



Back to Basics: A Framework for Leather Manufacture

Richard Daniels and Walter Landmann

Leather drying and conditioning: Paste drying

Overview

Paste drying is a system of first time drying which offers area gain as well as grain improvement along with relatively rapid and very uniform drying. A suitably formulated paste is applied to glass or steel plates, with the wet leather then hand set onto these plates with adhesion via the grain side. The plates travel through a continuous tunnel which circulates steam battery heated air evaporating the water contained in the leather from the flesh side.

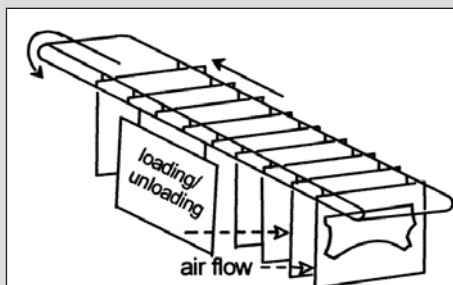
Although the method is seldom used, having been mainly replaced by toggle and vacuum drying, it was a very practical system mainly for corrected grain upper leather production and flash splits. It is technically interesting as the method enabled a strong hand-setting action on the drying plate from the centre parts of the leather, and this caused a gain in area-yield based on the samm/set area. Its shortcomings were due to inconsistencies in adhesion of the leather to the drying plate and the retention of paste to the grain layer. Small changes in leather processing or paste composition could cause leathers to curl from the plates during drying, thus losing potential area, or increased the adhesion so that the grain could be torn away from the leather with severe loss of value.

Objectives and outcome

Paste drying was developed in the United States where it came into general use in the 1930's. Its main application was for drying of leathers for corrected grain production. As corrected grain leather use spread more widely in Europe after 1950 the pasting method was also adopted. By changing the retanning and fatliquoring, the introduction of appropriate pastes, and washing techniques to remove residual paste, it was also possible to past dry some full grain leathers.

Paste drying offers the flesh side to the

Panel E22/1: The paste dryer



frames travel from the loading/unloading station along a single rail through points into dryer on two parallel rails

drying medium (air) which, in the normally adopted drying climate, promotes uniformity in the final water content of the leather. The cellular structure paste dryers are normally divided into zones, thus allowing precise regulation of the drying profile. Temperatures employed normally vary between 40°C and 60°C and relative humidity is regulated to between 35% and 55%. Softer leather types if they are to retain their feel touch require the lower settings.

A principal objective of the method is to achieve a satisfactory yield, and the following details are pertinent:

- Leather prior to pasting is sammmed or samm/set to higher residual water content than when intended for other drying systems. Only 20% to 25% of water is removed mechanically.
- On presentation to the drying plate, it is possible to extensively hand-set the centre parts of the leather towards the peripheral parts. This leads to an overall area extension, while retaining substance in the peripheral areas.

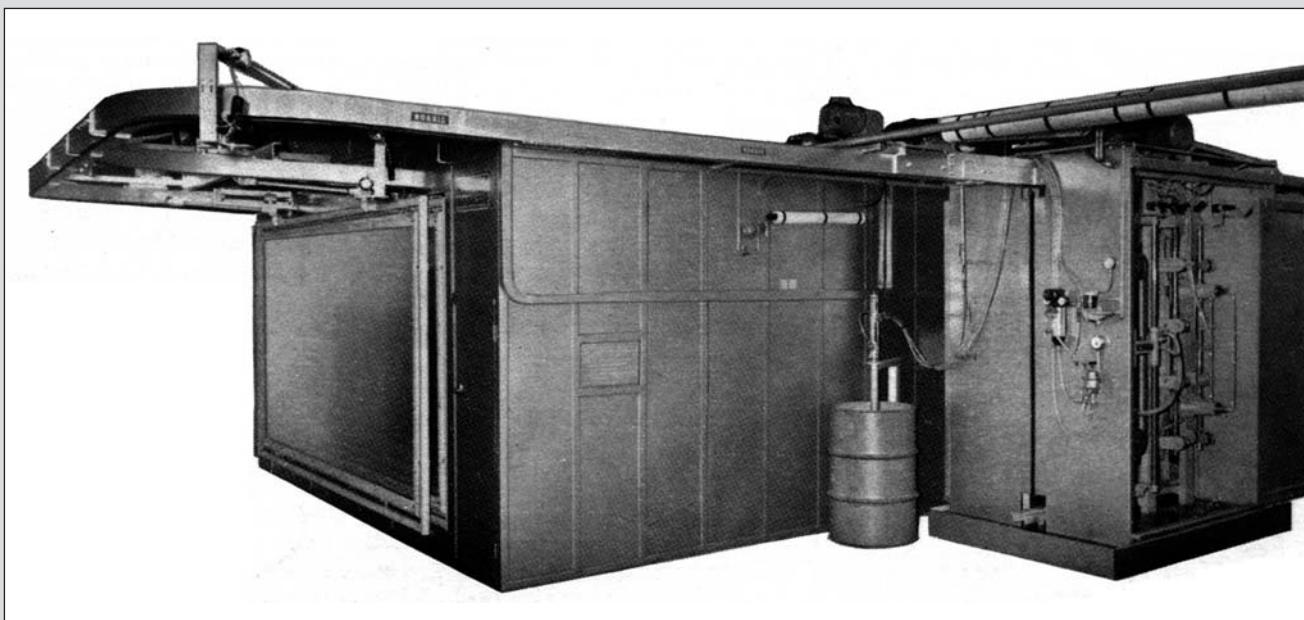
• The drying conditions are

controllable in cells and in sectors.

- Drying across the leather surface is uniform.
- Evaporation is from the flesh side. Free water and unbound volatile substances including many fatliquors, retanning agents and dye stuffs migrates towards the centre leather-layer and flesh surface.
- Over-drying must be avoided to prevent the grain layer becoming hard and inflexible.
- Over-drying can cause excessive adhesion of the leather to the paste. In this situation, when the dry leather is peeled from the drying plates there is a strong danger of grain damage or tearing.
- The final water content of paste dried leather generally needs to be higher than with other drying systems.
- A flat and solid grain face is achieved. This is an ideal condition for the subsequent buffing operation producing corrected grain
- The removal of paste residues when full grain leathers are produced can be difficult. Appropriate paste formulation and washing techniques can help overcome this problem.
- Paste drying leaves no marks or edge damage on the leather (such as indentations or tears from toggle clips) which subsequently need trimming out.
- Permanent area gain through pasting can be considerable.
- Cooling at the end of drying and



Panel E22/2: Typical paste dryer



before removal from the plate removal is required to make area gains more permanent.

- Conditioning is possible by using the appropriate setting in the final cells or sectors.
- The rounded animal shape largely disappears.
- The condition of the axillae is uniform and fuller. There is no distortion or substance loss as can occur in toggling or creasing as can occur in vacuum drying. This helps to improve yield.
- Grain appearance becomes more uniform, with reduced growth marks and flattened wrinkles.
- Lastometer and tensometer readings maybe low when drying conditions are severe.
- Severe initial drying conditions (in the first time drying phase) have little adverse outcome.
- Moderate final drying conditions make for an improved outcome.

Although static paste drying cabinets are sometimes in use, the full objectives and outcome associated with paste drying can

only be attained in the throughfeed tunnel dryer.

The average tunnel dryer generally becomes practical when holding between 50 and 200 plates. Tunnel cabinet construction is similar to that of throughfeed toggle dryers, as they are made up of cells and zones. Cells, depending upon manufacturers design may hold from 10 to 25 plates and a zone constitutes several cells. For example a 100 plate capacity machine would be divided into four or five zones, each with its own drying climatic settings. The settings determine the temperature of the air flow and the relative humidity. Exceptionally, some designs provide air flow velocity variation.

In a typical construction every cell contains a lateral plenum chamber with fan and steam or hot water heater battery. Low pressure heated air builds up in the chamber and is ejected through baffles to flow horizontally across the pasted leather. On the opposite side the air is received and then is ducted back to the plenum chamber where it is reheated. Extraction vents, normally fan assisted, expel the programmed proportion of humidity laden air. Make up vents admit fresh air. Opposing air flow directions promote uniform drying. These are obtained by alternating plenum chambers left and right in successive cells.

Broadly the drying profile in pasting is to expose the leather to the maximum

allowable temperature and the lowest practical relative humidity conditions in the first and second zones. In following zones conditions taper off to the lower end of the temperature range and up to higher relative humidity. The final zone can be used for cooling and conditioning the leather, but frequently this zone is used as extra drying capacity.

Temperature and humidity setting and monitoring tend to be governed by analogue instrumentation. Electronic programming and control is rarely if ever employed as paste drying plant is no longer manufactured.

Early on paste drying equipment was more generally known under the name of glass plate dryer. This arose from the practice to manufacture the drying plates from thermal shock resistant glass plates mounted flexibly in tubular steel frames. Later vitreous enamel coated steel plates mounted in simple fabricated frames came into general use.

A paste plant includes plate washing machinery, paste spraying equipment and motorised overhead conveyor track to take the plates in to the drying tunnel and to push them through in a time controlled manner. Spacing of the plates in the tunnel is at 100mm. ⚙️

Legend

*"The Machines in the Tannery" - Walter Landmann:
1) Paste dryers: Pages 228 to 229.*