

Efficient and eco-friendly beamhouse chemicals

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Introduction

Experienced tanners know that the quality of leather is mainly determined in the early stages of the process, what is commonly known as the 'beamhouse process'.

During this process the main target is to 'purify' the collagenic structure as much as possible by removing undesirable byproducts in order to start the tanning (the stage when the pelt is converted to leather) in an optimised condition.

Dirt, blood, flesh, fat, non-collagenic protein, elastin and keratin will be removed from the hide. These various materials represent quite a high percentage of the total mass of the hide. The removal of these is an essential process before the hides pass into the wet-end and finishing processes.

While the name of Stahl has been associated worldwide with the supply of quality finishing products for many years, it was not until the late 1980s that Stahl became involved in the wet-end. Within the last couple of years, Stahl have extended these activities into the field of the beamhouse, thereby providing a complete service to the tannery.

Soaking

The effects to be achieved are the cleaning up of unfixed material (dirt, urine etc), the removal of salt and the rehydration of the hide. Apart from basic chemicals such as sodium carbonate and/or fine particle magnesium oxide for pH adjustment, which could be used here, the addition of a wetting agent is generally the best way to combine rehydration and some efficient surface cleaning. Products such as Bemanol 1S, that are based on an alcane sulphonate derivative, are very effective because they reduce the surface tension of the water and so help the hide to be rehydrated quickly and evenly due to the increase in

wetting power. Cleaning is also promoted with Bemanol 1S as it acts like soap.

In some cases, particularly dried hides, wetting back is quite difficult and boosting the opening up of the structure so that water will penetrate more easily by using a suitable enzyme is advised. One of the options is then to add a reasonable percentage of soaking enzyme, Bemanol 2S.

At this stage, special conditions may exist. Really hard water has the drawback of inactivating soaping efficiency or the use of a fast soaking process, for example, to avoid bacteria proliferation. For these circumstances, Stahl have developed a selective mixture of surfactants based on an ether sulphate derivative which has the particular property of exhibiting an anionic group, the result of SO_4 from sulphate, along with a slight cationic charge from the ether bridge. By doing so, this kind of product, Bemanol WAU shows exceptional stability in hard water and will be effective even in these conditions.

Unhairing/liming

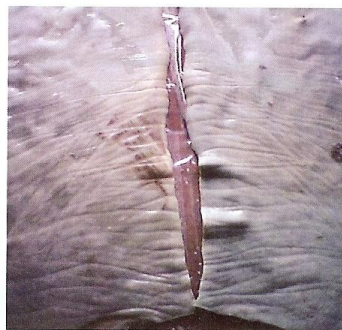
This is a crucial stage aimed at removing keratin and epidermis from the hide by unhairing. The fibre structure is also opened up by swelling during liming. Both processes are normally concurrent and have an important influence in the future reactivity of the leather. This is due to deamination during liming, leading to a shift from the isoelectric point where the pH of the collagen is neutral.

For many years the basic chemicals giving regular results were simply a mixture of sodium sulphide and lime in different proportions according to the different future properties needed, especially grain smoothness and leather softness. In modern processes the trend is to limit the pollution of sulphide in the effluent as well as to control the swelling of the pelt. The last point has a technical

advantage because controlling swelling means generally reducing the visibility of growth marks and veins.

This can be achieved with special chemicals that have a buffering effect at high pH and an additional effect on unhairing at around pH 12. Products like 2-mercaptoethanol and sodium glycolate have been well known for many years and are quite effective although they can suffer from air oxidation leading to an uneven result. This disadvantage is overcome by using Bemanol MLA to stabilise this product with a strong natural antioxidant. Bemanol MLA is then highly suitable for replacing a significant amount of sodium sulphide and so has a depilatory action without causing excessive swelling. Stabilisation of oxidation also means there is less odour during the unhairing process as well as a limited risk of toxic H_2S vapour formation during deliming.

Another option for improving the efficiency of unhairing/liming is the use of selected ethanol amine formulations. Here chemical expertise is needed in the make-up of the ethanolamine based product as it can give a poor and inconsistent result if not balanced correctly. Bemanol AWS is a blend of various ethanol amines and lyotropic agent with various buffering areas around pH 10 to 12. In this way, swelling is progressive as Bemanol AWS



Use of AWS anti wrinkle system.
Left – before, right – after

Table 1: Some trouble shooting solutions from Stahl's Wet-End Division

Tanner's problem	Stahl solution
High water hardness	Bemanol SW
Lime blast	Bemanol SW and Corilene WE30
Growth, vein marks and wrinkles	Bemano AWS
Unclean hair root, unclean pelt	Bemanol WAU
Rehydration problem	Bemanol 1S, Bemanol 2S
Over basification, chrome patches	Bemanol CR
High nitrogen effluent	Bemanol DLFA
Poor or long deliming	Bemanol DLJN
Wool felting in degreasing	Bemanol DTS
Sulphide limitation	Bemanol MLA
Poor degreasing	Bemanol D, Bemanol DG

has three buffer zones when the pH rises above 10. Growth marks, wrinkles and veins are then much less visible.

Bemanol AWS also lowers the surface tension of the water in general. Therefore, near the hair bulb, the chemicals become more effective, thus helping to get a cleaner grain and less hair roots when the hair is removed.

Deliming

Reducing the pH quickly and safely from 12 to 7.5–8.5 is the target of this process. Conventional deliming agents based on nitrogen derivative products such as Bemanol DLJN give consistent and reliable results due to the buffering action of the ammonia. However, if the tannery has restrictions on nitrogen loads in

effluent then other types of deliming agent are required. Bemanol DLFA has recently been successfully developed. The product is 100% nitrogen free and allows relatively fast deliming with a buffering action around 7.5. The desired end pH of deliming is controlled by the amount of products used in the process. The main advantage of Bemanol DLFA is the presence of a strong complexing agent that removes the free calcium salts from the hide. Knowing that calcium salts might cause problems such as dye patchiness, fat precipitation, poor degreasing and bating during subsequent processes, the removal of these salts is a sound option. Bemanol DLFA then gives a clean pelt, almost white and fuller than would be obtained with a conventional deliming agent.

Degreasing

Natural grease needs to be removed in a controlled way before tanning. Depending on the origin of the hide, the composition of fatty material can be quite different in proportion and in its location within the hide. A range of specific degreasers matching their needs is therefore of great help to the tanner. Bemanol D is Stahl's most versatile degreaser and is the ideal product for conventional degreasing. The HLB (hydrophilic-lipophilic balance) is around 13, the optimum value to form an emulsion with various natural greases. It is a fatty alcohol ethoxylate, very stable to heat and cold conditions, and so can be used during any season of the year.

Sometime, skins such as New Zealand sheepskins, need a very strong degreasing

process and a more specific degreaser is then required because HLB control is not enough. A combination of the HLB with products that reduce surface tension and avoid redepositing grease on the grain should be used. Bemanol DG is of this group. This is a well balanced combination of alcohol ethoxylate (to get the right HLB), surface tension reducer and emulsion stabiliser.

Felting of the wool is one of the problems, which might occur for doubleface leathers during degreasing with an unmasterised ethoxylated formulation. This problem is highly reduced when using Bemanol DTS due to the presence in the formulation of an ethoxylate with the right mole ether bridges.

Other beamhouse products

These are special products which can be used when a fast, efficient, trouble free process is necessary.

One of the most well known and safe basifying agents for chrome tanning is magnesium oxide. However, achieving the right particle size distribution and surface area of the particles is most important. Bemanol CR is an homogeneous magnesium oxide with an accurate particle size distribution and surface area resulting from double stage grinding and sieving. Basification is regular and chrome precipitation avoided, leading to fuller leather and regular dyeing.

Other interesting products for the beamhouse are the ones which reduce calcium concentration. In the case of calcium precipitation in the hide, known as lime blast, a product is needed to prevent or remove it. Bemanol SW is a polyphosphate derivative which is a strong calcium complexing agent (and iron as well) and can be used at all stages of leather production to reduce hardness of water. Corilene WE30, also a phosphoric derivative, can be used to control calcium salts.

Conclusion

All in all it is important to know that as well as regular and well known products for the beamhouse process, there are specific and safe products available that are proven by experience to help improve the quality of the leather in the everyday production. ■

Schematic of beamhouse processes