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**ASSISTANCE
IN THE ORGANIZATION
OF LEATHER
MANUFACTURING
AND IN THE PERFECTION
OF UPPER LEATHER
MANUFACTURING
TECHNOLOGY,**

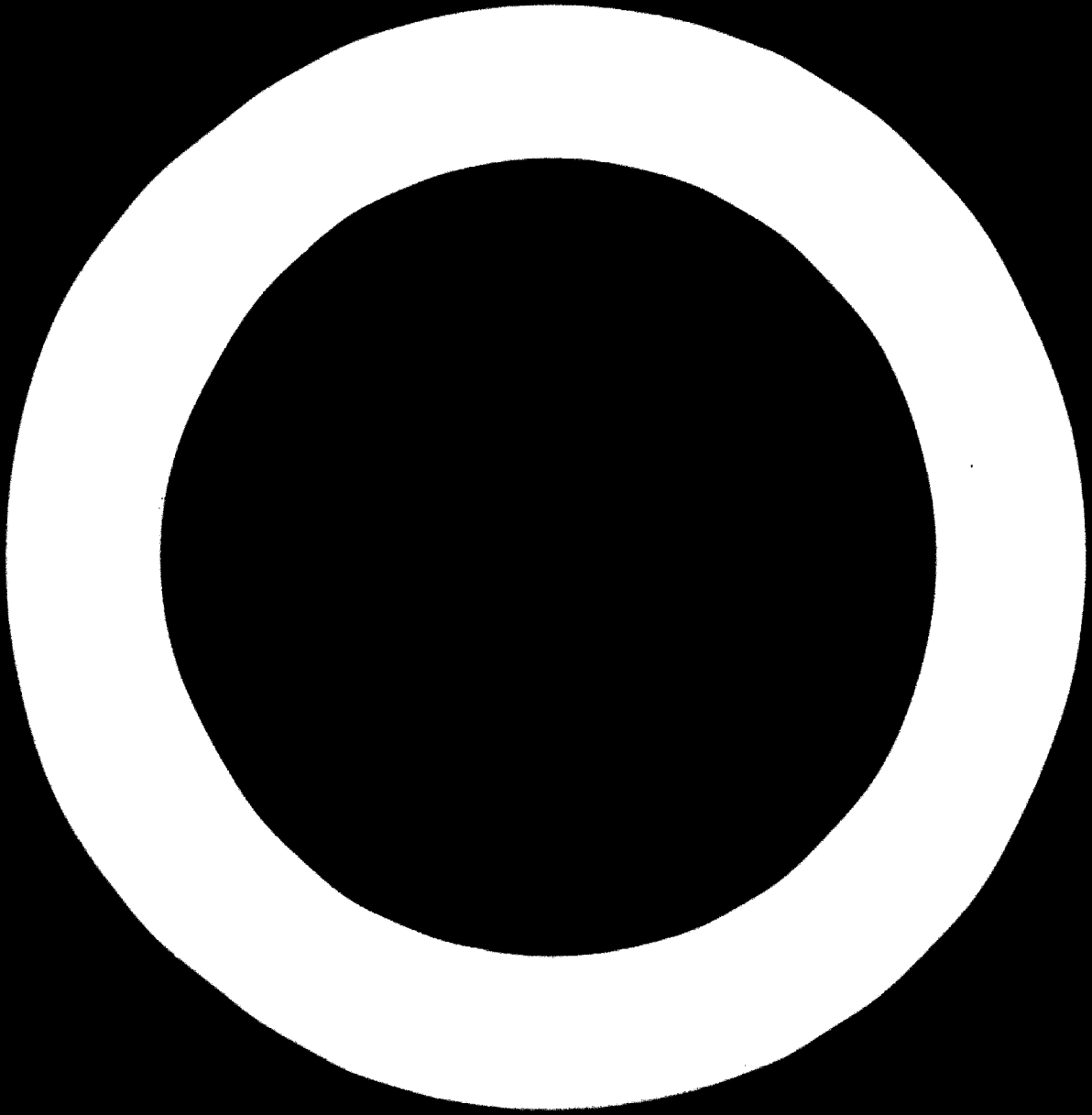
REPORT

NOVEMBER, 1951

UNITED STATES

**DEPARTMENT OF COMMERCE
BUREAU OF ECONOMIC RESEARCH
WASHINGTON, D. C.**

OFFICIAL BUSINESS PENALTIES APPLY



United Nations Development Programme

ASSISTANCE IN THE ORGANIZATION OF
LEATHER MANUFACTURING AND IN THE PERFECTION OF UPPER
LEATHER MANUFACTURING TECHNOLOGY

IS/HUN/74/016

HUNGARY

Project findings and recommendations

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

Based on the work of Bo G. Lundén, expert in leather manufacturing

United Nations Industrial Development Organisation
Vienna, 1976

Explanatory notes

Reference to "dollars" (\$) indicates United States dollars.

Reference to "tons" indicates metric tons.

The following forms are used in tables:

A dash (-) indicates that the amount is nil or negligible.

A full stop (.) is used to indicate decimals.

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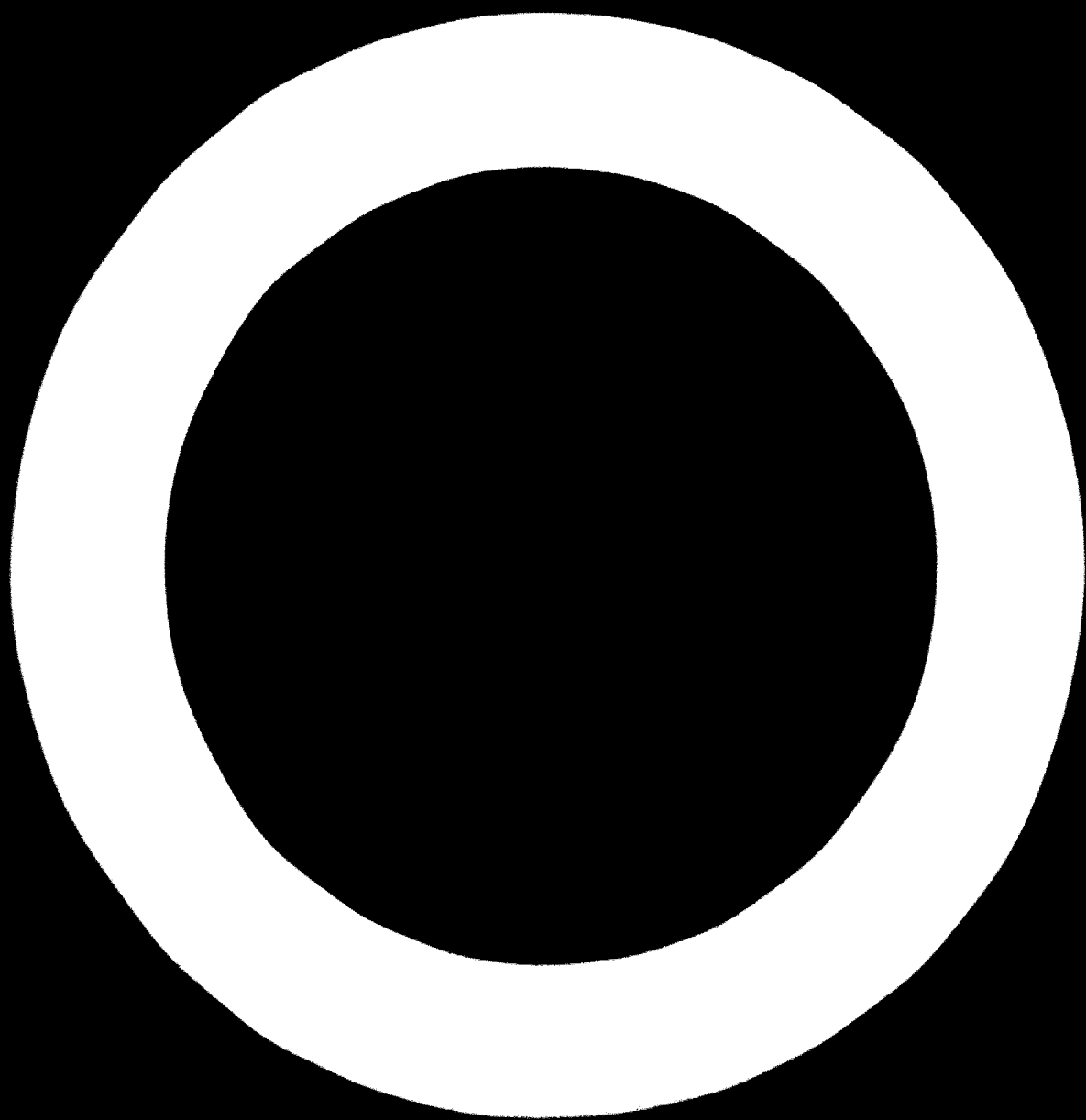
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SUMMARY

This report identifies what the expert considers to be the main causes for shortcomings at the Pécs Tannery in Hungary and suggests ways to remedy those shortcomings.

The range of leathers produced at the Tannery is very wide; efforts should be made to narrow it. The best way to divide and utilize heavy domestic hides is discussed, and suitable new products are suggested. Vegetable tanning is uneconomic and should be discontinued if possible. Split leathers are important for the economy; very good finishing results have already been obtained, and the developments seem promising.

Domestic fresh hides would be of great economic interest; the possibility of obtaining them in place of salted hides should be taken up with the Hungarian hide purchasing agency. Light imported hides are needed for the production of patent and light leathers. Sources are suggested and discussed.

With a few exceptions, the processing methods used are up to date. The most evident shortcoming is the large amount of chrome used for tanning. Suggestions are made for the reduction of chrome consumption and the improvement of some other processes.

The general quality of shoe upper leather is good, but improvements can be made. The greatest improvements, particularly where colour variations are concerned, could be made by purchasing new tanning machines.

Most of the machinery is modern, particularly that used for mechanical operations, but there are no Hagspiel tanning machines; the possibility of installing them should be investigated as soon as possible. The Hagspiel machines produce better quality, use less materials and are more productive than drums.

The main problem at the Pécs Tannery is total productivity, which is low compared with that of similar tanneries in the west (about 50 per cent). The main reasons for this are:

(a) Production is not organized to make the best use of the means of production, and the organization of work in the various departments is largely ineffective;

(b) The factory layout is very **extended**, confusing and complicated and requires a large and costly transport organization. It is also very difficult to organize supervision and communications (orders, information and the like) efficiently;

(c) Much of the **administrative work** being done is devoted to the collection and processing of enormous quantities of statistical and other data, but there are no staff left to work on rationalizing work in the production plants or offices.

There is no research and development department. **Experimental work** is carried out directly in the plants and disrupts operations.

The technical services employ a very large labour force, mainly because of the difficulties outlined above. Water consumption is very high. Better water-use discipline and water-saving technologies should be applied, and this should also lead to less costly effluent purification.

There is ample capacity available. The limiting factor is the labour force, and the Tannery considers the shortage of workers to be one of its main problems. It is difficult to recruit new workers; those available create further problems because of their lack of skills. As productivity increases, however, these problems should disappear.

Yield (m^2/kg salted weight, for example) figures could be collected in a better way and used for costing and purchasing purposes. A method for this is suggested. The costing makes no allowance for the higher unit costs incurred for small factory runs. A price difference is suggested to overcome this.

The central planning seems to be very rigid, with two unfortunate results:

(a) The enlargement of the pigskin factory, as planned, does not seem to be rational in the light of recent technological developments. It is suggested that the matter should be reconsidered and the factory replanned if at all possible;

(b) The new effluent purification plant should be designed for the processes to be used in the future. A thorough investigation should first be made into water saving and water-saving technologies.

The present organisation of the whole concern seems to be one of the causes of the difficulties that arise in the course of daily work. A new structure is suggested that would probably be more efficient. It incorporates research and development, work studies and administrative rationalisation departments, which would play an important role in increasing productivity.

INTRODUCTION

Background

The Hungarian shoe industry has been developing rapidly and now produces about 43 million pairs of leather shoes a year. Nearly half of these are exported, almost entirely to member countries of the Council for Mutual Economic Assistance. Only a very few are sold to western countries. For its further development, especially in higher priced markets where the intention is to increase the profit per pair of shoes, the shoe industry will depend on the leather industry to supply a sufficient quantity and range of shoe upper leathers (side leathers) of suitable qualities, with dependable deliveries and at reasonable prices.

The leather industry, which is divided into three concerns of similar size, employs more than 6,000 persons and processes about 57,000 tons of hides and skins a year. The domestic and imported cattle hides from which the side leather is made account for about 43,000 tons and domestic pig skins for most of the rest. The Pécs Tannery employs about 2,200 persons and processes approximately 13,000 tons of cattle hides and 7,000 tons of pig skins a year. About 2,000 tons of leather boards are also produced from chrome leather shavings, mostly from the Pécs works.

Most (about 25,500 tons) of the cattle hides processed have to be imported. The domestic supply is about 16,500 tons, chiefly made up of medium to heavy hides with a fairly large proportion of quite heavy hides. Formerly, these hides were mainly processed into vegetable (especially vegetable sole) leathers, but in later years the trend, as all over the world, has been to use them more and more for upper leather, and it is probable that in the future only a very small proportion of all available hides will be vegetable tanned. This poses a special problem because the heavier the hides, the more difficult it is to process them into good or acceptable upper leathers, especially when a fairly wide range of finished products is aimed for. As is to be expected, the imported cattle hides are therefore mainly lighter (calf, kip, extra light and light hides), but a certain quantity of heavier hides up to about 35 kg/hide is also included. Although perhaps not quite correctly representing the situation, the average weights of the two types at the Pécs Tannery will serve to indicate the difference. For the imported hides (including heavy hides) the average salted weight is about 15 kg/hide and for the domestic hides about 37 kg/hide. The real difference is still more pronounced. Since the domestic hides are better treated, they will gain more weight in the liming, and the resulting limed weights will give a truer, and more striking, picture. The average limed weights are

about 16 kg/hide and 46 kg/hide respectively. As a result, some of the end products, particularly the lighter upper leathers and especially the patent leathers, have to be made almost exclusively out of imported light hides.

A rather large percentage of the side leather production consists of corrected grain leathers. In the western countries the importance of this type of side leather has decreased considerably in recent years, owing to fashion trends that emphasize the softness and natural appearance of full grain (preferably aniline) leathers. For some types of shoe corrected grain leathers will certainly continue to be the most suitable and possibly only material. It must be anticipated, however, that developments in Hungary will follow somewhat similar lines with a decreasing demand for corrected and an increasing demand for full grain leathers. At present the leather industry is able to supply most, but not all, of the shoe upper leathers required. Some have to be imported, usually because of quality requirements, but also fairly often because it is not possible to deliver sufficient quantities of certain types of leather. Roughly 1 million m² out of about 6.5 million m² of shoe upper leathers (not including lining and sole leathers, etc.) is imported.

After an earlier United Nations Industrial Development Organization (UNIDO) project (TS/HUN/73/003) the Government of the Hungarian People's Republic requested further technical assistance to the shoe industry. The Government felt that the demand for leather could not be adequately met because of the backwardness and lack of capacity of the leather industry; so the request for technical assistance was extended to cover the leather industry. The Pécs Tannery was selected as most suitable for the work to be done under the project.

Official arrangements

The Government's request for assistance in the organization of leather manufacturing and in the perfection of upper leather manufacturing technology was transmitted to UNIDO on 20 September 1974. The project was approved by the United Nations Development Programme (UNDP) on 28 January 1975 to be financed out of Special Industrial Services (SIS) funds. It cost \$US 15,000. It began on 2 June 1975 and was completed during 1975. UNIDO was appointed as executing agency.

Objectives of project

The ultimate objective of the project was to assist in improving the manufacturing technology and organization of production of side upper leathers in order to provide a better supply of leather to the strongly developing shoe industry. To do this, the following specific tasks were to be carried out during the project:

- (a) Existing methods and management were to be evaluated;
- (b) An analysis of techniques used was to be made;
- (c) Methods of product and production development used were to be assessed;
- (d) A proposal was to be drawn up for the measures to be taken to improve the manufacturing technology and organization of production of side upper leathers.

If the objective can be wholly or partly achieved, it might reduce considerably the importation of finished leathers and raw cattle hides. It should also be possible to ask higher prices for shoes for export, to increase the capacity and productivity of the leather industry, and to lower production costs. It is very difficult, however, if not impossible, to estimate the gains in absolute figures. Foreign exchange rates are regulated by the Government according to the economic situation of the whole country, and different rates are used for different purposes, which makes calculations more or less meaningless.

FINDINGS

General observations

This report is chiefly concerned with upper leather (side leather) production at the Pécs Tannery. It refers to other types of production only when they affect the organization or efficiency of the whole company.

Discussions have revealed that most of the shortcomings of the company are known, and that most of the suggestions and recommendations in this report have been discussed at one time or another by members of the staff. The difficulty has been to convert the knowledge into action; the problem has been aggravated by the internal complexity of the organization and because it is policy to keep decision-making powers outside the company.

Almost all tanneries which, like the Pécs Tannery, have developed very quickly and under pressures of different kinds show a somewhat haphazard organization of production and production facilities. It is therefore fairly easy to find cause for critical observations, but it must be realized that throughout the world - even in the so called highly industrialized countries - the quality and efficiency of industries vary widely. Most tanneries are mixtures of old and new processes, machinery, planning and organization. In this report the writer has tried, when analysing existing conditions at the Pécs Tannery and making suggestions and recommendations, to use as a reference the best successfully adopted methods and processes revealed in studies of a fairly large number of different tanneries.

It must be pointed out that managements everywhere are reluctant to invest in new machinery and methods if the gains are small or non-existent. If total personnel costs are compared, for example (about 5% of total sales for Hungary and up to 20% or more for many western countries), it is evident that managements in the western countries are more willing to invest in rationalization programmes, and to obtain or test any kind of labour-saving devices and machines.

It is also clear that, in such a complex undertaking as a fairly large tannery, not all the factors or circumstances that influence production can be dealt with. Only those matters thought to be the most important - and, with a few exceptions, only their main aspects - have been analysed. Special circum-

stances and local conditions cannot but influence proper solutions to problems and the existence and result of these influences usually cannot be recognized by an outside observer. They must, however, be taken into account in the ultimate plan of action. In this report very little account has been taken of them.

Characteristics and volume of products

The main products produced and used by the Pécs Tannery in the third quarter of 1975 are listed in table 1. Owing to the rather rigid production schedules, the figures are fairly representative of those for the whole year. More detailed figures for chrome-tanned cattle hides - the main subject of this report - are given in tables 2 and 3.

Observations and comments

The full grain leathers listed in table 2 are subdivided into from two to four different sales products not counting colours and embossing patterns. This, together with all the different forms produced (sides, backs, etc.), results in a great variety of leathers and often small production lots, which is not conducive to efficient production. It is obvious, however, that the great number of forms results from the wish to make the best use of the hides, especially the large ones, and from cutting bends etc. for vegetable tanning. The principle is a good one, of course, but every effort should be made to reduce the number of different sales products.

The heavy domestic hides (over 30 kg/hide) pose a special problem when an attempt is made to use them for shoe upper leather production. Because of the different characteristics of the shoulder, butt and belly parts, the hides should be cut up for special processing appropriate to the part concerned. The best way to cut and process, however, must be determined by factory trials in co-operation with one or more shoe factories. Nevertheless, only one cut should be selected (backs and bellies or butts and shoulders) so as to restrict the number of articles. It is normally better from an economic point of view and for production to go for more products from a few types of leather than to make a narrower range in many types of leather. The best way would probably be to cut backs and bellies (bellies to a predetermined minimum width) in the raw stock shop for proper processing from the very beginning. It is understood that in Hungary bellies are classed as an inferior upper leather material which cannot be used for certain (men's and women's) shoes. If the cutting method suggested is used, an effort should be made to abolish this classification.

Table 1. Main products purchased and sold by the Pées Tannery during the third quarter of 1975

Type of leather or material	Weight (tons)	Area (thousand m ²)	Value (million forints)	Percentage of total sales
Cattle hide				
Vegetable tanned				
Grain (by weight)	317.48		36.63	
Grain (by area)		3.51	1.83	
Split (by weight)	8.20		0.51	
Split (by area)		<u>0.01</u>	-	
Total			<u>38.97</u>	<u>10.4</u>
Chrome tanned				
Full grain		93.06	41.22	
Corrected grain		212.20	81.90	
Patent		<u>94.56</u>	<u>56.26</u>	
Sub-total		<u>399.82</u>	<u>179.38</u>	<u>47.8</u>
Splits, coated		125.04	19.37	
Splits, natural (velour)		<u>11.57</u>	<u>6.32</u>	
Sub-total		<u>136.61</u>	<u>25.69</u>	<u>6.8</u>
Total		<u>536.43</u>	<u>205.07</u>	<u>54.6</u>
Finished				
Vegetable-tanned grain leathers		0.10	0.03	
Chrome-tanned full grain		164.69	35.98	
Chrome-tanned nubuck/velour		209.62	64.74	
Chrome-tanned split, finished		<u>21.81</u>	<u>1.17</u>	
Total		<u>396.22</u>	<u>102.92</u>	<u>27.6</u>
Other				
Raw stock, leather scrap			<u>1.82</u>	<u>1.1</u>
Finished				
		<u>24.49</u>	<u>22.84</u>	<u>6.1</u>
Total sales value			<u>375.39</u>	<u>100.0</u>

Source: Internal statistical reports.

Note: Annual sales approximately 1,500 million forints.

Table 2. Chrome-tanned cattle-hide grain leathers: July-September 1975

Type of leather	Average piece size (m ²)	Area (thou- sand m ²)	Percentage of area	Value (million forints)	Percentage sales/ percentage area
Full grain leather					
Smooth sides	1.22	27.10	6.8	12.50	1.03
Smooth backs	1.93	26.08	6.5	11.56	0.99
Smooth butts	1.93	16.78	4.2	8.50	1.11
Smooth shoulders	0.67	3.93	1.0	1.44	0.79
Smooth bellies	0.34	0.44	0.11	0.14	-
Sport sides	1.18	4.80	1.2	2.18	1.01
Embossed sides	1.10	6.93	1.7	2.84	0.91
Embossed backs	-	0.83	0.21	0.40	-
Embossed butts	-	0.16	0.04	0.07	-
Grain					
Sides	1.86	0.35	0.09	0.19	-
Minion					
Sides	1.89	3.62	0.90	0.97	0.6
shoulders	0.64	1.12	0.28	0.24	-
bellies	0.27	0.93	0.23	0.29	-
Corrected grain leather					
Smooth sides, dark	1.81	32.00	13.0	20.01	0.86
Smooth sides, pastel	1.38	32.71	13.2	20.12	0.81
Smooth sides, brushed	1.82	33.25	8.3	14.98	0.98
Smooth backs, dark	1.91	28.86	5.2	9.24	0.99
Smooth backs, pastel	2.03	2.92	0.79	1.24	0.95
Smooth backs, brushed	2.06	8.35	2.1	4.02	1.07
Smooth shoulders, dark	0.64	0.56	0.14	0.18	-
Smooth shoulders, pastel	-	1.05	0.26	0.33	-
Smooth bellies, dark	0.33	2.01	0.50	0.36	0.62
Smooth bellies, pastel	-	13.65	3.4	3.48	0.97
Embossed sides	1.31	5.72	1.4	1.77	0.8
Embossed sides, brushed	1.67	16.97	4.2	6.73	0.88
Embossed fancy sides	1.28	2.15	0.54	0.64	0.66
Embossed fancy backs	-	-	-	-	-
Blank leather					
Smooth sides, "paper"	-	7.47	1.9	4.91	1.47
Smooth sides, black	1.07	29.90	10.1	24.15	1.33
Smooth sides, white	-	29.88	4.8	12.62	1.54
Smooth sides, coloured	-	3.16	0.79	1.97	1.48
Embossed sides	1.08	2.08	0.52	1.13	1.21
Embossed shoulders	-	-	-	-	-
Embossed bellies	0.38	7.82	2.0	3.13	0.89
Cracked sides, black	1.22	8.8	2.2	5.10	1.33
Cracked sides, coloured	-	5.21	1.3	2.21	1.33
Total grain leathers		299.84	100	179.38	1.00

Table 3. Chrome-tanned cattle-hide split leathers: July-September 1975

Type of leather:	Average piece area (m ²)	Area (thousand m ²)	Percentage of area	Value (million forints)	Percentage sales/percentage area
Split leathers					
Upper, coated	0.66	8.02	5.0	1.98	1.53
Upper, velour	0.78	10.83	6.8	2.79	1.59
Garment, velour	0.32	3.98	2.5	1.02	1.59
Strap, naturel/pearl	0.68	13.05	8.2	2.13	1.01
Lining, coated	0.39	117.82	73.9	17.39	0.91
Lining, naturel	0.23	<u>5.71</u>	<u>3.6</u>	<u>0.45</u>	0.49
Total split leathers		159.41	100	25.76	1.00

Source: Internal statistical records.

Every material ought to be judged according to its own merits; properly tanned and finished bellies, full or corrected grain are just as suitable for many purposes as any other leather.

An effort should be made to discontinue the use of pieces from the vegetable tanning shop. The comparatively small output of vegetable leathers, its division into a very great number of different sales products, obsolete production facilities and locations (five different production buildings) and the old time-consuming tanning methods used (mainly pit-tanning) make it fairly certain that production is uneconomic. It would be much better to concentrate all efforts on the other, more important, products.

Competition between different production units is conducive to efficiency and quality when leathers in great demand and large volumes are involved. If vegetable leathers are a national necessity, it would be better to concentrate production in one unit subsidized, if necessary, by the other units.

Some garment leather (nappa) is already being produced; the large domestic hides should be very suitable for this purpose. One of the main problems would be the low tear strength at the reduced thickness that would have to be used. These heavy hides have of course a thick grain layer which, regardless of the processing, will give a low tear strength. On the other hand, to be attractive leather garments have to be light and the leather must therefore be thin

(preferably 0.5 to 0.6 mm and usually not much thicker). Experience has shown that most leather garment manufacturers can produce quite acceptable garments from leathers with a low tear strength if they know about it from the beginning. Most manufacturers, if they have to choose, prefer a lighter leather with a low tear strength. It is therefore important that the specifications for garment leathers take these considerations into account.

Another product for which the production facilities should be eminently suitable is upholstery leather. (Not the old vegetable-tanned leathers but the modern chrome-tanned, almost garment-like leathers with a suitable wear resistant (polyurethane finish.)

The split leathers produced seem to cover the field pretty well. What is surprising is the high yield - nearly 40 % of the grain leather area, compared with the usual 20-30%. This is largely because the thick domestic hides give a large and thick - but coarse-fibred - split, and also because of the good utilization of all the other types of splits. This is important for economic tannery operation.

Many attempts have been and are being made to produce a satisfactory shoe upper leather from splits. All the physical and chemical properties of the leather itself are normally good, but the problem is to obtain a finish with good wear resistance and a good appearance, avoiding, above all, the so-called orange-peel effect when the leather is stretched. The coated upper leather split produced at present seems quite good in many respects. The relatively new method where freon is used to make pores in the finish and reactive binders give excellent wear characteristics will certainly produce a better quality product. The Bay-cast method, where a porous polyurethane film is precast on a grain-patterned flat silicone mould, the split leather is flattened out and made to adhere to the still wet film and the film is then dried and cured in an oven, will produce excellent wear characteristics and appearance with negligible orange-peel effect.

Both methods should be thoroughly investigated and costed even though they have not yet proved themselves in practical large-scale production.

A third method which produces a fairly good patent split leather by applying a PVC-film to the leather in a heat and pressure system, has been proved in large-scale production. Machinery and know-how can probably be purchased, if desired.

Basic raw materials: cattle hides and skins

The Pécs Tannery is using partly rather heavy domestic hides and partly foreign hides, usually in lighter weights. Table 4 is a summary of the different hides and skins used during the first half of 1975.

Table 4. Raw hides and skins used in the first half of 1975

Sources	Salted weight (tons)			Total
	Light	Medium	Heavy	
<u>Domestic</u>		312	2,260	2,572
<u>Foreign</u>				
Europe	297	-	-	297
Overseas:				
Canada	57	35	239	331
United States	228	2,407	438	3,073
Australia	140	-	-	140
New Zealand	7	-	31	38
Kenya	-	15	-	15
Argentina (crust)	-	86	-	86
Total foreign	729	2,543	708	3,980
Total	729	2,855	2,968	6,552

Notes: Approximate annual input 13,000 tons.

Average daily input (tons):	Domestic	20.4
	Foreign	31.6
	Total	52.0

Observations and comments

As mentioned earlier, domestic hides constitute a larger proportion of the input, as their lined weights are significantly higher than the weights of the foreign hides. This changes the 40/60 ratio between domestic and foreign hides to about 45/55. The prices are not stated or discussed, as they are regulated by government agencies according to several domestic and foreign economic factors.

Whenever it is possible nowadays, tanneries throughout the world are trying to obtain domestic raw hides as fresh (green) hides, i.e. as soon as possible after slaughter and without salting. This will make for considerable gains, both economically and - especially in the case of heavy hides - in quality.

In Hungary, where distances are comparatively short - all points given good organization, are within a day's journey - and the raw hides from the slaughter houses are already gathered and distributed by a central agency, this should be possible, in which case the hides, at least at the big slaughter houses, should be rinsed in water and rounded (i.e. all unusable parts of the hides should be cut away). They should also be machine fleshed, this operation being much easier and effective at this stage than later at the tanneries. The offal could be used much more economically, partly for glue stock and partly for processing into animal feed. Experience has shown that the fresh hides will not deteriorate, even at fairly high summer temperatures, during the first two to three days, especially if leathers sold by weight do not have to be considered.

There is a clear trend in all developing countries to try to use their own raw hides as much as possible in their own leather production. Those who have advanced in this respect, e.g. Argentina, no longer allow the export of raw hides. It must be anticipated that wet-blues - and even crust - will also be very difficult to obtain in the near future in countries that used to be the main exporters of raw hides.

It should be possible for quite some time, however, to obtain wet blues in Asia (Bangladesh, India, Pakistan, etc.) and Africa (Kenya, Tanzania, etc.) at reasonable prices.

In the highly industrialized countries the trend is in the opposite direction. Those countries are producing more and more beef and consequently more hides, while their tanneries are reducing production or closing down. As a result the United States has changed from being a major importer of raw hides to being a major exporter. The trend towards producing more meat with a simultaneous decrease in the weight of the animals (and hides) will probably also appear in Hungary, which means that more and probably lighter hides will be available there. It should be possible to substitute them for imported hides without serious technical difficulties, especially if they are cut properly as mentioned earlier.

It is obvious that the need for lighter hides arises mainly from the demand for patent and, to a lesser extent, full grain leathers. It should be noted that the South Asian light cow and calf hides could be excellent, especially for patent leather production. Wet blues from Bangladesh, India and Pakistan,

for example, should, if properly bought and taken over at the different tanneries with whom contracts have been made, be suitable substitutes for many of the light, and usually expensive, salted raw hides from Europe and the United States.

Processing the hides

Description

While there is no need to go into the details of the chemical or mechanical processes or operations, a short description will be useful as a background to the subsequent observations and comments.

The hides are received in the raw hides shop where they are checked and stored until trimmed and made up into daily lots. The lots are then made up into processing batches, and the hides are marked with batch and purchasing lot number. They are then transported on flat cars to the lime yard where they are soaked and limed, the heavier hides (the heaviest being necked after a pre-soak) in pits and the lighter in drums. The processes are more or less traditional, the only special feature being the use of a well-known commercial enzyme in the drum to obtain the necessary short soak. After fleshing and trimming - and sorting out and usually cropping those to be vegetable tanned - the limed hides are transported in rectangular iron baskets on trailer cars by tractor to the chrome-tanning shop. The baskets are hoisted one after another to the third floor, pushed on a rail in the ceiling to and over the chrome-tanning drums and emptied into them.

Washing, deliming, bating, pickling and chrome tanning with self-reduced liquors are normally all completed in less than 24 hours; in a few cases a somewhat longer time is required. The chemicals are prepared on the third and fourth floors and are added from there. Water and some of the liquors are added automatically: the process is controlled from a large panel on the third floor. The hides and spent liquors are discharged on the ground floor; the discharge and the running of the drums are controlled manually from the second floor. The processes from deliming to chrome tanning are also traditional with a few special features. An ordinary chrome liquor is produced in a separate building, using molasses to reduce the bichromate. The liquors are stored in tanks and are used about four days later.

The hides are piled flat on the floor for some hours and are then halved and put on pallets. They are transported to the machines by fork-lift truck, sammied, sorted for ultimate product, and marked anew with hide type letter and batch number. If necessary they are cropped, in which case the bellies are cut into two parts.

The different lots are then split (almost exclusively in chrome) and shaved. The splits are trimmed immediately, sorted for different purposes and then split again. New lots for retanning and other treatment are made up, weighed and transported to the second floor, where the retan drums, located opposite the chrome-tanning drums, are charged with leather and chemicals and subsequently run.

Neutralization, retanning, dyeing and fat-liquoring are completed as appropriate in a sequence lasting some three to seven hours, depending on the type of leather to be produced. Discharged on the ground floor, the leathers are either horsed immediately or piled on the floor to be horsed later. All leathers are sammied and trimmed again, and almost all are set out.

Full grain leathers are then dried on horizontal, twin table vacuum driers and those to be buffed (corrected grain and patent leathers, and splits) are paste dried on glass platens in the usual tunnel oven. All paste-dried leathers are conditioned in piles for longer or shorter periods after passing through a wetting machine. They are then staked in Mollisa stakers (or sometimes in ordinary staking machines, buffed and sent to the fifth floor to be impregnated in a flow-coater with an acrylic impregnation resin. Almost immediately they are vacuum dried for a short period in a vacuum dryer installed in the same premises, sent down to the first floor to be cooled in an unheated tunnel and back again to the fifth floor for buffing in a continuous, endless-belt buffing machine combined directly with an airblast dust-removing machine. Ready now for finishing, the leathers are counted, transferred to flat cars and manually transported to the second floor of the finishing shop building. The patent leathers are transported to the ground floor of the same building.

The full-grain leathers are of course only conditioned and staked (garment leathers milled) after drying before being sent for finishing. The splits are milled after paste drying and then buffed on ordinary Pulminosa buffing machines and dusted. The velours are sent to the pig-skin shop to be finished, the pearls

are sent to dispatch and the coated-upper and lining-leather splits are sent to the finishing shop. Because of lack of capacity, quite a lot of the splits to be coated are sent to a village called Felsőszentmárton some 70 km from Pécs, where the Pécs Tannery has a small split-finishing factory (brushing, spraying, pressing).

The full grain leathers are spray coated with modified acrylic resins containing either pigments or aniline dyes in several passes through the automatic spraying machines, interspersed with and followed by plating in hydraulic or continuous rotating cylinder presses. The corrected grain leathers and the splits to be coated are brush coated once or twice in an automatic padding machine with an acrylic resin pigmented water emulsion dispersed through a nozzle between and in front of the two pads. After plating or embossing with a hair cell grain plate (or coarser grain) another coat of the same acrylic type modified for the purpose is applied in a curtain coater. At this stage the leathers are measured in an electronic measuring machine. All these leathers are then top-sprayed twice in an automatic spraying machine on the third floor with a nitro-cellulose hydro-lacquer or straight lacquer. All the automatic machines mentioned have drying tunnels of their own. On the same floor the leathers are then checked, graded and marked before being transported on flat cars to the dispatch department building, there to be rechecked, usually taken over by the customer, counted, marked, packed and dispatched.

Patent leathers are transported to the ground floor of the finishing shop, brush-coated there by hand on a moving conveyor belt with an emulsion base coat. After passing a drying tunnel they are placed on flat cars and transported to the polyurethane shop building to be lacquered. A few are toggled on frames, cleaned of dust with airblasts and sprayed with the two-component polyurethane solution. Most are passed through a curtain coater which applies the polyurethane solution. The leathers are positioned on wooden fibreboards which, like the frames mentioned earlier, are put horizontally into open cabinets which are placed in a heated room to cure and dry the lacquer. In order to save space and cabinets the patent leathers are removed after a couple of hours and are hung on wooden rods to complete the curing and drying in about 24 hours.

After they are removed from the rods and put on flat cars, the patent leathers are transported to the second floor of the finishing shop to be measured. They then go back to the ground floor again to be cleaned, checked and made up

into factory lots. Transported in the usual way to the dispatch department, they are once again counted, checked and graded before being taken over by the customers, marked, packed and dispatched by rail or truck.

Observations and Comments

These refer only to the particular methods, processes and operations used at present. New methods, quality, productivity, work organization, and the like are dealt with under appropriate subheadings.

From the short description it is evident that the techniques used are in the main those employed by most tanneries the world over. The latest developments in methods and machinery, especially in the wet departments, are not fully utilised; some features of the processes or operations are unusual and sometimes probably lower quality and efficiency. Some of these deviations, although really only a matter of detail are thought by the expert to be of general interest and are therefore mentioned here.

Raw hides department

The batches to be processed are drawn from the purchased lots in such a way as to give a "normal composition" of hide types each day. Unfortunately this results in different weights of the batches going into the various drums. This affects the soaking and liming mainly in two ways:

(a) Variations in the chemical action caused by variations in the basic physical conditions in the drum influence quality;

(b) Total drum capacity is reduced because the drums are not fully utilised.

A better approach would probably be to fix the drum capacity and draw batches of this weight from the purchased lots. Any hides that may be left over can be combined to make up a drum batch of similar hide types without endangering the book-keeping. The method will require more end product planning, but this will certainly be worth the effort.

The weights of the batches are calculated on the basis of the average hide weight in each lot bought. This will certainly cause fairly large deviations from the real batch weights, with subsequent variations in the ratio of chemicals to hides, and this will be detrimental to a proper and safe process. The batches should be correctly weighed and the weights noted prior to processing.

Because there is a lack of storage space - or perhaps because stocks are too large - many hides have to be stored for longer or shorter periods outside the warehouse, often in direct sunlight in the summer. There is a considerable risk of salt burns, often seen as small holes or imprints on the finished leather surface. If stocks cannot be reduced, the hides stored outside should at least be covered with white or other light-reflecting tarpaulines; even plastic covers are better than nothing.

Lime yard

Here again the resulting limed weights of the batches are calculated, using conversion factors for foreign and domestic hides, rather than weighed. This method undoubtedly gives a limed weight which will often differ greatly from the true weight with subsequent variations in and instability of processes, especially chrome tanning.

The drum soaking and liming time is short. This means that (a) there will be only small margins in the process and (b) larger quantities of chemicals will be used than is normal. Nearly 40 % of the Na_2S could be saved by increasing the liming time and the other chemicals could also be reduced. This time could probably be increased by utilizing the real drum capacity using appropriate batch weights.

The pit soaking and liming uses far more chemicals, labour and space than a correctly used drum or another, still more modern, system. Having two systems is also a definite disadvantage and every effort should be made to achieve a uniform processing method which can be varied according to the type of hide.

Using channels with running water to remove the machine limed leather from the fleshing machines and the trimmings was certainly an improvement in its time. Today, when water conservation is of such an importance, this method is unsuitable and another method should be employed to collect the blue stock.

De-liming to chrome-tanning

The de-liming and bating process is unusual. The repeated washings for fairly long periods, the order of adding the de-liming agents and a further de-liming after the bating (originally a control measure) is said to be necessary

because of the hardness of the water used. The total de-liming and bating time of between three-and-a-half and five hours is very long; it is very unusual elsewhere in the world to find de-liming and bating times of more than two hours, even for very heavy hides.

The problem could probably be solved by adopting the following procedure. After a short wash, de-liming is started by adding dilute hydrochloric acid continuously for half an hour, the other de-liming agents are added and, five minutes later, so is the bating agent. After about an hour the de-liming should be completed (no red with phenolphthalein). If it is not, the amount of the initial hydrochloric acid has to be increased until a safe margin has been reached. During trials the final pH must of course be regulated with ammonium sulphate $(\text{NH}_4)_2\text{SO}_4$ or a similar agent. The proper bating effect has to be ascertained in some other way (least drum grain in wet-blue or crust stage, for example). For many types of leather the amount of enzyme seems to be rather low.

Chrome alum is being used less and less in the pickle and has no place in the latest methods. With the present chrome tanning process however, it might help to produce a firmer grain.

The present chrome-tanning method, which was traditional up to five or ten years ago, uses what is regarded today as an excessive amount of chrome (about 3.7% Cr_2O_3). The short float, dry powder method normally uses 1.8-2.0% and at most 2.5% Cr_2O_3 . The details of the method have been discussed, and its feasibility has been proved in a few experiments at the factory. It has proved itself completely in practice, and almost all tanneries throughout the world are now using some variation of this basic method. If, for economic or other reasons, it is difficult to obtain powdered chromium salts, the possibility of using mixed high organic acid pickle with low salt content and recycling the chrome-tanning liquors should be carefully investigated. The method is already employed in practice with good results, including low chrome consumption. All methods allow recycling of the chrome liquors used in the pickle. Recycling will probably be inevitable in the future to minimize the loss of chrome in the effluent.

The present automatic chemical dispensing equipment has not been able to work as anticipated. Only some of the original functions are being used and the correctness of these (because of difficulties with valves and the like) is questionable. As it stands the equipment is counterproductive; to use it requires more labour than if all the additions were made and controlled manually.

Automation has been discussed for a long time now in the industry. Fully automatic systems have not yet been applied in practice, but big steps have been taken. Many tanneries today are using equipment that adds the required water and other liquors automatically, according to a program card, within small tolerances of volume, temperature and other simple characteristics, and controls the stopping and starting of the drums. Such proved systems are available commercially; the advantages are evident.

Intermediate mechanical operations

Chrome-splitting is employed, which is good practice. The advantages, mainly in labour saving, better splits and closer thickness tolerances, far outweigh the disadvantages of slightly higher chemical consumption and the loss of the possibility to vegetable tan the splits.

The possibility of arranging production lines (e.g. sawing-splitting-shaving) has been discussed and initial trials have been made. This has also been tried in many tanneries the world over, but without any real success. The different capacities of the machines in the line have made the production uneconomic compared with batch work at the individual machines when all factors are taken into account.

The splitting machine speeds are lower than those usually used elsewhere in the world. Feed speeds of up to 20 m/min have been achieved with good control of thicknesses etc. A common device using pneumatic cylinders to increase in a predetermined way the distance between knife and rollers at a certain point during splitting is very useful in order to get better substance in the shoulder and head parts of sides, especially the larger ones.

Neutralization, retanning, dyeing and fat-liquoring

These important processes that impart the ultimate characteristics to the leather itself are all more or less conventional and seem on the whole to give the desired results. The possible combinations are almost unlimited. It would therefore be pointless to discuss them in detail, and only a few points of general interest will be mentioned.

A chrome-retanning is employed for all non-corrected-grain leathers. This is a common practice especially for soft leathers, but powdered chromium salts are usually used because of their advantages and the smaller quantities needed. Usually 2% (24% Cr_2O_3) is added. Only for very soft leathers are larger amounts used (up to 4%) but then the reduced tear strength has to be kept in mind. It is often preferable to use a chromium/synton combination, that is much favoured in many places for its softening effect without impairment of the grain firmness.

A zirconium retanning is especially advantageous for white patent leather and other white leathers. It gives a whiter leather with a firm closed grain. The fat liquoring has to be adjusted accordingly using slightly more light fast oils.

In general, the formulae being used are fairly complicated, undoubtedly because of additions to the original formulae as time passes. This is common everywhere and would not matter had the chance for errors not grown logarithmically with the complexity of the weighing and other operations. It is advisable to review the formulae periodically and to try to bring them down to the simplest but most effective composition.

Prefinishing operations

These are all carried out in the usual manner and only a few points are mentioned.

The paste drying unit seems to give a rather variable water content to the leathers, which may be due to malfunctioning of the regulating instruments. It is as well to remember that the presence of instruments does not ensure a correct process: the instruments and their regulating functions have to be checked periodically. Whenever the process seems to be "out of line", any repairs necessary must be done immediately.

The way the paste is made and applied is rather primitive and may be partly responsible for the build-up of small, dry, difficult to remove particles on the glass platens. These particles, if left on the glass, can cause imprints on the grain, which are difficult to remove in the washing and might even remain after buffing.

A special mixing kettle of about 1,000 litres or more should be installed near the drying unit to permit paste making under controlled conditions and to specified viscosity (by Ford cup for example).

If difficulties are encountered in using the automatic spraying equipment installed with the unit, the paste can be very quickly sprayed on the glass manually from quite a distance using a low pressure spray gun.

The importance of correct water content in the leather during staking and dry milling must be pointed out strongly enough. If too much water is present the staking and milling will be easy, but the leather will dry out hard. With too little water, no amount of mechanical work will give acceptable results and in both instances the risk of obtaining a loose grain is very great. Some observations indicate that a closer supervision of these conditions might be advisable.

Finishing

It is evident that finishing has received the greatest attention from technical management, and most of the factory development work today is being done in this area. Close co-operation with all the progressive finishing materials suppliers in Europe and the United States ensures that absolutely up-to-date methods and materials are used. In this respect hardly more can be expected. The few points mentioned touch upon the application of these methods.

The padding (brushing) machine is not operating as it should. When turning the leathers over, the pads often coat the backs, sometimes very badly, and this is considered in many places to lower the quality. At the same time, paint is often applied outside the leathers, thereby causing economic losses. The machine should be corrected or rebuilt.

The base coat on patent leathers ought to be applied in a brushing machine as it is probable that a padding machine does not give a satisfactory bond. If manual brushing is preferred, the paint should at least be dispersed automatically, e.g. through low pressure nozzles, to ensure even distribution.

Polyurethane two-component lacquer has been applied during this period under very bad conditions due to the rebuilding of the lacquering plant. It has been impossible to avoid large amounts of dust. This and humidity variations militate

against a successful result. Great care should be exercised in obtaining favourable conditions. When the lacquered leathers are hanging over wooden rods to dry out, it has often been observed that the surfaces touch. They will then adhere, and this will cause bad blotches on the leather. A simple automatic conveyer system going up to the ceiling of the drying room could remove this danger and at the same time increase the drying capacity.

Quality and quality control

When speaking about the quality of leathers it must be borne in mind that some properties can be measured, chemically or physically, but others, of equal or greater importance, cannot. In Hungary there is a nation-wide control system, supervised by the Research Institute for the Leather, Artificial Leather and Shoe Industries in Budapest, which also issues the quality standards to be applied. In each factory a local quality control organization aided by an analytical and test laboratory is working to ensure that the leathers (a) meet chemical and physical standards and (b) conform to the other, non-measurable properties as closely as possible. The second task includes the establishment of the items in a given product range.

It is normally not difficult to achieve and maintain standard physical and chemical properties although at times there may be a difference of opinion between the leather and manufacturing industries. The complaints from the shoe industry, for example, are mainly about such things as wrong selections, looseness, wrong colour, colour differences within a batch or between different parts of a single side, softness, stand, touch, brilliance, coarseness of grain, and the like. All these properties are more or less impossible to measure, and most are a matter of opinion. In the end almost all such complaints have to be discussed and settled directly between the leather factory and the customer.

It should be pointed out that for the final results of shoe-making, for example, the manufacturing methods used are just as important as the quality of the leather. If, as has been seen in some instances, too much adhesive is used to bind the lining to the upper, it does not matter how soft and beautiful the leather is: the shoe will still be hard and uncomfortable and will break in ugly patterns.

Observations and comments

The quality of hide leather production at the Pécs Tannery, keeping in mind the raw materials being used, is generally good. With very few exceptions the products conform to chemical and physical standards and in the main the leathers are attractive and pleasant to the touch.

There is no reason to think that no improvements are possible. To mention but a few:

- (a) It might be possible to avoid some of the variations observed in the softness of the upper leathers;
- (b) looseness is sometimes unacceptably high, especially in larger sizes;
- (c) colour variations between and in full grain aniline sides and backs cause constant difficulties in finishing;
- (d) colour variations in velour split leathers cause grave difficulties at times;
- (e) Dust on the patent leather has been a daily occurrence; it is hoped that this will disappear when the rebuilding of the department is completed;
- (f) There are sometimes greasy spots and areas on patent leather. They probably do not affect the quality of the shoes, and they could be eliminated if any serious problems arise.

The main problem in obtaining good and, above all, consistent quality in leathers is caused by variations in and shortcomings of the tanning processes. With the present machinery, particularly the drums, it is difficult to make any real improvements. In recent years, however, a big step has been taken with the introduction of the new Challenger and Hagepiel tanning machines. Both have proved themselves in large-scale production, the former mostly in soaking and liming operations and the latter particularly in the retanning, where a spectacular improvement in dyeing has been observed in many instances. The Hagepiel machine has also proved itself for all wet processes, from soaking to retanning, with significant gains in quality, and reduced cost of materials and labour. The risk of tearing when processing very thin hides is minimized. The only real disadvantage is the relatively high investment necessary.

Physical and chemical control is very thorough and perhaps even too extensive. When a product line is well established and production is running well with no deviations in the test results for quite some time, it should be possible to rely on regular spot checks. This, however, will have to be decided in each case specifically.

It is doubtful whether most of the markings in and on the leathers for control and statistics are really necessary.

Productivity

The concept of productivity has been discussed extensively in the industry in recent years. It is usually expressed in m^2 man-hour or number of hides/man-day or some similar quotient. Figures of this type, however, are not absolute and cannot therefore be used to compare the productivity of different factories. The parameters affecting the calculations are almost infinite in their variations (factory size, hide types and weights, vegetable and chrome tanning, end products, splits handling, auxiliary materials, maintenance conditions and so forth), and for factories, with about the same real productivity, the quotients might be widely different.

A rather general estimate of productivity can still be made, however, by comparing two factories working under more or less the same conditions (size, hide types, tanning, etc.). A recent, fairly complete study of the productivity of a quite modern tannery producing about the same product range as the cattle-hide section of the Pecos Tannery and under similar general conditions indicated that productivity was about 70% of that of a hypothetical ideal factory of the same type. The productivity quotient was 3.5 hides/man-day, where the work of everybody from the general manager down was included in the man-days. This would give an ideal quotient of 5 hides/man-day for this type of factory - a figure which is probably not achievable anywhere for quite some time to come.

The cattle-hide section of the Pecos Tannery has 832 workers on the payroll. Adding other workers and employees in proportion to other sections (505) gives a total of 1,337 persons. The number of hides processed each day was about 2,430; so the productivity quotient is a little more than 1.8 hides/man-day. This indicates that the productivity at the Pecos Tannery is slightly more than half that of a modern western tannery or between 35 and 40% of a theoretical ideal tannery of similar type.

Observations and comments

Absenteeism is very high, because a large part of the labour force consists of women, who have the right to stay at home for three years when bearing children without being removed from the list of those employed by the factory. For comparison purposes these employees should be deducted from the labour force.

The machinery in the main is modern and working as well as can normally be desired. But in some cases the newest developments have been overlooked. As has been mentioned earlier, new processing machines have appeared during the last decade. The Hagspiel type, for example, not only improves quality and saves time and materials, but also reduces considerably the number of workers serving drums and pits in wet departments. It is quite evident that a tannery really wishing to rationalize its operations cannot afford not to use these machines, which are available with capacities up to about 12 tons. A small range of different sizes should be bought and installed in order to establish techniques and evaluate capacities and economics.

Work intensity at the machines appears to be quite good and it is not felt that much could be gained in this area.

The organization of work is not very successful. There are sometimes idle times for the machine operators due to difficulties in the flow of materials. This, however, is largely due to transport problems inside the different departments and, in some departments, to the small storage area allowed around the machines, which causes unnecessary movements of transport cars and pallets. A piece-rate system, besides being an incentive to high machine productivity, would minimize waiting time by incorporating transport time from storage area to storage area by manual transport (using cars or pallets with a hand fork lift) into the total cycle. To solve the problem of storage in the working areas requires a reorganisation of premises and machines.

The organisation of work should also include a precise description of the ways the machines are fed by the operators and the exact method should be explicitly described in the piece-rate agreement. If possible, all auxiliary workers should be included in the agreement in order to ensure the smooth running of the machines and minimize stops.

While much has been done in this area, much of the data is now obsolete and it is strongly felt that there remains much to be done. The necessary time and motion studies for all the cases mentioned are made everywhere by a work study department in co-operation, and this is important, with the foremen in the different departments and the necessary research and development department.

The work study department should therefore not simply measure the time necessary for a given job; it should first try to find out the best way to do the job and be alert to possible newer and better ways. The attitude of the department should be that there are always many ways to do a job and the present one is almost certainly not the best. It must also be pointed out, however, that the actual acceptance and incorporation of changes in the work is the responsibility of departmental heads. For the rationalization work in the plant, this department is most important and its proper functioning is essential to efficient production. The post of manager of the department is also one of the most important ones and should be close to that of the chief technical manager.

Quite a few people are employed in indirect work of a more or less humanitarian type because of disabilities. This is a local condition that lowers efficiency and working morale. It is a common and most commendable practice, but an investigation covering the whole company would probably find ways to make better use of disabled workers. In extreme cases it would be to the advantage of both workers and management to offer such workers early retirement. This is another task for the work study department.

If the operation of certain of the machines is to be efficient, time-saving and easy, there might be a need not only to organize their feeding (organization of work) but also for auxiliary equipment. A few examples: conveyor belts to move the hides into drums; placing the fleshing machines on high bases so that the hides can be passed through to a trimming belt after turning and then directly into the transportation cars; manual fork lifts to allow transport between machines; equipment for stacking after buffing; drying conveyors in the ceilings; automatic speed changer for the certain coaters; automatic take-off equipment in the patent leather flow coating.

The proposal and design of such equipment, based on the observations of work study personnel or after requests from departmental managers, should also be the duty of the work study department.

The indirect work being done in the different production departments is proportionately very high; its usefulness should be kept under constant review by the work study department.

Perhaps the most difficult problems at the Pécs Tannery are those connected with interdepartmental transport, because of the very dispersed layout of the whole company with many plant and administrative buildings of different types and areas spread over a large area. This not only requires considerable manpower and equipment for the means of transport themselves and their management, but also influences directly and indirectly all other work, creating problems of coordination, communication, control, and the like. In many instances transport causes damage to leathers due to tipping transport cars, bad coverings, leathers touching the ground or walls when passing through narrow spaces and so on. The layout and transport lines for a few leather products are shown in annex II.

It is obvious that the somewhat haphazard layout is a result of development over many years, when quick decisions and improvisations often had to be made; similar development can be seen in many tanneries the world over. Unfortunately, it seems that this type of development is continuing at the Pécs Tannery, while elsewhere in the world there is a very clear and strong trend to rationalize operations and streamline factories. The majority of modern tanneries have rebuilt old plant or built completely new plant and the investments have almost always paid off.

It is of course possible to improve the situation by organizing transport more efficiently and by relocating some departments, but to obtain a really efficient modern tannery a new factory would have to be planned, designed and built, perhaps around the existing chrome-tanning shop. If the latest tanning machinery is used the space required should not be too large.

Another significant departure from standard practice elsewhere in the world is the amount of administrative work being done. Paper work not only keeps a lot of administrative personnel occupied, but also interferes with the essential work to be done by the departmental managers, superintendents and foremen, whose work should principally be on the factory floor itself, ensuring a smooth flow of materials, organising the work and controlling product quality.

The reporting system for attendance, payments, output and other statistics more or less necessary for costing and book-keeping is complicated and requires voluminous paperwork. Elsewhere in the world, the most common system uses a

fairly simple batch reporting card containing the original hide dates and operations to be carried out, with spaces to be filled in by the operators during the movement of the batch from its formation to its separation where one or more batch cards will take over. These cards, together with individual time-cards to be stamped by a time clock for all personnel, would be sufficient for all the purposes mentioned. The time cards would indicate attendance and should bear a reference to the batch cards for piece-rate payments. All the cards should be collected after having been used for the various administrative purposes, and kept by the statistics section.

What has been said about the production departments also applies to the central administration which has to deal with all incoming data. All paper work, requests for information or statistics and the like should therefore be carefully scrutinized and periodically reviewed in order to avoid collecting data, that are of little or no real importance for the management or performance of the company.

Research and development

There is no research and development department at the Pécs Tannery, which is surprising in view of the size and importance of the company. Such a department has been found to be absolutely necessary at all tanneries of any renown for future activities and for keeping processes and methods up to date. The very rapid technological developments which have taken place in the industry in recent decades, especially in the field of tanning machines, which have also influenced the processes fundamentally, have further underscored the importance of research and development.

A highly qualified manager has been appointed for research and development work, but he has no special equipment or pilot plant or even an office of his own. All the development work, even initial small trials, has therefore to be done in the production departments; the manager does his paper work in the office of the production manager of the cattle hide department. The same office is also used for discussions with technical representatives from the leading European chemical industries supplying the tanneries.

This is certainly not a happy situation, and the work of all parties is affected. During the initial development work the production departments and their personnel should not be involved. When factory-scale trials are deemed

necessary, however, they should be carried out in the works in co-operation with the research and development department but under the direction and responsibility of the production manager.

At present the production managers at all levels are involved in development work and they devote a lot of time and effort to it. Although this could be considered useful, because it keeps them well informed of new developments, it interferes with their proper work, which is to keep the daily production running well, and focuses their attention very much on the chemical or material composition. The organization of work and mechanical operations do not receive the attention they should. If only for this reason, it is important that all development activities should be directed and co-ordinated centrally.

The recently appointed manager is above retirement age. His successor must therefore be found and appointed as soon as possible in order to ensure a smooth and efficient take-over.

Other considerations

Technical services

At present the technical services are split up among several departments, which is an unfortunate situation. They should be brought together under one management. All the technical services employ a lot more people than is usual elsewhere. Special arrangements for spare parts, autonomous construction and other circumstances account for much of the large labour force, however, as do the very extensive factory area, and the many buildings and installations, the age of which is responsible for breakdowns and hence much maintenance and repair work.

Electricity and steam are bought from outside and are used at seemingly reasonable costs, although the steam consumption seems comparatively high.

Water is partly supplied by the company's own pumps, and partly bought from the town. The highest cost, however, is incurred in the disposal of the water. The effluent passes through sedimentation lagoons on its way to the town purification plant. The cost depends on the analysis of the incoming water and is rather high. The total water cost - raw water and effluent - is estimated at 25 million forints a year, or more than 1.5% of total sales. A new purification plant is planned at an estimated cost of about 125 million forints, and this should reduce effluent disposal costs considerably.

The Pécs Tannery has a water consumption of about 90 l/kg salted weight of hides, however, which is very high indeed. Most tanneries nowadays use less than 50 l, a modern tannery uses less than 30 l, and special water-saving tanneries have been able to reduce water consumption to less than 20 or even 15 l/kg salted weight. The gains are evident and do not need further discussion. The high water consumption at the Pécs Tannery is chiefly due to bad water disciplines: valves are left partly open when not in use, floors and machines are cleaned with enormous amounts of water, correct washing times for the drums are not observed. In addition, the technology and tanning machines (drums) are not suitable for a very low-water process. The lowest consumptions are recorded at tanneries using Hagspiel tanning machines (and sometimes recycling) for all wet work. The introduction of these machines automatically reduces water consumption in all the cases mentioned.

Costs and costing

Because of the special circumstances involved the absolute costs of materials, labour, services and the like will not be discussed. Nevertheless, two noticeable factors influencing these costs and their distribution in costing will be mentioned.

In most tanneries the yield of the raw hides (the area obtained from the purchased weight) is carefully registered and used in dealing with the hide sellers. Although the hides for the Pécs Tannery are purchased centrally, the purchasing agency should be informed continuously of the yield of each lot purchased. At present only the yields of hide types according to the local salted weight classification are calculated and they are of no interest to the purchasing agency.

A statistical method is normally used to obtain the necessary data, which are also used later for re-calculation. When a hide lot is brought into the store-house, about 10% of the total number of hides, constituting a whole drum batch or a whole number of drum batches, are withdrawn at random and weighed immediately to establish the relationship between bought and received weights. These 10% are processed when convenient and lined weights are obtained for each batch of the different end-products for which the lot has been sorted. Subsequently, at each manipulation that changes the composition of the

At the different sub-lots are weighed and registered. In this manner, the total, each yield, and the split ratio for different end-products are established. This is important when deciding which product is the most suitable to produce in a given situation. The figures obtained differ widely, e.g. between corrected grain leather, patent leather and garment leather. The 10% is enough for all practical and statistical purposes. Processing weights have to be obtained as usual, of course, but they do not necessarily have to be collected centrally.

In the costing the distribution of indirect costs does not depend on the size of the lot processed. This is usually not correct: indirect costs - and very often specific direct costs (e.g. materials) - are significantly higher for smaller batches. This is very well demonstrated by the much higher productivity of factories with a narrow range of end-products. To establish the cost differences is difficult, if not impossible. To induce the customer to avoid ordering smaller lots, however, a higher unit price should be asked for lots under a certain area.

Capacity

The present processing capacity of about 50 tons of cattle hides a day should not be significantly increased. Machine capacity is sufficient with present technology for this production level. In a few instances production has been lower than planned, but this has been caused by a lack of workers and not a lack of capacity.

Labour

Because of the increased difficulty of obtaining workers in Pécs the company has started a split finishing plant in Felsőszentmárton. This plant now employs about 70 workers. Several company buses bring workers in from the surrounding towns and villages up to a distance of 30 km. Recruiting has also come to involve relatively large groups of people with no industrial experience or aptitude, which causes serious problems in training and because of absenteeism etc. The recruitment difficulties are largely due to the relatively low salaries, sometimes very heavy work and the crowded and often dirty working conditions.

This situation underscores again the importance of work study, which if properly conducted, should considerably ease these conditions and also free workers for other tasks. Indeed, with the existing possibilities for rationalization, no new workers should be needed, although the work study department must of course be given some time after its organization to produce results.

Planning

All managers at all levels must plan their work, but planning at the company level is especially important and can determine how successful the company will be in achieving its objectives in the future. The planning should cover both the near and the rather distant future and should be rotating, i.e. at any given time plans should always exist for the whole planning period - 10 years, say - although the plans should be regularly reviewed and adjusted. The nearer in time the plans are, the more rigid they must be to avoid uncertainties and economic losses. Conversely, the more distant the plan, the more flexible it must be to take advantage of all technical or other development.

From the outside, it looks as if the plans at the Pécs Tannery are very inflexible, and this seems to have led to some unfortunate results:

(a) The new pigskin plant will simply be a new addition to the old one and it will be equipped with relatively old technology. This fact is all the more disturbing when it is realised that perhaps the greatest difficulties in this type of production (colour variations in the dyeing) are exactly those that the new technologies are able to overcome most effectively;

(b) The new water purification plant is planned to cope with the present effluent situation. No account has been taken of the economics of a water saving technology and no investigation or evaluation has been made.

Company organization

From the discussion of productivity it has been established that the Pécs Tannery employs many more personnel than tanneries of similar production, size and type in western countries, not only directly in the production departments but also - and to an even greater extent - in other departments: maintenance, book-keeping, sales and others. Annex III shows the present organisation of the whole company. The pigskin and fibreboard departments are

included because of their influence on the organizational structure. It is noted that the company has recently been subject to special investigations into its organization, that quite a few changes have been made, and that more are planned. In this report, however, only the present situation has been recorded and discussed.

Observations and comments

How to organize a production company effectively is usually a matter of conflicting opinions, as is the question of administrative personnel needed in addition to the production workers. Sometimes local or national conditions, rules and regulations will have a considerable influence on the administrative work to be done and therefore on the organizational structure and the staff needed. A few basic principles, however, are commonly accepted by the more advanced tanneries all over the world and it is with these in mind that some features of the organization and administrative work of the Pécs Tannery will be commented on.

The general structure of the company seems to be a mixture of two organizational types. Usually a big tannery is organized either in self-contained units classified according to end-products with their own maintenance, transport, planning, development work and so forth, or in functional units covering the whole factory. There are many reasons to believe that an amalgamation of the pigskin and cattle-hide departments at the Pécs Tannery and their re-organization with one lime yard, one chrome-tannery shop and other common services would have great advantages over the present structure. Many products from one department already have to be sent to the other for processing (velour splits, crushed patent and full grain pigskins) and this can only cause difficulties and mix-ups. The gains from a reorganization would be evident in the co-ordination of the use of chemicals, especially aniline dyes, syntans and oils with correspondingly less stock and unused materials. Similarly, machines and manpower would be utilized much more efficiently, and with the technical people available the tasks of management would be made easier.

It is usually accepted that responsible managers should not have too many persons to deal with directly, and this is especially important for the managing director, who should be freed as far as possible from the daily routine work.

in order to be able to concentrate on the larger issues. The many smaller tasks now linked directly with him ought to be dealt with within the general organization. On the other hand, the distance from the managing director to the work force should not be too great and the tasks should therefore be spread out sufficiently to avoid too many links in the chain of responsibility.

Responsibility and authority go hand in hand: without one the other loses its meaning. Therefore a person in the line of responsibility should never be bypassed by a superior giving orders, information or other details unless there is special reason to do so. To some degree, this principle is not being observed and the practice can never cause anything but confusion, tension and difficulties for everybody.

A certain overlapping of duties has been noticed in some areas. This could and should be avoided by having written job descriptions clearly defining the areas of responsibility (and authority).

It must be emphasized again, that the biggest difference between the Pécis Tannery and western tanneries is to be found in the large number of people employed in administrative work, and in the division of similar or related tasks between different persons. The latter is costly and often creates confusion or uncertainty with the result that, to get only a fairly simple decision made, a lot of different people have to be consulted. The remedy is clearer and more defined organization, followed by an investigation into and rather rigorous decisions on what statistics, registrations, and other data are really necessary.

Annex IV shows a suggested tannery organization which is basically the most common structure used in Western Europe and the Americas. But no organization is better than its staff, and it should therefore be adapted to the staff available, trying to take advantage of their strengths and to minimize their shortcomings.

The purchasing department and the purchasing of hides has always been a special problem. There is no common practice to be found among the western tanneries, mainly because of the very important role that the hides play in the economy of a tannery. It is therefore common for the managing director to reserve this task for himself. In other companies, responsibility is given to the sales or production manager, while a special purchasing director will sometimes (usually only in very big companies) be found directly under the managing director.

At the Pôcs Tannery, where, because of the special circumstances, hide purchasing does not exercise the influence felt in western countries, the department is tentatively placed under the commercial director, which is generally the most practical approach.

RECOMMENDATIONS

1. Production should be reorganized by process. One of the greatest obstacles to a properly functioning production organization is the present set-up with separate pigskin and cattle-hide tanneries, each with its own lime yard, chrome-tanning, finishing etc. These shops should be made to process whatever raw hide material is available. The savings in labour, administration and materials, and the improvements in the utilization of machines, management personnel, etc. are quite evident.
2. The present enlargement of the pigskin plant should be replanned, if possible. This is partly a corollary to the preceding recommendation, but the change should also be made in light of the new techniques available, which, according to the existing plan, are unfortunately not to be utilized.
3. The whole company organization should be restructured. The present organizational structure is thought to be an important source of many of the difficulties and problems arising in the day-to-day work. A more rational organization is suggested, based on the most common structure to be found in modern western tanneries (annex IV). It is certainly believed to be more efficient and will fill the need for separate research and development and the rationalisation work in production plants and offices that has so far been largely neglected. The main features are:
 - (a) The managing director is freed from all small details, which are dealt with by an administrative director;
 - (b) Responsibilities are divided among a larger (but not too much larger) group than the present one;
 - (c) To ensure that important development questions are properly treated, the post of director of research and development, reporting directly to the managing director, is created;
 - (d) The head of sales, as in most companies, reports directly to the managing director;
 - (e) A work study department is created directly under the technical director to treat all questions of rationalisation methods and organization, and time studies in the production departments;
 - (f) A similar department, administrative rationalization, is to assist, under the administrative director, in organizing efficient office work in all departments. Studies and advice on paper routines will be an important part of the job;
 - (g) To avoid confusion and overlapping duties, similar or related tasks are gathered under one heading;
 - (h) Deputies to the different heads of department are appointed from among the subordinates to act in the absence of the head of department (or company).

Appropriate space and equipment should be assigned as soon as possible to the newly created research and development department. As a first step, a nucleus of technicians under the director of research and development should investigate, devise and suggest immediately in the light of the suggestions made:

- (a) A correct lime yard weights procedure;
- (b) A chrome-tanning process using less chrome;
- (c) New processes or methods corresponding to the points made in this report;
- (d) Processes to be used in the new machine, if and when available.

The suggestions should be made to the appropriate heads of department for action.

4. Two Hagpiel tanning machines (e.g. one 2 m³ and one 13.5 m³ - capacities of about 0.6 and 6 tons of hide material respectively) should be purchased. These machines, which are not used at the Pécs Tannery, have proved themselves in large-scale production. They save time, chemical materials and water and improve quality substantially, especially colour consistency. The two factory size machines should be bought in order to:

- (a) Establish appropriate processing data (times, temperatures) and formulae for liming, chrome-tanning and the various retanning and dyeing steps;
- (b) Evaluate improvements in quality;
- (c) Calculate costs and compare with earlier methods;
- (d) Evaluate the capacity of the machines;
- (e) Compare total gains with investment.

5. The factory layout should be completely replanned. This should take into account the possible new organisation and technology with the aim of concentrating and stream-lining production and minimising interdepartmental transport. The present layout (as seen in annex II) is the greatest obstacle to establishing an efficient and labour-saving organisation of work. Everything possible should be done to improve the situation. The best way to attack the problem would probably be to construct several models and investigate their capacities, transport, hide materials flow, and the investment costs of the change. One possible model is: lime yard in present finishing building; chrome-tanning unchanged up to drying; preparation for finishing and finishing in new pigskin plant; and patent finishing unchanged.

The only really efficient solution would be to build a completely new plant that follows the ordinary flow of the leathers and utilizes the new tanning machine techniques. The approach has been discarded, however, as too expensive under present conditions in Hungary and because of the rather unpredictable future of the tanning industry in all industrialized countries.

6. The possibility of abolishing vegetable tanning should be investigated. Vegetable tanning is, in all probability, uneconomical at the Pécs Tannery. If it is deemed necessary from a national point of view to continue vegetable tanning, it would be better to concentrate it in one tannery, even if the other tannery has to subsidize production.
7. The possibility of collecting and distributing fresh hides should be taken up with the domestic hide purchasing agency. This system is being employed increasingly in the western countries, especially in South and North America. The gains for both the slaughter-house and tannery are great. With the relatively short distances in Hungary the system ought to be readily applicable and really only needs good organization. But enough hides should be gathered in this manner to allow the tanneries to make up proper batches of the different weights.
8. Before a final decision is taken on the purification plant, a water-saving technology should be investigated and evaluated from an economic point of view. Much money could be saved in building the new plant if much less effluent was to be treated. The savings could be put towards the cost of installing the new machines necessary for a truly efficient water-saving technology.
9. A higher price should be introduced for short production runs. Short runs are definitely more costly than long ones; how much more is normally impossible to calculate. They also lower significantly the capacity of the production department concerned. Orders of less than, say, 1,000 m² should carry a percentage surcharge on the nationally agreed prices so as to induce the manufacturing companies to avoid small orders as much as possible.
10. Correct yield calculations should be introduced. This can be done by correctly weighing as described 10% of each lot purchased. Proper yields are important for correct price comparison of purchased hides and should be submitted regularly to the appropriate purchasing agency. They are also necessary for the correct evaluation of different end products.

11. The possibility of obtaining wet-blues in Bangladesh, India and Pakistan should be investigated. The small and light cow hides from these countries are excellent for patent leathers if properly bought and taken over. Unlike the other, older-established, hide-exporting countries, Bangladesh, India and Pakistan are still possible sources of wet-blues.

12. The possibility of cutting the heavy domestic hides in wide whole flanks (bellies) and backs should be investigated. Because of looseness in the bellies the heavy Hungarian hides are not easy to process as upper leather sides. If properly cut, however, the different parts would make acceptable upper leathers if treated separately. Acceptable garment and upholstery leathers can be produced in whole sides.

All the foregoing recommendations could be implemented by the existing personnel at the Pécs Tannery. The time needed to carry out the first steps after the initial decision should be fairly short - not more than six months. Apart from the new tanning machines, which would cost about \$150, no large investments are contemplated. Rather considerable investment might be necessary at a later stage, after the layout and economy of the new tanning machines have been investigated.

The reorganization of the management structure (recommendation 3) could probably be carried out with the aid of a firm of management consultants. The replanning of the factory layout (recommendation 5) would also probably be easier with the help of a foreign expert.

Recommendations 6, 7, 9 and 11 would need the assistance and co-operation of the national authorities.

The investigation suggested in recommendation 12, should be made in co-operation with one or two appropriate shoe factories.

Annex I

JOB DESCRIPTION

Post title: Expert in the organization of leather manufacturing and in the perfection of upper leather manufacturing technology

Duration: Six months

Date required: As soon as possible

Duty station: Pécs

Purpose of the project: In order to provide a better supply of leather to the strongly developing shoe industry, the Government considers it necessary to improve the manufacturing technology and production organization of side upper leathers

Duties: The expert will co-operate with the special department of the Ministry of Light Industry and his working area extends to the Pécs Tannery. Specifically the expert will be expected to carry out the following duties:

1. Evaluation of existing methods and management;
2. Analysis of applied technologies;
3. Judgement of applied methods of product and production development;
4. Elaboration of a proposal on necessary measures to be taken to improve the manufacturing technology and production organization of side upper leathers

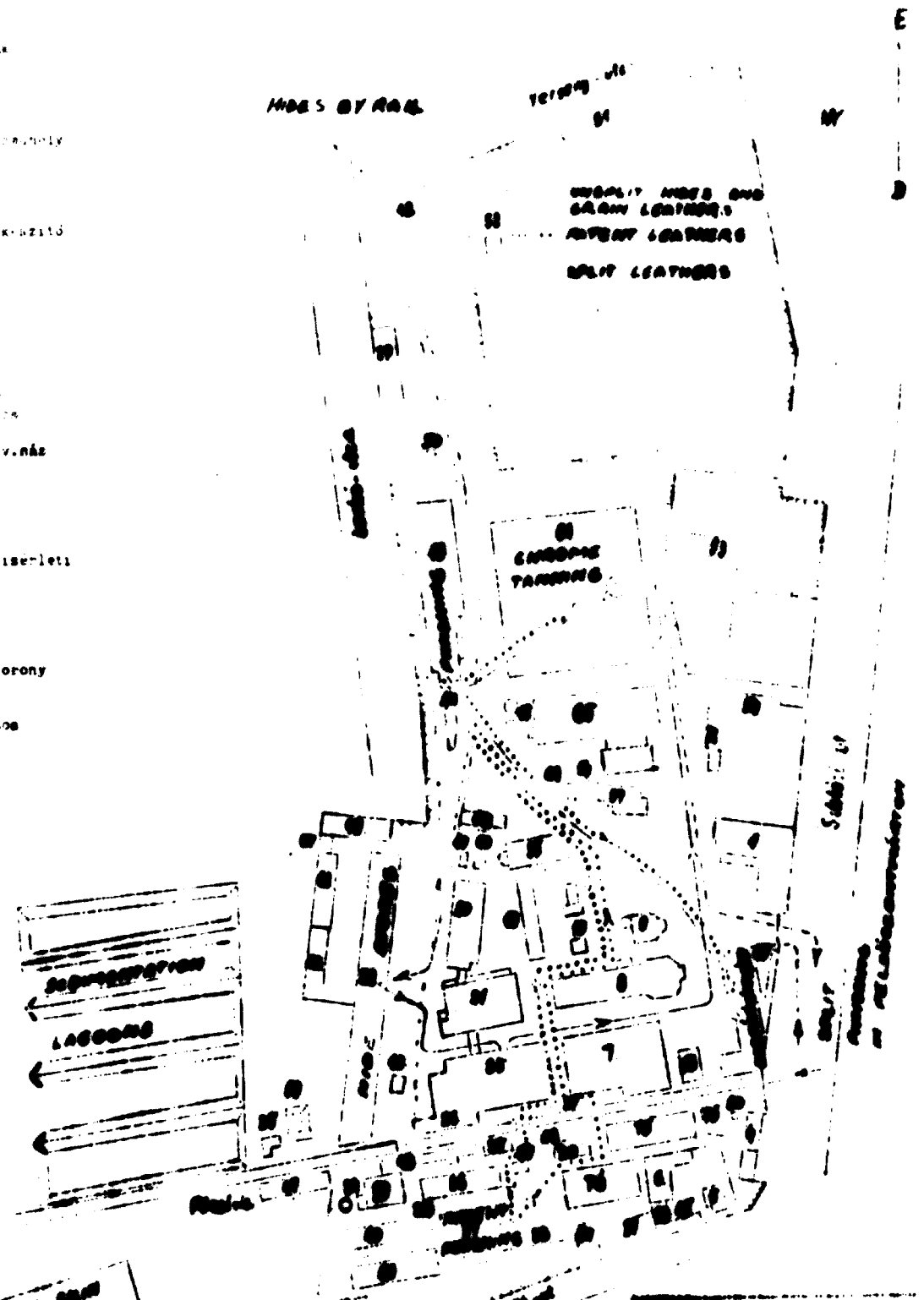
Qualifications: The candidate should have extensive experience in production organization and manufacturing technologies for the leather industries

Language: English or German

Background information: About 80% of the production of the Hungarian leather industry is made for the shoe manufacturing industry, mostly of side leather. The Hungarian leather industry processes about 50 thousand tons of raw hides per year. The industry is giving employment to some 6,000 persons. The Leather Factory Pécs produces about 30% of the total Hungarian production. The various types produced are sole leather, upper leather, garment leather, technical leather and fancy leather. Rapid development of the shoe industry is restrained by the relative backwardness of production of side upper leather; also the required level of production economy cannot be achieved. The Government expects solution of the above problems by the assistance of the expert.

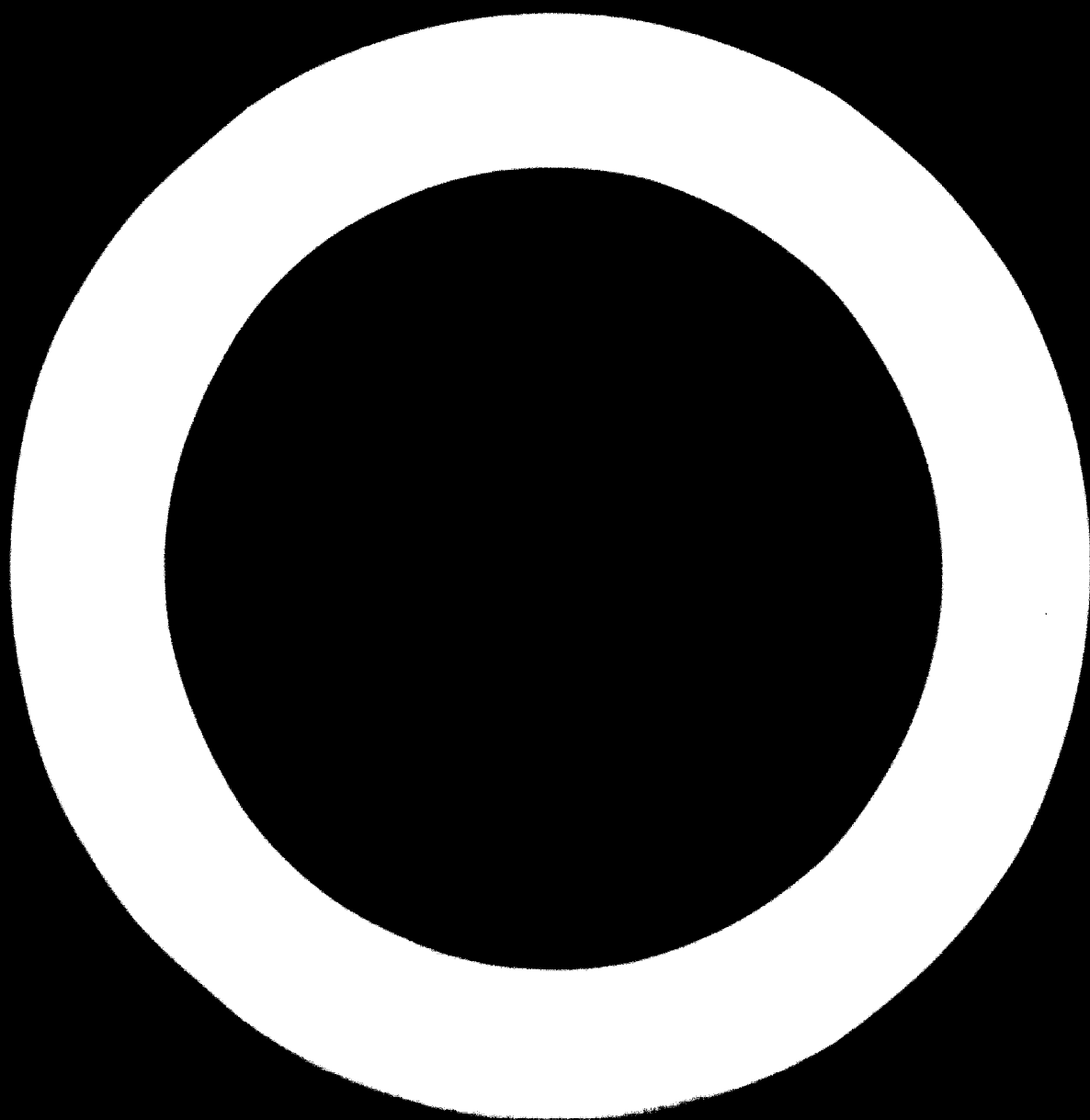
SITE PLAN OF FÉCS TANNERY

1. Készítők, szobák
2. Belső udvar
3. Iroda
4. Szobák
5. Iroda
6. Szobák
7. Szobák
8. Szobák
9. Iroda, iroda, iroda
10. Iroda
11. Iroda
12. Iroda
13. Üveglátvány, kávézó, kávézó
14. Kávézó
15. Szobák
16. Övohely
17. Övohely
18. Extraktórium
19. Csereváros
20. Hőcserélő
21. Csereváros
22. Nyersbőr, szaktár
23. Nyersbőr, szaktár
24. Sz.
25. Szaktár
26. Készítők
27. Készítők
28. Garázs
29. B. Szaktár
30. Szaktár
31. Víznyelő
32. Víznyelő
33. Tűzoltó lakóháza
34. Szaktár
35. Szaktár
36. Fehérítők
37. Lakás
38. Műhely
39. Műhely
40. Készítők
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42. Szaktár
43. Műhely
44. Készítők
45. Szaktár
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67. Műhely



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 FÉCS TANNERY
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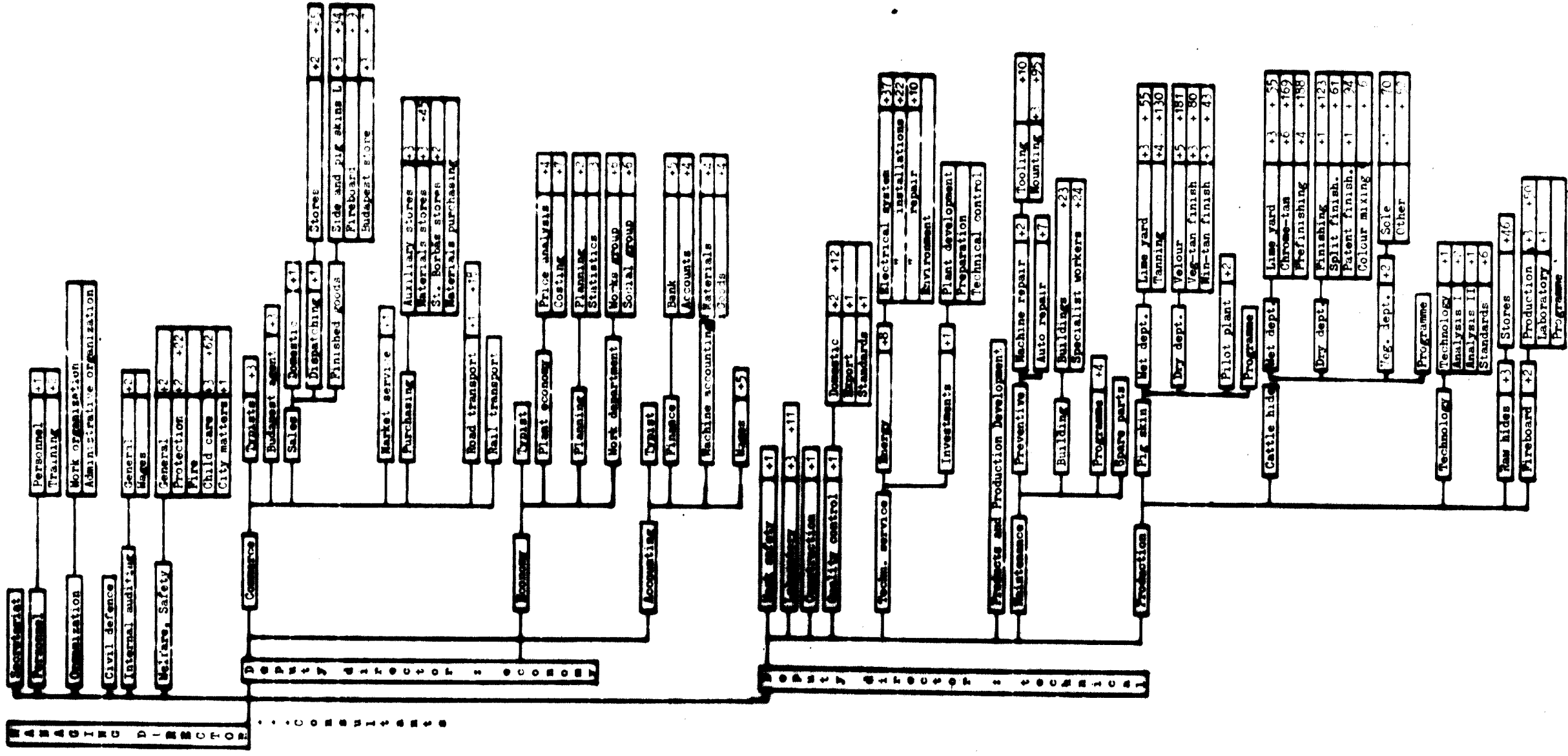
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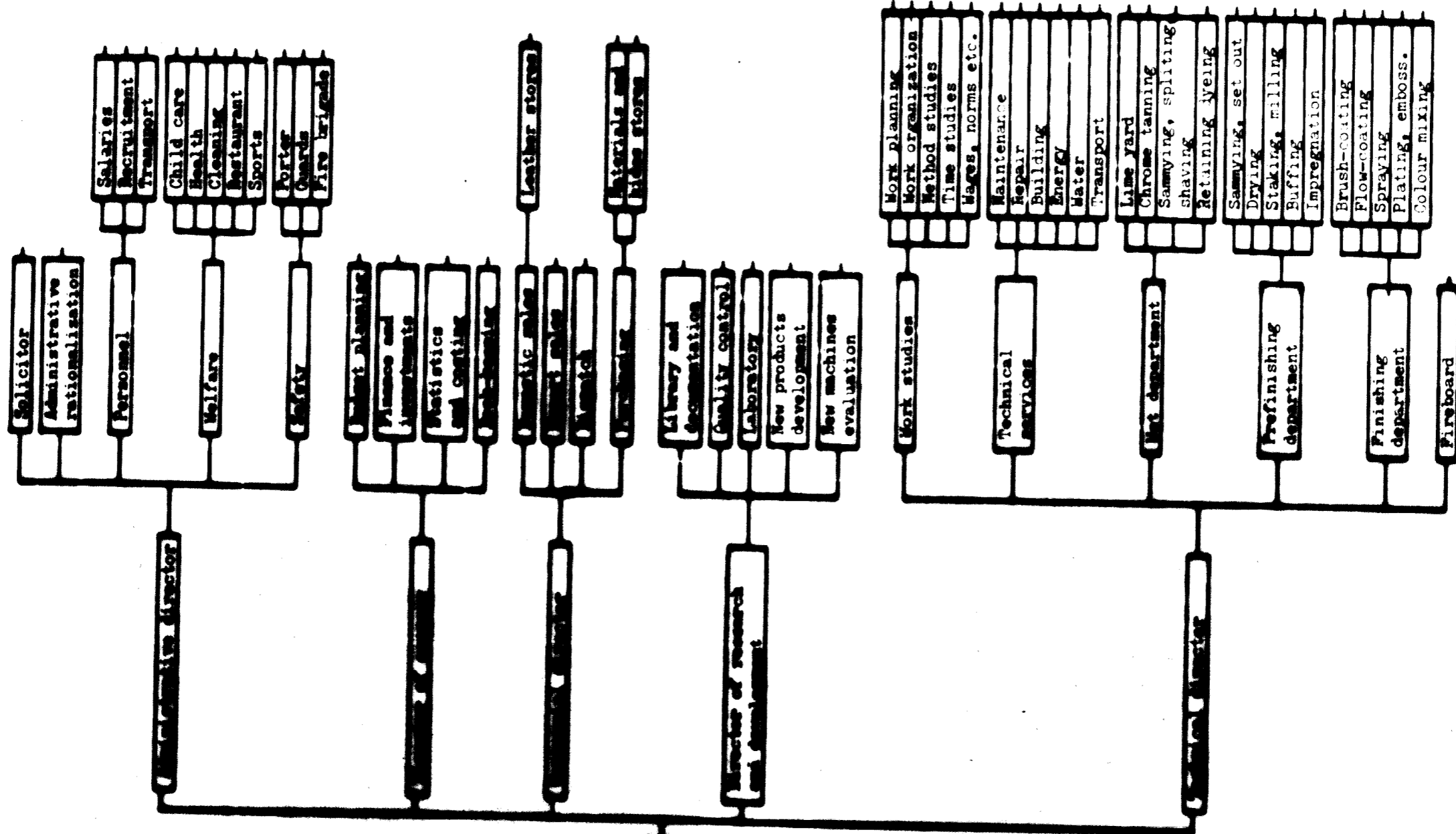
Annex III

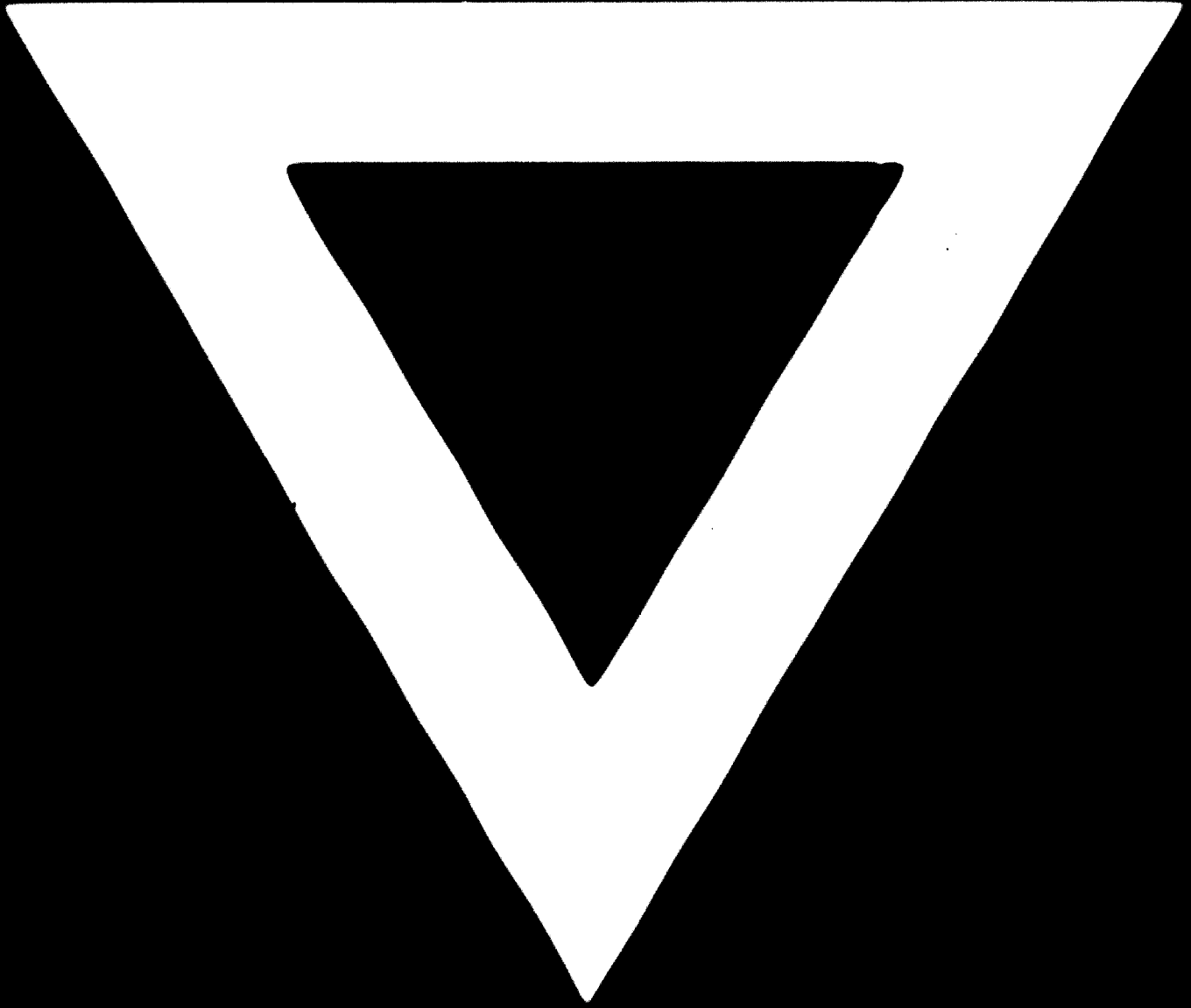
PRESENT ORGANIZATION OF THE PÉRS HANNEBY A FICTIVE

Level of competence or responsibility not indicated.
 Each rectangle represents one person.
 Additional personnel to the right of rectangles.



SUGGESTED TANNERY ORGANIZATION





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