Recycling of waste leather from footwear and other industries.
LIFE97 ENV/UK/000489

Project description  Environmental issues  Beneficiaries  Administrative data

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Project description:

Background

The European footwear industry produces in excess of 1000 million pairs of footwear each year, of which 70 percent has a leather upper material. It has been estimated that this process generates 100,000 tonnes of leather waste, most of which is disposed of by landfill or incineration. However, increasing legislation and environmental concern is resulting in these disposal options becoming more difficult and hence more expensive. The European Footwear industry is already under price pressure from South America and Asia and increasing costs due to waste disposal will hinder the ability of a company to compete on the world market. An industry wide approach would help to identify viable means of recycling leather, particularly finished leather. This would benefit not only footwear manufacturers but also industries such as furniture and automobiles. Efforts have already been made to recover useful materials from waste leather, such as chromium compounds by incineration and proteins by chemical digestion, or to use it as a filler in bricks and concrete, but these have not yet led to significant commercial processes. This project therefore sought to recycle waste leather with minimum pretreatment to produce commercially viable novel materials that could be used in the industry which generated the original waste, or other industrial sectors using similar materials.

Objectives

This project aimed to develop at least one commercially viable recycling route for finished leather, thereby lessening the environmental impact of the footwear industry and improving its competitive edge by reducing waste disposal costs. The use of products containing waste leather would be demonstrated in applications in footwear and other industries. The objective of finding a viable recycling route for finished leather was to be achieved by: - compression
moulding an intimate mix of binder and leather fibres - incorporating leather fibres into a nonwoven fabric - using leather fibres as a filler for polymeric systems. A comprehensive study would be undertaken to quantify what leather wastage there is in footwear and other industries such as clothing and furniture. SATRA had existing data on footwear production and leather usage, but this lacked detail. For the purpose of this study, information would have to be collected on the composition of the leather market such as type of leather (e.g. cow, pig or goat), type of tannage used and nature of finish. It was possible that these factors would affect the recyclability of the leather. Leather fibre properties would be fully characterised using techniques such as optical and scanning electron microscopy, FTIR, GCMS and wet chemical methods. Activities were also to be undertaken to disseminate information, both during and on completion of the project. This was to include in-house publications, trade journals and two seminars, at which use of the leather fibre containing materials would be demonstrated.

Results

The survey on leather usage and waste found that the percentage of bought leather reported as going to waste ranged from 10% to 39%, with a mean value of 25%. Leather samples collected had varying chemical and physical properties and mixed ground leather was found to comprise particles and fibres in a range of sizes. The processes tested included: compression moulded boards prepared from leather fibres with a range of binders; exploratory trials mixing leather into various polymers as a filler, before compression moulding plaques; and incorporation of leather in the manufacture of synthetic fibre nonwoven lining materials. It proved difficult to identify potential applications for the materials. Flexing resistance of the boards was insufficient for footwear insoles or soles, for soft furniture their leather content is likely to lead to poor dimensional stability, and for hard furniture their strength would be inadequate. In flooring and building, the variable consistency and strength presents certification difficulties. The nonwoven materials have a mottled appearance and leather smell which might prove attractive in some applications. Of the three types of products tested, the filled polymers appear to have the most potential, but these do not offer significant property advantages over conventional materials for footwear and related applications to offset against the cost of processing. In summary, the project showed that at present there is no strong incentive to develop commercial products based on recycled upper leather waste. However, as disposal costs increase, especially if leather ever becomes scheduled as a special category of waste requiring separate handling, the picture may change. The project met the objective of demonstrating products manufactured from waste finished leather, but was not able to develop a recycling route that is at present technically and economically viable. However, compression moulded boards and filled polymers were shown to have potential, given further technical development and conditions which favour recycling. Nevertheless, the project has generated a considerable body of knowledge which will be invaluable if and when conditions are favourable. If, or more likely when, the routes for recycling waste finished leather identified in the project become attractive for commercial exploitation then the anticipated environmental benefits (reduced disposal of materials to landfill and incineration, with consequent reduction in emissions of substances to land, water and air) will be achieved.
Environmental issues addressed:

Themes

Waste - Industrial waste
Industry-Production - Leather and Footwear
Waste - Waste recycling

Keywords

industrial waste, waste use, waste recycling, leather industry, furniture industry, clothing industry

Target EU Legislation

- Waste

Natura 2000 sites

Not applicable

Beneficiaries:

<table>
<thead>
<tr>
<th>Coordinator</th>
<th>SATRA Technology Centre</th>
</tr>
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<tbody>
<tr>
<td>Type of organisation</td>
<td>International enterprise</td>
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<tr>
<td>Description</td>
<td>SATRA Footwear Technology Centre is believed to be the largest independent research and technology organisation in the world devoted to footwear and footwear materials. Founded in 1919 SATRA has over 170 employees and serves over 1200 member companies (650 located in the EU) in over 50 countries worldwide. ELKEDE is the institute responsible for technical support, training and research to the Greek footwear industry and employs 26</td>
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</table>
highly qualified staff.

**Partners**
ELKEDE Hellenic Leather Centre

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**Administrative data:**

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<th>Description</th>
<th>Details</th>
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<tr>
<td>Duration</td>
<td>01-JUN-1997 to 01-MAY-2000</td>
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<td>Total budget</td>
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<tr>
<td>EU contribution</td>
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<td>Project location</td>
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</tbody>
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