Making Leather:
AN OVERVIEW OF MANUFACTURE
Part 10 of 10

Annex

Content

Making leather: THE TECHNOLOGY OF MANUFACTURE
Making leather: FINISHING TECHNOLOGY TO SPECIFICATION

Schematic 1(a)
Schematic 1(b)

Panel 1
Panel 2
“Overview” is a tool for technicians. It follows the most common methods of converting cattle hides into footwear leathers, then expands into different leather types, including small skin manufacture.

It makes it clear that different raw materials suit different purposes. It provides broad leather making principles, and gives insight into refinements that are required.

However, for making leather, a better understanding of the role of force is needed, and the way that chemical processes are designed and controlled.

This is the objective of “Technology”: it builds upon “Overview” for an improved perception of leather making, its development, and its management. “Technology” is for the Leather Technologist.

Technologists are people who have a good understanding of sciences. However, they apply their knowledge to manufacture instead of taking an academic path. In leather manufacture, these understandings include chemistry, physics and materials science. Other essential areas are sustainability, and the environment. These cannot be separated from responsible manufacture.

Central to “Technology” are the three leather making elements:

i] Hides and skins, and the properties that prevail throughout all procedures.
iii] Chemical processes and their management.

It involves:

i] How these elements interlink.
ii] Their manipulation to advantage in commercial leather manufacture.
iii] Sustainable manufacture: more efficient processing, minimised water and energy use, recycling of residual chemicals, and viewing waste as new raw materials.
The intent of “Finishing” is to provide the technology for leather to meet customer requirements. It needs to provide the technologist with knowledge and the ability to meet both aesthetics and performance to specification. This requires a clear-cut perception, since customers want:

- A blend of surface appearance and uniformity. There should be no skin to skin variation, for both manufacturing and end use.
- Individuality: to create appearance specific for a customer.
- Correct performance, for both the manufacture and the consumer.

This is to be provided through delivering:

- A greater understanding of what leather finishing is able do.
- The science needed to change subjective requirements into objective (or measurable) detail.
- An understanding of customer perceptions: for example, colour, filling, covering, adhesion, brightness, handle and texture.
- Some basic manufacturing techniques. This involves some detailing of chemistry within formulations, physics within applications, and requirements for mechanical operations.
- Knowledge to be able to balance performance, appearance and economics.
- Sustainable clean technology as is understood currently (health and safety, environmental).
### Stages of manufacture and procedures

**Bovine hides: chrome tannage: footwear leathers**

**Schematic 1(a)**

#### PROCEDURE

<table>
<thead>
<tr>
<th>Mechanical operations</th>
<th>Drum operations. (many configurations)</th>
<th>Many internal structures. Drums, mixer-type, tri- compartmental vessels. Many sizes and designs.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Chemical processes</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Observations</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Options</td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Stage 1</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Removal of unwanted materials from structure</strong></td>
<td>1st Soak</td>
<td>(weight range specific)</td>
</tr>
<tr>
<td>and</td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Extension of the structure</strong></td>
<td>Green flesh</td>
<td>+/- Lime splitting.Splitting in the limed state offers the best extension of the structure throughout all procedures until the completion of tannage. Also, maximum choice for use of the flesh split.</td>
</tr>
<tr>
<td></td>
<td>2nd Soak</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Unhair + lime</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Lime flesh</td>
<td></td>
</tr>
<tr>
<td></td>
<td>+/- Lime split</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Delime</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Bate</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Pickle</td>
<td>+/- Wet sort (pre-samm). Clear identification of grain defects are possible, due to lack of grain compression and samm indentations. + Blue sort (after samm) Better assessment for area and substance. Easier handling and enables rationalisation.</td>
</tr>
<tr>
<td></td>
<td>Chrome tannage</td>
<td></td>
</tr>
<tr>
<td></td>
<td>+/- Blue sorting/gradings</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Samm</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Side</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Selection: Blue sort</td>
<td></td>
</tr>
<tr>
<td></td>
<td>+/- Blue Split</td>
<td>+/- Blue Spliting. Maximum selections for grain quality/substance. (Note: Shave and trim Stage 1 procedures)</td>
</tr>
<tr>
<td></td>
<td>Shave</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Trim</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Neutralise</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Dye + fixation</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Retan</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Fatliquor/lubricate</td>
<td></td>
</tr>
</tbody>
</table>

Details set down for broad information only with variations in procedures according to hide classification, plant and equipment, and end requirements.
Stages of manufacture and procedures
Bovine hides: chrome tannage: footwear leathers

Stage 3
Removal of water
and
Reconfiguration
Into a flattened form
with specific properties

Stage 4
Application of finish
+ Structural amendment

PROCEDURE

Samm/set
+/- Side
+/- wet stretch/stake
Vacuum dry
in conjunction with
suspension dry
(tension free)
(or)
Toggle dry
(High strain and tension)
(or)
Dehumidification dry
(light tension)
+/- Conditioning
Vibration staking
(may be multiple)
Second time drying.
(tension free)
+/- Milling
Crust inspection
(assessment/evaluation)

Finishing operations
(multi-permutations)
according to
specification and end-use

- Preparation for drying.
- (very occasional)
- May be used before
drying and within drying.
- Many alternatives and
permutations possible
within drying and
mechanical operations.
- Temperature, strain and
compression significantly
influence final properties
of leathers.
- Moisture content adjust.
- May avoid if drying via
relative humidity control.
- Soften to specification.
- Lowering of water content
from staking requirement.
- Soften/texture if required.
- Quality, technical and
aesthetic to specification.
- Formation of new hybrid
grain/finish structure.
- Grain wetting/drying +
compression under heat
and pressure.
- Changes in appearance,
structure and properties.

Details set down for broad information only with variations in procedures according
to hide classifications, plant and equipment, and end requirements.
### Panel 1

**Characteristics of different tannages**

<table>
<thead>
<tr>
<th>Tannage</th>
<th>Properties of dried leathers (tanned only)</th>
<th>Shrinkage temperature (saturated) and Charge</th>
<th>Dyeing, retanning and fatliquoring (anionic products)</th>
<th>Properties of final leathers and End uses</th>
</tr>
</thead>
<tbody>
<tr>
<td>Other tannages (Many options)</td>
<td>White to pastel colours range. Moderately soft / firm.</td>
<td>75°C – 85°C. Anionic</td>
<td>Poor dye properties. Lower requirements for retanning agents and fatliquors.</td>
<td>Soft to firm. Many variations, with mainly glutaraldehyde – type properties.</td>
</tr>
<tr>
<td>Light vegetable</td>
<td>Cream to light brown colour. Moderately soft.</td>
<td>Approx. 85°C. Anionic</td>
<td>Poor dye properties. Low requirement for retanning agents and fatliquors.</td>
<td>Soft to firm with good shape retention. Well filled leather suited for shoe linings and leather goods. Anti-bacterial properties and warm handle.</td>
</tr>
<tr>
<td>Heavy vegetable</td>
<td>Light to red-brown. Firm, with dense structure.</td>
<td>Approx. 85°C. Anionic</td>
<td>Dyeing and retannage mainly not required.</td>
<td>Offers excellent shape retention. Suisited for soiling, harness, belts, moulding and carving.</td>
</tr>
</tbody>
</table>

**Note:**
- Information for general guidance only.

### Panel 2

**Finish variations**

<table>
<thead>
<tr>
<th>Structure</th>
<th>Category</th>
<th>Category</th>
</tr>
</thead>
<tbody>
<tr>
<td>Full grain</td>
<td>Aniline</td>
<td>Semi-aniline</td>
</tr>
<tr>
<td>Corrected grain</td>
<td>Aniline</td>
<td>Semi-aniline</td>
</tr>
</tbody>
</table>