



EasyWhite Tan leather: A new tanning evolution

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This paper describes a new white tanning system for leathers suitable for automotive, shoe upper and other classic leather types. This tanning system is not based on chrome, phenols or aldehydes, and the pickle and basification/fixation stages as used in conventional tannages are no longer required.

The absence of common salt as normally used in the pickle stage has significant implications within clean technology and the wider environment.

Tanning has evolved over centuries and, in recent times, a considerable number of attempts have been made to develop new tanning agents or improved processes based on existing tanning systems — chrome, vegetable and aldehyde-based. The main aims have been to reduce the overall environmental impact or an improvement of some or other specific characteristics in the final leather. All three tanning systems have their own characteristics, advantages and disadvantages.

The most common of these systems is chrome tanning, being widely used for many articles. Vegetable tanning has a narrower field of application, while glutaraldehyde tanning has found its

main application in the field of automotive leather interiors.

The foundation of a new type of leather

A new process for tanning leather has been developed which produces a white leather with excellent light fastness. It combines important advantages of the three traditional methods, but avoids their associated disadvantages.

Named “EasyWhite Tan”, the principal driver behind this development was to reduce the environmental impact of leather production in a commercially viable tanning system, coupled with process evolution and simplification.



First a tanning agent was developed that is based on substances not classified as toxic and dangerous to the environment. The focus was to develop a tanning agent that is free of metal, phenol or aldehyde - such as formaldehyde or glutaraldehyde - but would also have good tanning properties.

A major process simplification was achieved by moving from three process stages – pickle/tanning/basification – to a single tanning stage. Of considerable environmental significance was the avoidance of an acidification stage, hence the elimination of common salt from the process. The presence of salt in wastewaters is recognised as being a serious problem in many countries: controls and restrictions on the salinity of tannery effluents are established and will be increased. Furthermore, because of the pH profile of the tannage, the basification stage with its attendant chemical requirements and difficulties is no longer necessary.

The original development focused on the needs of the automotive industry. The objective was to satisfy all customers' physical and environmental requirements without compromising the typical characteristics which make leather a natural, unique and desirable product.

But the results showed that the potential was greater than just automotive leather, so work commenced on shoe upper leathers. This opened new horizons for metal-free shoe uppers, including white sport shoes and water repellent leathers.

The manufacturing process

DELIME AND BATING

The deliming process does not need to be free of ammonium salts, and both the deliming and bating procedure can be carried out as in a more conventional process. It is important, however, that the deliming is completed throughout the cross-section of the pelt, as any residual lime will affect the tanning process. The running time in the deliming stage will vary with the thickness of the pelt.

THE TANNING PROCESS

It is not necessary to cool the pelts after bating, but a wash at a temperature of 30°C to 35°C is advised. A short tanning float of between 10% and 30% based on the limed/split weight is required, being dependent upon the thickness of the pelt and the mechanical action.

The pickling stage is not necessary. Unlike any standard tanning system, no salt or acids are required.

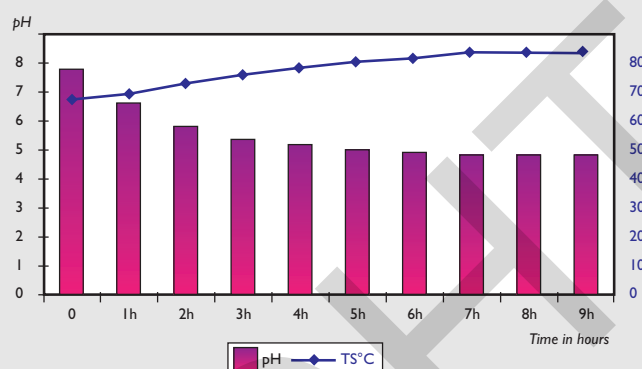
The tanning product - Granofin® Easy F-90 Liquid - is added in one single addition, and no further products or auxiliaries are required. The rate of penetration is normally between one and two hours (dependent on the pelt substance and mechanical action within the processing vessel), with a complete running time of eight hours.

The starting pH needs to be between 7.0 and 8.5, which is the normal pH range after bating. This pH will decrease steadily and continuously until the tannage is completed after eight hours tanning time to an end pH of 5.0, dependent upon the hides and water hardness.

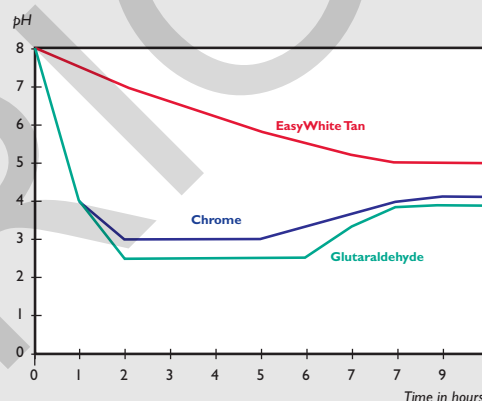
At the end of the eight hours running time the tanning agent is completely exhausted, and no further reaction or pH changes occur after this time. The final shrinkage temperature of the leather in most applications will reach 75°C; however, a value of 80°C is not considered unusual.

The gradual lowering of pH and the increase in shrinkage temperature during tanning is shown in *Panel 1*, and can be

Panel 1: Process progression regarding pH, time and shrinkage temperature



Panel 2: pH development between standard tanning process and EasyWhite Tan



compared to typical pH profiles experienced within chrome and glutaraldehyde tanning systems shown as *Panel 2*:

As stated previously in this paper, a basification or fixation stage is totally unnecessary: fixation is complete and the exhaustion level of the tanning bath is excellent. The addition of syntans to facilitate improved water release at samming or easier shaving is not normally required. A guideline process for tanning is given as *Panel 6*:

Comparison: EasyWhite Tan with other tanning systems

There are significant advantages offered by this new approach to tanning.

TECHNICAL ADVANTAGES

- The elimination of any pickling, basification, or separate fixation products or operations, as normally required by chrome or other organic based tanning system.
- Only one tanning agent, Granofin® Easy F-90 Liquid, and possibly some fatliquor, is required. In comparison, the various stages required by standard tanning systems will need between five and six chemicals, including salt, acids and basification agents.
- A reduction in the level of control required. A normal tanning is more demanding as each step needs a visual, pH and temperature control. In this new situation, once the initial temperature and float levels have been established, no



other controls are really needed. This eliminates many of the opportunities for error found in other tanning systems.

- Simplified and streamlined process. In particular, this process avoids the technical disadvantages stemming from the pickling and basification stages, thus enabling an easily managed and more uniform production.
- Ease of application. The tanning product is liquid, and can be pumped into the processing vessel using conventional dosing systems.
- Reduced production time of between 20% and 50%. This offers greater production flexibility and the possibility of an increase in production capacity.

ENVIRONMENTAL ADVANTAGES

- Due to the absence of the pickle stage, no common salt is needed for the tanning. This omission has direct benefits in effluent treatment (more efficient biological processing and reverse osmosis when practised), and lower salinity for discharge into the wider environment.
- A significant reduction in the weight of other neutral salts discharged. In particular, no neutral salts from interactions between pickle acids and basification/fixation agents.
- No metals, phenols or aldehydes to address in effluent treatment, or metals for disposal in solid wastes (sludges and leathers).
- Reduced water consumption. There is at least a 50% water saving when compared to the volume used for chrome and other tannages (floats and dilution of acids and basification agents).
- Reduced weight of chemicals of around 30%, with a reduction of transport-related environmental impact.

LEATHER CHARACTERISTICS

Over and above these advantages, in appearance the grain of the leather is white and very flat with fine, closely spaced hair follicles. This flatness is partly due to the absence of pickling, and there is also a noticeable absence of neck wrinkles or growth marks.

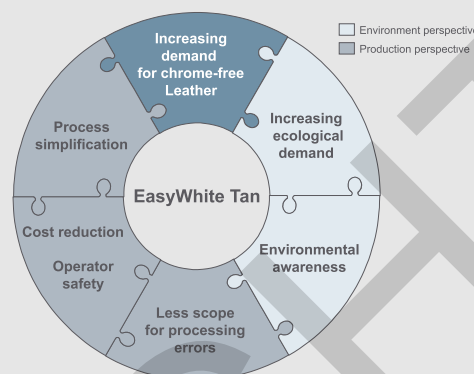
There is one very significant difference where this leather is quite different from other organically tanned materials: it is

Panel 3: Comparison of article versatility of different tanning systems

Article	Chrome Tanning	Glutaraldehyde Tanning	EasyWhite Tanning
Automotive	●	●	●
Upholstery	●	●	●
Vegetable Types	●	●	●
Sports Shoe	●	●	●
Garment	●	●	●
Waterproof Shoe Upper	●	●	●
Shoe Upper	●	●	●

● Excellent ● Recommended ● Not recommended

Panel 4: Advantages from production and environmental perspectives



Process Comparison



Panel 5: Properties of automotive leather

Based on numerous production trials and laboratory analysis, these leathers exceed the high standards required by the automotive industry. In particular, the resultant leather has an almost white appearance with high light fastness.

Method	Method	Requirement	Results
Tear strength	DIN 53329 / N	≥ 25 N	57 N
Stitch tear strength	DIN 53331 / N	≥ 50 N	97 N
Tensile strength	DIN 53328 / N	≥ 130 N	195 N
Elongation at break	DIN 53328	35-60%	40%
Fogging gravimetric	DIN 75201	≤ 3 mg	3 mg
Formaldehyde	VDA 275 HPLC	≤ 10 mg/Kg	N.D.*
Formaldehyde	DIN EN ISO 17226-1 HPLC	≤ 10 mg/Kg	N.D.*
VOC	VDA 227	<100 ppm	70ppm
Chrome Oxide	DIN EN ISO 5398-2	<0.1 ppm	<0.1 ppm
Thickness	DIN EN ISO 2589	+/- 1.2 mm	1.3 mm
Shrinkage after heat	168 h at 120°C	≤5%	4.5%
Shrinkage climate test	PV 1200, 8 cycles 70°C / 70% humidity	≤5%	1%

It is important to notice that the free formaldehyde content of the final leather is non-detectable.

* Detection limit: 2 ppm



cationic in character. This cationic charge makes the leather fill out and behave in a similar way to chrome tanned leather.

The retanning process

Mechanical operations such as samming and shaving are carried out with ease, with excellent and consistent results. The shaving substance should be close to the end substance of the finished leather, as the leather does not increase in substance during retanning in the same way that conventional organically tanned material will.

The resultant leather exhibits a high light fastness, and is suitable for the production of a wide range of colours, including pastel shades, but especially white leathers. Because of its cationic charge the behaviour is more similar to chrome leather than other types of organic tannages and therefore suitable for a wide range of articles as summarised in *Panel 3*. Due to the cationic character of this leather, it must be neutralised to manage the penetration and uptake of all anionic retanning agents, dyestuffs and fatliquors. The amount of retanning is dependent upon the type of leather being made, but due to the inherent grain flatness and tightness of the tannage less retanning agents are required when compared to other organic tanning systems.

The leather is readily dyed, and it is easy to achieve full penetration through the cross-section of the substrate. However, dye build-up is much stronger when compared to other organic tanning systems. This means that 20% to 30% less anionic dyestuffs are needed for any shade at a given intensity.

The main characteristics of leather after retanning, dyeing and fatliquoring are as follows:

- Extreme grain flatness is preserved.
- Excellent grain tightness across the full hide and skins.
- Minimal growth marks.

- Less stretch and elasticity than other organically tanned leathers.
- Possible to combine with mineral tanning agents such as chrome, aluminium and zirconium.
- Easy to produce pastel shades and white leathers if required.
- All anionic retanning agents, fatliquors and dyestuffs are well fixed to the leathers.

These properties make a wide range of leather possible, including automotive, upholstery, garment, shoe upper, and fancy leathers. Waterproof leathers can also be made if combined with metal tanning agents during retanning.

Conclusions

The work invested over the years has resulted in a commercially viable, safe, simple and reliable tanning process that can be easily applied to a wide variety of raw materials under tannery conditions.

As a completely new way of tanning, the rules have been changed and this requires an open mind in order to accept the new principles. In particular, the process has been optimised by eliminating the pickling and basification/fixation stages, both troublesome steps within the conventional tanning process. The removal of these two stages is beneficial in many respects, not least for the environment.

The initial focus for development was based around the automotive sector. Accordingly a process has been developed that achieves the customers' aesthetic, physical and environmental requirements.

However, the leather has wider potential as there is an increasing demand for quality chrome-free leathers for shoe upper uses. Development will continue into this and new areas including garment and gloving leathers. 🌐

Panel 6:

Guideline process: EasyWhite Tan Bovine hides, Lime split 3.0 mm (% based on limed split weight)

Process	%	Chemicals	Temp	Time	pH	Comments
Wash	200	Water	30°C			
	0.1	Tergolix® SL-01 liq				
	0.2	Dekalon CL p		15 min		
		Drain				
DELIME / BATE	50	Water	30°C			
	0.1	Tergolix® SL-01 liq				
	1.5	Dekalon CL p		15 min		
Add	1.5	Dekalon CL p		90 min	8.5	Colourless
Add	1.5	Feliderm® Bate PB1 p				
	0.2	Tergolix® SL-01 liq		60 min	8.3	
		Drain				
Wash 2x	150	Water	35°C	10 min		
		Drain				
TANNING	20	Water	35°C			
	9	Granofin® Easy F-90 liq				
	0.5	Derminol® SO-30 liq		60 min	7.0	
				420 min	5.2	
		Drain				
Wash	150	Water	30°C			
	0.2	Bactericide		20 min		

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**Panel 7:**
Guideline Process: Retannage: Classic Brown Shoe Upper Leather
EasyWhite Tannage: Bovine shaved 1.4-1.6 mm (% based on shaved weight)

Process	%	Chemicals	Temp	Time	pH	Comments
Wash	250	Water	35°C			
	0.2	Tergolix® W-01 liq		15 min	5.3	
		Drain				
NEUTRALISATION	100	Water	35°C			
Add	1.0	Derminol® OCS liq				
	1.5	Sodium Formate				
	2.0	Tanacor® AS6 liq		45 min	5.3	
		Drain				
RETAN and DYE	50	Water	35°C			
Add	4.0	Tergotan® ESN liq		20 min		
Add	1.0	Derminol® NLM liq				
	1.0	Derminol® CO-51 liq		20 min		
Add	4.0	Tergotan® RSN p				
	7.0	Tanacor® PVW p				
	8.0	Quebracho				
	5.0	Granofin® TA p		30 min		
Add	2.4	Melioder® Red Brown RO p				
	0.8	Melioder® Brown HDR p		60 min		
FATLIQUOR	150	Water	45°C			
	3.0	Tanacor® APF p		15 min		
Add	3.0	Derminol® CO-50 liq				
	3.0	Derminol® CO-51 liq				
	3.0	Catalix® 100 liq		60 min		
Add	0.7	Formic Acid 85%		20 min		
Add	0.7	Formic Acid 85%		20 min		
Add	0.7	Formic Acid 85%		30 min	3.6	
		Drain				
Wash	250	Water	45°C	10 min		
		Drain & Unload				

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Panel 8:
Guideline process: Retannage: Black Automotive Nappa Leather
EasyWhite Tannage: Bovine shaved 1.1 mm (% based on shaved weight)

Process	%	Chemicals	Temp	Time	pH	Comments
Wash	200	Water	40°C			
	0.2	Tergolix® W-01 liq				
	1.0	Derminol® OCS liq		30 min		
NEUTRALISATION	2.0	Tanacor® AS6 liq				
	2.0	Sodium Formate		30 min	4.7	
Add	0.5	Sodium Bicarbonate		60 min	5.2	
		Drain				
PRE-FATLIQUOR, RETAN and DYE	70	Water	35°C			
	3.0	Tergotan® PO-60 liq				
	1.0	Derminol® SPE liq				
	2.0	Derminol® NLM liq		15 min		
Add	8.0	Tanacor® RS-31 liq				
	8.0	Granofin® TA p		60 min		
Add	10	Tanacor® SCU liq		30 min		
Add	10	Tanacor® SCU liq		40 min		
Add	3.0	Melioder® Black AF 135 p		60 min		
Add	150	Water	50°C	10 min		
Add	0.75	Formic Acid 85%		30 min		
Add	0.75	Formic Acid 85%		30 min	3.8	
		Drain				
Wash	250	Water	50 °C	10 min		
		Drain				
FATLIQUOR	100	Water	50°C			
	3.0	Tanacor® APF p		10 min		
Add	3.0	Tergotan® PO-60 liq				
	3.0	Derminol® NLM liq		30 min		
Add	4.0	Tergotan® PMB liq		60 min		
Add	0.5	Formic Acid 85%		45 min	3.7	
		Drain				
Wash	300	Water	20°C	10 min		
		Drain & Unload				

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