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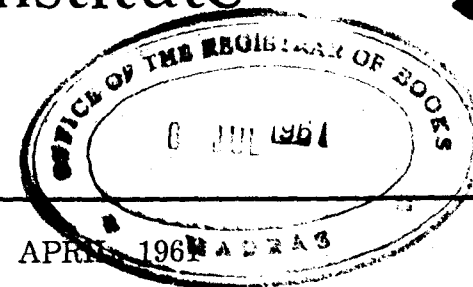
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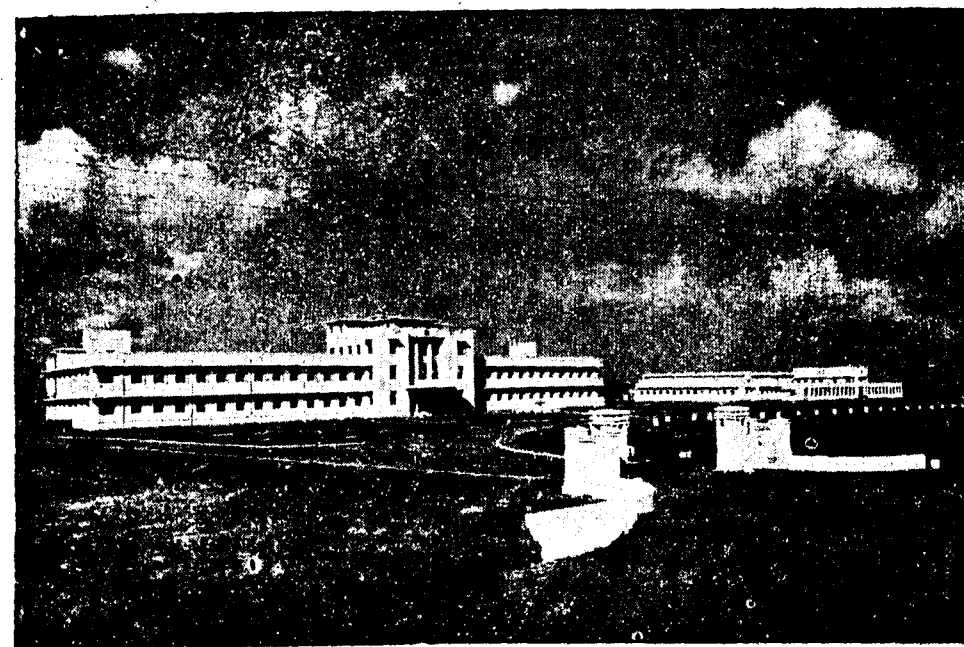


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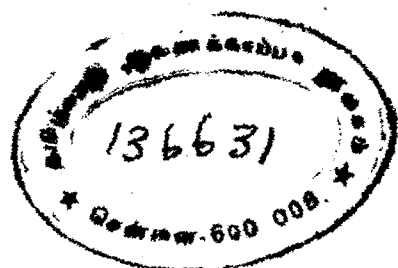
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Vol. VII

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No. 9

CONTENTS

Chemistry of bagasse reduced chrome liquors —T. J. Devassy & Y. Nayudamma	.. 403
Study of coconut pith reduced chrome liquors —T. J. Devassy & Y. Nayudamma	.. 412
Research Bears Fruit—Manufacture of oil seal leather by chrome retan—Polysulphide liquid polymer im- pregnation —S. N. Bose, T. S. K. Mahadevan, A. Ganesan & Y. Nayudamma	.. 420
Technical Seminars:	
(1) Fungi on tan liquors —E. C. George	.. 429
(2) Indian mangroves as a source of tannin —D. Ghosh	.. 430
Notes and News	.. 432
C. L. R. I. News	.. 434
Research Programme, 1961-62	.. 435

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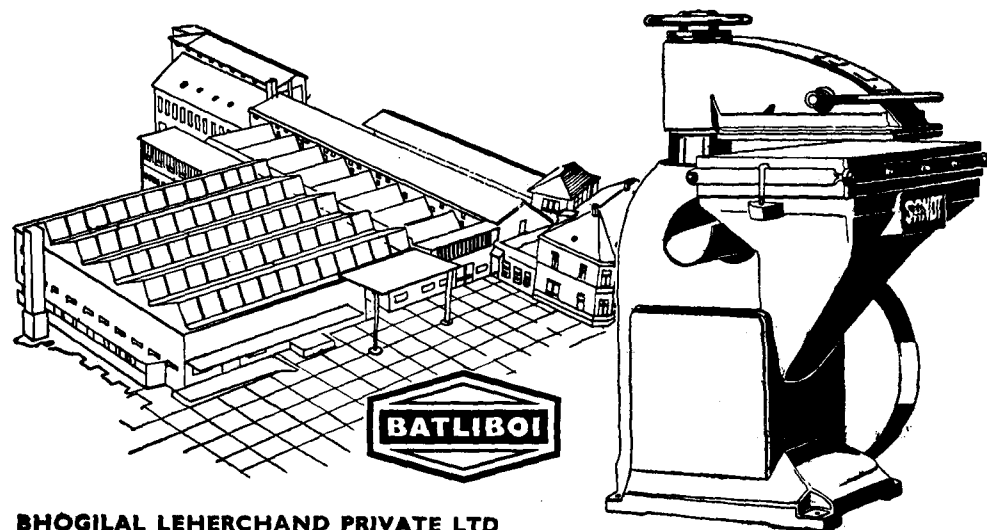
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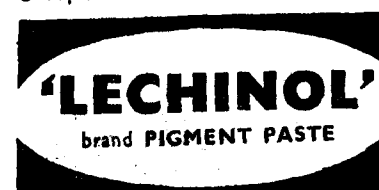
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CHEMISTRY OF BAGASSE REDUCED CHROME LIQUORS

BY

T. J. DEVASSY & Y. NAYUDAMMA,
Central Leather Research Institute, Madras

SUMMARY

A detailed study on the acid and basic radicals present in basic chrome liquors produced by reducing with different amounts of bagasse and bagasse pith, and of factors such as pH, degree of olation, basicity and ionic charge of the complexes was made. The results indicate that bagasse reduced chrome liquors compare favourably with those reduced by sugar; the liquors reduced with 25-50% of bagasse may prove more helpful to the tanner as compared to those reduced with higher amounts.

Introduction

The possibility for the use of bagasse in the preparation and use of basic chrome tan liquors was indicated in a previous paper.¹ The chemical constituents and characteristics of bagasse reduced chrome liquors have been studied in detail and the results reported in this paper.

Experimental

Preparation of bagasse reduced chrome liquors—The method of preparation of the chrome liquor was the same as detailed in the previous paper.¹ A series of chrome liquors was prepared, using different percentages of bagasse, namely, 25, 50, 75 and 100% on the weight of dichromate. The pith, which formed about 35% of the total, was separated from the bagasse. The separated pith was used for reduction using 25 and 50% on the weight of dichromate. For comparative purposes, sugar reduced liquor and sulphur dioxide reduced liquor also were prepared and the chemical characteristics compared.

The pH of the liquors at different dilutions, the acidity and basicity variations in the cationic, anionic and nonionic components, the organic and inorganic acid radicals present, the degree of olation and the potentiometric titration behaviour of these liquors were studied following the official methods of analysis.

Qualitative analyses by spot test technique² of the chromium-free solution obtained from the bagasse reduced chrome liquors indicated the presence of formate, oxalate, tartrate and glycollate ions. It was not possible to detect aldehydes or lactic or pyruvic acid.

Organic acid contents:—A quantitative study was made of the volatile acids and oxalic acid^{3,4} present in the liquors. The amounts of different acids formed during the reduction of 50 gm. of sodium dichromate with various reducing agents are recorded in table I below.

TABLE I

Reducing agent used	Volatile acids as acetic acid in gm.	Formic acid in gm.	Oxalic acid in gm.
SO ₂	.. Nil	Nil	Nil
Sugar (50% excess)	.. 1.66	1.151	0.650
Bagasse 25%	.. 0.50	0.227	3.394
„ 50%	.. 1.07	0.728	0.720
„ 75%	.. 1.46	1.081	1.97
„ 100%	.. 1.51	1.092	1.82
„ pith 25%	.. 1.02	0.310	0.398
„ „ 50%	.. 1.02	0.66	0.796

From this table, it is seen that with increase in the amount of bagasse, increasing amounts of volatile acids as well as of oxalic acid are produced. When the amount of the bagasse used is more than 75% on the weight of the dichromate, the value tends to become constant. The amount of acids produced in reduction with pith is approximately the same as that in the case of the whole bagasse. While the increase in the volatile acids content is of advantage, the simultaneous increase in the oxalic acid produced is probably detrimental to tanning. From the qualitative study it is found that acids such as tartaric and glycollic also are present in addition to the volatile acids such as acetic and formic (*vide supra*). These in small quantities, may be of advantage. As compared to the sugar reduced liquors, the ratio of oxalic acid to volatile acids is much higher in the case of bagasse reduced liquors which may tell upon the final characteristics of the leather. When bagasse is used in smaller amounts, upto 50%, the liquors

may be similar to sugar reduced liquors to a certain extent. With the judicious adjustment of the tanning processes, these chrome liquors containing various acids may be fruitfully employed for obtaining fuller leathers with other desirable characteristics.

Chromatographic studies:—A basic chrome liquor was prepared using ammonium dichromate in place of sodium dichromate and reducing with bagasse; the chrome was precipitated by ammonia and the chromium-free solution was used for chromatographic detection of different organic acids. Ammonium salt was used as the sodium salt would interfere in the chromatographic analyses. Alcoholic ammonia was used as solvent in one series of chromatograms which were run for 8 hours. Another series of chromatograms was run using a mixture of butanol, acetic acid and water as solvent. These chromatograms by comparison with standard ones showed the presence of the oxalate, glycollate, formate and acetate ions in the bagasse reduced chrome liquors, confirming the findings from spot tests.

Changes in pH at different dilutions:—The changes in pH are recorded in table II.

TABLE II

Reducing agent	pH at different dilutions		
	6% Cr solution	1.0% Cr	0.1% Cr
SO ₂	.. 2.7	2.95	3.15
Sugar (50% excess)	.. 2.85	3.15	3.35
Bagasse 25%	.. 2.90	3.0	3.3
„ 50%	.. 2.85	2.97	3.2
„ 75%	.. 2.8	3.0	3.15
„ 100%	.. 2.8	3.0	3.15
„ pith 25%	.. 2.8	3.0	3.15

From this table, it is observed that there is a slight decrease in pH with the increase in bagasse used; this would be due to the greater amount of organic acids. With increase in dilution, there is an increase in the pH value as is the case with sugar- and SO₂-reduced liquors.

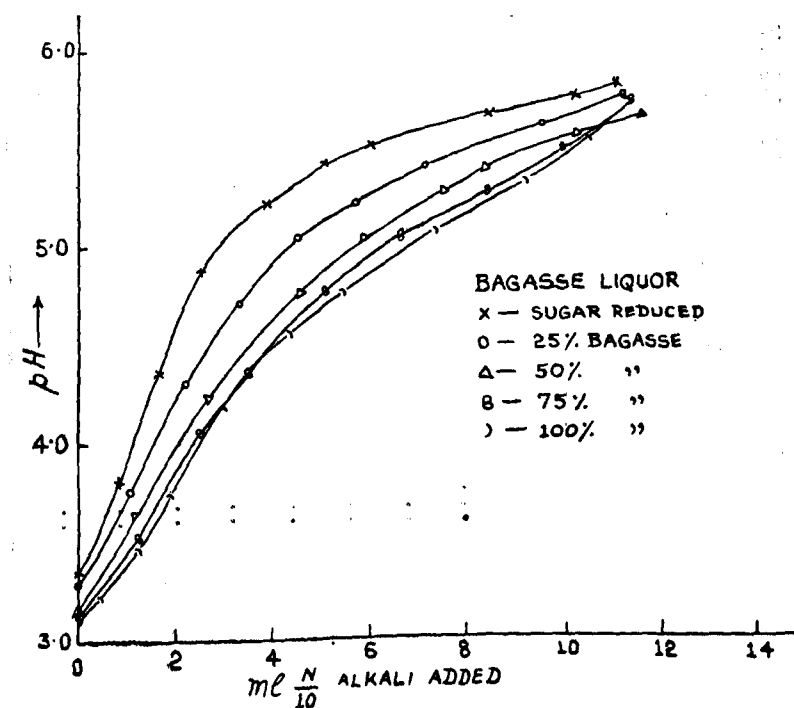
Acidity, basicity and degree of olation:—The figures for the Proctor and Lehigh basicities and the degree of olation are reported in table III.

TABLE III

Reducing agent used	Proctor Basicity		% of acid groups in the complex to the total combined with chrome	Lehigh basicity	Difference between Lehigh and Proctor	Degree of olation
	Hot	Cold				
SO ₂	..	32.5	37.1	6.82	—	90.3
Sugar (50% excess)	..	34.0	41.0	10.6	6.9	75.9
Bagasse 25%	..	34.2	37.4	4.86	6.3	93.5
" 50%	..	33.8	38.0	6.34	9.1	74.3
" 75%	..	32.8	37.2	6.55	11.1	72.3
" 100%	..	32.0	36.4	6.47	11.2	71.4
" pith 25%	..	34.3	36.9	3.9	11.7	92.3
" " 50%	..	33.7	37.4	5.58	11.4	70.2

The difference between the Proctor and Lehigh basicities gives a round estimate of the complexly bound organic acid radicals and this difference remains the same when more than 75% bagasse is used for reduction. The same trend is observed with the figure for the difference between the hot and cold titrations. The difference between the hot and cold basicity figures is probably due to the acid radicals that are not readily titratable in the cold; the difference in the figures between the hot basicity and Lehigh basicity, however, is a clear indication of the total amount of acid radicals that are complexly bound within the chrome complex. The difference between these two figures should then give an idea of the firmly complexed acid radicals such as tartrate, oxalate, etc.

The degree of olation decreases with the increasing amount of bagasse used. This is probably due to the nature and the amount of the organic acids present in liquors. The pith reduced liquors differ to an extent from the bagasse reduced liquors in that firmly complexed acid radicals are greater in the pith reduced liquors.



Acid radicals present in chrome liquors:—The distribution of the different radicals like OH, ionically and complexly held acid radicals and the neutral salts are reported in table IV.

TABLE IV

Different groups in m. equiv/100 m. equiv. of chrome

Reducing agent used	'OH'	Complexly held SO ₄	Ionically held SO ₄	Organic acidity	Neutral SO ₄
SO ₂	...	19.54	48.62	Nil	32.06
Sugar (50% excess)	..	20.0	46.1	6.8	21.9
Bagasse 25%	..	10.8	55.2	6.3	36.0
" 50%	..	7.0	59.3	9.0	28.3
" 75%	..	5.9	61.3	11.1	31.4
" 100%	..	5.7	62.3	11.2	30.2
" pith 25%	..	7.0	58.7	11.9	35.8
" " 50%	..	5.5	60.9	11.3	34.0

From this table, it is seen that the complexly held SO₄ decreases with the increasing amounts of the organic acidity present; with liquors obtained by reducing with more than 75% of bagasse, these figures tend to become constant. It is also observed that the pith produces greater amount of complexly bound organic acids. These results confirm the previous findings.

Potentiometric titration studies:—Figure (p. 407) gives the titration curves. 0.1% chrome solution was titrated with N/10 sodium hydroxide with a pH meter. These curves show that the bagasse reduced liquors are masked to a greater extent than the sugar reduced liquors; the masking effect is pronounced with the increase in the quantity of acids produced by the increase in the quantity of bagasse used. The trend of the curves, however, is the same showing the similarity of the masked nature of sugar and bagasse reduced liquors.

Ionic charge:—The percentage amounts of cationic, nonionic and anionic chrome complexes present in the chrome liquors were studied by two methods, namely, (i) ion exchange, using the resin IR. 120 on sodium cycle by shake method and (ii) paper electrophoresis⁵ as developed in this laboratory. The results obtained are given in table V.

Though the results obtained by the two methods are not identical, the trends are similar. Decrease in the amount of cationic complexes and increase in the amount of nonionic complexes is observed with increase in the amount of bagasse used. The nonionic complexes formed are nil or are very negligible. This is a striking fact in that only cationic and nonionic complexes but not anionic complexes are formed as contrasted to the sugar- and SO₂-reduced liquors. Evidently the increase in the amount of acids produced with the increase in the amount of bagasse used would convert cationic complexes into nonionic ones. The liquor reduced with the minimum amount (25%) of bagasse has a very high amount of cationic complexes and this is evidently the reason for the better leather obtained with it in comparison to other tan liquors.

Practical tanning tests:—As reported in the previous paper,¹ the chrome liquors produced by reducing with the minimum amount of bagasse, namely, 25% on the weight of dichromate, have given the best results by producing a leather of good characteristics. This is attributed to the observations made above, namely, that this liquor contains a large amount of cationic com-

TABLE V

Liquor	Ion Exchange Method			Electrophoresis Method			
	Cationic	Anionic	Nonionic	Cationic	Anionic	Nonionic	
SO ₂	..	77.1	2.9	20.0	63.9	7.9	28.2
Sugar (50% excess)	..	77.5	3.5	19.0	70.0	6.6	23.4
Bagasse 25%	..	85.2	—	14.8	84.9	3.7	11.4
“ 50%	..	77.8	—	22.2	76.9	3.4	19.7
“ 75%	..	75.6	—	24.4	74.2	3.5	24.5
“ 100%	..	72.4	2.2	25.4	72.0	3.5	24.5
“ pith 25%	..	76.9	3.6	19.5	79.2	2.9	17.9
“ “ 50%	..	77.7	4.4	17.9	75.2	4.37	20.5

plexes as compared to others. The amount of the oxalic and other strongly complexing acids like tartaric acid is small.

Acknowledgement

Our thanks are due to Dr. V. S. Padmanabhan for carrying out the chromatographic experiments.

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Changes in pH at different dilutions:—Table II indicates the changes in pH on dilution of liquors made using different amounts of pith.

TABLE II

Reducing agent	pH at different dilutions		
	6.0% Cr	1% Cr	0.1% Cr
Sugar	.. 2.85	3.15	3.35
Coc. pith 30%	.. 2.75	2.75	3.10
„ 60%	.. 2.70	2.70	3.10
„ 90%	.. 2.70	2.82	3.05
„ 120%	.. 2.65	2.82	3.0

The organic acids formed may be responsible for the small decrease in pH of liquor as the amount of pith is increased. As in the case of sugar and other organic-reduced chrome liquors, the pH increases on dilution in all cases.

Acidity, basicity and degree of olation:—Table III gives the details about the Proctor and Lehigh basicities and degree of olation⁵ and also an indication about the amounts of organic acid firmly complexed with chrome.

The difference between hot and cold titrations may be due to acid radicals that are not readily titratable in the cold, whereas the difference between Proctor basicity and Lehigh basicity is a definite indication of the total amount of organic acid radicals complexly bound with the chrome complex. The basicity figures gradually decrease as the amount of pith used increases. This is expected as more and more of organic acids will be formed as more of pith is used. It is observed that the difference between hot and cold titrations as well as that between Lehigh and Proctor basicities do not vary as the amount of pith increases. Also the figures are more or less close to those for sugar reduced liquors.

The degree of olation decreases with increasing amount of cocoanut pith and it is likely that the increasing organic acidity may be responsible for this. Compared to sugar reduced liquor, the degree of olation is much higher in 30% liquor which is otherwise very much similar to sugar reduced liquor.

TABLE III

Reducing agent	Proctor Basicity		% of acid groups in complex to the total combined with chrome	Lehigh Basicity	Difference between Lehigh and Proctor	Degree of olation
	Hot	Cold				
Sugar	.. 34.0	41.0	10.6	27.1	6.9	75.9
Coc. pith 30%	.. 37.0	42.0	8.4	29.5	7.5	89.0
„ 60%	.. 32.1	38.0	8.6	24.6	7.5	82.0
„ 90%	.. 29.2	35.5	9.0	21.4	7.8	78.5
„ 120%	.. 29.0	33.5	9.2	20.6	8.4	76.5

STUDY OF COCOANUT PITH REDUCED CHROME LIQUORS

BY

T. J. DEVASSY & Y. NAYUDAMMA

Central Leather Research Institute, Madras

SUMMARY

Use of coconut pith in the production of chrome liquor has been tried. The characteristics like pH, olation, basicity, ionic charge of complexes, distribution of acid groups etc. have been studied for such liquors prepared with different amounts of coconut pith. Comparison with sugar- and bagasse-reduced liquors has been made. It is shown that the liquor prepared with 30% pith is the best and that the leathers compare very well with those prepared with sugar- and bagasse-reduced liquors.

Introduction

Cocoanut pith is a bye-product of the coir industry. In beating the soaked cocoanut husk to remove the fibres, the pith is obtained. At present, this material is used only as a manure after burning. A good amount of it goes to waste by being thrown into the backwaters in Kerala State. The possibility of utilising this material for the manufacture of chrome liquors and the characteristics of liquors so produced are discussed in this paper.

Experimental

Preliminary experiments showed that with 90% concentrated H_2SO_4 , 30 gm. of the pith were needed for complete reduction of every 100 gm. of $\text{Na}_2\text{Cr}_2\text{O}_7$ (i.e., 30%). Dichromate and pith were mixed well; water was added in sufficient quantity to obtain a suspension which was heated to boil. Acid was then added slowly with continuous stirring, heating being discontinued. After completion of addition of acid, the mixture was boiled well, left to cool overnight, again boiled for some time and filtered through gunny bag.

A qualitative analysis by spot test technique¹ showed the presence of formate, oxalate, tartrate, lactate and glycollate. It is quite likely that small quantities of acetate also were present.

Aldehydes and pyruvic acid could not be detected. The results of qualitative analysis resemble very much those of sugar reduced liquor² and hence it is likely that the tanning characteristics also are similar.

Chrome liquors were prepared using different percentages of cocoanut pith, viz., 30%, 60%, 90% and 120% on the weight of dichromate. These liquors were analysed and the chemical characteristics compared with those of sugar reduced liquors.

Organic acid content:—The organic acids formed during reduction, viz., volatile acids, formic acid and oxalic acid^{3,4} were determined for the different concentrations of pith used. The amounts of acids formed during reduction of 50 gm. of sodium dichromate are given in table I.

TABLE I

Red. agent used	Total volatile acid in gm.	Formic acid in gm.	Oxalic acid in gm.
Sugar	.. 1.66	1.151	0.650
Coc. pith 30%	.. 0.653	0.200	0.394
.. 60%	.. 2.30	0.592	1.132
.. 90%	.. 2.40	0.890	1.382
.. 120%	.. 2.58	0.910	1.402

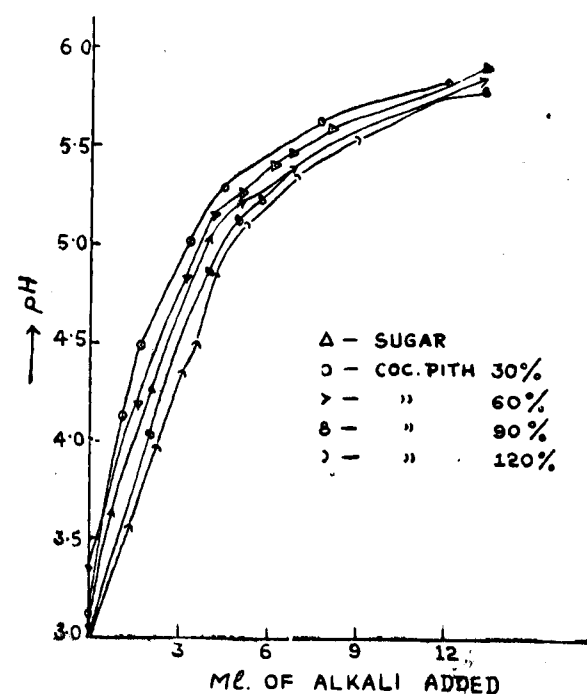
The table shows how the amount of organic acids increases with increasing amount of cocoanut pith used. In the case of total volatile acid and oxalic acid, there is practically no difference in the amount formed when 60% or more of cocoanut pith is used. Formic acid formed, increases gradually and is the same for both 90% and 120% of cocoanut pith. It is seen that when 30% of pith is used, the relative amounts of the different acids are better balanced, though only small quantities are formed, and the liquor compares very favourably with sugar reduced liquor. It can be expected that this liquor may have better tanning characteristics than the other liquors. When the amount of pith is increased to 60% and more, the quantity of volatile and oxalic acids, especially oxalic acid, increases very much. It is likely that the ratio between volatile acids and oxalic acid is above the optimum, thereby affecting the finer characteristics of leather.

Distribution of different radicals in chrome liquor:—Table IV gives the data regarding the distribution of radicals like OH, complexly and ionically held SO₄, organic acidity and neutral SO₄.

TABLE IV
Different groups in mgm. eq./100 m.eqs. of Cr.

Reducing agent	OH	Complexly held SO ₄	Ionically held SO ₄	Organic acidity	Neutral SO ₄
Sugar	27.1	20.0	46.1	6.8	21.9
Coc. pith 30%	29.5	10.0	53.0	7.5	35.5
" 60%	24.6	8.2	59.7	7.5	33.3
" 90%	21.4	7.8	63.0	7.8	32.4
" 120%	20.6	7.0	64.0	8.4	31.2

It is evident from the table that with gradual increase in the organic acidity the complexly held SO₄ decreases gradually. When compared to the sugar reduced liquor, the complexly held SO₄ is much less and the ionically held, much greater.



Potentiometric titration curves:—0.1% chrome solutions of the different liquors were titrated with N/10 alkali and the titra-

TABLE V

Reducing agent	Ion exchange method		Electrophoresis method	
	cationic	anionic	anionic	non-ionic
Sugar	77.5	3.5	70.0	23.4
Coc. pith 30%	78.9	Nil	90.0	8.2
" 60%	72.2	Nil	84.0	14.1
" 90%	71.0	1.0	79.8	19.2
" 120%	71.0	1.2	79.0	19.8

tion curves were drawn as shown in the figure. The curves show that pith liquor using 30% is less masked than the sugar reduced one and that the others more masked than the sugar liquor, the masking increasing with increasing percentage of pith. The general trend shows that these liquors also are masked as are the sugar reduced liquors.

Charge nature of complexes:—Paper electrophoresis method as developed in this laboratory⁶ and ion exchange method using Amberlite IRI20—in sodium cycle by shake method—were used for the determination of cationic, anionic and nonionic portions of complexes present in chrome liquors. Table V shows the results.

The results show that the cationic portion goes on decreasing with increasing amount of pith used as expected. But there is no substantial change in the amount of different complexes on using 60% or more of cocoanut pith; compared to sugar reduced liquor, the anionic portion is very little in all cases, but the cationic portion seems to be much higher and this may have some good effect in tanning. As is shown, the two methods do not agree but give the same trend.

Tanning tests:—Using the above liquors, 6" × 6" pieces from the butt portion of a cow hide were tanned at pH 3 under the same conditions and finished as chrome upper, with sugar reduced liquor as control. It was observed that chrome liquor produced by using 30% pith gave the best leather having very good tight grain and fine break, but slightly less full than that got with sugar reduced liquor. As has been shown by chemical characteristics earlier, the liquor from 30% pith is having the optimum conditions for producing good leather. Perhaps in the other liquors, the proportion between different masking agents is not quite satisfactory. The preponderance of the cationic complexes also may be helpful in producing better leather.

Comparison with bagasse reduced liquors:—Studies on bagasse liquors have been published elsewhere.⁷ As both pith— and bagasse are new materials in this field, a comparison of the main features is given below. The minimum amount required on the weight of dichromate needed for complete reduction, is 30% with cocoanut pith compared to 25% with bagasse. Qualitative analysis shows the same results except that cocoanut liquor contains lactic acid to a small extent. In quantitative studies of organic acids, the amounts of formic and oxalic acids are the same, whereas there is more of total volatile acids in cocoanut pith liquor than

in the bagasse liquor. pH changes on dilution are the same in both the cases. Difference between hot and cold Proctor titrations is more in cocoanut pith liquor than in bagasse liquor, whereas the difference between Lehigh and Proctor basicities is the other way about. Degree of ololation is more in cocoanut liquor than in bagasse liquor except in the case of 30% cocoanut pith liquor. In cocoanut pith liquors, basicity is less but complexly held SO_4 is the same, as in bagasse. In both the cases, titration curves follow the same trend. Cocoanut pith liquors are more cationic than bagasse liquors. In practical tests it can be said that bagasse liquor gives slightly better leather than cocoanut pith liquor; the only good feature of bagasse liquors is that the leather is slightly fuller. It may be because in bagasse liquors, there is a more optimum proportion of different organic radicals than in cocoanut liquors. It can be said that both the liquors have many common characteristics with slight variation in certain cases.

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RESEARCH BEARS FRUIT

Practical Demonstration No. 5

Fourth Series

Manufacture of oil seal leather by chrome retan — Polysulphide liquid polymer impregnation*

BY

S. N. BOSE, T. S. K. MAHADEVAN, A. GANESAN & Y. NAYUDAMMA

Introduction

Oil seal leathers are used for a wide variety of purposes in aeroplanes, automobiles and elsewhere as pneumatic or hydraulic packings subjected to high pressures as e.g., in airbrakes and hydraulic rams. The main properties desired are retention of the impregnated material, resistance to hot air, water and hot oils under high pressure (sometimes as high as 15000 lb/sq. inch) and temperatures -53.9°C to 121.1°C (from -65°F to 250°F). The leathers have the advantage of lubricating due to capillary action without scouring the shaft and are resistant to solvents such as carbon tetrachloride, trichloroethylene, benzene and ketones.

Oil seal leathers should not harden up in hot oil, must be capable of being moulded so that they retain their shape and flexibility at elevated as well as low temperatures as stated above.

The conditions in which the oil seal leathers are to work are such that the commonly known impregnating materials such as tallow, waxes, etc., when used will not give the impregnated leathers the long enduring capacity, since at high temperatures such as $120^{\circ}\text{--}130^{\circ}\text{C}$ ($248^{\circ}\text{F--}266^{\circ}\text{F}$), the waxes will melt and slowly come out of leather, thus spoiling the moulded shape and failing to impart longstanding durability to the leathers.

The right types of impregnating materials are the polysulphide liquid polymers such as LP-2, LP-3, LP-8, etc., and these products are being used in U.S.A. as the most successful impregnating materials.

*Demonstrations took place from November 21, to December 12, 1960.

These liquid polymers have been used as impregnating materials in our Institute on chrome retanned leathers and have been found to be suitable.

Any desired degree of impregnation is possible by using the different polymers and by pretreating the leathers with different pretreating chemicals such as cobalt hexogen, lead octate, etc. The process worked out is described below.

DETAILS OF PROCESS

Raw materials:

Wet-salted cowhides, stout, non-spready and of average quality but without deep cuts either in the grain or the flesh side and weighing between 55 to 65 lbs. (24.95 to 29.48 kg.) are usually taken for the manufacture of this type of leather.

Soaking:

The hides are soaked in plain water for about 6 hours, whereafter they are fleshed, then washed in running paddle for 2 hours, horsed up for $\frac{1}{2}$ an hour to drain off the excess water, rounded into butt, belly and shoulder. Only the butts are taken up for oil seal leather manufacture. They are weighed and taken for painting. (Note: Percentages indicated for painting and liming are based on this weight).

Painting: Composition of unhairing paste.

Fused sodium sulphide	—	2%
Slaked lime	—	10%
Water	—	8-10%

The above paste is applied on both sides of the butts which are then piled up overnight and covered with gunny bag.

Next day, the butts are given a light wash from the hose pipe, unhaired and then relimed.

Reliming: The composition of lime liquor is given below:

Slaked lime	—	5%
Water	—	400%

The butts are handled twice in this liquor in a pit and left overnight in the liquor.

During the next two days, the butts are hauled up and replaced thrice daily and left overnight in the liquor.

On the 5th day, the butts are fleshed, scudded and weighed. They are next washed in a drum in two changes of water for 15 minutes each time and then delimed. (Note: All percentages given hereafter upto tanning are based on this weight).

Deliming: The composition of the deliming bath is as follows:

Ammonium sulphate	—	2% on pelt weight
Water	—	200% " "

The butts are drummed in above solution for 1 hour and then are left overnight in the liquor.

Next day, the drum is run for ½ an hour or so and then a piece is cut from a butt, washed and again a fresh cut is made and the same tested with phenolphthalein solution. The cut edge should not show any colour with phenolphthalein. When deliming is complete, the butts are scudded, washed in 2 changes of water and then they are pickled.

Pickling: The composition of bath is given below:

Sulphuric acid	—	2%
Common salt	—	8%
Water	—	120%

The specified quantity of common salt and 100% water are taken in drum (R.P.M. 8-10) and the solution is prepared by drumming for 5 minutes. The butts are drummed in this solution for 15 minutes whereafter the specified amount of acid which has been diluted already with 20% water and cooled, is added in four instalments at intervals of ½ an hour. The drum is run for a total time of 4 hours with intermittent rest to avoid too much heating up inside the drum particularly in summer. The butts are left overnight in the bath. Next morning, the drum is run for ½ an hour and the pH of the exhaust pickle bath is checked; it will be 2.5 to 2.6.

The pickling should not be done in the deliming drum, since the ammonia evolved, during deliming with ammonium sulphate will neutralise some amount of the pickling acid and reduce the effective acidity of the pickle bath.

Depickling: is with

50% of the exhaust pickle bath,
8% of powdered Hypo.

Butts are drummed with 50% exhaust pickle bath liquor and then 8% powdered hypo is added to the drum (R.P.M. 10-12) and

the latter is run for 4 hours by which time the depickling will be complete. The cut section of butt and the exhaust depickling bath will have a pH of 3.5 to 3.6. The depickled butts are horsed up overnight.

Chrome tanning with 1.5% Cr₂O₃ equivalent liquor:

For subsequent partial impregnation with polysulphide liquid polymers, the chrome tanning of oil seal leather may be done with chrome liquor containing 1.5% Cr₂O₃ on pelt weight but for complete impregnation with the polysulphide polymer, the chrome tanning is to be done with liquor containing an equivalent of 3 to 3.5% Cr₂O₃ on pelt weight so as to enable the finished oil seal leathers to contain between 5 and 7% Cr₂O₃.

Composition of chrome liquor:

Common salt	—	3% on pelt weight of butt.
Formic acid	—	1/8% " " "
Water	—	90% " " "

Common salt and 80% water are taken in a drum (R.P.M. 10) which is then set in motion. The depickled butts are put in and then formic acid dissolved in 10% of water is added. The drum is run for 15 minutes whereafter 1.5% Cr₂O₃ equivalent chrome liquor prepared from 6% B. & C. chrome extract powder dissolved in 10% water and having 33% basicity is added in one feed and the drum run for 2½ hours. When the penetration of chrome liquor is complete throughout the entire cross section, the basification with sodium bicarbonate solution may be started. ¾ to 1% sodium bicarbonate dissolved in 10% water may be added to the bath in 8 instalments and the drum run for a total time of 6½ hours to 7 hours. The butts are kept in the liquor overnight. Next day, the drum is run for ½ an hour and the tanned butts are piled up for 2 days.

pH of exhaust tanning bath lies between 3.9 to 4.1. Shrinkage temperature of cut piece will be 98 to 100°C (208.4 to 212°F.) in water medium.

Alternatively, the chrome tanning using 3% Cr₂O₃ equivalent chrome liquor may be done with the following as described below:

Common salt	—	3% on pelt weight of butt.
Formic acid	—	1/8% " " "
Water	—	90% " " "

3% common salt and 80% water are taken in drum; the butts are drummed in the solution and 1/8% formic acid diluted with 10% water is added to the drum which is then run for 15 minutes. Next 1% Cr₂O₃ equivalent chrome liquor of 33% basicity is added to the drum and drumming is done for 1 hour; next another 1% Cr₂O₃ equivalent chrome liquor of 40% basicity is added and drumming continued for 1 more hour. Then the 3rd instalment of 1% Cr₂O₃ equivalent chrome liquor of 50% basicity is added to the drum which is run for 2 hours more. Then 1/2% sodium bicarbonate dissolved in 10% water is added in 4 instalments at intervals of 1/2 an hour and the drum is run for a total time of 6 1/2 to 7 hours from the beginning.

The butts are kept in the liquor overnight. Next day, the drum is run for 1/2 to 1 hour and then the tanned butts are piled up for 2 days. pH of exhaust tanning bath is 4.0 to 4.1.

Shrinkage temperature of a cut piece of tanned butt will be around 125°C (257°F) in glycerine and water medium.

After being piled for 2 days the tanned butts are sammed, split and shaved to 3.0 to 3.3 mm. which will give ultimately after retanning, a thickness of 3.5 to 4.0 mm., the thickness required in the oil seal leather.

The shaved weight of the butts is noted. (Note: All percentages mentioned hereafter are based on shaved weight).

Washing:

The shaved butts are washed in 2 changes of water, 10 minutes in each change of water.

Neutralisation: is with the following:

Sodium bicarbonate	—	1 to 1 1/4%	on shaved weight.
or			
Sodium formate	—	1 3/4 to 2%	" "
Water	—	300%	" "

280% water is taken in drum. The drum is set in motion and the butts are put in. The quantity of sodium bicarbonate or sodium formate mentioned above is dissolved in 20% water. This solution is added in 2 instalments at an interval of 1/2 an hour and the drum is run for a total time of 2 1/2 to 3 hours by which time the cut section of the leather will show pH 4.0 to 4.2 and the surfaces pH 4.6 to 5.

Washing:

The neutralised leathers are first washed in plain water for 10 minutes whereafter they are washed with water at 45°C (113°F.) for 10 minutes.

Fatliquoring: Composition of fat-liquor.

Sulphated fish oil	—	2%	on shaved weight.
Water at 60°C (140°F)	—	150%	" "

120% water at 60°C (140°F) is taken in drum (R.P.M. 15). After starting the drum, the butts are put in and 2% sulphated fish oil emulsified with 30% water at 60°C (140°F) is fed in; the drumming is continued for 1/2 an hour more in which time fat is completely taken up.

Vegetable retanning: is carried out with

Sulphated quebracho extract	—	25%	on shaved weight.
Sweetened chestnut	—	5%	" "
Water	—	150%	" "

The strength of the liquor is adjusted to 60°Bk. pH of the liquor will be 4.4 to 4.5.

The butts are taken in a drum which is set in motion; 2/3 of the above liquor is fed in and the drum is run for 15 to 20 minutes more; the remaining 1/3 of the liquor is now put in and the drum is run for a total time of 4 1/2 to 5 hours in which time the retanning is complete and the butts are completely penetrated. The tanned butts are piled up overnight.

Bk strength of the exhaust bath is around 16°. This liquor may be used for offal tanning. pH of exhaust bath is 4.2 to 4.3.

Washing:

Next day, the butts are first washed in plain water for 15 to 20 minutes to wash off all loose tannins and then they are washed with water at 54°C (122°F) for 10 minutes.

Refatliquoring: is with

Sulphated fish oil	—	2 1/4 to 2 1/2%	on shaved wt.
Fish oil	—	3/4%	" "
Paranitrophenol	—	1%	on wt. of the oil mixture
Water at 60°C (140°F)	—	200%	on shaved weight.

The sulphated oil and neutral oil are mixed together first very intimately and the mixture is emulsified with 30% water at 60°C (140°F).

170% water at 60°C is taken in a drum, which is set in motion. The butts are now introduced into the drum and the fatliquor emulsion mixed with the above quantity of paranitrophenol dissolved in minimum quantity of methylated spirit, is fed in. Drumming is continued for 30 to 40 minutes more by which time, the fat is taken up. The fatliquored butts are horsed up.

Cationic fatliquoring:

Fish oil	—	½%	on shaved weight of butts.
Cationic dispersing agent such as Fixanol VR (I.C.I.)	—	½	" " "
Water at 60°C (140°F)	—	200%	" " "
Paranitrophenol	—	1%	on the weight of the oil.

180% water at 60°C (140°F) is taken in drum, which is set in motion. The butts are put in the drum. The fish oil and Fixanol VR mixed together intimately are emulsified with 20% hot water at 60°C (140°F). The above mentioned quantity of paranitrophenol dissolved in just the minimum quantity of methylated spirit is now added to the emulsion. This fatliquor emulsion is added into the drum which is run for 10 to 15 minutes in which time, the fat is taken up completely.

The fatliquored butts are horsed up overnight.

Sammying and setting:

Next day, the butts are sammed and set, first on the flesh side and then on the grain side and the butts are hung up to dry at usual temperature overnight.

Next day, the butts are given a second setting both on flesh and grain sides and hung up to dry out completely for 2 to 3 days.

When the leathers are completely dried, they are snuffed finely on the grain with 400 emery paper, so as to enable better absorption of the impregnants and are brushed to remove buffing dust. The leathers are then cut into discs of the required dimension and then taken for pretreatment and impregnation.

Cobalt hexogen pretreatment:

The cobalt hexogen taken as a 1.5 to 2% solution is diluted with an equal volume of methyl ethyl ketone. The snuffed leathers are dipped in this solution for 5 to 10 minutes by which

time the pores of the leathers are filled up. The leathers are removed from the cobalt solution and dried uniformly at a constant temperature and humidity. Usually drying periods of 2 to 3 hours at 48.9°C to 60°C (120°-140°F) or 8 to 16 hours at 29.5°C (85°F) are considered satisfactory. Relative humidity should be controlled to be between 40 to 55%.

Once the leathers are dry, they are placed in a bath of polysulphide liquid polymer LP-3 or LP-8. Polysulphide liquid polymers such as LP-3, LP-8 etc. are synthetic rubbers prepared by the Thiokol Chemical Corporation, Trenton, U.S.A. The liquid polymers have the property of filling up the pores of leather and the capacity to withstand high temperatures like 121.1°C (250°F) or more, and low temperature like -53.9°C (-65°F) without getting affected and hence they act as permanent impregnants.

If LP-3 is used, the bath temperature should be controlled in the range of 26.7° to 65.6°C (80° to 150°F).

The leathers are allowed to soak in the polymer for several hours until they are completely filled. Alternatively filling can be accomplished in 15 to 30 minutes under a partial vacuum. Care must be taken to keep the leathers separated by spacing them on a rod or some similar suspending device in order to ensure a uniform impregnation. After impregnation, the leathers are allowed to drain. Wiping may be necessary to remove excess polymer from the surfaces.

The impregnated leathers will cure within 2 to 5 days at 26.7°C (80°F) or 1 to 2 days at 48.9°C (120°F).

Lead octate-Sulphur process:

An alternative curing method used for complete fill of voids in high pressure packing leather is a lead octate-sulphur cure of LP-3 or LP-8.

The lead octate is obtained commercially as a 40% paste.

This lead octate is diluted with its equal volume of methyl ethyl ketone; leathers are dipped in the solution in the same way as in the case of cobalt hexogen pretreatment and dried as stated in the above case.

Then the leathers are dipped in a mixture of 100 parts of LP-3 or LP-8 and 4 parts of sulphur (taking 4 parts of flowers of sulphur for every 100 parts of the polymer).

The temperature of the liquid polymer-sulphur bath is generally not higher than 37.8°C (100°F), since sulphur reacts with LP-3 or LP-8 to cause an immediate viscosity rise.

Impregnation by the dip method is very slow because of the higher viscosity of the impregnating bath.

Therefore, it is desirable to draw the polymer into the leather using vacuum or by some other mechanical means. Careful checking of the impregnating bath is needed each time since the sulphur becomes used up and is no longer effective as an accelerator for the cure. Sulphur analysis of the bath should be conducted periodically and fresh liquid polymer-sulphur mixture should be added to maintain the bath concentration at a constant level.

The lead octate cure is quite slow at ambient temperatures and hence the impregnated leathers should be cured for 24 to 48 hours at 60°C to 65.6°C (140°F to 150°F).

With this process, the treated leather displays excellent snap or resilience and has the appearance of a rubber like packing.

The cobalt hexogen pretreated and liquid polymer LP-3 impregnated leather after impregnation increased in weight by about 50 to 55% whereas the lead octate pretreatment and liquid polymer LP-8 and sulphur impregnation increase the weight by about 60% and more. No shrinkage during or after impregnation takes place in leathers if they are processed rightly from the beginning. The shrinkage temperature of the impregnated oil seal leather in oil medium lies between 150° and 160°C (302°F and 320°F).

Quality and economy of the process:

The oil seal leathers prepared as above have been tested by various engineering firms and the reported results show that these leathers are as good in quality and performance as the imported varieties. These oil seal leathers are cheaper than the exported oil seal leathers or synthetic oil seals. Since these leathers were processed and sent to many engineering firms for test, there has been growing demand for this type of leathers.

Acknowledgement

The authors are thankful to the Thiokol Chemical Corporation of U.S.A. for having kindly supplied them with all the procedure of impregnation and the impregnating materials.

TECHNICAL SEMINAR

Fungi on tan liquors*

BY

E. C. GEORGE

The position of the tan and non-tan utilisation by *Aspergillus niger* (1) at different levels of pH and (2) at variable extract concentrations, was studied with (a) avaram (catechol type of tannin), (b) myrab (pyrogallol type of tannin) and (c) babul (mixed type of tannin). Myrab liquor supported better the growth of *A. niger*, better than avaram and babul liquors. In avaram liquor, greater conversion or utilisation of tans was noticeable at low pH levels. Destruction of tan was seen at all pH levels in myrab liquor, and at all pH levels except at pH 8.0 in babul liquor. Non-tan utilisation by *A. niger* with regard to avaram was seen only at higher pH levels of 6.0 and 8.0. Non-tans were destroyed at all pH levels in myrab liquor. In babul, non-tan utilisation was observed at pH 4.0 and above. In general the results indicated that tan was preferentially utilised at lower pH levels and non-tan at higher pH levels.

The effect of tannin in Czapek's medium on the growth of the moulds, sugar utilisation and acid production was studied with four species of *Aspergilli*: *Aspergillus niger*, *A. flavus*, *A. fumigatus* and *A. oryzae*. All the above mentioned moulds except *A. oryzae* in babul tannin grew luxuriantly in the basal media containing avaram, myrab and babul tannins. Sugar utilisation decreased in the presence of tannins in all the cases except with *A. fumigatus* in avaram tannin. The increase in mould growth with decrease in sugar uptake indicated the preferential utilisation of tannin by moulds when both tannin and sugar were present in the basal medium. Acid production by these moulds did not correlate with either the sugar utilisation or the growth of the moulds.

Free amino acids present in the mycelium of *A. niger*, *A. flavus* and *A. fumigatus* when grown on Czapek's solution containing various tannins were studied. Sixteen different free amino acids were found in the mycelium of the above mentioned three species of *Aspergilli*. The addition of tannin was found to increase the quantity of free amino acids with *A. niger* and *A. flavus* and also to produce some new amino acids with *A. niger*.

*Summary of talk given on February 17, 1961.

TECHNICAL SEMINAR

Indian mangroves as a source of tannin*

BY

D. GHOSH

The availability of mangroves in India has been discussed.

A comparative study of the leaching and certain other properties of three mangroves which are available in India, viz., *Ceriops roxburghiana* (Goran), *Rhizophora mucronata* and *Bruguiera gymnorhiza* has been made. All the three mangroves yielded liquors of higher barkometer strength and darker colour as the temperature of extraction was increased. Two consecutive extractions were sufficient to extract almost all the tannins from the barks. Cold water extraction has been considered to be the best for extracting mangrove tannin, as higher temperature is likely to deteriorate the tannin quality.

Various methods of decoloration were attempted. Decoloration after tannage has been found most suitable. Pretreatment of pelt or the external addition of acids and salts to the liquors, has been shown to cause precipitation of the tan liquor with loss of tannin. Excess of acids and salts in the tan liquor has been shown to adversely affect the tanning properties of the liquor, notably in regard to ease of penetration through the pelt.

Goran was found to penetrate pelt within 5-6 days at 10°Bk, on the other hand, *Rhizophora mucronata* and *Bruguiera gymnorhiza* took 9 and 10 days respectively.

An initial tannin concentration corresponding to 20°Bk. was found to be unsuitable for tanning with *Rhizophora* and *Bruguiera* liquors as penetration was incomplete even after 6 weeks. However, 10°Bk. was found suitable for tanning with mangrove liquors. Even so, under these conditions, penetration of *Rhizophora* and *Bruguiera* liquors takes double the time taken by goran. The former two were found also to give dark coloured leather.

Most of the salts in mangrove liquors were found to be salts of strong acids. All mangrove tanned leathers gave a very high

*Summary of talk given on February 24, 1961.

shrinkage temperature, goran yielding the highest figure (96-98°C). Aged tan liquors were found to give better penetration and to produce leather having a higher shrinkage temperature and a higher degree of tannage than those tanned by means of freshly extracted liquors.

A comparative tanning experiment of purified and salt modified goran liquors was attempted and these were compared with salt adjusted mimosa liquors. Two tannage systems were attempted, system I, tannage without replenishment of liquors and system II, tannage with replenishment of liquors.

Goran liquor purified by lead acetate precipitation technique was found to penetrate pelt relatively quickly (4 days), whether the liquors were restrengthened or not. Leather tanned with purified goran was very dark and poor in substance in both the systems. System II gave leathers of better colour than system I. The shrinkage temperature of the leather tanned with purified goran in system II was found to be almost the same as that of the leather tanned with original goran. Consequently, it has been deduced that the naturally occurring nontans do not play any significant role in determining shrinkage temperature. The high thermal stability imparted to the leather appears to be an inherent property of the mangrove tannin molecules themselves. When the pH and salt content of mimosa liquor was adjusted to that of the original goran by the addition of sodium chloride and hydrochloric acid, no change in shrinkage temperature was observed, thus confirming the view that salts in the tan liquor have no significant effect on the shrinkage temperature of the leather under the conditions employed.

Though the acids and salts content of purified goran subsequently dialysed was reduced almost to that of the mimosa, the gelatin number of the former was much greater. The goran tannin molecule is therefore inherently more astringent than mimosa tannin and this fact would account for the known difference between the tanning properties of the two.

The higher shrinkage temperature, greater yield, higher degree of tannage, lower water solubles and darker colour of the leather tanned with goran as compared with leather tanned with mimosa were attributed to inherent differences in character of the goran and mimosa tan molecules. The same conclusion was applied to all mangrove species.

The ways of utilising the mangrove banks to a maximum possible extent were discussed.

NOTES AND NEWS

Govt. livestock farms

Speaking on the concluding day of the Fourth Madras State Cattle Show, Mr. Bishnuram Medhi, Governor of Madras, said that great pains had been taken both by the Animal Husbandry Department and some private individuals in cattle breeding and it was pleasing to note their success as evidenced at the Cattle Show.

Welcoming the Governor, Dr. D. Pattabhiraman, Director of Animal Husbandry, said that the work done in the various Government Livestock Farms in the State had helped to evolve several fine breeds of cattle for which there was good offer even from foreign countries. Such cattle shows helped to impart to the livestock breeders the valuable results achieved by the research workers. Under the All-India Poultry Development Scheme, 28 poultry extension centres had been opened in the State during the Second Five-Year Plan period.

The Hindu: March 2, 1961.

Fodder for cattle

Mr. M. Bhaktavatsalam, Home and Agriculture Minister, said in the Legislative Assembly that the cattle fodder problem in the State could be solved only if the numerical strength of the animals could be reduced and their quality improved instead.

Answering a question by Mr. A. Vedaratnam, the Minister said that if they took into account the present numerical strength of the cattle, no effort at increasing fodder and grazing facilities would be adequate. They should reduce their number.

Mr. Bhaktavatsalam also outlined the schemes taken up by the Government for the development of fodder and grazing facilities. The provision of these facilities in the deltaic regions like Tanjore district, he said, was difficult. But he would suggest the growing of grass in coconut and other gardens.

The Hindu: March 8, 1961.

Shipments of hides and skins during February, 1961

The following are the details (in bales) of shipments during February, 1961: To the U.K.: 1,114 tanned cow hides, 81 tanned cow calf skins, 36 tanned buffalo hides, 239 tanned buffalo calf skins, 107 tanned goat skins and 141 tanned sheep skins. To the Continent 6 tanned cow hides, 69 tanned cow calf skins, 9 tanned buffalo hides, 63 tanned buffalo calf skins, 453 tanned goatskins and 195 tanned sheep skins. To the U.S.A.: 69 tanned buffalo hides, 216 tanned buffalo calf skins, 159 tanned goat skins and 11 tanned sheep skins. To Japan: 7 tanned goat skins and 214 tanned sheep skins. To New Zealand: 7 tanned goat skins and 53 tanned sheep skins. To Australia: 9 tanned sheep skins. To Berbera: 12 tanned cow hides. Total: 3,270 bales.

The Mail: March 5, 1961.

Shipments upto March 15, 1961

The following are the details (in bales) of shipments during the fortnight ending March 15, 1961: To the U.K.: 2,571 cow hides, 174 cow calf skins, 25 buff hide, 496 buff calf skins, 405 goat skins, 438 sheep skins. To the Continent: 9 cow hides, 230 cow calf skins, 144 buff calf skins, 585 goat skins, 255 sheep skins. To the U.S.A.: 45 buff hides, 101 buff calf skins, 72 goat skins, 6 sheep skins. Total: 5,556 bales

The Mail: March 19, 1961.

Scheme to grow wattle

The Government of Madras has sanctioned Rs. 2,06,800 for the scheme to raise wattle plantations over 4,400 acres in the Nilgiris and the Palnis during 1961-62.

It is proposed to raise wattle over 20,000 acres in the Nilgiris and the Palnis during the Third Plan period.

The Mail: March 25, 1961.

Leather goods

S.T. levy to be made multi-point

Mr. R. Venkataraman, Minister for Industries, announced in the Madras Legislative Assembly that the Government had decided to switch over the levy of sales tax on leather goods from single point to multi-point.

The Minister also announced that the rate of tax on raw wool at single point would be reduced from three to one per cent, as an incentive measure for export.

The Hindu: March 28, 1961.

C.L.R.I. NEWS

A meeting of the Board of Visitors for the Institute of Leather Technology, Madras-21, was held at the Central Leather Research Institute on March 2, 1961, with Dr. Y. Nayudamma as Chairman.

Dr. Y. Nayudamma, Director, attended the meeting of the Board of Directors of the Mysore Chrome Tanning Co. at Bangalore on March 14, 1961.

The meetings of the Scientific Sub-Committee and the Executive Committee of the Central Leather Research Institute were held on March 22, 1961, with Dr. A. L. Mudaliar as Chairman.

Shri P. S. Venkatachalam, Senior Scientific Officer, attended the sixth meeting of the Advisory Committee for the Indian Standards Institution—Madras Branch Office, held on March 30, 1961.

Bulletin of the Central Leather Research Institute MADRAS

SCALE OF CHARGES FOR ADVERTISEMENTS

		Screen 125			
Position	Type Area	One insertion	Six insertions	Twelve insertions	
Full Page	.. $7\frac{1}{2}'' \times 4\frac{1}{2}''$	Rs. 60	Rs. 320	Rs. 600	
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*Communications should be addressed to The Managing Editor,
Editorial Board.*

**CENTRAL LEATHER RESEARCH INSTITUTE,
ADYAR, MADRAS-20.**

RESEARCH PROGRAMME 1961-62

Central Leather Research Institute

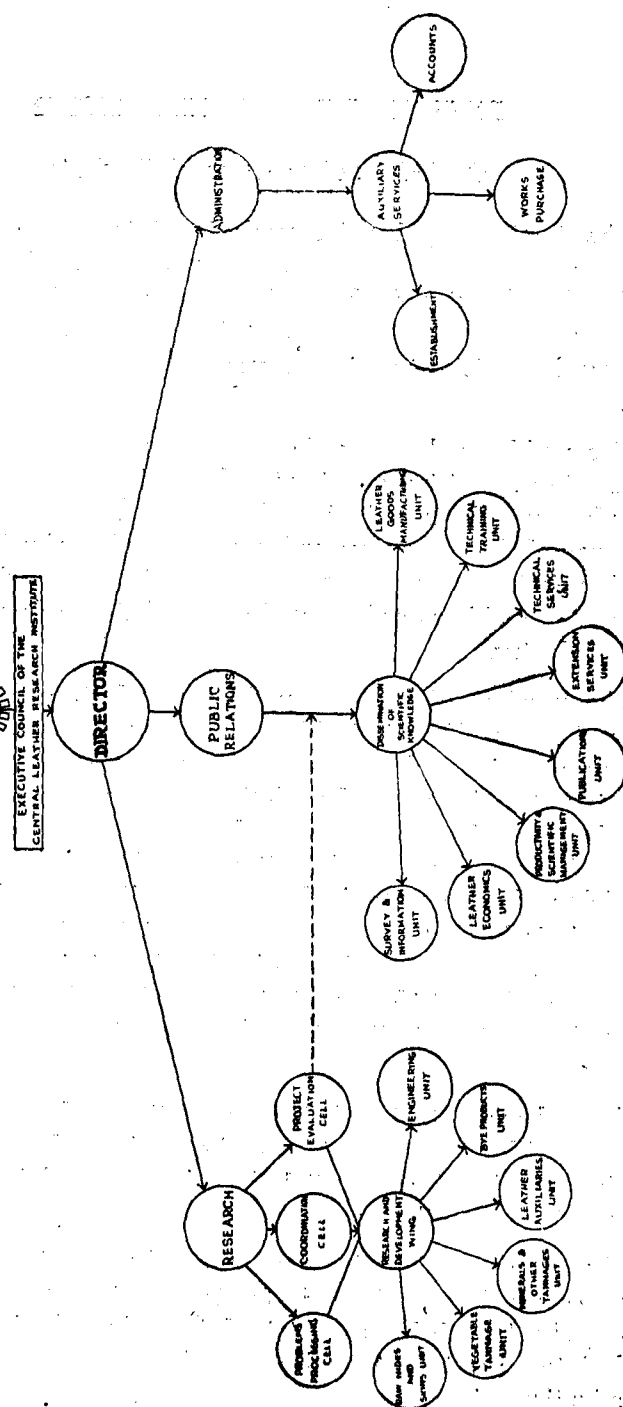
The Central Leather Research Institute was set up in the year 1953 for the advancement and dissemination of leather science and for the elevation of the Indian leather industry. It concerns itself particularly with the application of science to the leather industry that exists at various levels, viz., 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 is a few. Each problem is tackled by a team or teams of research workers of various schools of thought; 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 disseminated into the industry through the various units of the dissemination wing.



Problems Processing Cell

The problems that face the Indian tanning industry are first to be collected. The Information and Survey Unit, 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 Cell. The problems so collected are listed together and processed by this Cell in the order of priority to be undertaken by the research teams. This Cell for this year will consist of:

Mr. N. Subramanian (Secretary)

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 Cell will work directly under the Director. The problems that arise from these outside organisations will be transmitted to the team or teams of research workers.

The results of the researches from the various units and teams of research workers will be evaluated from time to time. This Cell will 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 Cell 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 tanners today are paucity of hides and 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 authentic information on the conditions and practices prevailing in the various regions of India, with a view to improve the quality of raw hides and the leathers made out of them. Personnel from varied schools of thought will work together as a team to achieve this object.

Research Team:

Dr. S. N. Sen (Leader)
Dr. Y. Nayudamma
Dr. S. K. Barat
Mr. A. Ganesan
Dr. S. M. Bose
Mr. S. K. Mitra
Dr. N. Ramanathan
Mr. P. S. Venkatachalam
Mr. S. C. Nandy
Dr. R. Bhaskaran
Dr. B. C. Basu
Mr. T. S. Krishnan
Dr. K. T. Joseph
Mr. N. N. Guha
Mr. D. B. Mukherjee
Mr. S. K. Sarkar
Mr. D. K. Das
Mr. S. C. Dhar
Mr. V. S. Krishnamurthy
Mr. T. S. K. Mahadevan
Mrs. V. V. Subbalakshmi
Mr. E. C. George
Mr. M. Natarajan
Mr. V. Mohana Radhakrishnan
Senior Research Fellow
I. C. A. R. Fellow
Senior Laboratory Assistant

Research Projects:

1. Study on the quality of raw hides and skins.

1.1 Survey of the existing conditions and practices in the States of Jammu & Kashmir, Madhya Pradesh, Rajasthan, Maharashtra and Gujerat and collection of authentic information and representative and reliable samples of hides and skins from animals covering various factors such as fallen, slaughtered, feed, breed, sex, age, rearing, curing, damages encountered due to ante and post-mortem causes and damages due to insects, pests, diseases, rainy season defects, salt stains etc.

R. Bhaskaran, A. Ganesan, T. S. Krishnan & S. K. Barat.

1.2. Histological studies of the samples of raw hides and skins collected.

R. Bhaskaran, S. K. Mitra, S. K. Sarkar & D. K. Das.

1.3. Preparation of a histological album of hides and skins.

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

1.4. Biochemical studies with particular reference to protein and lipid constituents of the hides and skins collected.

M. Natarajan & S. M. Bose.

1.5. Isolation and identification of micro-organisms from the raw hides and skins collected.

E. C. George, R. Bhaskaran & S. N. Sen.

2.1. Curing and preservation.

2.11. Curing and preservation of raw hides and skins (a) using antibiotics in admixture with common salt and (b) by solvent dehydration.

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

2.12. Treating hides and skins intended for export with special naphthalene sulpho acid syntans, the latter being stripped when not required.

S. C. Nandy & D. B. Mukherjee.

2.13. Studying the different regions of hides and skins susceptible in various degrees, to bacterial attack during staling, in order to evaluate the quality of the stock.

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

2.14. Studies on the problem of red heat and its prevention.

S. C. Nandy & S. N. Sen.

2.2. Practical studies on the prevention of mould growth on leather.

V. S. Krishnamurthy, R. Bhaskaran & S. N. Sen.

2.3. Studies on fur skins with special reference to bleaching and stain removal.

Senior Laboratory Assistant & S. K. Barat.

3. Transport and storage.

3.1. Studies on insect damages to stored hides and skins and their prevention by use of insecticides.

R. Bhaskaran & S. N. Sen.

3.2. Study of the optimum conditions for proper transport of raw hides and skins and prevention of damage during transit.

S. C. Nandy and S. N. Sen.

3.3. Practical studies in pickling of skins intended for export and storage.

R. Bhaskaran, T. S. Krishnan, P. S. Venkatachalam & S. N. Sen.

3.4. Effect of ageing on raw hides shipped from abroad vis-a-vis the lowering of tensile strength.

R. Bhaskaran & B. C. Basu.

4. Studies on uncommon hides and skins.

4.1. Collection of camel hides, frog skins, shark skins, horse hide etc.

R. Bhaskaran, P. S. Venkatachalam & A. Ganesan.

4.2. Histological studies of these hides and skins.

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

5. Leather making properties of the hides and skins collected under items 1.1. & 4.1.

P. S. Venkatachalam, Y. Nayudamma, S. K. Barat & I. C. A. R. Fellow.

6. Studies on collagen and other skin proteins.

6.11. Studies on (i) biosynthesis, (ii) metabolism, (iii) structural amino acid sequence in collagen, (iv) amino acid composition, terminal amino acids and structural stability of collagen from different sources.

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

6.12. Study on the morphology and fine structure of collagen and leather fibres, natural and reconstituted for producing leathers of uniform properties.

N. Ramanathan & Y. Nayudamma.

6.13. Shrinkage and swelling of collagen and leather fibres.

V. V. Subbalakshmi, N. Ramanathan & Y. Nayudamma.

6.14. Effect of radiations on collagen fibres and leather.

N. N. Guha, N. Ramanathan & Y. Nayudamma.

6.15. Physical properties of collagen and leather fibres.

V. Mohana Radhakrishnan & N. Ramanathan.

6.2. Structure and properties of skin in relation to the functioning of the part of the body it occupies to get desired properties of leathers meant for particular uses.

Senior Research Fellow, N. Ramanathan & Y. Nayudamma.

6.3. Specificity of certain enzymes capable of hydrolysing collagen and other skin proteins.

S. C. Dhar & S. M. Bose.

II. Vegetable Tannage Unit

Object:

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

(a) Dependence on imports of some major tanstuffs, and better utilisation of the indigenous vegetable tanning materials.

(b) Lack of fundamental knowledge and understanding about the constitutional make up of the important indigenous vegetable tanning materials.

(c) Studying the principles of vegetable tannage of heavy and light leathers.

(d) Modifying the existing processes and developing newer ones with a view to reduce the cost of tanning and improve the quality of the leathers.

(e) Finding newer uses for the tanned leathers.

For the better utilisation of indigenous tanstuffs, a systematic survey, in co-operation with other organisations, of the availability

and steady supply of the tanstuffs, an intensive fundamental study on the abundantly available tanning materials for making self-sufficient tanning agents and their practical use in tanning have been taken up in detail. Research personnel of various schools of thought will undertake this work.

Research Team:

Dr. S. K. Barat (*Leader*)
 Dr. Y. Nayudamma
 Dr. K. Wolf (*UNESCO Expert*)
 Dr. S. N. Sen
 Mr. A. Ganesan
 Dr. S. M. Bose
 Mr. S. K. Mitra.
 Mr. M. A. Ghani
 Dr. N. Ramanathan
 Dr. D. Ramaswamy
 Dr. K. N. S. Sastry
 Dr. E. C. Mathew
 Mr. P. S. Venkatachalam
 Mr. J. B. Rao
 Dr. R. Selvarangan
 Mr. J. C. Deb
 Dr. B. C. Basu
 Dr. W. Madhavakrishna
 Mr. T. S. Krishnan
 Mr. S. N. Bose
 Dr. S. Rajadurai
 Mr. G. Lakshminarayana
 Mr. K. Rajabather Mudaliar
 Mr. K. J. Scaria
 Dr. D. Ghosh
 Mr. M. A. Rama Iyer
 Mr. S. Banerjee.
 Mr. V. S. Krishnamurthy
 Mr. P. S. Santhanam
 Mr. T. Vijayaramayya
 Mr. R. S. Ghosh
 Mr. S. Ananthanarayanan
 Mr. S. Bangaruswamy
 Mr. K. R. V. Thampuran
 Mr. E. C. George
 Mr. K. J. Kedlaya

Mr. K. Udai Bhanu
 Mr. D. H. Kamath
 Mr. K. K. Reddy

Research Projects:

1. Better utilisation of indigenous tanstuffs^a
 - 1.1. Search for newer vegetable tanning materials.
 E. C. Mathew & K. R. V. Thampuran
 - 1.2. Assessment and proper utilisation of the known vegetable tanning materials obtained from different regions to meet the specific local needs.
 A. Ganesan, J. B. Rao & K. J. Kedlaya.
2. Fundamental knowledge on the constituents and constitution of the important indigenous vegetable tanstuffs.
 - 2.1. Isolation, purification and determination of constitution of tannins from the following:
 - (a) Konnam and dhawa.
 K. K. Reddy, K. N. S. Sastry & S. Rajadurai
 - (b) Babul.
 K. Udai Bhanu, K. N. S. Sastry, S. Rajadurai, K. J. Scaria & S. K. Barat.
 - (c) Divi-divi and myrab.
 J. B. Rao, K. N. S. Sastry, S. Rajadurai, P. S. Santhanam, S. Bangaruswamy & S. K. Barat.
 - (d) Sonali and goran.
 K. J. Scaria & S. K. Barat.
 - 2.12. Studies on certain physico-chemical characteristics such as molecular size, molecular weight, degree of hydration, charge etc. of vegetable tannins and their fractions.
 K. J. Scaria & S. K. Barat.
 - 2.13. Application of instrumental tools such as spectro-photometry, polarography, nonaqueous titration technique, tracer technique, microscopy etc. for the study of the various fractions obtained from the various vegetable tanning materials, for determining the constitution.
 D. Ramaswamy, S. Ananthanarayanan, S. K. Mitra & Y. Nayudamma.
- 2.2. Biogenesis and biosynthesis of vegetable tannins.

2.21. Studies on tannins of myrobalans, dhawa, divi-divi and babul.

K. N. S. Sastry, J. B. Rao, S. Rajadurai & Y. Nayudamma.

2.22. Effect of plant hormones on the tannin bearing plants.

K. N. S. Sastry, J. B. Rao & Y. Nayudamma.

2.23. Studies on the enzymes of avaram, babul, konnam, divi-divi, myrab and dhawa.

W. Madhavakrishna & S. M. Bose.

2.24. Synthesis of tannin constituents.

S. Rajadurai.

2.31. Isolation and identification of the species of *Aspergilli* and *Penicillia* growing in vegetable tan liquors.

V. S. Krishnamurthy & S. N. Sen.

2.32. Effect of the presence of traces of some common metallic ions on the growth of *Aspergillus niger* in avaram and babul liquors.

E. C. George & S. N. Sen.

3. Manufacture of vegetable tannin extracts.

3.11. Study of the optimum conditions for extraction, concentration, bleaching and modification for special uses in the industry.

R. Selvarangan, J. B. Rao & Y. Nayudamma.

3.12. Pilot plant production of vegetable tannin extracts.

J. B. Rao, R. Selvarangan & G. Lakshminarayana.

3.2. Alternative uses for vegetable tannin extracts for use in anti-rusting compounds, resin finishes, brick making etc. with special reference to myrobalan and tamarind seed testa.

J. B. Rao, R. Selvarangan & Y. Nayudamma.

3.3. Effect of tanning materials on the physical properties of fishing nets.

B. C. Basu, N. Ramanathan & Y. Nayudamma.

4. Principles of vegetable tannage and mechanism of tanning.

4.1. The reaction of some of the principal Indian vegetable tannins and their fractionated polyphenolic constituents with protein and non-protein substrates.

K. J. Scaria, P. S. Santhanam & S. K. Barat.

4.2. Studies on the chemical and tanning characteristics of some Indian mangroves.

D. Ghosh & S. K. Barat.

4.3. Principles of tannage with special reference to (i) oak bark and (ii) kaphal.

P. S. Santhanam, K. Rajabather Mudaliar & S.K. Barat.

4.4. E. I. tanning.

4.41. Effect of water on E. I. tanning.

D. H. Kamath & R. Selvarangan.

4.42. Bating prior to E. I. tanning.

K. Rajabather Mudaliar, R. Selvarangan & S. M. Bose.

4.43. Vegetable tanned belting leathers.

B. C. Basu.

4.44. E. I. tanned wool sheep skins.

B. C. Basu, N. Ramanathan & R. Selvarangan.

4.5. Study of relationship between birefringence of leather fibres and tanning characteristics of myrobalans.

B. C. Basu & N. Ramanathan.

5. Improvement of the existing processes and development of newer processes.

5.1. Sole leather (bag tanning, pit tanning and drum tanning).

T. Vijayaramaya, K. Rajabather Mudaliar, A. Ganesan, P. S. Venkatachalam & Y. Nayudamma.

5.2. E. I. tanning of hides and skins.

M. A. Rama Iyer & R. Selvarangan.

5.3. Vegetable tanned belting leather.

R. S. Ghosh, S. N. Bose & K. Wolf.

5.4. Semi-chrome glazed kid and shrunken grain leathers from E. I. tanned leathers.

J. C. Deb, T. S. Krishnan & P. S. Venkatachalam.

5.5. Upper leathers from E.I. skins without wet work.

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

5.6. Book binding leathers.

J. C. Deb, P. S. Venkatachalam & M. A. Ghani.

III. Mineral and other Tannages Unit

Object:

To study the complex nature of mineral and other tanning agents, to develop newer tanning agents, to study the mechanism of individual and combination tannages, to improve existing processes and to work out newer processes.

Research Team:

Dr. Y. Nayudamma (Leader)
Dr. K. Wolf (UNESCO Expert)
Mr. A. Ganesan
Dr. S. M. Bose
Dr. D. Ramaswamy
Mr. P. S. Venkatachalam
Dr. R. Selvarangan
Dr. N. Ramanathan
Mr. J. C. Deb
Mr. S. N. Bose
Mr. T. S. Krishnan
Dr. B. C. Basu
Dr. K. T. Joseph
Mr. K. Rajabather Mudaliar
Mr. K. S. Jayaraman
Dr. T. J. Devassy
Mr. S. P. Ghosh
Mr. G. N. Hore
Mr. T. S. K. Mahadevan
Mr. M. A. Rama Iyer
Mr. A. Parthasarathy
Mr. S. Ananthanarayanan
Miss S. C. Sumathi
Mr. J. K. Khanna
Mr. S. R. Srinivasan
Mr. A. Tulsiram.
Trainees

Research Projects:

1. Mineral tannages.
 - 1.1. Study of the uncommon inorganic tanning agents: Salts of (i) beryllium, (ii) cerium, (iii) titanium and (iv) zirconium.
A. Tulsiram, A. Parthasarathy & Y. Nayudamma.

1.2. (i) Chrome tanning agents by newer methods and materials. Preparation of chrome liquors using (a) non-aqueous solvents, (b) tamarind husk and (c) oil, and (ii) use of special chrome liquors with a view to dispense with some of the conventional unit processes involved in chrome tanning.

S. Ananthanarayanan, T. J. Devassy & Y. Nayudamma.

2. Oil tannages.

2.11. Studies with sulphochlorinated oils.

S. R. Srinivasan.

2.12. Studies with vegetable, animal, marine and epoxidised oils.

K. S. Jayaraman.

3. Studies in aldehyde tannages such as dialdehyde starch, glutaraldehyde etc.

K. T. Joseph, S. M. Bose & Y. Nayudamma.

4. Combination tannages.

4.1. Study of the chrome vegetable tannage in single bath.

S. C. Sumathi & Y. Nayudamma.

4.2. Alum vegetable tannage for heat resistant type of leathers.

R. Selvarangan & Y. Nayudamma.

5. Improvement of the existing processes and the development of newer processes.

5.11. Dressing of furs.

Trainee, M. A. Rama Iyer & R. Selvarangan.

5.12. White tannage of skins.

M. A. Rama Iyer & R. Selvarangan.

5.21. Water buckets.

G. N. Hore & A. Ganesan.

5.22. Garment and glove leathers fast to washing.

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

5.23. Leathers for sports goods, viz., cricket ball, hockey ball, foot ball and volley ball, etc.

T. S. K. Mahadevan, T. S. Krishnan, A. Ganesan & Y. Nayudamma.

5.241. Chrome and chrome retan upper leathers.

S. P. Ghosh, S. N. Bose, J. C. Deb, P. S. Venkatachalam & A. Ganesan.

- 5.242. Preventing grain crackiness in full grain retan leathers.
R. Selvarangan.
- 5.25. Buffalo hides for shoe upper and upholstery leathers.
Trainee, P. S. Venkatachalam & Y. Nayudamma.
- 5.26. Hydraulic leathers, viz., oil seals, washers, flexible couplings, packings etc.
T. S. K. Mahadevan, S. N. Bose, K. Wolf & P. S. Venkatachalam.
- 5.27. Cycle saddle leather.
T. S. K. Mahadevan & K. Wolf.
- 5.28. Finishing of leathers in oriental designs and screen printing.
A. Ganesan & P. S. Venkatachalam.
- 5.29. Leather puppets.
K. Rajabather Mudaliar, R. Selvarangan & Y. Nayudamma.
- 5.31. Raw hide and tanned pickers and picker savers—effects of ageing.
S. N. Bose, J. K. Khanna, K. Wolf & N. Ramanathan.
- 5.32. Hide and skins for musical instruments.
M. A. Rama Iyer & R. Selvarangan.
- 5.41. Physical testing of industrial leathers and method of preservation of tensile strength.
B. C. Basu & N. Ramanathan.
- 5.42. Relation of the physical properties of raw hide to those of the finished leathers.
B. C. Basu & N. Ramanathan.

IV. Leather Auxiliaries Unit

Object :

A variety of auxiliary materials goes 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 of each of these consumed by the industry is little—which militates against their manufacture in India economically on a large scale. 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 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:

Mr. M. A. Ghani (*Leader*)
Dr. Y. Nayudamma
Mr. A. Ganesan
Dr. S. M. Bose
Dr. D. Ramaswamy
Mr. P. S. Venkatachalam
Mr. J. B. Rao
Dr. R. Selvarangan
Mr. G. Lakshminarayana
Mr. J. C. Deb
Dr. W. Madhavakrishna
Mr. T. S. Krishnan
Dr. S. Rajadurai
Mr. K. S. Jayaraman
Mr. G. S. Rama Iyer
Mr. D. B. Mukherjee
Mr. K. Rajabather Mudaliar
Dr. T. J. Devassy
Mr. T. K. Parthasarathy
Mr. V. R. Kishore
Mr. S. C. Dhar
Mr. V. V. Subramaniam
Mr. V. V. Muralidhara Rao

Research Projects:

1. Fat liquors.
 - 1.1. Studies on the preparation, application and mechanism of reaction of cationic, anionic and nonionic fat liquors from indigenous vegetable oils, marine oils and mineral oils.
V. R. Kishore, V. V. Muralidhara Rao, M. A. Ghani and G. Lakshminarayana.
 - 1.2. Exploratory studies on suitable substitutes for sperm oils and neatsfoot oil using vegetable oils.
V. R. Kishore, M. A. Ghani and Y. Nayudamma.
 - 1.3. Preparation of neatsfoot oil from waste bones.
V. R. Kishore and M. A. Ghani.
2. Finishes and their evaluation.

2.1. Water based finishes.

V. V. Subramaniam, J. C. Deb and M. A. Ghani.

2.2. Resin and glossy finishes.

T. K. Parthasarathy, M. A. Ghani, A. Ganesan and Y. Nayudamma.

2.3. Studies on the preparation, testing and standardisation of acrylic and other resin emulsions for finishing.

J. B. Rao and M. A. Ghani.

3. Impregnation of polymers into leathers.

3.1. (i) Waterproofing sole leathers.

J. B. Rao, S. Rajadurai and K. Rajabather Mudaliar.

(ii) Waterproofing glove and clothing leathers.

T. J. Devassy, P. S. Venkatachalam and T. S. Krishnan.

4. Synthetic tannins.

4.1. Study and preparation of synthetic tannins.

D. B. Mukherjee and M. A. Ghani.

5. Dyestuffs.

5.1. Affinity of dyes to leathers of different tannages under different conditions and the mechanism of dyeing.

V. V. Subramaniam.

6. Enzymes.

6.1. Biochemical and physico-chemical properties of certain bates and depilatory enzymes.

S. C. Dhar and S. M. Bose.

6.2. Specificity studies on depilatory enzymes.

W. Madhavakrishna and S. M. Bose.

7. Adhesives, shoe polishes and stains.

7.1. Study and preparation of adhesives, stains, shoe polishes, dressings, wetting cement etc.

G. S. Rama Iyer.

8. Pilot plant manufacture.

8.1. Fat liquors.

V. V. Muralidhara Rao, V. R. Kishore and G. Lakshminarayana.

8.2. Synthetic leather oils.

D. Ramaswamy and G. Lakshminarayana.

8.3. Water based finishes.

V. V. Subramaniam, J. C. Deb, M. A. Ghani and G. Lakshminarayana.

8.4. Resin and glossy finishes.

T. K. Parthasarathy, M. A. Ghani, A. Ganesan, Y. Nayudamma and G. Lakshminarayana.

8.5. Synthetic tannins.

D. B. Mukherjee and G. Lakshminarayana.

8.6. Enzyme bates and unhairing agents.

S. C. Dhar, S. M. Bose and G. Lakshminarayana.

8.7. Shoe polishes and adhesives.

G. S. Rama Iyer and G. Lakshminarayana.

8.8. Basic aluminium sulphate.

R. Selvarangan, M. A. Ghani and G. Lakshminarayana.

8.9. Hide powder.

K. S. Jayaraman and G. Lakshminarayana.

9.0. Evaluation of the leather auxiliaries produced on a pilot plant scale at the Institute (This work is to be done by the Technical Services Unit and the staff of the tannery in collaboration with the concerned research associates).

V. Bye-products Unit

Object:

It is generally acknowledged that the profits of a tanner depend mainly upon the better utilisation of the bye-products. The Indian tanner has been treated as an untouchable, because of the obnoxious odour of 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:

Dr. Y. Nayudamma (Leader)

Dr. S. K. Barat

Dr. S. M. Bose

Mr. G. Lakshminarayana

Mr. K. Radhakrishnan

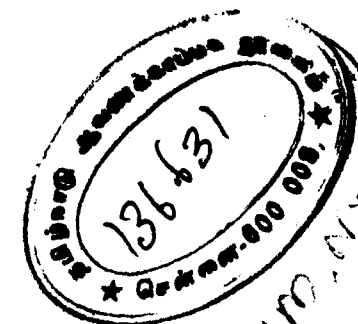
Mr. M. Natarajan

Mr. D. R. Krishnan

Mr. G. J. Thabaraj

Research Fellow

Senior Laboratory Assistant



Handwritten notes and dates: 'JL', '21.10.54', and 'N6/7-9'.

Research Projects:

1. Leather Boards.

1.1. Preparation of leather boards for different uses from (i) chrome leather shavings, (ii) vegetable tanned leather trimmings, (iii) in admixture with rags, jute and (iv) with vulcanisation.

K. Radhakrishnan and Y. Nayudamma.

1.2. Manufacture of leather boards on a pilot plant scale.

K. Radhakrishnan and G. Lakshminarayana.

1.3. Possibilities for using leather boards as stiffeners in moulded footwear.

K. Radhakrishnan.

2. Hair and wool.

2.11. Pilot plant work for salvaging, acid washing, bleaching and disinfection of tannery wool, goat hair, factory waste wool.

Senior Laboratory Assistant and S. K. Barat.

2.12. Study of the physical properties of the tannery wool and hair: effects of cross linking treatment.

S. K. Barat.

2.13. Softening of pig hair, camel hair for bristles.

S. K. Barat.

3. Manufacture of gallic and tannic acids from myrobalan wastes of extract factories.

Senior Laboratory Assistant and S. K. Barat.

4. Study on the preparation of glue and gelatin from indigenous raw materials.

D. R. Krishnan and S. K. Barat.

5. Tannery effluents and wastes.

5.1. Utilisation of amino acids prepared from proteinous wastes of tannery.

M. Natarajan and S. M. Bose.

5.2. Studies on the biological decomposition and oxidation of tannery effluents with particular reference to the utilisation of treated effluents.

G. J. Thabaraj and S. M. Bose.

VI. Engineering Unit

Object:

This unit is intended to undertake planning, construction and maintenance of buildings, roads, etc. and also to assist the research teams in designing, preparing, setting up and servicing analytical tools and tanning machinery.

Research Team:

Dr. N. Ramanathan (Leader)

Dr. Y. Nayudamma

Mr. A. Ganesan

Dr. D. Ramaswamy

Mr. M. Thiruvengadam

Mr. V. Madhavan

Mr. K. Seshaganapathy Rao

Mr. A. Parthasarathy

Senior Laboratory Assistant.

Projects:

1. Planning, construction and maintenance of buildings, roads and providing necessary auxiliary services like water, light, power etc.

V. Madhavan and M. Thiruvengadam.

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

N. Ramanathan, M. Thiruvengadam and P. S. Venkatachalam.

3. Design, development and construction of newer tools and instruments for research.

A. Parthasarathy, D. Ramaswamy, N. Ramanathan and Y. Nayudamma.

4. Newer tools and machinery for leather industry.

M. Thiruvengadam, A. Ganesan and K. Seshaganapathy Rao.

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 on the lap of science. This work will be undertaken by the following different units.

VII. (1) Survey and Information Unit

Object:

1. 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.
2. To disseminate the results of researches by (a) attending to technical enquiries, (b) holding symposia, 'Open Houses' etc. and (c) by maintaining a Museum and participating in public exhibitions.
3. To co-operate with the other organisations like Small Industries Service Institutes, tanning institutes of the various states, Leather Export Promotion Council etc., in promoting the interests of the leather industry.

Team:

Mr. N. Subramanian (Leader)
 Dr. Y. Nayudamma
 Dr. S. K. Barat
 Mr. A. Ganesan
 Mr. M. A. Ghani
 Mr. K. Seshaganapathy Rao
 Junior Scientific Assistant
 Mr. V. A. Lakshmanan
 Mr. K. Rangaramanujam
 Mr. S. Krishnamurthy
 Museum Assistant

Projects:

1. Compilation of information and statistical data relating to leather trade and industry.
 K. Seshaganapathy Rao and Junior Scientific Assistant.
2. Reports.
 2.1. Research Programme.
 N. Subramanian and S. K. Barat.
- 2.2. Half-yearly and Annual reports.
 M. A. Ghani.
- 2.3. Monthly summary to the cabinet.

N. Subramanian.

2.4. Parliamentary questions.

N. Subramanian.

2.5. Compilation of statement of technical aid rendered to industry.

Junior Scientific Assistant and N. Subramanian.

3. Symposia, seminars, open houses etc.

N. Subramanian *et al.*

4. Technical enquiries received from the trade and industry.

Junior Scientific Assistant, K. Seshaganapathy Rao and N. Subramanian.

5. Visitors.

Museum Assistant, Junior Scientific Assistant.

6. Press release and handouts.

N. Subramanian.

7. Museum and exhibitions.

(i) Maintenance and upkeep of the museum. (ii) Setting up and organising exhibitions at the Central Leather Research Institute and outside. (iii) Setting up of a permanent museum at the Institute. (iv) Preparation of charts, placards etc. for exhibition purposes.

Museum Assistant, K. Seshaganapathy Rao, V. A. Lakshmanan and Junior Scientific Assistant.

8. Mobile Exhibition.

8.1. Organising mobile exhibition on "Leather in Life" for being displayed in the various places all over India (to be organised by Committee consisting of the officials of the Institute, leather manufacturers and leather goods manufacturers).

8.2. International Leather Fair (to be organised in collaboration with other organisations pertaining to leather trade and industry).

9. Tanners get-together meetings.

To organise a meeting of the tanners at centrally located places to ascertain their problems and advise suitably. Centres: North Arcot District, Trichy (to cover Erode and Trichy), Coimbatore (Coimbatore and Salem), Bombay, Kanpur, Calcutta, Madras etc.

Y. Nayudamma, S. K. Barat, A. Ganesan and N. Subramanian.

10. Publicity: Lectures and popular talks on the leather industry, uses of leather etc. to schools, colleges, clubs, radio talks etc.

11. Photo-cine.

11.1. Taking photographs, cine films etc. of the functions held at the Institute and also recording experiments and results of researches and products, extension service work etc.

S. Krishnamurthy and K. Rangaramanujam.

11.2. Projection of cine films on leather in schools, colleges, clubs and other organisations.

K. Rangaramanujam and S. Krishnamurthy.

VII. (2) Extension Services Unit

Object:

Extension services unit will visit the tanners all over India from time to time, to study the conditions, collect information and samples to bring problems of the industry to the Institute. This unit will also arrange for practical demonstrations of the various processes worked out through research, at the Central Leather Research Institute and at other regional tanning institutes and tanning centres. The country is for convenience now divided into four regions, viz., East, West, North and South and each region is to be looked after by a Senior Scientific Officer who is well conversant with the regional languages and regional tanning processes.

At the request of the Tanners Federation of India, it has been decided to set up permanent regional centres at Calcutta, Bombay and Kanpur to be in constant touch with the important active tanning centres.

Team:

Mr. A. Ganesan (Leader)
Dr. Y. Nayudamma
Dr. S. K. Barat
Mr. P. S. Venkatachalam
Mr. N. Subramanian
Dr. R. Selvarangan
Senior Scientific Officers
Mr. S. C. Nandy
Mr. T. S. Krishnan
Mr. W. N. Pandav

Mr. G. N. Hore
Mr. I. M. S. Patel
Mr. S. P. Ghosh
Mr. T. Vijayaramayya
Mr. T. S. K. Mahadevan
Mr. S. M. De
Mr. J. K. Khanna
Mr. L. M. Prasad

Projects:

1. Survey.

The following areas will be surveyed:

(i) Bikaner and Jun Jun in Rajasthan, (ii) Himachal Pradesh, (iii) Jammu and Kashmir, (iv) Eastern U.P. in Uttar Pradesh, (v) Benares Kantha and Sambar Kantha regions of Gujarat, (vi) Eastern region of Madhya Pradesh, (vii) Marathwada, Vidarbha and Khandesh in Maharashtra and (viii) Mysore State (North and Central).

Y. Nayudamma, S. K. Barat, A. Ganesan and N. Subramanian.

2. Practical demonstrations at the Central Leather Research Institute.

April 1961	.. Belting leather.
May 1961	.. Chrome and mordanted crust from goat skins.
July 1961	.. Book-binding skivers and chamois from goat skin split.
Sept. 1961	.. Semichrome glove leather.
Dec. 1961	.. Cycle saddle leather. Chrome retan leathers for washers.

P. S. Venkatachalam and concerned research workers.

3. Practical demonstrations at outside centres.

3.1. PUNJAB

(i) Rajpura (Kasturba Seva Mandir): March, 1961.

Bag tanning and glossy finishes.

G. N. Hore and S. P. Ghosh.

(ii) Jullundur (Govt. Tanning Institute): Sept-Oct. 1961.
Football leather.

T. S. K. Mahadevan and W. N. Pandav.

3.2. JAMMU AND KASHMIR

(i) Shaltung (Govt. Tannery, Srinagar): July-Sept. 1961.

- (a) Chrome retan.
A. Ganesan.
- (b) Sole leather.
T. Vijayaramayya.
- (c) Fur dressing.
A. Ganesan.
- (d) Glossy finishes.
S. M. De.
- (e) Book binding and fancy leathers.
S. M. De.

3.3. RAJASTHAN

(i) Babaicha (Tanners Colony): April, 1961.

- Bag tanning.
G. N. Hore.

(ii) Bassi: Aug.-Sept. 1961.

- Bag tanning.
G. N. Hore and L. M. Prasad.

(iii) Jobner (Tanners Colony): Sept. 1961.

- Bag tanning.
G. N. Hore and L. M. Prasad.

(iv) Gillond: Aug. 1961.

- Bag tanning.
S. P. Ghosh and W. N. Pandav.

(v) Sajat Road: Sept. 1961.

- Bag tanning.
S. P. Ghosh and W. N. Pandav.

(vi) Pipar city: Dec. 1961 Jan. 1962.

- Skins tanning.
I. M. S. Patel and T. S. Krishnan.

3.4. MADHYA PRADESH

(i) Neemuch (Govt. Tanning Centre): Oct. 1961.

- Bag tanning and glossy finishes.
W. N. Pandav and I. M. S. Patel.

(ii) Bhopal: Oct. 1961.

- Bag tanning and glossy finishes.
G. N. Hore and L. M. Prasad.

(iii) Narsingadh: Nov. 1961.

- Bag tanning and glossy finishes.
W. N. Pandav and I. M. S. Patel.

(iv) Malhargadh: Feb.-March, 1962.

- Bag tanning and glossy finishes.
S. P. Ghosh and L. M. Prasad.

3.5. ORISSA

(i) Barpali (Govt. Tanning Centre): April, 1961.

- Bag tanning, charas leather and glossy finishes.
S. P. Ghosh.

3.6. WEST BENGAL

(i) Calcutta (S.I.S.I. Centre): Dec. '61—Jan. '62 and April 1962.

- (a) Cycle saddle leather.
T. S. K. Mahadevan.
- (b) Garment leather.
T. S. Krishnan.

3.7. MYSORE

(i) Bangalore (Tanners' locality): Feb.-March, 1962.

- E.I. kips process.
R. Selvarangan and I. M. S. Patel.

3.8. GUJERAT

(i) Rajkot (Central Model Tannery): March-May, 1961 and Sept.-Oct. 1961.

- (a) Sole leather
T. Vijayaramayya.
- (b) Upper leather.
S. M. De.

3.9. MADRAS

(i) Coimbatore (Tanners' locality): Aug.-Sept. 1961.

- Skins tanning.
R. Selvarangan.

(ii) Ambur (Tanners' locality): Feb.-March, 1962.

- Skins tanning.
R. Selvarangan.

4. Improved methods of curing: Conducting a practical demonstration of the new curing methods developed at the Institute at different centres.

S. C. Nandy.

VII. (3) Training Unit

Object :

During the last few years, the industry has been awakened to the need of trained leather technologists. The Central Leather Research Institute has the unique privilege of working in close collaboration with the University of Madras; the Department of Leather Technology of the University is run by the Institute. Facilities are offered at this Institute for training students at the different levels, mentioned below :

- (i) B.Sc. (Tech.) in Leather Technology of the University of Madras.
- (ii) Post-Graduate courses by research for Ph.D. degree of the various universities in India.
- (iii) Practical training programme for the tanners with no basic educational or other qualifications.
- (iv) To give advanced training in the newer methods to the staff of the various tanning institutes in India.
- (v) Training of students from abroad both in the laboratory and tannery.
- (vi) Training of apprentices, Government Scholarship holders.

Team :

Dr. Y. Nayudamma (*Hony. Professor*)
Dr. E. C. Mathew (*Hony. Reader*)
Dr. S. N. Sen
Dr. S. M. Bose
Mr. M. A. Ghani
Dr. D. Ramaswamy
Mr. S. K. Mitra
Dr. N. Ramanathan
Dr. R. Selvarangan
Mr. M. Thiruvengadam
Mr. P. S. Venkatachalam
Mr. T. S. Krishnan
Mr. K. S. Seshaganapathy Rao
Mr. R. S. Ghosh
Mr. K. R. V. Thampuran

VII. (4) Technical Services Unit

Functions :

This unit is intended to carry out analysis of the materials used in, and the products of leather manufacture for the Institute, tanning trade and industry.

(i) Analysis of samples of water etc. for the industry and to assist the Information and Extension Service Units in regard to such analysis.

(ii) Routine analysis of raw and treatment materials, stores and pilot plant products.

(iii) Analysing samples on behalf of various organisations like the Indian Standards Institution, Leather Export Promotion Council etc.

(iv) Undertaking job works in the tannery for small scale tanners.

(v) To analyse samples of leather auxiliaries as obtained in the market in India and abroad so as to advise the tanner and technologist suitably.

(vi) To test pilot plant products.

(vii) To develop newer analytical methods.

(viii) To carry out studies with a view to furnishing the processes of leather manufacture and leather auxiliaries.

(ix) Preparation of standard solutions for all laboratories of the Institute.

Team :

Dr. R. Selvarangan (*Leader*)
Mr. S. K. Mitra
Mr. M. A. Ghani
Dr. N. Ramanathan
Mr. J. B. Rao
Dr. R. Bhaskaran
Mr. T. K. Parthasarathy
Mr. V. V. Subramaniam
Mr. K. J. Kedlaya
Mrs. M. R. Mythili
Mr. S. Bangaruswamy
Mr. D. H. Kamath

Projects :

1. Analysis of leather, leather auxiliaries and water, analysis of trade products, testing of stores purchases, analytical work connected with Indian Standards Institution, development of newer analytical techniques, analysis and standardisation of pilot plant products and similar products from the industry.

S. Bangaruswamy & M. R. Mythili

2. (a) Determination of a suitable analytical procedure for the estimation of basicity in aluminium liquors and (b) quick method of estimation of acids and salts ratio in liquors to quicken up the working of the tan liquors.

S. Bangaruswamy & R. Selvarangan.

3. Correlation of chemical, physical, microscopical properties of leather and drawing up specifications for the Indian Standards Institution.

(a) Physical and microscopical data.

N. Ramanathan.

(b) Chemical data.

S. Bangaruswamy, R. Selvarangan & J. B. Rao.

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

N. Ramanathan, T. K. Parthasarathy, V. V. Subramaniam & M. A. Ghani.

5. Determination of correct sampling position for Indian hides.

R. Bhaskaran & S. K. Mitra.

6. Identification of defects in tanned hides and skins, location of their source.

D. H. Kamath & R. Selvarangan.

VII. (5) Publications Unit

Object:

(i) Publication of the Monthly Bulletin, other technical bulletins, leaflets, brochures etc. of the Institute.

(ii) Maintenance of the library.

(iii) Providing assistance to the research associates by way of abstracting and translation services in order to keep the research units posted with the current trends in science and technology.

Team:

Dr. V. S. Padmanabhan (Leader)

Dr. Y. Nayudamma

Miss V. Swarnakamakshi

Mr. K. C. Shivappa

Mr. K. A. Ramaswamy

Functions:

1. Editing research papers and other matter for the Bulletin and publishing the Process Bulletins and such other publications.

V. S. Padmanabhan & Y. Nayudamma.

2. Printing of Tamil and Hindi Bulletins and process Bulletins.

K. A. Ramaswamy & K. C. Shivappa

3. Library.

V. Swarnakamakshi & V. S. Padmanabhan.

4. Abstracting service.

V. S. Padmanabhan & Research staff of the Institute.

5. Translation service.

V. S. Padmanabhan, K. A. Ramaswamy & K. C. Shivappa.

6. Weekly seminar.

V. S. Padmanabhan.

(A seminar is conducted every Friday when one of the research associates or an outside speaker presents a paper for discussion.)

VII. (6) Leather Economics Unit

Object:

This unit is intended to study the economic aspects of the leather industry in the whole of India, by undertaking the study of leather economics, covering the survey of the existing industry and its practices, methods of production, marketing, transport, statistical quality control etc. The surveys of the leather industry already carried out by the various organisations, State and Central Governments will be taken into consideration to avoid overlapping or duplication of the work.

Team:

Mr. P. N. Chowdhury (Leader)

Junior Scientific Assistant

Projects:

1. This unit will undertake the work with advantage with (i) the primary data available by direct survey of the field staff,

(ii) with the secondary data obtained from the various organisations connected with the leather industry.

The data thus obtained may be fully analysed and interpreted. Where there is a conflict of information or where the sets of data from two different sources do not check properly, the field staff may make a special study of the problem to assess the problem fully. In this direction, the work undertaken by the Small Industries Service Institutes, Leather Export Promotion Council, Development Wing, marketing Department and other organisations would give enough data to be processed by this unit.

2. Survey of the existing uses of leather in the engineering, automobile and electrical industries.

3. Compilation of the necessary statistical data about the leather industry and weekly market reports.

4. Position of the leather substitute vis-a-vis leather.

VII. (7) Productivity and Scientific Management Unit

Object :

The Indian leather industry has for ages remained essentially a decentralised cottage industry. There has been an awakening amongst the Indian tanners to modernise their tanneries and avail themselves of the results of the researches. Increasing productivity and application of scientific management in the tanning industry will go a long way to improve the industry and also the people engaged in it. Training in various branches of productivity as applied to leather industry is now to be taken up.

The Institute is in liaison with the National Productivity Council and the Madras Productivity Council and two members of the staff of the Institute have been trained in some of the short term courses conducted by the Madras Productivity Council. Attempts are being made to obtain the services of an expert and also get the personnel of the Institute trained abroad in Productivity and Scientific Management under the Foreign Exchange Aid Programmes.

VII. (8) Leather goods Manufacturing Unit

Object :

Leather goods valued at about Rs. 10 lakhs are being exported annually and the demand for leather goods in the overseas markets is on the increase. The sale of leather goods depends mainly on the design, workmanship and finish. Formulation of finishes

required for leather and leather goods, and impregnation of anti-moulding and waterproofing compounds on leather forms an integral part of the research programme of the Institute. This unit aims at developing modern techniques in design and industrial art which are natural adjuncts to the final finish and workmanship. It is proposed to undertake research on design and finish of leather goods as well as to develop suitable types for their manufacture obtaining the services of a noted artist and designer as a consultant to this unit.

Team:

Dr. Y. Nayudamma (*Leader*)
Industrial Consultant
Mr. O. S. Davood
Designer-cum-Artist
Skilled Artist
Skilled Workman

Bulletin of the Central Leather Research Institute

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