

Closed-loop liming and chromium tanning systems in industrial practice

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Huanghua Defu Leather Industry Co. Ltd. processes raw bovine hides and calfskins, mainly from the US, for higher-quality footwear leathers. The total hide input is 12,000 hides per week. No wet blue sales or contract tanning takes place; everything is used in-house.

The tannery was constructed in 2003, but owner, Wang Yijun, has decided that the existing plant should be replaced with a new tannery, which he plans to complete in 2018. This has not prevented the company from investing in new technologies to improve existing operations, with the focus on maintaining high-quality wet blue – with special attention to grain fineness in the high-value calf production – while lowering the environmental impact of the tannery, improving effluent treatment and reducing chemical and water use.

Technology to facilitate this was introduced by Chinese leather chemicals manufacturer Biosk¹, and eliminates wastewater discharges both from unhairing and liming processes and from chrome tanning. The technology was implemented in two stages at Huanghua:

- 1] After trials, the first closed-loop procedures were brought into operation in the early part of 2016 for the collection of all the floats at the end of tannage, without any washings. Hides are dumped together with the float into stainless steel containers placed beneath each of the six tanning drums, then stacked in an area bunded with polythene in front of each individual drum. All of the drainage is delivered using dedicated pipework to a chrome collection sump located outside the tanning department where it is mixed, settled, filtered and delivered into two holding sumps, each of 30m³ capacity. Each sump is fitted with steel pipework for circulation of hot and cold water for accurate temperature control. One sump is maintained at 23°C and is used within the pickle as a chrome pre-tannage. This is followed by chrome addition for the main tannage using magnesium oxide for basification, then a second chrome addition at 75°C from the second sump to complete the tannage. At 0.2% chrome in the recovered floats, a reduction in the offer of chrome powder can be made, as well as reduced offers of salt, acid and water.
- 2] Following detailed trials on the two liming systems (*different techniques are used for calf and for cow hides*), new hair-saving liming systems were introduced. Used floats are collected, filtered and delivered into sumps for reuse either in calf production or bovine hide processing. For example, with an input weight of 6.5 tonnes calf and 7.0 tonnes cow hides, a low float of water is added to the skins or hides, followed by 25% recovered lime float from the appropriate collection sump. This is mixed by turning the drum before liming and unhairing chemicals are added.



Presentation of clean grained limed hides to the lime splitting operation.

Recovered lime liquors are not added directly, but pumped to containers on the feed mezzanine and then discharged into the drum.

After three hours the floats are drained from the drum, filtered to recover hair, with the float returned to the liming drum. A second addition of recovered lime bath is made for controlled swelling, with the drum turned occasionally to complete the process. The total float at the end of process is 200%/180% (*calf/bovine respectively*). At the end of the process the limed goods are dumped without washing, with the used floats being filtered and delivered to the collection sumps. These procedures have now been in use for 12 months.

Although there is no effluent for disposal or treatment from unhairing and liming, there is a continuous removal of some of the water – together with dissolved salts – due to alkaline swelling within the hides. This means that some fresh water is always needed as an addition to the process, and it is said that this reaches stability in five process cycles. Similarly, within tanning, analysis shows that the total solubles (*chloride/sulfate*) gradually rise to stability after the processing of 20 packs.

This closed-loop approach to the liming and tanning process, developed by Biosk, has enabled the tannery to continue the manufacture of leather to the standards required. Moreover, there have been significant savings in chemicals and water, and the elimination of effluents from these two difficult processing areas of leather making. ©

Legend

[1] Please see *World Leather* August/September 2016, "A radical approach within liming and chrome tanning technologies". This report by R.P. Daniels is based on visits to three tanneries using this technology.