

2 Tannage

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Tannage is the irreversible conversion of the natural fibre network of pelt into the material leather. The collagen structure is permanently cross-linked. This makes it resistant to bacteria, putrefaction and higher temperatures. When dry, it does not feel hard and can normally be rewetted.

PICKLE - OPTION TO EXPORT

The object is to prepare the pelt for tannage, or for export, by adjusting the level of acidity in salt solution. This controlled acidity is needed to allow penetration of tanning materials through all the thickness uniformly and to combine correctly. If this were not done, the tanning materials would react too strongly on the outer layers, not penetrate deeper and the appearance of the surface would be damaged. The leather would also not be tanned correctly. The pickle is varied according to the type of tannage to be made, with less acid conditions being used for vegetable tannage. However, salt concentrations are increased and essential to avoid any acid swelling. 6% salt on the total volume of water is a safety level for the most acid conditions. Temperature must not exceed 28°C.

Vegetable tannage should start at pH 4, chrome at pH 3 and the export pickle needs to have a stronger pickle in terms of acid content (absorbed by the pelt) and a preservative to prevent mould. This pH is below 2. Storage is good if the pickled pelts are kept cool, below 32°C air temperature.

TANNAGE

The object is to convert the pelt into leather by creating a more stable structure, which will not putrefy and maintain an attractive appearance. The options are:

- Chrome tannage is the most widely used and most important tannage, in more than 80% of leathers. This is used in the production of shoe upper, furniture upholstery, clothing, leathersgoods and gloving leathers. Basic chromium sulphate is the main chemical, penetrating at pH 3 in controlled stages and being fixed at pH 3.8-4.0. Process starts at about 24°C to finish at 39°C for better chrome exhaustion. The higher end temperature is achieved by increasing the drum speed from 5 to 10 rpm. The leather will have a shrinkage temperature of 95-100°C. The cross-linkage is identified as being made with the carboxyl groups of the collagen. The process is done in a drum and takes about 10 hours for hides; skins are tanned faster because they are thinner.

The colour is blue and it is often exported semi-finished as 'wet blue' with the use of preservative. Environmental protection is limiting the amount of trivalent chrome salts in an effluent for discharge into a public waterway, because the heavy metal affects the treatments in the waterworks. This has resulted in many developments to reduce the levels of chrome in effluent by increasing chrome uptake in the drums, and by various recycling methods. There are also ecological concerns that the trivalent blue chromium salts in leather could be converted into the carcinogenic hexavalent state, with its danger to health.

- Vegetable tanning uses material obtained from parts of certain plants. These may be the bark, wood, fruit, root or leaf of the plant. The chemical compositions are complex and are mixtures of natural polyphenolic compounds. The shrinkage temperature is 70-85°C. The characteristic colour varies from pale yellow-brown to an intensive red-brown depending on the type of vegetable tanning material or mixture of tanning materials used and the application conditions. The nature of the materials limits the light fastness, and there is a considerable change in colour with time and exposure to sunlight. They have high molecular weights and probably form linkages due to a combination of hydrogen bonding and their size. The resultant leather is therefore, much fuller and heavier, than chrome tanned leather. Vegetable is the original tanning method and used for heavier, more compact leathers from hides – sole, strap, belt, bag, harness, upholstery – but it can make soft light leathers such as linings and leathergoods - particularly from skins. The process is slow, with limited mechanical action from pits or slower running drums. The time is about 4 days for lighter weight leathers and 12 days for sole leathers. The temperature normally starts at about 20°C for penetration, increasing later to 35°C. It has been largely replaced by chrome tanning, because it is quicker and more economical.
- Alternative tannages now receive more attention because of environmental concerns. There have been synthetic tannages in use for many years, known as syntans. These cover a wide range of organic chemicals, such as phenols, naphthalene, glutaraldehyde and various polymers. This is a drum process and takes about 10 hours, similar to chrome tanning, but at temperatures of 25-30°C and pH 3.0-3.8. The shrinkage temperature of the leather produced is 70-80°C. It was originally used to make speciality leathers, such as white, and to replace part of the established tannages. The current interest is to replace chrome tanning and 'wet blue'. There are 'wet white' tannages for export and for further processing in the same tannery. These avoid the chromium but do not produce an exactly identical leather character to full chrome leathers at present. However, the auto-upholstery buyers are demanding 'chrome-free' leathers and such supplies are expected to increase. The colour of the leathers is white, or yellowish, and they have very good light fastness. These leathers are limited to drying temperatures of 40-50°C, compared with 70°C for chrome tanned wet blue.
- There are many pre-tannages which are used following the pickle, and before the main tanning, so that there is an improved uptake or performance from the tanning itself.

Such examples are formate before chrome tannage, phosphate before vegetable and syntans before 'chrome-free' tannage of wet white.

After tannage, leathers contain a lot of surplus tan liquor. Consequently, they are normally allowed to drain, from a pile on a horse or stacked on platforms, overnight. This allows further fixation of tanning material; the drained liquid is collected, for recycling or for treatment in the effluent.

SAMM

The object is to remove the unbound water so that the hide can be packed, split or shaved, with consistent uniform moisture content and an exact thickness. The natural differences in the structure of the hide mean that the tanning material absorption and the liquid absorption also vary. Consequently, the leather is still not the same thickness all over after tannage, even if it was already levelled by splitting in the pelt. It is first sammed to reduce the water content from about 70% to about 60%. The hides are then squeezed between the moist felt rollers of a samming machine, which also flattens the shape. A setting out action, to further spread the hide, is often incorporated into the sequence on the machine, with extra rollers. The moist leather is then sorted for export or for further production in the tannery.

SIDING

If the hides have not been cut into sides earlier, this can be done now. It is often done manually, with the use of a cutting guide on a table. It needs to be accurately done down the backbone to produce the flatness in that area.

SORT - OPTION TO EXPORT

The object is to grade the hides, and skins, according to their potential quality. Wet blue (or wet white) is normally exported without splitting, so that the full hide thickness is available to the buyer. Quality is sorted on an agreed basis. This will assess the degree of damage in the hide, or skin, and how it affects the cutting value. Each quality has a different value.

Exports may specify particular grades. The wet leathers for export need to be carefully folded, and packed in plastic sheeting so that the packing is completely waterproof. This is to prevent permanent creasing of the leathers and any drying out in transit. The rewetting of such dried leathers is extremely difficult, and it is advantageous if a very small amount of a hydrophilic compound (fat-liquor type) can be added to the tannage, provided there is no effect on final quality. If it is not for export, a similar sorting is done for the tannery's own operations. This has the same assessments, and produces a range of qualities. Sorting also decides whether it can be full grain leather, or whether the grain needs to be buffed away and corrected in some way

to disguise faults. The sorting figures are then compared with outstanding customer orders. Their requirements will show thickness, quality and quantity. In this way, the actual customer orders start from here, and should have a reliable completion date for a delivery schedule.

SPLIT OPTION - SPLIT FOR FURTHER PROCESSING AND TANNED WASTE

The object is to obtain a more even thickness for processing and more uniform final leather, if it were not done in the limed condition. At this stage, the leather has a more stable structure. The tanned hide is less swollen and so it is easier to handle. The actual levelling is more accurate. The thickness is determined by the final product to be made. It will allow for some final adjustment by shaving. The machine and operators are critical to a successful operation, from quality and profitability aspects. A good machine is a valuable investment for the tannery.

TRIM - DAMP TANNED LEATHER WASTE

The object is to produce an economic shape for sale or processing further. The grain layer (top split) needs to have any ragged edge cut away to facilitate other machine work, whilst the lower flesh split has to be trimmed to such a regular shape that can have a uniform thickness. Trimming should be to retain, or improve, value. The quantity of trim should be controlled to see that it is not excessive, because it loses profit. The actual flesh split is larger than a flesh limed split.

SHAVE - TANNED SHAVING WASTE

The object is to make the final thickness adjustment and have an even cutting through leather with consistent moisture. The moisture content should be 30-45%. Splitting leather can never be accurate enough and so a shaving machine is needed to refine the produced thickness and leave the flesh side smooth. The shaved thickness is determined by the customer requirements, allowing for the loss in processing between the semi-moist condition and the final despatch.

PREPARING LOADS FOR RETANNAGE AND DYE

The object is to plan the production of crust leather to meet the demands of the customers' and sales forecasts. Customer orders define the quantity and quality of finished leather. The tannery identifies the type of retanned leather (the crust) which corresponds to the finished leather. If there is not sufficient quantity and quality available in crust stock, there has to be more produced from the wet blue. In this way, the work tickets from the wet blue are planned to supply the crust stock as required, from orders or sales forecasts. The loads will be in standard sizes for the retanning drums and correspond to established processes.

