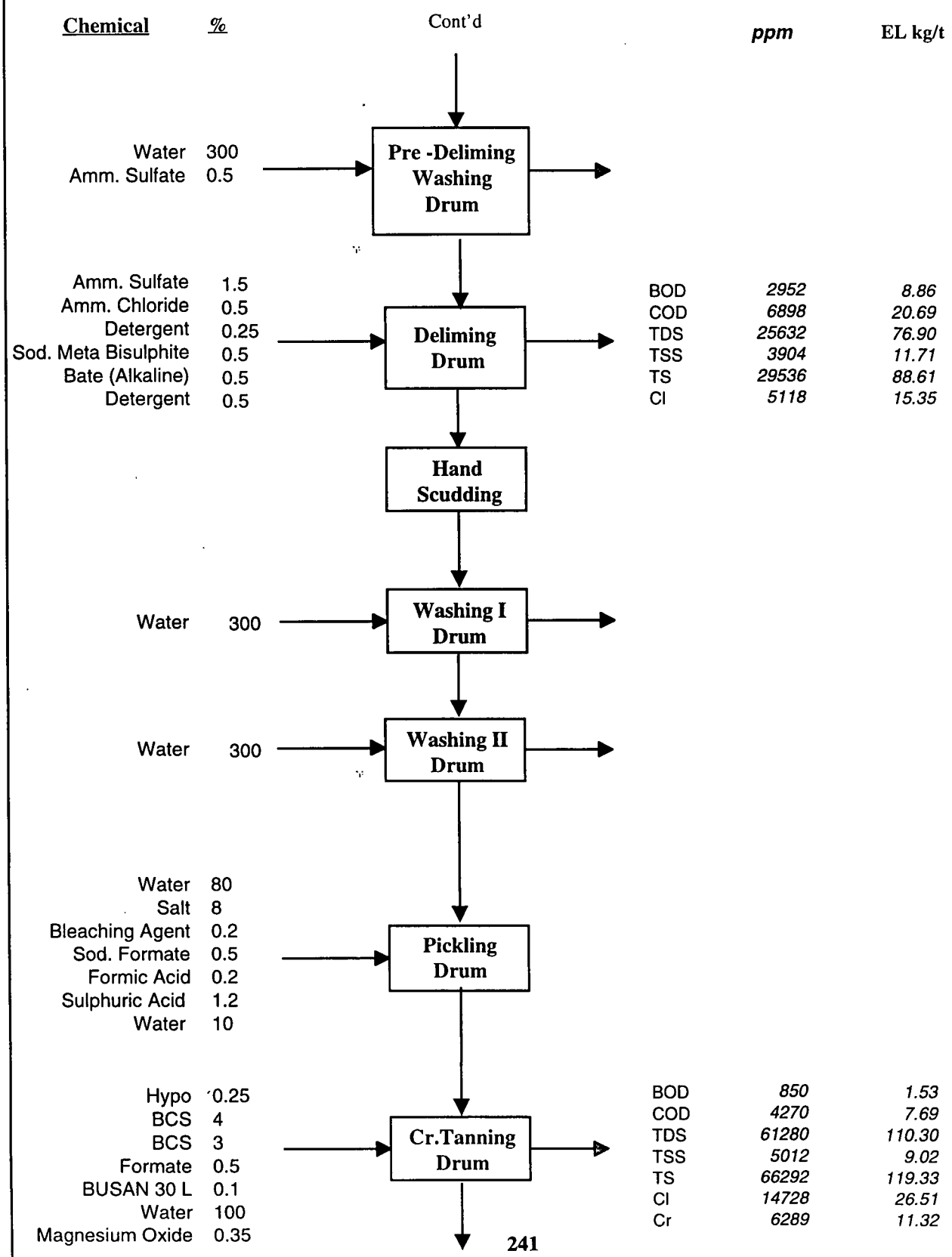
BD003	CONVENTIONAL PROCESS AND EMISSION LOAD	40 tons/day

Process : Cow Hides Raw to Wet Blue

Batch : 1000 Kg / 110 Pcs



Phase - II

THE CLEANER TANNING PROCESS TECHNOLOGIES DEMONSTRAED AT HAZARIBAGH TANNING CLUSTER, DHAKA, BANGLADESH

Tannery Name: **Dhaka Hides & Skins Ltd.**
Process: Cow Hides Raw to Wet Blue

Raw Material: Cow Hides *(Conventional Process)*
Lot Size/ No. Pieces: 1000 kg /110 Pcs

Operation	Water/ Chemical	%	Run Time	Remarks
Soaking-I	Water	300		
	ARACIT DA (Fungicide)	0.1		
	Detergent	0.2	60 min	Drain
Running Water Wash	Water	800%	2 hrs	Drain
Main Soak (III)	Water	300		
	ARACIT DA (Fungicide)	0.1		
	Detergent	0.25		
	Soda Ash	0.7	60 min	O/N Run 5 min/hr. Drain .Next day Liming
Liming	Water	200		
	Detergent	0.25		
	ERHAVIT-MB (TFL)	1	10 min	
	Sodium Sulfide	4		
	Lime	4	30	Sulfide & Lime to be added in 3 feeds at 30 min interval. After the third feed run for 1 hr
				Stop. Run 5 min/hr. Up to next day. Drain
Fleshing				
Washing	Water	300	20 min	
Pre-Delime Washing	Water	300		
	Ammonium Sulfate	0.5	20 min	Drain out
Deliming	Ammonium Sulfate	1.5		
	Ammonium Chloride	0.5		

	Detergent	0.25	45 min	
	Sodium Meta Bisulphite	0.5		
	Bate (Alkaline)	0.5		
	Detergent	0.5	45 min	Check completion of deliming. Cut neutral to phenolphthalein. Drain
Washing-I	Water	300	20 min	Drain out.
Washing-II	Water	300	20 min	Drain out
Pickling	Water	80		
	Salt	8	15 min	
	Bleaching Agent	0.2		
	Sodium Formate	0.5		
	Formic Acid -Water 25 lits	0.2	15 min	
	Sulphuric Acid -Water 12%	1.2	15 min	3 feed at 15 min interval. After 3rd feed run for 2 hrs. O/N 5 min/hr pH2.8-3.
				Next day Drain 50%
Chrome Tanning	Hypo	0.25	15 min	
	BCS	4	60 min	
	BCS	3		
	Formate	0.5		
	BUSUN 30L	0.1	2 hrs	Run up to complete penetration
	Water	100		
	Magnesium Oxide	0.35	7 hrs	pH 3.5-3.8 Drain & Pile

BD003

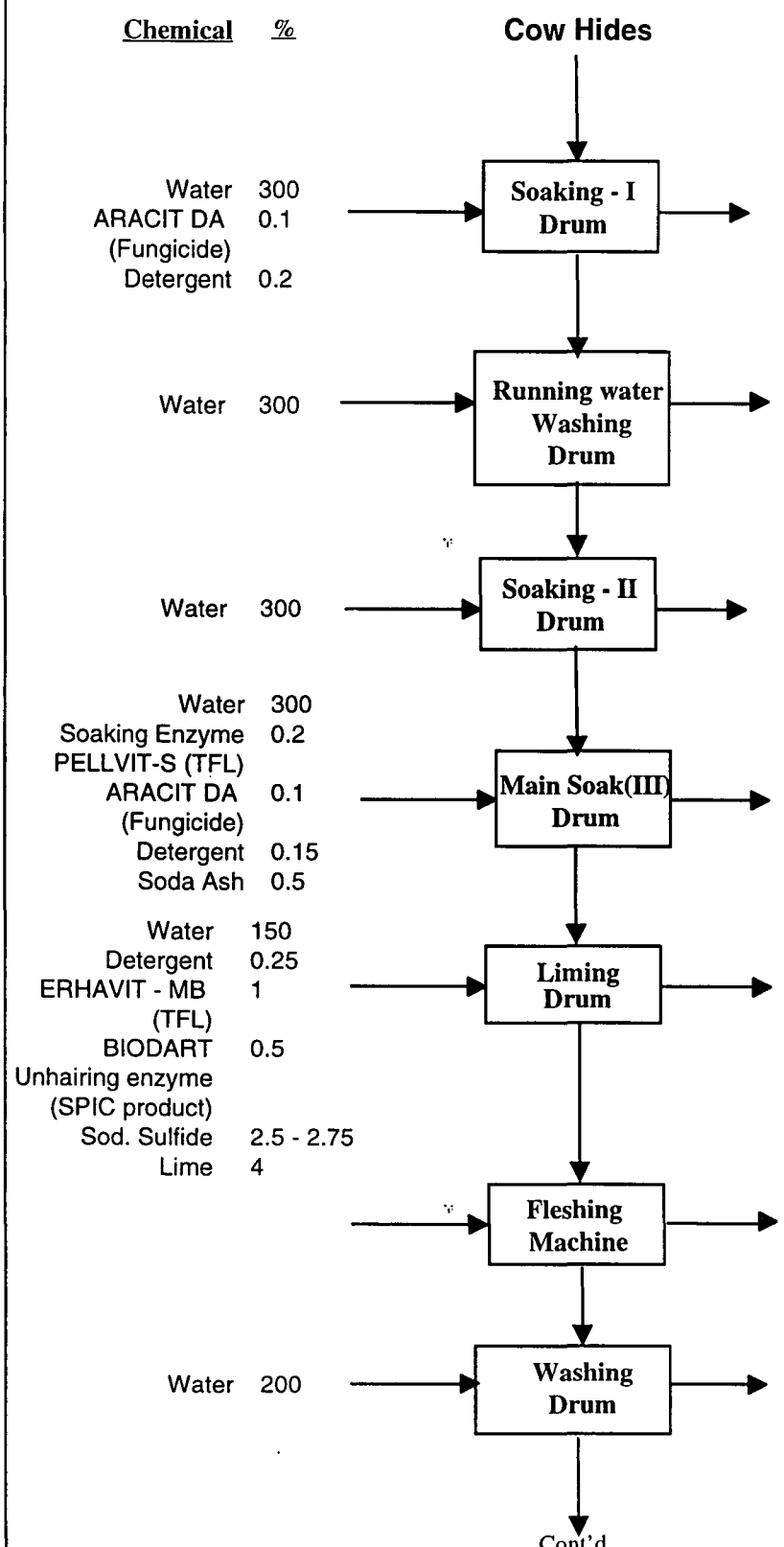
MODIFIED PROCESS FOR IMPLEMENTATION / DEMONSTRATION

40 tons/day

Process : Cow Hides Raw to Wet Blue

Lot-1

Batch : 1000 Kg / 157 cow



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Phase - II

BD003_mod 1

BD003

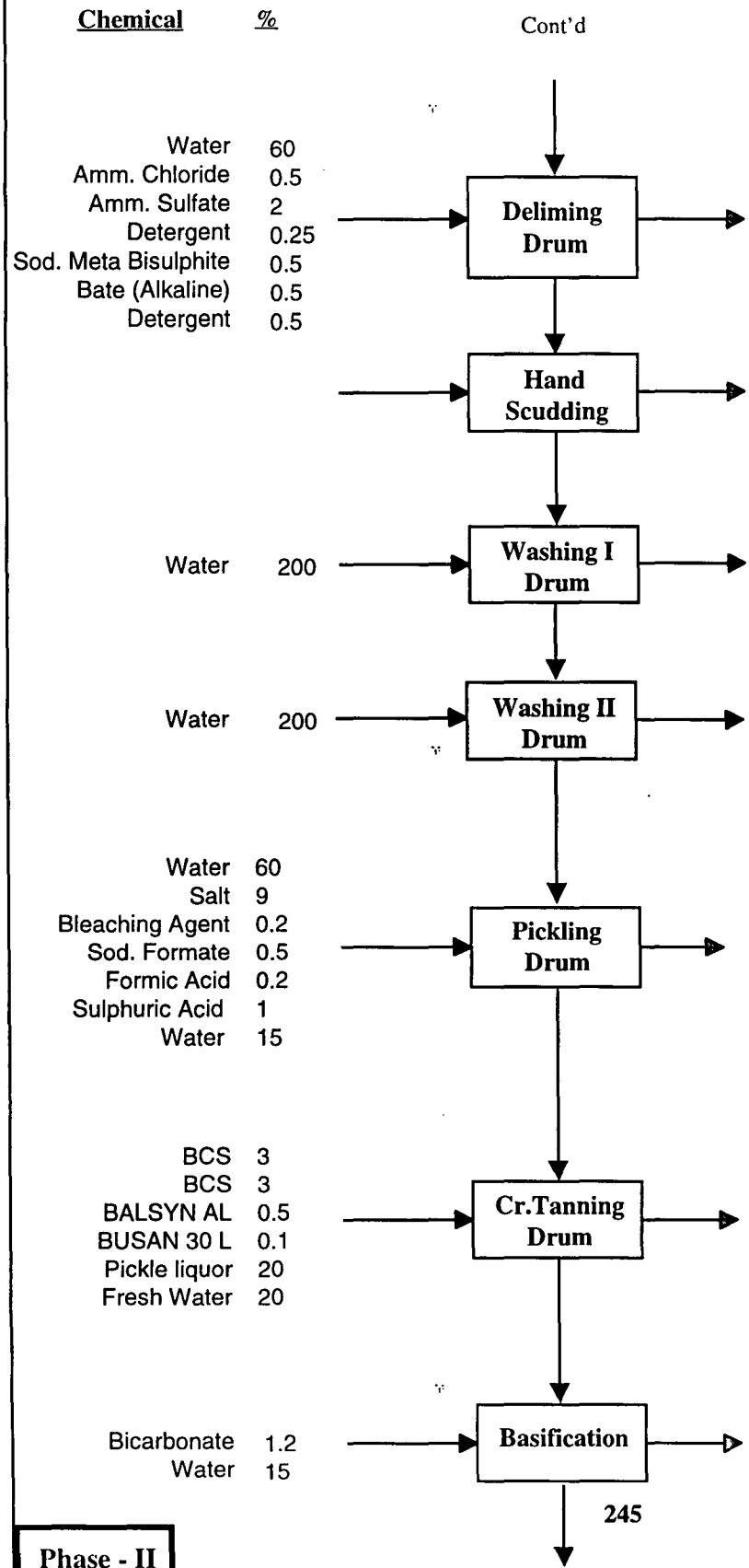
MODIFIED PROCESS FOR IMPLEMENTATION / DEMONSTRATION

40 tons/day

Process : Cow Hides Raw to Wet Blue

Lot-1

Batch : 1000 Kg / 157 cow



Phase - II

THE CLEANER TANNING PROCESS TECHNOLOGIES DEMONSTRAED AT HAZARIBAGH TANNING CLUSTER, DHAKA, BANGLADESH

Tannery Name: **Dhaka Hides & Skins Ltd.**
Process: Cow Hides Raw to Wet Blue
Raw Material: Cow Hides ***(Experiment Lot 1)***
Lot Size/ No. Pieces: 1000 kg / 157 cow light hides

Operation	Water/ Chemical	%	Run Time	**Remarks**
Soaking-I	Water	300		
	ARACIT DA (Fungicide)	0.1		
	Detergent	0.2	60 min	Drain
Running Water Wash	Water	300	30 min	Drain
Soaking -II	***Water***	***300***	***20 min***	***Collect the Liquor to use for the next lot Soak-I. Add 0.1% Aracit DA.***
Main Soak (III)	Water	300		
	Soaking Enzyme (PELVET-SPH)	0.2		
	Aracit DA (Fungicide)	0.1		
	Detergent	0.15	10 min	
	Soda Ash	0.5	30 min	O/N Run 5 min/hr. Drain .Next day Liming
Liming	Water	150		
	Detergent	0.25		
	ERHAVIT-MB (TFL)	1	10 min	
	BIODART unhairing enzyme (SPIC product)	0.5		
	Sodium Sulfide	2.5-2.75		
	Lime	4	30	Sulfide & Lime to be added in 3 feeds at 30 min interval
				Stop. Run 5 min/hr. Up to next day. Drain
Fleshing				**Note pelt weight**
Washing	Water	200	20 min	Collect the Liquor in collection tank for reuse as Liming bath for next lot.

Deliming	Water	60		
	Ammonium Chloride	0.5		
	Ammonium Sulfate	2		
	Detergent	0.25	60 min	Check completion of deliming. Cut neutral to phenolphthalein even in thick and compact regions of the hide
	Sodium Meta Bisulphite	0.5		
	Bate (Alkaline)	0.5		
	Detergent	0.5	60 min	Drain
Washing-I	Water	200	20 min	Drain
Washing-II	Water	200	20 min	Drain
Pickling	Water	60		
	Salt	9	10	
	Bleaching Agent	0.2		
	Sodium Formate	0.5		Run 15 min/hr for 8 hrs
	Formic Acid -Water 25 lits	0.2	15 min	
	Sulphuric Acid -Water 150 lits	1	15 min	3 feed at 15 min interval. After 3rd feed run for 2 hrs. O/N 5 min/hr. Check pH; should be 3-3.2 uniform in the cross section even in thick and compact regions of the hide
				Next day Drain 20% into the collection tank
Chrome Tanning	BCS	3	30 min	
	BCS	3		
	Balsyn AL	0.5		
	Busan 30L	0.1	2-3 hrs	Run up to complete penetration
	Water (20% pickle liquor from collection tank)	40	20 min	
Basification	Bicarbonate -Water 150 lits	1.2		Add in 10 feeds at 20 minutes interval. Then run the drum for 2 hrs. Check pH 3.8, if not adjust with 0.1-0.2% Bicarbonate. Finally run for 3.8 pH. Collect liquor into the collection pit. Adjust the Be° to 12 using 5-6% salt. Acidify with 0.2% formic acid and age the liquor overnight and reuse as pickle float for next batch.

BD003

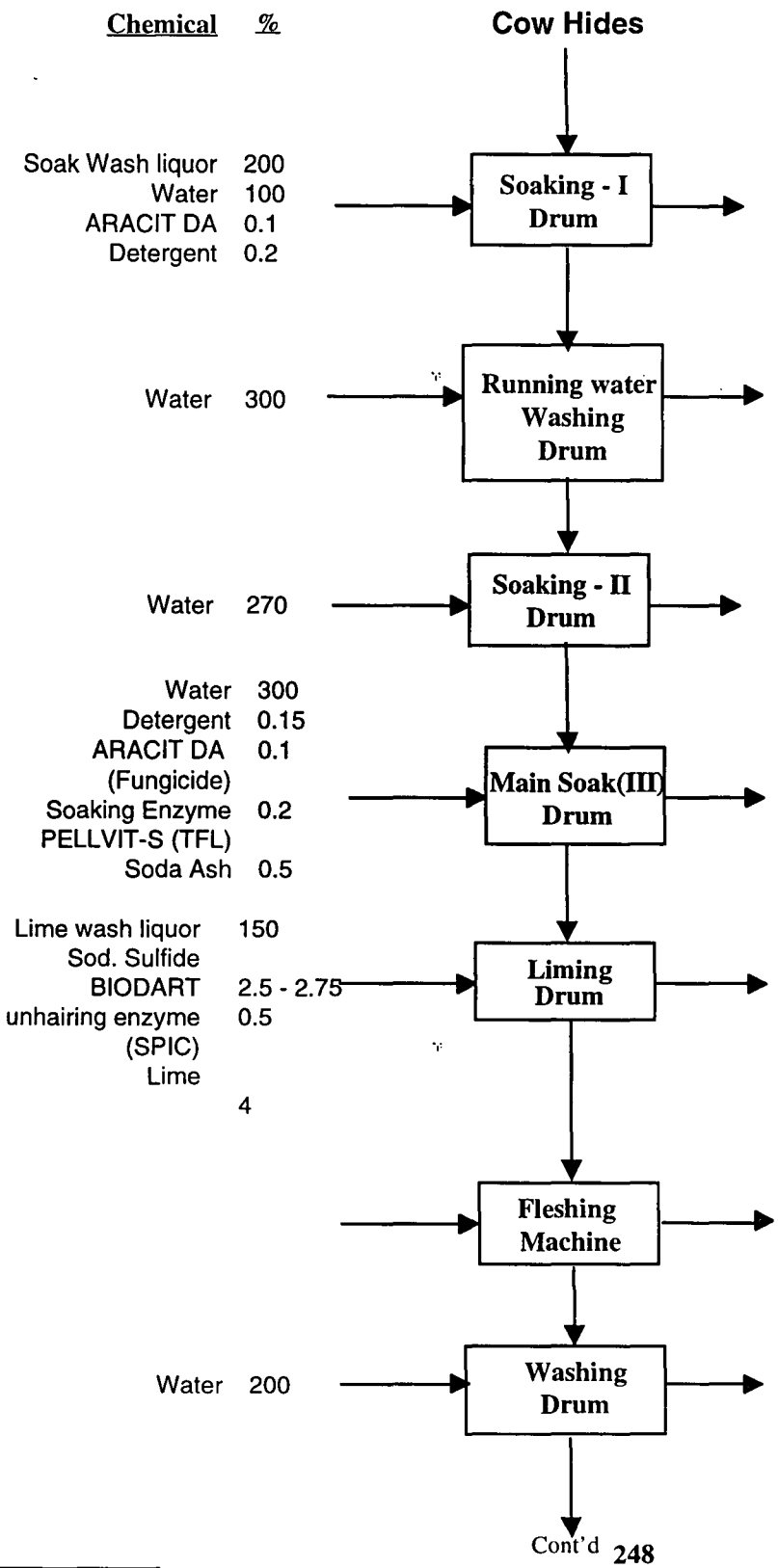
MODIFIED PROCESS FOR IMPLEMENTATION / DEMONSTRATION

40 tons/day

Process : Cow Hides Raw to Wet Blue

Lot-2

Batch : 1000 Kg / 104 cow



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Phase - II

BD003

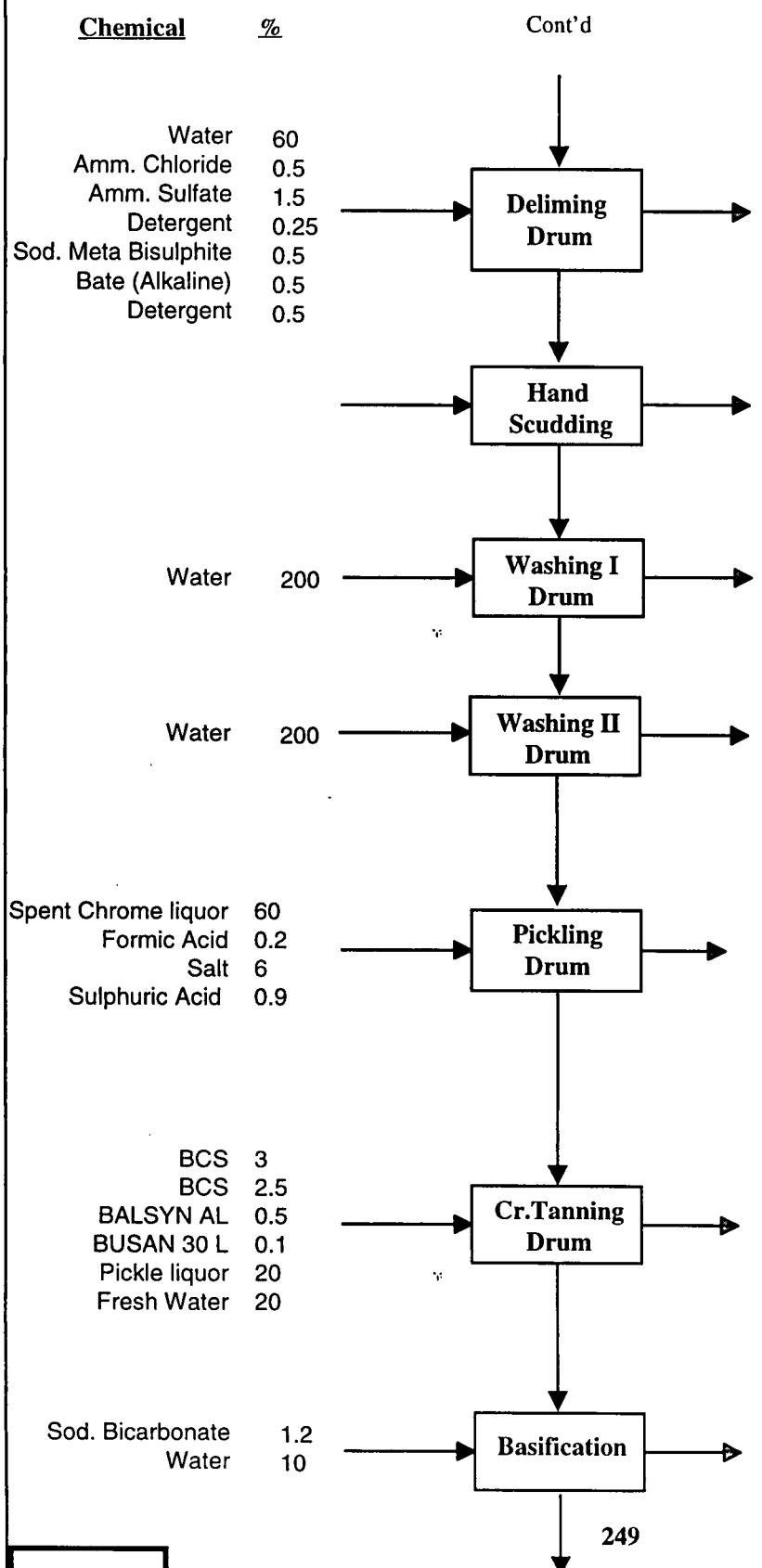
MODIFIED PROCESS FOR IMPLEMENTATION / DEMONSTRATION

40 tons/day

Process : Cow Hides Raw to Wet Blue

Lot-2

Batch : 1000 Kg / 104 cow



Phase - II

THE CLEANER TANNING PROCESS TECHNOLOGIES DEMONSTRAED AT HAZARIBAGH TANNING CLUSTER, DHAKA, BANGLADESH

Tannery Name: **Dhaka Hides & Skins Ltd.**
Process: Cow Hides Raw to Wet Blue
Raw Material: Cow Hides ***(Experiment Lot 2)***
Lot Size/ No. Pieces: 1000 kg / 104 cow hides

Operation	Water/ Chemical	%	Run Time	Remarks
Soaking-I	**Previous lot Soak-II liquor + 70% fresh Water**	300		
	ARACIT DA			Already added in collection tank previous day.
	Detergent	0.2	60 min	Drain
Running Water Wash	Water	300	30 min	Drain
Soaking -II	***Water***	***270***	***30 min***	***Collect the Liquor to use for the next lot Soak-I. Add 0.1% ARACIT DA.***
Main Soak (III)	Water	300		
	Detergent	0.15		
	ARACIT DA (Fungicide)	0.1	10 min	
	Soaking Enzyme (PELVET-SPH)	0.2		
	Soda Ash	0.5	30 min	O/N Run 5 min/hr. Drain .Next day Liming
Liming	**Previous lot** Lime wash Liquor	150		
	Sodium Sulfide	2.5-2.75		
	BIODART unhairing enzyme (SPIC product)	0.5		
	Lime	4	30	Sulfide & Lime to be added in 3 feeds at 30 min interval
				Stop. Run 5 min/hr. Up to next day. Drain

Fleshing				Note pelt weight
Washing	Water	200	20 min	Collect the Liquor in collection tank for reuse as Liming bath for next lot.
Deliming	Water	60		
	Ammonium Chloride	0.5		
	Ammonium Sulfate	1.5		
	Detergent	0.25	45 min	Check completion of deliming. Cut neutral to phenolphthalein even in thick and compact regions of the hide
	Sodium Meta Bisulphite	0.5		
	Bate (Alkaline)	0.5		
	Detergent	0.5	45 min	Drain
Washing-I	Water	200	20 min	Drain
Washing-II	Water	200	20 min	Drain
Pickling	**Previous lot** Spent Chrome Liquor (Acidified with 0.2% Formic Acid)	60		
	Salt	**6**	**15 min**	**Check the Be° , to be 8**
	Sulphuric Acid -20 lits	0.9	15 min	3 feed at 15 min interval. After 3rd feed run for 2 hrs. O/N 5 min/hr. Drain 20% float into collect into the tank. pH 3-3.2 even in thick and compact region of the hide.
Chrome Tanning	BCS	3	30 min	
	BCS	2.5		
	Balsyn AL	0.5		
	Busan 30L	0.1	3 hrs	Run up to complete penetration
	Water (20% pickle liquor of this lot from collection tank)	40	20 min	
Basification	Sodium Bicarbonate -Water 130 lits	1.2		Add in 10 feeds at 20 minutes interval. Then run the drum for 2 hrs. Check pH; 3.8 in the cross section; if not adjust with bicarbonate. Finally run for 2 hrs. Collect the liquor for recycling.

BD003

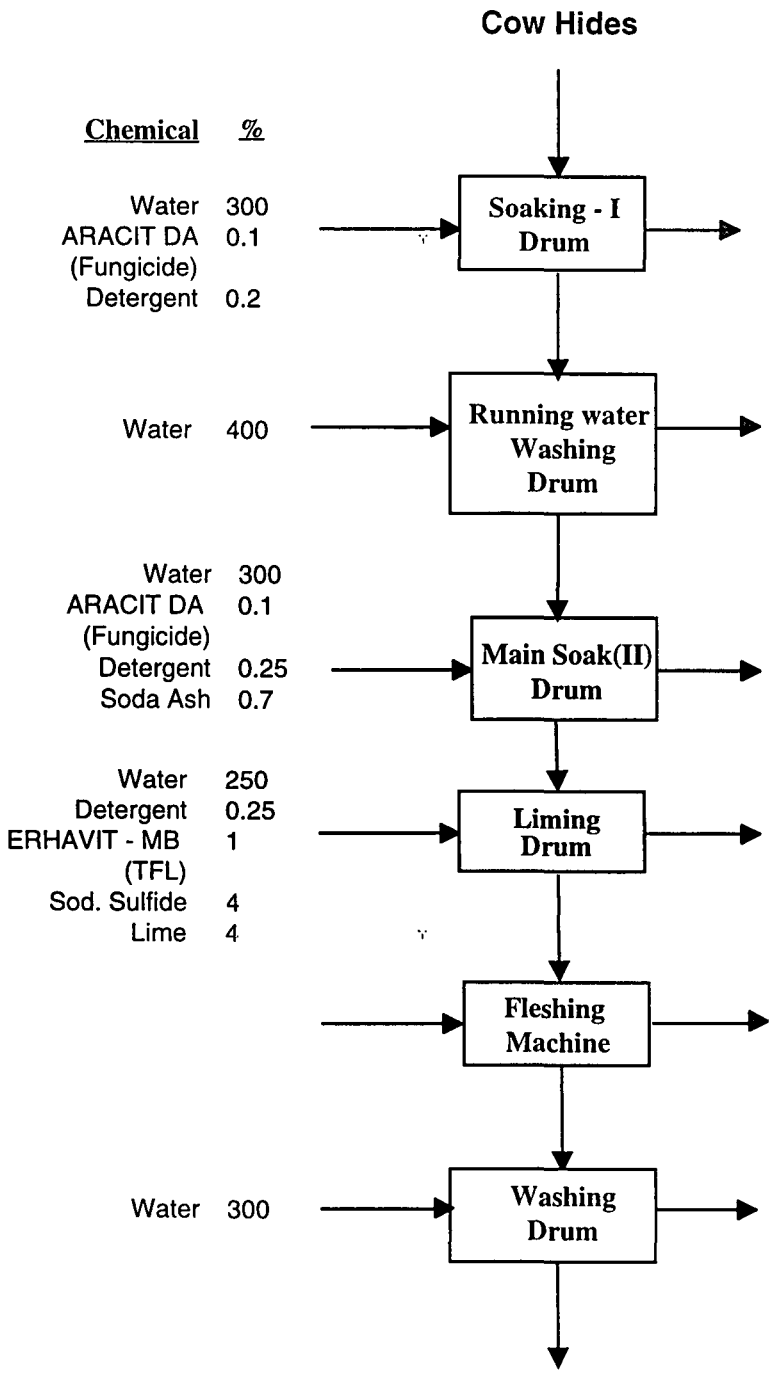
HIGH EXHAUST MONO ETHANOLAMINE PROCESS MODIFIED PROCESS FOR IMPLEMENTATION / DEMONSTRATION

40 tons/day

Lot-3

Process : Cow Hides Raw to Wet Blue

Batch : 1000 Kg



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Phase - II

BD003

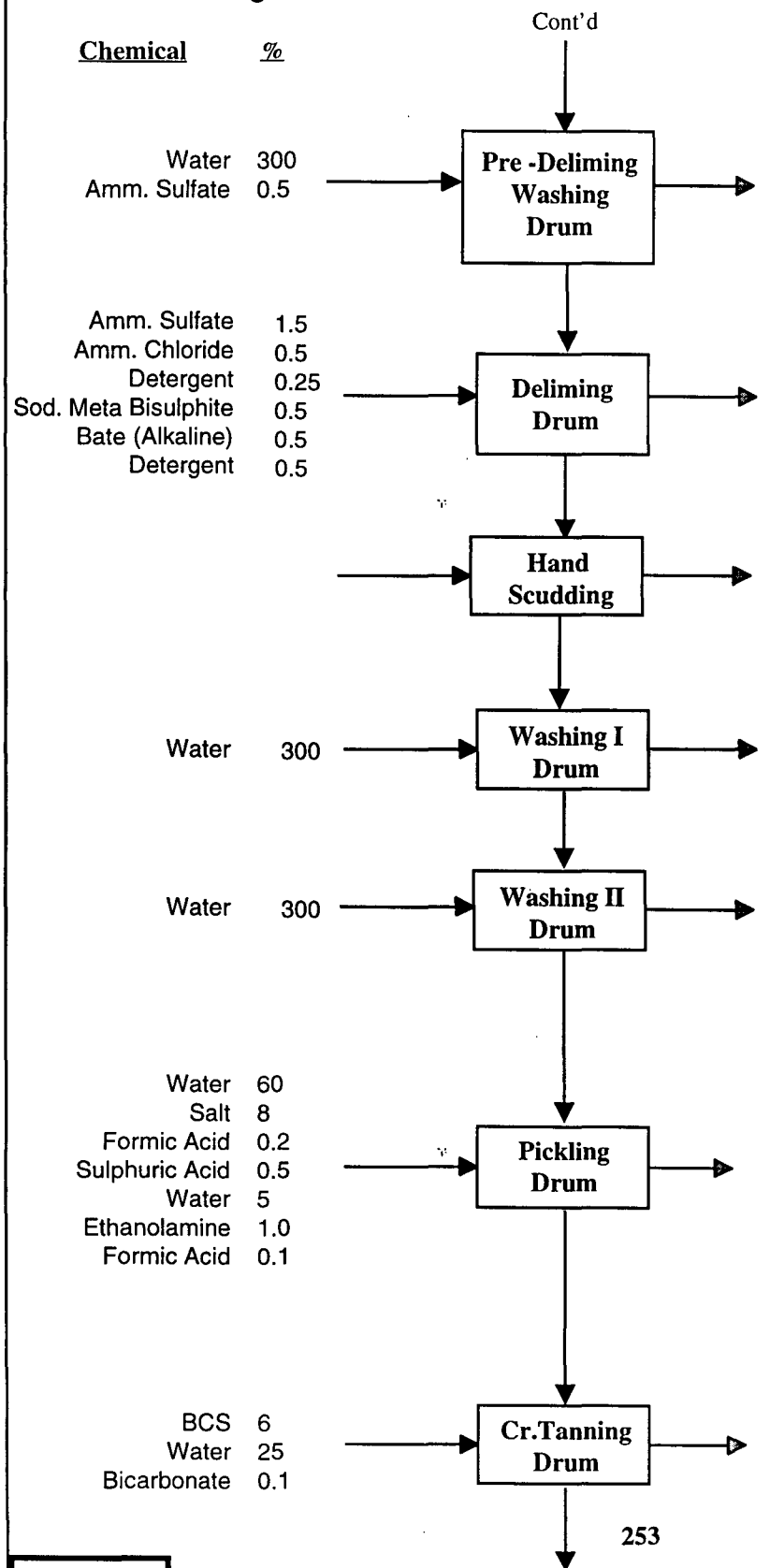
HIGH EXHAUST MONO ETHANOLAMINE PROCESS MODIFIED PROCESS FOR IMPLEMENTATION / DEMONSTRATION

40 tons/day

Lot-3

Process : Cow Hides Raw to Wet Blue

Batch : 1000 Kg



Phase - II

THE CLEANER TANNING PROCESS TECHNOLOGIES DEMONSTRAED AT HAZARIBAGH TANNING CLUSTER, DHAKA, BANGLADESH

Tannery Name: **Dhaka Hides & Skins Ltd.**
Process: Cow Hides Raw to Wet Blue

Raw Material: Cow Hides ***(High Exhaust Ethanolamine Process)***
Lot Size/ No. Pieces: 1000 kg /

Operation	**Water/ Chemical**	%	**Run Time**	**Remarks**
Soaking-I	Water	300		
	ARACIT DA (Fungicide)	0.1		
	Detergent	0.2	60 min	**Drain**
Running Water Wash	Water	400	30 min	Drain
Main Soak (III)	Water	300		
	ARACIT DA (Fungicide)	0.1		
	Detergent	0.25		
	Soda Ash	0.7	60 min	O/N Run 5 min/hr. Drain .Next day Liming
Liming	Water	250		
	Detergent	0.25		
	ERHAVIT-MB (TFL)	1	10 min	
	Sodium Sulfide	4		
	Lime	4	30	Sulfide & Lime to be added in 3 feeds at 30 min interval. After the third feed run for 1 hr
				Stop. Run 5 min/hr. Up to next day. Drain
Fleshing				Note pelt weight
Washing	Water	300	20 min	
Pre-Delime Washing	Water	300		
	Ammonium Sulfate	0.5	20 min	**Drain out**

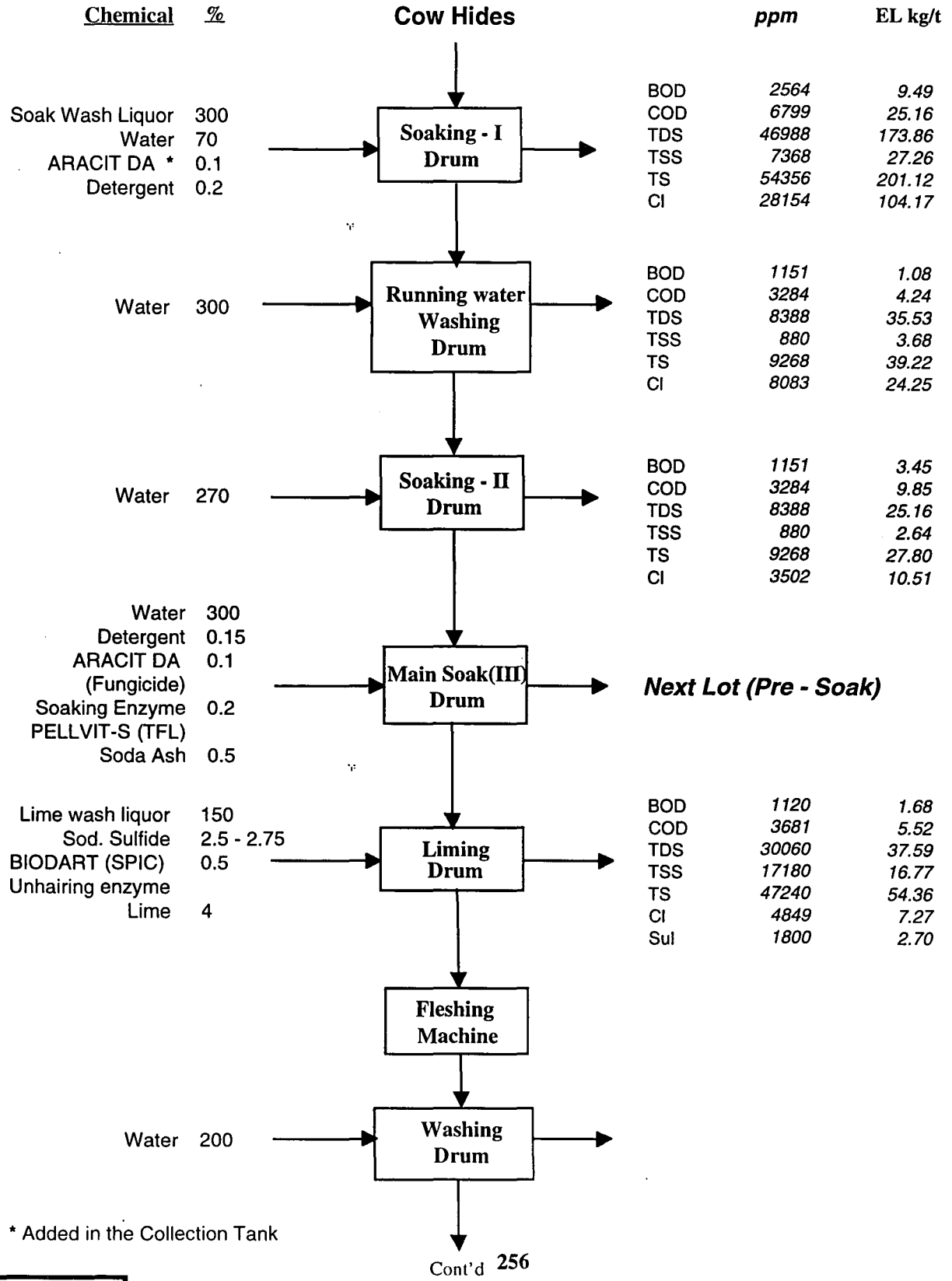
Deliming	Ammonium Sulfate	1.5		
	Ammonium Chloride	0.5		
	Detergent	0.25	45 min	**Check completion of deliming. Cut uniformly neutral to phenolphthalein throughout in even thick and compact regions of the hides.**
	Sodium Meta Bisulphite	0.5		
	Bate (Alkaline)	0.5		
	Detergent	0.5	45 min	Drain
Washing-I	Water	300	20 min	Drain out.
Washing-II	Water	300	10 min	Drain out.
Pickling	Water	60		
	Salt	8	10 min	Be° 7
	Formic Acid -Water 25 lits	0.2		
	Sulphuric Acid -Water 5%	0.5	15 min	2 feeds at 15 min interval. After 2nd feed run for 2 hrs. O/N 5 min/hr
				Bath & cross section even in thick and compact region of the hide pH 3.6-3.7
	Ethanolamine	1.0	90 min	pH 8.7- 8.8
	Formic Acid -Water 1%	0.1	10 min	Single feed
Chrome Tanning	BCS	6	2-3 hrs	Check penetration
	Water	25	30 min	
	Bicarbonate -Water 13 lits	0.1	60 min	Slow - Single feed Check the pH (3.8-3.9)
			60 min	**Pile. Liquor can be collected and recycled as pickle float of next lot.**

BD003	MODIFIED / IMPLEMENTED PROCESS AND EMISSION LOAD	40 tons/day

ALL TECHNOLOGY

Process : Cow Hides Raw to Wet Blue

Batch : 1000 Kg / 104 Cow Hides



* Added in the Collection Tank

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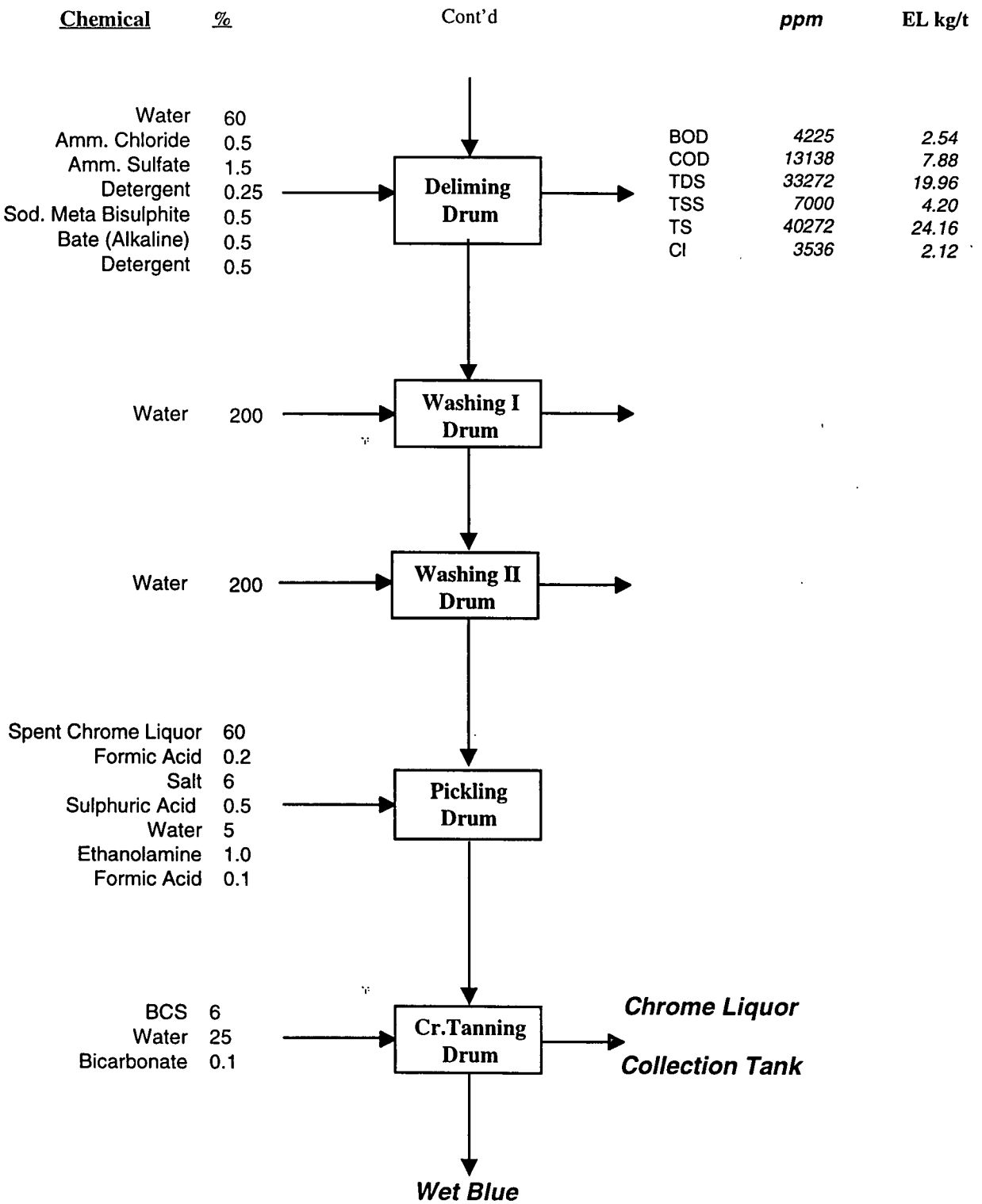
BD003	MODIFIED / IMPLEMENTED PROCESS AND EMISSION LOAD	40 tons/day

ALL TECHNOLOGY

Process : Cow Hides Raw to Wet Blue

Batch : 1000 Kg / 104 Cow Hides



Phase - II

BD003_all

THE CLEANER TANNING PROCESS TECHNOLOGIES DEMONSTRAED AT HAZARIBAGH TANNING CLUSTER, DHAKA, BANGLADESH

Tannery Name: **Dhaka Hides & Skins Ltd.**
Process: Cow Hides Raw to Wet Blue
Raw Material: Cow Hides ***(SK, LM reuse & Enzyme, PK-CT liquor, CT MEA)***
Lot Size/ No. Pieces: 1000 kg / 104 cow hides

Operation	**Water/ Chemical**	**%**	**Run Time**	**Remarks**
Soaking-I	**Previous lot Soak-II liquor + 70% fresh Water**	300		
	ARACIT DA			Already added in collection tank previous day.
	Detergent	0.2	60 min	Drain
Running Water Wash	Water	300	30 min	Drain
Soaking -II	***Water***	***270***	***30 min***	***Collect the Liquor to use for the next lot Soak-I. Add 0.1% ARACIT DA.***
Main Soak (III)	Water	300		
	Detergent	0.15		
	ARACIT DA (Fungicide)	0.1	10 min	
	Soaking Enzyme (PELVET-SPH)	0.2		
	Soda Ash	0.5	30 min	O/N Run 5 min/hr. Drain .Next day Liming
Liming	**Previous lot** Lime wash Liquor	150		
	Sodium Sulfide	2.5-2.75		
	BIODART unhairing enzyme (SPIC product)	0.5		
	Lime	4	30	Sulfide & Lime to be added in 3 feeds at 30 min interval
				Stop. Run 5 min/hr. Up to next day. Drain

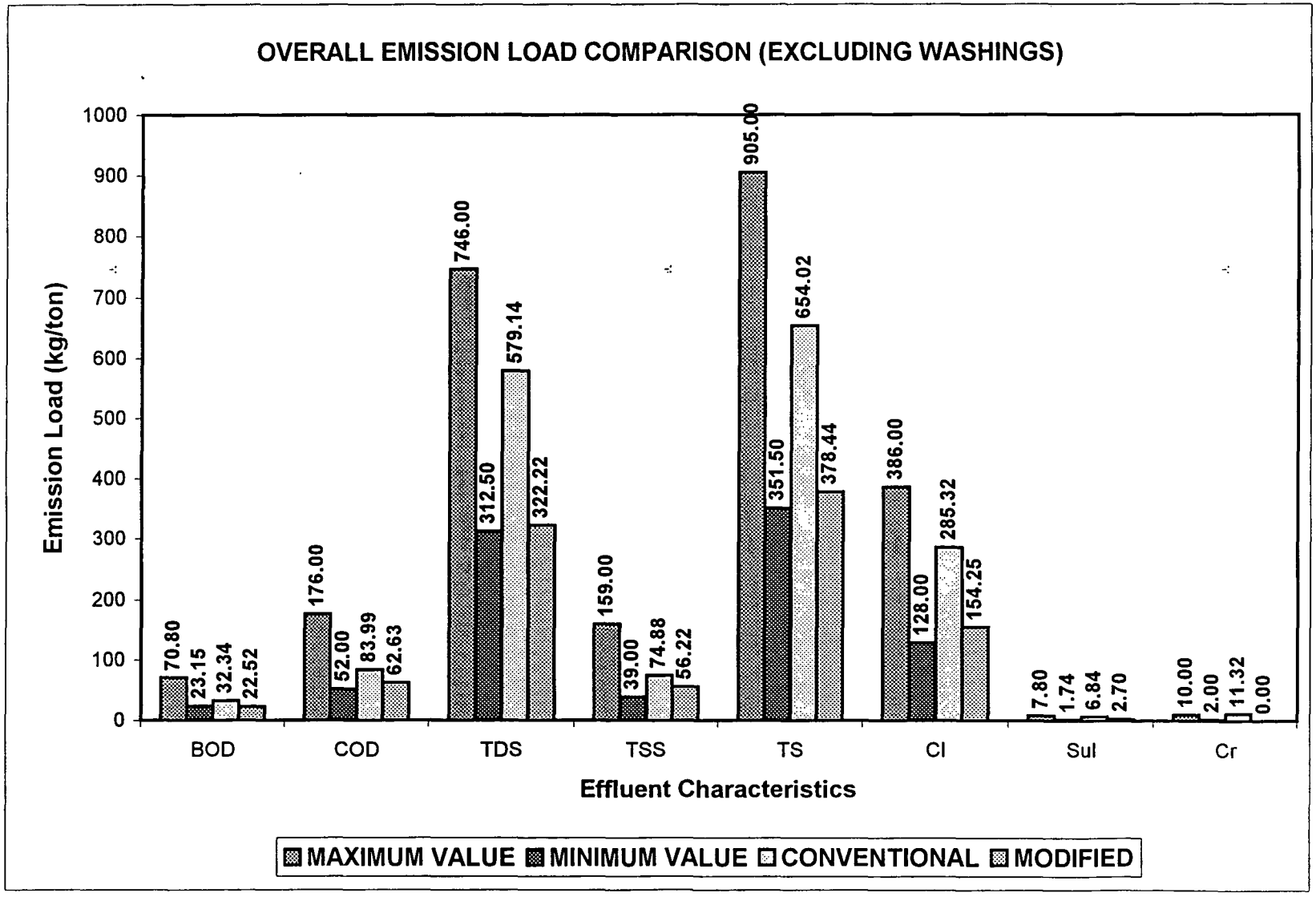
Fleshing				Note pelt weight
Washing	Water	200	20 min	Collect the Liquor in collection tank for reuse as Liming bath for next lot.
Deliming	Water	60		
	Ammonium Chloride	0.5		
	Ammonium Sulfate	1.5		
	Detergent	0.25	45 min	Check completion of deliming. Cut neutral to phenolphthalein even in thick and compact regions of the hide
	Sodium Meta Bisulphite	0.5		
	Bate (Alkaline)	0.5		
	Detergent	0.5	45 min	Drain
Washing-I	Water	200	20 min	Drain
Washing-II	Water	200	20 min	Drain
Pickling	**Previous lot** Spent Chrome Liquor (Acidified with 0.2% Formic Acid)	60		
	Salt	**6**	**15 min**	**Check the Be° , to be 8**
	Sulphuric Acid -Water 5%	0.5	15 min	2 feeds at 15 min interval. After 2nd feed run for 2 hrs. O/N 5 min/hr
				Bath & cross section even in thick and compact region of the hide pH 3.6-3.7
	Ethanolamine	1.0	90 min	pH 8.7- 8.8
	Formic Acid -Water 1%	0.1	10 min	Single feed
Chrome Tanning	BCS	6	2-3 hrs	Check penetration
	Water	25	30 min	
	Bicarbonate -Water 13 lits	0.1	60 min	Slow - Single feed Check the pH (3.8-3.9)
			60 min	**Pile. Liquor can be collected and recycled as pickle float of next lot.**

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	14.00	17.21	44.74	346.34	38.91	385.25	221.43		
	M	9.70	14.02	39.24	234.55	33.59	268.14	138.92		
	D %	-30.71	-18.54	-12.28	-32.28	-13.69	-30.40	-37.26		
Liming	**T**	**3.0 - 4.0**	**15 - 40**	**30 -100**	**72 -120**	**18 - 80**	**90 - 200**	**12.0 - 32**	**1.7 - 7.7**	
	C	5.00	4.75	10.88	45.60	15.24	60.84	22.03	6.84	
	M	1.50	1.68	5.52	37.59	16.77	54.36	7.27	2.70	
	D %	-70.00	-64.60	-49.23	-17.57	10.07	-10.65	-66.98	-60.53	
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**		
	C	3.00	8.86	20.69	76.90	11.71	88.61	15.35		
	M	4.60	6.83	17.87	50.08	5.86	55.94	8.05		
	D %	53.33	-22.91	-13.66	-34.88	-49.93	-36.87	-47.57		
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 %	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!		
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	1.80	1.53	7.69	110.30	9.02	119.33	26.51		11.32
	M*	0.00	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		-100.00
Overall (Excluding 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**	**2 - 10**
	C	23.80	32.34	83.99	579.14	74.88	654.02	285.32	6.84	11.32
	M	15.80	22.52	62.63	322.22	56.22	378.44	154.25	2.70	0.00
	D %	***-33.61***	***-30.35***	***-25.43***	***-44.36***	***-24.92***	***-42.14***	***-45.94***	***-60.53***	***-100.00***

T: Traditional C : Conventional M : Modified D : Difference

* Pickling & Chrome Tanning Close Loop ,


OVERALL EMISSION LOAD COMPARISON (EXCLUDING WASHINGS)
Emission Load (kg/ton)
1000
900
800
700
600
500
400
300
200
100
0
70.80
23.15
32.34
22.52
176.00
52.00
83.99
62.63
746.00
312.50
579.14
322.22
159.00
39.00
74.88
56.22
905.00
351.50
654.02
378.44
386.00
128.00
285.32
154.25
7.80
1.74
6.84
2.70
10.00
2.00
11.32
0.00
BOD
COD
TDS
TSS
TS
Cl
Sul
Cr
Effluent Characteristics
MAXIMUM VALUE
MINIMUM VALUE
CONVENTIONAL
MODIFIED

Good housekeeping practices at Dacca Hides & Skins

1. Walk-through survey

Criteria	Finding	Proposed follow-up action
1. Safety of machinery and equipment		
1.1 Placement and access to machines	Present layout allows easy access to all machines used in the hides tannery.	
	Drums are placed on proper fundaments, surrounded by sloped catchments areas.	
	Placement of machinery in the skins sections results in cramped space, particularly around toggling unit.	
1.2 Guarding of moving and hazardous machine parts	The newly imported machinery, mostly used in the crust, by and large meets international safety requirements in terms of proper positioning, availability of passive and active guards, placement and labelling of control buttons, dials and switches.	Put special attention on preventive maintenance and spare part management to sustain present condition.
	Safety facilities (e.g. guards, labels) on machines, which have been imported earlier are missing or are broken.	
	Local machinery (drums, fleshing machine) mostly used in raw-to-semi finished production, are without passive and active guards.	Install fence type covers and guards around motors, drive and gear mechanisms of drums and fleshing machines.
1.3. Control of machines	Control buttons on local and older imported machinery are not in reach of operator or are missing. Emergency-off switches are not available or not in reach of operator.	Install and relocate starters and emergency-off buttons to be in convenient reach of operator and helper.
		Clearly label all controls and buttons to allow their easy identification.
	Elevated platforms are available on most machines to allow good worker-operating point interface.	Provide a working platform on the unloading side of the lime splitting.
1.4 Maintenance practices	The general maintenance and cleanliness of machines is poor with waste and dust covering machine and electric installations.	Clearly place responsibility for condition of machine with concerned supervisor.
	A basic system of preventive maintenance seems to be in use. Most maintenance activities related to breakdown maintenance and repair.	Assist the maintenance team to prepare an inventory of all machines and to draw up an monthly and annual maintenance schedule (also based on the recommendations given in the machine manuals)
	All machines are numbered to allow easy and clear identification.	The existing numbering should be used to clearly label corresponding electrical switches and starters/
	No pre- and post-operation checking routine is being followed.	Place boards containing checklist type instructions (in Bengali) at each machine, listing points to be checked before and after production.
2. Safety of electrical installations		

Criteria	Finding	Proposed follow-up action
2.1 Protection rating of motors	Many electrical motors in use in the wet-processing areas do not conform to IP55 (or equivalent) level of protection as required for conditions prevailing in such work areas. Though some motors may have IP55 rating (according motor rating labels are missing or not legible), poor maintenance and condition of these motors have reduced the actual level of protection.	Consider replacement of motors with inadequate protection rating.
	Terminal boxes on many motors are partly missing.	Fix terminal boxes and connect cables through cable glands.
	Most motors and outer motor parts are heavily corroded.	Derust motors and provide corrosion protective coating.
	Fan covers on several motors are missing, which reduces the cooling capacity and thus motor performance, particularly during the hot months.	Fix fan covers.
2.2 Wiring and earthing:	Wiring on (local and second-hand) machines is unsafe; electric cables are not connected to the motors through cable glands.	Connect cable through glands to reduce loss of energy in transmission.
	Wire connections are poorly insulated (even blank wires) using even simple adhesive tape.	Replace all cut wires and replace with new and properly rated wires.
		Place all wires in protective cable ducts and locate cable ducts along the wall and ceiling.
	Earthing wires are missing or are loose on several electric motors in the wet-processing areas.	Check earthing connections on all motors and metal panel boards. There should be at least to earthing connections.
	Circuit breakers and overload relays are available on the imported machinery only. In many places in the skins processing section fuses are missing and have been replaced by wire pieces.	Replace missing fuses.
		Consider installation of circuit breakers and overload relays to prevent damage to electronic parts of newly imported machines.
	Electrical cables for minor tools and lighting in the work areas (e.g. near shaving m./c) have been placed across passageways and immediate work areas around machines, obstructing free movement.	Place cables in cable ducts and locate along wall and ceiling.
2.3 Switch boards and panels	The electrical connection on and around imported machinery conforms to international standards in terms of colour coding, overload and short-circuit protection.	Use same colour coding for other electric connections in the tannery.
	Switchboards and panels of imported machines are placed next to the machine in convenient reach of operators and helpers.	
	Most switches and starters on drums and local machinery in wet-processing areas are located near the machinery.	Shift starters closer to the machines.
		Clearly label the starter boxes indicating the corresponding machine or motor, using the existing numbering system.

Criteria	Finding	Proposed follow-up action
	Instead of adequate panels or boards, wooden boards are used for mounting switches, starter buttons and other controls in several areas. Due to humidity and poor maintenance practices, these boards are either soaked (high risk of becoming live!) or covered with dust (fire risk!).	Consider replacement of wooden panels with proper switchboards and distribution panels made of corrosion proof material.
	Piles of shavings and material in process block access to the main distribution panel behind the shaving machines. The panel cover is missing allowing ingress of dust from the shaving area.	Ensure that all distribution panels are easily accessible. Fix proper panel doors with rubber seal to prevent ingress of dust (to reduce risk of ignition by electrical sparks or heat).
	Labels, allowing clear identification of switches and buttons, are usually missing. Sample tests, asking workers to switch on or off a particular machine, resulted in trial and error exercises, switching on wrong machinery or light fittings.	Use labels for all switches and buttons to allow clear identification of corresponding fixtures and fittings by all workers.
	All switches, dials and controls on imported machines are clearly labelled in English but not in Bengali. Workers were not able to explain the meaning if the different controls from the labels.	Provide additional labels in Bengali on all imported machines.
2.4 Main electrical controls	There is a separate common main electrical control room located in the skins section and is surrounded by shielding walls.	
	The transformer unit is not protected by fence-type barrier.	Provide fence-type barrier, made of non-conductive material, to prevent access to transformer unit.
	The DG set is placed near the side entrance to the main electrical control room. Access to the DG set is not being prevented by fence or guard.	Provide fence-type barrier to separate pathway and DG set.
	Protective measures such as insulation rubber matting, high voltage and other warning signs, rubber gloves (with voltage rating) are absent.	Also, display warning sign (in Bengali) at entrance to main electrical control room ("no unauthorised entry"; "Danger – High voltage")
3. Safety in use of chemicals		
3.1 Availability of information on hazardous chemicals	Most chemicals used in the tanneries are imported. Chemical containers from European suppliers are labelled and marked as per international standards. However, in many cases these labels are partly torn or have become hardly readable while being handled in the tannery. Safety labelling and marking on containers of chemicals imported from other Asian countries does not conform to international standards.	Check labels before using chemicals in the tannery. In case labels are missing use no erasable marker pen to clearly mark content of respective chemical containers.
	Material Safety Data Sheets (MSDS) are not available in the tanneries.	Prepare an inventory of all chemicals in use. Obtain MSDS from the suppliers and keep on record with in-charge of chemical store and production manager.

Criteria	Finding	Proposed follow-up action
	Floor level supervisors/technicians and workers have already limited awareness about the potential health hazards of the hazardous chemicals in use and first aid measures.	Inform supervisors about the content of MSDS for hazardous chemicals used in their areas and provide for specific instructions to all workers handling chemical substances.
3.2 Storage of chemicals	The central chemical store is located in separate building away from the tannery. The store is of sufficient size for the amount of chemicals stored.	
	There are separate temporary chemical storage areas in the tannery. However, these are not efficiently used. Empty containers block available space. The floor is covered with spilled chemicals.	Clean temporary storage areas. Fix sign board clearly indicating area as "chemical storage area".
	Acids are haphazardly stored in an open space, adjacent to the rest room in the tan yard.	Ideally convert one existing temporary storage area for exclusive storage for acid containers. Place proper warning signs and make sure that an emergency drain is available.
	Most chemical containers and bags are stored on pallets, covered with a plastic foil. However, pallets are not used for easier shifting of chemicals within the tannery.	Consider introduction of a pallet truck and use of plastic pallets for easier movement of chemicals.
3.3 Transfer and handling of chemicals	Powered chemicals (BCS, salt) are usually carried in the original bags to the respective processing areas, where they are emptied into barrels for further preparation.	Use trolley for moving chemicals to reduce manual strain.
	Limestone is manually crushed and hydrated in open chemical barrels. Workers are affected by the splashes and spills during this process.	Consider closed system for hydrating lime stone. Replace existing goggles with proper splash goggles (should have seal on top and sides).
	Concerned workers are aware of the hazards involved and use personal protective equipment. The goggles in use are not suitable for protection against splashes.	Worker should wear full body apron, gum boots and gloves.
	Liquid chemicals (fatliquors, acids) are usually transferred using small measuring cups from the large containers to open (unmarked) buckets.	When moving liquid chemicals, use closed containers to prevent spill. Make sure that all containers and buckets are also clearly marked or labelled to allow easy identification all the time.
	The mixture is stirred with a wooden stick in the open barrel, exposing the concerned worker to acid vapours. Concentrated acids are carried by hand in open buckets and diluted in open barrels next to the drums.	Consider dilution in one designated area and transport acids to process area in a diluted from. Use a closed system or a mechanical mixer for stirring. Always avoid manual carrying of concentrated acids or alkalis. Use small trolley to move such material, even only for short distances.
	Mixing is done manually, using a wooden stick. The concerned workers are inhaling vapours, fumes and aerosols generated during these processes. Workers do not use any personal protective equipment	Besides personal protective equipment such as apron, boots, and gloves, the worker should wear a respirator suitable for acid vapours and splash goggles when manually mixing and diluting acid.
3.4 Control of emissions at source	No air quality monitoring has been carried out so far in the tannery.	

Criteria	Finding	Proposed follow-up action
	Any vapours, fumes, gases generated during the processes in the drums are diluted by venting the drums for a short period of time before removing material inside.	
	The layout of the beam house and tan yard allows for good cross-ventilation.	
	The imported shaving machines are not connected to any dust extraction facility.	
3.5 Disposal of chemical waste and containers:	Empty chemical containers and carboys are collected; rudimentary cleaned in one part of the main chemical store and sold to special agents.	Rinse chemical containers in work area and use chemical residuals in the process. Make sure the wash water is also discharged to the effluent treatment plant once installed.
	These sell the containers for reuse to chemical manufacturers or to private persons for storage of water of food.	Reuse of old chemical containers for storage of water and food is to be discouraged. Chemical residuals may enter the food chain!
	Solid waste such as fleshings are swept into the open drains and flushed out together with tannery effluent	
	At present, wastewater is discharged into drains to the outside of the tannery without treatment.	
3.6 Personal protection	Workers wear basic personal protective equipment such plastic foils or aprons, boots and gloves.	
	Personal protective equipment to protect against specific chemical hazards (e.g. splash goggles, respirators) is not available.	
	Workers on the shaving machines use handkerchiefs.	
4. Safe condition of floors and structures		
4.1 Flooring and passageways	General floor conditions are acceptable. Floor openings such as drains, wells or pits are covered. At a few points there are holes.	Cover remaining holes to avoid falls and trips.
	Passageways are of adequate width and flooring allowing easy movement of material and persons.	Carefully store material in process to remain passageways free at all times.
5. Illumination		
5.1 Light quality	Measurements conducted on-site using an industrial light meter showed that the general illumination levels in almost all work areas are inadequate. For detailed results, refer to enclose annex.	
5.2 Use of day light	Apart from poor use of natural (day) light due to the given structures of the buildings, the tannery does not have sufficient number of light fittings.	
	There is scope for more intensive use of natural light by provision of sky lights.	

Criteria	Finding	Proposed follow-up action
	Walls and ceilings have poor reflection values due to poor cleanliness and lack of whitewashing.	Whitewashing and good cleanliness of ceiling, floors and column will increase the light reflection.
5.3. Local lighting	The quality of local lighting of point of operations, particularly on machines with hazardous operations and moving machine parts are inadequate. Poor lighting does not only result in strain and impairment of eyesight, but results in worker's fast fatigue and dizziness. These factors in turn lead to low quality and increase risk of accidents.	
6. Noise		
6.1 Noise levels	As per the measurements conducted on-site noise levels were within safe limits of 85 dB(A) for a eight hour exposure. This has been the first noise measurement in this tannery.	
6.2 Hearing protection	No hearing protection (ear muff, ear plugs) was available or used by workers in operation with high noise levels.	
7. Ventilation and ambient air quality		
7.1 Natural ventilation	Most production facilities are placed in wide and open halls. How, additional wall openings e.g. windows, gates, louvers would allow better natural cross-ventilation.	Install louvers on the ground floor and ceiling to allow for better horizontal and vertical air flow.
7.2 Ventilation	Ceiling fans are available in some work areas to provide airflow for operators, but these do not contribute to sufficient air change in the work areas.	Install wall mounted exhaust fans on the ground floor.
7.3 Temperature and humidity	Indoor ambient air quality, temperature and humidity have not been monitored. There is no provision for dry-bulb and wet-bulb thermometers.	
8. Handling and movement of material and loads		
8.1 Use of trolleys	Trolleys are used for transport of material and inputs.	
	Tools such as tongs and long clamps are partly used by the workers when handling rawhides in beam house.	
	Due to current stacking and storage practices of material in process near the shaving machines, material needs to be carried manually.	Frequent removal of shavings, spare parts and scrap material will increase available workspace and allow use of mobile horses or access by pallet truck.
8.2 Storage of material	Process and input materials are mostly stored on plastic foils placed on the floor. When required the material is loaded manually. Hydraulic pallet trucks are not in use for moving stacks of material on the pallets.	
8.3. Organisation and management of workspace	Several areas for work, storage and movement are clearly segregated by semi partition walls. Floor markings are not in use.	Apply clearly visible floor markings (e.g. near and around shaving m/c) and make sure that all workers adhere to these.

Criteria	Finding	Proposed follow-up action
9. Emergency management and control		
9.1 Emergency planning	No written emergency plan listing actions required for different emergency scenarios is available.	
9.2 Dealing with fire and explosion	No systematic fire audit has been conducted in the tanneries to identify potential sources of ignition and potentially flammable material and to take preventive and preparedness measures. Workers in the tanneries are not aware of what to do in case of a fire. Emergency exits and routes are not clearly marked or indicated. There are no signs or boards, which prohibit smoking or open fire, particularly, in areas such as chemical stores, shaving and main electrical control room. No fire extinguishers were found during the survey.	
9.3 Dealing with medical emergencies	No first-medical-aid facility is available.	Provide for separate first-aid kits on each floor. Mark their location. Make the respective floor supervisor responsible for the maintenance and good condition of the first aid kit.
	The phone number of nearest doctor or hospital was not displayed on or next to the telephones with outside connection.	
	There not trained first-aiders available in the tannery.	Train at least two workers of the tannery as certified first aiders. One certified first aider should be available on each shift. Consider organising a basic first aid training for all workers.
10. Personal protection and welfare		
10.1 Personal hygiene	Workers frequently wash exposed skin after handling raw material or work in wet-processing yard. No separate washing facilities are available. Usually workers use water from the water taps in the production areas. Workers usually take food outside the factory.	
10.2 Working and protective clothing	No separate working uniforms are provided to the workers, who use the same clothes at work and at home. Most workers wear open sandals. Only a few workers in the wet-processing wear boots.	
10.3 Access to drinking water	No provision of clean drinking water is available in the tannery.	
10.4 Conditions of toilets	A number of toilets are available on several floors. There is no provision of separate toilets from the female workers.	

Criteria	Finding	Proposed follow-up action
11. Promotion of safety and health at work	The tannery does not have a written safety policy.	
11.1 Safety signs	Safety or cautionary signs and boards are not displayed in the workplaces. Imported machines usually bear safety and cautionary labels.	
11.2 Safety training	As the awareness on safety & health among supervisors is also very low, increase of general awareness by means of close supervision and on-the spot guidance is limited.	

2. Results of noise measurements at Dacca Hides & Skins

Following measurements have been carried out by means of an industrial sound level meter. The threshold limit level for safe noise exposure over an eight-hour shift is between 85 to 90 dB(A). Internationally continuous noise levels of around 75 to 80 dB(A) are recommended. Measurements have been done in A rating. Measurements have been taken at the place of the respective operator(s).

LA grab measurements
LAeq Equalised sound pressure level
LaMax Maximum sound pressure level recorded
All measurements are recorded in dB(A):

Operation	L_A	L_{Aeq}	L_{Amax}
Tanning drum 25 - walkway	**81...89**	**87.0**	**92.0**
Splitting m/c (front, right wheel)	**81...91**	**91.6**	**97.6**

3. Results of light measurements at Dacca Hides & Skins

Following measurements have been made by means of an industrial light meter. The measurements have been taken at the point of operation at the respective machines/operations. The general light level in all work areas is inadequate.

Operation	Lux (measured)	Recommended minimum level	Remarks
Fleshing m/c I (mech)	**5...6**	**300...500**	
Fleshing m/c II (mech)	**13...25**	**300...500**	
Skin fleshing m/c	**34...40**	**300...500**	
Drum yard (near loading bay)	**18...21**	**150...300**	
Skin setting m/c	**38**	**300...500**	
Through feed sammying m/c (feeding)	**4**	**300...500**	
Through feed sammying m/c (rear)	**15**	**300...500**	**Stroboscopic effect from fan**
Splitting m/c (front)	**5...17**	**300...500**	
Splitting m/c (rear)	**13...20**	**300...500**	
Wet-blue sorting	**250...850**	**750...1000**	
Wet-blue trimming	**21...40**	**300...500**	
Shaving m/c I	**23**	**300...500**	
Shaving m/c II	**20...25**	**300...500**	
Embossing m/c front	**5...7**	**300...500**	
Embossing m/c rear	**2**	**300...500**	
Auto-toggling	**30...32**	**300...500**	

ANNEXURE - IX

TANNERY PROCESS DETAILS

1. Tannery Name : **BD006**

2. Tannery Location and Land area
   a) Total land area (in acres/sq.ft.) : 40,000 sq.ft
   b) Open land available (in acres/sq.ft.) : 15,000 sq.ft
   c) Tannery boundary details: :
   Northern side: Apex Leather Eastern side: Kohinoor Tannery
   Southern side: Road Western side: Rana Tannery

3. Water
   a) Existing ground water Table -(feet) (within the tannery premises) : 40'
   b) Sources of water supply (If more than one source mention % share) : Tube well
   c) Characteristics of raw water (enclose water analysis report) : Not Available
   d) Residential Quarters (if any) within the campus : No. of quarters Nil; No. of persons residing Nil

4. Raw Material

Sl. No.	Source/ Origin	Species	Preservation Mode Dried / sod. chloride/ biocide (if so, which)
1	Local	Cow hides	Wet Salted, Sun Dried 10%
2	Local	Goat skins	Wet Salted
3			

5. Tannery Processing Capacity

Tannery Design Capacity : 6000 kg/day Cow hides 75%
Normal Operating Capacity : 4000 kg/day Goat skins 25%

Actual Processing/day

Process Mix		Present Processing			Future Plan		
		Species	Pieces	Weight (kg)	Species	Pieces	Weight (kg)
i)	Raw to Finish (via Wet Blue)	Cow	300	3000	Cow	450	4500
		Goat	1000	1000	Goat	1500	1500

6. Seasonal variation in processing (if any)

Season	Months	Processing / per year	
		Pieces	Weight (kg)
i) Peak season	Mar – June	5000	5000
ii) Lean Season	July – Sep	3000	3000

7. Production during last 3 years

Type of Leather	1996			1997			1998		
	Pieces	Weight (kg)	Area /ft ^{2}	Pieces	Weight (kg)	Area ft ^{2}	Pieces	Weight (kg)	Area ft ^{2}
Wet Blue	230000	230000	805000	270000	270000	945000	300000	300000	1050000
E.I.	-	-	-	-	-	-	-	-	-
Finished	-	-	-	-	-	-	10000	10000	45000

8. List of equipments available

Sl. No.	Equipment	No. of Equip.	Man power	Size/ Specification	Operating Capacity (kg)	Vol. (lit)	Power (HP)
1.	Desalting Machine	-	-	-	-	-	-
2.	Pits	-	-	-	-	-	-
3.	Paddles	2	4		2000 kgs	3000 ltrs	25
4.	Drums	16	8	10x8 3 nos 8x6 13 nos	700 kgs 400 kgs		25
5.	Fleshing Machine	2	4	Singlewidth			
6.	Unhairing Machine	-	-	-	-	-	-
7.	Splitting Machine	-	-	-	-	-	-
8.	Shaving Machine	1	2	24"	3000 pcs	-	-
9.	Sammying Machine	1	2	1200 Aletti	3000 pcs		
10.	Setting Machine			1200 Aletti	3000 pcs		
	i) Ordinary						
	ii) Reversible	1	2				
11.	Vacuum Drier	1	4	Double platform	2000 pcs		
12.	Staking Machine						
	i) Slow Comb	1	2	Local	500 pcs		
	ii) Mollisa	1	2	Mollisa	2000 pcs		
13.	Buffing Machine						
	i) Single Width	1	1	Local			
	ii) Feed Through	-	-	-	-	-	
14.	Dedusting Machine	-	-	-	-	-	
	Rotary Staking	1	2	Aletti	1000 pcs	-	
15.	Spraying Machine						
	i) Hand Spray	1	2	Local			
	ii) Auto Spray √	1	4	Carlessi	3000 pcs		
16.	Polishing Machine						
17.	Embossing Machine						
18.	Rotopress Machine	1	3	Rotopress			
19.	Area Measuring Machine	1	3				

20.	Boiler	1	2				
21.	Generator	1	2				
22.	Others						
	Glazing	1	2				

√

Power Source [PDB] **Electricity Board** [√] **Generator** [ ] **Oil Engine**

9. Production Pattern

Items			Present	Future plans (next 5 years)
i)	Working hours/day		8 hrs	16 hrs (2 shift)
ii)	Number of shifts/day		Single	Double
iii)	Number of working days in a week		Six days	Six days
iv)	Average working days/annum		300 days	300 days
v)	Total Manpower shift	1	60	90
		2	-	120
		3		

10. (a) Water and Chemical usage Chrome Tanning Process - Raw to Finish (via Wet Blue) for Cow hides

Lot Size 800 **kg** **pieces** 800

Sl. No.	Process	Number of Pits/Paddle/Drum	Size	Water used (%)	Chemicals used		Dura-tion	Tempa rature	pH
					Name	(%)			
1	Pre Soaking	2 Paddle		525%	-	-	2 hrs	NT	9.5
2	Main Soaking	2 Paddle	10'x8'	525%	Lissopol Soda Ash Preservative	0.2% 0.1% 0.1%	6-8 hrs	NT	9.5
3	Washing	-	-	650%	-	-	-	-	-
4	Liming	3 Paddle		500%	Seicol F Mollascal PH Lime Sod. Sulfide	0.1% 0.5% 4% 4%	24 hrs	NT	-
5	Fleshing	2 Machine	-	125%	Running water		-	-	-
Pelt Weight 500 **Kg**									
6	Washing before Deliming	Drum		500%	-	-	-	-	
7	Deliming	Drum		250%	Amm. Sulfate Amm. Chloride	1% 1%			
8	Bating	Drum		250%	Bating Agent (Cow) Bating Agent (Goat)	0.5% 2%			
9	Washing after I Deliming	Drum		300%	Wetting Agent	0.2%			
10	Washing after II Deliming	Drum		300%					
11	Pickling	Drum		100%	Salt Formic Acid Sulfuric Acid	10% 0.25% 1.8%	O/N		

* NT - Normal Temperature

12	Chrome Tanning	Drum		225% **No Wash**	Chrome Sod. Formate Sod. Bicarb	7% 1% 1%	6-8 hrs		
Shaved Weight		**4**	**0**	**0**	**kg**	**Wet Blue to Finish**		**Pieces**	
13	Acid Wash	Drum		250%	Acetic acid	0.2-0.3	15'		
14	Rechroming	Drum		225%	Chrome Cr.Syntan Acrylic Syntan Sod. Formate Sod. Bicarrb	4% 2% 2% 1% 0.5%	2-3 hrs		
15	Washing before Neutralisation	Drum		300%			30'		
16	Neutralisation	Drum		250%	Neut. Syntan Sod. Formate Sod. Bicarb	1.5% 0.5% 0.3%	60'		
17	Washing I after Neutralisation	Drum		300%					
18	Washing II after Neutralisation	Drum		300%					
19	Retanning, Dyeing & Fatliquoring	Drum		250%	Syntans DR , DLE, BSA & Magnapol PON Dye Fatliquor (if necessary)	20-25% 1-4% 5-14%			
20	Rinse	Drum		250%					
21	Top Dyeing (optional)	Drum		300%					
22	Other washing & wastages			725%					

11. Chrome Tanning Procedure

	Item	Wetblue		Rechroming	
1.	Number of Drums	7 drums			
2.	Size of the Drums	10 x 8 and 8 x 16			
3.	Average pelt weight(Kgs or Pieces/Drum)	400 – 700			
4.	Type of BCS used	Imported Chemical			
5.	% of BCS used	8%		4 – 6%	
6.	Basification and chrome uptake	75% uptake			
7.	Washings : Number	-		One	
8.	Washings : amount of water for each washing	-		250%	
9.	Water used (float) in %	225%		225%	
10.	Other chemicals used in %	**Chemical**	**%**	**Chemical**	**%**
		Sod. Formate	1%	Cr. Syntan	2
		Sod. Bicarb	1%	Acrylic Syntan	2
				Sod. Formate	1
				Sod. Bicarb	0.5

12. Water and chemical usage of leather manufacturing processes

Imported Chemicals

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

Process	Water m^3/ day	Water/ton m^3/ ton	Material
Chrome tanning	9	2.25	Cow hides & Goat skins
Rechroming	3.6	2.25	Cow hides & Goat skins

14. Drainage and disposal arrangements

a) Drainage system (Open / Closed) : Open

b) Status of segregation system : Nil

YARD	SEPARATE	COMBINATION
Lime yard		√
Drum yard		√
Machine yard		√

c) Whether scope exists for mixing up rain water with tannery waste water : Yes/~~No~~

d) Whether scope exists for mixing up solid water with tannery waste water : ~~Yes~~/No

e) Type of problems faced in operating existing drains/sewer
1. Chocking of drains with solid waste
2. Sludge settling leads to backflow / overflow

f) Mode of final effluent disposal (CETP/ETP) : Open Drain

g) Solar Evaporation Pan available : ~~Yes~~/ No
If yes, Surface Area : -

h)

Solid Disposal	Type of Disposal	Mode of Disposal
Salt containing material	-	Drain
Chrome containing material	-	Drain

15. Mode of solid waste management

Sl.No.	Solid Waste	Amount per kg of Raw Material	Disposal Method
1.	Dusted salt		Partly Reused / sent to drain
2.	Raw hide/skin trimmings		Sold to Glue Manufacturing Units
3.	Lime sludge		Drain
4.	Hair/Wool		Pulping Process
5.	Fleshings		Taken by Corporation Trucks
6.	Wet Blue / EI trimmings		Taken by Corporation Trucks
7.	Shaving/buffing dust		Taken by Corporation Trucks
8.	Others		-

16. Total water used perday : 30000 Gallons/day. (as reported)
218.6 cubic metre/day (as estimated)

17. Total Effluent discharged (approximate) : 30000 Gallons/day. (as reported)
218.6 cubic metre/day (as estimated)

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

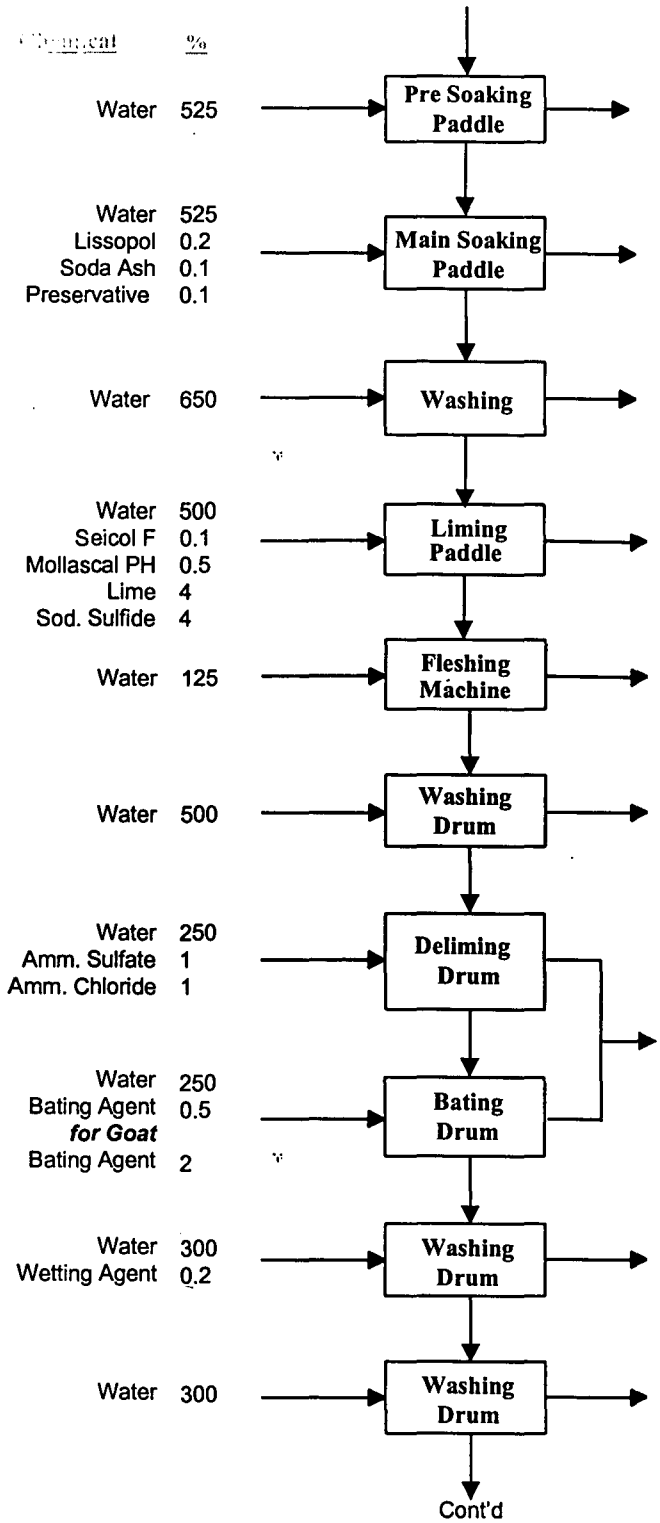
19. Remarks : -

BD006	CONVENTIONAL PROCESS AND EMISSION LOAD	4000 kg/day

Process : Cow hides/Goat skins Raw to Wet Blue - Finish

Batch : 1000 Kg

Raw Cow hides / Goat skins



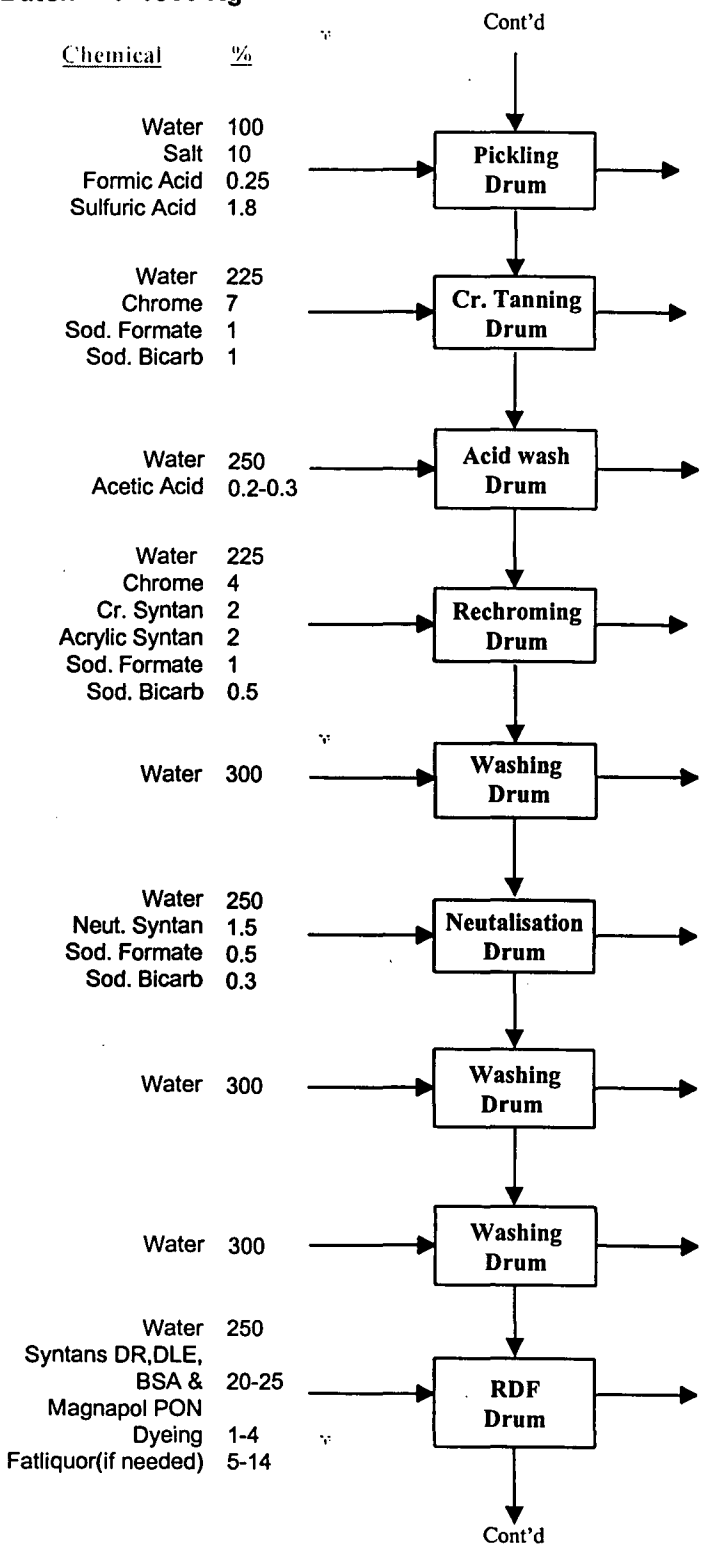
	ppm	EL kg/t
BOD	2250	11.81
COD	4575	24.02
TDS	42350	222.34
TSS	3920	20.58
TS	46270	242.92
Cl	24902	130.74
SO_4	214	1.12
BOD	2229	11.70
COD	3958	20.78
TDS	19860	104.27
TSS	1060	5.57
TS	20920	109.83
Cl	11700	61.43
SO_4	154	0.81
BOD	14100	70.50
COD	29753	148.77
TDS	22030	110.15
TSS	12580	62.90
TS	34610	173.05
Cl	1542	7.71
Sul	2540	12.70
SO_4	56	0.28
BOD	2475	12.38
COD	4309	21.55
TDS	14990	74.95
TSS	3735	18.68
TS	18725	93.63
Cl	4735	23.68
SO_4	1621	8.11
N	704	3.52

BD006

BD006	CONVENTIONAL PROCESS AND EMISSION LOAD	4000 kg/day

Process : Cow hides/Goat skins Raw to Wet Blue - Finish

Batch : 1000 Kg



	ppm	EL kg/t
BOD	1320	1.32
COD	3705	3.71
TDS	66075	66.08
TSS	1575	1.58
TS	67650	67.65
Cl	28736	28.74
SO_4	7978	7.98
BOD	619	1.39
COD	5656	12.73
TDS	57280	128.88
TSS	2630	5.92
TS	59910	134.80
Cl	15455	34.77
Cr	3224	7.25
SO_4	16440	36.99
BOD	300	0.68
COD	2596	5.84
TDS	12070	27.16
TSS	1750	3.94
TS	13820	31.10
Cl	1739	3.91
Cr	381	0.86
SO_4	4737	10.66
BOD	150	0.38
COD	1158	2.90
TDS	2865	7.16
TSS	755	1.89
TS	3620	9.05
Cl	356	0.89
Cr	75	0.19
SO_4	1347	3.37
Composite		
BOD	1372	74.99
COD	3171	173.33
TDS	8921	487.62
TSS	1415	77.34
TS	10336	564.97
Cl	3470	189.67
Sul	145	7.93
Cr	106	5.79
SO_4	860	47.01
N	21	1.15
BOD	4332	10.83
COD	12547	31.37
TDS	8560	21.40
TSS	2370	5.93
TS	10930	27.33
Cl	119	0.30
SO_4	1356	3.39

BD006

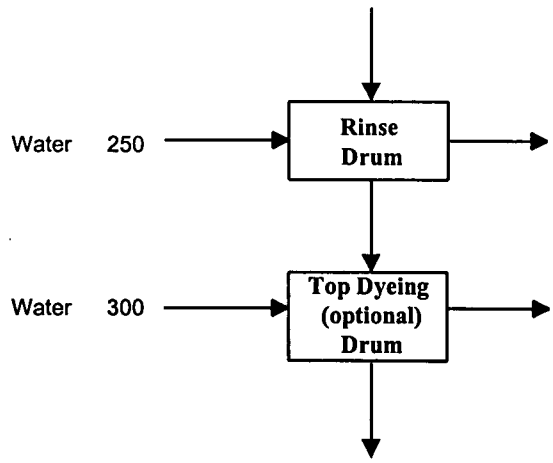
BD006	CONVENTIONAL PROCESS AND EMISSION LOAD	4000 kg/day

Process : Cow hides/Goat skins Raw to Wet Blue - Finish

Batch : 1000 Kg

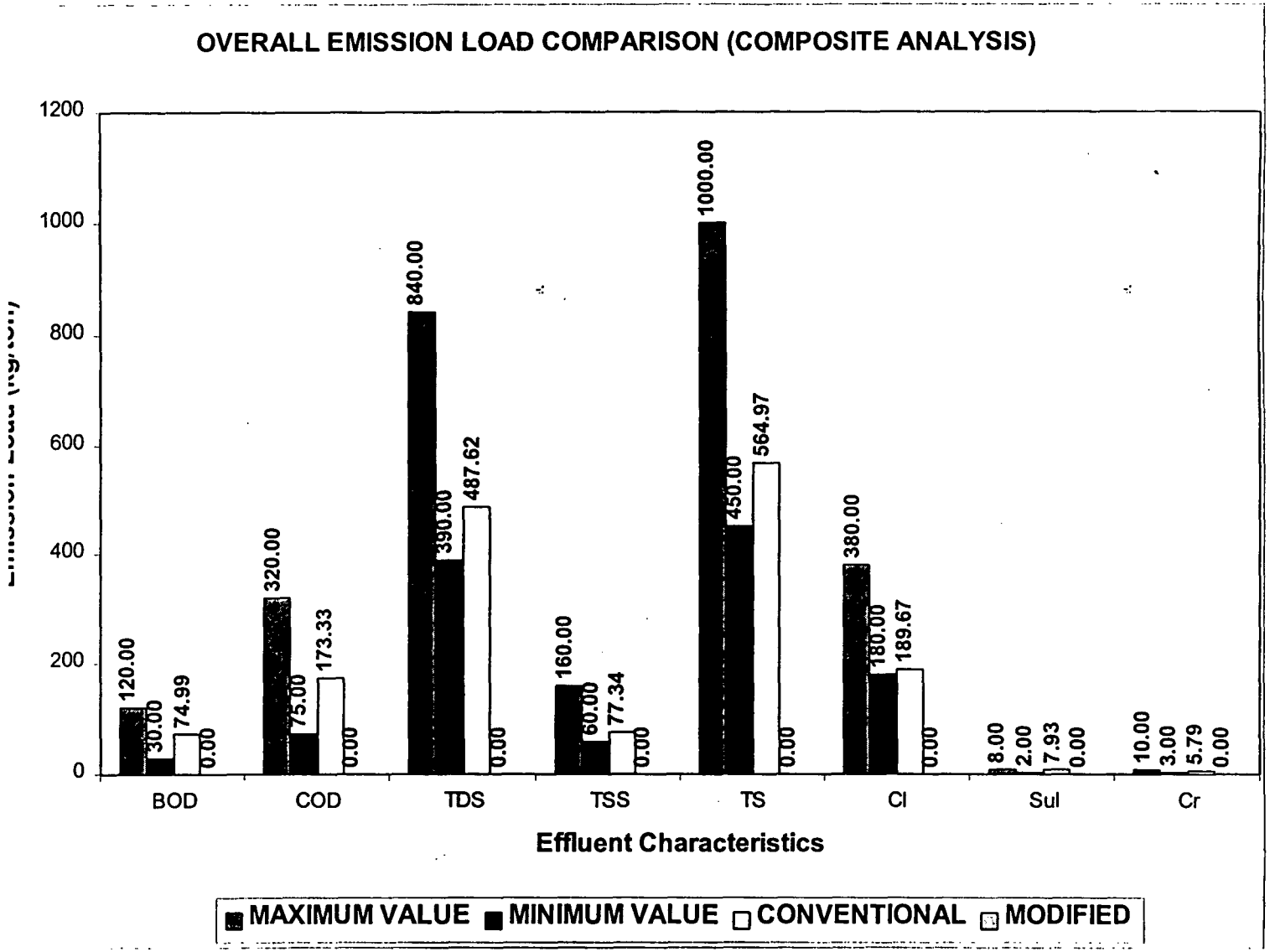
Cont'd

Chemical %



Other washings & wastages - 725%

BD006

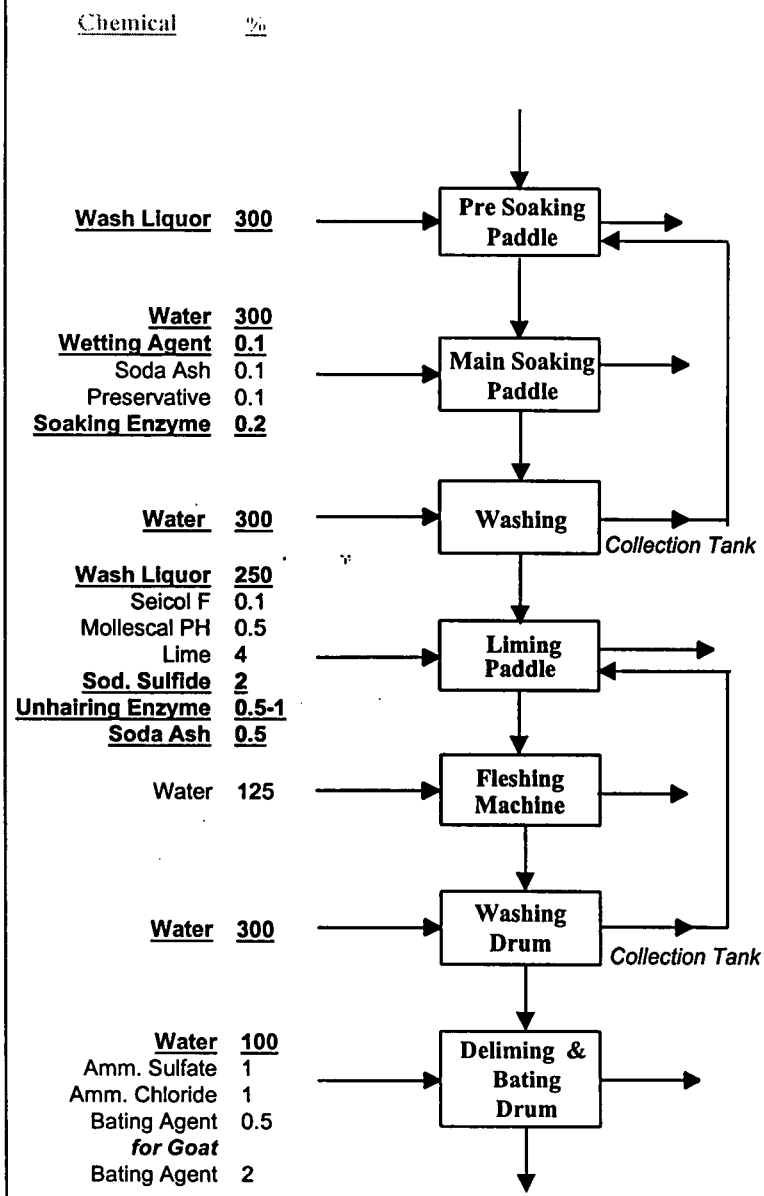

OVERALL EMISSION LOAD COMPARISON (COMPOSITE ANALYSIS)
1200
1000
800
600
400
200
0
120.00
30.00
74.99
0.00
320.00
75.00
173.33
0.00
840.00
390.00
487.62
0.00
160.00
60.00
77.34
0.00
1000.00
450.00
564.97
0.00
380.00
180.00
189.67
0.00
8.00
2.00
7.93
0.00
10.00
3.00
5.79
0.00
BOD
COD
TDS
TSS
TS
Cl
Sul
Cr
Effluent Characteristics
MAXIMUM VALUE
MINIMUM VALUE
CONVENTIONAL
MODIFIED

BD006	MODIFIED PROCESS FOR IMPLEMENTATION / DEMONSTRATION	4000 kg/day

Process : Cow hides/Goat skins Raw to Wet Blue - Finish

Batch : 1000 Kg

Raw Cow hides / Goat skins



Cont'd

BD006

BD006

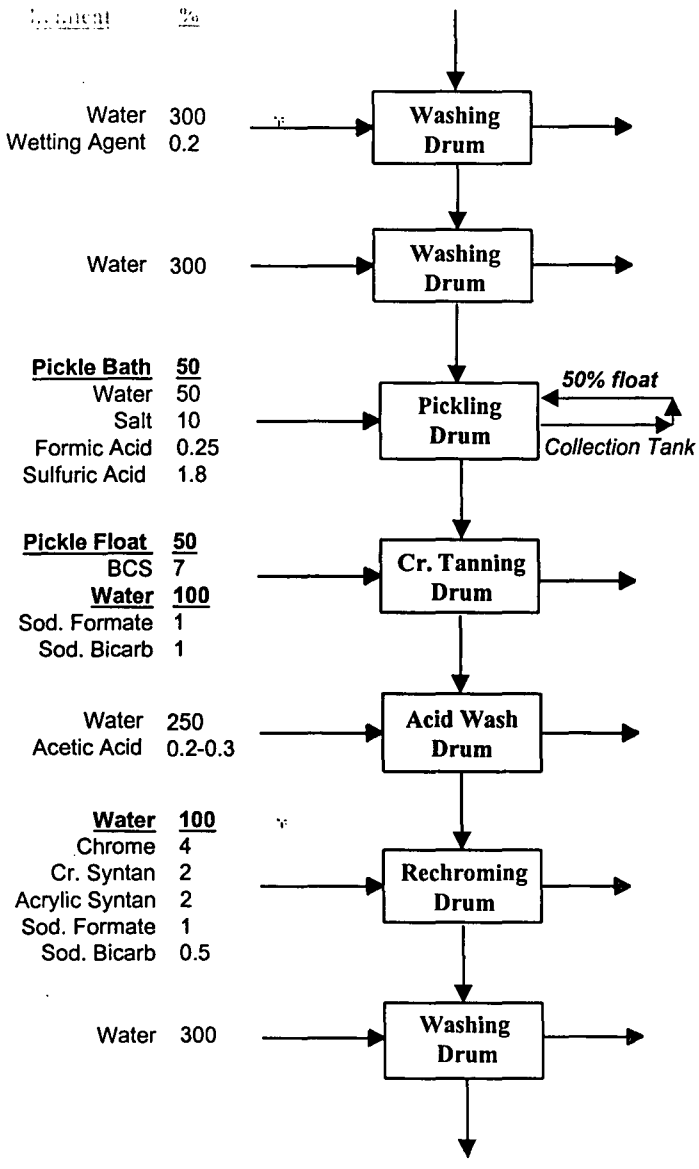
MODIFIED PROCESS FOR IMPLEMENTATION / DEMONSTRATION

4000 kg/day

Process : Cow hides/Goat skins Raw to Wet Blue - Finish

Batch : 1000 Kg

Cont'd



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BD006

BD006	MODIFIED PROCESS FOR IMPLEMENTATION / DEMONSTRATION	4000 kg/day

Process : Cow hides/Goat skins Raw to Wet Blue - Finish

Batch : 1000 Kg

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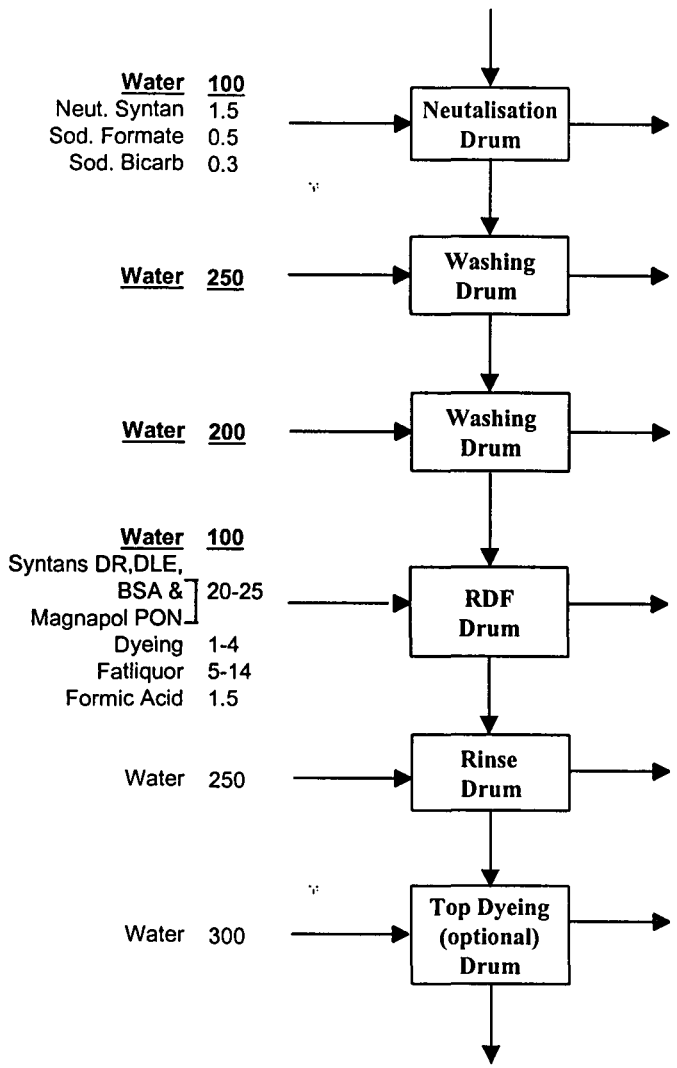
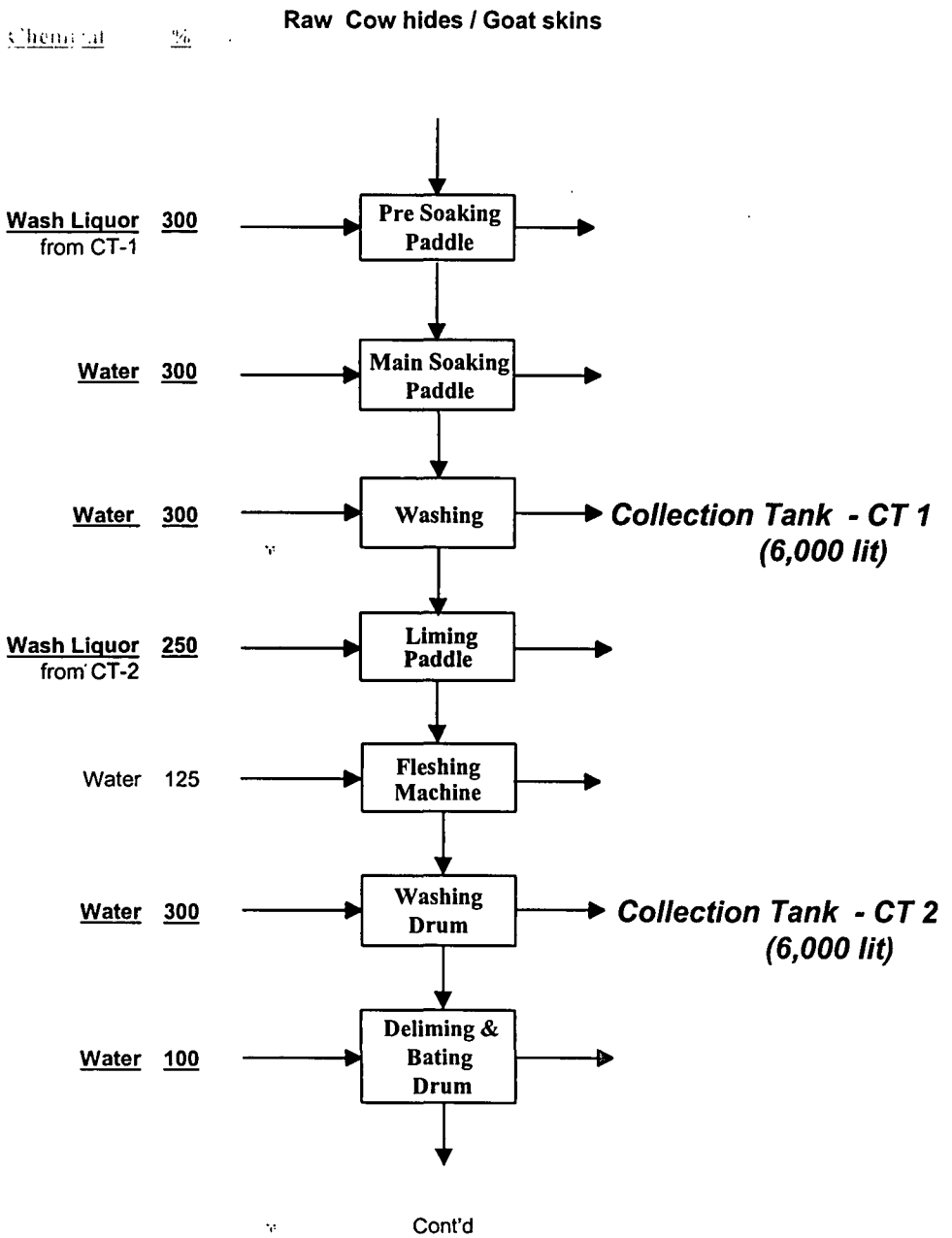


BD006	MODIFIED PROCESS FOR IMPLEMENTATION / DEMONSTRATION	4000 kg/day

Process : Cow hides / Goat skins Raw to Wet Blue - Finish

Batch : 1000 Kg

Water Flow Scheme / Recycle Scheme



BD006

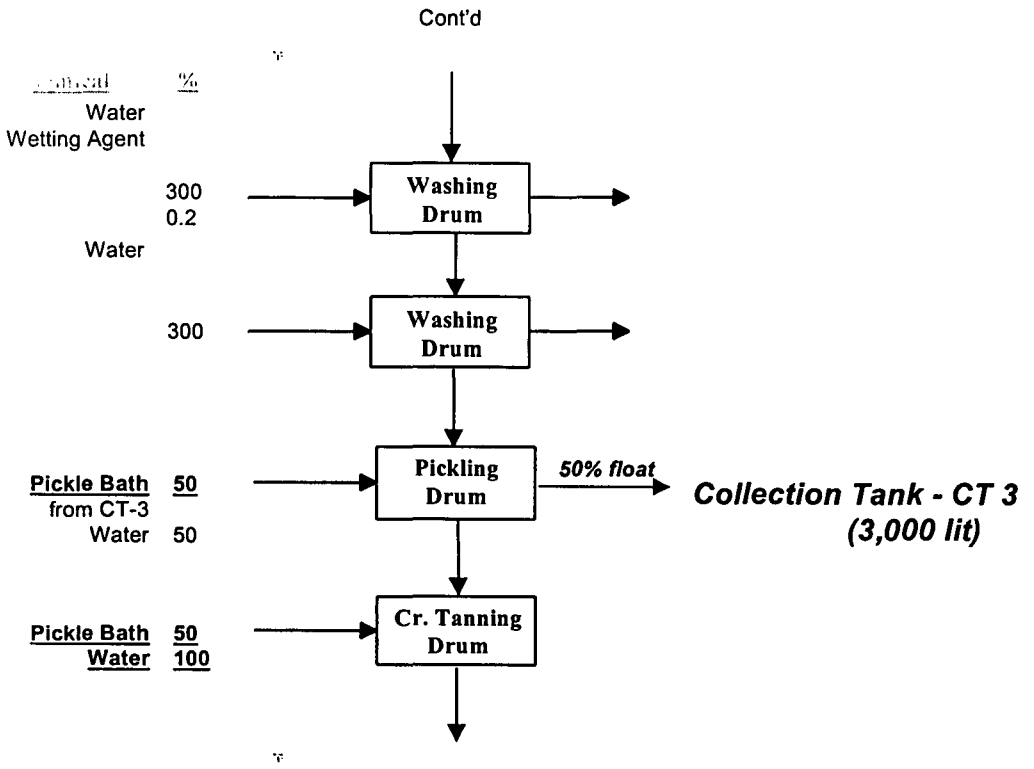
MODIFIED PROCESS FOR IMPLEMENTATION / DEMONSTRATION

4000 kg/day

Process : Cow hides / Goat skins Raw to Wet Blue - Finish

Batch : 1000 Kg

Water Flow Scheme / Recycle Scheme



BD006

CHEMICAL REQUIREMENT FOR IMPLEMENTATION / DEMONSTRATION OF CLEANER TECHNOLOGIES IN THE TANNERY CLUSTER , AT HAZARIBAGH, DHAKA, BANGLADESH

BD006

LIST OF CHEMICALS REQUIRED

Sl. No	Name	Requirement for 1000 kg lot size (kg)	Total Requirements (kg)	Suggested denomination of package
1.	Soaking Enzyme	2	10	
2.	Unhairing Enzyme	10	50	One bag of 50 kgs

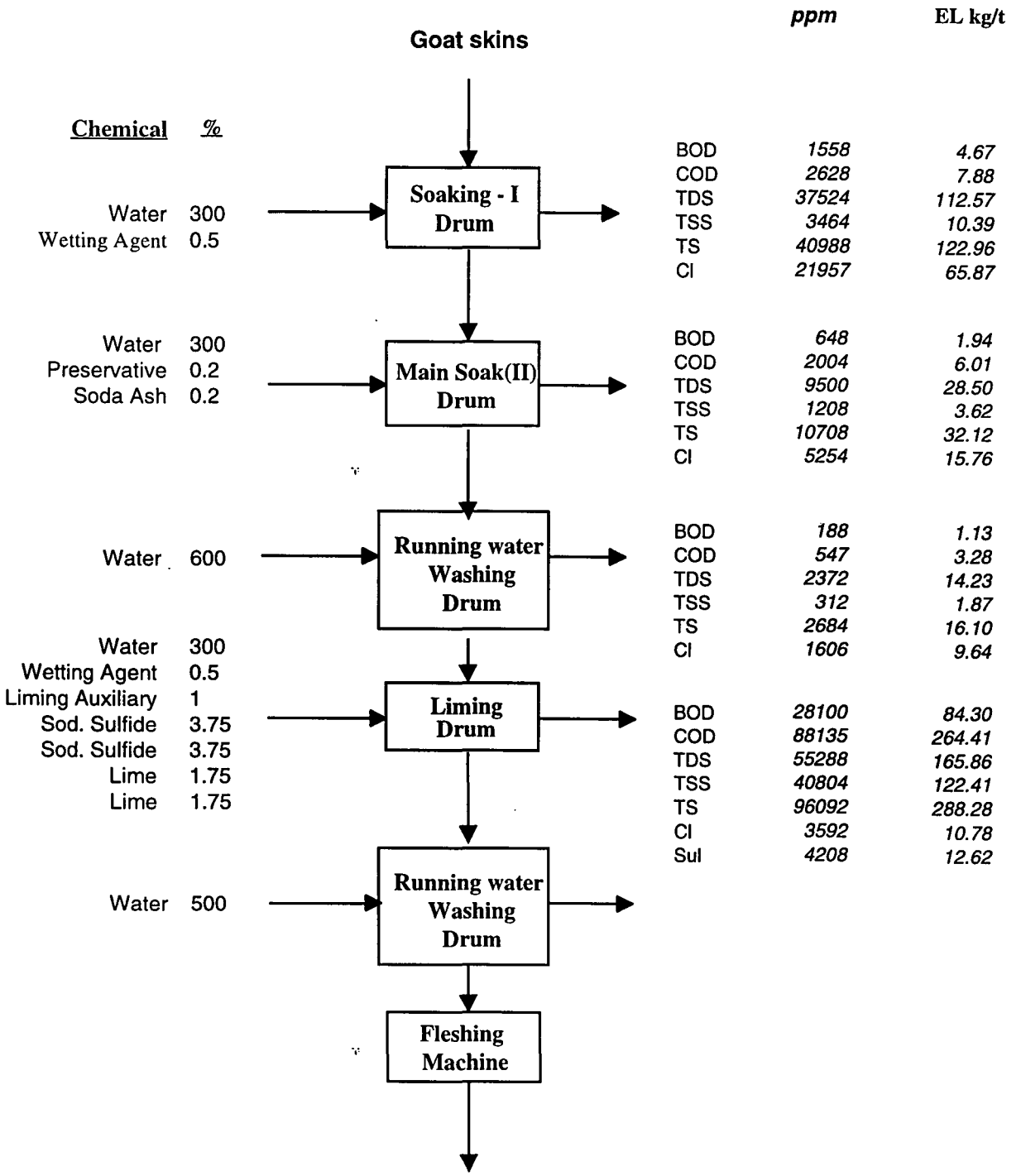
LIST OF EQUIPMENTS REQUIRED TANNERY WISE

Sl.No	Tannery	Hardware Proposed	Qty- Nos	Technical specification	Expected Benefits
1.	BD006	Liquor Collection Tanks for Soak Liquor for Lime Liquor for Chrome Liquor	 1 No. 1 No. 1 No.	Concrete. 6,000 lit capacity, 6,000 lit capacity, 3,000 lit capacity,	Reduction in hydraulic load to effluent
		Pumps	2 Nos		-do-
		Water Meter	3 Nos		-do-
		Modified Door for Drum	1 Nos		-do-
		Strainer in pipeline	5 Nos		
		Enzyme applicator	1 No		Reduction in sulfide load

BD006	CONVENTIONAL PROCESS AND EMISSION LOAD	4000 Kg/day

Process : Goat skins Raw to Wet Blue

Batch : 600 - 800 Kg



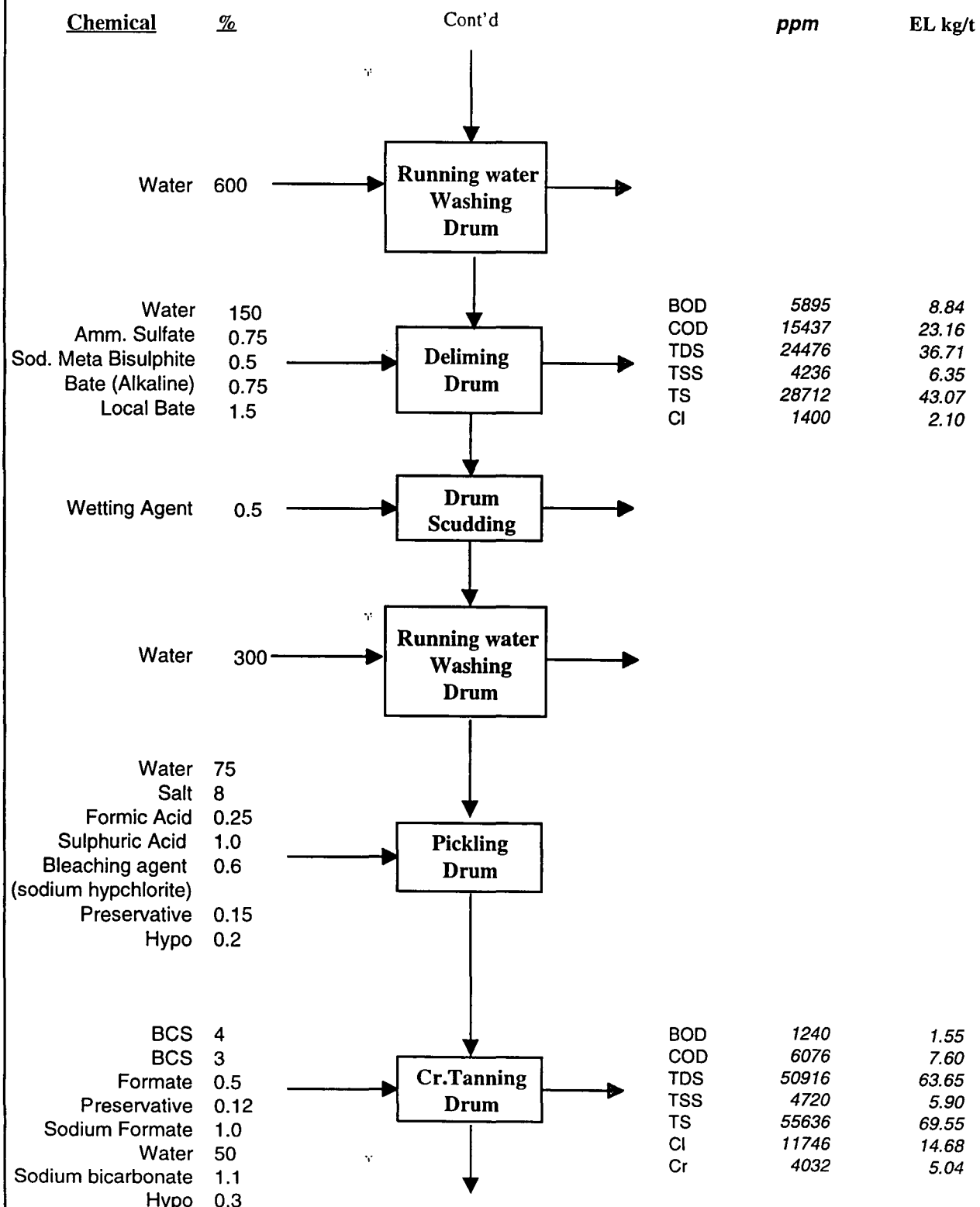
	ppm	EL kg/t
BOD	1558	4.67
COD	2628	7.88
TDS	37524	112.57
TSS	3464	10.39
TS	40988	122.96
Cl	21957	65.87
BOD	648	1.94
COD	2004	6.01
TDS	9500	28.50
TSS	1208	3.62
TS	10708	32.12
Cl	5254	15.76
BOD	188	1.13
COD	547	3.28
TDS	2372	14.23
TSS	312	1.87
TS	2684	16.10
Cl	1606	9.64
BOD	28100	84.30
COD	88135	264.41
TDS	55288	165.86
TSS	40804	122.41
TS	96092	288.28
Cl	3592	10.78
Sul	4208	12.62

Cont'd

BD006	CONVENTIONAL PROCESS AND EMISSION LOAD	4000 Kg/day

Process : Goat skins Raw to Wet Blue

Batch : 600- 800 Kg



Phase - II

THE CLEANER TANNING PROCESS TECHNOLOGIES DEMONSTRAED AT HAZARIBAGH TANNING CLUSTER, DHAKA, BANGLADESH

Tannery Name: **Ruma Leather Industries Ltd.**
Process: Raw to Wet Blue **(Conventional Process)**

Raw Material: Goat skins
Lot size : 600-800 Kg.

Operation	Water/ Chemical	%	Run Time	Remarks
Soaking-I	Water	300		
	Wetting agent	0.5	30 min	Stop 60 min; run for 20 min. Drain
Main Soak	Water	300		
	Preservative	0.2		
	Soda Ash	0.2	30 min	O/N Run 5 min/hr. Drain.
Running water wash	Water	600	30 min	Drain
Liming	Water	300		
	Wetting agent	0.5		
	Liming auxiliary	1	20 min	
	Sodium sulfide	3.75	40 min	Rest for 60 min. Run for 10 min
	Sodium sulfide	3.75	30 min	Rest for 60 min. Run for 10 min/hr for 4 hrs.
	Lime	1.75	30 min	Rest for 60 min;run for 10 min
	Lime	1.75	30 min	Stop for 60 min. Run 10 min/hru up to next day(Total duration of 24-26 hrs.) Drain
Running Water wash	Water	500	30 min	Drain out.
Fleshing				
Running Water	Water	600	45 min	Drain.

wash				
Deliming	Water	150		
	Ammonium sulfate	0.75	60 min	
	Sodium Meta Bisulphite	0.5		
	Bate (Alkaline) Local bate	0.75 1.5	120min	Drain out; Hand scud.
Drum scudding	Wetting agent	0.5	30 min	
Running water Washing	Water	300	30 min	Drain out
Pickling	Water	75		
	Salt	8	15 min	
	Formic Acid -Water 25 lits	0.25	15 min	
	Sulphuric Acid -Water 75 lits	1.0		3 feeds at 15 min interval. After 3rd feed run for 1 hr. O/N 5 min/hr
	Bleaching agent(sodium hypchlorite)	0.6		
	Preservative	0.15	40 min	Left o/n. Pickling pH 2.8.
	Hypo	0.2	30 min	
Chrome tanning	BCS	4	60 min	
	BCS	3		
	Formate	0.5		
	Preservative	0.12	75 min	Check penetration
	Sodium formate	1.0	40 min	
	Water	50		
	Sodium bicarbonate	1.1		3 feeds at 15 min interval; finally run for 90 min.
	Hypo	0.3	30 min	Check pH; 3.8. Drain out and pile.

BD006

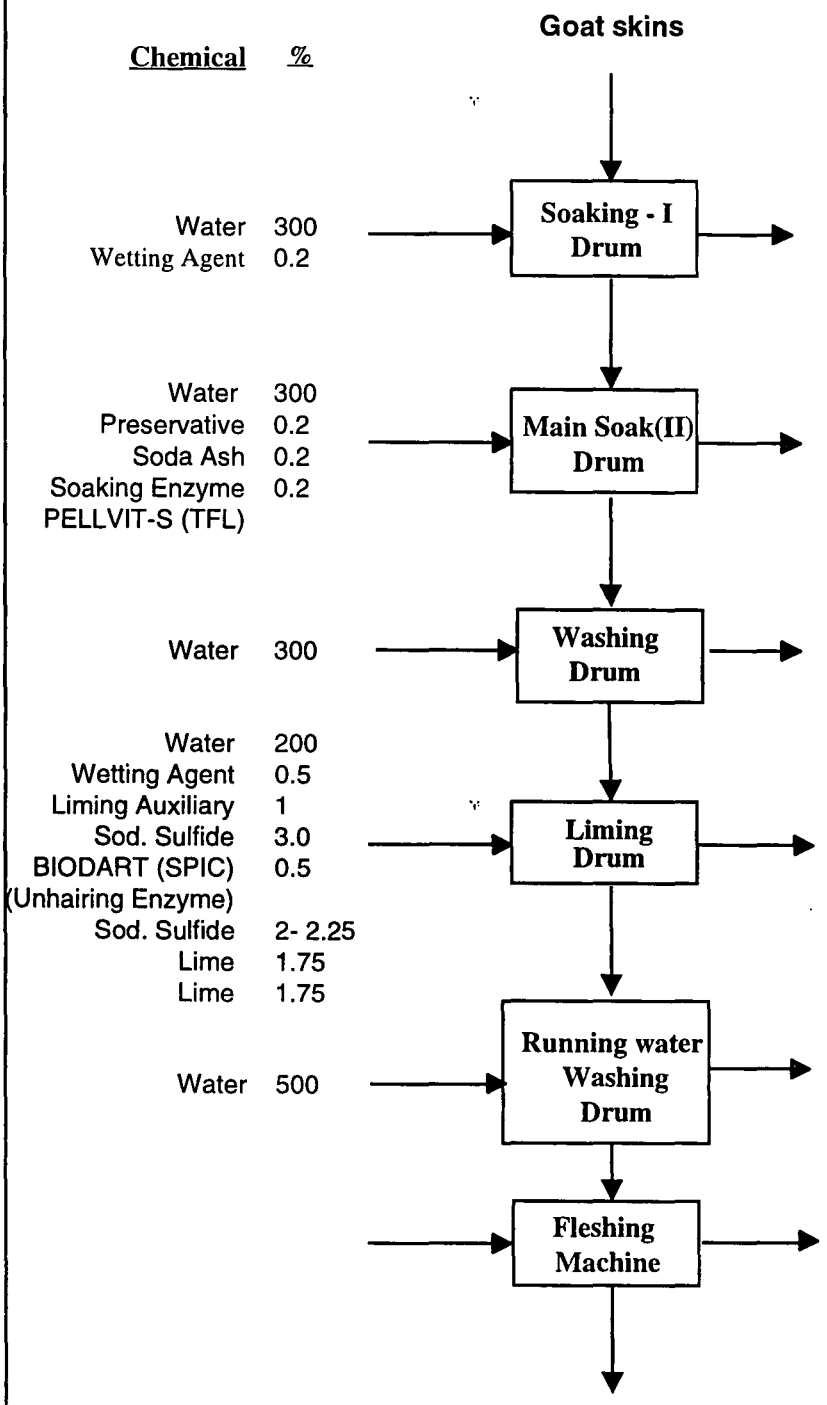
MODIFIED PROCESS FOR IMPLEMENTATION / DEMONSTRATION

4000 Kg/day

Process : Goat skins Raw to Wet Blue

Lot-1

Batch : 500 Kg



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Phase - II

BD006

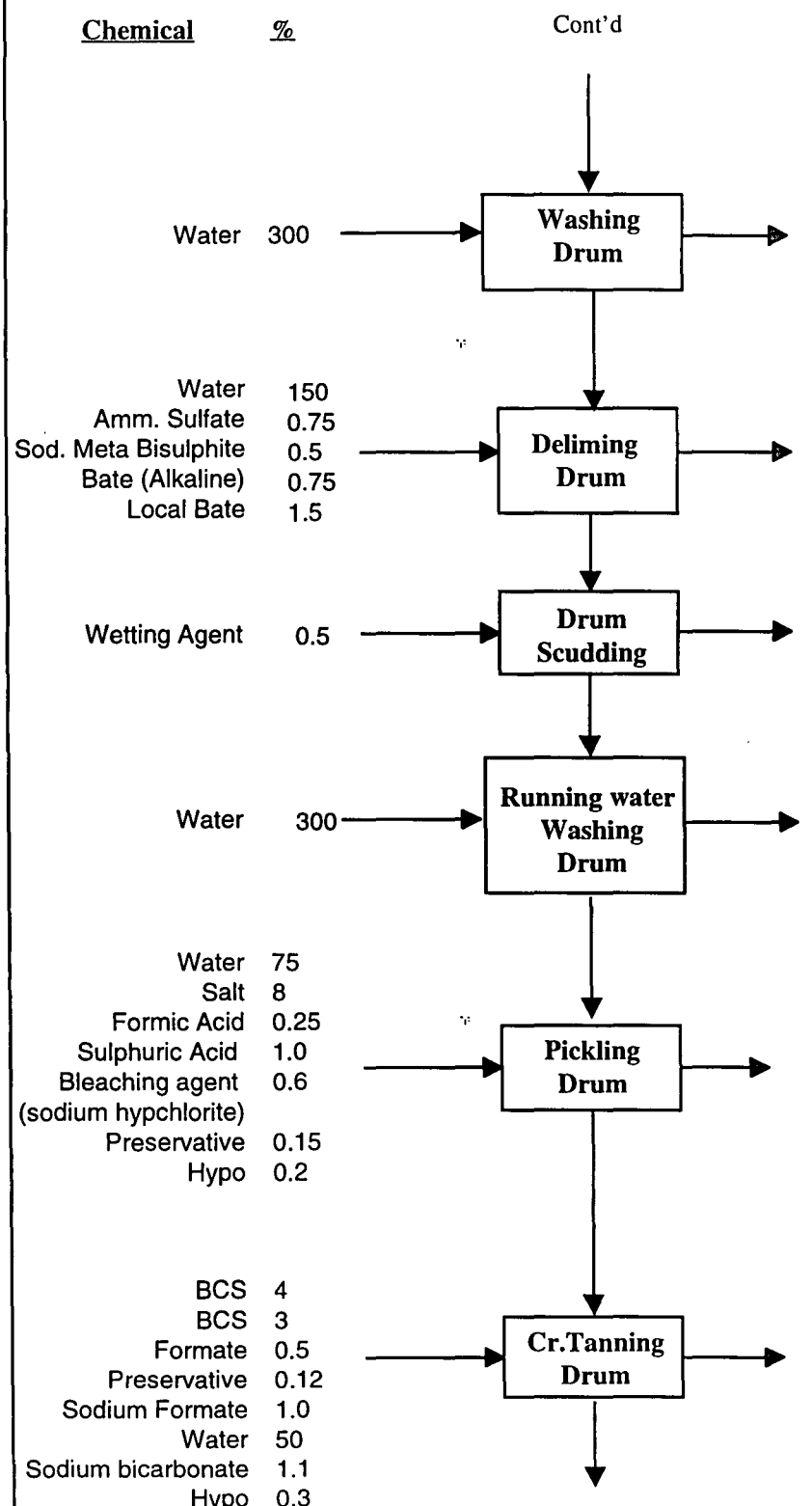
MODIFIED PROCESS FOR IMPLEMENTATION / DEMONSTRATION

4000 Kg/day

Process : Goat skins Raw to Wet Blue

Lot-1

Batch : 500 Kg



Phase - II

THE CLEANER TANNING PROCESS TECHNOLOGIES DEMONSTRAED AT HAZARIBAGH TANNING CLUSTER, DHAKA, BANGLADESH

Tannery Name: **Ruma Leather Industries Ltd.**
Process: Raw to Wet Blue (**Modified Process-I lot)**

Raw Material: Goat skins
Lot size : 500 Kg.

Operation	Water/ Chemical	%	Run Time	Remarks
Soaking-I	Water	300		
	Wetting agent	0.2	30 min	Stop 60 min; run for 20 min. Drain
Main Soak	Water	300		
	Preservative	0.2		
	Soda Ash	0.2	30 min	O/N Run 5 min/hr. Drain.
Washing	Water	300	30 min	Collect liquor into the collection tank for recycling for next lot.
Liming	Water	200		
	Wetting agent	0.5		
	Liming auxiliary	1	20 min	
	Sodium sulfide	3.0	40 min	Rest for 60 min. Run for 10 min
	Sodium sulfide	2.-2.5	30 min	Rest for 60 min. Run for 10 min/hr for 4 hrs.
	Lime	1.75	30 min	Rest for 60 min;run for 10 min
	Lime	1.75	30 min	Stop for 60 min. Run 10 min/hru up to next day(Total duration of 24-26 hrs.) Drain

Running Water wash	Water	500	30 min	Drain out.
Fleshing				
Washing	Water	300	30 min	Collect liquor for recycling as float for liming.
Deliming	Water	150		
	Ammonium sulfate	0.75	60 min	
	Sodium Meta Bisulphite	0.5		
	Bate (Alkaline) Local bate	0.75 1.5	120min	Drain out; Hand scud.
Drum scudding	Wetting agent	0.5	30 min	
Running water Washing	Water	300	30 min	Drain out
Pickling	Water	75		
	Salt	8	15 min	
	Formic Acid -Water 25 lits	0.25	15 min	
	Sulphuric Acid -Water 75 lits	1.0		3 feeds at 15 min interval. After 3rd feed run for 1 hr. O/N 5 min/hr
	Bleaching agent (sodium hypchlorite)	0.6		
	Preservative	0.15	40 min	Left o/n. Pickling pH 2.8.
	Hypo	0.2	30 min	
Chrome tanning	BCS	4	60 min	
	BCS	3		
	Formate	0.5		
	Preservative	0.12	75 min	Check penetration
	Sodium formate	1.0	40 min	
	Water	50		
	Sodium bicarbonate	1.1		3 feeds at 15 min interval; finally run for 90 min.
	Hypo	0.3	30 min	Check pH; 3.8. Drain out and pile.

BD006

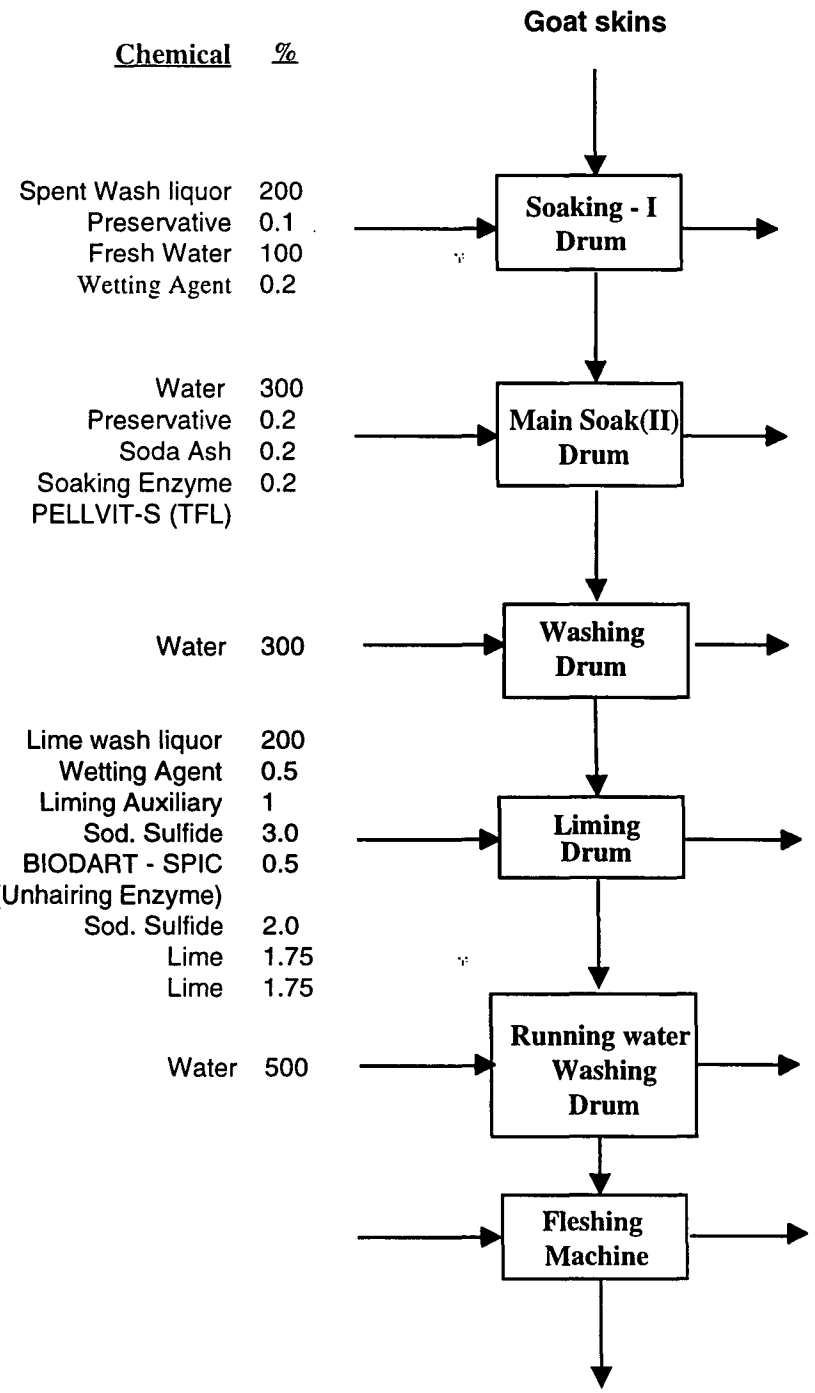
MODIFIED PROCESS FOR IMPLEMENTATION / DEMONSTRATION

4000 Kg/day

Process : Goat skins Raw to Wet Blue

Lot-2

Batch : 500 Kg



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Phase - II

BD006

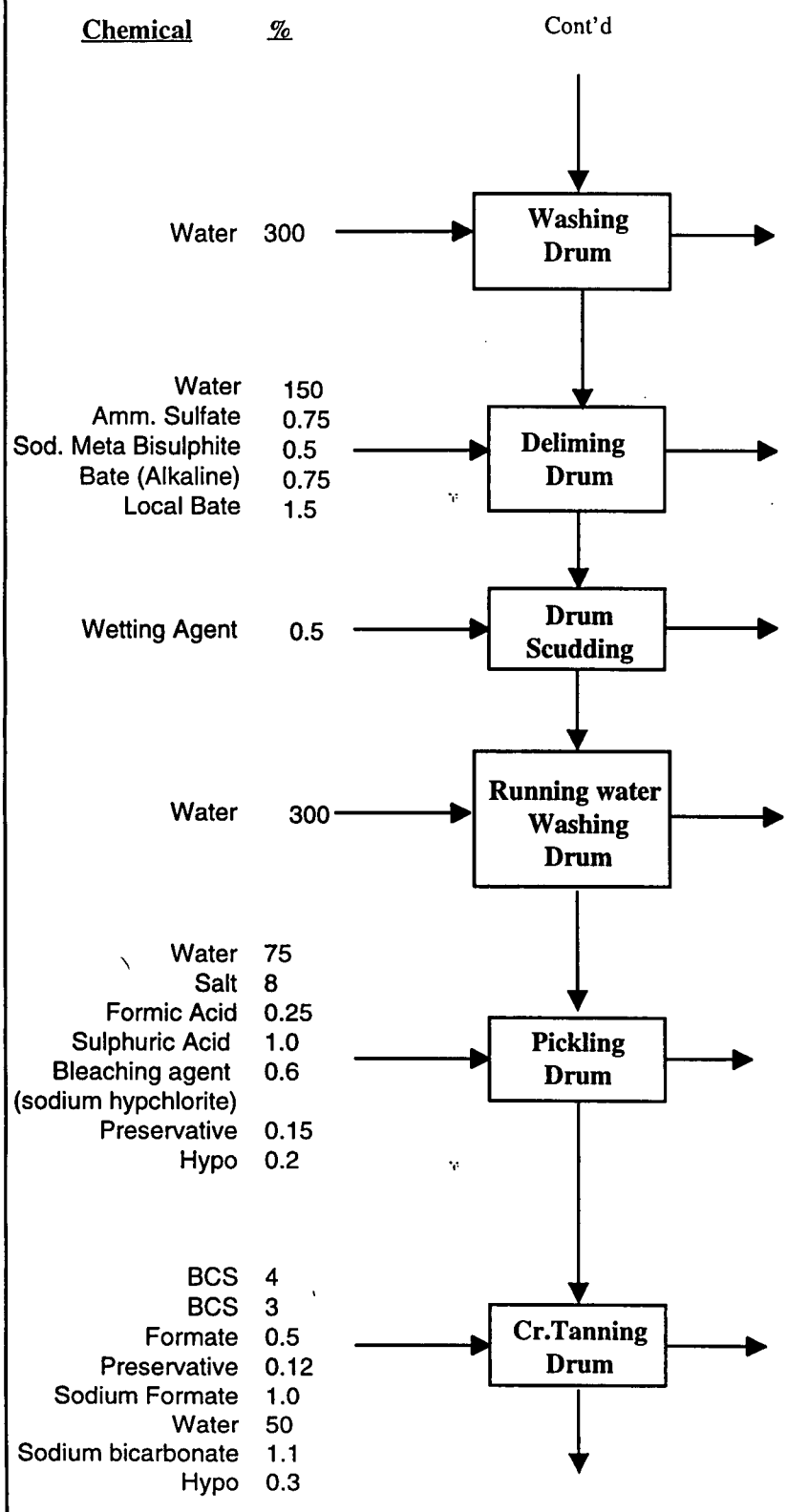
MODIFIED PROCESS FOR IMPLEMENTATION / DEMONSTRATION

4000 Kg/day

Process : Goat skins Raw to Wet Blue

Lot-2

Batch : 500 Kg



Phase - II

BD006_mod2

THE CLEANER TANNING PROCESS TECHNOLOGIES DEMONSTRAED AT HAZARIBAGH TANNING CLUSTER, DHAKA, BANGLADESH

Tannery Name: **Ruma Leather Industries Ltd.**
Process: Raw to Wet Blue **(Modified Process-II lot)**

Raw Material: Goat skins
Lot size : 500 Kg.

Operation	Water/ Chemical	%	Run Time	Remarks
Soaking-I	**Spent wash liquor**	200		
	Fresh water	100		
	Wetting agent	0.2	30 min	Stop 60 min; run for 20 min. Drain
Main Soak	Water	300		
	Preservative	0.2		
	Soda Ash	0.2	30 min	O/N Run 5 min/hr. Drain.
Washing	Water	300	30 min	Collect liquor into the collection tank for recycling for next lot.
Liming	Lime wash liquor	200		
	Wetting agent	0.5		
	Liming auxiliary	1	20 min	
	Sodium sulfide	3.0	40 min	Rest for 60 min. Run for 10 min
	Sodium sulfide	2.0	30 min	Rest for 60 min. Run for 10 min/hr for 4 hrs.
	Lime	1.75	30 min	Rest for 60 min;run for 10 min
	Lime	1.75	30 min	Stop for 60 min. Run 10 min/hru up to next day(Total duration of 24-26 hrs.) Drain

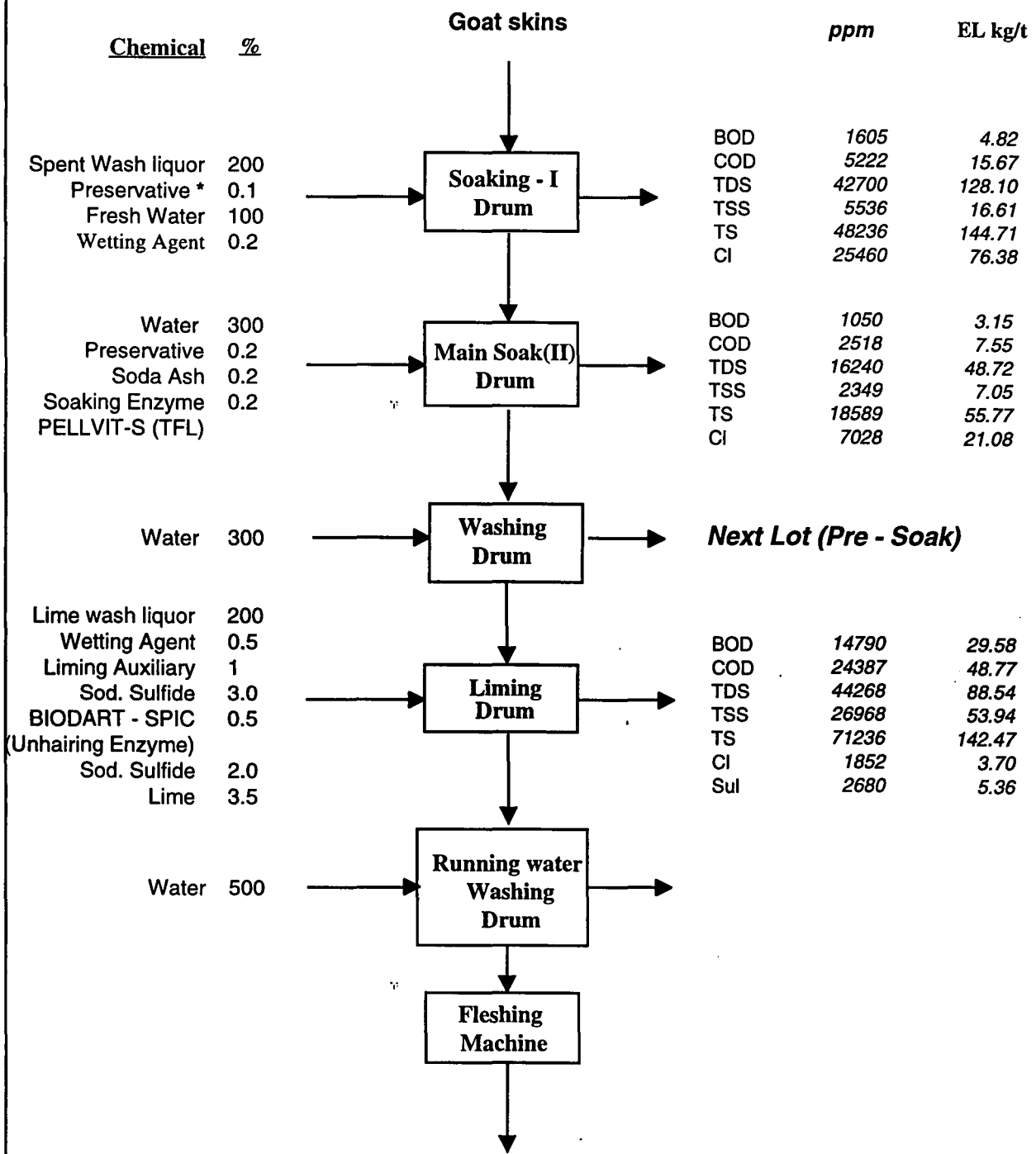
Running Water wash	Water	500	30 min	Drain out.
Fleshing				
Washing	Water	300	30 min	Collect liquor for recycling as float for liming.
Deliming	Water	150		
	Ammonium sulfate	0.75	60 min	
	Sodium Meta Bisulphite	0.5		
	Bate (Alkaline) Local bate	0.75 1.5	120min	Drain out; Hand scud.
Drum scudding	Wetting agent	0.5	30 min	
Running water Washing	Water	300	30 min	Drain out
Pickling	Water	75		
	Salt	8	15 min	
	Formic Acid -Water 25 lits	0.25	15 min	
	Sulphuric Acid -Water 75 lits	1.0		3 feeds at 15 min interval. After 3rd feed run for 1 hr. O/N 5 min/hr
	Bleaching agent(sodium hypchlorite)	0.6		
	Preservative	0.15	40 min	Left o/n. Pickling pH 2.8.
	Hypo	0.2	30 min	
Chrome tanning	BCS	4	60 min	
	BCS	3		
	Formate	0.5		
	Preservative	0.12	75 min	Check penetration
	Sodium formate	1.0	40 min	
	Water	50		
	Sodium bicarbonate	1.1		3 feeds at 15 min interval; finally run for 90 min.
	Hypo	0.3	30 min	Check pH; 3.8. Drain out and pile.

BD006	MODIFIED / IMPLEMENTED PROCESS AND EMISSION LOAD	4000 Kg/day

ALL TECHNOLOGY

Process : Goat skins Raw to Wet Blue

Batch : 500 Kg



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* Added in the Soak wash liquor Collection Tank

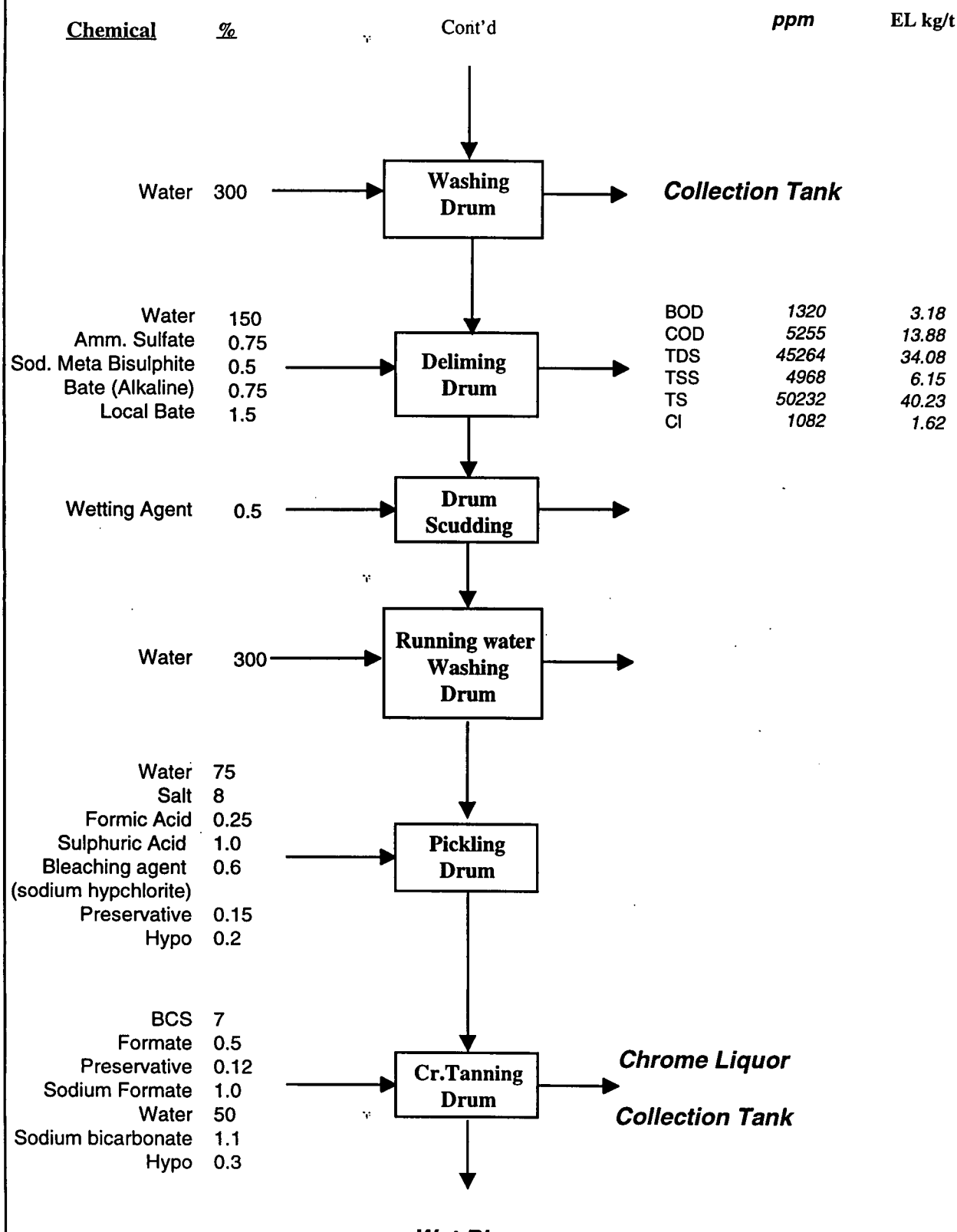
Phase - II

BD006 | MODIFIED / IMPLEMENTED PROCESS AND EMISSION LOAD | 4000 Kg/day

Process : Goat skins Raw to Wet Blue

ALL TECHNOLOGY

Batch : 500 Kg



Phase - II

BD006_all

THE CLEANER TANNING PROCESS TECHNOLOGIES DEMONSTRAED AT HAZARIBAGH TANNING CLUSTER, DHAKA, BANGLADESH

Tannery Name: **Ruma Leather Industries Ltd.**
Process: Raw to Wet Blue **(Modified Process-SK, LM reuse,)**

Raw Material: Goat skins
Lot size : 500 Kg.

Operation	Water/ Chemical	%	Run Time	Remarks
Soaking-I	**Spent wash liquor**	200		
	Fresh water	100		
	Wetting agent	0.2	30 min	Stop 60 min; run for 20 min. Drain
Main Soak	Water	300		
	Preservative	0.2		
	Soda Ash	0.2	30 min	O/N Run 5 min/hr. Drain.
Washing	Water	300	30 min	Collect liquor into the collection tank for recycling for next lot.
Liming	**Lime wash liquor**	200		
	Wetting agent	0.5		
	Liming auxiliary	1	20 min	
	Sodium sulfide	3.0	40 min	Rest for 60 min. Run for 10 min
	Sodium sulfide	2.0	30 min	Rest for 60 min. Run for 10 min/hr for 4 hrs.
	Lime	1.75	30 min	Rest for 60 min;run for 10 min
	Lime	1.75	30 min	Stop for 60 min. Run 10 min/hru up to next day(Total duration of 24-26 hrs.) Drain

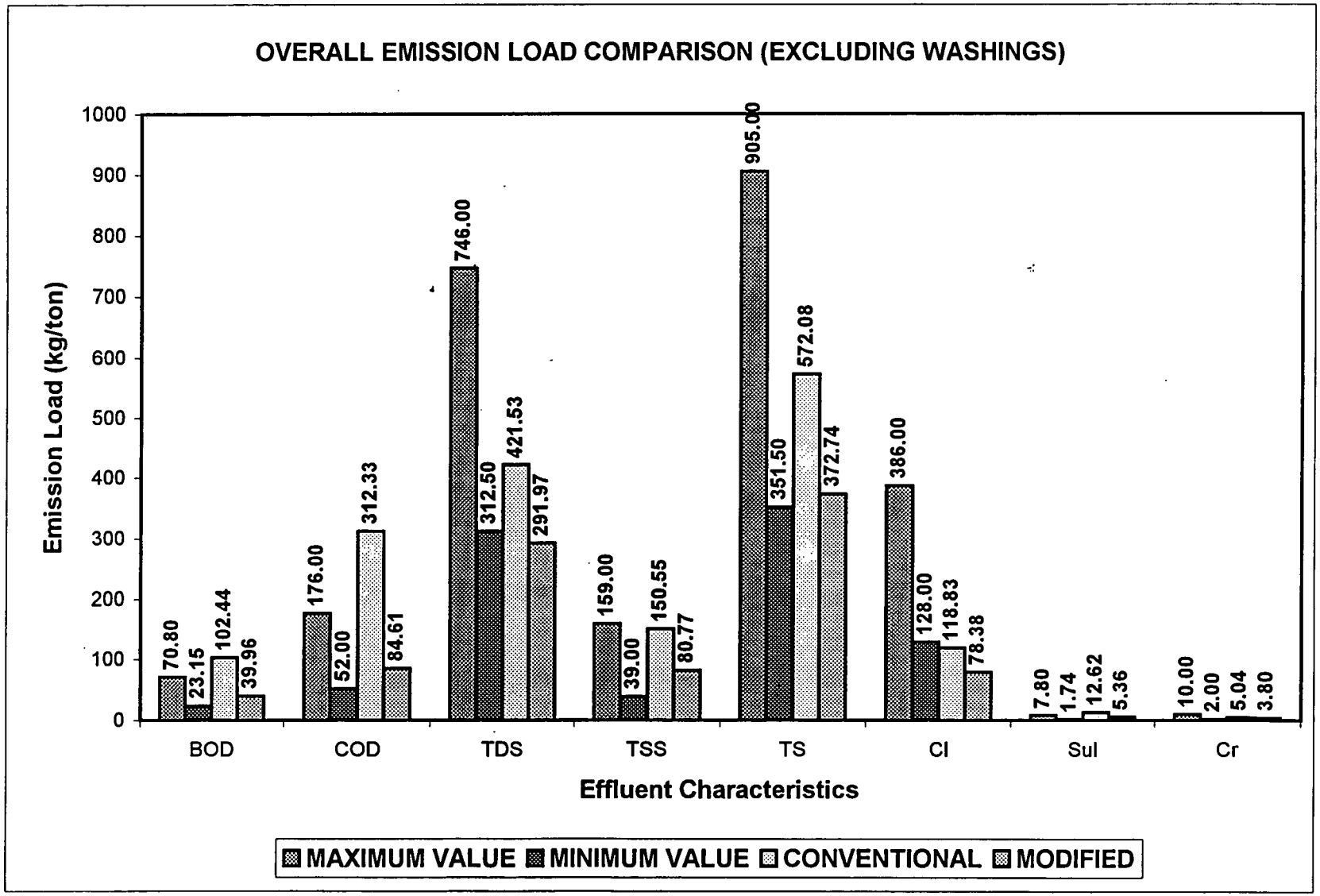
Running Water wash	Water	500	30 min	Drain out.
Fleshing				
Washing	Water	300	30 min	Collect liquor for recycling as float for liming.
Deliming	Water	150		
	Ammonium sulfate	0.75	60 min	
	Sodium Meta Bisulphite	0.5		
	Bate (Alkaline) Local bate	0.75 1.5	120min	Drain out; Hand scud.
Drum scudding	Wetting agent	0.5	30 min	
Running water Washing	Water	300	30 min	Drain out
Pickling	Water	75		
	Salt	8	15 min	
	Formic Acid -Water 25 lits	0.25	15 min	
	Sulphuric Acid -Water 75 lits	1.0		3 feeds at 15 min interval. After 3rd feed run for 1 hr. O/N 5 min/hr
	Bleaching agent(sodium hypchlorite)	0.6		
	Preservative	0.15	40 min	Left o/n. Pickling pH 2.8.
	Hypo	0.2	30 min	
Chrome tanning	BCS	4	60 min	
	BCS	3		
	Formate	0.5		
	Preservative	0.12	75 min	Check penetration
	Sodium formate	1.0	40 min	
	Water	50		
	Sodium bicarbonate	1.1		3 feeds at 15 min interval; finally run for 90 min.
	Hypo	0.3	30 min	Check pH; 3.8. Drain out and pile.

Summary of Emission loads in effluents from individual processing operations

Operation	Process	Water	Emission load kg/t							
		M^3/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	12.00	7.75	17.18	155.30	15.89	171.19	91.27		
	M	4.50	5.56	15.39	112.77	15.35	128.12	59.27		
	D %	-62.50	-28.25	-10.43	-27.39	-3.38	-25.16	-35.06		
Liming	**T**	**3.0 - 4.0**	**15 - 40**	**30 -100**	**72 -120**	**18 - 80**	**90 - 200**	**12.0 - 32**	**1.7 - 7.7**	
	C	3.00	84.30	264.41	165.86	122.41	288.28	10.78	12.62	
	M	2.00	29.58	48.77	88.54	53.94	142.47	3.70	5.36	
	D %	-33.33	-64.91	-81.55	-46.62	-55.94	-50.58	-65.63	-57.54	
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**		
	C	1.50	8.84	23.16	36.71	6.35	43.07	2.10		
	M	1.50	3.18	13.88	34.08	6.15	40.23	1.62		
	D %	0.00	-64.07	-40.07	-7.17	-3.21	-6.59	-22.71		
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 %	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!		
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	1.25	1.55	7.60	63.65	5.90	69.55	14.68		5.04
	M	1.25	1.65	6.57	56.58	5.34	61.92	13.78		3.80
	D %	0.00	6.45	-13.51	-11.10	-9.58	-10.97	-6.18		-24.55
Overall	**T**	**11.5-18.**	**23.2-70.8**	**52-176**	**312.5-746**	**39-159**	**351.5-905**	**128-386**	**1.74-7.8**	**2 - 10**
(Excluding	C	17.75	102.44	312.33	421.53	150.55	572.08	118.83	12.62	5.04
Washings)	M	9.25	39.96	84.61	291.97	80.77	372.74	78.38	5.36	3.80
	D %	*-47.89*	*-60.99*	*-72.91*	*-30.74*	*-46.35*	*-34.85*	*-34.04*	*-57.54*	*-24.55*

T: Traditional C : Conventional M : Modified D : Difference

BD006 GOAT SKINS RAW TO WET BLUE Phase -2



Good housekeeping practices at Ruma Leathers

1. Walk-through survey

Criteria	Finding	Proposed follow-up action
1. Safety of machinery and equipment		
1.1 Placement and access to machines	All machines are easily accessible at the loading and unloading side.	
1.2 Guarding of moving and hazardous machine parts	The newly imported machinery, mostly used in the finishing processes, by and large meet international safety requirements in terms of proper positioning, availability of passive and active guards, placement and labelling of control buttons, dials and switches.	
	Local machinery (drums, fleshing machine) mostly used in raw-to-semi finished production, are without passive and active guards.	Install fence type covers and guards around motors, drive and gear mechanisms of drums and fleshing machines.
	Simple passive guards have installed on one drum and one fleshing machine. However, these do not have a fine mesh preventing access to moving machine parts.	Fix fine mesh on existing guard structure and replicate on other machines in the tannery.
	Commonly one motor is used to drive two to three drums, using a flat-belt transmission system. While the motor is running all the time, the flat-belts are shifted mechanically to activate drum rotation. During this procedure, workers are working close to motor and immediate transmission system. The transmission mechanisms are not covered or fenced.	Consider replacement of current drive system with more energy-efficient individual motors with IP 55 rating. Replace flat-belt drives with V-belt drives, which ensure better transmission even when wet.
	In case of the dyeing drums the drive mechanism are adjacent to the wet walkway.	Provide fence type barrier between drive mechanism and walkway.
1.3. Control of machines	Control buttons on local machinery are not in reach of operator. Emergency-off switches are not available or not in reach of operator.	Install and relocate starters and emergency-off buttons to be in convenient reach of operator and helper. Clearly label all controls and buttons to allow their easy identification.
	There are no proper starter switches for many drums.	See replacement of motors
	Elevated platforms are available on most machines to allow good worker-operating point interface.	Provide a working platform on the unloading side of the lime splitting.
1.4 Maintenance practices	The general maintenance and cleanliness of machines is very poor with waste and dust covering machine and electric installations.	Clearly place responsibility for condition of machine with concerned supervisor.
	A system of preventive maintenance seems to be absent. Most maintenance activities related to breakdown maintenance and repair.	Assist the maintenance team to prepare an inventory of all machines and to draw up an monthly and annual maintenance schedule (also based on the recommendations given in the machine manuals)

Criteria	Finding	Proposed follow-up action
		Number all machines so to allow easy and clear identification in the maintenance schedule or in case of breakdown.
	No pre- and post-operation checking routine is being followed. Only in the case of one new finishing machine (upstairs), a safety instruction card (in Bengali) has been placed next to the machine.	Place boards containing checklist type instructions (in Bengali) at each machine, listing points to be checked before and after production.
2. Safety of electrical installations		
2.1 Protection rating of motors	Most electrical motors in use in the wet-processing areas to not conform to IP55 (or equivalent) level of protection as required for conditions prevailing in such work areas. Though some motors may have IP55 rating (according motor rating labels are missing or not legible), poor maintenance and condition of these motors have reduced the actual level of protection.	Consider replacement of motors with inadequate protection rating.
	Terminal boxes on many motors are missing.	Fix terminal boxes and connect cables through cable glands.
	Most motors and outer motor parts are heavily corroded.	De-rust motors and provide corrosion protective coating.
	Fan covers on several motors are missing, which reduces the cooling capacity and thus motor performance, particularly during the hot months.	Fix fan covers.
2.2 Wiring and earthing:	Wiring on (local and second-hand) machines is unsafe; electric cables are not connected to the motors through cable glands	Connect cable through glands to reduce loss of energy in transmission.
	Wire connections are poorly insulated (even blank wires) using even simple adhesive tape.	Replace all cut wires and replace with new and properly rated wires. Place all wires in protective cable ducts and locate cable ducts along the wall and ceiling.
	Earthing wires are missing or are loose on most electric motors in the wet-processing areas.	Check earthing connections on all motors and metal panel boards. There should be at least to earthing connections.
	Circuit breakers and overload relays are usually available on the imported machinery only. In many places fuse are missing and have been replaced by wire pieces.	Replace missing fuses. Consider installation of circuit breakers and overload relays to prevent damage to electronic parts of newly imported machines.
	Electrical cables for minor tools and lighting in the work areas have been placed across passageways and immediate work areas around machines, obstructing free movement.	Place cables in cable ducts and locate along wall and ceiling.
2.3 Switch boards and panels:	The electrical connection on and around imported machinery conforms to international standards in terms of colour coding, overload and short-circuit protection.	Use same colour coding for other electric connections in the tannery.
	Switchboards and panels of imported machines are placed next to the machine in convenient reach of operators and helpers.	

Criteria	Finding	Proposed follow-up action
	Most switches and starters on drums and local machinery in wet-processing areas are located away from the machinery and out of workers' reach.	Shift starters closer to the machines. Clearly label the starter boxes indicating the corresponding machine or motor.
	Instead of adequate panels or boards, wooden boards are used for mounting switches, starter buttons and other controls. Due to humidity and poor maintenance practices, these boards are either soaked (high risk of becoming live!) or covered with dust (fire risk!).	Consider replacement of wooden panels with proper switchboards and distribution panels made of corrosion proof material.
	Labels, allowing clear identification of switches and buttons, are usually missing. Sample tests, asking workers to switch on or off a particular machine, resulted in trial and error exercises, switching on wrong machinery or light fittings.	Use labels for all switches and buttons to allow clear identification of corresponding fixtures and fittings by all workers.
	All switches, dials and controls on imported machines are clearly labelled in English but not in Bengali. Workers were not able to explain the meaning if the different controls from the labels.	Provide additional labels in Bengali on all imported machines.
2.4 Main electrical controls	There is a separate main electrical control room with the transformer unit placed inside. Fences or guards preventing access to the transformer unit are missing.	Provide fence type barrier (made of non-conductive material) around the transformer. Access gate should be locked. Place signboards at entrance prohibiting unauthorised entry and warning about high voltage and fire risk.
	Various waste material (partly flammable) is stacked inside the main electrical control room.	Remove all material from store.
	The DG set is placed near the side entrance of the tannery. Fences or guards preventing access to the DG set are missing.	Consider shifting the DG set to a separate location, shielded by a wall from the production areas.
	Protective measures such as insulation rubber matting, high voltage and other warning signs, rubber gloves (with voltage rating) are absent.	Provide insulating rubber mats in front of all control and distribution panels.
3. Safety in use of chemicals		
3.1 Availability of information on hazardous chemicals	Most chemicals used in the tanneries are imported. Chemical containers from European suppliers are labelled and marked as per international standards. However, in many cases these labels are partly torn or have become hardly readable. Safety labelling and marking on containers of chemicals imported from other Asian countries does not conform to international standards.	Check labels before using chemicals in the tannery. In case labels are missing use no erasable marker pen to clearly mark content of respective chemical containers.
	Material Safety Data Sheets (MSDS) are not available in the tanneries.	Prepare an inventory of chemical in use. Obtain MSDS from the suppliers and keep on record with in-charge of chemical store and production manager.

Criteria	Finding	Proposed follow-up action
	Floor level supervisors/technicians and workers had little to no awareness about the potential health hazards of the hazardous chemicals in use and first aid measures.	Inform supervisors about the content of MSDS for hazardous chemicals used in their areas.
3.2 Storage of chemicals	The chemical store next to the raw material store is of adequate layout. Presently, storage of other material (e.g. spare parts) reduces space available for storage of chemicals.	Remove all non-chemical material and provide alternative storage (e.g. near staircase in dry finishing area). Reorganise chemicals as per plan prepared during visit, keeping all chemicals on pallets and in rows with sufficiently wide pathways for easy movement of pallets.
	Some acid containers (unmarked!) are kept outside the store in the dye yard, next to a temporary storage area. The latter is presently used as office space.	Provide separate storage area in the main chemical store. Use temporary storage area of storage of chemicals only.
	Finishing chemicals (e.g. spraying) is stored on open racks and tables near the upstairs spray booth.	Arrange for a separate storage area for finishing chemicals.
3.3 Transfer and handling of chemicals	Powered chemicals (BCS, salt, lime) are usually moved by trolley to the respective processing areas, where they are emptied into barrels for further preparation.	Use smaller trolley with rubber wheels to reduce number of workers currently required for moving material. Reduce the gradient of the ramp between raw material store and dyeyard or use trolleys with brakes.
	Liquid chemicals (fatliquors, acids) are usually transferred using small measuring cups from the large containers to open (unmarked) buckets.	When moving liquid chemicals, use closed containers to prevent spill. Make sure that all containers and buckets are also clearly marked or labelled to allow easy identification all the time. Consider use of hand-piston pumps or dipping racks for safer transfer of liquid chemicals.
	The buckets are moved on trolleys to the process areas.	
	Concentrated acids are diluted in open barrels next to the drums. Mixing is done manually, using a wooden stick. The concerned workers are inhaling vapours, fumes and aerosols generated during these processes. Workers do not use any personal protective equipment	Consider use of a corrosion protected hand-piston pump for transferring liquid chemicals from large to small containers. Workers should use protective gloves, boots, apron and proper respirator against acid vapours when manually mixing and diluting acid.
3.4 Control of emissions at source	No air quality monitoring has been carried out so far in the tannery.	
	Any vapours, fumes, gases generated during the processes in the drums are diluted by venting the drums for a short period of time before removing material inside. Poor general ventilation in the beam house and tan yard (low ceilings, no roof vents, no wall openings or windows) leads to accumulation contaminated air.	Install vent holes at ceiling level to provide escape of hot and contaminated air. Provide stand-fans to improve horizontal airflow in the drum areas.

Criteria	Finding	Proposed follow-up action
	Buffing and dedusting machines are provided with proper dust extraction and collection facilities. At the time of visit, machine were not in operation.	The functioning of exhaust fans should be checked on a daily basis before actual starting of operation.
	The hand spray booth exhaust is not connected to a scrubbing device. Spraying vapour is directly exhausted to the outside air.	Consider the installation of a scrubber system.
	The spraying chamber of the rotary spraying machine is connected to an exhaust duct, leading to a small room with a water spray. No such connection is provided for the exhausts on the drying tunnels.	Connect the exhaust fans of the drying tunnel to the existing ducting system.
3.5 Disposal of chemical waste and containers	Empty chemical containers and carboys are collected, rudimentary cleaned and sold to special agents.	
	These sell the containers for reuse to chemical manufacturers or to private persons for storage of water of food.	Reuse of old chemical containers for storage of water and food is to be discouraged. Chemical residuals may enter the food chain!
	At present, wastewater is discharged into drains to the outside of the tannery without treatment.	
4. Safe condition of floors and structures		
4.1 Flooring and passageways	General floor conditions are acceptable. Floor openings such as drains, wells or pits are covered. At a few points there are holes.	Cover remaining holes to avoid falls and trips.
	Passageways are of adequate width and flooring allowing easy movement of material and persons.	Carefully store material in process to remain passageways free at all times.
		Use of yellow floor markings in dry finishing area will improve present allocation and use of space.
	The ramp between raw material store and dyeyard is too steep. Workers have difficulties moving and braking the trolleys used for transport of material.	Reduce gradient of ramp.
4.2 Railing of stairs	Railings are available on all stair cases.	
5. Illumination		
5.1 Light quality	Measurements conducted on-site using an industrial light meter showed that the general illumination levels in almost all work areas are inadequate. The general light levels in the tannery are around 10 - 30 lux. For detailed results, refer to enclosed annex.	
5.2 Use of day light	Apart from poor use of natural (day) light due to the given structures of the buildings, the tannery does not have sufficient number of light fittings.	
	Natural light is more intensively used in the upstairs finishing, quality control/ measuring and packing area.	
	Walls and ceilings in ground floor sections have poor reflection values due to poor cleanliness and lack of whitewashing.	Whitewashing and good cleanliness of ceiling, floors and column will increase the light reflection.

Criteria	Finding	Proposed follow-up action
5.3. Local lighting	The quality of local lighting of point of operations, particularly on machines with hazardous operations and moving machine parts are inadequate. Poor lighting does not only result in strain and impairment of eyesight, but results in worker's fast fatigue and dizziness. These factors in turn lead to low quality and increase risk of accidents.	
6. Noise		
6.1 Noise levels	As per the measurements conducted on-site noise levels were within safe limits of 85 dB(A) for a eight hour exposure. This has been the first noise measurement in this tannery.	
6.2. Hearing protection	No hearing protection (ear muff, ear plugs) was available or used by workers in operation with higher noise levels.	
7. Ventilation and ambient air quality		
7.1 Natural ventilation	Most production facilities are placed in open structures and open halls. However, limited number of wall openings e.g. windows, gates, louvers do not allow good natural cross-ventilation, particularly on ground and first floor.	Install louvers on the ground floor and ceiling level to allow for better horizontal and vertical airflow. Ensure that staff opens windows upstairs to increase natural cross-ventilation.
7.2 Ventilation	Ceiling fans are available work areas to provide airflow for operators, but these do not contribute to sufficient air change in the work areas.	Install wall mounted exhaust fans on the ground floor.
7.3 Temperature and humidity	Indoor ambient air quality, temperature and humidity have not been monitored. There is no provision for dry-bulb and wet-bulb thermometers.	
8. Handling and movement of material and loads		
8.1 Use of trolleys	Most materials is transported on trolleys. Tools such as tongs and long clamps are partly used by the workers when handling rawhides in beam house. Material is manually carried between ground and first floor. There is no provision for an elevator..	
8.2 Storage of material	Process and input materials are mostly stored on the floor. When required the material is moved manually. Hydraulic pallet trucks are not in use for moving stacks of material on the pallets. Though the tannery has plenty of spare space, storage provisions for tools, spareparts and consumable material is not available.	
8.3. Organisation and management of workspace	Areas for work, storage and movement are not clearly segregated e.g. such as by floor markings.	Make plan to distribute available floor area, providing for separate areas for machine operation, storage of material and movement. Apply clearly visible floor markings and make sure that all workers adhere to these.

Criteria	Finding	Proposed follow-up action
	Accordingly, the current storage arrangements for material in process appear to be haphazard and wasting storage space.	See above
9. Emergency management and control		
9.1 Emergency planning	No written emergency plan listing actions required for different emergency scenarios is available.	
9.2 Dealing with fire and explosion	No systematic fire audit has been conducted in the tanneries to identify potential sources of ignition and potentially flammable material and to take preventive and preparedness measures.	
	Workers in the tanneries are not aware of what to do in case of a fire.	
	Emergency exits and routes are not clearly marked or indicated.	
	There are no signs or boards, which prohibit smoking or open fire, particularly, in areas such as chemical stores, spraying, buffing, and main electrical control room.	
	Fire-fighting equipment is insufficient for the size of production. In some instances the fire fighting equipment is wrongly distributed. For example, fire-fighting equipment is not available in areas with a high fire risk e.g. spraying areas or chemical store while being available in areas such as beam house/ tan yard.	
9.3 Dealing with medical emergencies	No first-medical-aid facility is available.	Provide for separate first-aid kits on each floor. Mark their location. Make the respective floor supervisor responsible for the maintenance and good condition of the first aid kit.
	The phone number of nearest doctor or hospital was not displayed on or next to the telephones with outside connection.	
	There not trained first-aiders available in the tannery.	Train at least two workers of the tannery as certified first aiders. One certified first aider should be available on each shift. Consider organising a basic first aid training for all workers.
10. Personal protection and welfare		
10.1 Personal hygiene	Workers frequently wash exposed skin after handling raw material or work in wet-processing yard.	
	No separate washing facilities are available. Usually workers use water from the water taps in the production areas.	
	Workers usually take food outside the factory.	

Criteria	Finding	Proposed follow-up action
10.2 Working and protective clothing	No separate working uniforms are provided to the workers, who use the same clothes at work and at home. Most workers wear open sandals. Only a few workers in the wet-processing wear boots.	
10.3 Access to drinking water	No provision of clean drinking water is available in the tannery.	
11. Promotion of safety and health at work	The tannery does not have a written safety policy.	
11.1 Safety signs	Safety or cautionary signs and boards are not displayed in the workplaces. Imported machines usually bear safety and cautionary labels.	
11.2 Safety training	As the awareness on safety & health among supervisors is also very low, increase of general awareness by means of close supervision and on-the spot guidance is limited.	

2. Results of noise measurements

Following measurements have been carried out by means of an industrial sound level meter. The threshold limit level for safe noise exposure over an eight-hour shift is between 85 to 90 dB(A). Internationally continuous noise levels of around 75 to 80 dB(A) are recommended. Measurements have been done in A rating. Measurements have been taken at the place of the respective operator(s).

LA.....grab measurements

LAeq..... Equalised sound pressure level

LaMax.....Maximum sound pressure level recorded

All measurements are recorded in dB(A):

Operation	L_A	L_{Aeq}	L_{Amax}
Dye drum supervisor desk	81...84	84.2	94.3
Dye drum I	86...90	89.5	94.5
Dye drum II	83...84	85.5	89.3
Dye drum III	84...92	88.0	93.6
Though-feed staking (Molissa) front	78...80	80.3	83.3
Though-feed staking (Molissa) rear	74...76	79.9	84.4
Skin setting m/c (Alleti)	81...91	88.7	96.3
Hide setting m/c (Rizzi)	77...94	91.4	100.6
Vacuum dryer (effect of setting m/c 5 m away)	78...86	83.8	94.1

3. *Results of light measurements*

Following measurements have been made by means of an industrial light meter. The measurements have been taken at the point of operation at the respective machines/operations. The general light level in all work areas is inadequate.

Operation	Lux (measured)	Recommended minimum level	Remarks
Raw trimming	8...35	150...300	
Chemical store (in-charge)	63...80	150...300	
Chemical store - balance	60	150...300	
Fleshing m/c	200	300...500	
Skin setting m/c (Aletti)	58	300...500	
Hide setting m/c (Rizzi)	300	300...500	Stroboscopic effect from fan
Vacuum dryer	4...26	300...500	
Slo-comb staking m/c	18	300...500	
Through feed staking m/c (feeding)	6	300...500	
Through feed staking m/c (rear)	116	300...500	Stroboscopic effect from fan
Wet-blue sorting table	1020	750...1000	Skylight!
Wet-blue measuring	200	750...1000	
Embossing m/c front	40	300...500	
Embossing m/c rear	45	300...500	
Staircase	3	100	
Hand-spray booth	160	300...500	
Glazing jack	139	500...750	
Roller coater	83	300...500	
Polishing m/c	320	500...750	
Foil attaching m/c	62	300...500	
Ironing m/c	165	300...500	
Measuring m/c	220	300...500	
Supervisor desk	360	150...300	
Quality control	2240	1000	Daylight!
Colour matching	290	750...1000	

ANNEXURE - X

TANNERY PROCESS DETAILS

1. Tannery Name : **BD004**

2. Tannery Location and Land area
   a) Total land area (in acres/sq.ft.) : Vaccant Land – Nil
   b) Open land available (in acres/sq.ft.) : Building 47252 sq.ft
      11813sq.ft / floor x 4 floors
   c) Tannery boundary details: :
      Northern side: Open Land — Eastern side: Road & Residence
      Southern side: Glue Industry Small Scale — Western side: Road & Residence

3. Water
   a) Existing ground water Table -(feet) (within the tannery premises) :
   b) Sources of water supply (If more than one source mention % share) : Tube well
   c) Characteristics of raw water (enclose water analysis report) : Not Available
   d) Residential Quarters (if any) within the campus : No. of quarters: Nil — No. of persons residing: Nil

4. Raw Material

Sl. No.	Source/ Origin	Species	Preservation Mode dried/sod. chloride/ biocide (if so, which)
1	Local	Cow Hides	Wet Salted
2	Local	Goat Skins	Wet Salted

5. Tannery Processing Capacity :

Tannery Design Capacity : 3000 kg/day
Normal Operating Capacity : 3000 kg/day

Actual Processing/day

Process Mix		Present Processing			Future Plan		
		Species	Pieces	Weight (kg)	Species	Pieces	Weight (kg)
i)	**Raw to Wet Blue** √	Cow	140	2100	full capacity		
		Goat	900	900			

Area per piece: Goat Skin = 3 – 3.5 sq.ft, Cow hide = 20 sq.ft
Wet Blue to Finish very rarely

6. Seasonal variation in processing (if any)

Season	Months	Processing / per day	
		Pieces	Weight (kg)
i) Peak season	Qurbani season		
ii) Lean Season			

7. Production during last 3 years : Not Available

8. List of equipments available

Sl. No.	Equipment	No. of Equip.	Man power	Size/ Specification	Operating Capacity (kg)	Vol. (lit)	Power (HP)
1.	Desalting Machine	-					
2.	Pits	2					
3.	Paddles	-					
4.	Drums Soaking & Liming Big Small Tanning	 3 1 6	 - - 	 2.6m(l)x3m(d) 2m(l)x2.7m(d) 2m(l)x2.7m(d)	 1200 1000 (800-900 kg operating) 800 – 900		
5.	Fleshing Machine	3					
6.	Unhairing Machine	-					
7.	Splitting Machine	-					
8.	Shaving Machine	2					
9.	Sammying Machine	1					
10.	Setting Machine						
	i) Ordinary						
	ii) Reversible	4					
11.	Vacuum Drier	1		Finvac			
12.	Staking Machine						
	i) Slow Comb	1					
	ii) Mollisa						
13.	Buffing Machine						
	i) Single Width	1					
	ii) Feed Through						
14.	Dedusting Machine						
15.	Spraying Machine	-					
	i) Hand Spray						
	ii) Auto Spray						
16.	Polishing Machine	-					
17.	Embossing Press	1		Turner			
18.	Finiflex Machine						
19.	Area Measuring Machine	-					
20.	Boiler	-					

21.	Generator	1					
22.	Others						
23	Hydraulic Press	1					
24	Toggling	1					

Power Source [√] **Electricity Board** [√] **Generator** [ ] **Oil Engine**

9. Production Pattern

Items			Present	Future plans (next 5 years)
i)	Working hours/day		8 hrs	16 hrs
ii)	Number of shifts/day		1	2
iii)	Number of working days in a week		6 days	
iv)	Average working days/annum		300 days	
v)	Total Manpower shift	1	50	
		2		
		3		

10. (a) Water and Chemical usage Chrome Tanning Process - Raw to Wet Blue for Cow hides

Lot Size ☐☐☐☐ **kg** **pieces** ☐☐☐☐

Sl. No.	Process	No. of Pit/ Paddle/Drum	Size	Water used (%)	Chemicals used		Dura-Tion	Tempa rature	pH
					Name	(%)			
1	Pre Soaking	Drum		550%	Wetting Agent, Non-Ionic (Detergent) Optional	0.2 - 0.3%	10'	-	
2	Washing	Drum		500%	Running water		15'		
3	Main Soaking	Drum		550% 50% **Drain**	Soda Ash Preservative (Erhavit LBH– TFL) Wetting Agent, Non-Ionic	0.5% 0.2 - 0.5% 0.3 - 0.5%	12 – 14 hrs		
4	Liming	Drum		275% Soak bath	Lime Sod. Sulfide - ***Run for 10' every 1 hr for 24 hrs***	4.5% 4 %	3 feeds at 30' interval		
5	Washing	Drum		500%			30'		
6	Fleshing	Machine	-	125%					

Pelt Weight				Kg					
7	Washing before Deliming	Drum		500%			15'		
8	Deliming	Drum		50% **Drain**	Degreasing Agent Amm. Sulfate Sod. Metabisulfite Bating Agent **<u>for Goat</u>** Bating Agent	0.3% 1-1.5% 0.25% 0.5% 1.5 – 2%	 60' 60'		
9	Washing after Deliming	Drum		500%					
10	Pickling	Drum		75% **No Drain**	Salt Preservative Formic Acid Sulfuric Acid	8% 0.15% 0.3% 0.8%	10' 10' 15' 3 feeds at 30' Interval Total Duration 3 hrs.		pH 2.8-3.0.
11	Chrome Tanning	Drum		Pickle bath + 100%	Sod. Formate Chrome Chrome Sod. Bicarb Tanbase	0.25% 4% 4% 1.5% 0.2 – 0.3%	 30' 90' 7.5 – 8 hrs.		pH 3.6-3.7
12	Other washing & wastages	-		725%					

11. Chrome Tanning Procedure

	Item	Wetblue		Rechroming	
1.	Number of Drums				
2.	Size of the Drums				
3.	Average pelt weight(Kgs or Pieces/Drum)				
4.	Type of BCS used	Imported			
5.	% of BCS used	8%			
6.	Basification and chrome uptake	75% uptake			
7.	Washings : Number	-			
8.	Washings : amount of water for each washing	-			
9.	Water used (float) in %	75% Pickle bath+100%			
10.	Other chemicals used in %	**Chemical**	**%**	**Chemical**	**%**
		Sod. Formate	0.25%		
		Sod. Bicarb	1.5%		
		Tanbase	0.2-0.3%		

12. Water and chemical usage of leather manufacturing processes

Imported Chemicals

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

Process	Water m^3/ day	Water/ton m^3/ ton	Material
Chrome tanning	3	1	Cow hides & Goat skins
Rechroming	-	-	-

14. Drainage and disposal arrangements

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/~~No~~

d) Whether scope exists for mixing up solid water with tannery waste water : Yes/~~No~~

e) Type of problems faced in operating existing drains/sewer
1. Chocking of drains with solid wastes
2. Sludge settling leads to overflow / backflow

f) Mode of final effluent disposal (CETP/ETP) : Drain

g) Solar Evaporation Pan available : ~~Yes~~/ No
If yes, Surface Area : -

h)

Solid Disposal	Type of Disposal	Mode of Disposal
Salt containing material		Dumped outside
Chrome containing material		-

15. Mode of solid waste management

Sl.No.	Solid Waste	Amount per kg of Raw Material	Disposal Method
1.	Dusted salt		Dumped / Reused
2.	Raw hide/skin trimmings		Glue / dumped outside
3.	Lime sludge		Dumped outside
4.	Hair/Wool		No Hair Shaving Process
5.	Fleshings		Dumped outside
6.	Wet Blue / EI trimmings		Dumped outside
7.	Shaving/buffing dust		Dumped outside
8.	Others		-

16. Total water used perday : 125 cubic meters

17. Total Effluent discharged (approximate) : 125 cubic meters

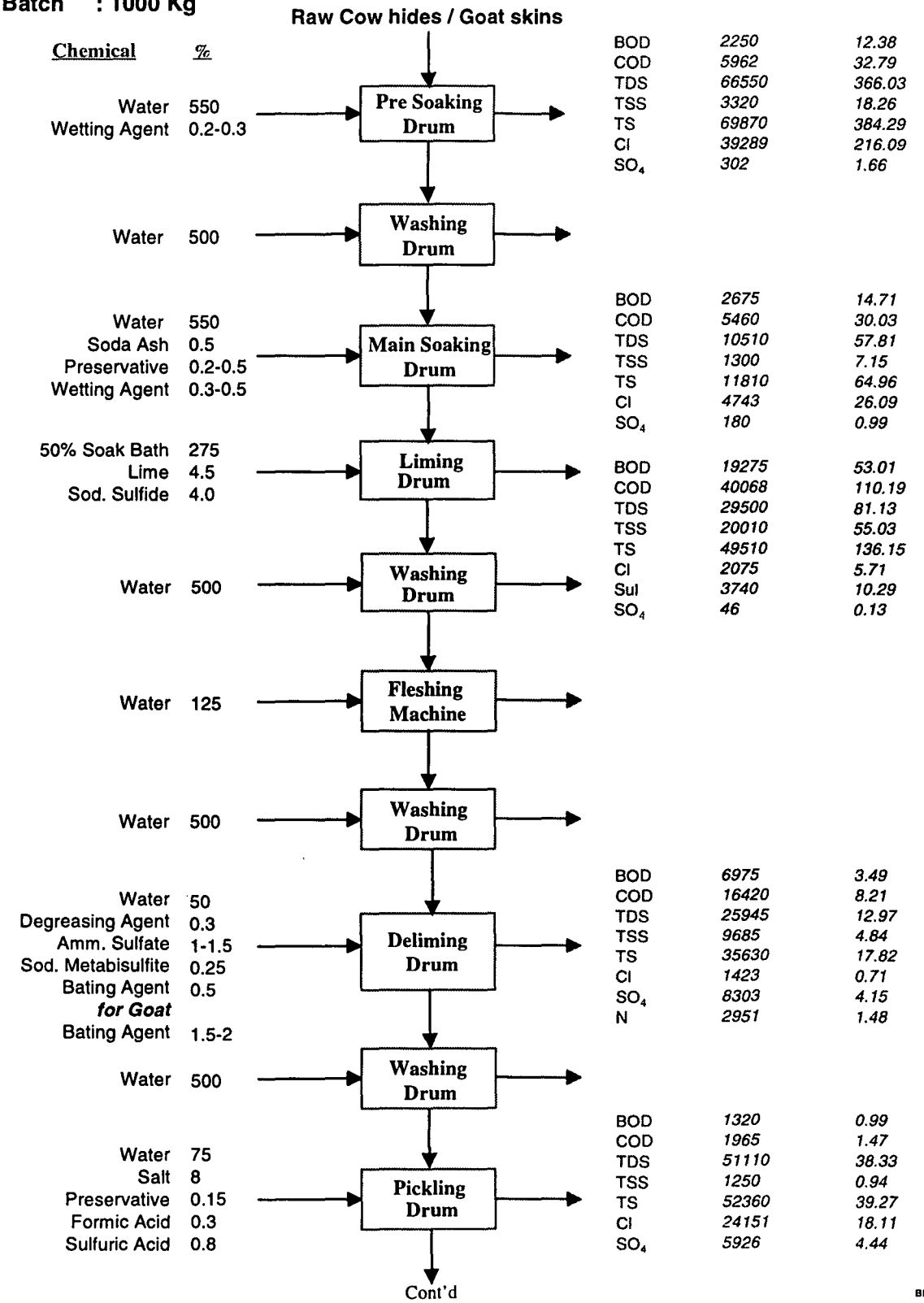
18. Whether Chrome Recovery Plant is proposed / under construction / existing : Nil

19. Remarks -

BD004	CONVENTIONAL PROCESS AND EMISSION LOAD	3000 kg/day

Process : Cow hides / Goat skins Raw to Wet Blue

Batch : 1000 Kg



	ppm	EL kg/t
BOD	2250	12.38
COD	5962	32.79
TDS	66550	366.03
TSS	3320	18.26
TS	69870	384.29
Cl	39289	216.09
SO_4	302	1.66

BOD	2675	14.71
COD	5460	30.03
TDS	10510	57.81
TSS	1300	7.15
TS	11810	64.96
Cl	4743	26.09
SO_4	180	0.99

BOD	19275	53.01
COD	40068	110.19
TDS	29500	81.13
TSS	20010	55.03
TS	49510	136.15
Cl	2075	5.71
Sul	3740	10.29
SO_4	46	0.13

BOD	6975	3.49
COD	16420	8.21
TDS	25945	12.97
TSS	9685	4.84
TS	35630	17.82
Cl	1423	0.71
SO_4	8303	4.15
N	2951	1.48

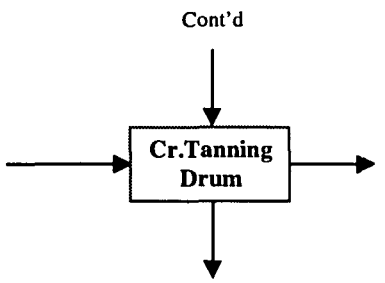
BOD	1320	0.99
COD	1965	1.47
TDS	51110	38.33
TSS	1250	0.94
TS	52360	39.27
Cl	24151	18.11
SO_4	5926	4.44

BD004	CONVENTIONAL PROCESS AND EMISSION LOAD	3000 kg/day

Process : Cow hides / Goat skins Raw to Wet Blue

Batch : 1000 Kg

Chemical	%
Full Pickle Bath	75
Water	100
Sod. Formate	0.25
Chrome	4
Chrome	4
Sod.Bicarb	1.5
Tanbase	0.2-0.3



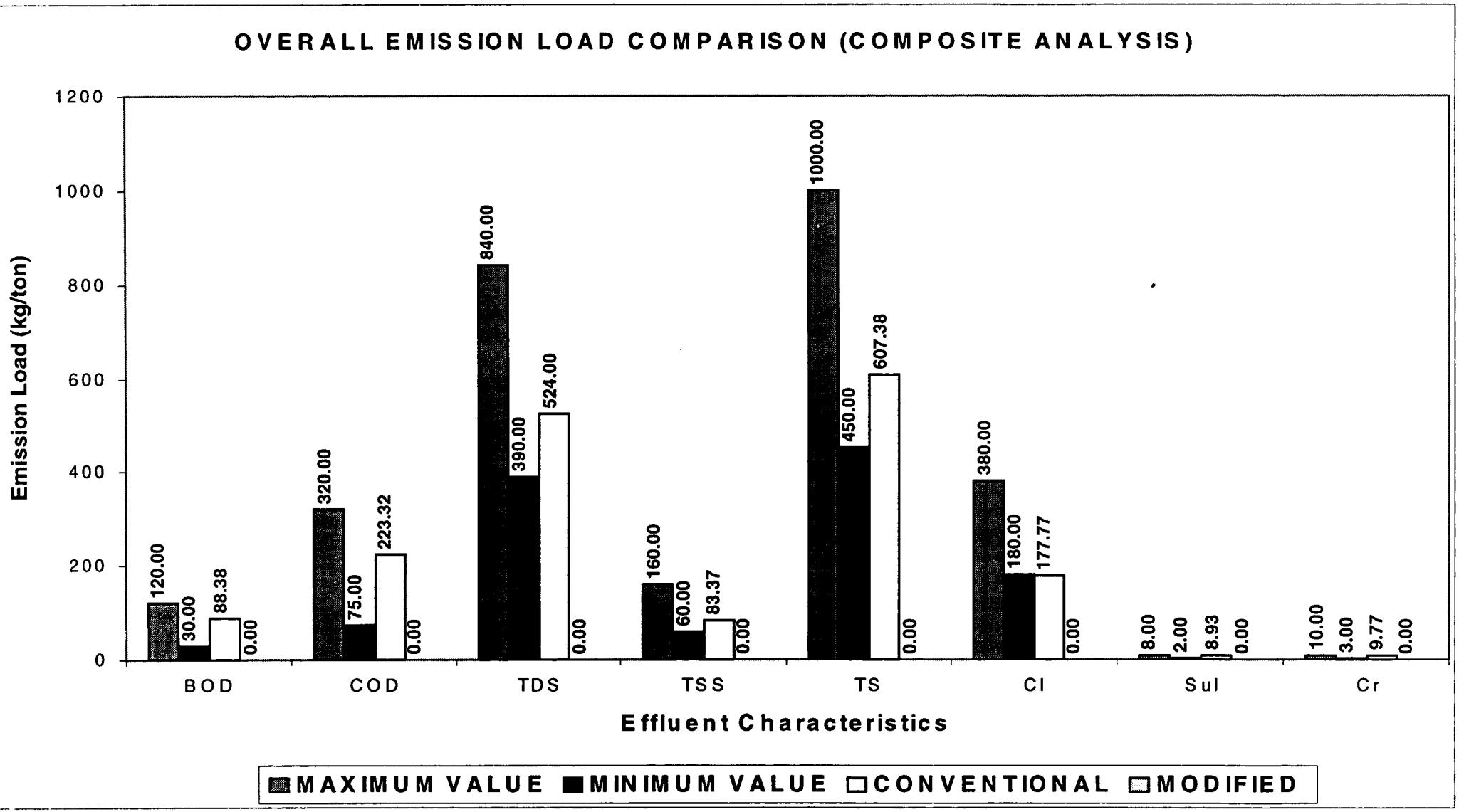
	ppm	EL kg/t
BOD	*375*	*0.66*
COD	*4603*	*8.06*
TDS	*70960*	*124.18*
TSS	*1860*	*3.26*
TS	*72820*	*127.44*
Cl	*21147*	*37.01*
Cr	*3522*	*6.16*
SO_4	*18298*	*32.02*

Other washings & wastages - 725%

Composite

BOD	*2117*	*88.38*
COD	*5349*	*223.32*
TDS	*12551*	*524.00*
TSS	*1997*	*83.37*
TS	*14548*	*607.38*
Cl	*4258*	*177.77*
Sul	*214*	*8.93*
Cr	*234*	*9.77*
SO_4	*1542*	*64.38*
N	*89*	*3.72*

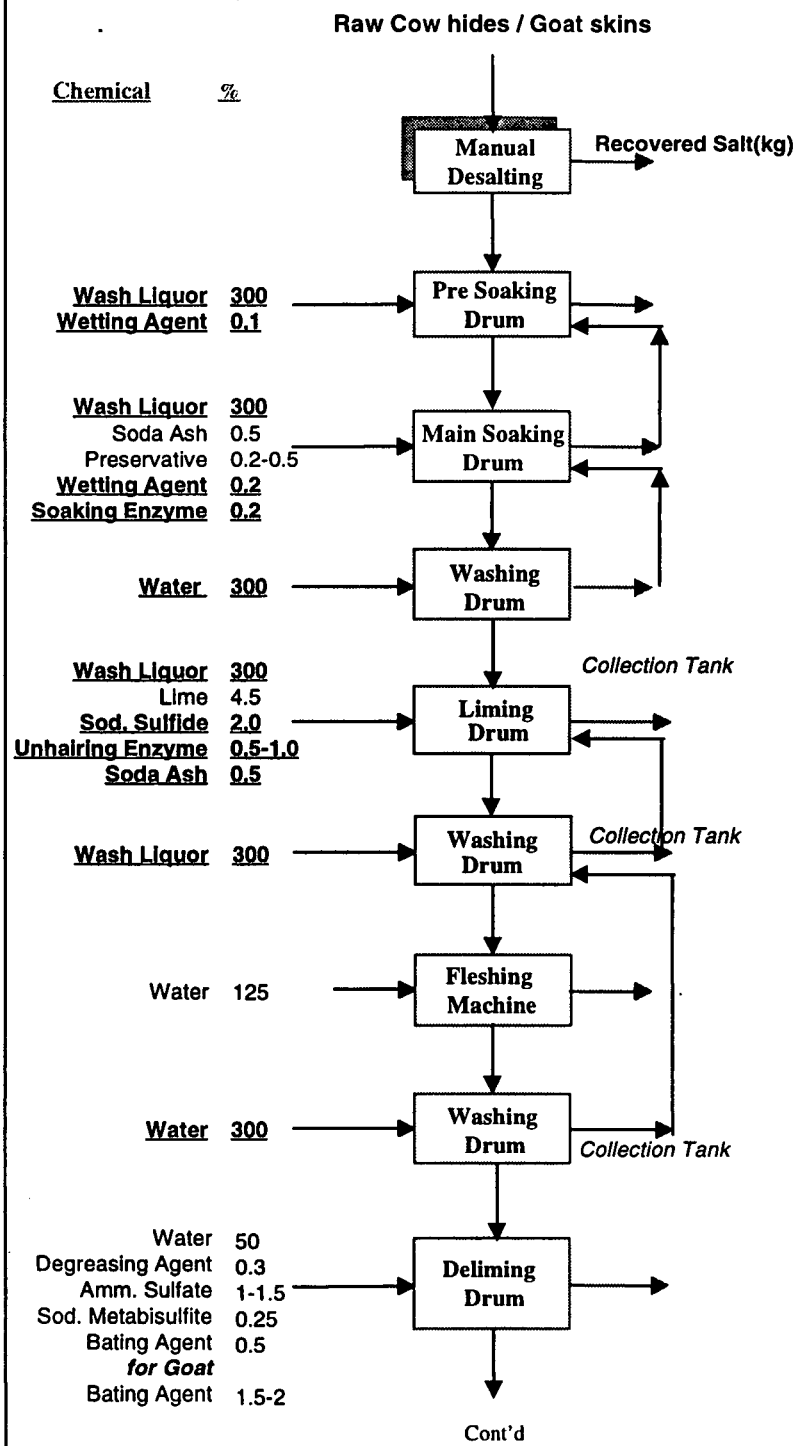
BD004


OVERALL EMISSION LOAD COMPARISON (COMPOSITE ANALYSIS)
Emission Load (kg/ton)
1200
1000
800
600
400
200
0
120.00
30.00
88.38
0.00
320.00
75.00
223.32
0.00
840.00
390.00
524.00
0.00
160.00
60.00
83.37
0.00
1000.00
450.00
607.38
0.00
380.00
180.00
177.77
0.00
8.00
2.00
8.93
0.00
10.00
3.00
9.77
0.00
BOD
COD
TDS
TSS
TS
Cl
Sul
Cr
Effluent Characteristics
MAXIMUM VALUE
MINIMUM VALUE
CONVENTIONAL
MODIFIED

BD004	MODIFIED PROCESS FOR IMPLEMENTATION / DEMONSTRATION	3000 kg/day

Process : Cow hides / Goat skins Raw to Wet Blue

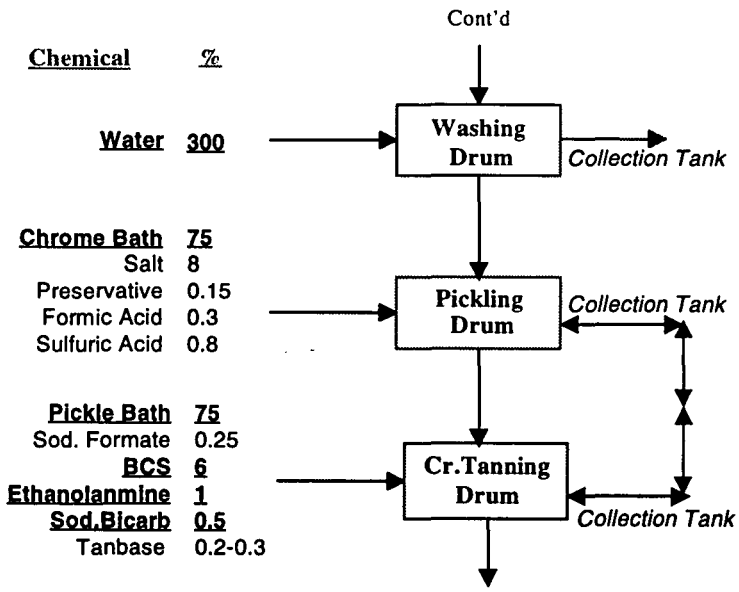
Batch : 1000 Kg



BD004	MODIFIED PROCESS FOR IMPLEMENTATION / DEMONSTRATION	3000 kg/day

Process : Cow hides / Goat skins Raw to Wet Blue

Batch : 1000 Kg

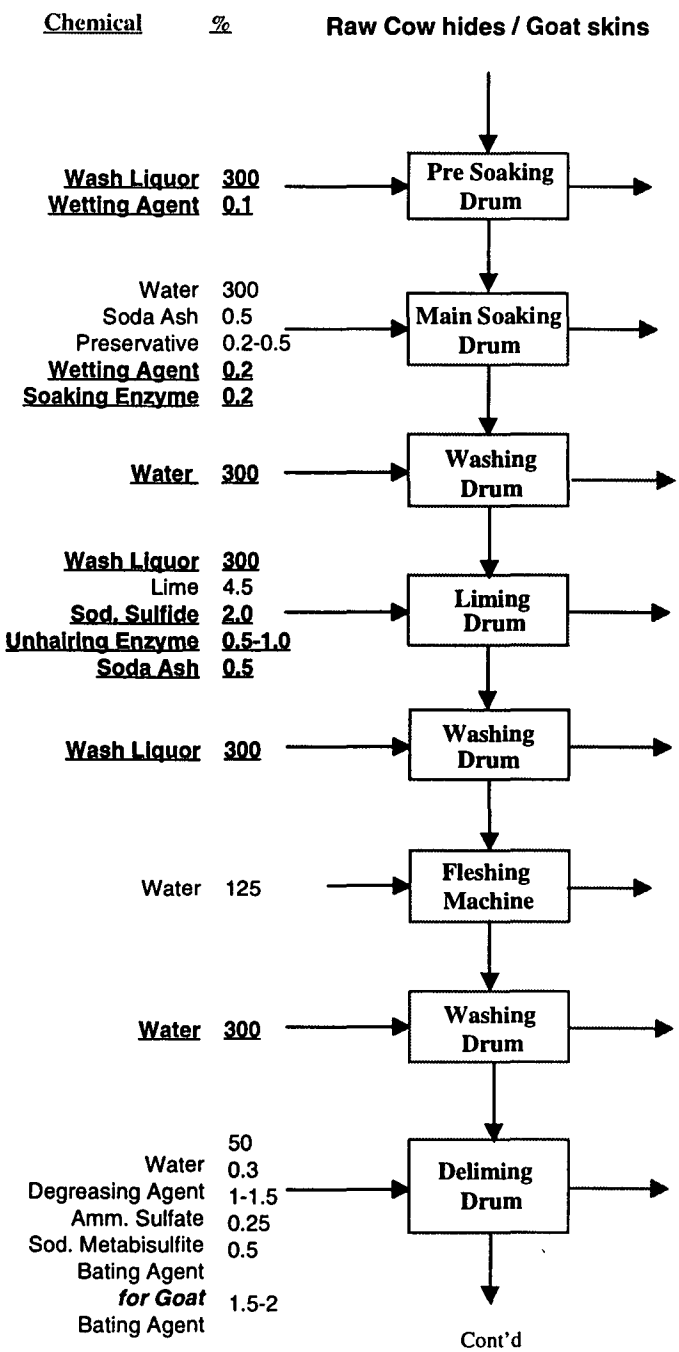


BD004

BD004	MODIFIED PROCESS FOR IMPLEMENTATION / DEMONSTRATION	3000 kg/day

Process : Cow hides / Goat skins Raw to Wet Blue

Batch : 1000 Kg

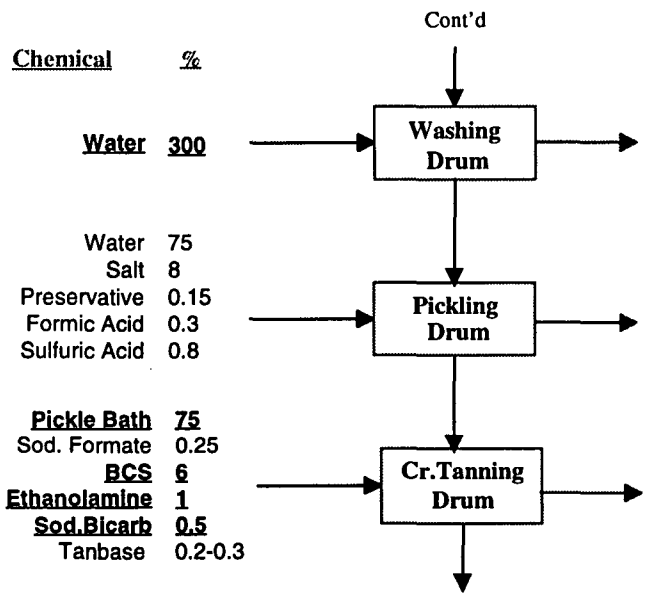


BD004

BD004	MODIFIED PROCESS FOR IMPLEMENTATION / DEMONSTRATION	3000 kg/day

Process : Cow hides / Goat skins Raw to Wet Blue

Batch : 1000 Kg



BD004

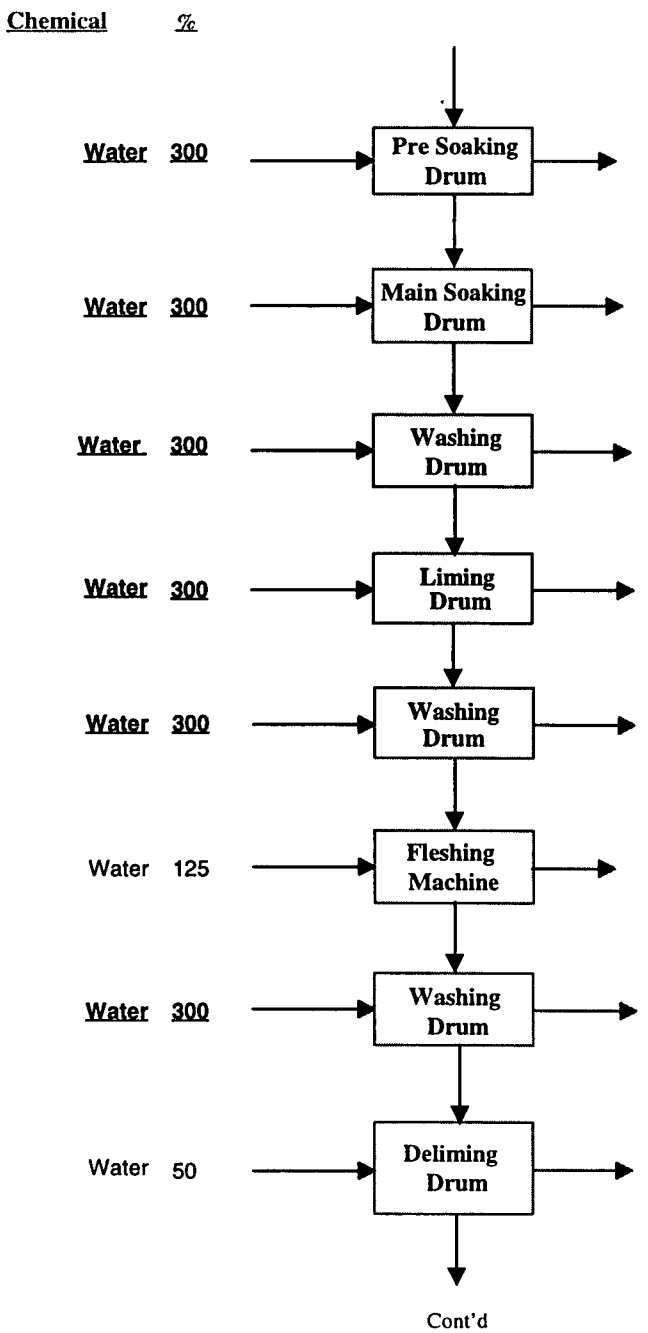
BD004	MODIFIED PROCESS FOR IMPLEMENTATION / DEMONSTRATION	3000 kg/day

Process : Cow hides / Goat skins Raw to Wet Blue

Batch : 1000 Kg

Water Flow Scheme / Recycle Scheme

Raw Cow hides / Goat skins



BD004

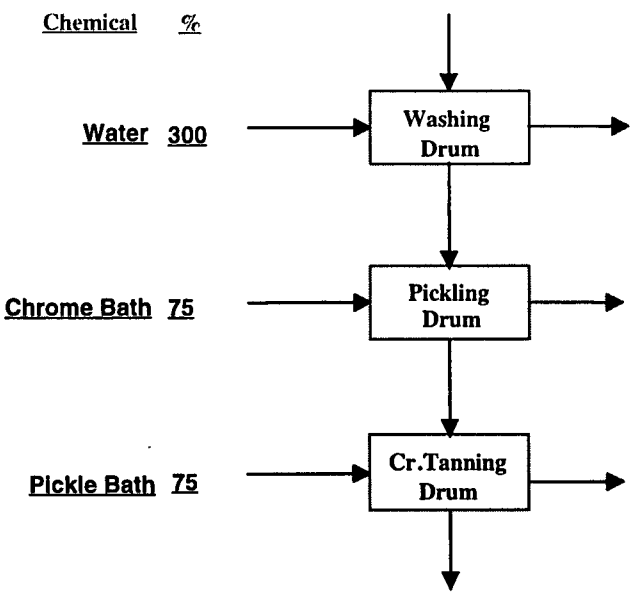
BD004 | MODIFIED PROCESS FOR DEMONSTRATIO | 3000

Process : Cow hides / Goat skins Raw to Wet

Batch : 1000

Water Flow Scheme / Recycle Scheme

Cont'd



BD004

CHEMICAL REQUIREMENT FOR IMPLEMENTATION / DEMONSTRATION OF CLEANER TECHNOLOGIES IN THE TANNERY CLUSTER , AT HAZARIBAGH, DHAKA, BANGLADESH

BD004

LIST OF CHEMICALS REQUIRED

Sl. No	Name	Requirement for 1000 kg lot size (kg)	Total Requirements (kg)	Suggested denomination of package
1.	Soaking Enzyme	2	10	
2.	Unhairing Enzyme	10	50	One bag of 50 kgs
3.	Ethanolamine	10	50	One carboy of 50 kgs

LIST OF EQUIPMENTS REQUIRED

Sl.No	Tannery	Hardware Proposed	Qty- Nos	Technical specification	Expected Benefits
1.	BD004	Liquor Collection Tanks for Soak Liquor for Lime Liquor for Chrome Liquor	 1 No. 1 No. 1 No.	Concrete. 6,000 lit capacity, 6,000 lit capacity, 3,000 lit capacity,	Reduction in hydraulic load to effluent
		Pumps	2 Nos		-do-
		Water Meter	3 Nos		-do-
		Modified Door for Drum	1 Nos		-do-
		Strainer in pipeline	5 Nos		
		Enzyme applicator	1 No		Reduction in sulfide load

ANNEXURE -XI

TANNERY PROCESS DETAILS

1. Tannery Name : **BD005**

2. Tannery Location and Land area
   a) Total land area (in acres/sq.ft.) : 14000 sq.ft
   b) Open land available (in acres/sq.ft.) : Nil
   c) Tannery boundary details: :
   Northern side: Bikrampure Tannery — Eastern side: Cloth Washing Plant
   Southern side: Road — Western side: College of Leather Tech.

3. Water
   a) Existing ground water Table -(feet) (within the tannery premises) :
   b) Sources of water supply (If more than one source mention % share) : Tube well
   c) Characteristics of raw water (enclose water analysis report) : Not Available
   d) Residential Quarters (if any) within the campus : No. of quarters: Nil; No. of persons residing: Nil

4. Raw Material

Sl. No.	Source/ Origin	Species	Preservation Mode Dried/sod. chloride/ biocide (if so, which)
1	Local	Cow hides	Wet Blue from other tanneries
2	Local	Goat skins	Wet Blue from other tanneries
3			

Note : Raw to Wet blue from other tanneries and Wet blue to Finish at this tannery

5. Tannery Processing Capacity :

	Shaved wt.	Raw wt.
Tannery Design Capacity :	2000 kg/day	5000 kg/day
Normal Operating Capacity :	1000 kg/day	2500 kg/day

Actual Processing/day

Process Mix		Present Processing			Future Plan		
		Species	Pieces	Weight (kg)	Species	Pieces	Weight (kg)
iii)	**Raw to Wet Blue**	Cow	350	1750	Cow	700	3500
	It is done from out side	Goat	600	750	Goat	1200	1500
	Tanneries The firm has full						
	Control over the process						
v)	**Wet Blue to Finish ***						
	Shaved wt	Cow	350	750	Cow	700	1400
		Goat	600	300	Goat	1200	600

Cow hides 60-70% Goat skins 30-40%

6. Seasonal variation in processing (if any)

Season	Months	Processing / per day	
		Pieces	Weight (kg)
i) Peak season	Qurbani Season		
ii) Lean Season			

7. Production during last 3 years **Not Provided**

8. List of equipments available

Sl. No.	Equipment	No. of Equip.	Man power	Size/ Specification	Operating Capacity (kg)	Vol. (lit)	Power (HP)
1.	Desalting Machine						
2.	Pits						
3.	Paddles						
4.	Drums Wet Finishing	6			300 kg (shaved wt)		
5.	Fleshing Machine						
6.	Unhairing Machine						
7.	Splitting Machine	1					
8.	Shaving Machine	3					
9.	Sammying Machine	1					
10.	Setting Machine	1					
	i) Ordinary						
	ii) Reversible						
11.	Vacuum Drier	1					
12.	Staking Machine	-					
	i) Slow Comb	1					
	ii) Mollisa	1					
13.	Buffing Machine	-					
	i) Single Width						
	ii) Feed Through	1					
14.	Dedusting Machine						
	Toggling						
15.	Spraying Machine						
	i) Hand Spray						
	ii) Auto Spray	1					
16.	Polishing Machine						
17.	Embossing Machine	1					
18.	Finiflex Machine						
19.	Area Measuring Machine	1					
20.	Boiler	1					
21.	Generator	1					
22.	Others						
23	Glazing	1					

Power Source [√] **Electricity Board** [√] **Generator** [ ] **Oil Engine**

9. Production Pattern

Items			Present	Future plans (next 5 years)
i)	Working hours/day		16 hrs	
ii)	Number of shifts/day		2	
iii)	Number of working days in a week		6	
iv)	Average working days/annum		300	
v)	Total Manpower shift	1	50	
		2	50	
		3		

10. (a) Water and Chemical usage Chrome Tanning Process - Raw to Finish (via Wet Blue)

Raw to Wet Blue

Lot Size ☐☐☐☐ **kg** **pieces** ☐☐☐☐

(It is carried out as Job Work by other tanneries for M/s. Paramount)

Sl. No.	Process	No. of Pit/ Paddle/Drum	Size	Water Used (%)	Chemicals used		Dura-tion	Tempa rature	pH
					Name	(%)			
1	Pre Soak	Drum		200%	Soda Ash Wetting Agent	0.1% 0.1%	30'		
2	Washing	Drum		300%			30'		
3	Main Soak	Drum		200%	Soda Ash Wetting Agent Soaking Auxiliary Rest 30' ***For every one hour, run for 10' for 15 hrs.***	0.3% 0.4% 0.1%			
4	Washing	Drum		300%			20'		
5	Liming	Drum		140% **Drain**	Lime Sod.sulphide Lime Sod.sulphide **One hour rest** Liming Auxiliary Degreasing Agent ***Run for 20' for every one hour for 24 – 28 hrs***	2% 2% 2% 2% 0.75% 0.2%	30' 30'		

6	Washing	Drum		300%					
7	Fleshing	Machine		125%	Running water		15'		
Pelt Weight		**Kg**							
8	Washing before deliming	Drum		400%					
9	Deliming	Drum		30% **Drain**	Amm. Sulphate Sod. Meta Bisulphite Bating Agent Degreasing Agent	2% 0.25% 0.5% 0.2%	One hr One hr		
10	Washing after deliming	Drum		300%					
11	Pickling	Drum		80% **1/3 Drain**	Salt Formic Acid Sulfuric Acid (added in three feeds) ***Run for 2 hrs***	7% 0.25% 1.1%	10' 20'		pH 2.8
12	Chrome Tanning	Drum		55 Pickle liquor + 50%	Chrome, Bayer Sod. Formate Chrome RAMCINO-OCS Tanbase Hodgson	2% 0.5% 2% 0.25% 0.35%	2hrs 2hrs 6 hrs		pH 3.8

Wet Blue to Finish

Shaved Weight ____ **kg** **Wet Blue to Finish** **Pieces** ____

13	Acid Wash	Drum		300%	Acetic Acid Wetting Agent, Non-ionic	0.25% 0.25%	25'		
14	Washing	Drum		300%		—	20'		
15	Rechroming	Drum		200%	Formic Acid Chrome Syntan, Butan141 Chrome Neosyn-N(Hodgson) Relugan – RF(BASF) Sod. Formate Sod. Bicarb **Drain & Pile for 3 days**	0.2% 4% 6% 2% 2% 0.5% 1%	30' 60' 30' Added slowly in feeds ***Run for 2 hrs***		pH 3.8
16	Washing	Drum		300%			10'		
17	Neutralisation	Drum		250% **Drain**	Bayer Syntan PAKM Sod. Formate	2% 1%	Added in feels ***Run for 1 hr***		pH 4.8-5
18	Washing I after Neutralisation	Drum		300%					

19	Washing II after Neutralisation	Drum		500%	Running water		15'		
20	Retanning & Dyeing	Drum	**Drain**	100%	Acrylic. syntan Fishoil based FL, (Atlas 400 R) Relugan D Mimosa Basyntan AN Tanigam OS Dye Formic Acid	4% 1% 4% 4% 4% 4% 3% 2%	45' 10' 45' 90' 20' 20'+20 & 30'	45°C	
21	Retanning & Fatliquoring	Drum		100%	Protein filler (Butan 1908) Conipol DXL SLP Liposl ESF NI (Stoppani) Formic Acid	2% 2% 2% 1% 0.5% 1.5%	20' 60' 20'+20'	60°C	
22	Rinse	Drum		350%			5'		
23.	Top Dyeing (optional)	Drum		250%					
24	Other Washing & Wastages			725%					

Pile

11. Chrome Tanning Procedure

	Item	Wetblue		Rechroming	
1.	Number of Drums			5	
2.	Size of the Drums				
3.	Average pelt weight(Kgs or Pieces/Drum)			300	
4.	Type of BCS used	Imported			
5.	% of BCS used	4%		6%	
6.	Basification and chrome uptake	75% uptake			
7.	Washings : Number	-		2	
8.	Washings : amount of water for each washing			300 % each	
9.	Water used (float) in %	55% PK bath + 50%		200%	
10.	Other chemicals used in %	**Chemical**	**%**	**Chemical**	**%**
		Formate	2	Formic acid	0.2
		Ramcino -OCS	0.25	Chrome syntan	4
				Neosyn-N	2
		Tanbase	0.35	Relugan RF	2
				Sod. Formate	0.5
				Sod. Bicarb	1

12. Water and chemical usage of leather manufacturing processes

Imported Chemicals Mainly from Italy

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

Process	Water m^3/ day	Water/ton m^3/ ton	Material
Chrome tanning	1.25	0.5	Cow hides & Goat skins
Rechroming	2	2	Cow hides & Goat skins

14. Drainage and disposal arrangements

a) Drainage system (Open / Closed) : Open

b) Status of segregation system -

c) Whether scope exists for mixing up rain water with tannery waste water : Yes/~~No~~

d) Whether scope exists for mixing up solid water with tannery waste water : Yes/~~No~~

e) Type of problems faced in operating existing 1. Frequent Choking of drains

drains/sewer

with solid wastes

2. Settling of sludge leads to backflow

3. Over flow due to settling of sludge

f) Mode of final effluent disposal (CETP/ETP) : -

g) Solar Evaporation Pan available : ~~Yes/ No~~

If yes, Surface Area : NA

h)

Solid Disposal	Type of Disposal	Mode of Disposal
Salt containing material	Not Applicable	as it is a wet blue to finish Unit
Chrome containing material	Not Applicable	as it is a wet blue to finish Unit

15. Mode of solid waste management

Sl.No.	Solid Waste	Amount per kg of Raw Material	Disposal Method
1.	Dusted salt		-
2.	Raw hide/skin trimmings		-
3.	Lime sludge		-
4.	Hair/Wool		-
5.	Fleshings		-
6.	Wet Blue / EI trimmings		Dumped outside
7.	Shaving/buffing dust		Dumped outside
8.	Others		-

16. Total water used perday : 52.5 cubic metres (Raw to Wet Blue)
36.8 cubic metres (Wet Blue to Finish)

17. Total Effluent discharged : 36.8 cubic metres

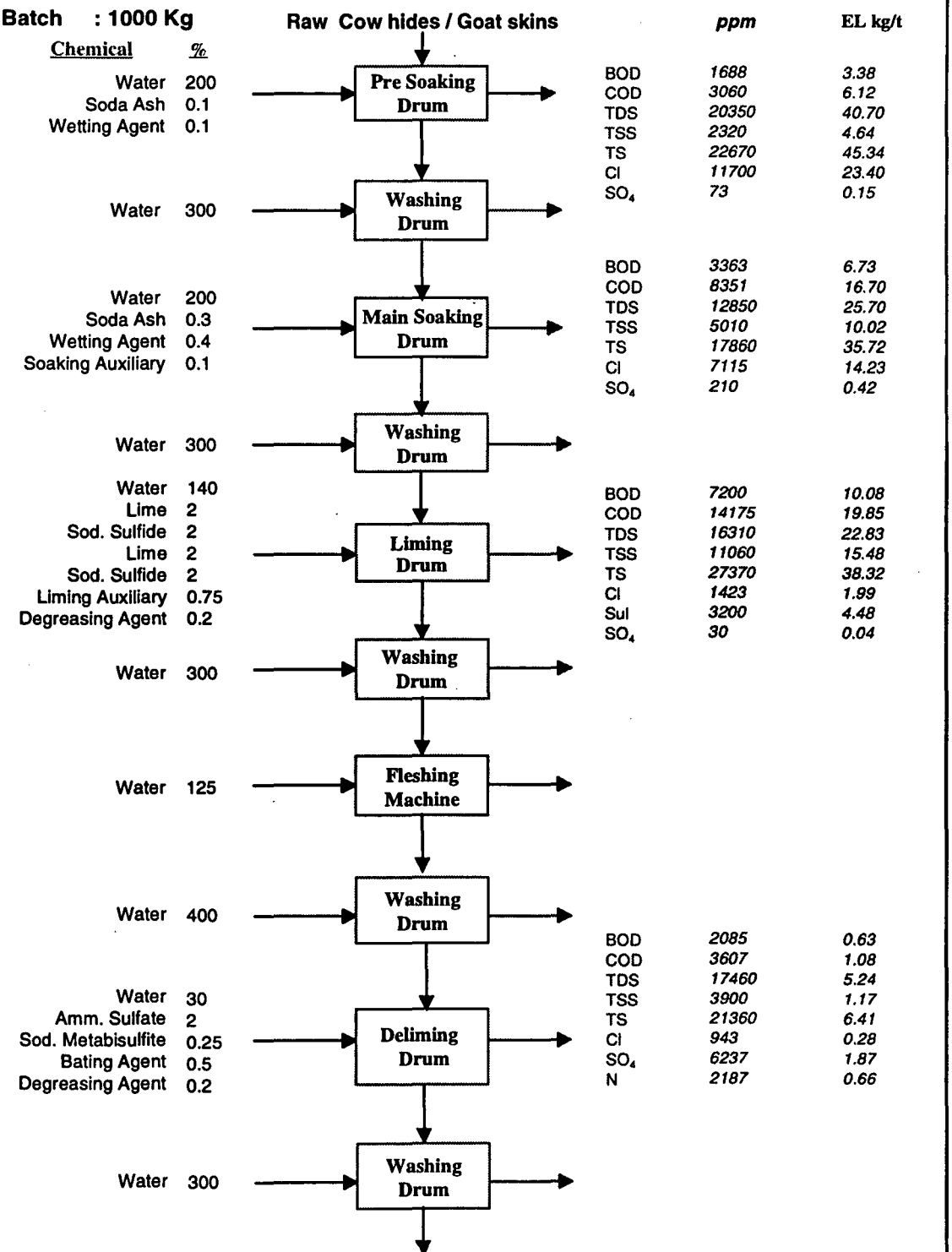
18. Whether Chrome Recovery Plant is proposed / under construction / existing : -

19. Remarks : Process adopted – Wet blue to finish
(Raw to wet blue – from Shah Jalal Leather Complex Ltd.,
Sainik tannery, East Euro Leathers)

BD005	CONVENTIONAL PROCESS AND EMISSION LOAD	2500 kg/day
	WBF	1000 kg/day

Process : Cow hides / Goat skins Raw to Wet Blue - Finish *

Batch : 1000 Kg



	ppm	EL kg/t

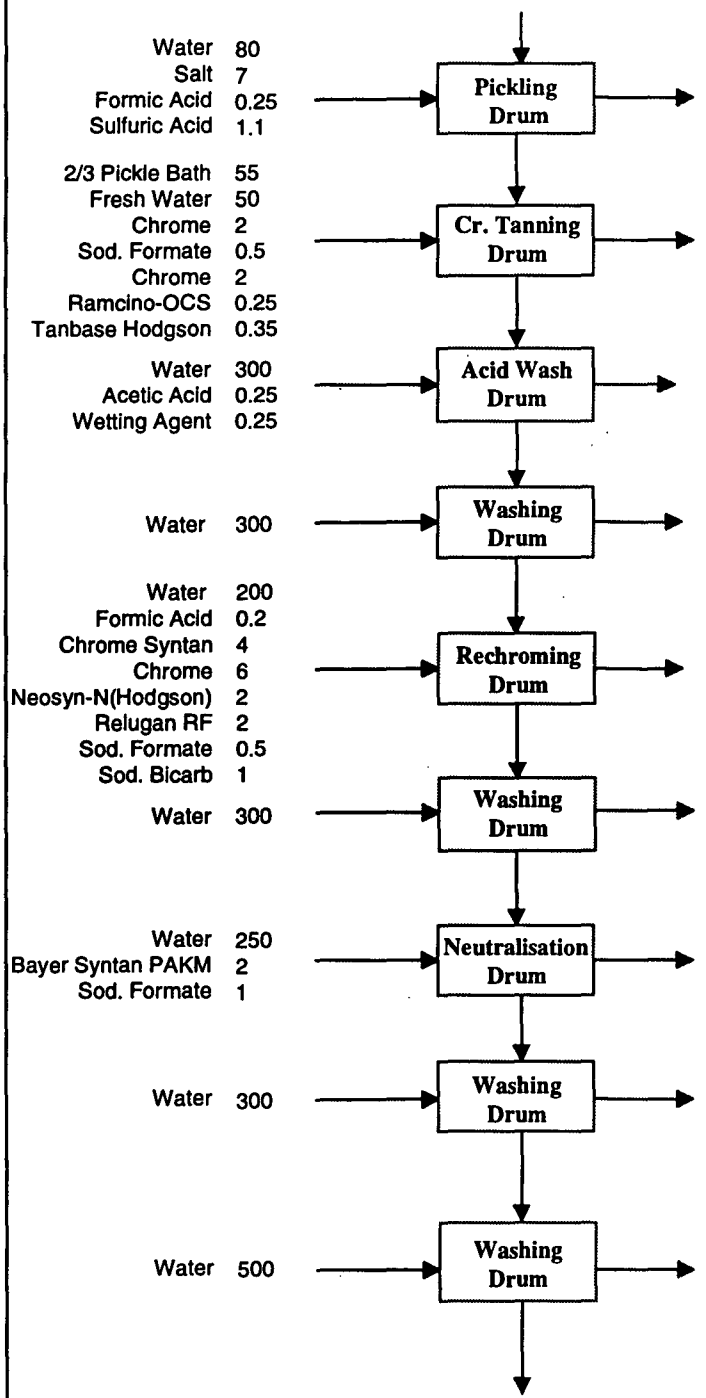
* *Raw to Wet blue is being carried out as Job Work at other tanneries*

BD005

BD005	CONVENTIONAL PROCESS AND EMISSION LOAD	2500 kg/day
Process : Cow hides / Goat skins Raw to Wet Blue - Finish		WBF 1000 kg/day

Batch : 1000 Kg

Cont'd



Chemical	%		ppm	EL kg/t
		BOD	1658	1.33
		COD	3705	2.96
		TDS	49135	39.31
		TSS	1830	1.46
		TS	50965	40.77
		Cl	22451	17.96
		SO_4	7811	6.25
		BOD	356	0.37
		COD	3817	4.01
		TDS	66995	70.34
		TSS	1050	1.10
		TS	68045	71.45
		Cl	17827	18.72
		Cr	3601	3.78
		SO_4	18094	19.00
		BOD	1240	2.48
		COD	5809	11.62
		TDS	21700	43.40
		TSS	1400	2.80
		TS	23100	46.20
		Cl	2330	4.66
		Cr	1670	3.34
		SO_4	8700	17.40
		BOD	595	1.49
		COD	2303	5.76
		TDS	7095	17.74
		TSS	990	2.48
		TS	8085	20.21
		Cl	435	1.09
		Cr	35	0.09
		SO_4	2340	5.85

Cont'd

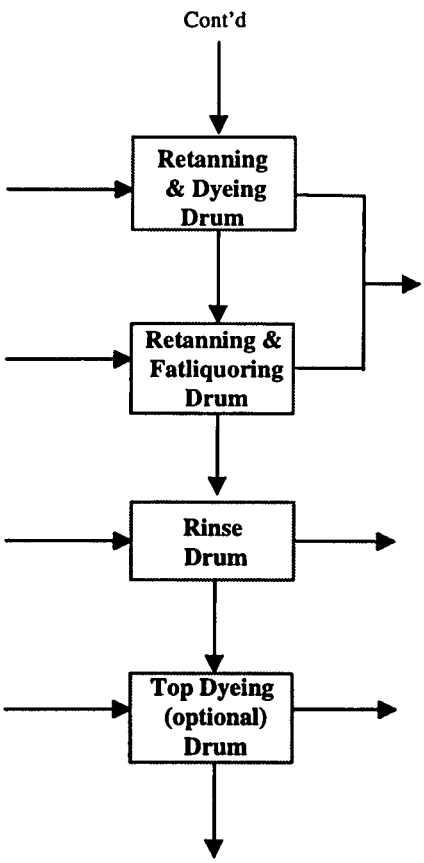
BD005

BD005	CONVENTIONAL PROCESS AND EMISSION LOAD	2500 kg/day
	WBF	1000 kg/day

Process : Cow hides / Goat skins Raw to Wet Blue - Finish

Batch : 1000 Kg

Chemical	%
Water	100
Acrylic Syntan	4
Fishoil based Fatliq	1
Relugan D	4
Mimosa	4
Basyntan AN	4
Tanigam OS	4
Dye	3
Formic Acid	2



Water	100	
Protein Filler	2	
Conipol DXL	2	
SLP	2	
Lipsol ESF	1	
NI (Stoppani)	0.5	
Formic Acid	1.5	
Water	350	
Water	250	

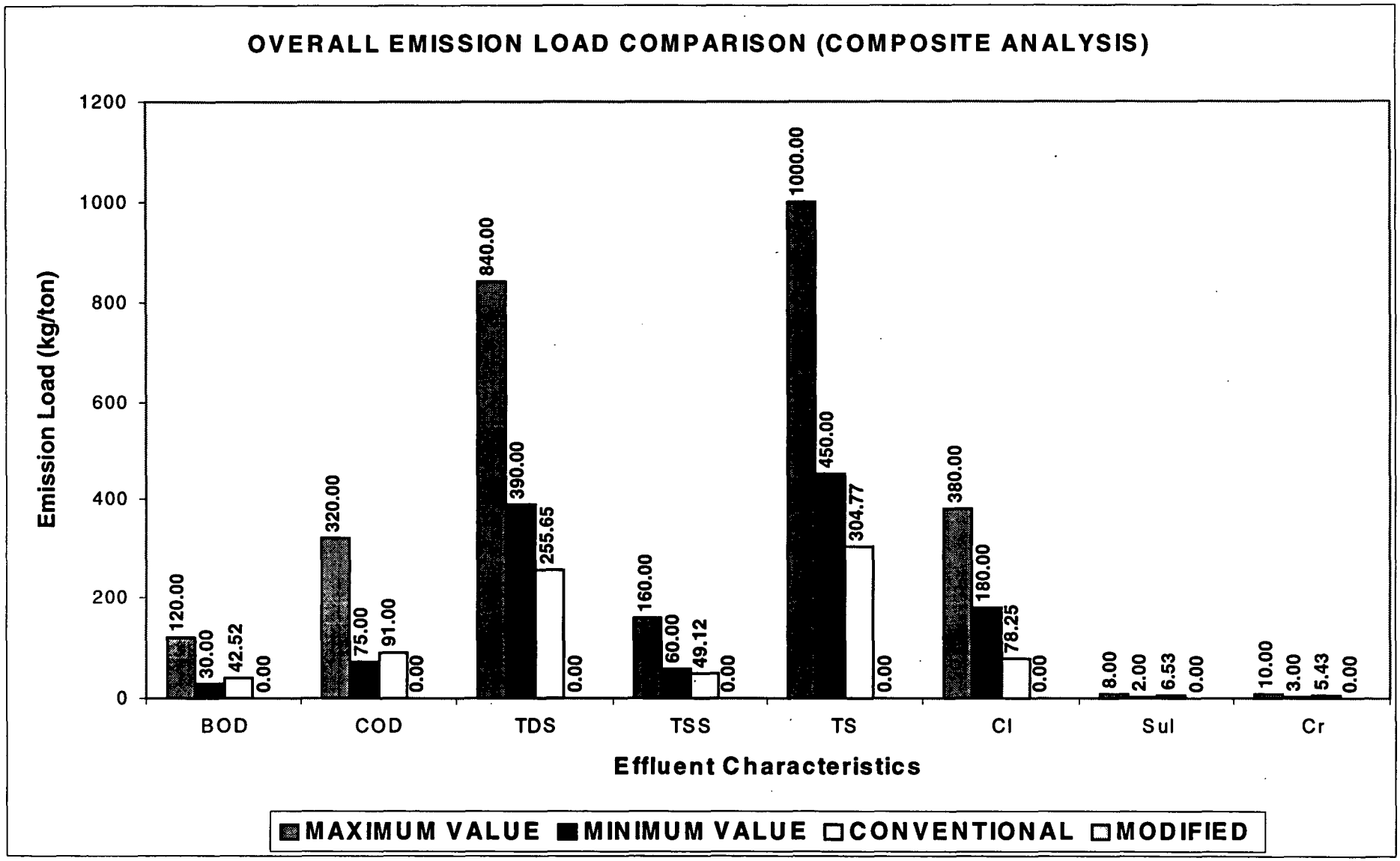
BOD	*8400*	*16.80*
COD	*14147*	*28.29*
TDS	*7390*	*14.78*
TSS	*1760*	*3.52*
TS	*9150*	*18.30*
Cl	*316*	*0.63*
SO_4	*3585*	*7.17*

Other washings & wastages - 725%

Composite

BOD	*1191*	*42.52*
COD	*2549*	*91.00*
TDS	*7161*	*255.65*
TSS	*1376*	*49.12*
TS	*8536*	*304.74*
Cl	*2192*	*78.25*
Sul	*183*	*6.53*
Cr	*152*	*5.43*
SO_4	*1248*	*44.55*
N	*66*	*2.36*

BD005

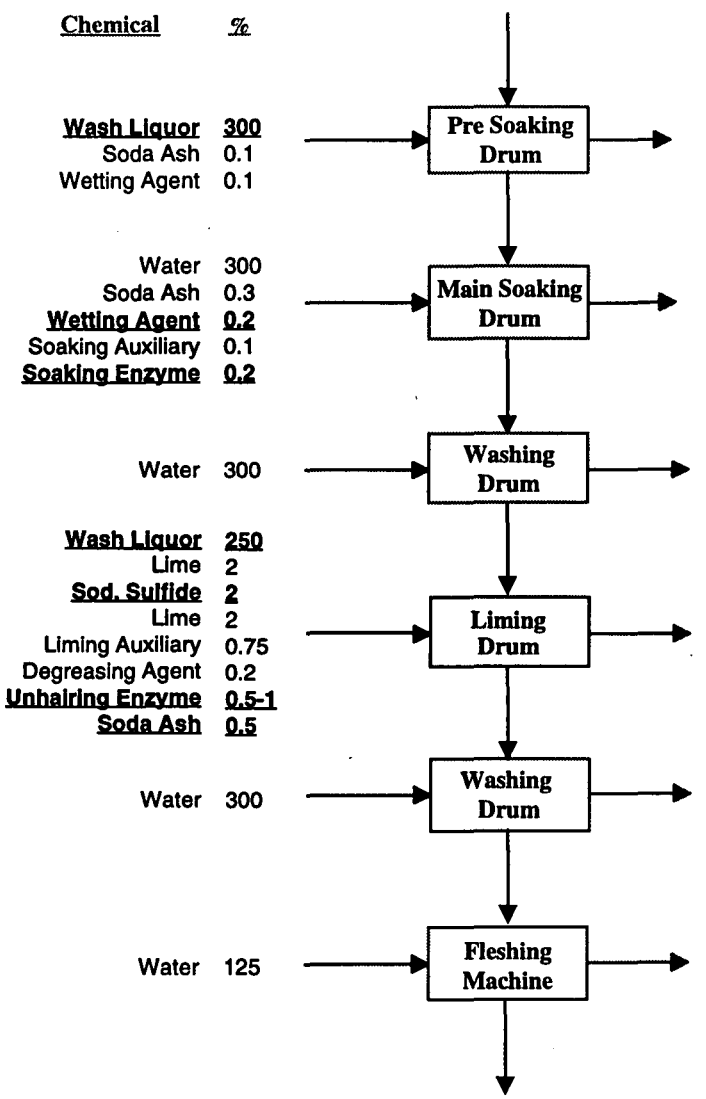

OVERALL EMISSION LOAD COMPARISON (COMPOSITE ANALYSIS)
Emission Load (kg/ton)
1200
1000
800
600
400
200
0
120.00
30.00
42.52
0.00
320.00
75.00
91.00
0.00
840.00
390.00
255.65
0.00
160.00
60.00
49.12
0.00
1000.00
450.00
304.77
0.00
380.00
180.00
78.25
0.00
8.00
2.00
6.53
0.00
10.00
3.00
5.43
0.00
BOD
COD
TDS
TSS
TS
Cl
Sul
Cr
Effluent Characteristics
MAXIMUM VALUE
MINIMUM VALUE
CONVENTIONAL
MODIFIED

BD005	MODIFIED PROCESS FOR IMPLEMENTATION / DEMONSTRATION	2500 kg/day
		WBF 1000 kg/day

Process : Cow hides / Goat skins Raw to Wet Blue - Finish

Batch : 1000 Kg

Raw Cow hides / Goat skins



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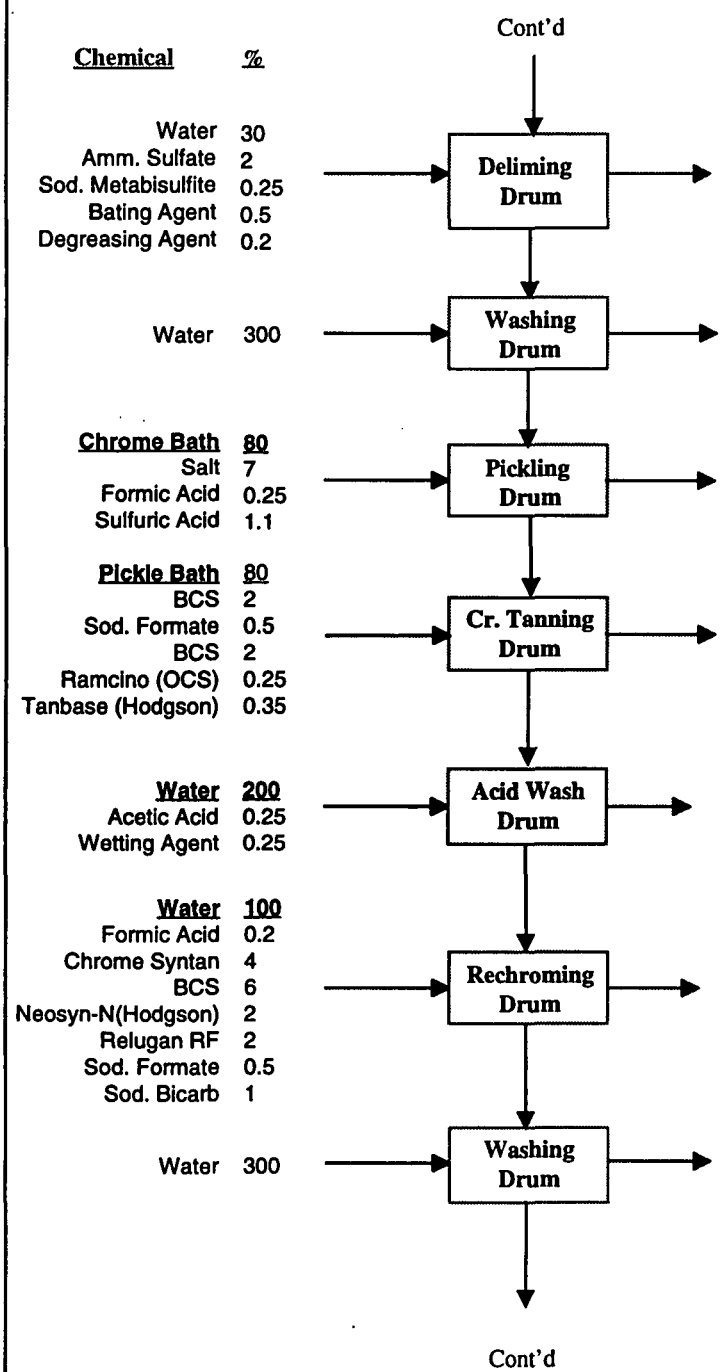
BD005

BD005	MODIFIED PROCESS FOR IMPLEMENTATION / DEMONSTRATION	2500 kg/day
	WBF	1000 kg/day

Process : Cow hides / Goat skins Raw to Wet Blue - Finish

Batch : 1000 Kg

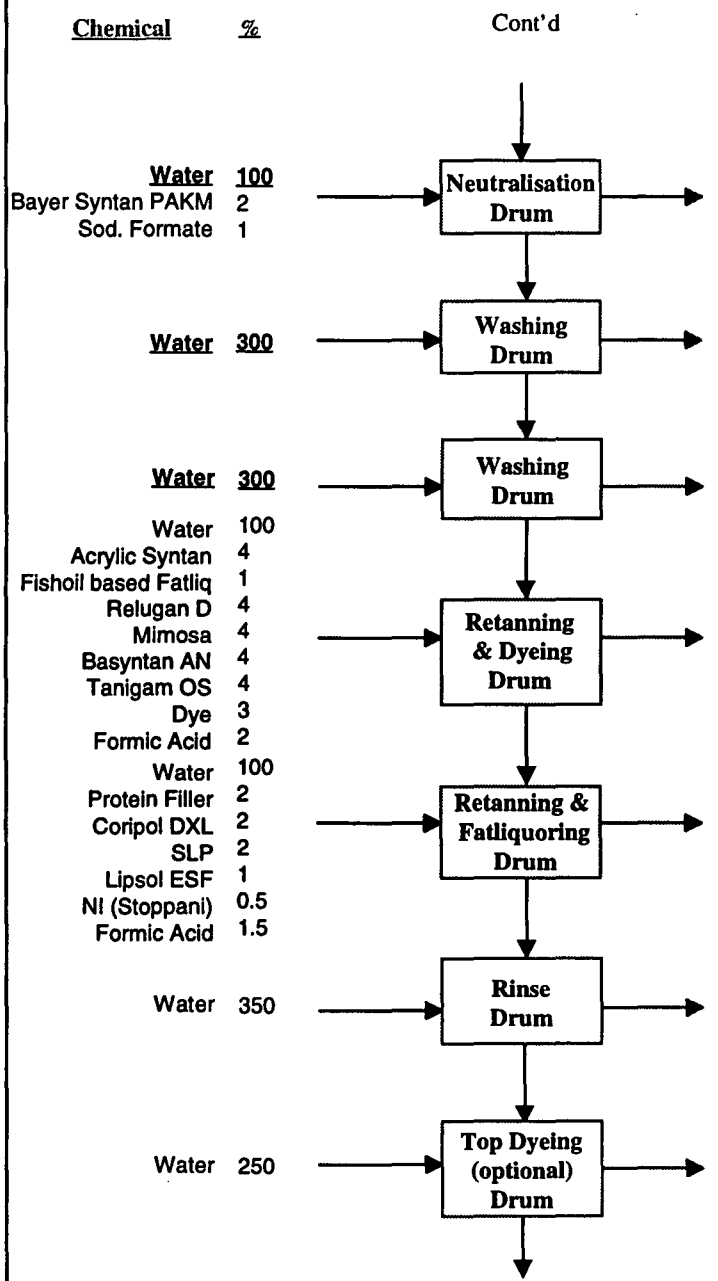


BD005

BD005	MODIFIED PROCESS FOR IMPLEMENTATION / DEMONSTRATION	2500 kg/day
	WBF	1000 kg/day

Process : Cow hides / Goat skins Raw to Wet Blue - Finish

Batch : 1000 Kg



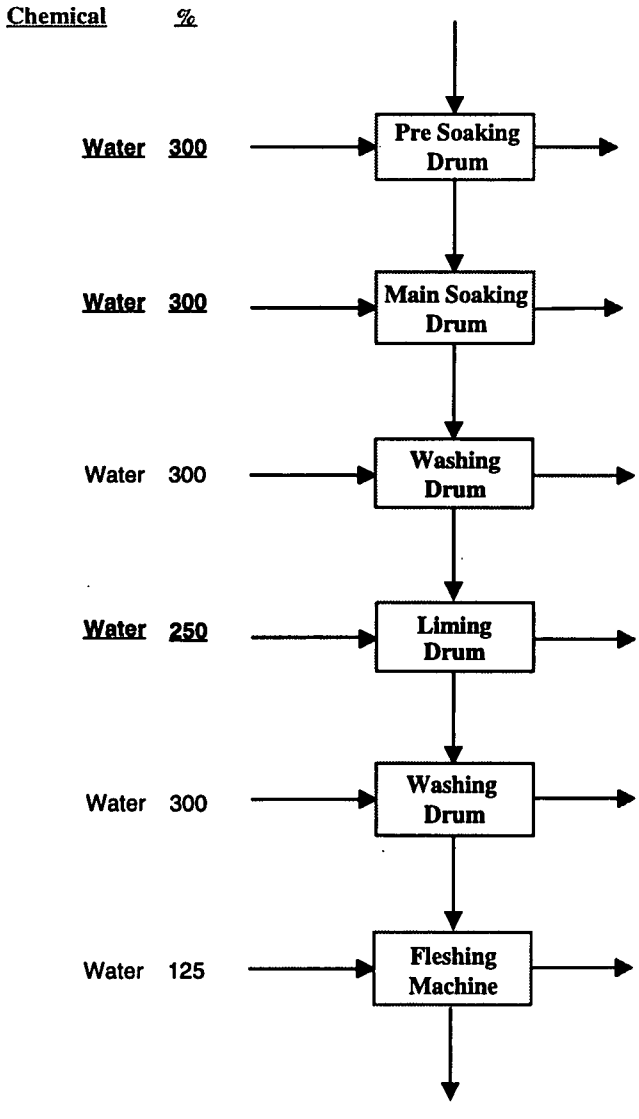
BD005	MODIFIED PROCESS FOR IMPLEMENTATION / DEMONSTRATION	2500 kg/day
		WBF 1000 kg/day

Process : Cow hides / Goat skins Raw to Wet Blue - Finish

Batch : 1000 Kg

Water Flow Scheme / Recycle Scheme

Raw Cow hides / Goat skins



Cont'd

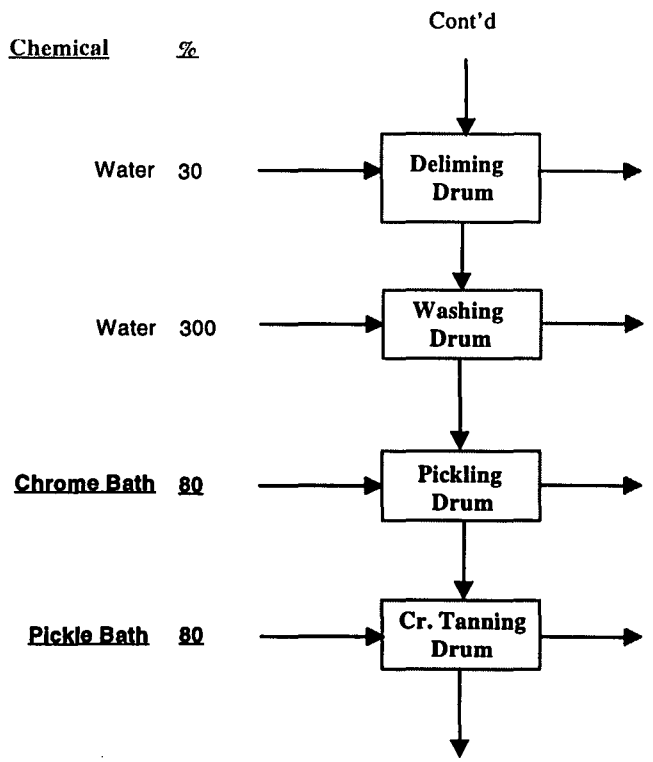
BD005

BD005	MODIFIED PROCESS FOR IMPLEMENTATION / DEMONSTRATION	2500 kg/day
		WBF 1000 kg/day

Process : Cow hides / Goat skins Raw to Wet Blue - Finish

Batch : 1000 Kg

Water Flow Scheme / Recycle Scheme



BD005

CHEMICAL REQUIREMENT FOR IMPLEMENTATION / DEMONSTRATION OF CLEANER TECHNOLOGIES IN THE TANNERY CLUSTER, AT HAZARIBAGH, DHAKA, BANGLADESH

BD005

LIST OF CHEMICALS REQUIRED

Sl. No	Name	Requirement for 1000 kg lot size (kg)	Total Requirements (kg)	Suggested denomination of package
1.	Soaking Enzyme	2	10	
2.	Unhairing Enzyme	10	50	One bag of 50 kgs

LIST OF EQUIPMENTS REQUIRED TANNERY WISE

Sl.No	Tannery	Hardware Proposed	Qty- Nos	Technical specification	Expected Benefits
1.	BD005	Liquor Collection Tanks for Soak Liquor for Lime Liquor for Chrome Liquor	 1 No. 1 No. 1 No.	Concrete. 6,000 lit capacity, 6,000 lit capacity, 3,000 lit capacity,	Reduction in hydraulic load to effluent
		Pumps	2 Nos		-do-
		Water Meter	3 Nos		-do-
		Modified Door for Drum	1 Nos		-do-
		Strainer in pipeline	5 Nos		
		Enzyme applicator	1 No		Reduction in sulfide load