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**ETHIOPIA**

**MISSION REPORT**

**Regional Hides and Skins,  
Leather and Leather Products Improvement Scheme**

**US/RAF/88/100  
US/ETH/88/100**

**From 13 January - 13 April 1990**

**Prepared by Hermann A Eckert  
Leather Finishing Expert (11-05)**

**This report has not been cleared with the United Nations Industrial Development Organization which does not, therefore, necessarily share the views presented.**

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Yilma Adamu, General Manager, National Leather and Shoe Corporation

The managers and production heads of the tanneries visited.

The monetary Unit in Ethiopia is

Birr

One US\$ = 2.07 Birr

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## INTRODUCTION

The development of the leather and leather products industry sector in Ethiopia was started in 1979 (DP/ETH/76/001) after a request from the Government of Ethiopia. UNIDO was acting as Executive Agency together with the FAO on the part of the UN, the National Leather and Shoe Corporation (NLSC) in the name of the Ministry of Industry on behalf of Ethiopia.

To monitor the progress of producing more and more hides and skins into semi-finished and finished quality products, tripartite review meetings took place during the first phase in 1980, 1982 and 1983 and a technical report was issued in April 1985. During the project's life, 11 experts and 3 short term consultants have been employed. Among them also a leather finishing expert, Mr R Hermoso, for 5 months in early 1982. His efforts in the finishing as well as in the retanning seem to have produced significantly good results. He introduced new types of leather, trained people for the colour kitchen and improved the finishing methods of existing and new production lines. Already at that time Mr R Hermoso pointed out that specific finishing materials are needed to ensure the required export chances for finished leather.

The continuation of the project was intermittently taken over by the Integrated Development Programme for the Leather and Leather Products Industry in Africa, (XA/RAF/85/610) which initiated finally, through the Alexandria Meeting in 1987, the project US/RAF/88/100 of which US/ETH/88/100 is an important part.

After the first introductory short visits to Addis Tannery, Awash Tannery and Ethiopian Tannery the finishing expert is in no doubt that the crust or finished leathers produced, especially at the 2 latter tanneries, can face the international leather market.

### 1 Purpose of Visit

As the Job Description points out the objectives of the visit of the finishing expert are:

an evaluation of the present leather production, mainly crust and finished leathers, for export purposes as the sale of pickled skins and wet blues cause no technical problems;

find ways and means for improving export chances, finishing methods, production range for export purposes, fashion colour aspects, training of the finishing personnel, marketing aspects etc.

## 2    Work Plan

The work plan had been discussed several weeks before between the Ethiopian tanneries which want to improve or extend their finishing activities and the NLSC on the one hand, and the national expert with the CTA in Nairobi and the UNIDO Headquarters in Vienna on the other hand. After a first discussion with the NLSC, the introductory visits at Addis Tannery, Awash Tannery and Ethiopia Tannery followed.

## SUMMARY OF RECOMMENDATIONS

After the working visits a list with production improvements and suggestions was handed over to the responsible managers of each tannery and afterwards also discussed.

- 1 Sort hides and skins into proper tannery lots: separate small, medium and large hides and skins.
- 2 Ensure accurate execution of all tanning operations (temperature, float, time, pH, storing, milling and so on.)
- 3 Ensure flat piling of wet blue sides, avoid folding and creases which result in cuts and considerable loss of leather sales area during splitting and shaving (present loss approximately 10 - 20%.)
- 4 Ensure proper laboratory equipment for small scale elaboration of new leather articles and colour matchings, quality control functions and so on. Present status: non existent.
- 5 Ensure proper equipment and functioning of pilot tanneries - in cooperation with the small scale results - to carry out all retanning, fatliquoring and colour matching trials in differing scale and quantities for present and new leather articles. Present status: insufficient - non existent.
- 6 Improve the proper grading of hides and skins mainly as pickled and wet blue to assure optimum sale results. Why such a large quantity of lining from skins?
- 7 Determine and elaborate your future sales range in bovine sides, sheep and goat skins and splits. Articles, shades and finishes.
- 8 Ensure adequate sales organisation for the export volume anticipated.



- 9 Use a technical contest between the important chemical companies to assure that all new articles fully meet newest technical standards and assure full competitiveness in the international markets. For your high quality skins choose the best results which pays much more than the chemical costs.
- 10 Reduce the regular production of cheap standard articles, switch systematically to higher priced full grain and fashionable articles.
- 11 Employ more sophisticated finishing methods - dye stains, printing effects, milling and so on.
- 12 Start at Ethiopia Tannery and Awash Tannery a small but steady production of sheep nappa - to gain production and sales experience.
- 13 To ensure a proper machine performance in all stages of production, use the available machine capacity.
- 14 Train foremen and employees permanently how to handle leather properly and to avoid folds and creases and how to make full use of all tannery machines.
- 15 Improve purchasing policy for all chemicals to reduce capital requirements for stockkeeping and to improve procurement flexibility for the important, but often time limited export orders.
- 16 What minimum/maximum quantity of splits can be expected out of production, what articles (shoe upper/suede/insole leather/lining/ASA) or sale guarantee optimum sales results? Difference between internal-external sales possibilities?
- 17 Ensure an adequate and flexible quarterly logistic system which can properly handle changing chemical product requirements and figures.
- 18 Send intelligent young people to Europe for apprenticeships in the important mechanical professions to make sure that in future with more sophisticated machines all technical problems can be adequately handled with all its advantages.

It is a fallacy to assume that with new machines technical problems will be solved and disappear. Important is, and this is the rule, that with the available people and the efficient and proper use of the machines, even when old, a good and saleable production result is achieved which satisfies customers and employees alike and guarantees a sound economical continuity.

## I SUMMARY

## Present State of the Ethiopian Leather Industry

With the large and substantial livestock and a leather producing potential of approximately 100 million square feet, Ethiopia is the largest leather producer in East Africa. Although at present a large portion of the sheep and goat skins is still being exported in the pickled, wet blue or crust stage and also the side leather in the crust stage, the finished leathers are technically quite acceptable and do not decisively differ from the leathers produced in other parts of the world. A present concentration in the production of the hides on cheap standard articles is certainly a handicap, but not of a serious technical nature. The high quality of the sheep skins is also visible in the finished skins, but mainly in sheep nappa for glove and garment.

The elaboration of suitable articles from the available goat skins seems not to have started.

A more serious handicap quite generally is the complete lack of adequate laboratory equipment for all kinds of small scale tanning, fatliquoring and dyeing trials which also makes it impossible to test auxiliaries and their comparable suitability. Similarly missing are adequate pilot tanneries which permit the required scale-up from acceptable laboratory results into production. This lack of proper trial facilities is certainly also to a large degree responsible for the fact that so far, astonishingly, only a few new product lines and colours have been elaborated.

Furthermore, in the finishing department, changes will need to be made. A change to soft full grain upper leathers is required which will make use of all sophisticated finishing methods and retain an aniline like appearance and feel. For goat skins a complete article range will have to be worked out from the start which assures adequate sales results.

The intended export of finished leather to improve the sales performance and the foreign currency exchange situation can, on a smaller scale, be started

with the offer of sheep nappa and suitable bovine articles. From the beginning it is important to have an efficient and adequate sales organisation to help overcome the unavoidable starting problems and provide all the information needed to secure and build up sales.

With the availability and functioning of the laboratory and pilot tannery equipment, plus the sales outlet, a steady increase of the export volume can be envisaged, the unavoidable production flexibility will then become more and more functional.

Apart from the production and sales considerations, an efficient logistic and purchasing department must help to reduce all negative impacts of production changes and assure a quick and flexible procurement of required chemicals for production.

As no part of the mentioned preconditions can function satisfactorily without the other integral sectors, it is very important that unavoidable and not postponable decisions are made as soon as possible so that the desired sale of more and more finished leather can really start in 1991.

Another word on production efficiency. To eliminate known shortcomings now will improve production quality, consistency and efficiency tremendously. Each serious step taken now will facilitate all efforts to get off the ground with the export sales of finished leather next year.

Training comes here last, but not least. All employees must be made aware of what the goal is and what part each one can and must play. Machine operators, foremen and department heads must really know what is expected from them and why, so that negligence or even disinterest must not be tolerated.

For very sensitive and vital positions in the future it seems indicated to point out what impact the thorough training of suitable and capable young persons can have for the eminent important proper functioning of all production sectors. Such a foresight might prove to be one of the best and cheapest investments for the future.

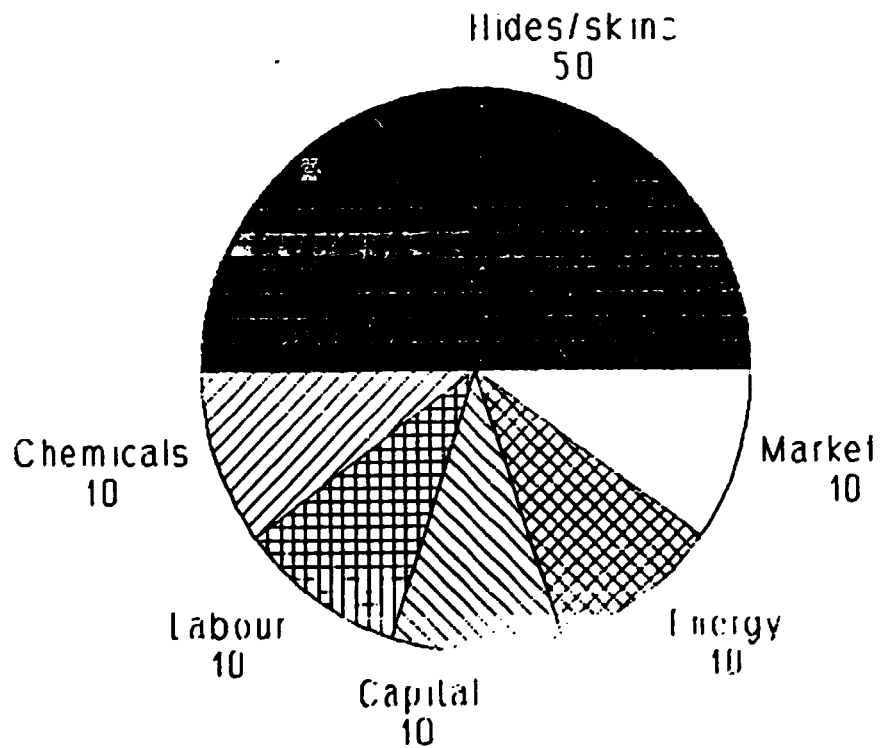
Due to the high quality of the Ethiopian sheep and goat skins which are among the best in the world, there is no doubt that the intended sale of finished leather instead of hides and skins in intermediary stages will be successful.



## 2.2 Basic Cost Structure of a Tannery in Europe

As a rule of thumb the cost structure is usually comprised as follows:

Hides & skins	50%
Chemicals for leather production	10%
Labour	10%
Capital & financing	10%
Energy, machines and buildings	10%
Marketing (inclusive of 2-3% profit)	10%



**Basic Cost Structure**

A comparison with the situation in Ethiopia will show where there are possibly significant variances and what can be done to achieve, if need be, adjustments in the cost structure.

In India and similar countries this cost structure for sheep skins may vary widely.

skins	30%
chemicals	40% - 30%
labour	2.5 - 4%

South Korea shows again a different cost structure. Due to the 100 per cent import of the cattle hides from USA and Australia the raw material input may be even higher.

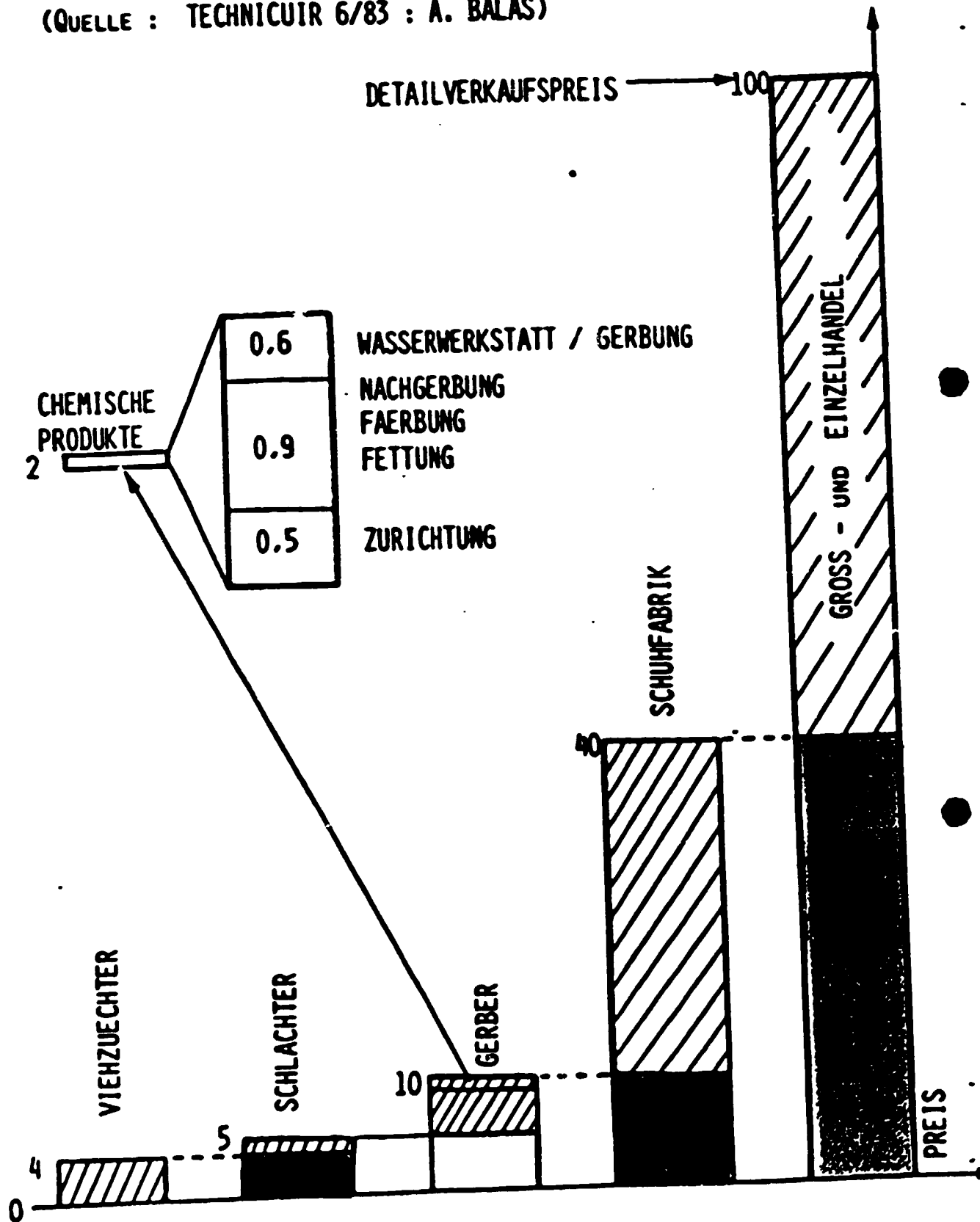
hides	60% - 70% - (80%)
labour	5%
chemicals	10%

Imperative and of the utmost importance is that the splits from all hides are being fully exploited for one article (shoe upper) or another (suede, lining).

The total amount spent for all chemicals (syntans, dyes, faltiquors and auxiliaries) used for the production of leather is, as can be seen, relatively small. (See Figure 1.) Therefore, it is definitely more important to use the chemicals which assure quality than to insist on, so to speak, savings which lower quality level and automatically reduce selling price.



VON DER ROHHAUT ZUM SCHUH  
 (QUELLE : TECHNICUIR 6/83 : A. BALAS)



**2.3 Average Selling Prices in Western Germany for The Most Important Leather Types - January 1990**

Article	Exchange Rate (1.75DM)	
	DM/sq ft	\$/sq ft
Sheep nappa	4.00 - 6.00	2.28 - 3.42
Shoe upper	4.00 - 4.40	2.28 - 2.51
Suede	4.50 - 5.00	2.57 - 2.80
Lining	2.50 - 3.00	1.43 - 1.71
Skivers	3.00	1.71
Goat (top qualities)	8.00 - 9.00	4.57 - 5.14
Glazed kid	3.50 - 6.00	2.00 - 3.42
Suede	4.00 - 5.50	2.28 - 3.17
Lining (semi-aniline)	2.60 - 3.00	1.48 - 1.71
Side leather (European hides)	5.40 - 6.00	3.08 - 3.42
Boxcalf (Italy)	6.50 - 7.20	3.71 - 4.11
Corrected grain (European hides)	4.50	2.57
Corrected grain (S. American hides)		1.80 2.20 \$/fob
	DM/sq metre	\$/sq metre
Upholstery leather		
Pigmented	38.00-42.00	21.71-24.00
Aniline	45.00-50.00	25.71-45.71

**2.4 Percentage Price Level for Intermediary Stages**

Stage	Sheep	Goat		Cattle
		5 - 6ft	3 - 4 ft	
Pickled	40 - 45%	40 - 45%	30%	
Wet Blue	50 - 55%	50 - 55%	45%	30%
Crust	65%	65%	60%	60%
Finished	100%	100%	100%	100%

Remark: Skins from South America are traded in the pickled stage only.

A comparison with the results achieved in Ethiopia in previous years should indicate to NLSC where action should no longer be delayed.

## 2.5 Basic Ethiopian Production and Export Figures (NLSC)

Due to the fact that most skins are exported in the pickled and wet blue stages and the side leather as wet blue or crust, the present production figures which can accurately be stated in square feet are relatively low.

The intention of Ethiopia to reduce and even ban the export of pickled and wet blue skins and hides and to concentrate all efforts on the sale of finished leathers or leather goods permits already today to take a look at what the production figures will be in square feet in the near future. Within this scope the potential of this market will become more evident.

### 2.5.1 Production of Sheep Skins for 1988

		<u>Approximate Total</u>
8.5 million skins at 4.5 sq ft		= 38.25 million sq ft
= 7.0 million skins were exported		= 31.50 million sq ft
1.5 million skins used locally		= 6.75 million sq ft
<b>Exported Sheep Skins</b>		
86% pickled	6.02 million pieces	= 27.09 million sq ft
10% wet blue	0.70 million pieces	= 3.15 million sq ft
4% crust	0.28 million pieces	= 1.26 million sq ft
	7.00 million pieces	= 31.50 million sq ft
<b>Total Export</b>		
+ Locally Used	1.50 million pieces	= 6.75 million sq ft
<b>= Total</b>	<b>8.50 million pieces</b>	<b>= 38.25 million sq ft</b>

2.5.2 Production of Goat Skins for 1988

4.1 million skins at 4 sq ft	=	16.4 million sq ft
= 3.8 million skins were exported	=	15.2 million sq ft
0.3 million skins locally used	=	1.2 million sq ft

Exported Goat Skins

90% wet blue	3.42 million pieces	=	13.68 million sq ft
10% crust	0.38 million pieces	=	1.52 million sq ft
<hr/>			
Total Export	3.8 million pieces	=	15.2 million sq ft
+ Locally Used	0.3 million pieces	=	1.2 million sq ft
= Total	4.1 million pieces	=	16.4 million sq ft

2.5.3 Production of Hides for 1988/98

1.2 million hides at 24 sq ft	=	28.80 million sq ft
= 0.6 million hides were exported	=	14.4 million sq ft
0.6 million hides locally used	=	14.4 million sq ft

2.5.4 Production of Splits for 1988/89

Approximately = 10.0 million sq ft

2.6 Export Chances For Ethiopian Hides And Skins or Finished Articles

In contrast to most agricultural commodities such as coffee, cotton or tea, hides and skins world-wide are always in short supply. The market requirements can never be fully met, especially not for high quality. This means that there exists no geographical limitation; the price of the offered leather is principally being determined by the quality and acceptance in the international market.

Ethiopian sheep skins of the highlands are known to be of the world's finest, and similarly the goat skins, known at "Bati Genuine" and "Bati Type", are ideally suitable for suede and other articles.

In other words, if the Ethiopian leather industry is capable of producing, offering and delivering the articles technically identical to the leading leather countries, such as England, France, Italy, Spain or Germany there is no reason why the same price level on the international market should not be obtained.

## 2.7 Sales Organisation

To achieve this desirable result which will ultimately significantly increase the foreign exchange volume from the leather and leather goods industry, it is of primary importance that the marketing and sales organisation is adequately strengthened and able to cope with the increasing export volume. There will have to be suitable agents in all important countries who work on a commission basis and really know their respective local markets in and out.

Due to the available export volume (approximately 60 million sq ft) the representation in all important leather countries must be assured. Agents or representatives in USA, Western Germany, England, France, Spain, Italy (2), Japan, Turkey, Russia and perhaps in a few more places must ensure an adequate sales force.

Additionally the agents will have to report constantly and as early as possible:

in what articles the bulk sales are being achieved for the production of shoes, leather goods and garments (prices/shades/thickness/handle.)

fashion trends, new developments

what orders for large quantities are being placed, in other words, what's happening in the leather world

what competition companies produce, sell or develop or intend to do to improve their companies' policies.

## 2.8 Production Flexibility

Production flexibility will have to be improved in all fields. Production will be asked to produce steadily various orders in a relatively short time, and marketing will likewise have to make sure that delivery is being executed within an accepted dead line.

The number of the chemicals needed for a more diversified production will possibly increase and availability will be a must. Especially with the dyestuffs and finishing chemicals, but also already with falkuors, syntans or auxiliaries it is very dangerous to assure that one product of one company can be replaced by a similar product of another company. Experience shows that this is absurd. Already names are misleading. What one company calls in it's pigment range "light brown" is for the other a "caramel"; a completely different shade and chemistry. Differing pigments require, for each new shade, a complete rematching. Possible influences on the fastness properties can produce catastrophic results leading to customers' claims for finished shoes or leather goods with technical deficiencies in the millions of Birr. And all this without even showing an optical difference on inspection during production.

We assume that it is not necessary for the informed reader to find here more examples of the difference between products thought to be identical for substitution: the list which would have to be given could be endless.

## 2.9 Purchasing Policy

The purchasing policy for dyestuffs and chemicals alike will require adequate flexibility to ensure that the required chemicals will be available in due course for use in production.

The question which will have to be asked is whether or not the present tender system can be maintained untouched. Leading companies of a highly complicated nature strive to achieve production nowadays without

stock-keeping at all in order to save substantial financial inputs. They rely on the prompt delivery from their chosen and reliable partners, and, funny as it may seem, it works. The high financial costs for stock keeping can thus be kept at an absolute minimum and the 'saved' money be used for more urgent projects or purposes. That this sophisticated system can not fully apply to Ethiopia and its's trading partners is clear, but it can apply in an adjusted manner.

Buying through a tender system or the custom of relatively high stock volumes, is always a big risk. Should an ever occurring change in fashion and production make certain chemicals obsolete, they will remain in store almost for ever, use up the storage space and bind up valuable capital.

Furthermore, these chemicals may perish before they may be used again. So it may be worth while to think about what optimum arrangement can be envisaged.

With the growing trade and product exchange, a delivery of goods on a steady or monthly basis should be feasible.

#### 2.10 Pilot Tannery

To develop permanently the new articles and shades which the market will ask for, and to cope with all other arising technical problems each tannery will have to have an adequately staffed and equipped trial department. The equipment must be able to treat 1 skin in all stages of production and likewise of say 6, 12, 36, and 60 or more skins or of 1, 6, 12, or 24 sides respectively in laboratory size units or correspondingly small drums. Leading in laboratory equipment is what Dose Maschinenbau GMBH, 5 Industriestrasse, 7585 Lichtenau, Western Germany, offers. Apart from accurate working conditions which ensure for each trial a later production reproducibility, the equipment must ensure optimum handling and the maintenance of temperature requirements (Dosomat.)

A diversified production of finished leathers will also require for an optimal production the availability of an adequate number of retanning, dyeing and milling drums, possibly in various sizes, which alone for largely varying lot sizes and shades ensure proper technical treatment and flexibility.

The proper functioning of the trial department will simultaneously offer an exceptional chance for ensuring an excellent training of young people destined to take over important production functions or even management responsibilities later on. It can also be used for the training of participants of courses of varying length or for others eager to learn something about the art of leather making.

It is doubtful that a centralised 'pilot' tannery can take over the technical work which has to be carried out by each tannery. Receiving reports, recommendations and formulas for execution will never replace the tannery's own experience, judgement and initiative.

Therefore, a proper separation of what the tasks of an institute will have to be and what a well-functioning tannery has to carry out seems indicated.

#### 2.11 How To Achieve Optimum Technical Production Results

Apart from the permanent technical assistance which the important chemical companies provide, they publish annually for the occasion of the 'Semaine du Cuir' their newest technical recommendations which include all information on how a 'new' leather article or effect can be produced or what new products do and how they are being used within normal application methods or otherwise. To stay abreast with all technical progress and to know what is going on world wide it seems advisable that the responsible managers or technicians in the tanneries visit the fair and hold technical discussions, for information purposes, with their most important suppliers before, during or after the fair,



then ask for the new technical literature and adequate sample quantities to permit the reproduction of the recommendations which are of interest for their production programmes.

Depending on the information and the results received, the need for the creation of new articles and the evaluation of other trends, it is customary and necessary to eventually introduce all technical changes into production which are required.

To really get to know what's technically new, it is a must that these important trials are carried out with the old or new recommended products and not substituted with something else which is by chance just available. A delay in carrying out the trials does not matter at all, what matters are the technical results and conclusions which must be drawn and which will influence decisively future production and policy.

To assume that this yearly technical upgrading is not needed for the technical personnel or can be postponed another year is, seen even in the medium range, just deadly. The yearly technical advancement in chemical methods, sophisticated machinery and ecological considerations are of far-reaching consequences so that the permanent information up-take is an absolute must.

Therefore, how often and who will be delegated to attend the yearly information centres, is of importance. It is evident that the assembling of information must include much more than merely technical data.

#### 2.12 The Execution Of The Finishing Trials

In principle all trials had to be carried out with the available products in the various tanneries visited. Samples of stock from the chemical company agencies were not available and, as it is known, the procurement takes some time.

In spite of such serious handicaps it was possible to demonstrate on various leather articles (shoe upper, clothing, upholstery, lining, suede) what various technical possibilities (smooth, embossed, milled) offer with aniline, semi-aniline and pigmented finishes. Additionally new bovine leather articles were prepared, starting in most cases from the wet blue stage, to illustrate which new leathers, especially soft and light weight, are in demand and must in future replace the standard articles. Furthermore various recipes for the production of finished sheep and goat articles were handed on.

The results of the demonstrated finishes, as far as appearance, aspect, handle and so on were concerned, were quite impressive due to the well prepared leathers to start with. Also the fastness properties showed, at Awash Tannery, very good results.

To demonstrate the reproducibility in production, several lots containing between 30 - 200 pieces in softy upper, sheep nappa and goat upper were subsequently made and showed similarly good results.

Due to the lack of non available product samples and finishing machines, trials could not be carried out at all the tanneries to illustrate the possibilities which polishing effects, glazed finishes on sheep or goat or cross linking binders offer.

No finishing trials with purely water based finishes were possible due to the lack of the required binders and at Addis and Awash tanneries of a Finiflex permitting plating at higher temperatures (between 110 - 140°C.)

Additionally, the responsible technicians for Ethiopia from Bayer, Mr O Rudolph, and BASF, Mr J Debs, told the consultant that the time has not yet come to switch production to solvent free systems. It is to be hoped that this change-over to solvent-free and ecologically preferable systems can take place in 1991.

New finishing techniques could not be demonstrated as no curtain coating machine, a roll coating or reverse-roll-coating machine for this purpose were available.

Many different trials were also carried out to show what technically can be done to produce from lower grade selections acceptable articles fetching a considerably higher selling price. (Bovine = 'Hunting', flesh side finish, goat and sheep lining = upper leather.)

Independent from these facts a lot of small adjustments can already be made in production to prepare the way for the future. Soft and aniline-like leathers in full grain must, to a large extent, replace the habitual black standard articles, and production must become more colourful and flexible.

### 2.13 Tanning Machines, Operations and Maintenance.

The consultant perceives a division - on the same organisation level - between production and maintenance. The separation of power appears to be responsible for the apparent confusion in responsibility.

With the given situation, the responsibility of machine maintenance should also include the proper working of the machines; ie delivering the required technical result. The maintenance of the machines purely for maintenance sake does not seem to make much sense. Extremely put, one would not have to use the machines at all to make sure that they are being properly maintained. The fact is that at present most machines, especially the most important ones, just do not produce the technical result or perhaps do not function properly.

If both sides, production and maintenance, do not cooperate closely and assume responsibility, each side may then hold the other partner responsible for assuring the proper technical results. What, however, would be the situation when, for whatever reason, both sides do not know what the proper results should be?

To clarify this unsatisfactory situation it should be decided once and for all who is to be responsible for the use of the machines and the technical result. Practice and experience seem to indicate that the production people should be mainly responsible; maintenance subordinate. Also, every machine requires sufficient operating space, and plenty of room for the massive material output and transport requirements. Additionally, easy handling, in all aspects, must be assured.

The most important machines for the leather production are not being used in the proper way:

#### 2.13.1      Fleshing machine

As the name suggests the flesh has to be removed from the soaked hide or skin. In many cases it is not achieved due mainly to the great variety of the hide and skin sizes which make the proper functioning of the machine impossible.

#### 2.13.2      Splitting machine

The splitting must be carried out in such a way that the exact thickness requirements are met for the finished leather; for example,

garment	0.8-1.0 mm
shoe upper leather	1.2-1.4, 1.4-1.6, 1.6-1.8, 1.8-2.0, 2.0-2.2 mm.

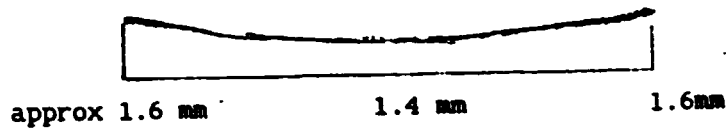
Additionally, as much split area as possible must become available which then permits the production of suede or shoe upper leather; the smaller pieces can be used for lining, ASA leathers and so on. Here the profit margin of a tannery is decisively determined.

If the splitting is carried out in the lime stage, consideration must be given to the changes in thickness during the various production stages.

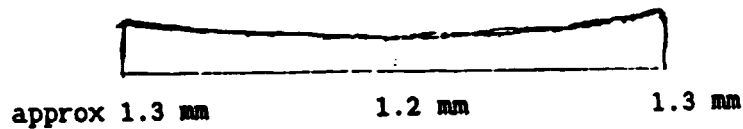
Due to the fact that the hide substance differs greatly, the less compact and looser parts of the sides in the flank areas must be split with this differentiation in mind. The modern splitting machines permit this differentiation with the finished leather and the required thickness level will then have been achieved.

**Example I - splitting of a bovine garment leather 1 mm**

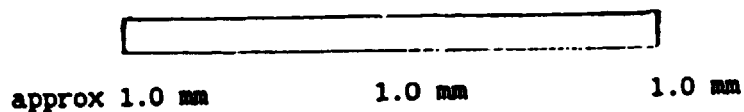
Lime stage



Wet Blue Stage (after shaving)

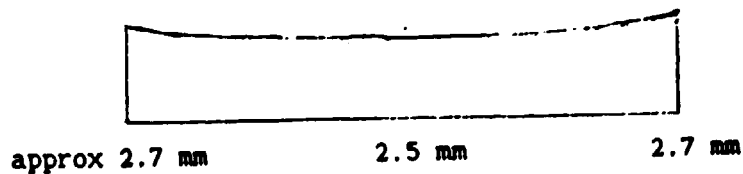


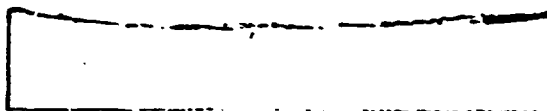
Finished garment leather



**Example II Shoe Upper Leather 2.0-2.2 mm**

Lime Stage



**Wet Blue Stage (after shaving)**

approx 2.4 mm                      2.3 mm                      2.7 mm

**Upper Leather 2.0-2.0 mm**

approx 2.1 mm                      2.1 mm                      2.1 mm

The more precise the splitting, the more split area is produced for the benefit of the tannery. The subsequent shaving is then also reduced to its proper function.

**2.13.3****Shaving Machine**

The shaving machine is required to level the flesh sides of the sides where necessary. To achieve this goal it may be necessary to shave off a maximum of 0.1 or 0.2 mm, not up to 1.5 mm as is happening now.

The leather factory should maximise production of useful leather area (grain plus split), this cannot be achieved if up to 40 per cent is lost in the form of chrome shavings which are then dumped outside. Apart from the loss of split area and the wasted percentage costs of chrome tannage material, a serious ecological problem is being created (chrome III complex risk).

As with the splitting machine, the shaving machine has the provision to adjust the thickness of the sides shaved between the compact parts and the looser parts of the sides.

**2.13.4 Sammying machine**

Instead of doing the job of reducing the water moisture properly and delivering the hide or side in an acceptable condition, almost every side leaves the machine with creases and wrinkles which later on lead to cuts and loss of saleable leather area during the subsequent splitting and shaving (estimation of loss: approximately 10 per cent.)

### III TANNERIES AND FACTORIES VISITED

The Expert refers to the report of Mr A T Rongved, September 1989, the contents of which are still valid.

#### 3.1 Addis Tannery

Addis Tannery was visited on the following dates:

16 January 1990  
 23 January - 6 February 1990  
 27 March 1990

Addis Tannery is the oldest tannery in Ethiopia and is located deep down (approximately 200 metres) a very narrow roadless valley at the confluence of two rivers. It is accessible only on a partly very steep dirt road from the normal road from Addis Ababa. Cars and trucks, even under dry conditions, can not go faster than 10 miles per hour.

Due to the fact that floods and landslides endanger the site, space for enlargement or for the building of an effluent plant is not available, renovation of the plant is practically out of the question as it would cost much more than the erection of a new plant in a modern shed construction on a new site. If such a new site could be found nearby and would not cause social hardship due to relocation, a transfer would have to be, seen from all aspects, strongly recommended.

The production of Addis Tannery, concentrated on the production of bovine hides for home consumption and wet blues for export, has steadily increased during the last few years and reached:

1989	3.6 million sq ft	shoe upper leather
	0.6 million sq ft	lining
	1.6 million sq ft	wet blue export
	-----	
Total	5.8 million sq ft	
	=====	
	+ 83,500 kg	sole leather.



Part of the production is exported in wet blue, the rest finished mostly in black. The pigment coats are applied by swab coats, the top coats by hand with spray guns. A curtain coating machine is no longer in use due to lack of spare parts.

To be able to keep up this production output, the present production problems (boiler capacity, electricity shortages, machinery) must be eliminated. Any increase in output or even diversification in the finishing department requires a new finishing department with all mechanical equipment with the exception of the presses.

Apart from having a look at the production in general, the expert demonstrated that out of the present wet blue production quite a few interesting softy upper leather articles can be produced, possibly for export. To show how these leathers can look when finished, 2 finishing trials were carried out in 2 different shades. Additionally, a finishing of the flesh side showed how grain-damaged sides can be used to get better sale results.

Due to the presently prevailing conditions it was not possible and it did not seem advisable to carry out more finishing trials.

(See Annex I.)

### 3.2 Awash Tannery

Awash Tannery was visited on the following dates:

17 January 1990

2 February - 1 March 1990

29 March 1990

2, 4, 5 and 9 April 1990

In 1989 Awash Tannery produced:

Upper leather		3.4 million sq ft
Wet blue sides		2.5 million sq ft
Crust sides		1.5 million sq ft
Splits		4.4 million sq ft
Fickled sheep skins	2.1 mio @ 4.5 sq ft	9.4 million sq ft
Wet blue/crust sheep	0.15 mio @ 4.5	0.7 million sq ft
Wet blue goat skins	0.70 mil @ 4.0 sq ft	2.8 million sq ft
	Approximately	21.7 million sq ft

+ Vegetable sole leather 120.996 kgs

The production of Awash Tannery is still concentrated on finished side leather for local consumption and the export of skins in the pickled and crust stage. To show what can be achieved with good finishing, a number of trials were carried out on side leather, skins and lining leather.

The quality of these finished sides and skins was very high and very promising as sales outlets exist both in the home and export market.

Additionally, several retannage trials on bovine sides for softy upper leather articles were carried out with the aim of showing what can be produced from the regular wet blue production.

In the skin sector appropriate techniques, which would assure that optimal use is made of the available valuable skins, are not yet being applied. The expert recommended the trial use of the latest methods for the retannage and production of various finished versions of nappa, shoe upper and suede. It will take some time to perfect these methods and the trials should therefore be commenced without delay.

With the introduction of a new grading policy far fewer hides and skins will end up being incorrectly graded and down-valued.

A small and steady production of sheep nappa in black and brown will help to make use of the available spray machine and ensure that the machine performance in general will improve. Sales experience will also

improve. An extension in the production of sheep nappa in black and brown will then be possible leading to a bigger export market. See Annex II.)

### 3.3 Ethiopia Tannery

Ethiopia Tannery was visited on the following dates:

18 January 1990  
5 - 23 March 1990  
30 March 1990  
3 April 1990

In 1989 Ethiopia Tannery produced:

Upper leather			7.6 million sq ft
			+ 3.2 million sq ft
Pickled sheep skins	0.9		
Wet blue	0.5		
Crust	0.2	= 1.6 @ 4.5	7.2 million sq ft
		---	
Wet blue goat skins	0.3		
Crust	0.3	= 0.6 @ 4.0	2.4 million sq ft
			-----
		Approximately	20.4 million sq ft
			=====

+ Vegetable sole leather 60,364 kgs

Production at Ethiopia Tannery concentrates on finished standard black articles, wet blue and crust sides and all intermediary stages of sheep and goat skins.

Diversification of production will have to take place in order to produce more and more articles to ensure steady export sales.

To ensure the proper functioning of production the necessary laboratory equipment and pilot drums must give the required support, likewise the sales and logistic departments.

Several retannage trials on bovine sides and sheep and goat skins were carried out; these were also finished. Recipes for the production of various sheep and goat skin articles were handed over for further trials.

It is important that the percentage of skin linings is drastically reduced and that more outlets for the splits can be found. (See Annex III.)

#### 3.4 Modjo Tannery

Modjo Tannery was visited on 30 March 1990.

In 1989 Modjo Tannery produced:

1.2 million sheep and goat skins = approx 5.1 million sq ft.

At present only the lining is sold as finished.

The tanning of crocodile skins will diversify production but the chance still exists to produce more and more finished articles in the future for export. (See Annex IV.)

#### 3.5 Ethiopia Pickling and Tanning Factory

Ethiopia Pickling was visited on 5 April 1990

In 1989 the production was

1.2 million pickled sheep skins @ 4.5 sq ft = 5.4 million sq ft  
 0.8 million wet blue goat skins @ 4.0 sq ft = 3.2 million sq ft  
 Approximately = 8.6 million sq ft

Similar to the other tanneries, Ethiopia Pickling produces at the moment half finished skins only, but intends to change production in the near future to crust and finished skins.

In a laboratory the necessary production controls are carried out.

### 3.6 Universal Leather Articles Factory

Universal Leather Articles Factory was visited on 5 April 1990 and the expert spoke with Mr Tamrat Beyene, the General Manager.

During the visit to the factory the production of leather jackets, school bags and other various articles were shown and explained.

In the subsequent discussion, the usual profit margin of sale chains and various possibilities to diversify production of leathergood articles were mentioned

IV SEMINARS HELD

Finishing seminars were held at:

Awash Tannery on 1 March 1990: Approximately 15 participants.

Ethiopia Tannery on 22 March and 23 March 1990:

Approximately 20 participants.

(See Annex V.)

A Managing Technical seminar was held on 10 April 1990:

Approximately 65 participants.

(See Annex VI.)

Very positive responses were elicited by the participants. It is recommended that in future more time is allotted to training.

## V MISCELLANEOUS

5.1 PTA Leather Fair - Addis Ababa 25-30 January 1990

The Fair was opened by The President of The Republic of Ethiopia, Comrade Mengistu Haile Mariam. Most Government Ministers were also present at this significant ceremony and the fair was a big event for all PTA countries.

Ethiopia was the biggest exhibitor, followed by all the other PTA countries according to their economic importance.

The fashion show, both at the Fair on Opening Day and later at the Hilton Hotel was outstanding. Garments of all colours were presented and were of a world standard and could have been shown in Paris or New York and received the same applause.

It was astonishing and a pity that all the garments were of European styles: Ethiopia's rich cultural heritage was not portrayed as it is in other materials - textiles, wood, metal, paintings and jewelry. This should be looked into to help export sales.

5.2 Artisan Industry for Leather Articles

There is no doubt that Ethiopia could produce leather articles similar to those made in Morocco and sell them successfully to tourists or export them to interested trading chains in various countries. The only prerogative would have to be that they resemble, in one way or another, Ethiopia.

There are certainly many Ethiopian artists who would be willing to integrate Ethiopian artwork with leather. Like Morocco, thousands of individual artisans could find satisfying employment.

How the interest can be awakened and the relatively simple requirements and training can be carried out is perhaps a task which the NLSC could possibly initiate.

### 5.3 Ethiopian Management Institute Productivity Improvement Centre - Leather Processing Workshop

We are thankful to Mr Amde Birhan who invited us to visit the leather workshop where for several years different courses connected with leather help train groups of students in the various fields. Attached is the programme which shows the various courses and their duration (see Annex VII.)

Whereas most tannery machines permit the production of leather, the laboratory requires additional equipment to permit the execution of future control, research and development functions.

It is hoped that the decision of the survey carried out by UNIDO will eventually lead to the upgrading of the training centre.

### 5.4 Making Leather From Horse and Donkey Hides

The number of horses and donkeys in Ethiopia is probably unknown, but there must be millions of them. Just to give some weight to our deliberations, let us assume that the number of horses and donkeys is approximately 7 million.

The carcasses of horses and donkeys are not used; just left for the hyenas. In spite of prevailing considerations based on tradition and religion, a change in disposal may be necessary in the future including ecological reasons.

It is evident that as long as the carcasses are not being used, the hide as a by-product is also lost.



The carcasses of horses and donkeys (also cattle carcasses unfit for human consumption) consist of meat, bones and other usable materials. The meat can become part of animal nutrition fodder; the bones can be used as fertilizer, once ground up. The viability of rendering plants should not be ignored.

Donkey meat could also be used for human consumption. In Italy and other surrounding countries, ie Hungary, donkey meat, which has a specific taste, is mixed with other meats for the production of the world famous 'Salami' sausages. With the possible decline of donkey meat in Europe, there could also be an opening to export donkey meat to Europe in order to keep up the production of the traditional 'salami' sausages.

The hides of horses and donkeys measure between 8 - 20 square feet. These can be tanned and made use of in various ways. If in the future, half a million horse and donkey hides were processed through the tanneries annually at least 7 million square feet of leather would be added to the production volume.

The changing living and ecological conditions in the world may attribute more importance to this subject in the future.

## VI VISITS AND PERSONS CONTACTED DURING THE MISSION

National expert	Seyoum Hailu
National Leather and Shoe Corporation	Yilma Adamu Redda Tamrat Tesfaye Arega Netseha Sequar
Addis Tannery	Bulti Tefera Mulato Mammo Yetateku Mekuria
Awash Tannery	Mesfin Sahle Abdulahi Yousuf Solomon Tesmariam Birbirssa Chequala Getachew Tuta Solomon Toddelcke Taye Lakew Bekila Gete Wubshet Adisu Gemechou Gulilat
Ethiopian Tannery	Gugsa Mengistu Kidanu Chekol Urga Workineh Abdulaziz Mohammed Kebede Amde Rafferra Fayesa Tekle Wolou Tadelech Dega
Modjo Tannery	Woldu Alemu
Ethiopian Pickling and Tanning Factory	Leul Berhane Endaletch Bekele
Universal Leather Articles Factory	Tamrat Beyene Yitbareke Tsige
Ethiopian Management Institute Leather Processing Workshop	Amde Birhan
UNIDO, Addis Ababa	Country Director JPO
	Peter Manoranjan Jorgen Brissor

Hermann A. Eckert  
Unido Consultant

February 6th, 1990

Preliminary Report

Regional Hides and Skins, leather and leather products  
improvement scheme

US / RAF / 88 / 100

A d d i s   T a n n e r y

preliminary visit	16.1.1990
working visit	23.1.1990 - 5.2.1990

Prepared by:     Hermann A. Eckert

Leather Finishing Expert   11-05

A) Production problem areas

- boiler capacity - insufficient supply of adequate amounts of hot water for the daily production requirements. The lower bath temperatures in all stages of production reduce chemical action and hamper machine performance ( -fleshing ) and lower the quality of the finished leather.
- electricity shortage - can considerably impair production schedule
- lay out deficiency - insufficient storage space for the wet blue sides after chrome tannage.
- effluent plant - no space near factory available

B) Suggestions for production improvements

- try already before soaking to separate small, medium and large hides for separate production to improve leather quality and, very important, machine performance.
- pile wet blue sides always flat on flat transport carts to avoid creases which result in considerable surface loss during splitting and shaving.
- improve accuracy of the splitting and shaving operations
  - gain more split area for the production of shoe upper leather or suede
  - employ 2 persons for the feed-in at the shaving machine
    - at present up to 1 square foot/side is being lost through avoidable creases and wrinkles.
    - train one expert especially for splitting by
      - sending him to Europe for training, or
      - having a splitting expert come here for some time for training on the spot
- use sharp knives for the trimming instead of razor blades which causes more loss of leather area
- do not cut 2 holes in the butt of each side for putting a wooden stick through for the air drying = loss of appr. 1/2 square foot/side = use clips instead
- do not make 30-40 cm cuts into the butt of the vegetable leather sides = ensure flat drying

- produce also thinner leathers, i.e. 1.2 / 1.4 / 1.6 mm to gain more split area and offer more upper leather for women's shoes
- the "Lama"-embossing plate does not sufficiently hide grain defects - use or buy another bossing plate to improve the surface levelness = better grading
- select good flesh side upper leather for new article: "Hunting" and sell it with natural shade or drum-dyed, re-fatliquored and softer.
- produce more variety with embossing plates, i.e. perforating plate

C) Some trials for new and soft upper leather articles

1. Shoe upper leather, very soft, with milling grain  
1.8 mm
2. "Hunting"-suede  
from chrome upper leather sides . 2.0 mm
3. Shoe side leather, heavily vegetable retanned,  
milled 1.6 -1.8 mm
4. "Crust"-leather for spraying or immersion-  
dyeing 1.6 -1.8 mm

D) Finishing Trials

1. Finish on flesh side instead of grain side on shoe upper leather

	<u>Trial 1</u>	<u>Trial 2</u>
Black Pigment	100	100
water	400	400
Eukanol Resin FD	400	200
Corial Binder IF	-	200
Eukanol Binder FA	100	100

2 swab coats, 1 spray coat with lacquer, emboss with lama plate

2. Two sides each were made as trial 1, but embossed at Awash Tannery with another embossing plate

Observations:

- many upper leather sides have many defects on the grain side, practically none on the flesh side. If the finishing of the flesh side is accepted, a better grading should result. Also, to have the smooth grain side on the inside of the shoe offers advantages, no lining is needed. This method has always been used in Europe for working boots.

- have the fastness properties of the trials 1 and 2 tested from BAYER to find out, whether or not there is a difference between the 2 trials. Theoretically Nr. 2 should offer technical advantages.

3. 4 sides of the retanning trial

"Shoe upper leather, very soft, with milling grain" were finished with following formulas:

pigment coat	100 g pigment
	150 g Corial Binder IF
	50 g Binder 1377
	50 g Binder K 50
	50 g Finish Wax 660
	50 g Penetrator 1079
	550 g water
top coat	100 g Melio-ES-127
	150 g Melio-S-4830

application: 3 spray coats, dry, 1 spray top coat, vaduum dry, mill 3 hours, vacuum dry

observation: have the fastness properties tested before producing more sides

4. 1 side of the retanning trial

"Crust"-leather for spraying or immersion dyeing"

was finished in the following way:

1-2 wet spray coats	100	Eukesolar Rubine liquid
	100	Melio Solvent S 4830

dry

2 spray coats with	90	Carmine Pigment
	10	White Pigment
	100	Corial Binder OHN
	150	Vorial Binder JF
	50	Finish Wax 660
	400	Water

dry

1 lacquer spray coat	100	Melio-ES-127
	150	Melio-S-4830

dry, plate 70°C, mill 2 hours, vacuum dry

obsergation: have fastness properties tested before producing more sides

A) Production problem areas - further observations

- drying capacity - insufficient for present production volume
- pilot tannery - one drum will be insufficient if several leather articles and various shades will be produced
- laboratory - insufficient equipment for production control purposes
- water treatment - the water is being used as it becomes available. There are always temperature variations, and after rains a lot of mud impairs tannery operations.
- piece rate - splitting and shaving must become more accurate to ensure optimum leather area and profits. Until the required quality standard has been reached and is then going to be maintained, no piece rates should be paid.

E) Relocation of tannery

The Addis Tannery is situated deep down (appr. 200 m) in a roadless very narrow valley at the confluence of two rivers and is furthermore almost not accessible on a partly very steep dirt road from the normal road from Addis Ababa. Cars and trucks, even under dry conditions, can not go faster than 10 miles/hour. Due to the fact that floods and land slides endanger the site of Addis Tannery, space for enlargement or an effluent plant is not available, a renovation of the existing factory is practically out of question as it would cost much more than the erection of a new plant in a shed construction on a new site. If such a new site could be found nearby and would not cause social hardship due to relocation, a transfer would have to be, seen from all aspects, strongly recommended.



Shoe upper leather, very soft, with milling grain

indications given on shaved weight, 1.8 m/m

---

wash : 300 % water, 30° C 10 min

---

neutralisation : 100 % water, 30° C  
0.5 % natriumbicarbonate  
1.0 % natriumthiosulphate  
2.0 % Sellasol 4162  
2.0 % Sellasol TD 90 min  
pH: 6.4

---

wash : 300 % water, 50° C 10 min

---

retanning, fatliquoring, dyeing :

100 % water, 50° C  
4 % Sellasol AG  
2 % Mimosa extract  
0.5 % Sellaflor Beige L 60 min

---

add 4 % Invasol SD  
6 % Invasol ETN 60 min  
pH: 5.2

---

4 % Irgatan LV liquid 45 min

---

0.2 % formic acid 85 % 15 min  
pH: 4.5

---



---

pile up, sammy, vacuum dry 70°C/3 min, hang up to dry,  
condition, stake, mill 3 hours, hang up, toggle

---

Shoe upper Leather, very soft, with milling grain

indications given on shaved weight, 1.8 mm (1.6-1.8)

10 sides, 28 kg

wash : 300 % water, 30°C 10 min

-----  
neutralisation : 100 % water, 30°C

0.5 % sodiumbicarbonate

3.0 % Tanigan PC 60 min pH 5.5

1.0 % Sodiumbicarbonate 30 min pH 6.5

6666-----  
wash : 300 % water, 50°C 10 min-----  
retanning, fatliquoring, dyeing :

100 % water, 50°C

4 % Tanigan OS pH 5.6

2 % Mimosa extract

0.1 % Derma Brown RD 60 min

-----  
add 4 % Lipsol BZN

6 % Olinor 77 60 min pH 5.4

-----  
add 2 % Tanigan OS 45 min-----  
add 0.2 % formic acid 85% 15 min-----  
pile up, sammy, vacuum dry 70°C/3 min, hang up to dry,  
condition, stake, mill 3 hours, hang up, toggle-----  
The 10 sides were retanned with the above stated formula  
due to the fact that most chemicals had to be exchanged for  
available substitutes.

23. 1. 1990

"Hunting" - suede from US-side leather, chrome tanned, 2.0 mm

---

direct working method

material: USA side leather, chrome tanned, 2.0 mm

indications given on shaved weight

---

wash	300 % water	40°C	
	0.3 % Iragol DA		15 min

---

neutralisation	150 % water	30°C	
	2 % Sellasol NG gran.		pH 5.0/15 min
	4 % Sellasol PR gran.		15 min
	2 % ammoniumbicarbonate		pH 6.8 60 min
	6 % Mimosa extract		pH 6.3 90 min

---

wash	200 % water	20°C	5 min
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---

dyeing, fatliquoring "Foam"	50 % water	20°C	
	2 % ammonia	24 %	
	2 % Sellasol TN gran.		5 min
	0.2 % Sellaset Yellow H		
	0.050 % Sellaset Red H		
	0.150 % Sellaset Blue H		60 min

---

add	100 % water	70°C	10 min
	2 % Invasol EP		
	3 % Invasol MO		
	4 % Invasol GH		60 min
	2.5 % formic acid 85%		20 min
	1 % Irgamin KS		20 min

---

pH 3.8

---

pile leather on horse overnight, sammy, vacuum dry 70°C,  
1 1/2 min, toggle wet, buff with paper 180, mill over night,  
toggle, buff with paper 320

---

30. 1. 1990

"Hunting" - suede from US-hides, chrome tanned, 2.0 mm

---

direct working method

10 sides, chrome tanned, 2.0 mm

indications given on shaved weight, 10 sides 40 kg

---

wash	300 % water	40°C	
	0.3 % Amollan P		15 min

---

neutralisation	150 % water	30°C	
	2 % Tanigan PC		15 min pH 5.1
	4 % Tanigan OS		15 min
	1.5 % Sodumbicarbonate		60 min pH 6.7
	6 % Mimosa extract		90 min pH 5.5

---

wash	200 % water	20°C	5 min
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---

fatliquoring	200 % water	70°C	
	4 % Lipsol BZN		
	4 % Olinor 77		60 min
	2.5 % formic acid 85%		20 min pH

---

pile leather on horse overnight, sammy, vacuum dry 70°C,  
1 1/2 min, toggle wet, buff with paper 180, mill over night,  
toggle, buff with paper 320

---

the 10 sides were retanned with the above stated formula  
due to the fact that most chemicals had to be exchanged  
for available substitutes.

Shoe side leather, heavily vegetable retanned, milled

---

material: Brazilian side leather, chrome tanned, 1.6 mm

method: neutralisation and retanning with Sellasol NG liq.,  
Sellasol PR gran., Sellasol AGT gran., vegetable  
tanning agents

compact working method

indications given on shaved weight

---

neutralising, retanning, dyeing, fatliquoring	100 % water    30°C 3 % Sellasol NG liquid	20 min pH 5.2
add	3 % Sellasol PR Gran. 0.2 % Irgaoln ST	20 min
	1 % natriumbicarbonate	40 min pH 6.5
add	0.5 % Sella Acid Brown 5GL 160% 2 % Sellaflor Havanna GB 1 % Sellasol TN gran. 1 % Invaderm LU 2 % Sellasol AGT Gran. 10 % castanien extract (chestnut) 10 % mimosa extract	90 min
add	100 % water    60°C 4 % Invasol EP 2 % Invasol SDN 3 % Invasol GH 2 % formic acid 85%	5 min 60 min 20 min pH 3.8
	1 % Invaderm S	20 min

---

wash	300 % water    25°C	10 min
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---

horse up over night, sammy, vacuum dry 70°C/2 min, dry,  
toggle wet, mill 24 hours, toggle

---

2. 2. 1990

Shoe side leather, heavily vegetable retanned, milled

material: 10 sides, 1.6/1.8 mm, chrome tanned,  
indications given on shaved weight

neutralisation	100 % water	30°C		
retanning	3 % Tanigan PC		20 min	pH 4.7
dyeing				
fatliquoring				
add	3 % Tanigan OS		20 min	
	1 % sodiumbicarbonate			pH 5.3
	1 % sodiumbicarbonate			pH 6.5
add	0.2 % Derma Brown RD			
	0.2 % Luganil Uellow NG			
	5 % Tanigan OS			
	10 % Mimosa extract(15)		90 min	
add	100 % water	60°C	5 min	
	4 % Lipsol BZN:			
	5 % Olinor 77		60 min	
	2 % Formic acid 85%		20 min	pH 3.7

-----  
wash 300 % water 25°C 10 min  
-----

horse up overnight, sammy, vacuum dry 70°C/2 min; dry,  
toggle wet, mill 24 h, toggle

-----  
The 10 sides were retanned with the above stated formula  
due to the fact that most chemicals had to be exchanged  
for available substitutes.

23. 1. 1990

"Crust" - leather for spray or immersion dyeing

material: USA side leather, chrome tanned, 1.6-1.8 mm

method: good filling synthetic/vegetable retannage which ensures a good spray or immersion dyeing

indications given on shaved weight

---

retannage	200 % water 50°C	15 min
	0.5 % Tinovetin JU	
	0.1 % oxalic acid	15 min
	0.2 % Irgalon ST	
	6 % Tannesco HN liquid	90 min
	1.5 % glutardialdehyde 50% pH 2.9	

---

neutralisation	100 % water 30°C	
	2 % natriumformiate	45 min
	2 % Sellasol NG Granulate pH 4.3	

---

retannage	100 % water 40°C	15 min
	4 % Gambir extract	
	2 % Sellasol PG liquid	15 min
	1.5 % Mimosa extract	30 min
	3.0 % Cyandiamid resin	
	2 % Irgatan LV liquid pH 4.1	30 min

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wash	300 % water, 50°C	10 min
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fatliquoring	100 % water 50°C	
	6 % Invasol MO	45 min
	2 % Invasol SDN	
	2 % Invasol GH	
	0.5 % formic acid 85% pH 3.5	15 min

---

wash cold, sammy, vacuum dry 70°C/2 min, dry, conditioning,  
stake, vacuum dry 70°C/ 1/2 min

1989/90 1.8





Hermann A. Eckert  
Unido Consultant

February 28th, 1990

Preliminary Report

Regional Hides and Skins, Leather and Leather Products

Improvement Scheme

US / ETH / 88 ./ 100

Awash Tannery

preliminary visit	17 January 1
working visit	2 February - 1 March 1990
	29 March
	2, 4, 5 and 9 April 1990

Prepared by Hermann A. Eckert  
Leather Finishing Expert 11-05

Awash Tannery - Suggestions for Production Improvements

- goat skins - form / filling
- organigramme - technical responsibilities
- personnel - requirements / further training for assignment
- establish future export sales potential / time table
  - required net of sales net / organisation
- set up a time table for fixed export goals for next 3 years
  - upper leather / sheep skins / goat skins
  - revise production schedule / include export volumes
- what finishes can Awash carry out with the help of Ethiopian tannery - roll coating machine / polishing effects
- use water based lacquers for top coats
  - save solvent costs / ecology
- investigate polished finishes for bovine - sheep - goat
- sheep lining leather - improve wettability for finishing
- have balance in colour kitchen which permits accurate weighing down to 0.1 g = material saving / scale up accuracy
- sammying machine - improve performance = avoid creases
- split sales area - goal for production programme
- enlarge leather craft department
  - key purses with zips / bags from lining-leather /  
ASA-work gloves a.s.o..

Awash Tannery - Suggestions for production improvements

Production problem areas

- Effluent plant
- Water treatment
- Sort hides and skins in the storehouse
  - separate large / medium / small hides/skins for specific lots, thus
    - improve leather quality and machine performance
- Improve the grading of hides and skins for the various production articles
  - f.e. -"hunting" instead of upper leather
    - finish flesh side instead of grain side
    - goat skins; selection - suede / shoe upper / nappa
    - sheep skin: nappa / suede / nubuck
- Reduce the production of standard articles (= cheap selling price) - increase the production of fashionable articles
- Strengthen sales organisation
- Establish a growing and continuous production of sheep nappa in different shades to gain production and sales experience in the export market and to ensure proper machine performance in all stages ( shades: white, pastel, brown, red, bordo, blue, green, black)
- Elaborate and establish an adequate range of finished articles from goat skins =
  - shoe upper leather in pigmented / semi/aniline / aniline finish
    - polished, glazed and plated
  - suede for shoe and garment / leather goods (bags a.s.o.)
- Pilot tannery - ensure production flexibility and development

Awash Tannery - Suggestions for production improvements

- Ensure flat piling of wet blue sides and skins to avoid creases and ensure proper splitting and shaving - all creases result in holes and significant loss of leather sales area
- Improve accuracy of the splitting and shaving operations
  - gain more split area for the production of shoe upper leather or suede
  - train specialists for the splitting operation to ensure splitting accuracy by
    - sending mechanics for training to Europe for a sufficiently long time (3 - 12 months)
    - have a specialist here in Ethiopia to train the proper people here on the spot as long as necessary
    - employ a specialist from Europe as long as necessary to ensure accurate splitting
  - improve shaving accuracy - do not shave more off than 0.2 mm
    - shaving implies levelling the thickness of the hides and not to shave holes into the sides which reduces leather sales area
      - employ 2 persons for the feed-in if advisable
  - do not cut 2 holes in the butt of each side for the air drying of the sides = loss of appr. 1/3-1/2 sq.ft./side. Use clips instead.
  - Produce more thinner leathers in production to gain more split area for shoe upper leather or suede: 1.2 - 1.4 - 1.6 mm upper leather
  - use more embossing plates to diversify production, e.g. perforating plate
  - produce more milled and soft leathers, possibly also shrunken grain
  - make use of the Roll-coating machine, even when the application is being carried out at the Ethiopian Tannery, to improve the grading
  - increase steadily production of leather articles for export - hides and skins - gain experience in all aspects
  - do not export the best hide and skin selections in the pickled or wet blue stage = change sales policy = adjust production

Hermann A. Eckert  
Unido Consultant

Awash Tannery - Suggestions for production improvements

- study the possibility for the use of a fork lift to load the tanning drums (= no service floor)
- train permanently the employees to handle the leather in all production stages properly - never produce wrinkles while handling leather!
- use in colour kitchen for trial quantities small plastic cups, brushes and spatulae which can be re-used quite often but permit to prepare accurate trial quantity
- ensure proper elaboration of new leather articles or shade matchings with dyestuffs
- use shade cards individually for the various leather articles - the tanners seldom fabricate various articles simultaneously, they tend to specialize
- ensure that samples of new chemicals are ordered from the suppliers
  - they must be available for production improvements or changes
- foster personnel development for interested young people

February 27th, 1990

Finishing Trial: Sheep Nappa, grey

trial		I	III	II	
<u>Pigment Coat</u>	Pigment Paste	100	100	100	
	Wax 650		20	20	
	Luron Top		20	20	
	Corial Binder W60	60	60	50	
	M60	60	60	-	
	Binder IF	-	-	200	
	Bottomer 25A	50	50		
	Filler 75	30	40	50	
	Baysin NL	20	20	-	
	water	680	640	560	
		1000	1000	1000	
	<u>Lacquer</u>	Isoderm Base HF		300	
		Mattierung 2089		30	
Solvent S 4830			100		
water			570		

2-3 pigment spray coats, 1 x lacquer top, mill,  
 1 x lacquer coat

observation: handle of trial II seems to be smoother  
 than trial I and III

Finishing Trial: Sheep Nappa Black

trial		I	II	III
<u>Pigment Coat</u>	Lepton Black	95	95	95
	Blue	3	3	3
	Bordo	2	2	2
	Wax 660		20	20
	Filler 75	50	50	50
	Luron Top		20	20
	Corial Binder IF		200	
	Binder W60	60	50	60
	Binder M60			60
	Bottomer 25A	50		60
	40B	60		
	Luron Lustre E	40		
	Baysin NL	20	20	20
	water	600	600	600
	<u>Lacquer</u>	Melio ES 111		300
DN 221			30	
Thinner S 4830			500	
Wax S			5	

2-3 pigment spray coats, 1 x lacquer top, mill,  
 1 x lacquer coat

observation: reduce Thinner S 4830 from 500 g to 300 g

16. February 1990

Finishing Trials: Aniline Finish on Shoe Upper Leather, light brown

Spray dyeing:	Eukesolar Yellow GL		30 g	
	Brown 3RL		70 g	
	butylacetate		100 g	
	water		300 g	
Spray coat:	trial	I	II	III
	Eukesolar Yellow GL	6	6	6
	Brown 3RL	14	14	14
	Lepton Yellow	6	10	14
	Orange	22.5	37.5	52.5
	Black	1.5	2.5	3.5
	water	730	695	675
	Corial Binder IF	120	150	140
	Euderm Resin 40B	40	40	40
	Filler H	30	30	30
	Wax A	10	10	10
	EM Finish G	15	15	15
Lacquer Coat:	Lacquer NL 500		2000	
	ND 221		200	
	Solvent S 4830		4000	
	Corial Wax S		30	

2 x spray dyeing, dry, 2 x spray coat, dry,,  
plate smooth, spray lacquer coat

1 side trial I: milled 24 hours, 1st lacquer coat  
with additon of Eukesolar dyes  
before milling

1 side trial II: embossed after 2 spray coats,  
then again 2 spray coats, 1st  
lacquer with addition of Eukesolar  
dyes, 10 g/l

Finishing Trial: Upholstery Leather, light brown, Trial 2: D

spray coat:	Neosan Orange		20
	Light Brown		5
	White		5
	Lepton Caramel		65
	Black		5
	Filler 75	50	39
	Wax FF		20
	Luron Top		20
	Corial Binder IF		200
	W60		50
	water		560
lacquer coat:	Lacquer LE 500		300
	ND 221		50
	Wax S		50
	Thinner S 4850		600

3 spray coats, dry, 1 lacquer coat, emboss Marocco,  
mill 8 hours, 1 lacquer coat

February 14th, 1990

Finishing Trial: Full Grain Shoe Upper Leather, blue

2 sides

pigment coat:	Neosan White	33 gr
	Black	33 gr
	Blue	23 gr
	Euderm Bordo C	<u>11 gr</u>
	Matting Agent	50 gr
	Eukanol Paste FA	60 gr
	water	600 gr
	Corial Binder W 60	125 gr
	Corial Binder M 60	125 gr
	Baysin NL	<u>30 gr</u>
lacquer coat I	lacquer NL 500	200 gr
	matt ND 221	20 gr
	solvent 4830	400 gr
	Corial Wax S	3 gr
lacquer coat II	Isoderm Base HF	300 gr
	butylacetate	100 gr
	water	150 gr
	water	450 gr

1 side smooth grain:

2 pigment spray coats, haircell,  
 1 lacquer coat II

1 side milled:

2 pigment spray coats, 1 lacquer coat I,  
 mill 6 h, 1 lacquer coat I

Finishing Trial: Shoe Upper Leather, egg shell

pigment coat	Neosan White appr	46 gr
	caramel	3 gr
	Brown	1 gr
	Schwarz	<u>0.3 gr</u>
	water	735 gr
	Corial Binder JF	120 gr
	Euderm Resin 40B	40 gr
	Filler H	30 gr
	Wax A	<u>10 gr</u>
	water /	1000 gr

2 spray coats, haircell, 1 spraycoat,

1 lacquer coat 300 Isoderm Base HF 300 gr  
 100 Butylacetate  
 600 water



February 27th, 1990

Finishing Trials: Milled Softy Upper Leather, Beige 7 sides

trial		I	II	III
Pigment Coat	Lepton Whsite	50	100	150
	Wax	30	30	30
	Luron Top	50	50	50
	Bottoamer 25A		100	
	40B	50	110	80
	Corial Binder W60	50	60	60
	Binder IF	150		120
	Baysin NL	25	25	25
	water	600	640	490

Trial III 1 x pigment coat, trial II and II 2 x pigment coat, 1 x habitual lacquer coat, mill or emboss and mill, 1 x lacquer vacuum dry to make sides smooth if necessary.  
 observation: Nr I and II were sticky after pigment coat, check

Finishing Trial: Milled black softy sides 7 sides

trial		I	II
dye stain	Eukesolar Black 2R liq.		100 g
	Thinner S 4830		100 g
	water		500 g
	Baysin NL		30 g
Pigment Coat:	Lepton Black	100	50
	Eukesolar Black 2R		15
	Wax 660	30	30
	Luron Top	50	50
	water	600	600
	Corial Binder IF		150
	Binder W60		50
	Eukanol Binder 40B	120	50
	Binder 25A	150	
	Baysin NL	<u>50</u>	<u>50</u>
Lacquer Coat:	Melio ES 111		300
	DN 221		30
	Thinner S 4830		500
	Wax S		5

Nr. II dye stain, Nr. I and II 2-3 pigment spray coats, 1 x spray lacquer, mill, 1 x lacquer, vacuum dry if necessary.  
 observation: Nr II has more aniline character, Nr I is normally pigmented.

Finishing Trials:: Smooth Grain Aniline Upper Leather, drum dyed

dye stain	Eukesolar Brown 3RL	30		
	Yellow GL	10		
	Brown RG	60		
	Thinner S 4830	50		
	water	400		
	trial		I	II
				III
pigment coat	Lepton Yellow	20	10	10
	Orange	45	22	22
	Lepton Bordo	30	15	15
	Black	10	6	6
	Corial Binder W60	70	60	60
	M60		50	50
	Eukanol Binder 40B	50	60	60
	Mattting Agent	30	50	50
	Paste FA	30	50	50
	Baysin NL	15	30	15
	Eukesolar Yellow GL		4	
	Brown 3RL		10	
	Brown RG		6	
water		700	640	665
		1000	1000	1000

trials: 3 sides Nr 1, 2 sides 2 x pigment coat  
 1 side 3 x pigment coat

3 sides 1 x dye stained, 2 sides 2 x II pigment coat  
 1 side 2 x III pigment coat

3 sides Nr. III, 1 side pre-dyed, see above  
 2 sides 2 x III pigment coat

lacquer Melio NL 500 200  
 NA 221 20  
 Thinner S 4830 400  
 Wax S 10

after pigment coats, 1 x lacquer spray, smooth sides  
 haircell plate, 1 x lacquer spray,  
 the other sides: mill after lacquer coat I, spray  
 again lacquer coat after milling, vacuum dry

observation: Trial I has probably not enough binder quantity  
 for long milling, check and increase quantity.

Trial II and III were sprayed also on sheep lining leather  
 with good results:

6 skins dye stain, 1-2 pigment coats  
 6 skins 1-2 pigment coats  
 clear lacquer spray with Isoderm Base HF

observation: good handle and appearance

February 16th, 1990

**Finishing Trials: Upper Leather, full grain, dark brown**

dye spray coat: Eukesolar Brown RC 100 g  
Thinner 100 g  
water 300 g

pigment coat: Lepton Orange 33 g  
Brown 50 g  
Black 17 g  
Filler 75 30 g  
Paste FA 60 g  
water 600 g  
Eukanol Binder 40B 180 g  
Corial Binder IF 60 g  
BaysinLN 30 g

2 x spray dye, dry, 2 x pigment coat, dry,  
plate smooth, , spray lacquer

Lacquer NL 500 2000 g  
ND 221 200 g  
Solvent S 4830 4000 g  
Corial Wax S 30 g

plate smooth

**Finishing Trials: Black Finish on Flesh Side of Upper Leather**

Pigment coat: Lepton Black 100 g  
Filler 75 50 g  
Corial EM Finish G 20 g  
Lepton Binder SD 250 g  
Binder IF 150 g  
water 300 g

1 swab coat, dry, plate, 1 swab coat, 2 spray coats  
1 black lacquer coat, emboss Lama, 1 black lacquer  
coat

**Finishing Trials: Lacquer Trials for Sheep Nappaa**

I Isoderm Base HF 300  
Mattierung 2089 30  
Thinner S 4830 100  
water 570

II Isoderm Base HF 300  
Mattierung 2089 30  
Thinner S 4830 500

III Melio Solvent 4830 400  
Lacquer NL 500 180  
DN 221 20  
Corial Wax S 5

IV Melio Solvent 4830 400  
Lacquer NL 500 180  
DN 221 40  
Corial Wax S 5

Observation: after milling all skins were  
sprayed with lacquer Nr I for the  
2nd time

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Finishing Trial: 1 garment leather side, buffed

			<u>trial III</u>
Pigment Coat	Lepton Whsite	26 g	26
	Caramel	55 g	55
	Orange	21 g	20
	Black	4 g	4
	Waxx 660	30 g	30
	Lauren Top	30 g	30
	Filler 75	20 g	20
	Paste FA	20 g	20
	water	500 g	500
			100
	Corial Binder IF		
	Corial Binder M60	50 g	
	Binder W60	60 g	50
	Bottomer 25A	50 g	
Baysin NL Binder 40B	30 g	30	

3 spray coats, 1 x habitual clear lacquer coat, emboss,  
mill, 1 xx habitual clear lacquer coat, vacuum dry

observation: trial III best result

Finishing Trial: 2 sides Upper Leather Black, undyed

dye stain:	Eukesolar Black 2R liq.	100 g
	Thinner S 4830	100 g
	water	500 g
pigment coat	Lepton Black Paste	100 g
	Eukesolar Black 2R liq	10 g
	Filler 75	30 g
	Paste FA	60 g
	water	600 g
	Binder 40B	180 g
	Corial Binder IF	60 g
Baysin NL	20 g	
lacquer coat	Melio ES 111	300 g
	DN 221	30 g
	Thinner S 4830	500 g
	Wax S	5 g

1 dye stain spray, dry, 2 x pigment spray coats, 1 x lacquer,  
haircell plate, 1 x lacquer, smooth plate

Finishing Trials: Goat Shoe Upper Leather, pigmented 6 pieces

Pigment Coat	Lepton White	39	39
	Caramel	47	47
	Orange	13	13
	Black	1	1
	Corial Binder W60		80
	M60		80
	Eukanol Binder 40B		30
	Mattiang Agent		
	Filler 75		50
	Paste FA		50
	Water		600
	Baysin LN		<u>30</u>

2 pigment coats, clear lacquer with Isoderm Base HF,  
 h. arcell

Finishing Trials: Sheep Lining Leather, undyed, 12 pieces

dye stain:	Eukesolar Brown 3RL	100
	Thinner S 4830	100
	Baysin NL	30
	Water	470

pigment coat	trial		
		II	III
	Lepton Yellow	10	10
	Orange	22	22
	bordo	15	15
	black	6	6
	Corial Bi W60	80	80
	Bi M60	80	80
	Eukanolbinder 40B	80	80
	Filler	50	50
	Paste FA	50	50
	Baysin NL	30	30
	water	<u>580</u>	<u>560</u>

6 skins: 1 x pigment coat II  
 6 skins: 2 x pigment coat II  
 6 skins: 1 x dye stain  
 2 x pigment coat III

finish with clear lacquer coat: Isoderm Base HF

observation: Trial Nr. III contained also

Eukesolar Yellow GL	4 g
Brown 3RL	10 g
Brown RG	6 g

to differentiate from trial Nr II.

February 16th, 1990

Finishing Trials: Sheep Nappa, Grey		trial	I	III	II.
pigment coat:	white pigment		75	75	75
	Caramel pigment		22	22	22
	Black Pigment		3	3	3
	Wax 660		-	20	20
	Luron Top		-	20	20
	Corial Bi W60		60	60	50
	M60		60	60	-
	IF		-	-	200
	Euderm Bott 25A		50	50	-
	Filler 75		30	40	50
	Baysin NL		20	20	-
	Water		680	640	560
	lacquer coat	Melio S 4830		150	
Melio NL 500			100		
NL 221			50		
Corial Wax S			5		
lacquer coat II	Isoderm Base HF		300		
	Matt 2089		30		
	Thinner S 4830		100		
	water		570		

3 pigment coats, dry, 1 lacquer coat, mill,  
 1 lacquer coat II

observation:-the lacquer coat did not give a satisfying handle, lacquer coat II was o.k.  
 -handle after pigment coat o.k., 2 better

Finishing Trial: Sheep Nappa, bordo		trial	I	II
pigment coat:	pigment		100	100
	Wax 660		20	-
	Luron Top		20	20
	Filler 75		50	40
	Corial Bi JF		200	-
	Bi W60		50	60
	Bi M60		-	60
	water		560	650
	Baysin NL		-	20
	Bottomer 25A		-	50
lacquer coat:	Isoderm Base HF		300	
	Mattierung IO 89		20	
	Thinner S 4830		100	
	water		540	
	Stahl LW 98		20	

observation: handle of trial I better, drier as tri.  
 II, before milling

16. February 1990

Finishing Trials: Upholstery Leather, light brown, full grain

pigment coat: Neosan Orange	20 gr
Light Brown	5
White	5
Lepton Caramel	65
Black	<u>5</u>
Filler 75	30
Eukanol Paste FA	20
water	600
Euderm Resin 40B	100
Corial Binder IF	150
Euderm Bottomer 25A	30
Baysin NLL	<u>30</u>

3 spray coats, 1 lacquer spray coat,  
emboss Marocco Plate, mill 8 hours,  
1 lacquer spray coat

Finishing Trials: Upholstery Leather pieces

trial	I	II
Neosan Orange	42	42
Red	39	39
Rubin	4.5	4.5
Blue	<u>14.5</u>	<u>14.5</u>
Filler 75	50	50
Wax FF	20	20
Luron Top	20	20
Corial Binder IF	250	200
Corial W60		50
water	560	560
Lacquer		
lacquer NL 500	2000	
ND 221	200	
Thinner S 4850		
Corial Wax S		30

2 spray coats, smooth plate, 1 x lacquer spray,  
fmill, 1 x lacquer spray

Pieces marked with a W got a lacquer diluted  
with water:

Isoderm Base HF	300
butylacetate	100
water	150
water	450

April 5th, 1990

Finishing Trials: Softy Aniline - on retannage trial

	<u>Trial 1</u>	<u>Trial 2</u>
Pigment Coat		
Eukesolar Brown 3RL	10	10
Brown RG	10	10
Lepton Caramel	-	10
Brown	14	8
Black	2	2
Yellow	36	-
Filler	30	30
Corial Binder W60	50	50
Binder M60	50	50
Eukanol Binder 40B	80	80
Paste FA	20	20
Luron Top	20	20
Wax FF	20	20
Baysin NL	20	20
Water	660	690
Topcoat		
Melio NL 500	300	300
Melio ND 221	30	30
Thinner S 4830	600	600

2-3 Spray coats, 1 top coat, emboss, mill 8 hours,  
 1 topcoat

-add to top coat 5 g/l Eukesolar Brown RG

observation: result very satisfying

Black Softy Upper Leather

dye stain	Eukesolar Black 2R	100 g
	Thinner S 4830	100 g
	Water	500 g
	Baysin NL	30 g

	<u>Trial 1</u>	<u>Trial 2</u>
pigment coat		
Lepton Black	70	70
Irgaderm Black M209 liq	15	
Wax 660	20	20
Luron Top	20	20
water	600	600
Corial Binder IF	150	150
Eukanol Binder 40B	100	100
Paste FA	20	20
Baysin NL	20	20
top coat		
Melio ES111	100	100
Thinner 4830	100	100

Trial 1: 1 dye stain, 3 pigment coat, 1 top coat,  
 hair cell, 1 top coat

Trial 2: 3 pigment coats, 1 top coat, hair cell, 1 top co

Trial 3: 1 pigment coat, haircell, 2 pigment coats,  
 1 top coat, smooth plate, 1 top coat

Trial 4: 1 pigment coat, haircell, 1 pad coat, 2 spray  
 coat, 1 top coat



April 5th, 1990

Finishing Trial: Sudan Sheep Skins

dye stain	Eukesolar Yellow GL	25
	Brown 2RG	75
	Thinner S 4830	100
	Bays; in NL	30
	water	770
pigment coat	Lepton White	5
	Yellow	67
	Brown	25
	Black	3
	Eukesolar Brown 2RG	10
	Filler	40
	Corial Binder IB	180
	Eukanol Binder 40B	80
	Paste FA	20
	Wax FF	30
	water	550
Top coat for 2 tone effect		
	Melio ES 127	400
	ND 221	40
	Melio S 4830	560
	+ 10 g Eukesolar dye liquid	

1 dye stain, 2-3 pigment coats for coverage,  
1 top coat, emboss, mill 8 hours, 1 top coat for  
two-tone effect

April 5th, 1990

Finishing Trial      Finishing White Upper Leather, retannage trial

pigment coat	White Lepton	100
	Wax ff	15
	Luron Top	25
	Water	150
	Filler 75	10
	Binder AF	10
	40B	40
	W60	25
	M60	25
	Paste FA	10
	Baysin NL	10

top coat:

Corial EM Top White GE	100
Thinner S 4830	200

- Trial 1: 2 swab coats, 2 spray coats, 1 top coat, hair cell,  
1 top coat
- trial 2: 1 swab coat, 3 x spray coats, 1 top coat, hair cell,  
1 top coat
- trial 3: 2 spray coat, hair cell, 1 swab coat, 2 spray coats,  
1 top coat, plate smooth, 1 top coat
- trial 4: 1 spray coat, hair cell, 1 swab coat, 2 spray coats,  
1 top coat, smooth plate, 1 top coat

Hermann A. Eckert  
Unido Consultant

March 19th, 1990

### Preliminary Report

## Regional Hides and Skins, Leather and Leather Products Improvement Scheme

US / ETH / 88 / 100

### Ethiopia Tannery

preliminary visit	18 January 1990 .
working visit	5 - 23 March 1990
	30 March 1990
	3 April 1990

Prepared by Hermann A. Eckert  
Leather Finishing Expert 11/05

Ethiopia Tannery - Suggestions for production improvementsProduction problem areas

- Effluent plant
- Water treatment
- Laboratory - production control / elaboration of new articles / quality control / comparisons with competition quality standard
- Pilot Tannery - Adequate equipment to ensure elaboration of new articles, colour matchings / scale up
- Sort hides and skins in the storehouse
  - separate large / medium / small hides/skins for specific lots, thus
  - improve machine performance and leather quality
- Ensure proper execution of all tanning operations temperature / time / float / ph / milling / storing / a.s.o.
- Improve the grading of hides and skins for the various production articles
  - f.e. - produce "hunting"-upper leather for better grading
  - finish flesh side. instead of grain side
  - select sheep skins in nappa / suede / upper / lining
  - select goat skins in upper leather / suede / lining
  - upper in glazed, plated, aniline, polished finishes
- Reduce the production of standard articles = cheap selling price
  - produce more fashionable articles in various colours
- Elaborate and establish a steady production of sheep nappa in different shades to gain production and sales experience and to ensure proper machine performance in all stages (shades: white, beige, brown, red, bordo, blue, green, black)
- Elaborate and establish an adequate range of finished articles from goat skins =
  - shoe upper lather in pigmented / semi-aniline/aniline finish
  - polished, glazed and plated
  - suede for shoe and garment / leather goods
- Strengthen sales organisation

March 19th, 1990

Ethiopia Tannery - Suggestions for production improvements

- ensure flat piling of wet blue sides and skins to avoid creases which result in cuts during splitting and shaving
- improve the accuracy of the plitting and shaving operations
  - gain more split area for the production of shoe upper leather or suede
  - train specialists for the splitting operation to ensure splitting accuracy by
    - sending mechanics for training to Europe for a sufficiently long time ( 3-12 months)
    - have a specialist here in Ethiopia as long as necessary to train the proper people on the spot
    - or employ a specialist from Europe as long as possible to ensure accurate splitting
- improve shaving accuracy - do not shave more off than 0.2 mm
  - shaving implies levelling the thickness of the hides and not to shave 1.0 mm - 1.5 mm off or to shave holes into the hides which reduces the leather sales area
  - reduce speed of shaving machines to assure proper feeding of hides into the machines = avoid holes and cuts
- produce more thinner leathers in production of bovine hides to gain more split area for shoe upper or suede leather
- use more embossing plates to diversify production of upper leather e.g. perforating plate hides all defects
- produce more milled and soft leathers, also shrunken grain
- make use of the roll coating machine to hide hide defects
  - 1-2 applications are used now in Europe to improve grades
- do not export the best hide and skin selections in the pickled or wet blue stage = change sales policy = adjust production
- train permanently the employees to handle the leather in all production stages properly = never produce wrinkles while handling leather
- use in colour kitchen for trial quantities small plastic cups, brushes and spatulae which can be re-used quite often but permit to prepare accurate trial quantity = reproducibility large scale
- ensure that spray booth for hides is usable for this purpose
- have balance in colour kitchen permitting accurate weighing down to 0.1 g = material saving / scale up accuracy

March 19th, 1990

Ethiopia Tannery - Suggestions for production improvements

- ensure use of new trial drum, already partly installed, for trial purposes
- ensure that new article suggestions of the important chemical companies are tested in the pilot tannery and plant - evaluation
- ensure that sample of new products of the supplier companies are being obtained and tested (according the circular specifications)
- ensure proper colour matching of new shades (selection of new dyestuff = fastness level) and subsequent scale up for production
- foster personnel development for interested young people
- improve the form of the sheep / goat skins
- establish future export sales potential / time table
  - required sales net and sales organisation
- set up a time table for fixed export goals for the next 3 years
  - upper leather / sheep skins / goat skins
  - revise production schedule / include export volume
- establish logistic forecast for internal/export requirements
- use water based lacquers for topcoats - save solvent costs
- investigate polished finishes for bovine - sheep - goat
- do not use good skins for lining - reselect for shoe upper leather or other articles
- sammying machine - improve performance - avoid creases which result in holes during splitting and shaving
- split area - goal for production programme
- improve performance of the fleshing machine
- ensure that vegetable tanned hides are dried flat - better rolling performance
- repack endangered chemicals in stock - rusty drums - loss
- ensure steady use of spraying machines - quality standard
- make use of available machines: plating machines for skins
- hold constantly seminars for department heads and foremen
  - proper use of machines / maintenance : actual demonstration
- prepare and distribute shade cards in a specialised form,
  - separation of different articles
- control fastness properties of each finished lot before sending it to the customer

Hermann A. Eckert  
Unido Consultant

March 21th, 1990

Ethiopia Tannery - Suggestions for Production improvements:

- split 2 mm: -do not cut in two pieces thus reduce area
    - do not shave down to 1 mm = loss of substance = production of shavings
    - sell splits for shoe upper leather or suede or sell splits tel quel to tannery
  - does dry milling of goat or sheep skins before staking improve overall result?
  - ensure constant required softness of crust upper leather (no hard/medium/soft sides in a lot)
  - do not cut 2 holes in the butt of the vegetable tanned leather = loss of appr 1/2 sq.ft. of best leather area per side
  - deflesh sole leather better - clean flesh side
  - what articles do the tanneries make out of our sheep and goat skins which they buy from us pickled or in wet blue?
    - what clours and fastness levels do they achieve?
  - send young intelligent men to Germany for an apprenticeship in mechanics / machine mechanics / electricity / a.s.o. apprenticeship lasts app. 3 years = assures technical standard improvement in future
  - production / maintenance : responsibility machine operation
  - what procedure is required to speed up import of chemicals and dyestuffs needed for export orders with fixed delivery dates?
  - start a technical contest between the most important chemical companies to find out which company produces the best technical result in the most important leather articles
    - sheep skins : nappa / suede / shoe upper
    - goat skins : aniline finish / shoe upper (glazed/plated) suede / aniline lining
    - bovine hides: softy articles for aniline and milled
      - roll coating effect print / 1-2 x
- don't fold wet blue sides - causes creases and cuts
- start in laboratory the required fastness tests for dyestuffs
    - compare with competition leathers to assure same standard
  - ask Stahl how stock in binder CR 1761 A (7800 kg) and CR 1157 (705 kg) can be used up

March 14th, 1990

Retannage Trial Nr. 5

Corrected Grain Upper Leather - Compact Method  
shaved weight 1.8/2.0 mm -- % based on shaved weight

wash	300 % water	40°C	10 min	drain
	150 % water	40°C		
	1 % Tanigan PC		10 min	
	2 % Tanigan OS		20 min	ph 4.8
	2 % Tanigan OS		20 min	
	6 % Mimosa			
	2 % Salla Fast Brown	DR	60 min	
	1 % formic acid		30 min	
wash	200 % water	40°C	5 min	drain
	150 % water	50°C		
	7 % Olinor 77		45 min	
	0.5 % Pellan S	)		
	0.3 % formic acid		1.5 min	
rinse	300 % water	20°C	5 min	

---  
horse up o/n, sammy, set out, vacuum dry 70°C/2 min,  
hang to dry, condition, stake, vacuum dry 70°C/1 min,  
buffing paper 280

observations:



Retannage Trial Nr. 4

Shoe Upper Leather, very soft

shaved weight 1.4/1.6 mm --- % based on shaved weight

wash	300 % water	40 <sup>o</sup> C	10 min	drain
	100 % water	40 <sup>o</sup> C		
	6 % Bastamol	CN	60 min	
+	50 % water.	30 <sup>o</sup> C	5 min	
	2 % Tanigan	PC		
	2 % Sulfinex	234	15 min	
	2 % Sodiumbicarbonate		60 min	ph 5.3
				drain

wash	300 % water	30 <sup>o</sup> C	10 min	drain
	100 % water	30 <sup>o</sup> C		
	1 % ammonia		5 min	
	3 % Tanigan	PC	10 min	
	1 % Sella Fast	Brown DS		1 : 4
	1 % Sella flor	Havanna GB		
	1 % Tamol	NNOL	45 min	
	10 % Perfectol	CN	60 min	
	2 % Tanigan	OS	30 min	
+	100 % water	60 <sup>o</sup> C	15 min	
	2 % formic acid		10 min	
	2 % formic acid		20 min	ph 3.8

-----  
wash 300 % water 20<sup>o</sup>C 5 min  
-----

horse up, sammy, set out, hang dry, condition, stake,  
mill 3 hours, toggle

observation: the substitution of all retanning agents and  
fatliquors has changed too much the result of  
this retannage trial.

Retannage Trial Nr. 3

Bovine Upper Leather, heavily retanned

shaved weight 1.6/1.8 --- % based on shaved weight

wash	300 % water	30°C,	10 min	drain
neutralisation	100 % water	30°C,		
	2 % Tanigan PC		20 min	ph 5.2
	3 % Tanigan OS		20 min	
	1 % sodiumbicarbonate		40 min	ph 6.5
+	2 % Sella Fast Brown DR			
	1 % Tamol NNOL			
	2 % Tanigan OS			
	10 % Mimosa			
	10 % Qiebracho		90 min	
+	100 % water	60°C	5 min	
	4 % Olinor 77			
	4 % Coripol BZN.		60 min	
+	2 % formic acid		20 min	ph 3.8
wash	300 % water	25°C	10 min	

-----  
horse up o/n, sammy, set out, vacuum dry 70°C/2 min,  
toggle wet, mill 24 hours, toggle

(check already after 8 hours milling - effect)

13. March 1990

Retannage trial Nr. 2

Shoe upper leather, soft milled, dyed brown shade  
shaved wet blue 1.6/1.8 - % based on shaved weight

wash; 200 % water 40°C 5 min

drain

neutralisation

200 % water 30°C  
2 % sodiumformate

2 % sodiumbicarbonate

90 min

ph 6.5

drain

retannage 200 % water 20°C

dyeing 2 % Sulfinax 234

fatliquor 1 % ammonia

3 % Luganil Brown NR

20 min

2 % Tamol NNOL

3 % Quebracho

3 % Mimosa

2 % Tanigan OS

60 min

+ 30 % water 60°C

5 % Olinor 77

5 % Coripol BZN

60 min

3 % formic acid

30 min

drain  
ph 3.5

wash 200 % water 50°C 5 min

drain (bath clean)

200 % water 50°C

1 % Luganil Brown NR

20 min

0.5 % formic acid

20 min

6-----

wash, horse up o/n, sammy, set out, toggle wet, condition,  
mill overnight, toggle, finishing

observation: - the sides are very soft with a partly perfect  
milling grain - meets expectation  
- for soft leathers for export better  
weaker grades should be chosen

Retannage trial Nr. 1

Softy upper leather, with milled grain

shave 1.8-2.0 mm - % based on shaved weight

wash: 300 % water 30°C 10 min  
drain

neutralisation:

100 % water 30°C  
1.5 % Sodiumbicarbonate  
3 % Tanigan PC 90 min

ph 6.4  
drain

wash 300 % water 50°C 10 min  
drain

retannage dyeing fatliquor 100 % water 50°C  
4 % Tanigan OS  
2 % Mimosa  
0.3 % Sellaflor Havanna 60 min

5 % Olinor 77  
5 % Coripol BZN ) 1:4  
60 min ph 5.2

2 % Tanigan OS 45 min

0.2 % Formic acid 15 min ph 4.5

wash 300 % water 20°C 5 min

-----  
horse up o.n., sammy, set out, vacuum dry at 70°C/3 min,  
hang up to dry, condition, stake, mill 3 hours, dry toggle

observation: -the sides are very soft with the expected  
milling effect, the result meets expectation.  
-For such a trial better wet blue grades should  
be taken

March 19th, 1990

Finishing Trial: Finishing of Brown Sheep Nappa, appr. 250 pieces

Pigment Coat:	Lepton Brown	35 g	2800 g
	Black	35 g	2800 g
Trial Nr. 7	Caramel	28 g	2240 g
	Corial Binder IF		
		150 g	12000 g
	Corial Binder EON		
		100 g	8000 g
	Filler FI 1261	40 g	3200 g
	Luron Lustre E	20 g	1600 g
	Wax 660	20 g	1600 g
	Baysin NL	20 g	1600 g
	water	<u>550 g</u>	<u>44000 g</u>
		1000 g	80000 g
Top Coat			
	Isoderm Base HF	300 g	6000 g
	NL Matt	50 g	1000 g
	Wax S	5 g	100 g
	Q 208	5 g	100 g
	butylacetate	100 g	2000 g
	water	100 g	2000 g
	water	200 - 300 g	6000 g

3-4 spray coats on spray machine - only slight spray coat  
 1 top coat, dry, mill 8 hours, 1 top coat, Finiflex if  
 necessary

observations:

- reduce the quantity of pigment solution on skins =  
 spray less coats or apply slighter coats each time
- adjust quantity of Q 208 in top coat to obtain the  
 required waxy and slippery handle\*
- for trials

Finishing Trials: Brown Sheep Nappa:

Trial Nr.	1	3	4	5	6	7	8
Lepton Pigment	100	100	100	100	100	100	100
Corial Binder IF	200	200	200	200	200	150	130
Corial Binder OHN	50					100	100
Eukanol Binder 40 B		50	50	50	50		30
CR 1158	20						
Filler FI 1261			50	70	40	40	40
Luron Lustre E	20	20	20	20	20	20	20
Wax 660		30	30	30	20	20	20
Matt NDS 527	20						
water lacquer		20	20	20			
water	<u>565</u>	<u>580</u>	<u>570</u>	<u>510</u>	<u>570</u>	<u>570</u>	<u>560</u>

- observation : Nr. 1 a bit sticky  
 Nr. 3 good, a bit glossy  
 Nr. 5 too dull, dry  
 Nr. 6 good,  
 Nr. 7 good, Nr. 8 not made yet

Hermann A. Eckert  
Unido Consultant

March 19th, 1990

Finishing Trial: Finishing of Black Sheep Nappa, each 2 skins

Trial	Nr. 1	Nr. 2
Lepton Black	95 g	58 g
Blue	3 g	2 g
Bordo	1 g	0.5 g
Eukesolar Black 2R 150%	10 g	10 g
Corial Bihder IF	200 g	200 g
Eukanol Binder 4)B	50 g	50 g
Filler FI 1261	40 g	30 g
Luron Lustre E	20 g	20 g
Wax 660	20 g	20 g
water	560 g	590 g
	<u>1000 g</u>	<u>1000 g</u>
Penetrator 1079		20 g

Top Coat:

Corial EM Base S	100 g
Matt NL	50 g
butylacetate	100 g
wax S	10 g
water	100 g
water	200 g
Eukesolar Black 2R 150%	3 g

2-3 spray coats, 1 top coat, dry, mill 8 hours,  
 1 top coat

observation: add 5 g Wax Q 208 for handle improvement  
 coverage and handle almost good.

Finishing of Grey Nappa Sheep 2 skins

Pigment Coat		
Lepton White	22 g	22 g
Yellow		4 g
Orange		48 g
Black		33 g
Corcoal Binder IF		180 g
Binder CHN		20 g
Eukanol Binder 40 B		50 g
Filler FI 1261		40 g
Luron Lustre E		20 g
Wax 660		20 g
water		580 g

Top Coat with Corial EM Base S

observation: handle good

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Finishing Trials: Finishing of Flesh Side of Shoe Upper Leather

Trial	Nr. 1	Nr. 2
Lepton Black	100	100
Lepton Binder SD	250	450
Corial Binder IF	150	-
Wax 660	20	-
Filler FI 1261	50	50
water	310	400
water lacquer	20	-

1 swab coat, hairsell plate, 1 swab coat,  
2 spray coats, 1 top coat, emboss, 1 top coat

observation: trial Nr. 1 too flat, Nr. 2 much better  
- possibility to use lower grades for a shoe  
upper leather

Spray-Finish of "Hunting"-Upper Leather from  
Grade 6 Upper Leather (Reject)

Spray-Solution

Eukesolar Brown 2G 150%	50 g
Butylacetate	100 g
Penetrator 1079	20 g
water	830 g

Spray for Handle

Irgamin SFC	100 g
Water	900 g

2 wet spray coats with spray solution,  
dry, Molissa-stake,  
1-2 spray coat for handle, dry

observation: - effect quite satisfying,  
handle good

- technically possible to drum dye and after-treatment with Irgamin SFC for handle and gloss to achieve deeper dyeing and overall better result.
- The normal upper leather is quite suitable for this "Hunting"-leather

Hermann A. Eckert  
Unido Consultant

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Finishing Trial: Finishing of Shoe Upper Leather, Eggshell

Pigment Solution:	Lepton White	76 g
	Caramel	3.8 g
	Black	0.2 g
	Corial Binder IF	120 g
	Eukanol Binder 40 B	40 g
	Filler FI 1261	30 g
	Wax 660	20 g
	water	710 g

Top Coat: Corial Base S diluted with water

- 3 spray coats with pigment solution, 1 top coat, haircell-plate, 1 top coat

observation: coverage insufficient on this relatively poor side. Use better grade to achieve a satisfying finishing result.

Even an increase of the pigment quantity to 100 g/l will not solve the problem.

Finishing of Upper Leather, Medium Brown = C

spray dye:	Eukesolar Brown 2GR	100 g
	Isopropanol	100 g
	water	600 g
	Baysin NL	50 - 20 g

Pigment Solution:	Lepton Orange	65 g
	Bordo	29 g
	Black	9 g
	Corial Binder IF	100 g
	Eukanol Binder 40B	100 g
	Filler FI 1261	40 g
	Wax 660	20 g
	water	640 g

Top Coat	Corial EM Base S	100 g
	Matt NL	50 g
	Wax S	10 g
	Q 208	10 g
	butylacetate	100 g
	water	100 g
	water	200 g

1 side: 2 x pigment solution  
1 side: 2 x pigment solution heavy,  
1 top coat, emboss, mill, 1 top coat, Finiflex 80°C



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Unido Consultant

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Finishing Trials: Finishing of Semi-Aniline Upper Leather = A + B

<u>Trial</u>	<u>A</u>	<u>B</u>
Spray dyeing		
Eukesolar Yellow GL	50 g	
Brown 5RL	40 g	
isopropanol	100 g	
water	500 g	
Baysin NL (if necessary)	20 g	
Pigment coat:		
Lepton Yellow	14 g	20 g
Orange	52.5	75 g
Black	3.5	5 g
Eukesolar Yellow GL	12.5	-
Brown 5RL	10.0	-
Corial Binder IF	140 g	120 g
Eukanol Binder 40 B	40 g	80 g
Paste FA	10 g	20 g
Filler FI 1261	30 g	30 g
Wax 660	20 g	20 g
water lacquer	20 g	20 g
Baysin NL	20 g	20 g
water	640 g	610 g

Top Coat: Corial EM Base S diluted

- spray dye, dry, 2/3 pigment coats, 1 top coat, emboss or haircell plate, mill if necessary, 1 top coat, Finiflex 80°C without pressure

observations: use Corial Mattierung G instead of NL Matt  
use Lepton Filler H instead of FI 1261  
use Corial Wax S instead of Wax 660  
use partly Corial Wax G (Silicon) if a gliding handle is required.

Finishing of Softy Upper Leather, Brown, Trial II

spray dyeing	Eukesolar Brown 2GR	100 g	
	Isopropanol	100 g	
	water	800 g	
pigment solution		<u>H 50</u>	
	Lepton Caramel	26 g	48 g <u>H 100</u>
	Brown	19 g	30 g
	Orange	8 g	16 g
	Black	5 g	8 g
	Euk. Brown 2GR liq.	10 g	15 g
	Corial Binder IF	170 g	170 g
	Eukanol Binder 40B	80 g	80 g
	Paste FA	20 g	20 g
	Filler FI 1261	40 g	40 g
	Wax 660	20 g	20 g
	Corial Lustre E	20 g	20 g
	Baysin NL	20 g	20 g
	water	580 g	530 g

- spray dye, 2 x pigment solution, 1 top coat (Base S)  
emboss, mill 24 hours, 1 top coat, Finiflex 80°C

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Finishing Trials: Finishing of Lining Leather, 6 pieces with pigment

pigment coat:	Eukesolar Brown 2GR	5 g
	Yellow GL	5 g
	Lepton Brown	15 g
	Black	5 g
	Yellow	40 g
	Orange	40 g
	Corial Binder IF	130 g
	Euderm Binder 40B	80 g
	PasteFA	20 g
	Filler F 1261	40 g
	Wax 660	20 g
	Baysin NL	20 g
	Water	590 g

3 pieces 1 x pigment coat  
3 pieces 2 x pigment coat, Corial Base S diluted with water  
1 x top coat, finiflex 100°C-120°C

Finishing of Lining Leather, F

pigment coat:	Lepton White	26 g
	Caramel	58 g
	Brown	14 g
	Black	2 g
	Corial Binder IF	200 g
	Euderm Binder 40B	80 g
	Filler FI 1261	50 g
	Wax 660	30 g
	Penetrator 1079	20 g
	Water	520 g

1-2 pigment coats, 1 top coat, Finiflex 100°C

Aniline-Finish of Softy-Upper-Leather, dyed brown

Spray coat:	Eukesolar Brown 2GR	20 g
	Lepton Brown	10 g
	Caramel	10 g
	Corial Binder IF	170 g
	Euderm Binder 40B	80 g
	Filler FI 1261	50 g
	Wax 660	20 g
	Lustre E	20 g
	Baysin NL	20 g
	Water	620 g

3 spray coats, 1 top coat, Molissa, mill 8 hours,  
Finiflex 80°C

Hermann A. Eckert  
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Finishing Trials: Pigment Finish of Softy-Upper-Leather, dyed brown

Pigment Coat:	Lepton Caramel	53 g
	Brown	22 g
	Orange	15 g
	Black	10 g
	Corial Binder IF	150 g
	Euderm Binder 40B	50 g
	Filler FI 1261	40 g
	Wax 660	20 g
	Baysin NL	20 g
		620 g

1 x pigment coat, 1 top coat	Corial Base S	100 g
emboss, mill 8 hours,	Matting Agent	50 g
1 top coat, Finiflex 80°C	Q 208	15 g
	butylacetate	100 g
	water	100 g
	water	200 g

Finishing of Black Sheep Nappa, Rejects

Trial	I	II	
Lepton Black	58 g	78 g	
Blue	2	2 g	
Eukesolar Black 2R 150%	10 g	15 g	
Corial Binder IF	150 g	150 g	
Binder CHN	70 g	70 g	
Euderm Binder 40B	40 g	40 g	
Filler F 1261	40 g	40 g	
Euderm Paste FA	10 g	10 g	
Was 660	20 g	20 g	
Lustre E	20 g	20 g	
Baysin NL	20 g	20 g	
water	570 g	550 g	
3 slight pigment coats,	Corial Base S		100 g
1 top coat, mill 8 hours,	NL matt		50 g
1 top coat, Finiflex 80°C	Wax S		10 g
	Celulosilo 6		10 g
	Euk. Black 2R 150%		5 g
	butylacetate		100 g
	water		100 g
	water		200 g

observations:

- if skins are not sufficiently black dyed, give first aniline spray coat with 100 g Eukesolar Black 2R150%<sup>1</sup>.
- for Black Topcoat use Corial EM Base Schwarz ~~DK~~ to ensure good fastness properties and black shade
- check fastness properties before production starts
- trial Nr. 2 : deeper black

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Finishing Trials: Finishing of Brown Sheep Nappa, appr. 120 skins

Pigment Coat			
Lepton	Brown	35 g	1750 g
	Caramel	28 g	1400 g
	Black	35 g	1750 g
Corial	Binder IF	160 g	8000 g
	Binder OHN	50 g	2500 g
Euderm	Binder 40B	40 g	2000 g
	Paste FA	10 g	500 g
Filler	FI 1261	40 g	2000 g
Corial	Lustre E	20 g	1000 g
Wax	660	20 g	1000 g
Baysin	NL	20 g	1000 g
water		540 g	2700 g
		1000 g	5000 g
Top Coat			
Isoderm	Base HF		100 g
	NL matt		50 g
	Wax S		10 g
	Q 208		13 g
	butylacetate		100 g
	water		100 g
	water		200 g

3 slight spray coats, the bad skins 1 spray coat more,  
1 light top coat, mill 8 hours, finiflec appr. 80°C,  
1 light top coat

observation- coverage and handle very good, natural  
- do not spray wet spray coats!

Finishing of Upper Leather, Light Brown

Aniline spray	Eukesolar Brown 2G150%	50 g
	Thinner	100 g
	water	350 g
Pigment Coat		
	Lepton Orange	65 g
	Bordo	30 g
	Black	5 g
	Eukesolar Brown 2GR	10 g
	Corial Binder IF	200 g
	Euderm Binder 40B	60 g
	Filler FI 1261	40 g
	Wax 660	30 g
	Baysin NL	20 g
	water	550 g

1 anilin spray coat, dry, 3 pigment spray coats,  
1 top coat, plate

Finishing Trial: Finishing of Lining Leather, Medium Brown  
Semi-Aniline-Finish 50 pieces

dye stain	Eukesolar Yellow GL	50 g	500 g
	Brown 5RL	40 g	400 g
	Isopropanol	100 g	1000 g
	Baysin NL	20 g	200 g
	Water	500 g	5000 g
pigment coat	Lepton Yellow	14 g	140 g
	Orange	52.5 g	525 g
	Black	3.5 g	35 g
	Eukesolar Yellow GL	12.5 g	125 g
	Brown 5RL	10.0 g	100 g
	Corial Binder IF	140 g	1400 g
	Euderm Binder 40B	40 g	400 g
	Filler FI 1261	30 g	300 g
	Wax 660	20 g	200 g
	Eukanol Paste FA	20 g	200 g
	Baysin NL	20 g	200 g
	water	660 g	6600 g

1-2 dye stain spray coats, dry, 3 slight pigment spray coats,  
1 top coat, dry, plate or Finiflex, mill 8 hours or more,  
1 top coat if need be

observations: this lining leather can also be finished un-  
milled

- use Lepton Filler H instead of FI 1261
- use Corial Wax instead of Wax 660
- use Corial Mattierung G instead of NL matt

top coat	- Corial EM Base S	100 g
	- Corial Mattierung G	50 g
	- Wax S	10 g
	- Wax G (Silicon)	12-10 g
	- water	100 g
	- water	200 g

Observation: use for black finishes no clear top coats,  
use instead Corial EM Base B lack DK - pigment  
Corial EM Black S - dyestuff  
to avoid a grey black and to intensify black  
shade

March 4th, 1990

Finishing Trial: Finishing of Blue Chevreaux

		<u>Trial 1</u>	<u>Trial 2</u>
dye stain spray			
	Bayderm A blue liquid		100
	Butylacetate		100
	Baysin NL		20
	Water		780
Pigment coat	Lepton Blue	50	10
	Bayderm A Elue liq.	10	20
	Lepton White	10	
	Filler 1261	20	30
	Corial Lustræ E	80	100
	Eukanol Binder 4OB	100	150
	Corial Binder IF	100	-
	Eukanol Paste FA	20	40
	Wax 660	30	
	Water	600	620
Top Coat	Corial Base S		100
	Water		50
	Water		100

Trial Nr. 1: 3 pigment coats, 1 top coat, finiflex 80°C,  
1 top coat, finiflex 110°C

Trial Nr. 2: 1 dye stain, dry, 2 pigment coats, 1 top coat,  
finiflex 80°C, 1 top coat, finiflex 110°C

Trial Nr. 3: 1 dye stain, 2 x pigment coat Nr. 1, 2 Pig/  
ment coats Nr. 2, 1 top coat, finiflex 80°C  
1 top coat, finiflex 110°C

Hermann A. Eckert  
Unido Consultant

14. February 1990

Finishing - Discussion points

- Pigments - anorganic / organic - concentration range
- white pigment - anatas / rutil
- black pigment - covering / shading
- light fastness - 7 --- 4 (pastel shades)
- migration fastness - heat / solvent
- coverage - overloading -- black / white
- film elasticity - fastness properties
- quantity - aniline - semi-aniline - covered  
 10-30 30-70 70-150
- casein-free pigments
- application in the drum
- aniline-pigments
- Dyestuffs - liquid dyes - metal complex dyes - acid dyes - basic dyes - solvent dyes
- application in the finishing department
- quantity
- fastness properties - light fastness  
 migration fastness  
 solvent fastness  
 formaldehyde
- compatibility
- Binders - acrylic - polyacrylic - polyester -  
 - polyurethane  
 - co-polymer - acryl / vinyliden  
 - butadiene / acrylic  
 - vinyl / butadiene  
 - polymere butadiene  
 - mixtures of copolymeres  
 - fastness properties - migration / penetration /  
 - adhesion / rubbing fastness / cold resistance  
 alcohol fastness / flexometer  
 - concentration  
 evaluation - dry / sticky / filling / natural /  
 - plastic / glazable / platable / shiny  
 - flow-out / covering  
 - transparent / milky

- casein-replacements -  
condensation products of a protein / polyamid  
= for glazed or satinated finishes

- Lacquers
- solvent based products - polyamid  
polyurethane  
nitrocellulose  
cellulose ester
  - lacquer emulsions - solvent / water

- Auxiliaries
- bottomer - oil base - for buffed leather
  - penetration - tensio active substances
  - flow out
  - matting agents - inorganic / silicate  
- organic
  - fixation - crosslinking; *aziridine 1-4%*
  - wax - emulsion of waxy esters
  - thickener
  - softening agents
  - handle
  - water repelling agents

Various auxiliaries : blood / albumine / caseine / carnauba wax /  
irish moss / dextrine / egg yolk / gelatine  
caoline / lin seed / marseille soap /  
methylcellulose / milk / talc

Working in the colour kitchen -

- preparation of a formula
  - equipment - balance / cup / brush / products
  - calculation of quantity
  - formulation / composition / limitations
  - application quantity
  - solvent-free finishes
  - Curtain Coating Machine
  - Roll Coating Machine - reversible
- Finiflex



Hermann A. Eckert  
Unido Consultant

22. February 1990

A. Pigments

- today mostly casein-free pigments are being used = technical advantage
- for white finish use preferably an anatas pigment, for pastel shades and shade combinations a rutyl white pigment - higher coverage power
- Differentiate between Black, Deep Black and Shading Black
- A complete range of pigments from white to black consists of inorganic and organic pigments and mixtures of the two.
- The light fastness of all shades, especially pastel shades, is very important, requires the knowledge of the light fastness of each pigment in full and pastel shade.  
Minimum lightfastness requirement = 5
- Pigments should be sufficiently heat resistant, should not change shade whilst being plated at high temperatures (130°C)
- Migration fastness important, as fastness to solvents = during shoe production.
- Pigment quantity determines the coverage or anilin character of the film or finish, overloading of film will ultimately destroy film properties. Example: black.
- Pigments are also employed in the drum to intensify the white retannage or black dyeing, or to improve dyeing effect - intensity / levelness.

Lacquer Pigments

- Specific pigment range to be used in lacquers with solvents.

Aniline Pigments

- Effect similar to aniline dyes, very high light and migration fastness properties

### B. Dyestuffs for Finishing

- Liquid dyestuffs for general use ( - in solvent )  
Usable with solvent or water in all applications.  
Application quantity 10 - 100 g/l
- Liquid dyes, water based, for drum dyeings and finishing
- Metal-Complex-Dyes, powder form, for drum dyeing and finishing  
High concentration = no salt addition = high brilliance =  
covering power = fixation = no migration. (0-20 g/l)
- Acid dyes - restricted application in finishing (0-20 g/l)
- Basic dyes - Powder and liquid form = for specific application  
= high gloss and coverage = - migration / light fastness !
- Organic Metal Complex Dyes (Zapon, Zapon Fast, Orasol)  
for spray dyeings or as addition to lacquers (0-20 g/l)

### C. Binders

Polymers based on acrylate - butadiene - polyurethane and combinations are used.

Typical differences:

Acrylates: good adhesion, high light fastness, good flexing properties

Butadienes: good coverage and filling properties, cold crack resistance.

Polyurethanes: good adhesion, light fastness, cold crack resistance, good flexing properties. Film properties can be varied extensively.

Binders with reactive groups can be crosslinked which improves resistance to water, solvents and flex, e.g. overall properties:

The choice or the combination of the binders being used depends on the leather article, the appearance, the handle and the required fastness property level.

The quantity to be employed again depends on the leather article and the technical requirements

aniline leathers

--- 100 g/l

split upper leather

--- 500 g/l

#### Optical and handle evaluation

transparent / milky / natural / plastic / filling / covering / dry / sticky / matt / shiny / platable / glazable / flow/out

- Casein/replacements, based on condensation products of a prote polyamid are needed for polishable, glazable and satinated finishes with a high gloss.

D. Auxiliaries

- Bottomer - oil base / binder
- Penetration / Driver - tensio active substances / solvents
- Matting agents - organic / inorganic products
- Flow-out - fluor /
- Crosslinking Agents - fixation
- Wax - emulsions of waxy esters
- Thickeners
- Softening agents - Sulforicinate, polyglycoether
- Handle - silicon / fluor / wax / oil /
- Fixation agents - for dyeings, films
- Intensifying Agents - for drum or spray dyeings
- Water repellent agents - chrome stearates, a.s.o.

Natural Auxiliaries

E. Topcoats / Lacquers

- Which type of top coat is being used depends on the article and the physical finish requirements:

Shoe Upper Leather

- casein top coat
- aqueous acrylic top coat \*\*
- aqueous PUR top coat \*\*
- aqueous emulsion lacquer
- ✓ solvent emulsion lacquer
- NC solvent lacquer

\*\* = crosslinked = higher properti.

Garment, furniture and car upholstery leather, sport shoes

- 1 comp. PUR solvent based top coat
- 2 comp. PUR solvent based top coat

Available lacquers:

- Nitrocellulose
- Nitrocellulose/emulsion
- Polyurethane / Nitrocellulose
- Polyesterpolyol
- Polyamide
- Polyurethane

Water based lacquers:

- Nitrocellulose emulsion

## The Colour Kitchen

### - The work bench

To permit the preparation of small trial quantities quickly and efficiently, a work bench with a balance is needed.

Behind and to the side of the bench should be shelves on which all required chemicals (pigments / binders / dyestuffs / auxiliaries / lacquers / solvents / e.t.c. ) are being stored in 0.5 or 1.0 kg plastic bottles within reach. All bottles must be kept closed to avoid evaporation or thickening of the products, but permit easy removal even in the smallest quantities.

To avoid unnecessary material loss for trial quantities and assure reproducibility for production quantities a balance permitting the weighing of quantities as small as 0.1 g is recommendable. It allows the preparation of the exact quantity required for a trial, e.g.

150 g pigment solution for a sheep skin  
or 300 g pigment solution for a upper leather side  
or correspondingly more. Thus daily losses of material are avoided.

For easy handling cheap plastic cups (400 cc) are recommended, just as brushes and spatulas which can all be re-used quite often.

The original packages in which the various materials for the finishing are delivered should be opened only when production batch quantities are being prepared.

Preparation of a Pigment Solution

For example	100 g pigment paste
	200 g water
	50 g Filler
	20 g Top
	20 g Wax
	150 g Binder A
	100 g Binder B
	50 g liquid dye
	<u>310 g water</u>
	1000 g

Make sure that during the preparation all products are properly mixed and no precipitation does occur.

Weigh pigments first, add part of the water and stir well with brush. Then add the auxiliaries and binders, stir after each addition. Add liquid dyes, preferably diluted 1: 1 or with the rest of water to avoid precipitation.

Observe indications of suppliers how chemicals should be added, take necessary safety precautions.

Filter pigment solution to make sure that no precipitation has taken place. Spray solution onto a piece of leather, then check shade, appearance and handle. The result must correspond with sample or expectation.

Shade corrections are permissible within tolerable limits (appr. 5 %). Otherwise adjust binder and auxiliary quantities as well.

If need be, rectify pigment mixture to assure future reproducibility.

Calculation of production quantity consumption

The spray quantity of a pigment coat may vary between appr. 4 - 10 g/sq.ft. Therefore a side leather with 12 sq.ft. average size will consume with each spray

<u>spray coat</u>	<u>1 x</u>	<u>2 x</u>	<u>3 x</u>	<u>4 x</u>
4 g / sq.ft.	48 g	96 g	144 g	192 g
5 g / sq.ft.	60 g	120 g	180 g	240 g
6 g / sq.ft.	72 g	144 g	216 g	288 g
7 g / sq.ft.	84 g	168 g	252 g	336 g

pigment solution. Additionally the wastage created by the spraying machine, 20 / 40 %, must be taken into consideration.

Average figures are thus easily established, so that the actual consumption of spray solutions can be prepared

for example: side leather      200 g / pro side 12 sq.ft.  
                  sheep skin        100 g / pro skin 4.5 sq.ft.

## Leather Finishing - Market and technical requirements

For export purposes, leather today must have an appearance and handle as natural as possible. In addition it must fulfill the required fastness properties and be light weight.

The raw material, the available hides and skins, has too many defects, such as brand marks, scratches, holes etc, so that it is technically not easy to produce the quality and grades which the consumers require and demand. Therefore, all chemical and mechanical means and methods must be employed to avoid inferior leathers which nobody wants to use and buy.

For many hides and skins with damaged grain side, a suitable outlet has been found with the production of suede, hunting or nubuck. The dictates of fashion ensure that the available quantities here will be sold. Additionally the use of various machines helps to reduce the negative effects of grain damage. Embossing plates with many variable designs are able to hide a lot of defects, but can not be used for smooth leather articles. Here pore or haircell plates are commonly used. And this quite often already at the beginning or during intermediary stages to make their effect as invisible as possible on the finished leather. Additionally the possibilities which milling the leather or the production of shrunken grain provide help too.

Most recent is the wide use of the roll-coating or reverse-coating machines which again differ widely from what can be done with the curtain-coating machine. It remains to be mentioned that also polishing effects and once again glazed finishes are being applied to improve quality and appearance.

On the application side also a lot can be done to obtain optimal results

- use the proper application method
- more finishing operations may be required when the quality of the raw material decreases.
- select the adequate formulae to obtain optimum appearance, handle and properties
- decide what is needed: bottom coat - stain dye - pigment coat - printing effect - effect colour - top coat I - top coat II
- use adequate binder combination - quantity and quality

- add auxiliaries to influence handle, levelness, gloss, penetration, flow-out, fastness properties, a.s.o.
- choose proper pigment quantity and combination for effect and coverage within normal application methods
- decide whether or not to use the addition of dyestuffs to enhance aniline character or brilliance of finish
- check selection and ensure result before starting production

### Aniline Finish

Even an aniline finish should permit some coverage, improve surface levelness and give, if desired, brilliance.

An aniline finish can consist of

- dye stain - anionic liquid dyes
- top coat

The addition of a PUR-dispersion in the stain coat offers the advantage that it is even less film forming than an acrylic resin and can be polished which gives a smoother and more natural handle.

- An additional cationic liquid dyestuff spray coat + a cationic PUR-dispersion can be given for better coverage and brilliance, but this will result in a lower light fastness and migration resistance.

The addition and amount of solvent to the dye stain must be decided upon (methoxy propanol - isopropanol - ethylglycol - denaturated alcohol) and or the addition of some driver.

A polishing ground offers some technical advantages

- better filling and coverage
- more levelling effect / smoother grain

Here casein products and wax or oil-based products are being used and followed by a through-feed plating at 140°C.

Then the effect colour of a roll-coating machine (appr. 1 g/sq.ft.) with liquid dyestuffs or pigments is applied with a pattern design roller for a cloudy effect which hides grain defects quite well. (Viscosity appr. 25-30 sec., DIN cup 4 mm) Coupled with milling, optimum results are obtained.

The dry and wet rubbing fastness of such an aniline finish then will depend almost exclusively on the top coat.



### Pigmented Finishes

If the possibilities of an aniline or semi-aniline finish do not lead to an acceptable result and even milling or embossing does not help, then the leathers must be more heavily pigmented or buffed.

For the heavily pigmented full grain leathers the same possibilities for up-grading exist as for aniline or semi-aniline leathers.

For the classical corrected grain side leather - e.g. black and white - curtain-coating or reverse-roll-coating processes are used. But this leather has been standard for many years and the selling price is very low.

Today, a very soft, dry drummed corrected grain leather without impregnation is being asked for. To keep here the leather soft, padding or even spraying may be out. Here a highly concentrated formulation without water applied with the roll-coater machine (a fine screen roller) may provide the answer = 2-4 g/sq.ft. The subsequent pigment coat can be applied by normal spraying or air-less spray. Then a spray or printing effect colour may follow.

Important for the look and handle, but also for the physical properties is the base coat which determines also the dry and wet flexing properties. Therefore, a proper binder combination must be chosen. If crosslinking binders are employed, higher fastness properties can be obtained.

The top coat employed depends on the fastness requirements, but efforts must be undertaken to eliminate the use of solvents as soon as possible.

Hermann A. Eckert  
Unido Consultant

April 5th, 1990

Finishing Trials: Finishing of Lining Leather in Black

dye stain	Irgaderm Black M 209 liq.	100
	Butyl acetate	100
	Baysin NL	20
	water	280
pigment coat	Lepton Black	60
	Filler 75	30
	Corial Binder W60	70
	M60	50
	Eukanol Binder 40B	70
	Paste FA	20
	Irgaderm Black M209 liq.	15
	water	600
Top Coat	Melio ES 111	100
	Thinner S 4830	100

1 wet dye stain, dry, 3 pigment coats, 1 top coat,  
 emboss/haircell/mill, 1 top coat

observations: - add Baysin NL 30 g/l if necessary  
 - increase Irgaderm Black M209 liq. from 15 g  
 to 30 g/l if necessary  
 - if more coverage is required, reduce water  
 to appr. 450 g

Finishing of Lining, Light Brown

pigment coat:	Eukesolar Brown 3RL	10
	Brown RG	10
	Lepton Caramel	
	Brown	14
	Black	2
	Yellow	36
	Filler 75	30
	Corial Binder W60	50
	M60	50
	Eukanol Binder 40B	80
	Paste FA	20
	Luron Top	20
	Wax FF	20
	Baysin NL	20
	water	660
top coat	Melio NL 500	300
	Melio ND 221	30
	Thinner S 4830	600

remarks: - use more pigment, up to 100 g/l, if more  
 coverage is required  
 - depending on shade, start with dye stain

2-3 pigment coats, 1 top coat, mill 8 hours or emboss/mill

Hermann A. Eckert  
Unido Consultant

Addis Ababa, April 4th, 1990

Ethiopian Leather Industry

- Marketing
- Production
- Prospects

Seminar, April 10th, 1990

Addis Ababa, 4th April 1990

Leather Industry - Seminar April 10th, 1990

- Marketing - Ethiopia Leather Industry - market volume  
- market potential
- Marketing Intelligence
    - know how about competition
  - Sales Organisation
  - Optimal Leather Articles for Export
    - bovine full grain / softy / smooth  
aniline / pigmented
    - sheep skins / nappa / shoe upper / suede  
aniline / pigmented / glazed / plated
    - goat skins / clothing / shoe upper / suede  
aniline / semi-aniline / pigmented / glazed
    - split / shoe upper / suede
  - Logistic / Rolling Forecast
  - Purchasing Policy

*leather goods  
Safian  
book binding  
leathers*

Production

- Sorting of Hides and Skins for Production
- Grading of Hides and Skins during Production
- Influence of Proper Execution of Tanning Operations on the Quality of Leather
- Piling of Wet Blue Hides and Skins
- Machine Performance
  - Fleshing Machine
  - Splitting Machine
  - Shaving Machine
  - Sammying Machine
  - Set Out Machine
- Responsibility
- Influence of Retannage / Fatliquor / Dyeing on Finishing - remedies "auxiliaries"

New Article Elaboration

- Laboratory Equipment
- Pilot Tannery
- Scale up of Articles / Matchings
- Quality Control / Shade / Fastness / Appearance
  - Finish / Dyestuff / Suede
- Selection of Finishing Method and Products
- Samples / Evaluation / Integration

Training of Personnel

- Handling of Leather
- Professional Training

Conclusion

- Sales Budget Export 1991 - 1992 - 1993

**SEMINAR ON ETHIOPIAN LEATHER INDUSTRY**  
**PRESENTED BY: UNIDO IN COLLABORATION WITH NLSC**

**PROGRAMME**

10/4/1990

Time	Topic	Presenter
8:00 - 8:15 a.m	Registration of Participants	
8:15 - 8:30 a.m	Opening Speech	G.M
8:30 - 9:30 a.m	Marketing	Mr. H.A. Eckert
9:30 - 10:00a.m	Discussion on MKTNG	Participants
10:00 - 10:20a.m	Coffee Break	
10:20 - 11:20a.m	Production	Mr. H.A. Eckert
11:20 - 12:00a.m	Discussion on Production	Participants
12:00 - 1:00 a.m	Lunch Break	
1:15 - 1:45 P.m	New Articles Elaboration	Mr. H.A. Eckert
1:45 - 2:00 p.m	Discussion on above Presentation	Participants
2:00 - 3:00 p.m	Leather Articles (1-4)	Mr. D. Tracy
3:00 - 3:20 p.m	Coffee Break	
3:20 - 4:20 p.m	Leather Articles (5-7)	Mr. D. Tracy
4:20 - 5:00 p.m	Discussion on L/A Presentation	Participants
5:00 - 5:15 p.m	Summation	
5:15	End of Programme	

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Annex VII

ETHIOPIAN MANAGEMENT INSTITUTE  
PRODUCTIVITY IMPROVEMENT CENTRE  
LEATHER PROCESSING WORKSHOP

I. OBJECTIVES

- Increase the production of hides & skins, improve the quality and collect the uncollected hides & skins through training the extension agents and giving consultancy to the Ministry of Agriculture and concerned organizations.
- Raise the productivity of tanneries
- Adapt newly developed Leather Technology processes to the Ethiopian Objective realities.
- Develop methods of preparing leather processing chemicals from indigenous raw materials so that imported chemicals could be partly and at last replaced.
- Improve the present methods of tannery processes and rural tanning.

II. STRATEGIES

- Research
- Consultancy
- Training
- ~~Training~~

III. CLIENTS

- National Leather & Shoe Corporation; Tanneries
- Ministry of Agriculture; Livestock Products Marketing Development Department.

.../

- Handicraft and Small Scale Industries Development Agency
- Ministry of Social Affairs
- Ministry of National Defence
- Wild life conservation and Development Organization
- Ministry of Education: Adult Education Department
- Private Tanneries
- Private Hides & Skins Dealers
- Taxidermists
- International Livestock Centre for Africa ( In. C. A. )
- Abattoirs

IV. COURSES OFFERED

	<u>Course Title</u>	<u>Duration</u>
1.	Hides & Skins Quality Improvement	2 Months
2.	Raw Hides & Skins Classification and Grading	1 "
3.	Beam House Operation	2 Weeks
4.	Tanning-Retanning & Fat liqueuring	1½ Month
5.	Dyeing & Finishing	1½ "
6.	Classification and Grading of Semi-processed and Finished Leathers	1½ "
7.	Leather Manufacturing Technology	6 Months
8.	Rural Tanning	3 "

.../



V. ACCOMPLISHMENTS

1. Research

- Ostrich Skin Processing
- Pig Skin "
- Rural Tanning Methods Standardisation
- Extraction of Tanning Material from Indigenous Plants
- Effect of Feeding Methods and breed on the Quality of Ethiopian Highland Sheep Skins.

2. Consultancy

- National Leather & Shoe Corporation
- Ministry of Agriculture
- Handicraft and Small Scale Industries Development Agency
- Wildlife Conservation and Development Organization
- International Livestock Centre for Africa
- Addis Ababa Abteir
- Private Tanneries

3. Training

<u>COURSE TITLE</u>	<u>Number of Trainees</u>
- Leather Manufacturing Technology	167
- General concepts of Leather Technology	94
- Classification & Grading of Semi-processed & Finished Leathers	28

.../

<u>COURSE TITLE</u>	<u>NUMBER OF TRAINEES</u>
- Hides & Skins Quality Improvement	581
- Tanning - Retanning & Fat liqueuring	139
- Beam House Operation	316
- Raw Hides & Skins Classification & Grading	58
- Rural Tanning	6
- Finishing	27
- Dyeing & Finishing	<u>14</u>
T O T A L .....	1430

#### VI. FUTURE PLAN

- Raise the National Revenue from Hides, Skins and Leather;
- Conduct more research so that the dependency on imported chemicals and technology could be reduced;
- Conduct more research so that more appropriate Leather Technology could be formulated based on the objective reality of our country and the demand of the market;
- Improve the methods of production and preservation of Hides & Skins so that they could be conducted with minimum cost and wastage as well as the quality could be improved;
- Process the tannery and abattoir trainings, fleshing, bone, blood etc. into usefull commodities ( animal feeds, glue, gelatine etc. );
- Conduct research so that the tannery processes become shorter, cheaper and simpler;
- Develop more links and exchange experience with International Sister Leather Research and Training Institutions.
- Add more courses appropriate to the demand of the client organizations.