



Removing phospholipids from hides: Looking back on a “New Perspective on Wet Processing”

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The paper "New perspective on wet processing" was published in World Leather October/November 1993, in which the advantages offered by the removal of phospholipids were discussed. It is a curious fact that the advantages offered by a new development are sometimes so restricted by established practices that the technology becomes marginalised. In the situation described, the gains in surface area became problematic in machine operation, the removal of unwanted hide components created increased effluent charges, and improved wet blue properties increased chemical costs. At that time the advantages were judged against the disadvantages and found to be lacking. Given that the value of raw hides and leather selling prices - strongly influenced by area and quality - are so important to the tanner, perhaps it is time to re-evaluate this technology.

Towards the end of the twentieth century, Roehm Ltd. in the UK embarked on a huge project to eliminate draw from cattle hides during the liming process. It began back in 1992 with an observation that draw in the liming process became more evident at two distinct times during the year—April and September. It was also observed that the free grease in the processing vessels also increased when the draw was at its worst.

The grease was analysed and found to be sebum, the product of the sebaceous glands. Literature studies determined that the sebaceous glands become over active when the hides are subject to excessive growth, during pregnancy and maturity. It was not realised straight away, but the reason for seasonal variations in the processing of wet salted cattle hides had been found.

The structure of sebum

Sebum is a complex mixture of phospholipids and triglycerides, with the former having a melting point in excess of 120°C. With the objective of removing this grease from hides, more than 2,000 laboratory trials were performed to find a product that would break down the phospholipid matrix.

There were slight successes with nonyl phenol surfactants, but the breakthrough came when an enzyme was found that removed the phosphate group away from the phospholipid. This was the result of screening several enzyme types. From all the products tried, the choice was limited to just one product.

Armed with this information, the company set about applying this product to remove the sebum from cattle hides during the liming process, and to assess the condition of the resulting wet blue. This was the major breakthrough that tanners worldwide had been looking for.

The first observations were as follows:

- Hair removal was more efficient.
- Draw in the complete hide was eliminated.
- Growth in the neck was less pronounced.
- Lime penetration was much faster.

Subsequently, wet blue were made and the following observations were noted:

- More deliming salts were required to completely delime the hides.
- Pickling times were reduced by up to 50%.
- Full penetration of the chrome tanning salts, even of full substance hides, was achieved within 30 minutes.
- The wet blue was very even in colour and very bright.
- There was no yellow/brown fat staining on the wet blue.

Different wet blue behaviour

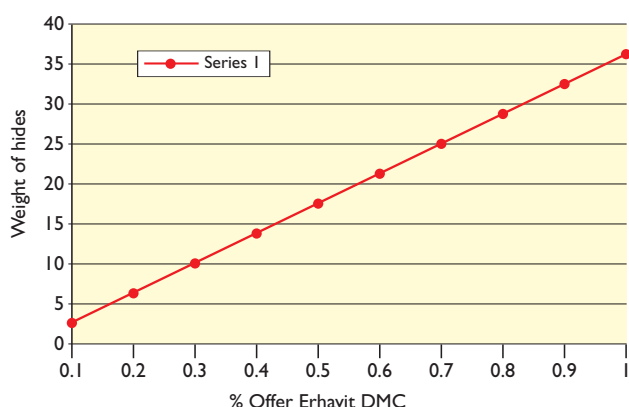
The wet blue looked so good that they were monitored very closely through the rest of the wet processing. The most striking aspect of the new properties of the wet blue was the speed of chemical penetration through the grain side. It was much faster than through the flesh side, as found with normal wet blue. Gone were the days of that faint “pencil line” of no-dye just under the grain.

Literature stated that penetration through the grain side was slower because the fibre structure was denser. But penetration was slower through the grain side because of the naturally occurring, highly waterproof sebaceous layer just underneath the grain. Remove this and you manufacture a wet blue that is not ➤



REMOVING PHOSPHOLIPIDS FROM HIDES

Enzyme use within formulations



The enzyme offer is given as "x%". This is because the offer changes with regard to the average weight range of the hides in the drum. The chart covers this aspect very well. From experience, use less and draw begins to creep in, use too much and you simply waste money.

only draw free, but more importantly, much more consistent than "standard" wet blue. The text books had been rewritten! More firsts are generated through sorting because:

- downgrading because of draw does not happen.
- Chrome distribution is even through the cross section so rechroming after splitting is not required.
- Direct black nubuck leather can be made. (*No need to redye after buffing*).
- No rejects due to uneven dyeing.
- Natural defects on the hide dye the same colour as the rest of the hide.

Success, but requiring change

Sebum, the product of the sebaceous glands, is present in all living animals. During the life of the animal, this product acts in two ways:

- It stops the invasion of external bacteria through the skin.
- It renders the skin waterproof.

Removing the sebum layer makes penetration faster though the grain, because there is no longer any resistance to chemical penetration. Consequently, this translates into leather processing as follows:

- All chemicals penetrate faster though the grain, so liming is more efficient. The more lime in the hides, the more deliming salts are required.
- Penetration times of everything are reduced by up to 50%.
- Because liming is so even, the finished leathers are much softer. A standard fat liquor addition will result in the leathers being much softer. Experience has shown that the total fat liquor additions can be reduced by 20% to achieve the same degree of softness.
- The retannage penetrates deeper, effectively reducing the concentration of retans in the grain layer. To achieve the same break, experience has shown that the total retannage offer should be increased by about 10%.

Dye penetration is faster though the grain, making dyed-through leathers very easy. However, the concentration of dye on the surface, like the retannage, is reduced. This lowers the colour yield of the dyestuffs. Experience has shown that the total offer of dyes should be increased by 10%

Problems and opportunities

There are other problems associated with this system that have also become apparent after several years of its commercial application. Removal of the sebum—which equates to about 3.0% of the hide weight—means that it ends up in the effluent. This has to be treated, and this adds to the total running costs of the tannery.

By achieving thorough liming and opening up the fibre structure just under the grain, the leathers no longer show an increase in substance down the backbone. The whole structure is more even. This translates into larger hides.

Outline processes:

Liming of Domestic wet salted hides

Hair Burn process

Dirt Soak:	As standard		
	Drain		
Main soak:	As standard		
	Drain		
Hair removal:	80%	Water 28°C	
	1.0%	Liming auxiliary	30 mins
	1.25%	Sodium Hydrosulfide	30 mins
	1.0%	Lime	
	x%	ERHAVIT DMC	150 mins
		Drain	
		Wash	
White lime:	120%	Water	26 mins
	+0.5	Sodium Sulfide	
	2.5%	Lime Run	30 mins
		Automatic 5/55	- 10 hours

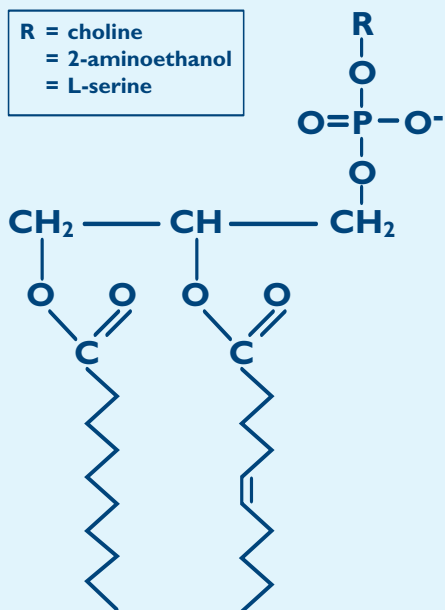
Hair Save process

Dirt Soak:	As standard		
	Drain		
Main soak:	As standard		
	Drain		
Hair removal:	80%	Water 28°C	
	1.0%	Liming auxiliary	30 mins
	1.0 %	Lime	30 mins
	1.25%	Sodium Hydrosulfide	30 mins
	x%	ERHAVIT DMC	150 mins
		Drain	
		Wash	
White lime:	120%	Water	26 mins
	+0.5	Sodium Sulfide	
	2.5%	Lime Run	30 mins
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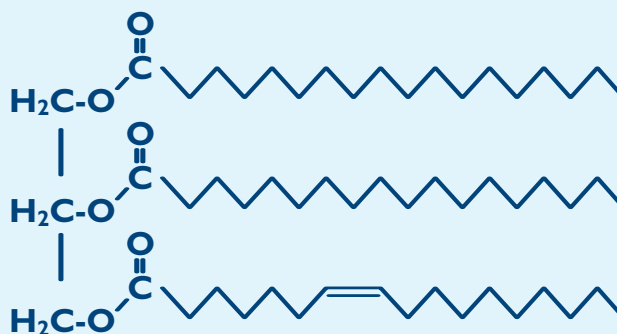


Outline formulae for Phospholipids

R = choline
= 2-aminoethanol
= L-serine



Outline formulae for Triglycerides



- Lime splitting requires the machines to be set differently; there is no extra substance down the backbone and the bellies better retain their substance.
- In some tanneries, standard machinery has been unable to cope with the extra size achieved in the hides. Sometimes shaving machines, finishing machines, embossing machines etc. are just too small to cater for the increased yield.

Salted hides are the tanner's raw material, accounting for at least half of the annual turnover. By utilising the raw material to its fullest extent, the tannery can increase its finished leather sales by at least 10% without having to increase production levels.

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