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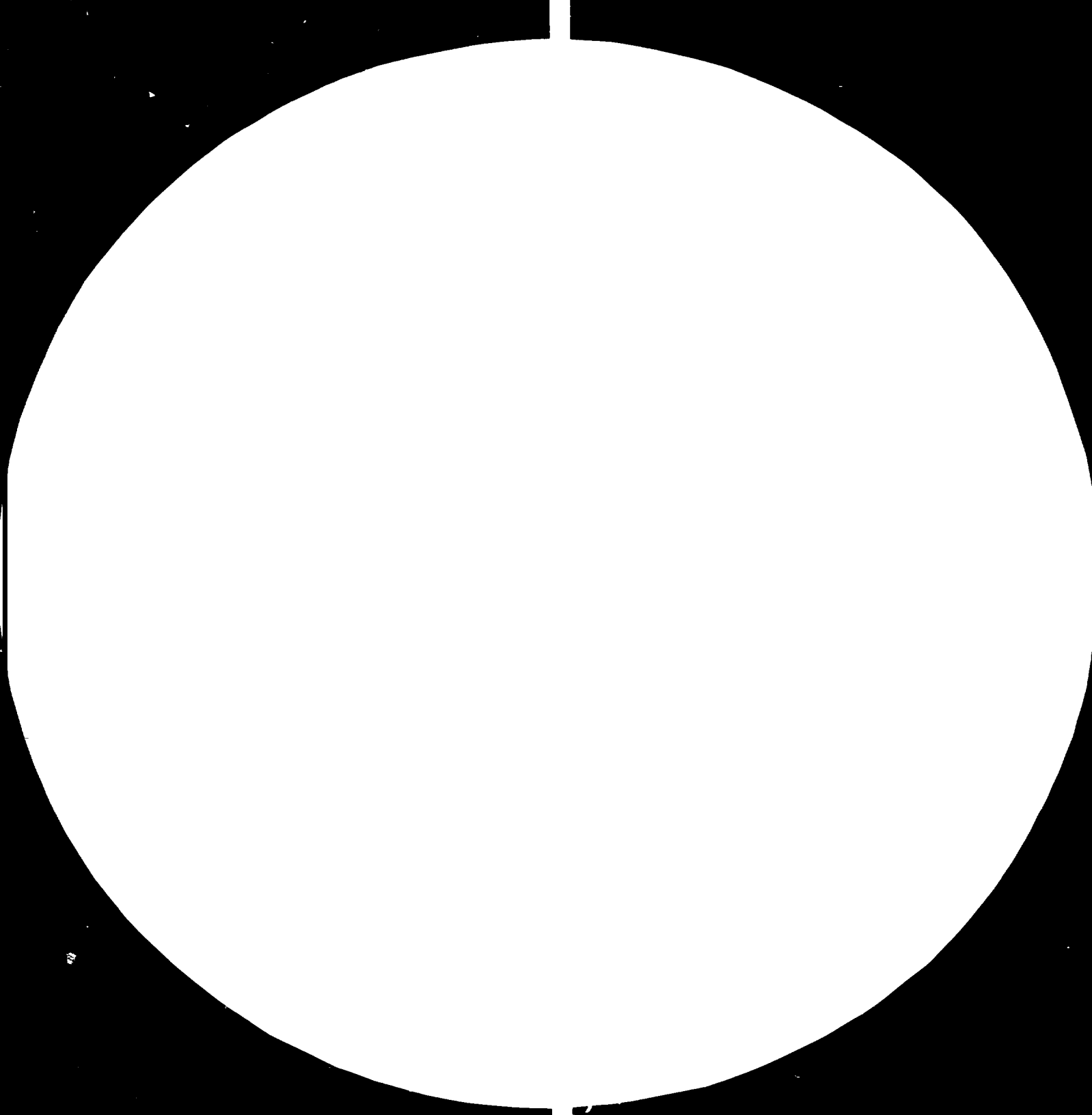
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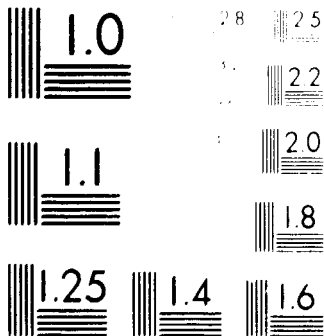
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ASSISTANCE TO REGIONAL CENTRES FOR  
TECHNICAL RESEARCH AND ASSISTANCE

DP/TEX/77/003

MEXICO

Technical report:

Technological assistance to the tanning industry

Prepared for the Government of Mexico  
by the United Nations Industrial Development Organization,  
executing agency for the United Nations Development Programme

Based on the work of Bo Lundén, tanning expert

United Nations Industrial Development Organization  
Vienna

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

Explanatory notes.

During the period of the mission the value of the local currency was approximately

22.5 Mexican pesos to 1 United States dollar

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CONACYT = Consejo Nacional de Ciencia y Tecnología  
CRIAT = Centros Regionales de Investigación y Asistencia Técnica  
CIATEG = Centro de Investigaciones y Asistencia Tecnológica de  
Estado de Guanajuato  
UNDP = United Nations Development Programme  
UNIDO = United Nations Industrial Development Organization  
R & D = Research and Development

Acknowledgement.

For this report many persons in governmental and international organizations and institutions as well as in industry, besides those mentioned below, have been involved through interviews, discussions or other activities. They have all shown great interest in the work and an evident wish to aid and collaborate, for which a sincere appreciation and gratefulness is expressed.

Abstract.

A ten week mission during June - September 1980 was completed by a tanning expert to give technological assistance to the tanning industry in León/Guadalajara, Mexico, under the project "Assistance to Regional Centres for Technical Research and Assistance" (DP/MEX/77/008). CIATEG (Centro de Investigaciones y Asistencia Tecnológica de Estado de Guanajuato), working in the field of shoe and leather, has for its R&D unit proposed a program, which has been studied and with certain adjustments is recommended to be approved and implemented. Further recommendations, to improve the pilot plant, to up-grade the capability and the experience of the staff and to strengthen the links with industry, are made.

Some pilot plant work - primarily to increase the capability of the staff, some technical assistance to several tanneries and a seminar on leather production were carried out.

The tanning industry in Mexico is a mixture of many small, some medium and a few fairly large tanneries. León, the most important tannery area in the country, has an estimated 250, usually small tanneries. The majority of the tanners, with obvious exceptions, has a rather rudimentary knowledge of leather processing technology. The auxiliary raw material suppliers are usually responsible for methods and formulas. The need for development inside the industry is very great and consequently also the need for an institution like CIATEG with its R&D work and continuous technical assistance to the tanneries.

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## INTRODUCTION

### Background.

CIATEG (Centro de Investigaciones y Asistencia Tecnológica de Estado de Guanajuato) - one of the centres comprising CRIAT (Centros Regionales de Investigación y Asistencia Técnica) is at the moment dealing almost exclusively with the tanning and the shoe industries, both of extreme importance to the city of León. It is estimated, that about 250, small to fairly large, tanneries are operating in the city, primarily supplying some 400 to 450 local shoe factories. This makes León, as to tanning capacity, the largest of the three main tanning centres in Mexico, Guadalajara and Mexico City itself comprising the other two.

The relationship of CIATEG with, and access to, the tanning industry was never as close or as beneficial as that with the shoe industry. Some reasons for that can be explained, others are rather intangible. Therefore, the tanning industry demands and receives far fewer services, although the tanners could benefit greatly from good advice and technical services, particularly from the laboratory, R & D and the pilot plant. In addition, the materials available in Mexico are not optimally used and the tanning processes are mostly antiquated.

It seems that a revival of interest through orientation on the spot, through offering new, easily adaptable processes as well as indications for the proper use of familiar materials, and finally through a visibly increased capability of CIATEG's staff to serve the tanning industry would consolidate and improve the relations between the Centre and the industry, considerably increase the participatory use of the Centre's services and lead to better products, i.e. higher quality leather, and greater productivity.

An earlier two weeks mission in June 1980 by Mr. W. Vos, expert in the field of tanning and leather production, under the same project (DP/MEX/77/008/11 - 14/A) studied and evaluated the applied research programmes presented by CIATEG. The programs were in the main judged to be good with some reservations as to their being valued by the industry due to the poor theoretical



and practical knowledge of the tanners and as to the time and effort needed for their implementation.

Official arrangements.

Based on the foregoing, the Director of CIATEG, Mr. A. Rodriguez, requested the assistance of a tanning expert and in cooperation with the international team leader, Mr. J. Gilgun, of the on-going project "Assistance to CRIAT" (DP/MEX/77/008) formulated the purpose of the mission. A ten weeks assignment was approved under budget-line 11-06 (DP/MEX/77/008/11-06). The expert took up his duties on July 6th, arriving in León July 10th and leaving September 5th, terminating, after debriefing in Vienna, 12 September 1980. The friendly advice and collaboration of the international team leader, the director of CIATEG and their staffs have been a pleasant experience.

Objectives.

The main objectives were to broaden the capabilities of the tannery oriented staff of CIATEG and at the same time enhance the confidence of the tanning industry in the centre as detailed in the Job Description (See Annex I).

Originally a period of at least 6 months was proposed for the mission, but even so, it would probably have been too short a time to attain some of the objectives, especially those concerned with the expert's own R&D work. Within the ten week mission, and without prior acquaintance, neither of the equipment nor of the raw materials available at CIATEG or otherwise in León, it would virtually be impossible to attain any practical or significant results in this area. The situation was discussed with the international team leader and the director of CIATEG and it was decided not to change the job description, but to try to attain as much as possible of the stated objectives, focusing the work in the R&D more on methodology and how to organize such work.

## I. RESEARCH AND DEVELOPMENT WORK

### A. The pilot plant

#### Location.

The pilot plant is located in the main tannery area of the city, about 1.5 kilometres from CIATEG. It was presented to the Centre in 1977 by the Association of Leather Chemists and Technicians of León and occupies a minor part of the association's own premises. From the point of view of collaboration with the industry the location is excellent, but the distance to CIATEG does create communication and transport problems. All considered, it would surely benefit the work if the pilot plant had been under the same roof as the rest of CIATEG.

#### Equipment.

At present the equipment consists of 4 experimental drums, each having an inside diameter of about 1.4 metres and a width of about 0.6 metre, one experimental paddle, unfortunately with an inoperable motor, a small drying section with toggling and paste drying frames and a rather badly functioning oilheated steam generator to serve the drying section and to deliver live steam to heat water for the drums.

For all other operations the pilot plant depends on machines and operators in friendly tanneries. Although these were easy to find, the organizing of the work and the necessity to find mutually convenient times, inevitably caused delays and some confusion.

The pilot plant had not been in operation for over a year and consequently the malfunctioning of some of the equipment was not surprising. One of the drums was also inoperable because of breakages in the wood. Two drums had a common drive, i.e. both had to be run or stopped at the same time. All drums could be run in one direction only, but several speeds were available and also an automatic timer to allow for runs and stoppages during the hours when no personnel were present. The pegs inside the drums had very rough edges, which could and would cause damages to the hide material during the drum processes. Rounding and sanding the pegs to obtain a smooth surface should be done soonest possible.

The auxiliary equipment consisted mainly of three balances of different sizes. They were all in order, but for the work of this type, weighing scales would be preferable. A couple of wooden horses and some small tools should also be available.

Space.

The total space for the pilot plant must be considered very small and insufficient for work on a more continuous basis. The room is so narrow that a proposed exchange of the inoperable drum for a new one with a larger diameter - for a better re-tanning/dyeing/fat-liquoring operation - is out of the question.

B. Tanning experiments

Purpose.

Mainly in order to train the technical staff of the pilot plant a series of tanning experiments were planned and executed in the field of chrome upper leathers. The focus would be on demonstrating modern methods, starting with safe, fairly simple, formulas, but discussing during the work possible variations which would be necessary or beneficial in order to improve on the deficiencies almost certain to appear during the processing.

Execution.

By necessity only the chemical operations were to be carried out in the drums of the pilot plant, while the mechanical operations, which for the resultant leather quality are just as important, were to be carried out in neighbouring tanneries. Similarly, needed auxiliary raw materials, the majority of which were not available directly at the pilot plant, were to be acquired through the tanneries or in some instances directly from the suppliers of such materials.

For the initial processes, up to and including the chrome-tanning, the modern short float and powder methods given in Annex II were used. For subsequent operations the pilot plant staff, after discussions of pertinent processes, i.e., re-tanning/dyeing/fat-liquoring and suitable finishing methods, and taking available

chemicals into account, suggested appropriate formulas for the different end products. These formulas were then discussed further, adjusted if necessary, approved and executed.

As much as possible the pilot plant staff carried out the actual work also at the machines of the different tanneries. Most of the finishing operations were carried out at the well-equipped tannery "Impulsora Búfalo". The main features of the formulas used are also found in Annex II.

Raw hide materials and end products.

The raw, wet-salted hides were also obtained through a couple of tanneries and consisted of 10 US native steers and 15 domestic hides, which after rounding had an average weight of 28 and 22 kilogrammes respectively. The hides were cut in halves and batches of about 10 sides were processed in the drums. A dozen goat skins were also processed, but, because of the small total weight, they were treated in the smaller, acrylic drums in the laboratory of CIATEG.

The following typical end products were to be aimed at:

- Garment leather (a few sides)
- Shoe upper side leather:
  - . Full grain, aniline, light colour
  - . " " " dark "
  - . " " semi-aniline, light colour
  - . " " " dark colour
  - . Corrected grain, light colour
  - . " " dark colour
- Goat skins:
  - . Full grain, aniline, ladies' shoes upper leather
  - . Suède
- Split leather:
  - . Suède (hunting)
  - . Linings, pigmented, grain-simulating

The American hides, although unevenly cured in the salting, were considerably better than the domestic hides. These were badly damaged, on the living animal by insects, scratches etc., in the slaughterhouses by many and deep flaying cuts and also

through a bad curing. Evidently no mexican hides are flayed by the modern method of pulling, which fact is most unfortunate. Such methods ought to be introduced soonest possible in all slaughterhouses in Mexico for the benefit of the entire tanning industry.

### C. Discussion

#### The methods.

The used methods worked generally quite well, although changes or refinements, as indicated earlier, after checking the resultant leathers, would be needed for their use in a larger scale. But as a starting point for further development work for similar products the formulas were certainly appropriate.

#### Problems.

Some problems, mainly of three categories, were encountered during the work. The first refers to the equipment and cramped space of the pilot plant itself. As an example, although care was used in draining the drums, the liquors in some cases were touching leather from other drums already piled on the floor, resulting in some very badly discoloured sides.

The second category concerned the mechanical work done in the tanneries, which very often was not up to good standard. The fleshing, for example, was in most tanneries carried out rather badly, which of course adversely affected the leather quality.

The third type of problems was caused by irregular or low quality chemicals. In some instances the sulfuric acid had to be doubled against normal requirements - the low quality acid had evidently been diluted with water to a considerable extent, and apparently without protest from the tannery, or perhaps, without the tannery noticing the falsification. At another time the neutralizing salt was found to be much weaker than normal, etc.. Incidentally this points to one of the real problems for the tanneries in Mexico: the authenticity and control of common chemicals as well as proprietary products used in the tanning industry - the fat-liquoring oils are typical examples.

#### Personnel.

The pilot plant staff carried out their assignments with

interest and in a commendable way, but a better total planning of their work; i.e., their looking forward and planning the next phases in the continuing process, would greatly increase the efficiency. The exercise has visibly increased their understanding of tanning problems and their capability to tackle and solve them. Concurrently the work in the tanneries has also established a link with industry, which hopefully will bear some fruit in the future.

## II. TECHNICAL ASSISTANCE TO TANNERIES

### A. The seminar

#### Purpose.

In order to make new and old members of the tannery-oriented staff of CIATEG more aware of the practical aspects of tanning operations as well as to inform them about modern practices in leather manufacturing and about process and quality control, it was decided to hold regular meetings, at which the expert would talk about a given subject and then have some time open for questions and discussions. As this type of exercise was thought to be of value also to tanners interested in developing their know-how, it was subsequently decided to formalize the talks into a seminar and invite interested tanners to take part. This could also help to forge new links between the CIATEG and the tanning industry.

#### Program.

The seminar dealt with "Practical aspects of production and control of the chemical and mechanical processes in the tannery". All the different stages were treated, from raw hide to finished leather, including a discussion of machinery and chemicals, but with special emphasis on the later processes, re-tanning and finishing. A certain time was also allotted for a discussion of the importance of maintenance, work organisation, how to make factory trial runs and, last but not least, the continuous development of the factory processes.

The total time for the seminary was 24 hours, with 2 hours a day, 3 days a week. Originally, 22 August was to be the final day, but due to a few changes the seminar terminated on 25 August instead. A nominal fee was charged the tanners, as otherwise, as experience has shown, no interest would have been forthcoming. The language was all through Spanish. The invitation to the tanners is added in Annex III.

#### Participants.

From CIATEG 8 persons took part, 4 of them ordinary staff members and 4 holders of fellowships to the centre. From the industry came 18 technical people. The complete list of participants is found in Annex IV.

#### Comments.

The attendance was usually very good, although now and then some tanners had to abstain, allegedly for business reasons. The discussions were often lively and the observations and questions usually penetrating and interesting. In general it is felt that the seminar served its purpose very well.

### B. Visits to tanneries in León

#### The tanneries.

Of the estimated 250 tanneries in León, most are very small with a production of less than 100 hides a week. A few are medium-sized with about the same production per day. Very few process 400 hides a day or more, which production otherwise seems roughly to be the lower limit for a modern, mechanized unit. Many tanners buy some machine work from their neighbours and in fact there are some 150 entrepreneurs, who do not own any machines at all, but process all their leathers through contract tanning in cooperating tanneries. A donkey carrying hides in some stage of processing is a very common sight in the tannery quarters of León.

The production is mainly chrome-leather, although there are some fairly big vegetable tanning factories too. Altogether

some 15 tanneries were visited, of which several were represented at the seminar . In the list of participants (Annex IV) an asterisk indicates such a tannery. At the Visits the services of the expert for advice and discussions of production problems or other pertinent questions were made known to be available and in most cases this was taken advantage of. In some cases, rather extended assistance was provided. At all the visits a staff member of CIATEG was always present, not the least to get an idea of the problems found in the tanneries and how to attack these problems.

Comments.

With some obvious exceptions the tanners in general had a rather poor knowledge of modern production and control methods. Most relied for their processes on materials suppliers and the methods thus obtained seemed often to be more advantageous to the supplier than to the tanner. Indeed the need for training of tannery managers seemed to be very great. The need to control the chemicals and other tanning auxiliaries has been mentioned earlier and can evidently not be exaggerated.

The machine work was repeatedly very badly executed and reasonably good work seemed to be the exception rather than the rule. Partly this was due also to a maintenance of the machinery, that in most cases was below normal standard. Many new and very modern machines, such as splitting machines of the most modern design, wide and high-speed shaving machines, vibrating staking machines, vacuum driers, rotating ironing presses, the newest polishing machines, etc., etc. were seen in various plants, but it was curious to notice the usually very unbalanced production lines obtained thereby. Vital work was often performed in old and dilapidated machines, while the newest types were standing idle most of the time. The planning of the production and the purchasing of new machines seemed generally to be rather haphazard.

The over-all picture might, however, be somewhat distorted, due to the fact, that many factories were working below,



sometimes much below capacity. This had its roots in the raw hide market situation. The importation of American hides, used mainly for vegetable tanned sole leather, for which purpose almost no domestic hides could be used - being too light in substance, and for the better grade upper leather - such as full grain, aniline leather, was during the period in question more or less completely disallowed. This, on the other hand, caused the domestic hide prices to rise far above the international level with the result that most tanners refrained from buying, preferring to reduce production rather than accepting probable great losses.

As to the number of tanneries, it must be assumed that in time - as has happened under similar circumstances in other countries - many plants, smaller and larger, will close, leaving a rather reduced number of progressive, well-equipped and well-organized factories to produce in total even more leather than is produced at the moment. And these tanneries will be those that today are aware of the necessity to develop the know-how, the operating skills, the processes and the needed controls inside the factories and are taking action to this end.

### C. Visit to Guadalajara

#### Arrangements.

The purpose was to obtain at least a rough idea of the situation inside the tanning industry in this, the second most important leather and shoe producing area in Mexico. The international team leader, whose duty station is Guadalajara, had prepared a short but intensive study tour, including a visit to the tanning school attached to the University of Guadalajara. The visits took place 11-12 August and names and places are listed in Annex V. Part of the visits were made accompanied by the international team leader and the rest with one of his staff, which of course greatly facilitated the undertaking.

#### The tanning school.

The school is now giving a three year course in tanning

technology and some 15 technicians are graduated annually. The chemical education is integrated with other departments, but a fairly well-equipped physical laboratory for testing leather is available, evidently used for training purposes only. Recently a new, large and apparently well-planned building for a pilot plant has been erected at a cost of about 12 million pesos. The equipment, not yet installed, is now restricted to a number near production-capacity drums and a fairly big drying section with toggling and glass paste-drying frames. The rest of the machinery is missing and the tanning department is looking for sources to finance the purchasing of the machines. In reality the pilot plant as planned will be a complete tannery, larger than most now existing in León or Guadalajara. The further cost will probably be rather more than less than 1 million US dollars. A long discussion of the situation in the industry and of the needs of training and R&D. took also place during the visit.

#### The tanneries.

A similar estimation as that of León points to an existence of about 150 tanneries in Guadalajara. The mixture of small and large factories is more or less the same in both cities, but it seems as if the largest tanneries in Guadalajara are somewhat larger and more extensively equipped with modern machines than those in León. The visits were made to the largest and most important factories, the exception being the Curtidos Canadá, which is under reconstruction and enlargement. This factory has only one customer: the huge shoe factory, Calzado Canadá (present daily production approximately 54,000 pairs of shoes of all kinds, from simple canvas shoes to leather dress shoes). The production manager of the tannery is also acting as coordinator at the tanning school mentioned earlier.

#### Comments.

In spite of the greater number of machines in the large factories, the situation as to processes, organization, control, etc. seems to be similar to the one in León. Most of the tanners

are self-taught and, although in many cases possessing an impressive practical experience, do not have more than a rather rudimentary knowledge of the basic principles of tanning and finishing. Some companies, however, have started to employ chemical engineers, who are able to understand and will probably fairly quickly learn these principles and pick up the necessary know-how. A number of problems were discussed at the different factories and advice and hints about processes etc. were provided on those occasions.

As to the school, the plans are very ambitious, but it could be questioned if such a large pilot plant is reasonable under the circumstances existing. The whole of Mexico should not need more than one such pilot plant and the plant should not be used only for the rather restricted purpose of training a comparatively small number of technicians each year, but should be part of an institution concerned with training at all levels as well as with Research and Development for the entire industry in the country. For such a program it can further be questioned if Guadalajara would be the best location. Certainly a case can be made for León as a better place to select. It is a smaller city, but still large enough to have all needed services. As a centre for leather manufacturing it is the most important in Mexico and, last but not least, in the tannery-oriented staff at CIATEG there is a nucleus of competent leather technologists, accustomed not only to train and advice industry personnel but also to R&D work, which all will be difficult to emulate quickly at another place. This is said without conscious bias, but however that may be, it would be a pity to carry through such an undertaking without first discussing and taking into account all its ramifications for the country and its tanning industry as a whole.

### III. CIATEG TANNERY PROGRAMS

#### A. Organization

##### Departments.

Disregarding the activities concerned only with the shoe industry CIATEG has 4 units which, under the coordination of the director, are working for the tanning industry, namely units for

- information
- analysis and quality control
- research and development (R&D)
- practical tanning (pilot plant)

At the moment the first two units are headed by one person, a graduated chemist, as are the two last ones, in this case headed by chemical engineer.

##### Information unit.

This unit is above all responsible for the library and the journal "Información Técnica CIATEG", which is intended to be bi-monthly. The numbers so far published contain articles, roughly half of which are treating shoes and shoe production and half of which are dealing with leather, and this will generally also be the policy in the future. Work performed at CIATEG will be reported on in the leather section and the remaining space will contain articles from renown leather journals from all over the world translated into Spanish. The result, to judge from available copies, looks very promising and there is no reason to change the policy as outlined.

A detailed analysis of the unit and its activities, with suggestions as to the future work and organization, is provided in "Diagnóstico CIATEG" by José Luis Villar, INFOTEC, Julio 1980 (sponsored by UNIDO).

It should, however, be noted here that the promotion (information) of the services which CIATEG can offer the tanners, is especially important and it is suggested that special efforts be made in this direction. A tanner is usually difficult to reach by telephone, visits or through the journal. But he will read a letter addressed to him, if it is short and has something interesting to say. A one-page, short letter,

sent once or twice a year, for example with a question, if his plant is suffering from a specific problem - this has to be spelled out - followed by a statement of what CIATEG could do to help and what it would cost, would catch his eye. Some individuals would in all probability respond - and then it would be up to the technical staff to deliver.

Unit of analysis and quality control.

The chemical and physical laboratories are integrated into this unit. About 60% of the work concerns testing of shoes and materials for shoes, including leather, requested by shoe manufacturers. The remaining 40% is used for chemical and physical analysis of leather and chemicals or other products used in the leather industry. Some of the requests for this work come from the tanning industry directly, but quite a few originate in the research unit, which is needing the analysis in its own work. The laboratories are fairly well-equipped to perform almost any kind of analysis required by the shoe and leather industries, but a few additions are still needed in order to permit them to give a complete service. The needed equipment, listed in Annex VI, has been mentioned in earlier reports, but it is felt necessary to repeat the list again. The unit is visibly carrying out its work with dispatch and efficiency.

Unit of R&D (and of pilot plant).

These units, although at the moment for certain reasons of organization, made into two, should be and are here treated as one R&D unit only. The pilot plant, as is the other equipment at CIATEG - the acrylic drums, the spraying booth, etc., is a tool to be used in connection with the R&D and should not be separated from this unit. The activities of the department will be treated separately below.

B. The programs.

Classification.

The work can in general be divided into two categories:

- work for individual tanneries
  - . technical advice of all kinds
  - . studies of special processing problems and advice on how to solve them
  - . process control in the plants
  - . control of auxiliary raw materials
  - . development of new or special processes.
  
- general work for the entire industry, proposed by CIATEG, the advisory board to CIATEG, other organizations or individuals
  - . studies of general problems of interest to the industry as a whole
  - . development of special tannery processes
  - . training of technical people at various levels through courses, seminars and conferences.

Technical assistance to individual tanners.

Disregarding that the income from such activities might financially be of interest to CIATEG, it must be emphasized the all over importance of this kind of work also to all other activities, including R&D of general interest. Without the close collaboration of the industry even this kind of research will be extremely difficult to carry through and the results will hardly have an effect. Only if the individual tanner feels that the research institution has something to offer him personally in his job, will he co-operate wholeheartedly in other matters. The more tanneries that are involved, the greater are the chances of obtaining satisfactory results in all investigations.

As to the type of assistance needed, the different tanneries have to decide this together with appropriate staff-members of CIATEG.

Research and development work of general interest.

For an institution like CIATEG the work under this heading is of course the most important, if for no other reason than that so far no other institution in Mexico could be charged to

carry out any investigation of this type in the leather field. On the other hand, it is also important to realize that CIATEG, certainly for a long time to come, must confine itself purely to applied R&D. Original research in this field is costly and time-consuming and in addition would surely not constitute any assistance to the leather industry in the country. The programs proposed by CIATEG are taking this into account. They are all of a practical nature and of definite interest to the tanneries, directly and immediately, but they will also tax the resources of CIATEG to the utmost, in equipment, space and personnel and the time required to carry them out will be extended. For this reason, no further projects are suggested here, but a comment on each of those proposed will be made and, later, also a general comment on the resources of CIATEG in this connection.

The programs:

1) Studying the contamination.

Keeping in mind the locations, i.e. right in the middle of the city, of most of the tanneries, with all the problems that this entails, this study must be tremendously important to the industry. The initial purpose is to investigate the present situation as to total amount, content of toxic and other substances, etc. in the effluents and to suggest viable solutions in those cases, where immediate aid is needed.

A longer term task would be to compile in Spanish a summary of what has been done in similar circumstances in other countries. (The literature on this subject is plentiful indeed) This should be done before decisive action is taken here, and it is a task almost impossible to carry out by individual tanners, but eminently suited for an institution like CIATEG.

2) Testing the efficiency of auxiliary products used in retanning to drying.

The origin to this project lies in the earlier mentioned fact, that many products sold to the tanneries in Mexico

seem to be diluted or otherwise falsified. It must be pointed out, that only the tanneries themselves can put a stop to these practices by refusing to buy the products. But it is also obvious, that a neutral checking and analysis of classes of products, e.g. fat-liquoring oils, would constitute a great help to the industry in their endeavour to rectify the situation.

3) Studying how to make a drum automatic in a manner applicable to local industries.

The new, automatic systems for the wet operations in drums and other "tanning machines" are indeed expensive. A complete, simple, and cheap, solution to this problem surely does not exist, but any step in this direction should be of great help to the industry. A very commendable side-effect to the project would be to make the tanners more conscious of the importance of keeping the fundamental factors as constant as possible: time, weight, volume, concentration, temperature, pH and drainage.

4) Studying the efficiency of the chemicals used in the soaking to the tanning processes.

This is really only an extension of project 2) above and both could probably more logically be integrated into one, reading for example, "Studying the efficiency of certain classes of auxiliary raw materials used in the tanning industry".

5) Studying the possibility to standardize different types of leather through variations in the chemicals and methods used.

A complete standardization of all types of leather is within all probability impossible, but certainly in specific cases between manufacturer and client. However, the production of fairly simple guidelines of how to use the different classes of chemicals and auxiliary products to obtain certain classes of leather would be of great help, especially to the smaller and less experienced tanner, and



this is evidently what is aimed at with this project.

6) Studying in the leather the effect of conditioning.

The re-humidifying of the leather before staking (mechanical softening) is very important. If the water content is too high, the staking will be easy, but in drying back the leather will harden again. Too dry leather, on the other hand, is very difficult to stake and, if too much force is then used, the risk of obtaining the much feared "loose grain" is very high. After having abandoned saw dusting, as most tanneries everywhere have done, the problems in connection with the conditioning have grown considerably and any method to indicate and control the parameters would greatly aid the tanner.

7) Recirculation in actual production of liming/depilation and chrome liquors as an anti-contamination measure.

This is of course an interesting and for the industry extremely important project. The results so far are indeed promising and further refinements to make the process easier to introduce in many more plants can be expected.

Projects 7) and 1) are clearly two sides of the same problem: in the first place, how to reduce the total volume and the contaminating substances and, in the second place, how to treat the effluent, that in any case will be emitted from the tanneries. The best solutions to both sides of the problem are far-ranging in their implication to tanneries and the country as a whole alike.

C. Comments on CIATEG resources.

Equipment.

Most of the work in the programs will be carried out in collaboration with selected tanneries in their plants. But, besides the chemical and physical laboratories, laboratory

scale equipment and a pilot plant for initial testing of materials and development of methods and processes must be available. Present equipment is unfortunately not very adequate. Clearly the best solution would be to construct and equip a completely new pilot plant (disregarding the pilot plant under construction at the tanning school in Guadalajara). Taking into account the real need for development of the Mexican leather industry and the present and certainly also future importance of this industry for the national economy and employment, such a pilot plant cannot be said to be but appropriate. The improvements on the present pilot plant suggested here and otherwise should, however, be arranged as soon as possible, since the existing plant in any case will be the only one for quite some time to come.

Personnel.

The present staff members seem to be capable, interested and dedicated to their jobs. Their theoretical knowledge is generally adequate, but what is clearly lacking is the practical experience in real tannery work. Another problem seems to be their remuneration. Many of the staff are looking for economically more rewarding jobs and consequently there are frequent changes in the personnel. Ways and means to remedy this situation should be sought.

As to the practical experience, it is probably very difficult to find persons with needed qualifications in Mexico. The need is, however, evident and it is therefore suggested, that an effort is made to locate and engage at least two Spanish-speaking leather technologists with extensive factory experience, one a specialist in tanning and the other in finishing. These people might well be recently retired factory managers, looking for one or two more years of satisfactory employment for a fairly modest remuneration.

#### IV. CONCLUSIONS AND RECOMMENDATIONS

1) The programs proposed by CIATEG, possibly adjusted according to suggestions in this report, are realistic and practical projects, the implementation of which certainly would lead to important results in aid of the entire tanning industry. (Page 20). It is recommended, that the programs presented are approved and put into work.

2) The need for a more adequate tannery pilot plant at CIATEG and León is evident in order to allow the R&D unit to carry out its work in an appropriate manner. It is recommended, that

- a new tannery pilot plant is built and equipped, preferably under the same roof as the rest of CIATEG. (Page 23).
- the decision to build a large pilot plant at the tanning school, attached to the University of Guadalajara, is reconsidered. (Page 16).
- the present CIATEG pilot plant is improved immediately. (Pages 7 and 23).

3) The lack of practical tannery experience in the CIATEG staff is obvious and unfortunate. (Page 23). It is recommended, that two Spanish-speaking leather technologists are engaged for a year at least, preferably two. One should be a specialist in tanning, the other in finishing.

4) Due to a low pay scale there are frequent changes in the staff of the R&D unit. (Page 23). It is recommended, that ways and means to remedy the situation are investigated.

5) To increase the awareness among the tanners of the aid that CIATEG could provide, more promotion seems required. (Page 17). It is recommended, that the Information unit is making a special effort outside the journal for this purpose.

6) Seemingly the Mexican hides are generally of a rather low quality compared to those of many other countries. One of these low-quality characteristics, the offensive cuts, could rapidly be obliterated by changing the flaying technique. It is recommended, that ways are sought to induce the slaughterhouses to use pulling machines instead of knives in the flaying (e.g. by law, if necessary). (Page 9).

PROJECT IN MEXICO

JOB DESCRIPTION

DP/MEX/77/008/11-06

Post title	Tanning Expert
Duration	Ten weeks
Date required	As soon as possible
Duty station	León, Guanajuato, with possible travel to Guadalajara, Jalisco, both Mexico.
Purpose of project	To provide technological assistance to the tanning industry.
Duties	<p>The Expert will carry out specific applied research and development work; take part in evolving a methodology for organizing R &amp; D in his field; assist in the formulation of a consistent programme for CIATEG's existing pilot tanning plant; advise the respective units of CIATEG on processes and techniques so as to enable the technical staff to give services to the tanning industry and thus help to increase the confidence of this industrial sector in the Centre.</p> <p>Specifically the Expert will:</p> <ol style="list-style-type: none"><li>1. Study the functions and the set-up of CIATEG and its facilities and visit various plants in Guanajuato and Jalisco in order to understand the systems prevailing in this industry and, using these opportunities, provide advice, orientation and recommendations in specific areas.</li><li>2. Investigate the possibility of obtaining Fashion Leather of very good quality, using raw materials and products available in Mexico and keeping in mind the applicability and the adaptability of the processes developed by him, at acceptable costs, to the typical tanneries in the region.</li><li>3. Apply individually products such as oils, resins, pigments, etc., on the leather and develop, according to the results, the appropriate processes and establish the process parameters.</li></ol>

Cont....

4. Transmit the methods used in planning and organizing his research to the technical staff for future use.
5. Study the existing pilot plant, evaluate its potential for useful development and service for the benefit of the tanning industry, and assist in evaluating a work programme for the pilot plant.
6. Advise the technical staff of the units dealing with tanning (pilot plant, laboratory, engineering, information) on processes and techniques which might be helpful in improving the services to industry.
7. Analyze and evaluate the results of his investigations and the knowledge of the tanning industry acquired during his activities and present his reasoned conclusions and his specific recommendations for a follow-up and for future work.

Basic formulas for pilot plant processes. (Examples only)1) Soaking to chrome tanning.

With small variations used for all hides and skins.

Percentage on wet-salted weight.

Drum 2 r.p.m.	Washing	300 %	water 25°C	Run 15'	Drain completely
	Soaking	300 %	water 25°C	Run 10'	then 2'/h for 18h
				Drain completely	Flesh if needed
	Liming	100 %	water 25°C		
		3.5 %	Ca(OH) <sub>2</sub> powder		
		2.5 %	Na <sub>2</sub> S flakes		
			Run 2 h then 5'/h for 18h		
			Drain	Flesh	Weigh

Percentage on limed weight.

Drum 6-8 r.p.m.	Deliming	100 %	water 38°C	Run 10'	Drain completely	
	Bating	100 %	water 38°C			
		1.5 %	(NH <sub>4</sub> ) <sub>2</sub> SO <sub>4</sub>			
		0.2 %	Bate (5000 i.u.)			
			Run 45'	Check deliming (no red colour with phenolphthalein)	Check temperature (no less than 35°C)	
	Washing	100 %	water 25°C	Run 10'	Drain completely	
	Pickle	40 %	water 25°C			
		5 %	NaCl	Run 15'	Check density (Min. 6°Bé)	
		1 %	NaHCO <sub>3</sub>	Run 15'		
		1.5 %	H <sub>2</sub> SO <sub>4</sub> conc. (1:10 added slowly)			
			Run 90'	Rest over night	Run 15'	
			Check pH (Less 2.8 in hide and liquor)			
	Chrome tanning	7 %	Chrome powder (25% Cr <sub>2</sub> O <sub>3</sub> , 33% Basicity)			
			Run 30'			
			1.2 %	NaHCO <sub>3</sub> (1:10) slowly during 1h		
				Run 6h	Check pH (3.5)	
				Check temperature (min. 35°C)		
			Drain	File smoothly	Rest 1 day	
			Wring-out	Split	Shave	

Main variations: Increased bating (time and bate) for goat and hide garment leather. Re-liming and less chrome for hide garment leather.

Other variations, including addition of auxiliary products, when necessary or for experimental purposes.

2) Retanning/dyeing/set-liquoringAniline Side Leather

Percentages on shaved weight.

Drum 12-16 r.p.m.	Washing	100 %	water 50°C	Run 5'	Drain
		100 %	water 50°C	Run 5'	Drain completely
	Profat- liquoring	100 % 2 %	water 40°C Kataliz (Synthetic oil -Sandoz)		
				Run 20'	
	Retan	2 %	Chrome powder (42% Basicity)		
				Run 40'	
	Neutrali- zation	1 %	NaHCO <sub>3</sub>	Run 10'	
		0.5 %	NaHCO <sub>3</sub>	Run 30'	
			Check pH (4.6-4.8)	Drain completely	
	Dyeing	100 %	water 60°C		
		1.5 %	Aniline anionic	Run 20'	
			Check up-take and uniformity		
	Fat-liquo- ring	3 %	Licker I (BASF)		
		3 %	Sandolix RL (Sandoz)		
		1 %	raw synthetic oil		
				Run 40'	
	Retan	1.5 %	Mimosa powder		
		1.5 %	Quebracho powder		
		2 %	Syntan		
			Check complete take-up		
		0.5 %	HCOOH (1:5)	Run 15'	
			Wring-out Set-out Vacuumdry 2.5' 85°C		
			Hang to dry completely Condition		
			Stake		

Variations with different anilines and auxiliar products.

Corrected Grain Side Leather

Percentages on shaved weight.

Drum 12-16 r.p.m.	Washing	200 %	water 50°C	Run 10'	Drain completely
	Retan	2 %	Chrome powder (42% Basicity)		
				Run 40'	
	Neutrali- zation	0.6 %	NaHCO <sub>3</sub>		
		0.6 %	NaHCO <sub>3</sub>	Run 40'	
			Check pH (4.5-4.8)	Drain completely	
	Washing	200 %	water 50°C		Drain completely

Cont....

Cont.....

Dyeing	150	%	water	60°C	
	1	%	Aniline anionic		Run 20'
	0.5	%	HCOOH		Run 10'
	Check take-up and pH (4.2-4.4)				
Fat-liquoring	2.5	%	Licker I (BASF)		
	3.5	%	Licker II (BASF)		
	1.5	%	Derminol HSP (Koechst)		Run 60'
Retan	3	%	Mirosa powder		
	2	%	Quebracho powder		
	2	%	Syntan		Run 60'
	1	%	Lipaminlicker O (BASF)		Run 20'
	Drain Set-out Paste-dry Condition				
	Stake (Vibration and jaw)				

Variations with different auxiliar products etc.

3) FinishingAniline Side Leather

Aniline spray	2-7	Aniline anionic dyestuff
	200	Cellusolve acetate
	800	water
	Spray twice in cross and repeat	
Top	300	Resin (40% acrylic, semi-hard to hard)
	685	water
	15	Formaldehyde 30%
	Spray twice in cross Dry	
	Plate in rotary press 80°C	

Corrected grain, side leather

Buff with fairly coarse paper.

Impregnation in	300	Acrylic impregnation Resin
curtain coater	100	Driver
20-25 g/sq.ft.	600	water
	Plate or Vacuumdry 30' Buff 400-500 paper	
Base coat	50	Pigment paste (40%)
	150	Resin (40 %, semihard)
	10	Penetrator
	790	water
	Evenly coated by brush Dry well	
Spray coat	Base coat mixture Spray twice in cross	
	Dry well Plate with haircell grain	
	80°C 150 atm.	
Top	Emulsion lacquer, extended 2:1 with water or solvent depending on type Dry Plate	

Many variations with different and added auxiliar products





centro de investigaciones  
y asistencia tecnológica  
del estado de gto, a.c.

Rep. de Cuba 211, León, Gto., México.

Estimado Sr. Curtidor:

Por medio de la presente lo invitamos a participar en nuestro próximo Seminario sobre: "Aspectos prácticos de control y producción del proceso químico y mecánico de la tenería.

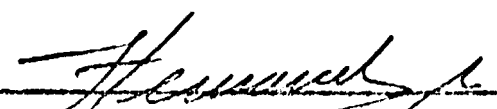
Dicho seminario será impartido por el Ing. Bo Gunnar Lunden. El Ing. Lunden está actualmente trabajando como asesor en el CIATEG y viene contratado por las Naciones Unidas. Su experiencia es amplísima, ya que cuenta con 30 años de experiencia y ha pasado por todos los trabajos en una tenería, desde químico en el laboratorio, hasta director técnico de una tenería sueca.

El Ing. Lunden visitará durante las mañanas las tenerías que participan en el seminario, para hacerlo más objetivo y que los participantes puedan convivir más en el seminario.

El seminario abarcará desde materia prima hasta acabado, incluyendo todos los procesos químicos y mecánicos a que es sometido el cuero, haciendo especial énfasis en el acabado.

Duración: Lunes, miércoles y viernes del 28 de Julio al 22 de Agosto.  
Horario: 19:00 a 21:00 Hrs.  
Cupo máx.: 25 participantes  
Costo: \$5,000.00 por participante  
Nivel: Supervisores y gerentes de producción.

Sin más por el momento enviamos un cordial saludo y quedamos a sus ordenes para mayor información.

  
ING. JUAN FCO. HERNANDEZ MEDINA  
JEFE DE LA U. DE INVESTIGACION  
Y DESARROLLO

List of Participants at the Seminar dealing with  
"Practical Aspects of Production and Control of  
the Chemical and Mechanical Processes in the Tannery".

CIATEG staff members:

Ing. Victor Santacruz Casas  
Ing. Juan Fco. Hernández M.  
Sr. Alejandro Ayala  
Sr. Enrique Córdova

CIATEG fellowship holders:

Fernando Díaz Infante González  
Sr. Jaime Muñoz  
Sr. Sergio Castro  
Sr. Alejandro Hares Bernudez

Tanners:

Sr. Aureliano Valdez Ramírez Pielés Cava, S.A. +) Palo Cuarto 705	Q.T.C. Alberto Rodríguez Río de la Loza Tenería José Ma. Noriega Peña +) Rayón 645
Ing. Javier Serrano Urbista BASF Mexicana Hidalgo 526	Sr. Jorge H. Romero BASF Mexicana Hidalgo 526
Sr. Mario Bretschneider Lozano GUINBA +) Aguiles Serdan 527	Sr. Jorge Plascencia GUINBA +) Aguiles Serdan 527
Sr. José Hidalgo Van-Dick Química Hoechst Gigante 201	Ing. Oscar Obregón Piel, S.A. +) Rayón 615
Sr. Hector Ruiz Calvillo Tenería Leder, S.A. +) Hidalgo 709	Srita. Blanca E. Moreno Valle Curtidos del Bajío, S.A. +) Lerdo de Tojada 102
Sr. José Luis Moreno Tenería Moreno Sahuayo 212	Sr. Jorge Padilla Olivares Pielés Omega +) Rayón 313
Ing. Francisco Anda Balderas Ing. Francisco Anda Balderas Cuzco 401	Ing. Salvador Ortega Avila Tenería Lourdes +) 27 de Septiembre 121
Ing. Manuel Tejada Ruiz Ing. Manuel Tejada Ruiz Rosas Moreno 509	Ing. Ariel Alvarez Fuentes Curtidos Doble AA Río Lerma 103
Ing. José de J. Falcon Amador Curtidos Finos del Centro Insurgentes 726	Ing. P. Humberto Ramírez López Impulsora Púfalo +) Carr. León-Sn. Fco. Km 58

+ ) Tanneries visited.

Visits in Guadalajara 11-12 August 1920.

Tanning School, Escuela Politécnica, Universidad de Guadalajara  
Avenida Revolución y Calle 44

Director: Ing. Antonio Humberto Rodríguez Ruvalcaba  
Coordinator of tanning activities: Ing. Marcel Bellón

Calzado Canadá  
Curtidos Canadá

Ing. Marcel Bellón

Curtidos Raxis, La Barca 1730

Sr. José Luis Gómez Cuevas

Curtidos Guadalajara, Matías Romero 735

Sr. Rigoberto Medina

Curtidos Star, Río Tizapan 1751, Colonia Atlas

Sr. Alberto Chenarúa

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Additionally Needed

Laboratory Equipment for the Analysis and Quality Control Unit.

Laboratory Leather grinding Mill

Electric Water distillation Equipment

( Minimum capacity one litre per hour )

Laboratory Drying oven

( Temperature range 20 - 200 °C )

Equipment for the determination of Nitrogen

( Kjeldahl )

Equipment for Melting point determination

pH Meter ( complete with electrodes )

