



Sustainable Leather Foundation's pathway to Tannage



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Introduction

A commonly asked question in the tanning industry is: "What is the most sustainable tannage type?". Fortunately, most of the unsafe and non-sustainable tannage types have been legislated out or discontinued (through interventions/market forces) and the chemicals that remain are continuously improved to achieve greener chemistry principles.

The tanning industry continues to evolve as greener chemistries are perfected and adopted. Sustainability of tannage is linked to a balanced, whole consideration of tanning agent manufacture, from the producer to end-of-life of the leather.

¹ BSI (2015) Leather – Terminology – Key definitions for the leather trade (BS EN 15987: 2015) British Standards Institute, Milton Keynes, United Kingdom.

What are the different tannage types?

Tanning is defined as "hide or skin converted to leather by a tanning agent"¹.

Chromium tanning is defined as "hide or skin converted to leather by treatment solely with chromium salts, or with chromium salts together with a small amount of some other tanning agent..."².

Chromium-free tanning is defined as "hide or skin converted to leather by a treatment free of chromium salts where the content of chromium in the leather is less than or equal to 0.1% (mass of chromium/total dry weight of leather)"².

Vegetable tanned leather is defined as "hide or skin converted to leather by vegetable tanning agents where the total content of tanning metals is less than 0.3% (mass of all metals/total dry weight of leather)"².

Wet white leather is defined as "leather that after tanning with substances that confer a whitish colour, (...) has not been further processed and is maintained in the wet condition"².

In leather, tanning should:

- stabilise the structure during its working life
- interact favourably with the leather and other leather chemicals
- allow stable transportation and storage after tannage
- allow the leather fibres to be easily separated after drying
- be safe for use by tanners
- use sustainable, renewable chemistry
- impart desirable properties to the final leather.

Many of the tannage types meet some of the criteria, but none meet all the criteria above. For this reason, it is very rare for a leather to be made from a single tannage type. In general, leather is made using a combination tannage.

² BSI (1983) Glossary of leather terms (BS 2780:1983+A1:2013) British Standards Institute, Milton Keynes, United Kingdom.

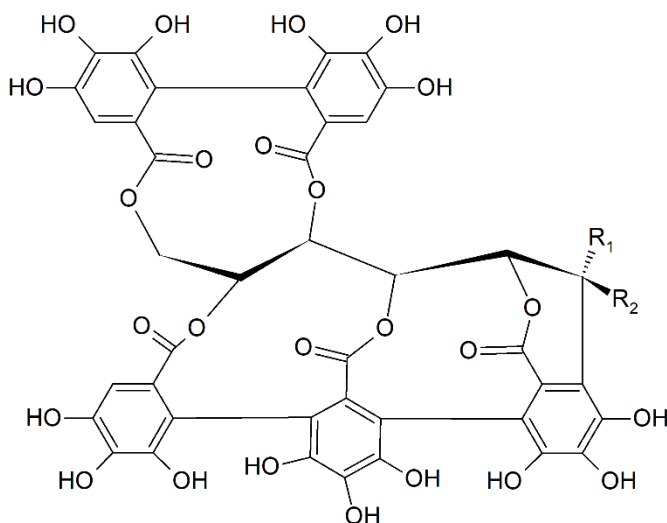
The tannage types fall into the following categories:

- Metal tannages:
 - chromium
 - aluminium
 - titanium
 - zirconium
 - iron.
- Non-metal tannages:
 - vegetable extracts
 - oil
 - sulfur
 - synthetics (syntans, polymers)
 - zeolites
 - aldehydes (aldehydes, etc).

In the outline of the tannage types above, the categorisation is based on how the tanning chemical interacts with the leather fibre. In each grouping there are many different types of compounds that can be used, but the list shows how the leather fibre and the chemical react.

The list is diverse and has chemistry that is derived through the following methods:

- mining (minerals that can be extracted and recycled back in the leather, or other industries)
- farming (plant-based materials that can be regeneratively grown for future leathers)
- petroleum derived (where crude oil is refined into tanning compounds).



The above ingredients are then used in the form that they were derived (which constitutes use of the word 'natural'), or they are processed lightly or heavily to

produce extracts or synthesised products. Natural or synthetic products will be different in their sustainability through:

- Degree of processing (energy and water footprint)
- Renewability, or recyclability
- How they affect humans or animals
- Impact on the planet in their end-of-life.

Challenges with Each Type

The type of tannage used has a significant impact on the effluents produced, the wastes generated, and what the final properties of the leather will be.

The perfect tanning agent is:

- made with human-friendly renewable green chemistry (with a tanning agent that has low production impacts),
- one that gives the leather ideal properties (including interactions with other tanning chemicals), and
- one that is easily recycled at the end of its life.

Longevity – tannages are used to produce leathers that can work for hundreds of years – but when leather is disposed of, can rapidly degrade. A long-lived leather product made from any tannage will displace many non-durable plastics (and other alternative products) because of leather's superior strength and durability. When maintaining leather (of all tannage types), water and electricity are seldom used when compared to textile alternatives – making it have a low environmental footprint in its working life. Leather of all tannages is easily remanufactured, easily maintained, repairable, and re-usable.

Renewable chemistry – tanning chemistry that comes from a fast-growing renewable plant-based origin, or from a feedstock that is based on waste products from a plant-based stream are highly prized. Many plant-based extracts that are standardised to be used as a tanning agent are making progress. Standardised vegetable tanning extracts or natural vegetable tanning materials have been used for a long time in the industry.

Natural tanning agents or lightly processed tanning materials that use minimal energy, low water inputs,



and do not have excessive carbon miles result in a low production environmental impact. The location of the tanning chemical manufacturer being close to the intended market has allowed for increased sustainable tanning practices.

Leather properties - that are imparted to the leather help the leather to be more sustainable. Strength and durability are two of the greatest attributes that a tanning type can contribute. A leather that doesn't wear or break will be used for a longer time. Leather alternatives are less sustainable than leather for this reason. The chemistry that is used and how it interacts with the dye and oil compounds is critical in the product sustainability. Some non-metal tannages are less able to be absorbed by the leather which could result in more chemistry remaining in the effluent, which in turn will result in the tannery having to do more treatment.

Safety – forms an additional part of the tanning challenge in consideration of how the chemical responds to the human using it and the environment that the final product (or its waste) may end up in. Contact with human skin should be safe. A reaction with human tissue that is sensitising (e.g., chromium VI, or formaldehyde/glutaraldehyde) is an area that tanners need to show due diligence. The levels of these sensitisers are managed, and responsible tanners will meet the regulations. Using alternative tanning chemistry that can avoid having to manage these in the first place is key. Management of these tanning chemicals also means the prevention of these chemicals being present in the by-products/effluents/wastes as well.

End-of-life – is the final challenge for a tanning material that should be easily recycled. Removing a metal out of a leather at the end of its life is possible as metals are recyclable. Non-metals like organic substances, or inert substances like the zeolites are also possible and work is currently underway to perfect these technologies. Elemental recycling, with biorefineries (chemical hydrolysis, aerobic and anaerobic composting/digestion) is at the core of the circular bioeconomy. Even energy from waste is a strategy that could be used as a sustainable option in some instances.

SLF Approach

SLF believes that consideration of whether a tannage type is sustainable is dependent upon other interconnected aspects, such as application, availability of resource and available control of environmental safeguards for use and treatment.

In some instances, the environmental attributes of the tanning method will favour certain technologies like those associated with longevity and environmental outputs. In other instances, the social responsibility and due diligence are also important areas that need attention and have often been downplayed by people's concerns for the environmental considerations.

The SLF approach is to consider the ESG aspects and to weigh these in relation to a market segment or type of customer. Support for industry research that strives for tannages that can meet the requirements specified above are also strongly supported by the Foundation.

Communication about the detail associated with the ESG considerations to the end-user of leather is another priority of the Foundation. There is a lot of misunderstanding about the risks associated with different tannage types, in particular the idea that all chemicals are dangerous – when chemists know that the type and the dose of chemical is what is important.

SLF's approach is to encourage and give visibility to innovative new solutions whilst at the same time supporting research for improved methods of existing tannage types to minimise risk and impact across the sustainability spectrum.

Tools

The Sustainable Leather Foundation's tools and partnership provide a mechanism to enhance tannage responsibility and sustainability that works throughout the leather value chain. By working with industry and non-industry stakeholders, the SLF toolbox provides metrics and modern advice to actors according to their abilities.

This will provide a critical infrastructure to inform research for potential solutions by providing accurate assessments of current sustainability performance.

Sustainable Leather Foundation

Industry Led – Consumer Focused



The Sustainable Leather Foundation's Audit Standard is built on the idea that a tannage type is part of a whole balanced system and that the ESG audit will identify overall whether a process is sustainable or not.



SLF's Transparency Dashboard™ will clearly indicate a value chain partner's ability to demonstrate their own careful thought and deliberation on what type of tannage they are or should be using.

Future

The desire is for an assessment method that could, as an overall indicator, tell which is the most sustainable method - something the industry at large is debating, and the Foundation will continue to support. By raising awareness of the problem and collectively acting to mitigate it, the Foundation works to provide sustainable, long-term solutions and better outcomes.

SLF also works with stakeholders to define a framework for policies, commitments, and procedures to facilitate real problem solving and innovation. To achieve that, we work with chemical companies and industry bodies.

The Foundation seeks a pathway to balance that protects people, the planet and is economically viable for the benefit of future generations.



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