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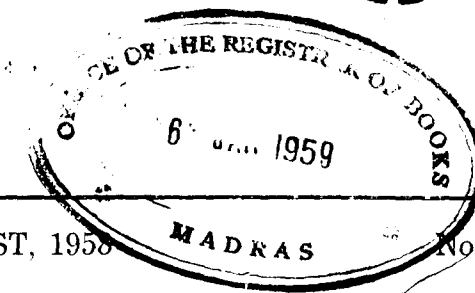
C.L.R.I. Madras

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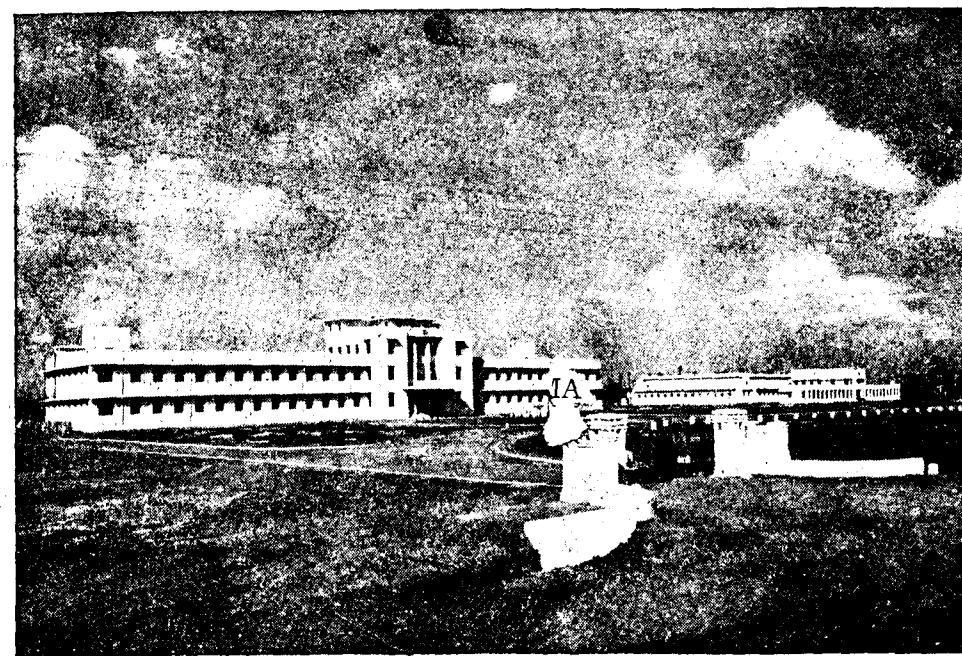
VOL. V

AUGUST, 1958

MADRAS

No. 1

333



COUNCIL OF SCIENTIFIC & INDUSTRIAL RESEARCH
INDIA

Bulletin of The Central Leather Research Institute

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The Bulletin of the Central Leather Research Institute is issued monthly.

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SPECTROPHOTOMETRIC STUDIES IN LEATHER RESEARCH—PART IX*

Photometric Titration Method for Estimation of Salts
of Weak Acids in Tanliquors

BY

A. NAGASIROMANI, D. RAMASWAMY &
Y. NAYUDAMMA

Central Leather Research Institute, Madras 333

SUMMARY

By modification of the method of Rehm and Higuchi, a photometric titration method has been worked out for the estimation of salts of weak acids present in tan liquors. The method consists in using an indicator, metanil yellow, whose pK_a is one or two units higher than that of the weak bases titrated and then extrapolating the points much beyond the end point on to the X-axis. The tan liquors gave linear plots which could be extrapolated to unmistakable stoichiometric end point. The method has been found to be valid with mixtures of tanning solutions to which known amounts of salts of weak acids are added and spent tan liquors.

Tan liquors contain salts derived from weak acids like oxalic, lactic, acetic, gallic, phosphoric and uronic acids and sometimes those from strong acids like hydrochloric acid. The acids and salts present in tan liquors have a profound effect on the properties of leather produced, an increase in acidity giving a firmer leather and an increase in salts, a softer specimen. The balance between the two is an important factor in making leather. So correct estimation of the salts present in tan liquors is imperative. Several methods have been proposed for determining these, the following being the main ones: (1) Ion exchange resin method,^{1,2} (2) sulphated ash method,³ (3) electrometric titration to pH 2.8 and 2.0⁴ and (4) the recent non-aqueous titration method.⁵ The ion exchange method has been

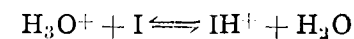
* Presented by (late) Miss A. Nagasiromani at the Seminar on 11-7-1958.

found to give low values due to adsorption of the acids by the resin and the possible precipitation of the insoluble acids from the salts. The second method fails when volatile ammonium salts are present. Moreover these two methods cannot distinguish between salts of weak and strong acids. The criticism levelled against the widely used method of titration of pH 2.8 or 2.0 is that it is arbitrary in the sense that none of the salts of weak acids gives a sharp inflection in potentiometric titration; also the arbitrary pH values chosen may not be applicable to all types of salts. However there is the advantage of quickness. Non-aqueous titration method is fairly applicable because a definite inflection is obtained at the endpoint. However, it has got its limitations, e.g., more than 5% of water and salts of strong acids should not be present. Therefore, to determine salts in leach liquors, the latter have to be evaporated to dryness and then subjected to estimation.

Photometric methods are generally accurate, fool proof and reproducible. Hence a photometric method has been tried for the determination of salts of weak acids in tan liquors. The present method is based on the work of Goddu and Hume^{6,7} and Higuchi, *et al.*⁸ and consists in using an indicator whose pK_a is one or two units higher than that of the weak bases titrated and then extrapolating the points much beyond the endpoint on to the X-axis. Metanil yellow is an ideal indicator for salts of weak acids present in tan liquors, in that it is so weak that about 80% of the salts are titrated before the indicator becomes into the picture and then the rest is titrated along with the indicator so that extrapolation is necessary. The colour of the indicator in acid medium has at 530 mμ, maximum absorbance which is linearly proportional to acid added. Rehm and Higuchi⁸ have photometrically titrated weak bases like pyridine, aniline, benzoates and salts of weak acids, in aqueous medium with metanil yellow as indicator. There are altogether three types of plots in these titrations, with

volume on the X-axis and the spectrophotometric reading on the Y-axis. The first type is a direct plot of absorbance against volume of acid added, applicable as developed by Goddu and Hume⁷ to cases where the titrated species itself acts as the indicator, the endpoint being indicated by a break in the titration curve. An external indicator could be added in other cases where the endpoint is obtained by extrapolation to the X-axis. The second type of plot is one⁹ wherein the acid base ratio IH^+/I is plotted against either the volume of titrant added or its reciprocal, depending upon the pK of the system and the pK of the indicator. The intercept on X-axis on extrapolation gives the stoichiometric equivalent directly or reciprocally, respectively. These two types of plots were found to be unsuitable for the present investigation because a number of salts with widely varying pK values are present. The first type of plot resulted in non-linear and irregular graphs making extrapolation erroneous. Hence the third type of plotting IH^+/I against volume, as followed by Higuchi⁸ was resorted to.

The theory involved in this is that an aqueous system containing the weak base B and the indicator will in the course of titration contain the two acidic species BH^+ and H_3O^+ . For a weakly basic indicator, the equilibrium $BH^+ + I \rightleftharpoons B + IH^+$ would be far to the left; the concentration of BH^+ will have, therefore, very little effect in bringing about a colour change. Beyond the end point or in the final stages of the titration of the weak bases, there will be an accumulation of hydrogen ions in the form H_3O^+ with which the indicator will be competing to react. At this stage, the equilibrium will be



The constant for the above equilibrium can be written

$$K = \frac{[I][H_3O^+]}{[IH^+][H_2O]} \quad \text{Taking the concentration of water as con-}$$

stant it becomes $\frac{[I]}{[IH^+]} \frac{[H_3O^+]}{[I]} = K_1$ i.e. $[H_3O^+] = \frac{K_1 [IH^+]}{[I]}$

If the excess acid present in the system is made equal to (X-S) where X is the total amount of standard acid and S the amount which is stoichiometrically equivalent to the base, the resultant equation would be

$$(X - S) = K_1 \frac{[IH^+]}{[I]}$$

Thus a plot of the ratio of $\frac{[IH^+]}{[I]}$ against X cuts X-axis with an intercept of S, corresponding to the concentration of the base.

EXPERIMENTAL

Reagents and Chemicals :

Approximately N. HCl was prepared and standardised against carbonate free alkali. A 0.24% aqueous stock solution of metanil yellow was prepared (2 ml. of this were added to 100 ml. of the tanliquor).

2% solutions of different tannin extracts were prepared, centrifuged and 5 or 10 ml. of the centrifuged solution were used for each titration. In cases where extracts were not available centrifuged leached liquors were used, the solubles being found previously. The procedure followed by Higuchi *et al.*⁸ is a direct titration wherein the solution of the weak base and the indicator are taken in a beaker and titrated against acid, the absorbance reading being taken after each addition with the original solution of salt with indicator added as blank. Some serious drawbacks were observed in the preliminary experiments in applying the same procedure to the tanliquors. Negative absorbance readings were obtained upto a certain stage; this could be due to the absorbance of chromophore groups of the tannin decreasing with the addition of the acid. The positive values when plotted gave points which were not linear even at the end, thus making correct extrapolation difficult. This difficulty could also be due to the fact that acid-added tanliquors were susceptible to changes of

absorbance with time. For systems where there are chromophore groups absorbing at the particular wavelength used this method fails and hence a modification of the method is necessary wherein the blank is continually renewed with the addition of the acid so much so the effect due to absorbance of the chromophore groups will be nullified and the absorbance due to indicator alone is measured. Accordingly, the following procedure was adopted. Two aliquots of the tanliquor were taken in different 25 ml. flasks, the indicator being added only to one of them and adding increasing amounts of the titrant each time into both the flasks and making up the solution. The solutions were transferred into 1 cm. corex cells and the readings taken using the cell filled with the solution without the indicator as blank. The IH^+/I values were computed from the experimental values as follows :

$\frac{IH^+}{I} = \frac{A - A_b}{A_a - A}$ where A_a is the absorbance of the pure acid form obtained by adding excess acid, A_b — that of the pure base form obtained without adding acid and A is the reading during the course of the titration. $A - A_b$ is the difference between the value for the combined acid and base forms and that for the pure base forms (which is equivalent to the free acid form); $A_a - A$ is the difference between the value for the total acid equivalent of the indicator and that for the combination of acid and base form which corresponds to the total free base form of the indicator converted into its acid equivalent.

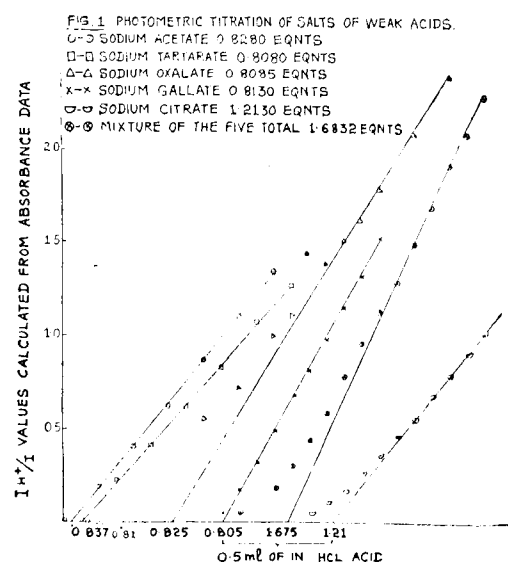
Data and Discussion :

A number of weak bases like acetate, oxalate, tartrate, citrate and gallate were titrated both individually and in mixture to test the accuracy of the method and also to standardise the concentration of the indicator. The results are given in Table I. A few typical ones are plotted in Fig. 1. It is seen from the results that the observed values

TABLE I
Titration of Salts

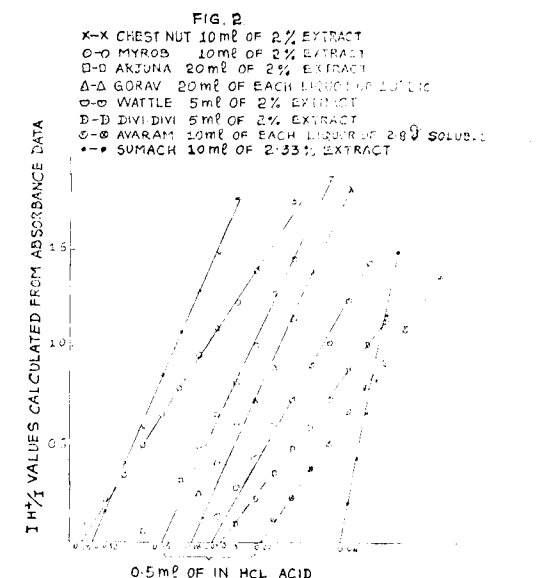
Nature of salt	Theoretical (m.eq.)	Observed (m.eq.)	Error %
Sod. acetate	.. 0.8279	0.837	+1.1
oxalate	.. 0.8085	0.82	+1.4
tartrate	.. 0.808	0.810	+0.2
citrate	.. 1.213	1.21	..0.0
gallate	.. 0.8193	0.805	-1.8
Mixture of Salts:	.. 1.6832	1.675	-0.6
gallate, acetate, oxalate, tartrate, and citrate			
Do.	.. 0.5909	0.59	-0.2

agree within 1% with the stoichiometric equivalents. However, in the case of oxalate and other salts of polybasic acids, it is necessary to calculate $IH^{1/2}/I$ values upto 2 and the



extrapolation should be done from the end values because of the strong nature of their 1st pK values as observed by previous workers.

Fig. 2 shows the photometric titration curves for different tanliquors like white-valem, sumach, wattle, myrob,

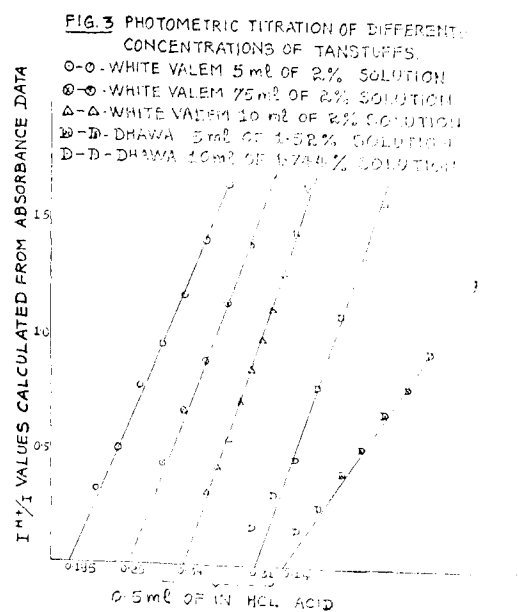


chestnut, avaram, dhawa, goran and divi-divi. In Table II are given the salt of weak acid content in terms of mgm.

TABLE II
Photometric titration of weak acid salts in tanliquors

Nature of extract	m.eq. of salts per 100 gm. extract
1. White-valem	.. 186.6
2. Dhawa	.. 180.3
3. Sumach	.. 27.5
4. Quebracho	.. 20.3
5. Wattle	.. 39.3
6. Myrob	.. 39.0
7. Chestnut	.. 16.9
8. Divi-divi	.. 30.9
2nd con	.. 29.8
9. Avaram	.. 78.6
after removal of tannins	.. 34.1
10. Goran	.. 78.0
after removal of tannins	.. 35.3
11. Arjuna T	.. 116.6

equivalent per 100 g. of extract. It is seen that the points lie in a linear line beyond 0.5 and when extrapolated to the X-axis give unmistakable end points from which the salt contents were obtained by simple calculation. The values vary with different tanning materials from 16 m.eq. for chestnut to 185 m.eq. for white-vale.



The method has also been applied in cases of mixture of tanning extracts where extrapolation of the linear points gave values corresponding to the added value of the individual tannin extracts within 3-4% error (Table III). To test further the validity of the method, mixtures of salts were added to the tanliquors and the results obtained photometrically are given in Table III. It is seen that the experimental values agree within 2% error with the theoretical values, thus proving the validity of the method. It is also clear that weak acids like gallic and salts of strong acids like NaCl and Na₂SO₄ have no effect on these titrations as shown by the non-variation of the values when NaCl and Na₂SO₄ were added. The ineffective nature of the weak

acids is due to their incapacity to react with the weak bases and the still weaker indicator. Hence it is clear that neither the presence of weak acids nor the presence of salts of strong mineral acids has any effect on the determination of salts of weak acids photometrically. In the case of avaram and goran after removal of tannins by chromed hide powder, spent tanliquors were used. The values for the salts were approximately half their original values as observed by non-aqueous technique showing thereby that the method could

TABLE III

Nature of the solution	Theoretical value (m.eq.)	Observed value (m.eq.)	Error %
Avaram + acetate + oxalate			
+ tartrate + citrate and gallate	0.52879	0.52	- 1.6
Chestnut + gallate + acetate			
+ tartrate + oxalate + citrate	0.59085	0.59	- 0.4
+ NaCl and Na ₂ SO ₄			
Mixture of extracts:			
Chestnut + White-vale + Wattle	0.2298	0.22	- 4.4
White-vale + Wattle + Quebracho	0.23818	0.2363	- 0.9
Avaram dialysed	0.1434	0.15	-

be used for spent tanliquors. In the case of avaram, the liquor was dialysed exhaustively, and the dialysate analysed according to the method of Burton.¹⁰ The salts present in dialysate showed concordance with the theoretical values for the avaram. The dialysis was practically complete after 6 to 7 days. In the next figure, proportionality to the concentration is depicted for 3 different concentrations of white-vale and 2 concentrations of Dhawa. It is seen from the data that values within 1% error were obtained in all concentrations excepting a low concentration of white-

valem which gave a deviation of 4%. Table IV shows the comparative values by the three methods, viz., photometric, non-aqueous titration and potentiometric titrations to pH 2.8 for a number of tanliquors. It is seen from the results given in the Table that the values obtained by photometric titration technique are slightly higher than the values obtained by pH titration to 2.8. The slightly lower figure obtained with sumach is not very significant. But if the pH titration was continued further, values corresponding to those of photometric technique were obtained between pH

TABLE IV

Comparison of values by different methods.

Nature of extract		Photometric	Non-aqueous	Titration
		(m. equts/100	gms. of extract)	to pH. 2.8
White-valem	..	186.6	171	160
Dhawa	..	180	122	124
Sumach	..	27.5	28.5	35.1
Quebracho (sulphited)	..	20.3	35.5	21.6
Wattle	..	39	35	29.5
Chestnut	..	17	16.4	13.8
Divi-divi	..	31	37	19.6
Avaram	..	78	—	74
Myrob	..	39	36.6	30.5

2.8 and 2.5 the actual pH varying with different liquors. Mostly the values agree with figures obtained with the non-aqueous technique. Only in cases of dhawa and quebracho considerable variation is observed. The quebracho used in the experiment was sulphited and it is possible that the presence of free sodium bisulphite might interfere with the non-aqueous technique. Since the dhawa used for photometric experiment was of a different variety, strict comparison of the content of salts of weak acid obtained by the different techniques does not hold good.

Thus it is seen that the salts of weak acids are titratable accurately with high reproducibility by photometric titration procedure. The method, however, depends on the use of spectrophotometer to indicate the end points, and gives only the total amount of salts of weak acids present and not the salt contents individually.

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RESEARCH BEARS FRUIT

Practical Demonstration No. 4

(Second Series)

RAPID TANNAGE OF SOLE LEATHER USING INDIGENOUS SUBSTITUTE FOR WATTLE*

BY

E. C. MATHEW

Raw Material : Wet salted buffalo hides weighing 40-50 lbs. each.

Soaking : The hides are soaked overnight or for a period of six hours, in plain water, cut into sides, washed in four changes of water, drained well and weighed.

First Liming : They are limed in once used second lime liquor with addition of 6% slaked shell lime and handled twice. Next day 1% sodium sulphide is added and the sides are handled twice. They are handled once on the following day also. On the fourth day the sides are unhaired and relimed.

Second Liming : The unhaired sides are relimed for two days in a fresh bath containing 12% slaked lime and 1% caustic soda. The sides are handled twice on the first day and once on the second day. (The percentages are all based on the soaked weight of the sides).

Fleshing : The sides are fleshed, weighed, washed for two hours in a paddle, scudded and left overnight in plain water.

Deliming : Next day the sides are paddled for half an hour, scudded, and delimed with 1½ to 2% sodium bisul-

* Process demonstrated during July 1958.

phite and 1 to 1½% boric acid in a paddle. When ¼ of the thickness of the butt has been delimed, ½ to 1% formic acid is added and the sides paddled further. When 2/3 of the thickness of the butt has been delimed, the sides are scudded, rinsed in plain water and taken to the suspender. The pH of the pelt is now 7.0.

Tanning : The liquor in the suspender is of 10°Bk strength and of pH 4.65 and is got by leaching four parts of Pithecolobium dulce bark and one part of myrobalans both on weight basis. The sides are rocked for one hour in the suspender. Next day the sides are rocked several times. Further handling and strengthening are as follows :

3rd day: Beaming on the flesh side, laying flat in 20°Bk liquor (pH 4.18) and handling several times.

4th day: Handling.

5th day: Piling and transferring to 30°Bk liquor (of pH 4.10).

6th day: Piling and putting back in the same liquor.

7th day: Piling and transferring to 50°Bk liquor (of pH 4.05).

8th day: Piling and putting back in the same liquor.

9th day: Piling and transferring to 70°Bk liquor (of pH 4.0).

10th day: Piling; the strength is maintained at 70°Bk, and the sides are put back in the same liquor.

11th day: Beaming; the strength is maintained at 70°Bk, the pH is adjusted to 3.5 with addition of formic acid; the sides are put back in the same liquor.

12th day: Piling and putting back in the same liquor. (The liquor required is throughout got by leaching 4 parts of Pithecolobium dulce bark and one part of myrobalans on weight basis).

13th day: *First myrobing*. The sides are put in once used myrob liquor of 65-70°Bk.

14th day: Handling.

15th day: *Second myrobing*. The sides are put in fresh myrobalan liquor of 65-70°Bk.

16th day: Handling.

17th day: Handling.

18th day: The sides are washed on both sides with plain water and piled for two days keeping them grain to grain and well covered.

Oiling: The sides are first drummed for 15 minutes in a slowly revolving drum with the addition of Gum Tragon paste using 2-3 oz. % of Gum Tragon. Then 2% of Epsom salt and 1-2% glucose are added and the drum run for 15 minutes. Then a mixture of 2% raw pungam oil and 2% sulphonated pungam or castor oil is added and the sides drummed for two hours. Then the sides are removed and hung to dry. When sammed, the sides are set well and again hung to dry. They are set twice more before the drying is complete.

(N.B. From deliming to oiling, percentages are all based on the fleshed pelt weight).

Seasoning and rolling: Water is applied to the sides and after drying they are rolled. A season of the following composition is applied: casein: 1 lb., borax: ¼ lb., boric acid: 4 oz., gelatine: 1 oz., decoction from 2 oz. of linseed, water to make upto 1 gallon. After applying the season the sides are dried and then rolled.

Yield: 60-65% on fleshed weight.

AN IMPROVED PROCESS FOR THE ENZYMIC UNHAIRING OF SKINS AND HIDES BY MADAR (*CALOTROPIS GIGANTEA*) LATEX FOR THE MANUFACTURE OF LEATHER *

BY

S. M. BOSE, W. MADHAVAKRISHNA & (Late)
B. M. DAS

SUMMARY

A process for the enzymic unhairing of skins and hides making use of madar latex for the manufacture of glove leather, glace kid, box sides, E.I. tanned kips and skins, sole leather or the like has been developed. The process consists in immersing soaked and drained skins or hides in an unhairing bath comprising a mixture of madar latex, common salt and water at pH 5.5 for unhairing and bating within a period of about 20-24 hours.

Unhairing of skins and hides by the liming process is well-known. It is also known that pancreatic enzymes as well as certain mold and bacterial enzymes of proteolytic character could be used for unhairing. The only plant enzyme the use of which is known for unhairing is papain. Recently, it has been reported that unhairing by means of certain mucolytic enzymes is also possible. The available literature on enzymic unhairing, however, relates to the manufacture of light leathers only. No work appears to have been made so far with regard to the suitability of enzymic unhairing for the manufacture of heavy leathers.

It is further known that in some of the tanneries of Punjab, the fermented mixture of madar (*Calotropis gigantea*) leaves, *maida* and salt is used for unhairing of goat skins for the production of what is known as 'Nari'

* This process which was originally covered by Indian Patent No. 50806 is now released to the trade, free of cost.

leather and of sheep skins to make a leather known as 'Kabuli Bheris' much used for cheap book binding. The process adopted is very crude and requires quite a number of days to prepare the fermented liquor and to complete the unhairing of the skins. No process, however, has been hitherto proposed for unhairing skins as well as hides making use of madar latex under scientifically controlled conditions for the manufacture of different types of leather.

The object of the present investigations was to develop an improved process which would enable the use of madar latex for the enzymic dehairing of goat, sheep or calf skins and cow, ox or buffalo hides in the manufacture of glove leather, glazed kid, box sides, E.I. tanned kips and skins, sole leather and the like. Another object was to develop the process under scientifically controlled conditions, but at the same time make it as simple and economical as possible.

The following is a detailed description of the process for both skins and hides. Though the process has been described with reference to skins, it also applies in the case of 'hides'.

The skins are weighed and soaked in water. If the stock is wet-salted, soaking for about two hours is quite enough, and, if dry salted or dried, soaking overnight in water containing 0.1% or 0.15% (on the basis of volume of soak water of caustic soda or sodium sulphide is preferable. Addition of about 0.1% (on the volume of soak liquor) of a disinfectant like bleaching powder will prevent bacterial action. If fresh skins are available, only a few changes of water are needed. When the stock is thoroughly soaked, they are washed well and kept immersed overnight in enough float of water containing 1.0% of commercial (40%) lactic acid based on the soaked weight of the skins. Next morning they are thoroughly washed, drained and weighed. 3.0% madar plant latex (the latex used is tapped from madar plants which grow wild practi-

cally throughout India) and 5.0% common salt (both based on the drained weight of skins) are thoroughly mixed in water the volume of which should be such that there is just enough float for the skins. The pH of the medium is adjusted to 5.5 by adding the required amount of a mixture (2:1 by volume) of lactic and acetic acids and the skins are handled in the liquor for sometime and left completely immersed under it. Periodical stirring of the liquor and handling of the skins are necessary, otherwise uniform unhairing will not result. The stage when the hair comes off quite easily should be very carefully observed and any prolongation of unhairing beyond this optimum time results in putrefaction of the skins. The time required is inversely proportional to the atmospheric temperature. In the course of our investigation we have noticed that at room temperature of 28-32°C, the entire process of unhairing and bating is completed in 20-24 hours. If the room temperature is lower, more time, and if the room temperature is higher, less time is required. After the optimum time, the skins are unhaird, fleshed and scudded to remove all short hairs and thoroughly washed in several changes of water. If any short hairs are still not removed by scudding the skins are put back in the unhairing bath for a couple of hours more but this time the unhairing bath is diluted by removing about half of the old liquor and adding the same quantity of fresh water to it. After about two hours, the skins are scudded well and washed thoroughly in water. No difficulty has been experienced in the above operations and the unhaird pelt after thorough washing has a bated feel and appearance and hence no further bating is required. Another noticeable feature of the pelt prepared by this process is its extreme cleanliness in both the grain and flesh sides.

The skins are then pickled if they are to be chrome tanned or pickled and depickled if they are to be vegetable tanned. The tanning and finishing operations are carried out in the usual manner except that such of the modifica-

tions in the processes as recorded under the examples are to be adopted.

The following specific examples are described to indicate the way in which different types of leather can be produced making use of this process of enzymic unhairing, these do not in any way limit the scope of the application of this process.

EXAMPLE 1

Glazed Kid: Goat skins after unhairing by the process are pickled with 10.0% Na_2SO_4 , 1.0% H_2SO_4 (Sp. Gr. 1.74) and 100% water based on the pelt weight. They are handled in this liquor for some time and left in it overnight. Next day they are drummed for about an hour in the same pickle liquor along with 2.0% aluminium sulphate based on the pelt weight. Then the first bath of two bath chrome tanning process is given with 7.0% dichromate of soda and 3.5% HCl based on pelt weight of stock. The usual dip bath is given and the reduction bath consisting of 20.0% hypo and 8.0% HCl is fed. The leathers are found to be highly satisfactory and the leathers compare well with glazed kid produced by the conventional liming processes.

EXAMPLE 2

Box Sides: Cow hides after unhairing by this process are pickled as mentioned under No. 1 and tanned by the single bath chrome process making use of a hypo reduced liquor containing 5.0% dichromate on pelt weight. When the leathers stand the boiling test, they are taken out, piled and the next day, dyed, fatliquored with 4.0% Cremol 'S' and finished in the usual manner. The quality of the leathers produced is found to be highly satisfactory.

EXAMPLE 3

Glove Leather:

Up to tanning the same process as described for box sides under Example 2 is followed with the skins. They

are then shaved lightly to uniform thickness and neutralised with 8.0% hypo for one hour and washed well with water. Next they are bleached for one hour with 4.0% Perfectan 'O' (bleaching syntan) and 0.5% oxalic acid based on the chromed shaved weight, rinsed well in water and fatliquored with 6.0% Turkey red oil, 2.0% China clay in water and 2.0% titanium oxide and drummed for two hours. The rest of the process is the same for chrome tanned glove leather.

EXAMPLE 4

East India Tanned Kips:

Cow hides after being unhaird by this process are washed well and then handled for some time in 3.0% 'Basyntan' (auxiliary syntan for pretanning) solution based on the pelt weight and left overnight in this liquor. Next day they are beamed well on the flesh side and put in the bark liquor along with the syntan liquor and the bark tanning and finishing process are followed in the usual manner. The kips produced compare well with E. I. tanned kips of the trade.

EXAMPLE 5

E. I. tanned goat and sheep skins:

Usually in E. I. tanned goat and sheep skins, pickling is not adopted. However, in the case of skins unhaird by this enzymic process, it has been observed that pickling and depickling help to improve the quality of finished leather. Accordingly, goat and sheep skins after unhairing by this process are pickled with 1.0% H_2SO_4 (Sp. Gr. 1.74), 10.0% common salt and 100.0% water on the pelt weight by handling them for some time in the pickle liquor and leaving in it overnight. Next day, they are drained and depickled by handling them for about two hours in a liquor of 4.0% hypo, 4.0% common salt and 100.0% water on pelt weight. They are washed well in

many changes of water, scudded on both sides and again washed well and finally vegetable tanned and finished according to the traditional process of East India tanning. The finished leathers have properties very similar to those produced by the usual liming process.

EXAMPLE 6

Sole Leather :

Bark tanned sole leather has been produced by employing the process of enzymic unhairing. Buffalo hides after unhairing are handled for about three hours in 1.0% solution of lactic acid based on the volume of the solution and then well washed in water. They are handled for some time in 3.0% 'Basyntan' (Auxiliary syntan for pretanning) solution based on the pelt weight and left overnight in the same liquor. Next day they are beamed well on the flesh side and bark tanned along with the syntan liquor and finished as is customary with the bark tanned sole leather. The quality of the finished leather is quite satisfactory.

A distinct advantage secured by the process of enzymic unhairing by means of madar latex is that it is applicable to skins as well as hides, in the production of different types of both light and heavy leathers. Another advantage is that the process can be applied with great success for getting triple action to the extent that the effects of the three processes of liming, deliming and bating can be achieved in one process alone and within a period of twenty-four hours only. The process described shows that the enzymes present in the madar latex possess unhairing and bating action.

TECHNICAL SEMINAR

The Problem of Raw Hides in India

Mr. Cohn of Kanpur Hide Co., Ltd., and Mr. W. A. Rutherford of Gordon Woodroffe Leather Manufacturing Co., Ltd., Madras, discussed the problem of raw hides with the Technical Staff of the Central Leather Research Institute on 25th June, 1958.

Initiating the discussion Mr. Cohn said that the problem with regard to raw hides had its origin in the villages where proper care was not taken to cure hides immediately due to right type of salt being not available in the villages. Delay in transport of hides to collecting centres in Kanpur, leading to loss of substance was another problem. Due to the practice of mixing good and bad quality hides, the tanner did not get the right type of hides. Mr. Rutherford next said that in the tanners' point of view the best quality hides were from North-western parts of India. The region of origin of hides has a great bearing on the quality.

In the course of the discussion, Mr. Cohn made the following suggestions:—

The hide should be cleaned, washed and salted after flaying. A second salting was to be given if the hide were not properly salted. Minimum delay should occur in sending hides to the collection centres and from there to the tanners. As regards cow slaughter, it was a clash between religious feelings and economic interest. In the light of the verdict of the Supreme Court permitting slaughter of useless cows, the question was one of deciding when a cow or bullock could be taken as useless. As far as this Institute was concerned, it could collect samples of hides from different districts, classify them and have a record of the hides

available throughout the country so that the tanner might readily get information pertaining to his requirements. The Institute could help in eradicating ticks and warble.

One of the principles of the hide merchant was to buy hides in wet condition, for in the dried conditions one could not find out whether it had hairslip and so on. One could look at the size and weight.

The other points that were brought out in the course of the discussion were the following :—

Proper slaughter houses should be situated in towns where animals are slaughtered and the hides cured under the Government control. Bittern salt could be used for wet-salting but when these wet-salted hides are subsequently dried, the use of this salt is dangerous. 3% zinc chloride solution was good; but use of Preventol and sodium pentachlorophenate was better. The Government could start a hide collecting centre in a place like Dharbanga from where best hides are got. A dead hide was not always inferior to slaughtered one. If a perfectly good animal died of internal disease a first-class hide was obtained. Only when animal died of old age or mal-nutrition were the bellies and shoulders thin and the hide inferior. Some years ago 60,000 to 80,000 hides were coming to the Kanpur market every week and the curing also was good. Nowadays only 20,000 hides are coming and those too badly cured.

TECHNICAL SEMINAR

Activities of the Small Industries Service Institute in Relation to
the Leather and Foot-wear Industry*

BY

J. GOSH,

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Cottage and small scale industries have been given an important place in the new industrial policy of the Government. The following are the important points which give special emphasis to the development of small scale sector:—

(1) Paucity of capital resources, (2) more direct incentive to broader sections of population and providing personal attention to every small body of investors for greater distribution of capital concentration and utilisation of small capital resources, (3) distribution of industries to help regional employment, (4) requirement of comparatively less and smaller machinery and equipment which may be available or be developed with the indigenous resources, (5) less number of skilled staff, less machinery and less investment required by small scale units and (6) easy diversification of production in terms of market.

Small scale industries are expected to meet the increased demand for consumer goods and also for components and parts required by the large-scale sector. A sum of 61 million rupees has been allotted in the Second Five Year Plan for development of small scale industries. Units employing less than 50 workers and using power and those employing 100 workers without power and having a capital

* Condensed from the talk given on 4-7-1958.

structure of less than 500 thousand rupees are considered as small scale units. The general technical pool of small scale service institute has been created by the Ministry of Commerce & Industry for (1) providing technical assistance to small scale units, (2) assisting the State Governments in implementing the various schemes of small scale production training and service, (3) providing service facilities through opening model workshops, (4) conducting economic survey of industries and areas and make recommendations for their development, (5) instructing small industrialists in business management and marketing, (6) publishing bulletins, pamphlets, model schemes, etc., for the guidance of the small industrialists, and (7) co-operating with the National Small Industries Corporation. Leather industry section is only a part of the Small Industries Service Institute (SISI).

Footwear Industry. Approximately 12 to 15% of our population only wear foot-wear. There is however an annual increase in this number with increase in per capita income. Traditional footwear workers are present in almost every village of industry, most of them having very low standard of living, low productivity and limited marketing capacity. Mechanised or organised production of footwear has not taken away the prospects for further production in the small scale sector. Our present effort is to see that more organised small scale footwear units are established in the Southern Region where there has been very little of this industry in the past. The Southern Region does not have any large scale production of footwear either.

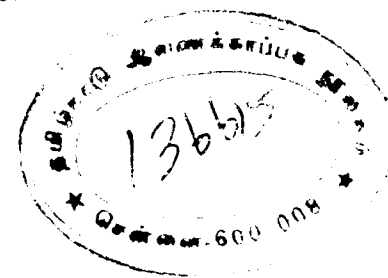
Three demonstration vans have been sent out in the three southern States as part of the programme of developing the footwear industry. During the last two years there has been a general increase in footwear production in the South. To feed these expanding small scale units, with adequate staff of operatives, foremen and managers, the

Central Foot-wear Training Centre has been started in 1957 by the S.I.S.I., under the able guidance of foreign experts. The training imparted here is modelled to suit the purpose of small scale units.

Leather Industry. The role of S.I.S.I. with regard to leather industry is to be considered in the back ground of the development of footwear industry. The demand for finished leathers has increased considerably and East India tanners have been thinking for sometime past about diverting their production to finished leathers. The demonstration of processes by the Central Leather Research Institute has been of help to the tanners in formulating some plans for future development.

The S.I.S.I. has helped some of the tanners in the South in mechanising their production by extending hire purchase facility through National Small Industries Corporation. In consultation with the State Government a Servicing centre has been established at Erode. This centre takes job orders for all machine work and assists the tanners in solving their workshop problems.

The S.I.S.I. is now engaged in a survey of leather, footwear and leather goods industry in the Southern region. With the continuous and able guidance and co-operation of the Director, Central Leather Research Institute, it is hoped to be able to present by the end of this year a comprehensive picture of the present situation of the above industries.



CLASSIFIED ABSTRACTS

RAW MATERIALS

RHABDITIDIASIS, J. J. Tancous and W. T. Roddy, J.A.L.C.A., 53, 350 (1958). Rhabditidiasis, also referred to as Rhabditis dermatitis, is caused by a small worm which burrows in the epidermal portion, making channels through the hide. It is found in 'country hides' of animals which have been housed in filthy quarters. The nematode (worm) which causes this disease is normally saprophytic and nonparasitic, living in manure and filth piles where decaying organic matter is present. Under circumstances of extreme insanitation the worm becomes parasitic and burrows into the animal's hide causing a dermatitis and extensive grain damage. In veterinary literature it is reported that if the environment is favourable or, possibly, if animals have nutritional deficiencies, this disease can spread rapidly. The damage done is permanent, and there is nothing that the tanner can do to correct it. The leather made from hides having advanced infestations is useless.

A STUDY OF THE USE OF LYSOL AS A BACTERICIDE FOR HAIR SLIP HIDE. M. K. Dalal, B. R. Roy and M. Bannerjee, J. Ind. Leath. Tech. Assoc. 6, 62 (1958). Freshly slaughtered hides were allowed to remain in moist condition without addition of salt, for 48 hours. Hair slip occurred and hide substance content decreased. The soak solution of such hides was taken and bacteria from this were grown on agar plate, with 0.1-0% (on hide weight) Lysol added. 0.75% of Lysol was found to be effective in checking bacterial growth. The same was confirmed by adding various amounts of Lysol to pieces of the hide which had developed hair slip; leathers obtained from these pieces were found to be normal. Addition of Lysol up to 0.75% caused no discolouration. It is concluded that Lysol is an efficient preservative, causing no difficulties in leather manufacture.

— V. S. P.

PROCESSES PRIOR TO TANNING

THE CHEMICAL CLEANSING OF HIDES WITH PHOSPHATE SALTS. V. P. Suvorova, M. G. Margulis and N. D. Tru-

bitsynz Legkaya Prom. 16, No. 1 26-8 (1956)); Chem. Abst. 52, 7749 (1958). Scudding of fine skins for chrome tanning generally is done by hand (in USSR); the machines in use such as the tumbler do not give satisfactory results. For the chemical scudding and deliming operation a fresh water change is made in the vat and 2 separate portions of Na_2PO_4 solution are added. A solution of $(\text{NH}_4)_2\text{SO}_4$ is then immediately added at intervals of 10 minutes. The bath is maintained at 30-5° for 35-40 minutes. The amount of phosphate salts used varies with the kind and thickness of the hide; sheep skin, 2% of the hide weight; goat, 1.5-2.0%; calf, 1.0-1.5%. Addition of $(\text{NH}_4)_2\text{SO}_4$ ranges from 0.5 to 1.5%. The application of chemical cleansing eliminates much of the machine and hand labour and reduces the possibility of injury to the skins.

VEGETABLE TANNING

ACCELERATING THE PROCESS OF EXTRACTING TANNINS. R. I. Preobrazhenskaya. Legkaya Prom. 16, No. 8, 22-4 (1956); Chem. Abst. 52, 7751 (1958). To increase the rate of diffusion of tannins from oak wood, wet chips (45% H_2O) serving as semiconductors were preheated in a high-frequency induction field before the usual water extraction. Temperatures of 140-220° were attained in 3 or 4 minutes. By virtue of the high temperature gradient between the centre of the chip and the steep water the coefficient of absorption was raised from 100 (without preheating) to 150-160. Green or unseasoned woody material can be treated in this way; this reduces the demands for storage space for stock piling. The absolute quantity of extract so obtained is not raised by this means, but no deterioration in the quality of the tannins results from the high temperatures employed. Molds are destroyed.

CHROME TANNING

MANUFACTURE OF CHROME TANNING AGENTS BY ELECTROLYTIC REDUCTION. III. REDUCTION OF SEXIVALENT CHROMIUM COMPOUNDS IN AQUEOUS SOLUTIONS IN THE PRESENCE OF ZIRCONYL SULFATE AND THE TANNING PROPERTIES OF THE REDUCED SOLUTION. Toshimitsu Komuro and Takashi Uchida (Govt. Chem. Ind. Research Inst. Tokyo) Tokyo Kogyo Shikensho Hokoku, 52, 277-80 (1957); Chem. Abst. 52, 7749 (1958). To reduce electrolytically M CrO_3 and $\text{M Na}_2\text{Cr}_2\text{O}_7$ to $\text{Cr}_2(\text{SO}_4)_3$ in the presence of strongly hydrolyzed Zircos ($3\text{ZrOSO}_4 \cdot 2\text{Na}_2\text{SO}_4 \cdot 1/3\text{H}_2\text{SO}_4$) at least

2.90 and 8.04 M respectively of ZrOSO_4 were needed, and these amounts when hydrolyzed in H_2O would release about 1.5 and 4.0M respectively of H_2SO_4 , confirming the previous finding that 3 equivalents H_2SO_4 are necessary for the reduction of 1 equivalent hexivalent Cr. The current efficiency in the electrolysis was higher at higher temperatures and in higher concentrations. The reduced solution changed from blue to green on heating and tanned calf skins readily. Both Cr and Zr combined readily with hide powder.

OTHER TANNAGES

TANNING IN THE SOLVENT SYSTEM. Cecil Powell. *Leath. Manf.* 75, No. 434 (1958). Solvent processing of leather is to-day out of the laboratory stage has passed through the pilot plant stage and in the case of upper leather is in commercial production. Even with regard to sole leather, a product of superior quality, having the appearance of the usual product and with some added features like lighter weight and availability in various colours, has been produced. This type of sole leather has very good cutting value. The solvent processed side leather is equal to commercial chrome side leather and has in addition some unique properties.

Solvent processing is subject to better plant control and quality regulations and makes possible saving in labour and material as for example, by elimination of rocker yard and lay away facilities, reducing finishing time and labour; and reducing that part of the sewage disposal problem caused by tanning. The increased versatility of the procedure is another feature.

There are still numerous engineering problems and details to be worked out; however these do not appear to be any fundamental difficulties.

-- V. S. P.

PRODUCTION OF LEATHER USING NON-AQUEOUS SYSTEMS. Alexis E. Ushakoff, *J.A.L.C.A.* 53, 314 (1958). A summary of the investigations of reactions of hides in solvent systems and a description of the Secotan process for making leather in a solvent medium are given. Solvent dehydration, the predominant factors controlling leather quality, and the reactions of hides in solvents and water are discussed. Solvent dehydration involves removing water from the hydrated structure without causing shrinkage. Quality depends on the stresses and tension-

ing in the fiber structure produced by the degree of hydration and by high-volume materials combined with the hide substance. The reactions of hides are intimately associated with the nature of the medium in which the reaction takes place. The magnitude and direction of a reaction can be reversed or changed by a change in the medium or its composition. It is concluded that the reactions are absorption effects. The Secotan process consists of an aqueous pretreatment followed by a solvent process in an automatic machine. The Secotan machine consists of an endless conveyor running through a series of enclosed chambers. Pretreated hides are slicked out on the loading end of the conveyor. Each hide is successively dehydrated, tanned, and/or fatliquored and dyed, and dried. It emerges from the machine flat, dry, and ready for sorting and finishing. The machine processes up to sixty sides per hour. The solvent (acetone) is automatically recovered and reused.

RETANNING CHROME LEATHER WITH RESIN TYPE TANNING AGENTS. F. Edmonds, *Leath. Manfr.* 75, No. 3, 9 (1958). Many of the recent changes made in processing chrome leather to effect greater economy have a tendency to reduce fullness and roundness in the leather. This deficiency has to be made up by improvement in methods and materials used in tanning. While the effects conferred by vegetable extracts, and naphthalene syntans in retanning are sufficiently known, the phenolic tannins and the amino resins are comparatively newcomers. The phenolic resins are fully polymerised prior to use but the amino resins obtain the maximum particle size only after contact with leather. Many of the resins are retained in the dispersed state by neutral naphthalene syntans.

The phenolic syntans resemble the vegetable tannins more than the amino resins do and so are frequently combined with vegetable extracts. The phenolic syntans possess filling power, penetrate the hide very rapidly, are strong bleaching agents (since they impart no colour) and are advantageously employed as leveling agents in dyeing light coloured or pastel leathers. Frequently however, these syntans produce poorer break; this could be set right through combining naphthalene type syntan with them if light fastness is not necessary. The syntans have to be selected carefully, especially with regard to light fastness when pastel shades are needed. Further certain dyestuffs may not be fully compatible with them. These syntans are very sensitive to iron contamination.

The synthetic amino tanning resins are derived from melamine, urea, dicyandiamide and guanidine. These resins are not readily removed by washing from the leather and are compatible with neutral naphthalene syntans but not vegetable extracts; their filling powers are excellent and they exert a tightening action on the grain. The urea resins require a dispersing agent and so could be dispersed in fat liquor. The melamine resins seem to be compatible with all lignosulphonates provided the pH is not too low. A deeper penetration of both the melamine and urea types of resins is effected when the leather is neutralised, at least at the surfaces. A ratio of 80 to 125 lbs. of water per 100 lbs. of stock with 3 to 5% resin, and a temperature range of 100-140°F is recommended. One of the principal uses for melamine resins is in the manufacture of chrome white leathers. Leathers retanned with resins have to be fatliquored, and finished in a slightly different manner. Wet staking is preferable.

Methods are described for producing chrome white leathers and natural black or coloured leathers with these different resins.

— V. S. P.

PROCESSES AFTER TANNING

INCREASING THE THICKNESS OF SOLE LEATHER WITH THE USE OF FORMALIN. S. V. Arbutov, *Legkaya Prom.* **16**, No. 10, 44-7 (1956); *Chem. Abst.* **52**, 7752 (1958). Heavy leathers (sole, saddle, and belting) tanned by the combined chrome syntan vegetable process are not satisfactory with respect to final thickness and other properties. The use of formalin (0.5-2.0% of dry weight of hide) at pH 4.2-10.5 as an auxiliary tanning agent reduces shrinkage in the subsequent tanning operations by 10-15% (50% in the case of nondelimed hides) and imparts a certain elasticity to the leather due to the formation of an intermediate structure in the collagen. The combination, more active at high pH values than at low, is indicated by rise of temperature. Desalted, delimed, and defleshed hides are washed 10-15 minutes at 12-16°, then treated with a solution of Na_2CO_3 (1.5-2.0 g./l.) for 1.5-3 hours with intermittent stirring followed by washing for 40-60 minutes to bring the pH down to 8.6-9.0. The hides are treated with formalin (0.3-0.5% of hide weight diluted 10 times at 20-5° for 4-6 hours followed by a wash at 20-5°.

RAISING THE WATER RESISTANCE OF DRY SHOE LEATHER. S. V. Arbutov and M. N. Seleznev, *Legkaya Prom.*,

16, No. 1, 36-7 (1956); *Chem. Abst.* **52**, 7752 (1958). A stuffing emulsion is made up of a technical fat 30, fish oil 20, sulfonated fish oil 20, tar 10, and paraffin 20%. One part of water at 55-65° is added to 2 parts of the sulfonated oil. The other materials in the molten condition are added and carefully incorporated into a smooth emulsion. The leather is pressed to 50% H_2O , after which 20% of the total amount of the emulsion is heated to 55° and applied to the flesh side. After piling 12-16 hours the leather is drum-dried by a current of air blown in at 65-70°. The oil mixture is then added in 2 portions. After the first charge the drum is rotated for 30 minutes; after the second for 60-90 minutes. The leather is piled 16-24 hours, then dried to 35-40% H_2O . Data on the water permeability and other physical properties are tabulated.

IMPREGNATION OF SOLE LEATHER WITH POLYMERS. Bernard H. Fouquet and Joseph R. Kanagy, *J.A.L.C.A.* **53**, 336 (1958). The utilization of elastomers and elastomer-resin blends for upgrading sole leather now practised to a limited extent in the industry has promoted the determination of some of the important principles involved and a comparative study of properties imparted to the leather by different materials.

Evaluations made with elastomers such as Butyl rubber, polybutene, and polyisobutylene blended with a polymerized resin, and with a thermoplastic resin plasticised with oils indicate that the molecular weight of the impregnant is a primary consideration for proper impregnation of unfilled leather. Elastomers having molecular weights over 60,000 are unsatisfactory. Best results with ease of handling are obtained for elastomers such as polybutene and polyisobutylene with molecular weight not greater than 10,000. Improvements in water resistance are slightly greater per unit of impregnant for Butyl rubber than for the polybutenes. The improvements in these two physical properties are, in general, proportional to the amounts of the impregnants deposited in the leather.

Wear tests with vegetable-tanned sole leather indicated improvements in the order of 50% for the elastomer-resin treatment and lower-order improvements for resin-castor oil treatments.

LIGHT BUFFALO LEATHER AS A PROBABLE SUBSTITUTE FOR HEAVY LEATHER. B. C. Pal, *J. Ind. Leath. Tech. Assoc.* **6**, 69 (1958). It is proposed to utilise light buffalo leather in 'two-ply' as a substitute for heavy leather after lamination with

nitro-cellulose base adhesive. The nitro-cellulose adhesive should be of the composition similar to that used in the manufacture of belting leather and should have moderate consistency and contain a plasticiser. Bonding is preferably done grain to flesh with prior roughening of the surfaces. After one coat of the adhesive has dried, a fresh coat is applied to one of the plies. The plies are then joined together and pressed together for 6-8 hours. After drying for 24-48 hours they are cut to shape. Leathers thus made do not separate under continuous flexion, and on wetting. Moderately high and low temperatures and humid atmosphere do not appear to affect the two-ply leather even on flexing.

— V. S. P.

DRYING AND CONDITIONING METHODS IN TODAY'S TANNERIES. *Melvin Herman, Leather & Shoes 135, No. 5, 18 (1958).* The hot tunnel method is used to process the so-called toggled or tacked leathers. This involves almost complete drying of dyed and fat-liquored leather, followed by seasoning to regain moisture and sammying to distribute uniformly the moisture content. After staking, the leathers are toggled or tacked. Drying in the tunnel results in a hard and bony leather with considerable loss in area. Further, with leathers of low T_g there is danger of irreparable damage. Also due to non-uniformity in drying the penetration of oils towards the inside will not be uniform. Coarse saw dust used in sammying will produce small pits and indentations. Staining of pastel coloured leathers also would occur. Due to non-uniform soaking of the leather the final drying produces an over-stretched condition in some places. Several of these defects would not naturally be traced to improper drying. So the question arises: could not leathers be dried to the sammied condition and then staked and toggled. This is, to some extent, achieved in paste drying. The advantages gained are, positive increase in area, minimum hand labour, improved grading and saving of time. The fatliquored and dyed leather is after setting out coated on the grain side with suitable paste and slicked out on plate glass, stainless steel, plastic or aluminium plates and then passed through a series of drying chambers in which the conditions are accurately controlled. The recent trend is to spray the paste on to the plates and then slick down the sides. Actually moisture is removed only from the flesh side. However, there is no universal paste for all types of leathers. Plate glass is easily the best material since the paste sticks to the plate and not to leather. This is a very important advantage.

By utilising electronics for drying, it is possible to drive off moisture without excessively heating the leather. Further, as the moisture content decreases, the electrical load demand also decreases. However, electronic drying is quite costly.

— V. S. P.

TESTING

A PRELIMINARY STUDY ON THE EFFECT OF IONISING RADIATION ON CERTAIN PROPERTIES OF BOVINE HIDE AND LEATHER. *The staff of Tanners' Council Research Laboratory, University of Cincinnati, Leather & Shoes 135, No. 8, 14 (1958).* It is known that gamma rays can deaminate amino compounds, alter the cross linking in polymers, cause denaturation of proteins and decomposition of matter and increase the molecular size. The Tanners' Council Research Laboratory and the Battle Memorial Institute have co-operated in a preliminary experiment to determine the influence of ionising radiation on the properties of bovine hide and leather. Stock in five stages — (1) flayed hide preserved by fast freezing, (2) cured hide, i.e., hide subjected to brine and salt treatment immediately after freezing and held under refrigeration till needed, (3) pickled stock from a chrome tannery, (4) chrome tanned-in-the-blue stock from a tannery and (5) a formaldehyde tanned sample, obtained from the pickled stock — was examined by a combination of chemical and physical methods after irradiation (10 million Roentgens per specimen 3" diam.). After irradiation all the specimens were refrigerated and dehydrated with acetone. The tests carried out were stitch tear, ball puncture, breaking load, load at 15% extension, trypsin digestion and T_g . The results obtained indicate that the irradiation did not have a significant effect on the properties of the stock. However, this conclusion could have been vitiated by three possible experimental deficiencies: due to the small size of the test piece, the test employed could not have been sufficiently sensitive to detect possible effect; the possible effect may have been concentrated on the surface layers, the small size of the specimens precluding any examination of these; the tendency of the radiated samples to show damage could have resulted from irregular acetone dehydration.

— V. S. P.

SUITABILITY OF INDIAN HIDES IN THE MANUFACTURE OF INDUSTRIAL HEAVY LEATHERS — A HISTOLOGICAL STUDY. *S. K. Sarkar and S. K. Mitra, J. Ind. Leath. Tech.*

Assoc. 6, 45 (1958). It is commonly believed that the imported industrial leathers made from ox or steer hides are superior to those locally made from buffalo hides. A histological study of Indian buffalo and ox hides has been made to assess the leather forming qualities of the same. Fundamentally the two types of hides are the same, the differences existing in the relative proportion and distribution of the various histological features. Buffalo hide has well developed nerve papillae, smaller amount of epidermal appendages in the grain layer, low angulation of fibres with developed reticulin sheath and a more or less balanced tissue distribution and is less greasy. Ox hide has relatively larger amounts of elastin and high angulation of fibres with compact packing in the centre of the corium. So it is concluded that buffalo hide, though appearing to be less compact and somewhat porous, is in no way inferior to ox hide, as raw material for manufacture of picking band leather, provided the processes are controlled to give fuller fibres.

— V. S. P.

THEORY

A THEORY OF THE GAS-LIQUID CHROMATOGRAPHIC PROCESS. J. H. Beynon, S. Clough, D. A. Grooks and G. R. Lester. *Trans. Faraday Soc.* 54, 705 (1958). A theory of the gas liquid chromatographic process is developed starting from an idealised model in which all soluble molecules spend the same time in the vapour phase in their passage through the column. This is then extended to the practical case by assuming a simple distribution for the time spent in the vapour phase, introducing a parameter B which may be taken as a figure of merit for the column. A simple extension enables gas diffusion to be taken into account and an expression for the 'height of the equivalent theoretical plate' is derived. This is shown to have a simple relationship to the mean gas velocity in the column, with a minimum value for a certain optimum velocity. Simple measurements enable the constants of the system to be evaluated and the optimum flow rate to be predicted.

THE REACTION OF AMINO AND IMINO COMPOUNDS WITH SUGARS. PART-2. THE REACTIONS OF GLYCINE AND DL- ALANINE WITH D-GLUCOSE. S. Lewin and Z. Kosinski. *Trans. Faraday Soc.* 54, 222 (1958). The interactions of glycine and alanine with glucose have been examined aerobically and anaerobically using the pH depression method for

evaluation of the equilibrium constants. A series of subsequent steady pH states was found to accompany the reaction. In the first steady pH state, the interaction can be described primarily in terms of reversible interactions of both one and two glucose molecules with the anions of amino acids. The equilibrium constants, heats of reaction, free energy and entropy changes have been evaluated. The equilibrium constants of the monoglucose interaction decrease with rise in temperature but the corresponding diglucose equilibrium constants are practically temperature independent. Addition of urea, mannitol and electrolytes (NaCl and Na_2SO_4 up to 0.250 N) did not affect the equilibrium constant values. The results suggest that the reaction can be described primarily in terms of the openchain form of glucose.

PATENTS

TANNIN FIXATIVES FROM α , β -UNSATURATED ALDEHYDES AND NITROGEN-CONTAINING COMPOUNDS, DEUTSCHE GOLD UND SILBER-SCHNEIDANSTALT VORM. Roessler (Franz Kohler, inventor). Ger. 897, 408, Nov. 19, 1953 (Cl. 12q. 9); *Chem. Abst.* 52, 7752 (1958). α , β -Unsaturated aldehydes, particularly acrolein, are treated in aqueous solution at normal pressure with preferably equivalent amounts of a compound of the general structure $\text{N(R') (R'') (R''')}$ or their inorganic or organic salts. R', R'' and R''' are H, alkyl, hydroxyalkyl, cycloalkyl, aryl, aralkyl, or heterocyclic radicals. The reaction product is heated with organic acids to give the title products. Thus, acrolein 56 was added to 25% $\text{NH}_4\text{OH(I)}$ 68 diluted with water 272 to give a viscous light-yellow solution which was heated with glacial AcOH 60 parts by weight for 30 minutes at about 90°. A brown, orange coloured water soluble product was obtained. It precipitated native and synthetic tannin from slightly alkaline or acid solutions. I can be replaced by NH_4OAc , NH_4Cl , dimethylamine, monoethanolamine, ammonia and urea or thiourea, or dicyandiamide.

GENERAL

RAW HIDE RESOURCES OF INDIA—ARE THESE SUFFICIENT FOR MANUFACTURE OF INDUSTRIAL LEATHERS. J. K. De and A. Sen, *J. Ind. Leath. Tech. Assoc.* 6, 41 (1958). Extra heavy buffalo hides are the only raw materials in India for Industrial Leather manufacture. Hides of Northern India buffaloes are only suitable as they are large, heavy and

substantial. India has been importing for a long time important industrial leathers like leather belting, picker, and picking bands. The total quantity of best year's import of these three items is about 1085 tons for which roughly 3600 tons of raw hides or roughly one lakh hides are required. This along with indigenous production of another 50,000 hides would make a total requirement of 1.5 lakhs buffalo hides. Total number of slaughtered hides produced in different States of Northern India amounts to roughly 5.6 lakhs, 10 to 12% of which falls under the category of extra heavy, the only type suitable for industrial heavy leathers. India therefore is short of nearly 0.83 lakhs heavy hides which have to be met from import, provided all the Indian hides are properly flayed and not damaged, either in the process of curing or flaying.

NOTES & NEWS

TANNING MATERIALS

RESOURCES SURVEY SUGGESTED

The State Forest Utilisation Advisory Board, at its meeting here, Mr. M. Bhaktavatsalam, Agricultural Minister presiding, considered certain suggestions of Dr. Y. Nayudamma, Director, Central Leather Research Institute, Madras, for the development of indigenous tanning materials by the Forest Department.

Dr. Y. Nayudamma suggested a survey of potential supply in the State might be jointly undertaken by the Forest Department and the Leather Research Institute. He was sure that even after 20 years, when the target area of 33,000 acres of wattle was reached the country was not going to be self-sufficient. Therefore, he said alternative barks and the growing of wattle on the plains would have to be considered.

The Minister welcomed the suggestion and promised to give all the necessary help.

He also suggested exploring the possibilities of utilisation of spent barks and wood chips for the manufacture of chip boards.

Mr. V. S. Krishnaswami, Chief Conservator of Forests, said the possibility of starting a chip board factory was constantly in the Government's mind. As soon as the supply position of raw material improved and spent bark became available, private parties would be interested in the scheme.

Dr. M. N. Ramaswami, Chief Research Officer, Forest Research Laboratory, Bangalore, stressed the necessity of a regional survey of cellulosic resources.

A Government spokesman said survey of bamboo resources had been undertaken by the Forest Department based on instructions from the Union Government. Efforts were also being made to find out the cellulosic content of Bombax and Eucalyptus.

—*The Mail*, dated 11-5-1958.

WATTLE STORY FOR 1957

The U.S. Officials in Pretoria report:

The total acreage under wattle is estimated at 800,000. Production of wattle extract was 98,390 tons in 1957, 93,300 tons in 1956 and 1,05,000 tons in 1955. Sale of wattle extract in 1957 was 1,03,504 tons. Of this, 95,674 tons were exported and 7,830 tons locally sold. In 1956, 83,427 tons were exported.

Wattle bark production was 24,500 tons in 1957 and 30,000 in 1956. Wattle bark exports were 25,043 tons in 1957 and 29,836 tons in 1956.

The United Kingdom takes nearly one-third of the wattle extract and Europe about 20% followed by Japan with more than 10%. The U.S. took 8,193 tons last year, 9,205 tons in 1956 and 7,695 tons in 1955. Australia and New Zealand are other major destinations. Nearly two-thirds of the wattle bark went to Europe last year followed by the U.S. with 6,465 tons and Japan, Australia, New Zealand, United Kingdom and China. China doubled its imports of wattle extract from South Africa, to 7,317 tons.

—*Leather and Shoes*, 135, No. 11, 10 (1958)

NEW TECHNIQUES IN TANNING

Among the latest technological advances in the tanning industry is the electronic colorimetric process for matching batches of skins. When the finish is being applied to a tanned hide the hide is exposed to a photo electronic unit that adjusts the spraying device so that the colour of each skin will be the same.

J. E. McMahon in a survey mentions equipment that puts an electrostatic charge on each skin during tanning as another recent advance. Depending on the charge applied the skin absorbs certain types of pigments and finishes in a uniform density thus eliminating the possibility of human error in the application of dyes.

Tanners are working more closely with packers to produce improved hides. One result is a machine for removing cattle and calf skins, eliminating the damage frequently done to hides when they are removed manually. Other developments include automatic 'stacking' machines which remove skins from conveyor belts at various stages of processing and stack them on racks ready for the next step.

About 83% of all American leather products goes into shoes with sales of about 600,000,000 pairs a year. About 285,000,000 pairs are women's shoes, 111,000,000 are men's and the rest are for children and the armed forces.

In co-operation with leading chemical companies tanners have developed leather that is water-proof, scuff resistant, and soil resistant. Silicones and other chemicals are introduced into the tanning liquids to produce these results. Leading tanneries have been re-equipped to provide for a continuous flow of production, the leather industries of America reported. Among the engineering developments are electronic sprayers, moving, pasting machines and buffing machines.

—*Australian Leather Trades Review*, 54, No. 5, 22 (1958)

GLAZED KID LEATHER AND BELTING LEATHER INDUSTRIES

On the question relating to the processing of goat skins, the Minister of Commerce & Industry said in the Parliament:

"There are three units, all located in the Madras State, which produce glazed kid leather by processing goat skins with chromium sulphate. The total capacity of the three units is about 1.8 million pieces a year. The possibilities of setting up one or two more glazed kid tanneries have been explored but efforts to induce entrepreneurs from the private sector to take up this line of manufacture have not yielded any results so far".

"It has not been possible to increase the production of glazed kid leather because of its limited domestic demand and the poor quality compared to the leather manufactured in the U.S.A., who are the main importers of Indian manufactured glazed kid leather".

Relating to the leather belting industry, he observed:—"The low production of leather belting in the country has been mainly due to (i) unmechanised nature of the manufacturing units and (ii) the paucity of suitable hides.

Parties are being encouraged to undertake manufacture of good quality leather belting with the aid of modern machinery and in financial/technical collaboration with foreign firms. Licence under the Industries (Development and Regulation) Act is expected to be issued shortly to two firms".

—*J. Ind. & Trade* 8, 811 (1955)

NEW PROCION DYES FORM CHEMICAL BOND WITH LEATHER

Procions, a new type of dyestuffs, form an actual bond with leather, according to Arnold, Hoffmann and Co., Inc. Fastness is therefore of a high order. Recently introduced for dyeing and printing of textiles, these dyes possess ease of application, brightness of shade and high degree of fastness. Chemical combination with the substitute occurs through a covalent bond. Through newly developed application methods, they are now available for use on leathers. The Procion dyes are anionic, possess very high cold aqueous solubility and good stability to hard water. They are compatible with one another in aqueous solution and with anionic or nonionic wetting agents but should not be mixed with cationic dyestuffs or cationic agents. Dyeing is carried with higher concentration of common salt for inducing aggregation of the dyestuff and thus increasing the intensity of shade and fixed under neutral conditions. Shades produced are brilliant and of a wide range. Penetrating property is excellent and intensity of dyeing uniform. Dyeings on suede leathers are particularly fast to buffing. Leathers dyed with these are much faster to all wet treatments.

—*Leath. Manfr.* 75, No. 2, 52 (1958)

STRONGER LEATHER

Several cheap processes for producing strong leathers—some of which have been shown under test to have a 30 per cent longer working life—have been developed as the result of recent UK research.

The processes are, said by the scientists responsible for the research, to be not only cheaper to apply than some other processes for increasing the durability, or operating life, of shoe sole and other types of hard-wearing leathers, but also simpler to use.

The techniques depend on the use of relatively cheap and readily available material, such as waxes, greases and rosins, for impregnating the vegetable-tanned leathers. The results achieved in the experiments are said to have demonstrated that the same results can be achieved using such simple impregnating materials, as can be achieved in using complex and expensive impregnating agents, such as polyisobutylene.

Other U.K. research into the preservation of hides for use as leather has shown, it is claimed, that the use of radio active irradiation to preserve calf hides helps their preservation in storage and has no ill effects on their tanning quantities.

—*Hindustan Standard, Calcutta*, 14-6-1958

SEVEN FOOT-WEAR CENTRES PROPOSED UNDER HARIJAN WELFARE SCHEME

The opening of seven centres in the districts this year for the manufacture of footwear articles, is among the schemes for development of cottage industries among Harijans, which have been taken up by the Madras State Government. The Government also proposes to introduce cottage industries for Harijans such as hand-pounding of rice, poultry farming, tailoring, and blacksmithy on a co-operative basis.

—*The Mail*, 22-5-1958

VOLUNTARY QUALITY CONTROL OF EAST INDIA TANNED LEATHER

A scheme for voluntary quality control designed to discipline the industry and create confidence in the foreign consumers was inaugurated on Thursday, July 17th, 1958, by Mr. K. B. Lal, I.C.S., Joint Secretary, Ministry of Commerce & Industry, Union Government and Director-General of foreign trade. Mr. K. Rangaswamy, Chairman, Leather Export Promotion Council, welcoming the gathering, referred to the fact that the dollar earning from South India came mainly through export of agricultural products and of hides and skins. The dollar earnings of hides and skins were of the order of Rs. 30 crores. The Leather Export Promotion Council was formed on the advice of Mr. T. T. Krishnamachari. It had formulated the quality control scheme to reassure the foreign buyers the quality of the products and to strengthen mutual confidence. Mr. Lal expressed the hope that the scheme of voluntary control would be observed by one and all engaged in the leather industry thereby enabling the country to earn more dollars at a critical period. At the same time, he indicated that if by any chance the scheme failed to make the progress the Government might be obliged to impose a certain amount of compulsion. Mr. R. Venkataraman, Minister of Industries, Madras State, said that quality control would surely help them to expand the trade, establish good reputation abroad and increase the wealth of the country.

Mr. B. A. Khan, Secretary, Leather Export Promotion Council, read the messages received.

Mr. M. J. Jamal Mohideen Sahib, Vice-President of the Council, proposed a vote of thanks.

The main object of the Scheme is to ensure that the consignments of East India tanned leathers tendered for export contain the quality of goods as understood by the marks under which they are exported and as per the declaration of the exporters. It also enables the importers to know, if they so desire, chemical standards of goods going under each of the various marks in use and actually imported by them. Only vegetable tanned leathers of the type of E. I. tanned hides and skins, exported to foreign countries come under the purview of the scheme. The scheme is applicable only to those exporters who register themselves with the Leather Export Promotion Council. It empowers the Council to draw samples from the lots exported and get them analysed for their chemical standards. The percentage of leather substance in pure and conventional tannages namely primes, semi-primes and single tannages has been fixed at 62%. If there is a reduction in the leather substance content, provision has been made for suitable action against the exporter.

RESEARCH BEARS FRUIT

Practical Demonstration No. 5

(Second Series)

Process : Manufacture of Picking Band Leathers.

Period : 19th August to 29th September, 1958.

Place : Central Leather Research Institute, Madras-20.

The next in the Second Series of Practical Demonstrations will be on the manufacture of Picking Band Leathers.

You recall that two processes for the manufacture of Picking Band leathers were demonstrated during April and May, 1957. Since then there have been requests from the industry for details of this process and demonstration of the process again. Additional researches have since been conducted at the Institute on the manufacture of Picking Band Leathers. It is, therefore, proposed to demonstrate this process from 19th August to 29th September, 1958. If you are interested in this line of work, you are most welcome to send your representative/s to get trained in the manu-

facture of Picking Band Leather. You may kindly intimate the name/s of the representative/s who is/are likely to attend this demonstration. After following the process, we would request you to try this process in your Tannery and give us your valuable comments.

N.B. In our Circular letter No. XV-CLRI-Pub (2)/58-PD-3 dated 26th May, 1958, issued in connection with the Practical Demonstration on the manufacture of Glazed Kid, it was stated that out of 22.2 million pieces of raw goat skins produced in India 80% are exported annually.

It has been pointed out by the Development Officer (Leather), Development Wing, Ministry of Commerce & Industry, Govt. of India, that 'the correct position appears to be that out of the total availability of 31.1 million pieces of goat skins, approximately 2 million pieces of goatskins would be required for domestic purposes. Out of the balance, about 45% is exported in the tanned & dressed state and the rest about 55% as raw goat skins'. This may be kindly noted.

APPENDIX

CENTRAL LEATHER RESEARCH INSTITUTE

Research Programme 1958-59

C. L. R. I. NEWS

Dr. Y. Nayudamma, Director, attended the Leather & Leather Goods Seminar convened by the Ministry of Commerce & Industry, at Hyderabad and is visiting the tanneries in the Andhra Pradesh and the Regional Research Laboratory, Hyderabad.

Mr. A. Ganesan, Senior Scientific Officer, visited Katiawar and Vidharbha regions of the Bombay State in connection with organising Extension Service Work.

Mr. Hla Chit Tin, a research worker of Burma on UNTAA Fellowship, accompanied by Mr. E. Gergely, United Nations Leather Adviser in Burma, has come to the Institute for training.

Dr. R. L. Ernst, Dip. Ing. Chem., F.R.I.C., F.R.A.C.I., Research and Consulting Chemist, Australia, visited the Institute on 29th July, 1958 and gave a talk on modern trends in Tanning with special reference to Syntans.

OBITUARY

We deeply regret to announce the sudden demise of Miss. A. Nagasiromani, Junior Scientific Assistant, Central Leather Research Institute, on 16-7-1958.

Born in 1931, Miss Nagasiromani graduated from Andhra University, where she got her M.Sc. degree also. She joined this Institute in December 1954 and was associated with application of instrumental methods of analysis in studies of tanning materials. She had to her credit six publications.

Prof. K. V. Giri, Member, Executive Council of Central Leather Research Institute, passed away on 17-7-1958, at the age of 50.

Dr. Giri was Professor of Biochemistry, Indian Institute of Science, Bangalore. His researches were chiefly in the chemistry of enzymes, proteins and carbohydrates. His contributions in the fields of circular paper chromatography and agar electrophoresis deserve special mention.

Editor Y. Nayudamma. Published by N. Subramanian, on behalf of the Central Leather Research Institute, Adyar, Madras-20. Printed by G. Srinivasachari, B.A., at The G. S. Press, 21, Narasingapuram Street, Mount Road, Madras-2.

The Central Leather Research Institute was set up in the year 1953 for the advancement and diffusion of leather science and for the elevation of the Indian Leather Industry. It concerns itself particularly with the application of science to the leather industry that exists at various levels, viz., large, small and cottage scale.

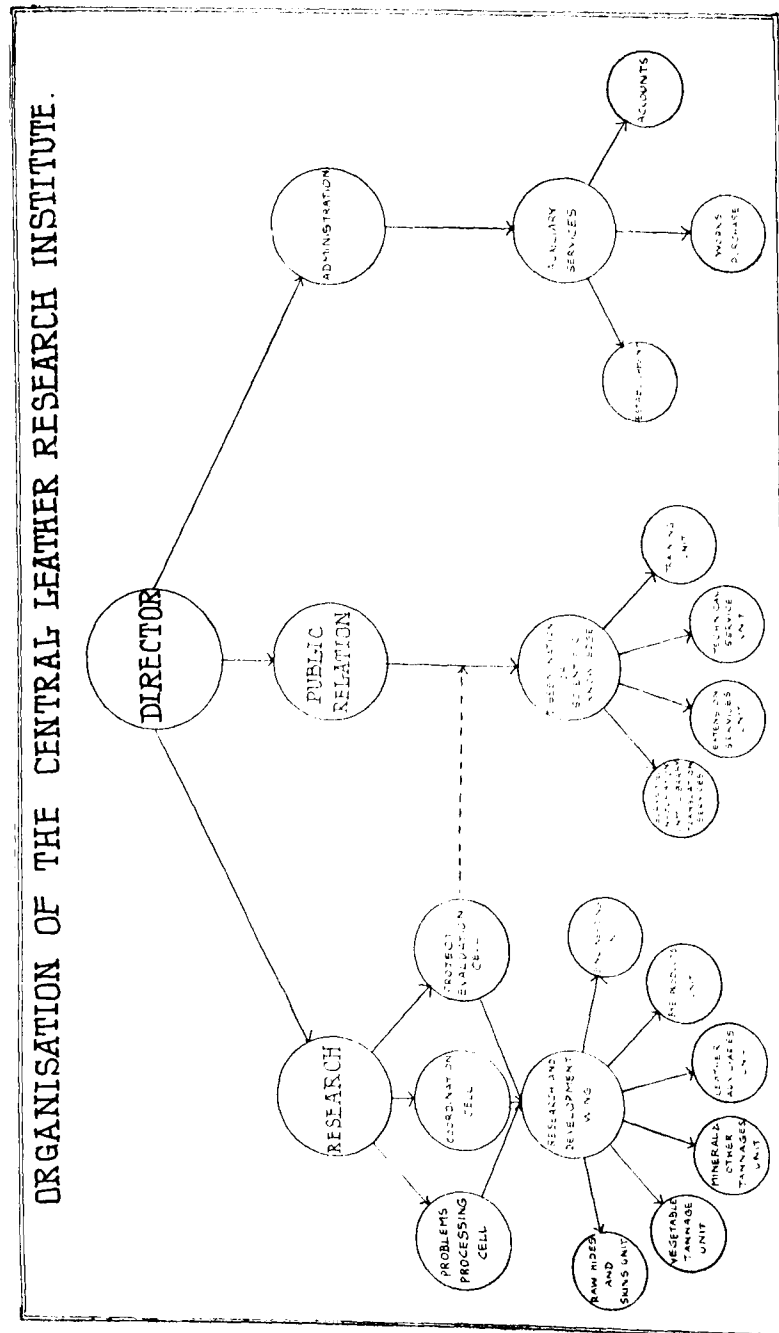
The problems that face the industry are collected from time to time through visits, enquiries and keeping in close touch with the industry and its activities. The problems are listed as they come from different sources and given an order of priority. Based on this priority, the research programme is planned for the year, to solve the problems and serve the immediate needs and demands of the industry.

The number of research problems undertaken for study are few. Each problem is tackled by a team or teams of research workers of various schools of thought and concentrated and combined effort is put in for a speedy solution of the problem undertaken. Thus the research problems are undertaken as units and the objectives and the work of each unit are well-defined and the men, materials and money required for each unit are precisely known. Each unit is headed by a leader—by training, temperament and ability. The progress of the work of each unit is evaluated from time to time by outside experts in the field and their criticism is conveyed from time to time to the research team for their further guidance.

A good amount of collation, correlation and co-ordination of the work within the Institute and the work conducted in outside organisations is also essential for the successful and speedy implementation of the programme.

The results of the laboratory researches are to be translated and processes developed, ready for immediate commercial exploitation. The knowledge so obtained is to be effectively diffused and disseminated into the industry through the various units of the dissemination wing.

The job of the Director is thus clear. He is the Director of research, a public relations man and an administrator. The research programme and the organisational set-up for the effective implementation of the Institute's programme for the year 1958-59 are detailed in the following pages.



Problems Processing Unit

The problems that face the Indian Tanning Industry are first to be collected. The Information and Survey Cell, the extension staff and the tanner-visitors that come to the Institute would be in a position to offer the problems that face the industry. All the research staff are expected to transmit any problems that may be of interest to the industry, to this Unit. The problems so collected are listed together and processed by this Unit in order of priority to be undertaken by the research teams. This unit for this year shall consist of:

Dr. S. K. Barat (Chairman)
 Dr. S. N. Sen
 Mr. K. T. Sarkar
 Mr. A. Ganesan
 Dr. D. Ramaswamy
 Mr. M. A. Ghani and
 Mr. N. Subramanian (Secretary).

Co-ordination Unit

Researches are presently being conducted at this Institute in co-operation and collaboration with the many outside organisations such as Defence Science Organisation, Forest Research Institute, Leather Export Promotion Council, etc. This unit shall work directly under the Director. The problems that arise from these outside organisations will be transmitted to the team or teams of research workers.

Project Evaluation Unit

The results of the researches from the various Units and teams of research workers will be evaluated from time to time. This Unit shall consist of a leading tanner as Chairman, and one tanner and one or two scientists on invitation depending upon the nature of work to be evaluated, with the Director as the Secretary. The comments of this Unit will be communicated back to the research teams for further guidance.

I. Raw Hides and Skins Unit

Object:

The major problems that face the Indian tanner today are the paucity of hides and the deterioration in the quality of hides and skins. Researches are, therefore, geared to improve this existing position. This research unit will collect representative and reliable samples of hides and skins and also the information on the conditions and practices in the various regions of India, with a view to improve on the existing practices such as preservation and drying and to develop methods for making better leathers from them. Personnel with varied schools of thought will work together as a team to achieve this object and the work is distributed as follows:

Research Team:

1. Dr. S. N. Sen (*Leader*)
2. Dr. Y. Nayudamma
3. Dr. S. M. Bose
4. Mr. S. K. Mitra
5. Mr. K. T. Sarkar
6. Mr. S. C. Nandy
7. Dr. R. Bhaskaran
8. Mr. S. K. Sirkar
9. Mr. D. K. Das
10. Mr. S. C. Dhar
11. Mr. K. T. Joseph
12. Mr. W. Madhavakrishna
13. Mr. V. S. Krishnamurthy
14. Mr. E. C. George.

Research Projects:

1. Survey of the existing conditions and practices in the various regions of India and collection of representative and reliable samples of hides and skins from animals—dead and slaughtered—and study of the effect on the quality of raw hides and skins, of various factors, such as feed, breed, sex, age, etc., and damages due to insects, pests and diseases.

Dr. R. Bhaskaran.

2. Histological studies of the samples of hides and skins so collected and preparation of a Histological Album of Indian hides and skins.

Mr. S. K. Mitra, Mr. S. K. Sarkar & Mr. D. K. Das.

3. Biochemical studies with particular reference to protein and lipid constituents of the hides and skins collected from the various regions.

Dr. S. M. Bose & Mr. K. T. Joseph.

4. Enzymatic studies on hides and skins with reference to unhairing and bating.

Dr. S. M. Bose, Mr. W. Madhavakrishna & Mr. S. C. Dhar.

5. Bacteriological studies on the hide and skin samples collected:

- (a) The study of micro-organisms.

Mr. E. C. George, Mr. V. S. Krishnamurthy & Dr. S. N. Sen.

- (b) Preservation by the customary and newer methods.

Mr. S. C. Nandy, Dr. S. N. Sen & Dr. Y. Nayudamma.

- (c) Storage of hides.

Mr. S. C. Nandy and Dr. S. N. Sen.

- and (d) Insect damage and control.

Dr. R. Bhaskaran, Mr. V. S. Krishnamurthy and Dr. S. N. Sen.

6. Leather making properties of the hides and skins collected.

Mr. K. T. Sarkar and Dr. Y. Nayudamma.

II. Vegetable Tannage Unit :

Object : Vegetable tanning industry is the major part of the Indian Leather Industry. This covers the E.I. tanning of skins and hides, sole leather by the pit and the bag tannages and some heavy and industrial leathers. The problems that face this industry are:

- (a) to stop imports of tanstuffs and to better utilise the indigenous tanstuffs,

- (b) to study the principles of vegetable tannage of heavy and light leathers.

(c) to modify the existing processes and develop newer processes with a view to reduce the cost of tanning and improve the quality of the leathers,

and (d) to find newer uses for the leathers.

For the better utilisation of indigenous tanstuffs, a systematic survey of the availability and steady supply of the tanstuffs in co-operation with other organisations, an intensive fundamental study on the abundantly available tanning materials to make them self-sufficient tanning agents and their practical use in tanning have to be taken up in detail. Research is geared to achieve these objects as outlined above. The research personnel of various schools of thought will undertake this work as shown below:

Research Team :

1. Dr. S. K. Barat (*Leader*)
2. Dr. Y. Nayudamma
3. Dr. S. M. Bose
4. Dr. D. Ramaswamy
5. Dr. K. N. Shama Shastry
6. Dr. E. C. Mathew
7. Dr. S. Ghosh
8. Mr. R. Selvarangan
9. Mr. J. Budaga Rao
10. Mr. K. Rajabather Mudaliar
11. Mr. J. C. Deb
12. Mr. M. K. Udaya Varma
13. Mr. W. Madhavakrishna
14. Mr. S. Banerjee
15. Mr. K. B. Mathur
16. Mr. S. P. Ghosh
17. Mr. T. S. Krishnan
18. Mr. M. A. Rama Iyer
19. Mr. K. J. Scaria
20. Mr. P. S. Santhanam
21. Junior Scientific Assistant
22. Senior Laboratory Assistant.

Research Projects :

1. Survey of the availability of the tanstuffs in the various regions of India.

(a) Work should be undertaken in collaboration with the Conservators of Forests of the various States, Forest Research Institute and other institutions for the collection and preliminary analysis of authentic indigenous samples of tanstuffs and to study the effect of various factors such as age, soil, climatic conditions, methods of collection, handling, drying, storage and transport etc.

Senior Laboratory Assistant and Dr. Y. Nayudamma

(b) to assess promising substitutes for Wattle from indigenous tanstuffs and work out suitable processes for their full utilisation.

Dr. E. C. Mathew and Mr. M. K. Udaya Varma

2. Intensive studies on the abundantly available tanning materials to make them self-sufficient tanning materials.

Active research is limited to a few important materials like myrobalans, divi-divi, babul and avaram

2.1 Organic chemistry of vegetable tannins :

Study on the isolation, purification and constitution of vegetable tannins.

Dr. K. N. Shama Shastri, Mr. J. Budaga Rao & Dr. Y. Nayudamma.

The purified components of each system should be made available to the other teams of workers.

2.2. Studies on certain physico-chemical characteristics such as molecular size, molecular weight, charge etc. of vegetable tannins and mechanism of vegetable tannage.

Dr. S. K. Barat, Dr. S. Ghosh & Mr. K. J. Scaria

2.3. Application of instrumental tools such as spectrophotometry, polarography, non-aqueous titration techniques etc. for the study of the various fractions obtained from the organic chemistry laboratory.

Dr. D. Ramaswamy, Senior Laboratory Assistant
and Dr. Y. Nayudamma

2.4 Biogenesis of tannins and enzymatic studies on the chosen vegetable tannins.

Dr. S. M. Bose and Mr. W. Madhavakrishna

2.5 Myrobalan as a self-sufficient tanning material

Dr. S. K. Barat, Junior Scientific Assistant,

Mr. R. Selvarangan and Dr. Y. Nayudamma.

3. Study on the manufacture of vegetable tannin extracts from the indigenous tanstuffs used alone or in blends.

The optimum conditions for leaching and for manufacture of extracts should be studied in detail and the work to be undertaken on a pilot plant scale based on the available results.

Mr. R. Selvarangan and Dr. Y. Nayudamma

4. Alternative uses of vegetable tannin extracts for purposes other than tanning, namely, for use in boiler compounds, anti-rusting compounds, resins, finishes etc.

Mr. R. Selvarangan, & Dr. Y. Nayudamma

5. Utilisation of bye-products as tanning materials:

5.1 Scheme on Arecanut tannin.

Mr. S. Banerjee & Dr. Y. Nayudamma.

5.2 Ligno-sulphonates.

Mr. K. B. Mathur & Dr. S. K. Barat.

5.3 Study on cutch liquors and recovery of catechin. (Work to be completed early).

Dr. S. K. Barat.

6. Studies on the principles of heavy and light leather vegetable tannage.

Studies on E. I. tanning, Sole leather tanning etc.

Dr. S. K. Barat & Mr. P. S. Santhanam.

7. Modification of the existing processes with a view to reduce the cost of tanning and improving the quality of leathers.

7.1 Rapid tannage of sole leather.

Mr. K. Rajabather Mudaliar & Dr. Y. Nayudamma

7.2 Trying out various indigenous tanning materials in vegetable tanning

Mr. K. Rajabather Mudaliar & Dr. Y. Nayudamma.

7.3 Improvements in bag tanning process.

Mr. S. P. Ghosh, Mr. K. T. Sarkar & Dr. Y. Nayudamma.

8. Finding newer uses for the leathers.

8.1 Dressing of E.I. leathers — kips for lining, upholstery and other finished leathers, skins for semi-chrome, semi-alum glazed kid, clothing and other leathers.

Emphasis may be given to the use of basic aluminium sulphate in this work

Mr. J. C. Deb, Mr. T. S. Krishnan, Mr. M. A. Rama Iyer and Mr. P. S. Venkatachalam.

III. Mineral & Other Tannages Unit :

Object : To study the complex nature of mineral and other tanning agents, to develop newer tanning agents and to study the mechanism of their tannages, to modify the existing processes for the manufacture of the same. The work is distributed as follows :

Research Team :

1. Dr. Y. Nayudamma (*Leader*)
2. Mr. B. N. Pal
3. Dr. D. Ramaswamy
4. Mr. K. T. Sarkar
5. Dr. N. Ramanathan
6. Mr. M. A. Ghani
7. Mr. S. K. Mitra
8. Mr. R. Selvarangan
9. Mr. B. C. Basu
10. Dr. S. Ghosh
11. Dr. T. S. Ranganathan
12. Mr. J. C. Deb
13. Mr. S. N. Bose
14. Mr. D. B. Mukherjee
15. Mr. K. R. V. Thampuran

16. Mr. T. S. Krishnan
17. Mr. T. J. Devassy
18. Mr. S. P. Singaram
19. Mr. N. R. Sikdar
20. Mr. K. S. Jayaraman
21. Mr. M. A. Rama Iyer
22. Mr. T. S. Kailasa Mahadevan
23. Mrs. D. V. Subbalakshmi
24. Junior Scientific Assistant
25. Senior Laboratory Assistant.

Research Projects:

1. Chemistry of chrome salts and the mechanism of chrome tanning.

I.C.A.R. Scheme—Mr. B. N. Pal and Mr. K. R. V. Thampuran, and Mr. T. J. Devassy, Dr. Y. Nayudamma and Dr. D. Ramaswamy.

2. Study on the combination tannages with particular reference to:

(a) Chrome-vegetable

Mr. N. R. Sikdar, Mr. S. P. Singaram & Dr. Y. Nayudamma

(b) alum-vegetable

Mr. T. S. Krishnan, Mr. R. Selvarangan & Dr. Y. Nayudamma

(c) zirconium-vegetable

Dr. T. S. Ranganathan & Dr. Y. Nayudamma

(d) formaldehyde

Mr. K. S. Jayaraman & Dr. Y. Nayudamma

3. Study on oil tannages

(a) Fish oil tannage

Mr. K. S. Jayaraman, Mr. J. C. Deb, Mr. S. N. Bose &
Dr. Y. Nayudamma

(b) Synthetic leather oil tannages

Mr. K. S. Jayaraman, Dr. D. Ramaswamy & Dr. Y. Nayudamma

(c) Oil combination tannages

Mr. K. S. Jayaraman, Mr. S. N. Bose & Dr. Y. Nayudamma

4. Synthetic polymeric and newer tanning agents:

(a) Polymeric tanning materials:

Junior Scientific Assistant & Dr. Y. Nayudamma

(b) Study on the syntans and pilot plant manufacture of syntans

Mr. D. B. Mukherjee

5. *Industrial leathers*: Belting, hydraulic and related leathers, gas meter leathers.

Mr. S. N. Bose, Mr. N. R. Sikdar & Mr. A. Ganesan

6. Manufacture of light leathers, particularly washable clothing and gloving leathers.

Mr. J. C. Deb, Mr. M. A. Rama Iyer & Mr. P. S. Venkatachalam

7. Manufacture of leathers meant for sports goods.

Mr. T. S. Kailasa Mahadevan & Mr. A. Ganesan

8. Improvements in chrome and chrome retan upper leathers, glazed kid etc.

Mr. K. T. Sarkar, Mr. S. N. Bose & Mr. J. C. Deb

9. Correlation of chemical, physical, microscopical properties of leather and drawing standard specifications for Indian Standards Institution.

9.1. Physical & Microscopical data

Dr. N. Ramanathan & Mr. B. C. Basu

9.2. Chemical data

Senior Laboratory Assistant & Mr. P. S. Venkatachalam

10. Swelling and shrinkage phenomenon of untanned and tanned collagen.

Mrs. D. V. Subbalakshmi, Dr. N. Ramanathan and Dr. S. Ghosh

11. Use of microscopy as analytical tool for the control of the process.

Mr. S. K. Mitra & Junior Scientific Assistant

IV. *Leather Auxiliaries Unit*

Object:

A variety of auxiliary materials go into the finishing of leathers. A majority of these are at present being imported at great

cost. The variety and number of auxiliaries are large and the quantity consumed by the industry in each is little which militates against their manufacture in India on a large scale with profit. Suitable methods, have, therefore to be developed for their manufacture, making use of the indigenous materials.

A fundamental study is also required on the reaction of these auxiliaries with the protein, for better appreciation of their properties and use. The research programme has been planned keeping these in view and work is distributed as follows:

Research Team:

1. Mr. M. A. Ghani (*Leader*)
2. Mr. A. Ganesan
3. Dr. D. Ramaswamy
4. Dr. S. M. Bose
5. Dr. N. Ramanathan
6. Mr. K. T. Sarkar
7. Mr. G. Lakshminarayana
8. Mr. R. Selvarangan
9. Dr. S. Ghosh
10. Mr. J. C. Deb
11. Mr. J. Budaga Rao
12. Mr. G. S. Rama Iyer
13. Mr. V. Radhanandha Kishore
14. Mr. V. V. Muralidhara Rao
15. Mr. T. K. Parthasarathy
16. Mr. K. S. Jayaraman

Research Projects :

1. Studies on the preparation and use of cationic, anionic and non-ionic fatliquors from

1.1 (a) fish oil, (b) non-edible vegetable oils and (c) synthetic leather oils

Mr. V. R. Kishore, Mr. V. V. Muralidhara Rao,
Mr. M. A. Ghani & Dr. Y. Nayudamma

- 1.2 Pilot plant manufacture of fatliquors

Mr. V. R. Kishore & Mr. G. Lakshminarayana

2. Preparation and use of leather finishes.

- 2.1 (a) pigment finishes

Mr. J. C. Deb & Mr. T. K. Parthasarathy

- (b) Pilot plant manufacture of pigment finishes

Mr. J. C. Deb & Mr. G. Lakshminarayana

- 2.2 Resin finishes

Mr. A. Ganesan, Mr. T. K. Parthasarathy and Mr. J. Budaga Rao

- 2.3 Glossy finishes

Mr. A. Ganesan, Mr. T. K. Parthasarathy & Dr. Y. Nayudamma

3. Study and preparation of natural and synthetic polymers for

(a) Impregnation and

(b) Finishing

Mr. M. A. Ghani, Mr. J. Budaga Rao & Dr. Y. Nayudamma

- 4.1 Study and preparation of shoe polishes, stains, adhesives

Mr. G. S. Rama Iyer & Dr. Y. Nayudamma

- 4.2 Pilot plant manufacture of polishes and adhesives

Mr. G. S. Rama Iyer & Mr. G. Lakshminarayana

5. Study and preparation of synthetic leather oils on a pilot plant scale.

Mr. V. R. Kishore, Dr. D. Ramaswamy and
Mr. G. Lakshminarayana

6. Pilot plant manufacture of enzymatic bates and unhairing agents.

Dr. S. M. Bose & Mr. G. Lakshminarayana

7. Manufacture of hide powder on a pilot plant scale.

Mr. K. S. Jayaraman & Mr. G. Lakshminarayana

8. Pilot plant manufacture of basic aluminium sulphate.

Mr. R. Selvarangan & Mr. G. Lakshminarayana

9. Pilot plant manufacture of vegetable tannins.

Mr. R. Selvarangan & Mr. G. Lakshminarayana

10. Testing and standardisation of leather finishes and finished leathers.

Dr. N. Ramanathan, Dr. S. Ghosh, Mr. T. K. Parthasarathy
and Mr. M. A. Ghani

11. Use of alternative materials for sodium sulphide as sharpening agents.

Mr. M. A. Ghani and Mr. K. T. Sarkar

12. Trying out leather auxiliaries of the C.L.R.I. on a large-scale in the tannery.

Mr. K. T. Sarkar *et al.*

V. Byproducts Unit

Object:

It is generally acknowledged that the profits of a tanner depend mainly upon the best utilisation of the byproducts. The Indian tanner has been treated as an untouchable because of the obnoxious odour and the tannery effluents. Treatment of these effluents to avoid objectionable odour and colour is thus essential. Researches are geared to tackle these problems.

Research Team:

1. Dr. Y. Nayudamma (*Leader*)
2. Dr. S. K. Barat
3. Dr. S. M. Bose
4. Mr. G. Lakshminarayana
5. Mr. O. S. Davood
6. Mr. K. Radhakrishnan
7. Research Fellow

Research projects:

1. Manufacture of leather boards:
 - (a) Study of the optimum conditions
Mr. K. Radhakrishnan & Dr. Y. Nayudamma
 - (b) Manufacture of leather boards on a pilot plant scale
Mr. K. Radhakrishnan & Mr. G. Lakshminarayana
2. Salvaging, acid washing and bleaching of wool and goat hair.

Dr. S. K. Barat

3. Utilisation of:

- (a) Spent tan bark for chip boards and leather boards
Mr. K. Radhakrishnan & Dr. Y. Nayudamma

(b) Tannery offal, fleshings and hair for the recovery of amino acids

Dr. S. M. Bose & Research Fellow

(c) Gut and surgical sutures

Research fellow & Dr. S. K. Barat

4. Tannery effluents—their treatment and disposal

Dr. S. M. Bose & Research Fellow

5. Leather goods from fancy leathers, split leathers etc.

Mr. O. S. Davood & Dr. Y. Nayudamma

VI. Engineering Unit

Object:

This is an auxiliary unit for the various research units to assist the research teams in designing, preparing, setting up and servicing analytical tools and tanning machinery.

Team:

1. Electrical cum Mechanical Engineer
2. Dr. N. Ramanathan
3. Dr. D. Ramaswamy
4. Mr. A. Ganesan
5. Mr. T. Gopinath
6. Mr. V. Madhavan

Projects:

1. Planning and construction of buildings and providing necessary auxiliary services like light, current etc.

Mr. V. Madhavan & Electrical cum Mechanical Engineer

2. Setting up, upkeep and maintenance of the machinery and equipment in the tannery, workshop and laboratories.

Electrical cum Mechanical Engineer

3. Design, develop and construct.

(a) newer tools and instruments for research

Dr. N. Ramanathan, Mr. T. Gopinath, Dr. D. Ramaswami
and Electrical cum Mechanical Engineer

(b) newer tools and machinery for the leather industry

Electrical cum Mechanical Engineer & Mr. A. Ganesan

VII. Dissemination of Scientific Knowledge

The Institute concerns itself particularly with the application of Science to the industry. It is, therefore, not enough to conduct research, but it is essential to disseminate the results of the research into the industry effectively and within the shortest period to put the leather industry in the lap of science. This work will be undertaken by four different units.

VII. (1) Survey and Information Unit

Object:

(i) To survey the existing conditions and practices of the leather industry and to obtain the necessary statistics in regard to production, consumption, imports, exports of raw materials, Leathers, Leather Goods and Leather auxiliaries and to keep the research units posted with the current trends in the industry

(ii) to bring the problems of the industry to the research unit

(iii) to disseminate the results of researches by (a) attending to technical enquiries, (b) holding Symposia, Seminars, 'Open houses' etc. (c) Publishing Bulletins, Brochures, technical leaflets etc., (d) to provide all necessary help to the research group by way of library and translation services to keep the research units posted with the current trends in the Industry and (e) by maintaining a museum and participating in Public Exhibitions

and (iv) to cooperate with the other organisations like small scale industries, tanning institutes of the various States, Leather Export Promotion Council, etc., in promoting the interests of the leather industry.

Team :

1. Mr. N. Subramanian (*Leader*)
2. Dr. V. S. Padmanabhan
3. Mr. G. Roy Choudhury
4. Mr. K. Seshaganapathy Rao
5. Mr. V. V. Subramanian
6. Mr. S. M. De
7. Assistant Editor (Tamil)
8. Assistant Editor (Hindi)

Projects:

1.1. Survey, Information and Marketing

Mr. N. Subramanian & Mr. K. Seshaganapathi Rao

- 1.2 Preparation of: (a) Annual plan, (b) Half yearly reports, (c) Annual Reports, (d) Monthly Summary to the Cabinet and (e) Parliamentary questions.

Mr. N. Subramanian

1.3 Symposia, Seminars & Open houses etc.

Mr. N. Subramanian *et al.*

1.4 Technical Enquiries

Mr. G. Roy Choudhury & Mr. K. Seshaganapathy Rao

1.5 Visitors to the Institute

Mr. G. Roy Choudhury & Mr. K. Seshaganapathy Rao

2.1 Publication of Bulletins, Brochures etc.

Dr. V. S. Padmanabhan, Assistant Editor (Tamil)
& Assistant Editor (Hindi)

2.2 Preparation of articles for publication

Dr. V. S. Padmanabhan, Assistant Editor (Tamil)
& Assistant Editor (Hindi)

2.3 Press release and hand-outs

Mr. N. Subramanian

3.1 Maintenance and upkeep of Museum

Mr. S. M. De

3.2 Public Exhibition

Mr. G. Roy Choudhury, Mr. K. Seshaganapathi Rao &
Mr. S. M. De

VII. (2) Extension Services Units

Object:

The Extension Services Unit shall visit the tanners all over India from time to time, to study the conditions and to bring back the problems of the industry to the Institute. This unit will also arrange for practical demonstrations of the various processes developed through research at the Central Leather Research Institute

as well as other regional tanning Institutes and tanning centres. The country is now divided into 4 regions, namely, East, West, North and South and each region is looked after by a Junior Scientific Officer who is well conversant with the regional languages and regional tanning processes.

Team:

VII. (3) *Training Unit*

1. Mr. A. Ganesan (*Leader*)
- 2-5. Junior Scientific Officers
6. Mr. M. A. Rama Iyer
7. Mr. G. N. Hore

Object:

To implement the results of researches, technical personnel suitably trained are required. Facilities are offered at this Institute for training students towards the B.Sc. (Tech.) Degree in Leather Technology and also for advanced training towards higher degrees. Refresher courses are offered for practical tanners.

Team:

1. Dr. Y. Nayudamma (*Hony. Professor*)
2. Dr. E. C. Mathew (*Hony. Reader*)
3. Mr. K. T. Sarkar
4. Mr. P. S. Venkatachalam
5. Mr. T. S. Krishnan
6. Mr. M. K. Udaya Varma

Projects:

1.1 (a) Laboratory work

Dr. E. C. Mathew & Mr. M. K. Udaya Varma

(b) Tannery Work

Mr. T. S. Krishnan & Mr. P. S. Venkatachalam

1.2 Refresher courses for practical tanners

Mr. P. S. Venkatachalam & Mr. K. T. Sarkar

VII. (4) *Technical Service Unit*

Objects:

(i) To analyse the samples of water etc. for the industry and to assist the Information & Extension Units

(ii) To assist research workers in routine analysis of materials and leathers obtained during processing

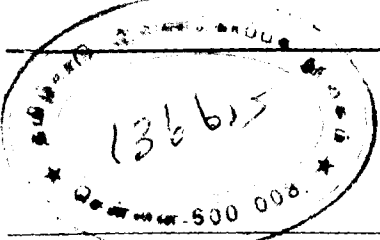
(iii) to analyse samples coming from various organisations like the Indian Standards Institution

and (iv) to undertake job-works in the tannery for small scale tanners.

Team:

1. Sri P. S. Venkatachalam, (*Leader*)
2. Mr. K. T. Sarkar
3. Senior Scientific Assistant
4. Senior Laboratory Assistant

Budget for 1958-59



	Research (in lakhs) Rs.	Auxiliaries (in lakhs) Rs.	Total (in lakhs) Rs.
I. Raw Hides & Skins Unit	0.93	0.61	1.54
II. Vegetable tannage Unit	1.70	0.82	2.52
III. Mineral Tannage Unit	1.30	0.78	2.08
IV. Leather Auxiliaries Unit	0.61	0.78	1.39
V. Bye Products Unit	0.29	0.25	0.54
VI. Engineering Unit	0.50	0.18	0.68
VII. Dissemination Unit	0.85	0.34	1.19
Total	6.18	3.76	9.94
Provision for Salary for technical posts vacant			0.79
Total			10.73