The advantage of EasyWhite Tan leathers in retanning, dyeing and fatliquoring processes

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Initially, EasyWhite Tan was developed for use in the manufacture of automotive leather. But during the early stages of development it became clear that its chrome-like character also made it suitable for use in a very wide range of articles, including shoe upper, garment, upholstery and vegetable type leathers.

Previously, it was considered very difficult or almost impossible to use organically tanned wet white for shoe upper, water resistant shoe upper, suedes, nubucks, aniline or semi-aniline, white and pastel coloured leathers. The range was more or less limited to automotive and perhaps some types of garment, gloving and lining leathers.

The advent of this new system has caused change in the situation. Many of the leather types that were previously thought impossible to make on a white-based material are now possible. Additionally, not only can these articles be made using less retanning agent and dyestuff, but the discharge of unfixed chemicals - typical for previous wet-white leathers - is reduced.

The challenges of the past

- The character of the leather produced from the previously available wet-white systems was somewhat spongy or open in nature. This precluded the production of more compact types of articles with a fine and tight grain, such as many types of shoe upper leathers.
- Because of this open and spongy substrate, natural grain faults have always been exaggerated. This may actually have caused a down-grading of some leathers.
- In the retanning, dyeing and fatliquoring stages, an excess of chemicals were required to achieve the desired end result. These high offers of processing chemicals were related to the rather limited reactivity of the leather towards anionic charged products that are commonly used. The implications for cost and within effluent treatment were major disadvantages of this characteristic.
- The physical strength of these leathers relative to chrome tanned was very low. In sewn leather articles complete confidence in the tear and stitch-tear resistance is demanded. This is to ensure that the article could withstand the rigours of wear and use.
- Because of the low reactivity between retanning materials and the leather substrate of these earlier tannages, an excess of retanning agents was required. These materials are normally hydrophilic in nature, hence it was almost impossible to make high-performance water-repellent leathers on these wet-whites. This problem was compounded as it was difficult to fix the water repellent products to the anionic charged fibre structure.
- The inherent nature of previous wet-white leather - even before retanning and fatliquoring had taken place - made it difficult to produce, with any confidence, a white or pale coloured leather that would not yellow or become discoloured in use. Only if the leather was coated with a heavy pigmented finish coat was this discolouring avoided, but this could have an impact on the perceived quality of the leather.

Panel 1: A different tanning system

The various stages within standard tanning systems need between five and six chemicals, including salt, acids and basification agents. In addition, every step needs visual, pH and temperature control, making a total of six to eight inspections. This represents a considerable level of control.

The advantages of EasyWhite tannage start with the elimination of the pickle, basification or fixation process stages, and products that are normally required by chrome or organic based tanning systems. Only one tanning agent (Granofin Easy F-90 Liquid), and possibly some fatliquor, are required. Once the initial temperature and float levels have been established, no other controls are needed.

This eliminates the opportunities for error found in other tanning systems. The production consistency is streamlined and the production time reduced by between 20% and 50%.

Reactivity within retanning, dyeing and fatliquoring processes

In the retanning, dyeing and fatliquoring of EasyWhite Tan leather, it is important to understand the crucial differences between this and other types of leathers. This is best understood by looking first at the way that Granofin[1] Easy F-90 tans the leather in comparison with glutaraldehyde, and then for reference comparing it with chrome tanned leather.

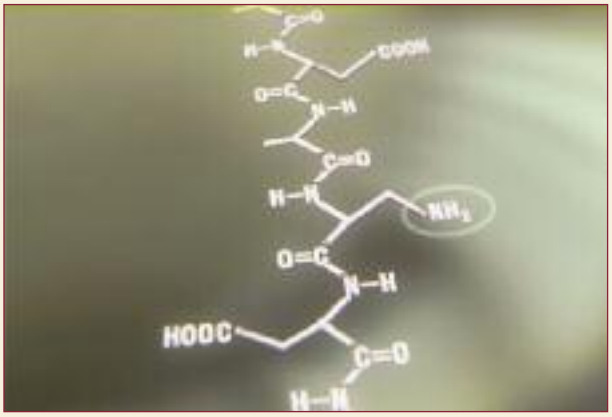
With reference to *Panel 2*, the schematic shown as *Item 1* identifies the amino groups on the collagen molecule that are needed for bonding with aldehydes (previous wet-white leathers). The carboxyl groups on the collagen molecule that are essential for the fixation of chromium compounds in chrome tannage are indicated in *Item 2*. However, as indicated in *Item 3* the Granofin Easy F-90 reacts with the collagen at multiple points to form stable bonds and cross-links.

It is this degree of enhanced linkages with the collagen that helps to make a stronger and less spongy leather than previously possible based on an organically tanned, wet-white substrate.

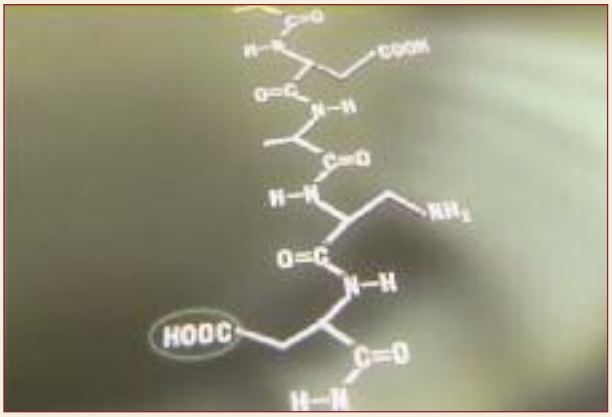
Although strongly linked, this new white leather still retains

Panel 2: Tanning schematic for fixation of aldehydes, chromium compounds and EasyWhite Tan with collagen

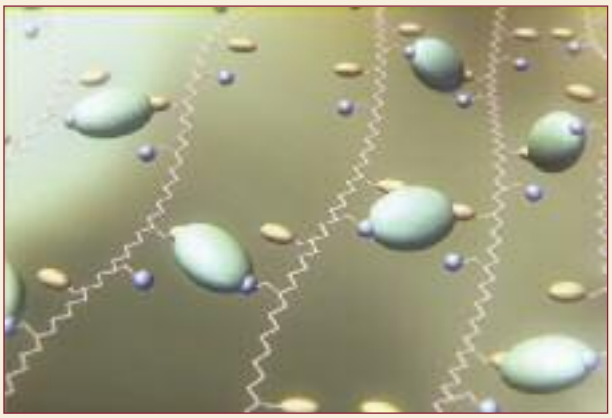
Item 1: Aldehyde forming bonds with amino group.



Item 2: Chrome forming bonds with carboxyl group on collagen molecule.



Item 3: Possible multipoint fixation of Granofin Easy F-90 with collagen molecule.



some elasticity, so that it's commercially viable for use in a very wide range of articles. The relatively compact fibre structure also means that the grain layer of the leather remains flat, and any physical grain defects are not emphasized.

Critical to the understanding of how best to design an appropriate retanning, dyeing and fatliquoring formulation for EasyWhite Tan leather is the fact that it carries a cationic charge. This applies even though the tanning agent exhibits multipoint fixation properties. This is central to the enhanced uptake and fixation of anionic charged retanning, dyeing and fatliquoring chemicals with these leathers.

Moreover, because the fibre structure is compact relative to aldehyde tanned leather, there is no need to apply high offers of retanning agents. It is common practice to reduce the retanning agent by between 20% and 30%, and the dyestuff by 20% depending on the final article. Accordingly, this results in measurable cost savings and less issues with unused or wasted anionic processing products in the effluent. It's commercially viable, cost-effective and an improved performance alternative to aldehyde based tanning systems.

Shoe upper leather on an organically tanned "white" substrate

Because of the compact nature of EasyWhite Tan leather the variety of shoe upper type articles that can be produced is wide. The almost white colour is of particular note as opposed to the yellow or perhaps pale yellow colour of typical aldehyde tanned leather. In addition, the stable nature ensures that it is lightfast to a high degree. Provided that the appropriate retanning and fatliquoring materials are selected, it is thus straightforward to make a well performing, white or pastel shaded leather with the knowledge that it will retain its original whiteness or colour in use.

The open structure of aldehyde tanned leathers did not lend itself to the production of a white shoe upper leather and there was little scope for adding vegetable based retanning agents to compensate for this. The most commonly used "make-do" production method was to take chrome tanned leather and then apply heavy doses of bleaching syntans to make as pale a coloured leather as possible. This method may have incorporated titanium dioxide (white pigment) in the retanning or fatliquoring stages. This was usually complemented with the use of a heavy, pigment-containing finishing coat.

The production of water-repellent shoe upper leathers

It was hardly possible to make a full grain, nubuck or suede leather with high levels of dynamic water-resistance on aldehyde based tannages. But this is possible with these new leathers due to the improved reactivity towards all anionic retanning and water repellent treatment agents.

Also, in common with chrome tanned leather, the tannage does not have any negative effects on water resistance. When soaking, liming, dehairing and tanning operations are carried out in the absence of too many hydrophilic processing auxiliaries, it is straightforward to make a high performance water-repellent type leather. This offers real opportunities in creating a great variety of water-repellent leathers without chrome being used as the base tannage or during capping of the waterproof fatliquors.

Conclusions

EasyWhite Tan is a change in the traditional way of tanning. It offers a simplification of process and speeding up of the production time, coupled with a lowering of the effluent load, and water and energy consumption.

The chrome-like character of this leather coupled with its nearly white colour and high level of lightfastness are of high value. In addition to automotive leathers, it is possible to make a great variety of organically tanned leathers, including sport shoes and outdoor waterproof leathers. Work continues to develop new applications in this field of chrome-free leathers.

(1) Granofin is a registered trademark of Clariant.