



Variations within hides and skins

PART 2: THE EFFECTS OF LEATHER PROCESSING

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The structure of hides and skins is modified in leather making to make leathers with specified properties. Many of the natural variations found across a skin can be addressed to make both the appearance and physical properties more uniform. The following images indicate the effects of the major processing stages.

Modifying the skin structure

Unwanted skin components - mainly hair, epidermis, interfibre proteins, saccharides and grease - are removed in the soaking, liming/unhairing, deliming/bating and degreasing processes to isolate the collagen fibre structure.

But, in addition, a free movement of this structure is demanded to ensure classic leather characteristics in terms of flexing, folding and compression. This requires the separation and splitting of the fibre bundles and is brought about mainly by controlled alkaline swelling within the liming process. Examples of poorly split fibre bundles, and a structure that is well opened to ensure free movement is shown in *Panels 2/1a and 2/1b* respectively.

the cross-skin appearance and properties more uniform. An example of selective filling using micro-spheres (unexpanded) is shown in *Panel 2/2b*.

The effects of selective fibre-lubrication

The controlled movement of the fibre structure is critical in the final leather to ensure a desired degree of softness, handle, and break characteristics. This is managed in part by lubrication of the fibre structure via the fatliquoring process.

The greater the amount of oil distributed within the fibre structure, and the deeper the level of penetration, the softer the final leather. *Panel 2/3a* shows a fatliquor penetration that has been limited mainly to the grain and flesh side of a skin to

Panel 2/1a: Fibre structure: small splitting up



Magnification x 400

Panel 2/1b: Fibre structure: large splitting up



Magnification x 400

The influence of tanning/retanning agents

In addition to stabilising the collagen protein, a function of tanning and retanning agents is to provide filling within the fibre structure. A high degree of filling increases the angle of weave and produces a dense, strong and less flexible structure: an example of this effect deep in the corium is shown in *Panel 2/2a*. The more open structure typical of the belly areas requires more filling than areas that are naturally more dense to make

provide a firm leather. In contrast, *Panel 2/3b* shows a vertical section taken from a very soft leather where the fibres have been lubricated throughout the complete fibre structure.

Realigning the fibre structure

Fibre isolation and splitting, selective filling and controlled lubrication are essential in creating well-balanced leathers. However, there is a massive reconfiguration of the fibre



structure as water is removed in the first-time drying process. This strongly affects the properties and characteristics of the final leather.

Where leathers are dried relatively tension-free the angle of weave is high, and the fibres remain well separated to form a more open structure. This favours softer flexible leathers and an example is shown as *Panel 2/4a*. In contrast, drying under

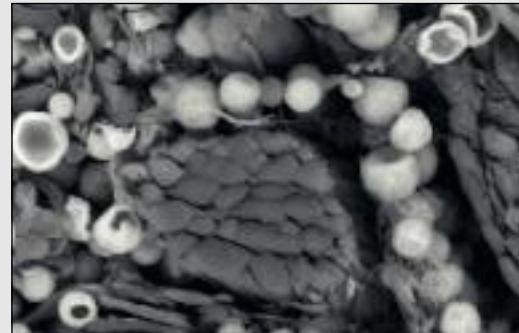
tension produces a lower angle of weave as shown in *Panel 2/4b*. This encourages strong adhesions between the individual fibres, a dense and compact structure, and produces firm leathers with strong shape retention and higher tensile strength.

Harmonisation of these four major stages is needed to ensure optimum performance and leather characteristics. ■

Panel 2/2a: Filling voids: tanning and retanning



Panel 2/2b: Micro spheres (unexpanded) in open spaces in corium layer

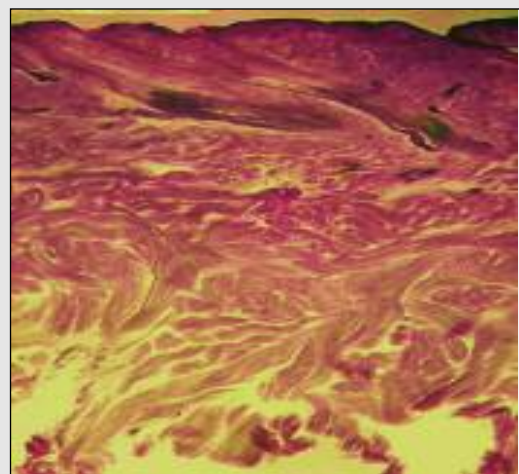


Panel 2/3a: Fatliquor penetration - surface



Fatliquor stained red

2/3b: Fatliquor penetration - deep lubrication for softer leather



Fatliquor stained red

Panel 2/4a: High angle of weave typical of tension-free drying



Panel 2/4b: Lower angle of weave typical from drying under tension



Acknowledgements

• Panels 2/1a and 2/1b and credit Betty Haines: selected from the document "The fibre structure of leather", courtesy of the Leather Conservation Centre, Northampton, United Kingdom.

• Panel 2/2b, image courtesy Lanxess Deutschland GmbH.