

Eco-friendly leather

Professor Roberto Bianchini describes his efforts to replace petrochemical compounds with natural derivatives in the leather tanning process, the importance of working closely with technology experts, and potential benefits for industry and the environment alike

Can you provide a brief outline of the aspects of the leather tanning process that your project addresses?

The tanning process is very complex because leather has to be heavily treated to become resistant to the passage of time, weather, etc. There are a number of steps to arrive at the finished product, one particularly important stage being the defatting of the skins. This is achieved with products that can be very dangerous for human health and for the environment: chlorinated solvents and alkylphenols.

The LIFE-ECODEFATTING programme aims to use eco-friendly processes instead. This project will demonstrate a new class of products with natural origins, capable of substituting chlorinated products currently used in the defatting phase of the leather tanning cycle. Ultimately, we aim to produce leather products with a significantly higher eco-sustainability profile.

You have identified the petrochemical products used in this process as harmful. Can you explain the ways in which they cause environmental harm?

Chloroalkanes and alkylphenols both bio-accumulate in the environment. Chloroalkanes can oxidise chromium from Cr(II) to Cr(VI) in products released into the environment. This is particularly concerning, as Cr(VI) has a proven link to cancer. Moreover, alkylphenols are thought to cause metabolic disruptions in humans.

How is LIFE-ECODEFATTING going about identifying replacement natural products for these petrochemical products, and how was the project initially established?

The project uses sugar derivatives that have already shown effective interactions with animal

skins. LIFE-ECODEFATTING is a consequence of results already obtained by the ECODEFATTING (Environmentally friendly natural products instead of chloroalkanes in the fatting phase of the tanning cycle) and BIONAD (Naturalised dyes replacing commercial colorants for environmentally friendly leather dyeing and water recycle) programmes, two completed EU LIFE programmes. Our final aim is to improve the overall treatment of leather and its environmental impact, which is considerable due to the amount of water consumed and the diffusion of the leather industry across Europe, mainly in Italy and Spain.

How closely are you working with industrial partners to ensure the project's success?

Our interaction with the Technological Institute for Footwear and Retail Industries, (INESCOP) – a Spanish service organisation – is close, and INESCOP is directly involved in the skin defatting process. The Environmental Department at INESCOP develops different activities within the environmental field, offering its services with the aim of providing a comprehensive solution to companies in footwear and similar sectors. The organisation has extensive experience in the study of environmentally friendly tanning technologies, as well as the development of innovative new processes. It also has different pilot installations aimed at the technical and environmental improvement of leather tanning processes. The Department has participated in the investigation and development stages of several projects, as well as in the introduction of new technologies both at a national and international level.

We are also working with the Italian National Research Council (CNR)'s Institute of Chemistry of Organometallic Compounds (ICCOM) to find spectroscopic evidence for the new eco-compatible strategy, and with the Newport tannery to test our new materials.

Newport is primarily concerned with the natural defatting of cattle skin, while INESCOP deals with sheep skin.

What does your institution, the University of Florence, bring to the project?

The University's Chemistry Department (Ugo Schiff) furnishes new formulations to optimise the process, as it is equipped with a modern laboratory and computational instrumentation, and up-to-date experimental apparatus.

Will the outcomes of the project benefit industry?

The benefits for industry will be extensive. For example, the use of defatting products will allow leather manufacturers, as well as consumers of tanned leather, to obtain the European Ecolabel for their products. This ensures compliance with Ecolabel parameters related to leather and its processing (eg. chromium III content in wastewater; arsenic, cadmium and lead content in products).

Encouraging the uptake of new processes in traditional settings can be challenging. Do you envisage any issues arising from communicating these new concepts across the EU leather tanning industry?

We do anticipate problems in convincing industries to change their normal approach to the defatting process, and perhaps also the machinery they use. However, the structure of EU LIFE projects offers good opportunities to tackle this, since applicative demonstrations are at the heart of the programme.