NEW WET WHITE/CHROME FREE PROCESS OFFERING SIGNIFICANT ENVIRONMENTAL AND PHYSICAL PROPERTY ADVANTAGES FROM BEAMHOUSE TO CRUST

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Abstract. A combination of processing techniques and speciality chemicals has been developed to target environmental issues and legislation in the European leather industry, especially for automotive upholstery leather. This process combines new techniques in the beamhouse process through to the tanning process. Initial work on several different individual concepts showed some excellent improvements, but when these concepts have been brought together to form a single strategic process the advantages and improvements have exceeded expectations. The process demonstrates a reduction in the use of salt, formic acid and sulphuric acid. After more than two years of trials from small scale to full production in an automotive leather production environment, we are able to present independently test results showing the benefits of following this system.

1 Introduction

ATC Tannery Chemicals have been promoting a pickle free chrome tanning process for a number of years, with excellent results in removing sulphuric acid, formic acid, salt and magnesium oxide from the tanning process, at the same time total chrome used is reduced by up to 1/3 and the resultant effect of chrome in the effluent after the tanning process is greatly reduced. Now, a recent study has shown that the use of the same technology can also apply to wet-white production as well as wet-blue. Resulting in the elimination of sulphuric acid from this tanning process as well. As the automotive leather industry is very aware the popularity of wet-white tanning has increase massively over the years and in some automotive plants, chrome leather production has been stopped, or at least significantly reduced in favour of wet-white.

2 The Paper in full

Mankind has known for years the harmful effect that many chemicals can have on the environment, we hear about these issues daily. All tanners and especially those that specialise in the automotive industry are well aware that many of the products they have to use on a daily basis are often classed as hazardous and polluting. Add to this the worldwide growth in employee welfare and the ever-increasing amount of legislation required to maintain a legal manufacturing presence and the pressure on a leather manufacturing facility to provide a viable, quality product and maintain the safety and health of their workforce becomes almost impossible.

Obviously, this pressure to consider the people and environment of our planet is a good thing, any improvement in general health and safety and better manufacturing processes can only be

applauded. However, the question of "how" to do this is being repeated in almost every responsible leather manufacturing facility around the world. The Automotive sector is under even greater scrutiny as compliance with ISO14001 is seen as a must.

For this article ATC wanted to consider just one chemical and inform the reader of a cost effective, safe, easy method to take one of the most dangerous chemicals from the warehouses of tanneries for ever. Sulphuric Acid has been widely used within leather tanning for many hundreds of years. It is considered an essential product to manipulate the acidity of processes such as the tanning process. It is almost universally used for vegetable tanning, aldehyde tanning, chrome and other metal tanning processes.

As a young leather technician fresh from school I can still remember what happens to my own skin when sulphuric acid comes into contact with it. I still have the scars. The fumes from the sulphuric acid storage tanks are also not good to experience. If we also consider recent work on the effects of sulphuric acid on collagen it can be shown that one of the products we reply on so heavily, is actually causing damage to the very substance we are trying to preserve.

A recent paper given at the ***VGCT 7th Freiberg Leather Days*** by ***Dr Rafea Naffa from LASRA entitled. Skin Strength: A critical analysis of strength differences of sheep, goat, deer skins and cow hides*** discusses how much damage that tanners are doing to natural collagen during the many processes involved in making a piece of leather. One of the primary areas of concern was the pickling process, just before tanning, where quite high quantities of sulphuric acid are used and a large number of natural crosslinking bonds within the fibre structure are destroyed, thus weakening the resultant leather.

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However, one of the draw backs of wet-white leather has been that this tanning method does not produce a product that is as physically strong as a chrome tanned leather. Physical properties of wet-white leather often show poor results in typical physical properties tests required by the automotive manufactures, such as the following:

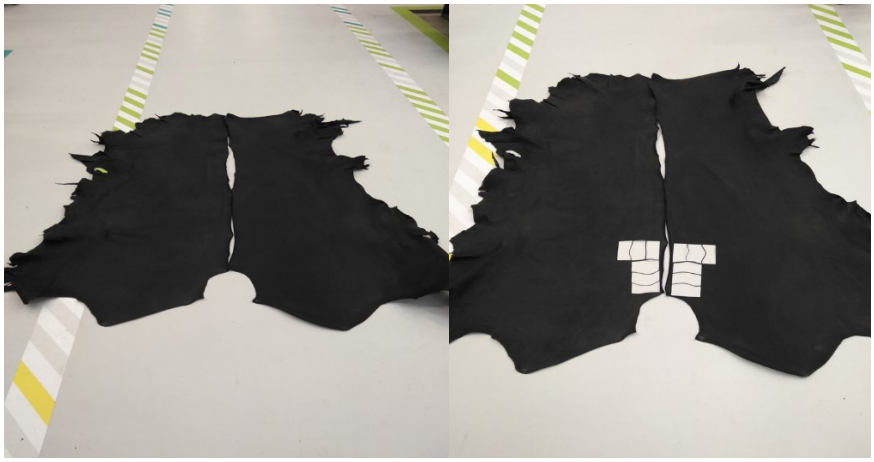
Strength	**Determination of distension and strength of grain (ball burst test)**	**Internal methodology**	**Ball burst**
Softness	Determination of softness	ISO 17235	ST 300
Determination of tear load	Determination of tear load – Single edge tear	ISO 3377-01	Dynamometer
Strength	Determination of tensile strength and percentage extension	ISO 3376	Dynamometer

ATC wanted to answer the question of what improvement could be seen in a typical wet-white upholstery leather by removing the pickling process and therefore sulphuric acid from the method.

- We took lime split full hides.
- After deliming and bating as normal, the hides were cut in two parts :

SAMPLE 1 - the Right side was pickled with sulphuric acid (normal process, with brine)
SAMPLE 2 - the Left side was prepared with Actipickle NSA (without any acid)

- Pretannage was done with Actidial GTA (modified dialdehyde)
- After 48 hours shrinkage temperature was taken:
  Sample 1 = 80°C
  Sample 2 = 82°C
- The two sides were put together and processed with an automotive style dyeing and retanning system
- Dried, conditioned and staked, identically



3 Results

Average Strength (N) Average of 3 values	Transverse	Parallel
Side 1 (no NSA)	65.6	65.6
Side 2 (NSA)	80.9	101.6
Gain	+23%	+55%

The results have been extremely dramatic and the improvements in the trial were exceptional. The next steps were to scale up the trials and finally try this in full production sized lots. Various further experimental and bulk trials have been performed with the assistance of several tanneries around the world and results have been extremely positive. Although due to the sensitive nature of these trials and to maintain the wishes of our customers, we are not prepared to add these results to this paper.

3.1 Environmental Improvement Results

3.1.1 Chrome Tanning Environmental Results

Independent testing of effluent liquors by the UK company W2O Environment Ltd. from trial tannages-running side by side, gave the following results and conclusions:

ADVANTAGES

Improved clarification with 86% less suspended solids in the samples
Reduced COD and higher biodegradability COD/BOD from 9.5 to 3.5
Less than ½ of chrome in the sample, reduced by 57%
Less than 1/2 of the TDS in the supernatant reduced by 56%
Chloride content reduced by 99% in the sample.
1/5 of sludge generation TDS reduced by 79%
1/5 of chrome content in the sludge (-79%)
Less organic residues derived from the hides (-95%)

DISADVANTAGES

None

3.1.2 Chrome Free/Wet White Tanning Environmental Results

Independent testing of effluent liquors by the UK company W2O Environment from trial tannages running side by side, gave the following results and conclusions:

ADVANTAGES

Improved clarification with low suspended solids of 22 mg/l in the sample
Chloride content reduced by 54% in the sample
29% less TDS and environmental salt impact
Less organic residue derived from the hide, (-10%)

DISADVANTAGES

None

4 Conclusion

In final conclusion, the system developed over many years for ATC Tannery Chemicals using the product Actipickle NSA and incorporating techniques and methods gained from trial and production testing has demonstrated without doubt, the many benefits of using this system to give improvements in quality of the final leather, to reduce the amount of chemicals consumed in the tannery process, while significantly reducing the environmental impact at the tannery, on both, Chrome tanned leather and chrome free, wet white leather. If more information is required, please contact ATC Tannery Chemicals.

References

1. *VGCT 7th Freiberg Leather Days by Dr Rafea Naffa from LASRA entitled. Skin Strength: A critical analysis of strength differences of sheep, goat, deer skins and cow hides.*