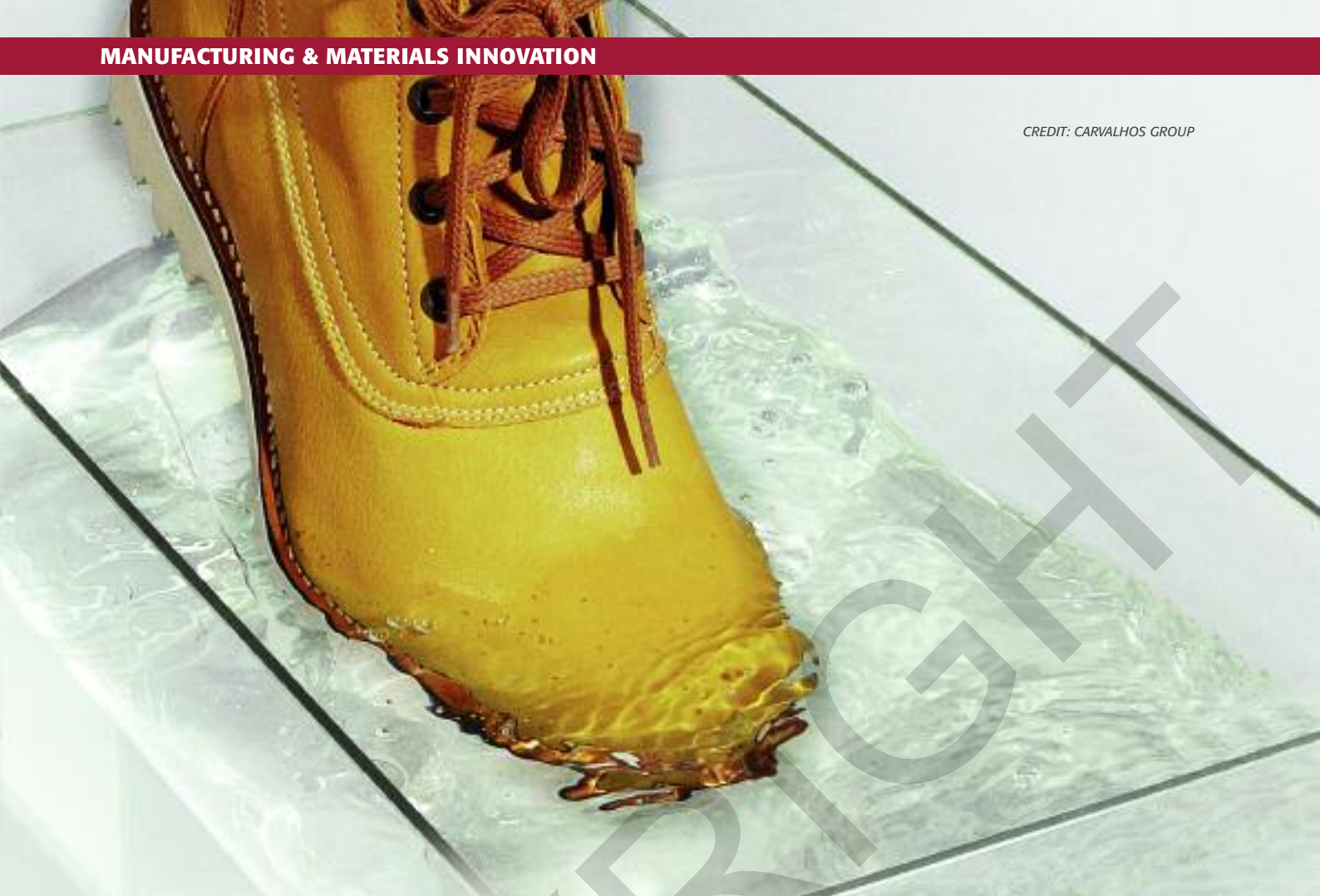




Three in one

In recent years, a combination of media and consumer concern has led to increasing pressures on tanners to review certain of their processing operations. A key area has been the use of chrome tannage. Although only chrome III compounds are used, it has been shown that, under certain conditions, this harmless form can oxidise into chrome VI which is a potential health risk even though we have been using chrome tanning, apparently safely, for shoe upper leathers for well over one hundred years.

This has led to the development of wet white tanning systems which use combinations of synthetic and vegetable tannins, glutaraldehydes and mineral such as aluminium and zirconium as alternatives to chrome compounds. They are thus free of base metals which not only eliminates the potential risk to health factor but also makes them far more biodegradable. One tanner that has gone down this route is Portugal's Carvalhos Group with its OakLeather range of materials for shoe uppers that

features some positive properties for both shoemakers, consumers and the environment.

METAL-FREE LEATHER

The first of these is the metal-free factor, based on a wet white tanning system that also incorporates tannins extracted from the bark of oak trees. The original development work began around 10 years ago and was focused on the automotive sector which was a prime mover in the development of wet white tanning to aid biodegradability at end of life for car seats. The range has now expanded to other uses including leathers for furniture, leathergoods and shoe uppers and linings.

A demand for metal-free leather in footwear has increased with requests from makers of shoes for babies up to three months and toddlers of up to three years. This follows concerns that small children sometimes put their feet (and shoes) in their mouths, making metal-free options attractive to concerned parents. The use of this material has

since extended through into adult footwear and the range now also contains leathers offering a further two useful properties.

BIODEGRADABLE LEATHER

The second is a leather that is designed to be completely biodegradable once an article has reached the end of its useful life. This breakdown is complete within a period of two months under normal conditions of moisture and temperature as found within landfill, and in accordance with the conditions of ISO 20200-2004 (*Figures 1-4*). Known as BiOnature this product was developed by the Carvalhos Group through joint investigations with the faculty of science and technology (FCT) of the Universidade NOVA de Lisboa, and the leather and shoe technological centres CTIC in Alcanena and CTC, France.

WATER REPELLENT LEATHER

More recently, the project has expanded further to create a leather within the same family that is water-

repellent as well as metal-free. This has been called HydroOak and was initially aimed at the outdoor footwear sector covering activities such as hiking, mountain walking, sailing and golf. To achieve this within the scope of a metal-free leather making process, products were identified and incorporated within wet processing to link and maintain waterproofing agents within the fibre structure and create an effective barrier to water penetration and uptake.

Extensive testing has shown that leathers from this range perform extremely well in terms of repelling water. For instance, they are able to withstand over 420 minutes of flexing using the Bally Penetrometer (crank motion 15%, and visual end point), with a final water uptake of 13.2% at that time. They will also withstand more than 25,000 cycles using the Maeser Penetrometer (alarm for end point), with a water absorption of 8.2% at that time. These results have been verified by CTIC, the parameters being tested across several analyses with excellent

repeatability and confirmation that these leathers are chrome-, heavy metal- and CFC-free.

ENVIRONMENTAL ADVANTAGES

These new leathers offer distinct environmental advantages all round. As far as the consumer is concerned, they meet all the parameters normally expected such as colour- and light-fastness and smoothness of grain surface, while remaining within the same price range as normal chrome-tanned or wet white leathers.

The raw material used to produce them is taken from fresh Iberian hides that have been preserved by cold storage and without any use of preserving agents. As a result, there is a lower level of salinity for ultimate discharge which, when added to the possibility for high-grade use of both fleshings and trimmings, also helps to control costs.

Another big plus is, of course, the absence of any chromium-based products which in light of ongoing consumer concerns with regard to

chrome VI can only be seen in a positive light. This also avoids the need to separate chrome-containing waste-waters for subsequent treatment, simplifies the management of effluent treatment and solids disposal, and therefore again reduces costs.

A further advantage is that as solid waste products from the tannery are metal-free, they can be used as a component in fertilisers. At the same time all dyestuffs used are also metal-free and the finishing systems water-based thus again simplifying the treatment of emissions.

A change in drying operations inside the tannery has also taken place whereby vacuum driers are no longer used, leading to considerable energy savings and a lower carbon footprint. Instead, the leather is suspension-dried using on-line pole conveyors that circulate in the roof areas of the finishing department. Although this requires a longer drying time, it utilises heat from the finish drying cabinets which again reduces energy consumption. 🌱

COMPOSTING UNDER LABORATORY CONDITIONS



Figure 1. The test shoe was produced using only biodegradable components with uppers and linings made from BioNature leathers.



Figure 2. After 7 days the shoe shows colour fading and degradation of the fibre structure. This compares to a similar breakdown after 17 days under natural composting conditions.



Figure 3. After 14 days degradation of the leather structure is profound. This compares to 31 days under natural composting conditions.



Figure 4. After 21 days the shoe has now totally disintegrated. This compares with 2 months under natural composting conditions.