

# Water use optimization in the liming process of the tanning industry, allowing better quality and lower environmental impacting

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The reuse of treated waters from the liming process does not negatively affect the quality of export type hides and skins.

## Material and Methods

With the aim of establishing the relationship between the quality variables of the dehairing process and the effect of recycling, the experience of expert tanners in the Villapinzon zone is verified and quantified in order to determine the most relevant quality control parameters in the dehairing process to obtain export type leather. Salted animal skins are worked with, keeping in mind the following considerations:

- The dehairing processes to be compared are:
  - Mixed dehairing (A mix between chemical dehairing with sulfide and the enzymatic agent)
  - Chemical dehairing without sulfide

2. Two different animal skins divided in four parts are dehaired, as indicated in Figure 1, with the aim of reducing interferences and to be able to compare the effect of the dehairing processes to be evaluated. The skins have different properties depending on the race, origin (for example, from the savannah or from the coast), sex, color, age and breeding conditions, which allow distinct manners of absorption of the chemicals utilized in the dehairing process. ITALCUR. 2010.

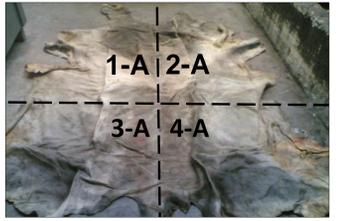


Figure 1. Division of a raw hide  
Source: ITALCUR. 2010

3. Before carrying out the dehairing, the salted skins should be washed very well in order to remove the salt and blood, earth and dung residues, and should be passed through a soaking process the objective of which is to return lost moisture to the skin, through the addition of chemical products like tensoactive agents.

Following the soaking process, the skins are well washed and drained, until the Baume<sup>1</sup> Degrees (°Bé) are found to be between 1.0 and 2.0 to be able to start the dehairing process.

<sup>1</sup> One Baumé degree (Bé) is equivalent to the density of a sodium chlorate solution at 1%.

## Results

### Determination of quality control parameters

- The amount of hair or hair root in the skin.
- Division of the epidermis.
- Size of the skin.
- Number of closed wrinkles on the skin.
- Uniformity in the internal color of the skin.

### Quantifying the quality control parameters

Quality parameter	Excellent	Good	Regular	Irregular	Very irregular	Quantification
Number of hair or hair root	0%	1% - 3%	4% - 6%	7% - 9%	>10%	% hair in the skin
Division of the epidermis	100%	99% - 90%	89% - 80%	79% - 70%	<69%	% skin removal
Size of the skin (SALT)	150%	149% - 130%	129% - 110%	109% - 90%	<89%	% increased caliber
Number of closed wrinkles	0	1	2	3	>4	# wrinkles in the skin
Uniformity in the internal color	100%	99% - 90%	89% - 80%	79% - 70%	<69%	% homogeneity in the skin

## Effect of liming on the parameters of quality control

Leather quality parameter	Type of skin	
	Mixed	No Sulfide
Number of hair or hair root	Excellent 0	Excellent 0
Division of the epidermis	Good 97%	Good 97%
Size of the skin	Good 146%	Good 147%
Number of closed wrinkles	Excellent 0	Excellent 0
Uniformity in the internal color	Good 99%	Excellent 100%

## Proposed treatment system to recycle water

For discharges generated by the process of liming without sulfide by recommendations of the chemical house<sup>2</sup> providing reagents and formulations, it is not necessary to perform any different treatment to remove the hair one hour before the end of the application of the dosage of reagents at the liming stage.

For discharges generated by the process of mixed liming, a system treatment with hair removal by a sieving operation, oxidation of sulfides and coagulation and sedimentation is suggested with the purpose of removing pollutants in the water due to the addition of chemical reagents and the disposal of useless skin elements such as hair, meat and fat.

<sup>2</sup> PROCUR S.A

## Effect of water recycling in the quality control parameters

Type of skin	Number of hair	Division of the epidermis	Size of the skin	Number of wrinkles closed	Uniformity in the internal color
No Sulfide	Excellent 0%	Excellent 100%	Excellent 150%	Excellent 0	Excellent 100%
No Sulfide R1	Good 3%	Good 97%	Good 146%	Excellent 0	Good 97%
No Sulfide R2	Very Irregular >10%	Very Irregular <69%	Good 147%	Very Irregular >4	Very Irregular <69%
No Sulfide R3	Very Irregular >10%	Very Irregular <69%	Good 149%	Very Irregular >4	Very Irregular <69%
Mixed	Good 2%	Good 98%	Good 149%	Excellent 0	Good 98%
Mixed R1	Good 2%	Good 99%	Good 149%	Excellent 0	Good 98%
Mixed R2	Good 1%	Excellent 100%	Good 149%	Excellent 0	Good 99%
Mixed R3	Excellent 0%	Excellent 100%	Good 150%	Excellent 0	Excellent 100%

R<sub>i</sub> indicates the number of recycling that leads, for example R1 is one

## Quality leather obtained with recycled water

Analyzing the quality control parameters established it becomes evident that dehairing without sulfide allows maximum one recycling as at the second recycling the quality of the dehaired animal hide is damaged. It is essential to perform a more in-depth study in order to maximize the number of recyclings as at an industrial level drum a greater friction effect is produced, helping to remove the hair of the skins. On the other hand, mixed dehairing does not show deterioration of the quality of the animal hide dehaired throughout the recyclings, and on the contrary presents a tendency towards an improvement. In this study only three recyclings were performed, but according to the results obtained in the mixed dehairing, a greater number of possible recyclings can be performed with this dehairing process.

## Cost – Benefit

Implementing water reuse does not generate higher operating costs than today's and implementing these cleaner production techniques improves the image of the tannery industry to customers, suppliers and community in general.

## Management of waste generated in the process of liming

The waste produced can be handled through composting. It is nevertheless important to stress the need for analysis of the compost produced in order to certify their quality, properties, composition and permitted use.

## Tips

- In the limed hides the epidermis is shown as a black spot, indicating that the division of the epidermis was not complete.
- In order to measure the thickness of the skin, the same area should always be measured before and after, because some areas swell more than others.
- There should always be a very high percentage of swelling in order not to risk damaging the flower by closing the pores.

## Discussion

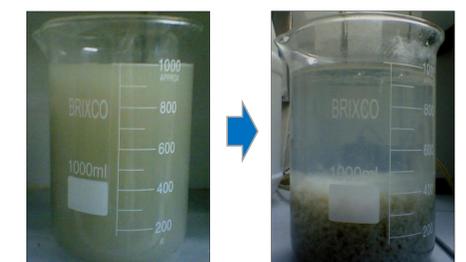
It is important to underline that the results obtained in the dehairing process depend 100% on the previous stages such as washing and soaking. For this reason, it becomes essential to establish and quantify the quality parameters that assure the adequate operation of these stages.

## Future Work

- The number of recyclings can be increased. It is important to continue conducting tests to confirm the proposed trend lines.
- The results obtained in the recycling of mixed liming baths show that the remanence of the chemicals in the water does not affect the quality of the skin, so it's worth doing a study on the feasibility of reusing the liming baths with just a sieving treatment.

## References

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## Jar Test

Clarification physicochemical water

## Objective of the research

To optimize water use at the dehairing stage in a tanning process allowing the best quality of the finished leather and the least environmental impact.

## Scope

Since there are many variables such as race, origin, sex, color, age and rearing conditions that affect the final quality of the limed hides, this report is limited to the study of the leather quality obtained by the use of mixed liming processes (mixture of chemical and enzymatic liming) and no sulfide liming in salted skins of bovine origin.

**Keywords:** Tanning industry – Liming – Recycling– Remanence – Water uses