Improving the traditional vegetable tanning process

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Vegetable tanned leathers are typical of the high-quality leathers produced within the tanning district of Santa Croce sull'Arno, Italy. This is the oldest and most classic type of leather, combining the values of quality and tradition.

To safeguard and improve these traditional leathers, it is recognised that the tanning industry not only needs to pay more attention to the process, but also employ new technologies to guarantee better production constancy.

Investigations by Polo Tecnologico Conciario *(Po.Te.Co)* indicate that the parameters within an established process that mainly affect the production of vegetable tanned leathers are:

- The temperature reached inside the drums.
- The mechanical action to which the hides are subjected during the processing.

Normally, to promote penetration of vegetable tanning agents during the tannage, tanners operate with rather short baths and long processing times—typically between 20% and 50% water based on pelt weight and between eight and 10 hours running time. However, this high level of mechanical action can cause the temperature to rise and, in the early stages of tannage, the hides are very sensitive to thermal damage.

In addition to these control-related problems the hides can also be subject to grain damage. This is due to friction within the system, and is directly related to:

- Quantities and size of the hides in process.
- Quantity of water.
- Roughness of the inner walls.
- Speed of drum rotation.
- Quantity and types of chemical used, especially those in powder form.

The load size, quantity of water and chemicals, and rotational speed of the drum within the process are based on a balance between the quality of the finished product and productivity. The only aspect not connected with productivity, but crucial for the quality of the finished product, is the smoothness of the drum inner walls and any pegs or paddles that are fitted.

Innovation in drum construction

When polypropylene is used in drum construction, the root cause of damage by mechanical action can be eliminated. In time, the interior of wooden drums can become rough and splinter because of stress and wear. However, polypropylene drums maintain a smooth interior because polypropylene is incapable of swelling or absorbing chemical even after long use.

The versatility of this material allows for new design features, including the construction of a space between the inner and outer skin of the drum. This provides a new way of keeping the process temperature under control, as water at a carefully controlled temperature can be circulated throughout this space. This means that for the first time mechanical requirements (controlled by the number of revs/min), can be completely separated from temperature effects. The temperature within the process can be controlled independently: there is never a need to increase the running times or speeds of rotation to maintain or increase the temperature of process.

It is also very important to emphasise that this heat-exchange occurs across a wide surface area—practically the entire drum—and with low thermal differentials. This provides a gentle heat exchange and avoids the problems caused by conventional heating methods, which are intense and localised, and capable of damaging sensitive vegetable tanning agents or hides and skins. ➤



Panel 1

Shoulders and butts traditionally processed by the company

	Shoulders	Shoulders	Bull butts
Hides:	*From* 32+kg	*From* 32+kg	*From* 32+kg
Number:	700	700	440
Origin:	France	France	France
Split:	4.0/4.1 mm	4.0/4.1 mm	5.0/5.1 mm
Vegetable tanning:	***with*** dyeing	***without*** dyeing	***with*** dyeing

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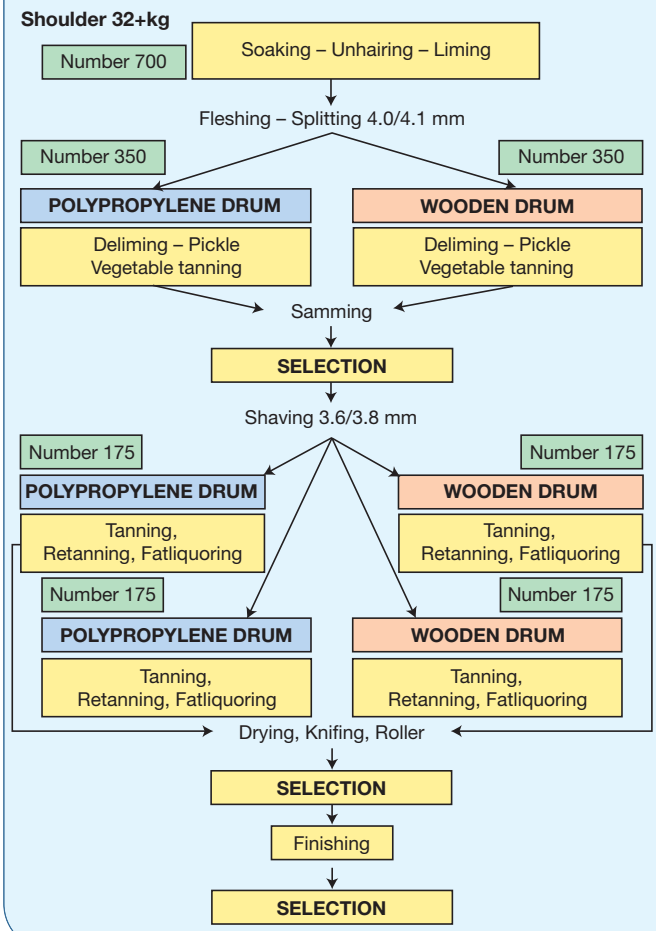
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Panel 2

Trial Procedures



Panel 3

Quality assessment of shoulders and butts: Processed in wooden and polypropylene drums

Properties	Assessments Score (from 1 to 10)	
	WOOD	POLYPROPYLENE
Grain appearance	7	8
Tendency to loose grain	8	8
Fullness	9	9
Roundness	8	8
Colour cleanliness	7	8
Dying yield	7	8
Feel	7	8
Abraded grain	5	8
Peg scratches	6	10

Comparing polypropylene and wooden drums

To demonstrate how fundamental temperature and mechanical effects are within the vegetable tanning process, three investigations were conducted on industrial scale to compare the outcome from processing in wooden and polypropylene drums. These drums were of the same size (three metres in diameter): the polypropylene drums were provided by Italprogetti Engineering, the wooden drums made available by the tannery were used daily for tanning, retanning, dyeing and fatliquoring

various types of shoulders and butts.

Shoulders and butts were used for the investigations, being traditionally processed by the company for the leathergoods sector. Details are given in *Panel 1*.

1) INVESTIGATION USING SHOULDERS

Shoulders from 700 French hides of weight 32+kg (a standard load for the company) were processed in a single drum to the unhaired/limed state. After fleshing and splitting, they were then divided in two lots of 350 shoulders with the subsequent processing carried out in polypropylene and wooden drums. After pressing and levelling, the hides were retanned, dyed and fatliquored in the two types of drums. These leathers were then dried, reconditioned and properly selected. The procedures used are given as *Panel 2*.

2) INVESTIGATION USING SHOULDERS (Undyed)

A second investigation was carried out in a similar manner to Investigation no.1, but for the production of non-coloured leathers (natural colour). Except for omitting the dyeing process, the procedures were the same as used in the first investigation.

3) INVESTIGATION USING BUTTS

440 butts were processed in this investigation, being the standard load size for the company.

The procedure used was similar to that of the shoulders, but synthetic tanning agents were used for the tanning. After fleshing and splitting, the pack was divided in two lots of 220 hides for each tanning drum, then sub-divided after shaving at 3.1 to 3.2 mm into four lots of 110 each for retannage, dyeing and fatliquoring.

Observations and assessments

When using wooden drums, an increase in temperature occurred in the final stages of tanning, causing a slight overheating of the hides. The space between the inner and outer skin of the drum constructed within the polypropylene drums enabled the temperature to remain under constant control throughout the entire tanning process.

The pieces were assessed after tanning and before shaving, after the drying to the crust state, and finally on the finished product. These assessments were performed by the company's technical experts to the market properties required of these types of leathers. These findings were rated on a scale of 1 to 10 and the results are in *Panel 3*.

Findings from the investigation

- Peg scratches were absent from the shoulders and butts processed in the polypropylene drum, providing an improved selection when compared to pieces processed in the wooden drum.
- There was a dramatic reduction of pieces with slightly abraded grain. This is of primary importance because it will allow the production of leathers with extremely transparent finishes, thus enhancing the quality of these leathers.
- There is the potential to rationalise the tanning, retanning dyeing and fatliquoring operations as problems related to temperature control and mechanical effects can be completely avoided.
- The drum cleaning operations were extremely fast with less consumption of water.

