



The Realisation of a 'Zero Waste to Landfill' Approach in the Manufacturing Sector

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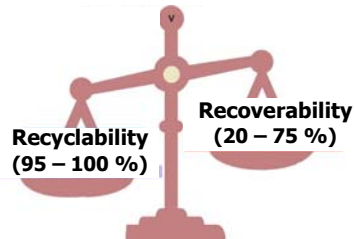
Presentation Contents

Sustainable Product Recovery and Recycling

- Recoverability versus Recyclability
- Existing Product Recovery and Recycling Applications
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Recoverability versus Recyclability

- **Recyclability** : Ability to remanufacture and reuse the entire product or some of its parts and components and/or to recycle its material content.
- **Recoverability** : Ability to collect, sort, disassemble the parts or components and/or to separate the materials content of a product at the end of its useful life.

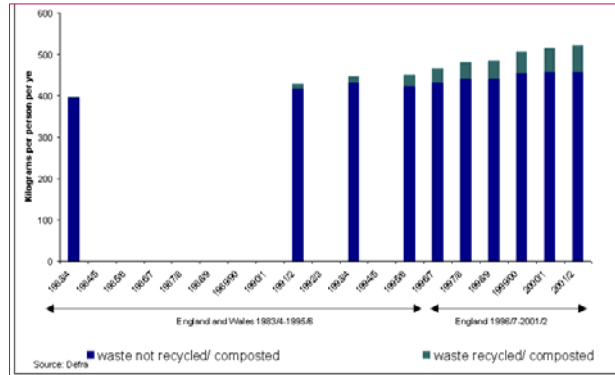


Existing Product Recovery and Recycling Applications

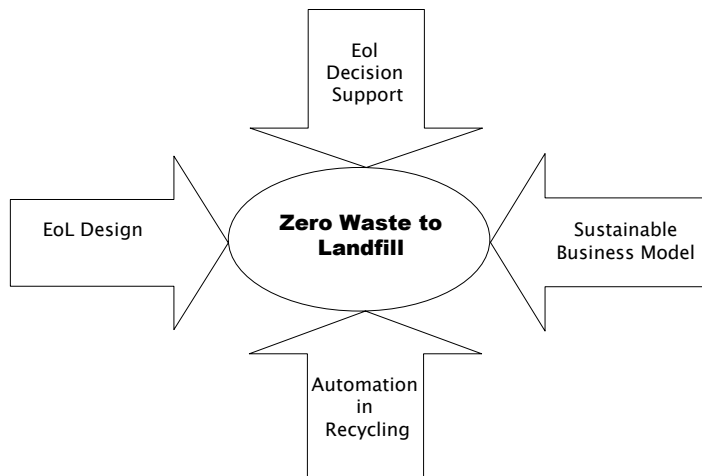
- Well established recovery and recycling sectors
 - Automotive
 - Packaging
- Recently established recovery and recycling sectors,
 - Electrical and Electronic
 - Furniture
 - Carpet
- New/future recovery and recycling sectors
 - Textile and Shoes
 - Fuel Cells,

Household Waste And Recycling Per Capita in UK

Rebound Effect : The increase in waste generation is outstripping any gains made through increased recycling.



Major Factors Influencing Sustainable Product Recovery and Recycling



EoL Design : End-of-life Product Considerations to Support Design

- existing theoretical design paradigms including 'design for environment', 'design for disassembly' and 'design for recycling' **have failed to significantly increase** the recoverability and recyclability of products.
- The increased **end-of-life value recovery** will be of paramount importance.
- End-of-life knowledge** (disassembly indices, material recyclability, efficiencies of current automated separation technologies, calorific values for energy recovery technologies, etc.) must be feed back into the product development phase.
- Hence, the requirements for international collaboration regarding the integration of end-of-life product requirements into **widely adopted manufacturing design tools and standards**.

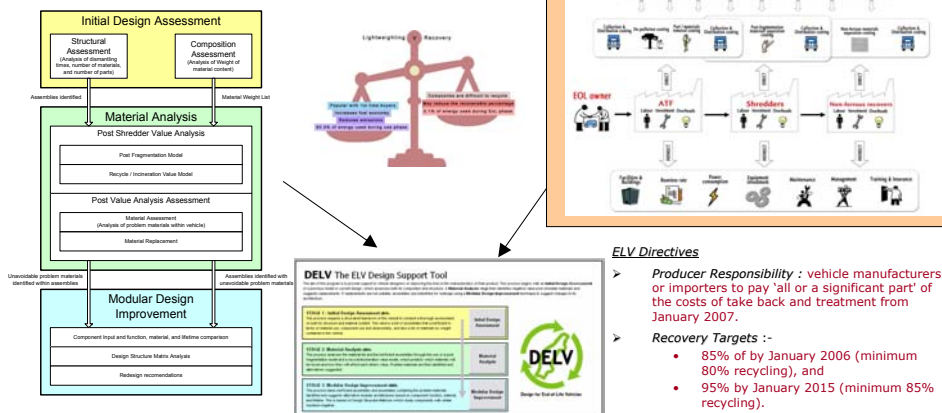
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EoL Design : Case Study _ End-of-Life Vehicle Recovery

End-of-life Management

It is estimated that around 2,000,000 cars are scrapped in the UK every year, from which :-

- 1,400,000 million are true ELVs,
- 400,000 crashed/premature write-offs, and
- 300,000 are abandoned vehicles.

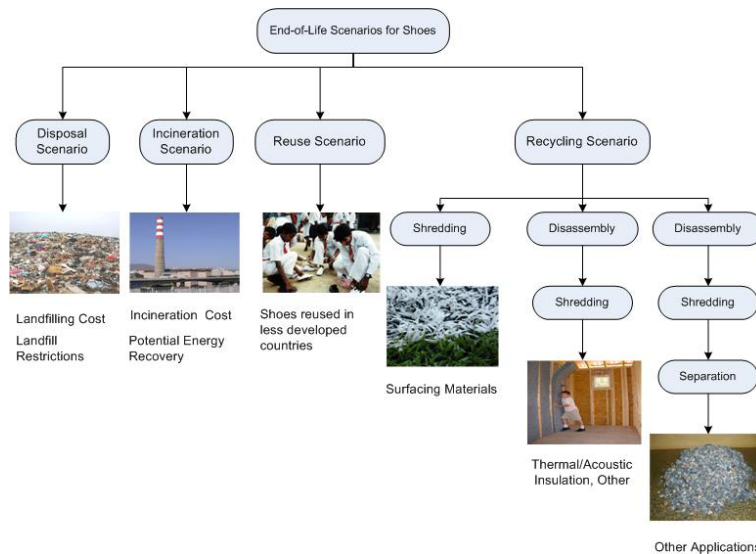


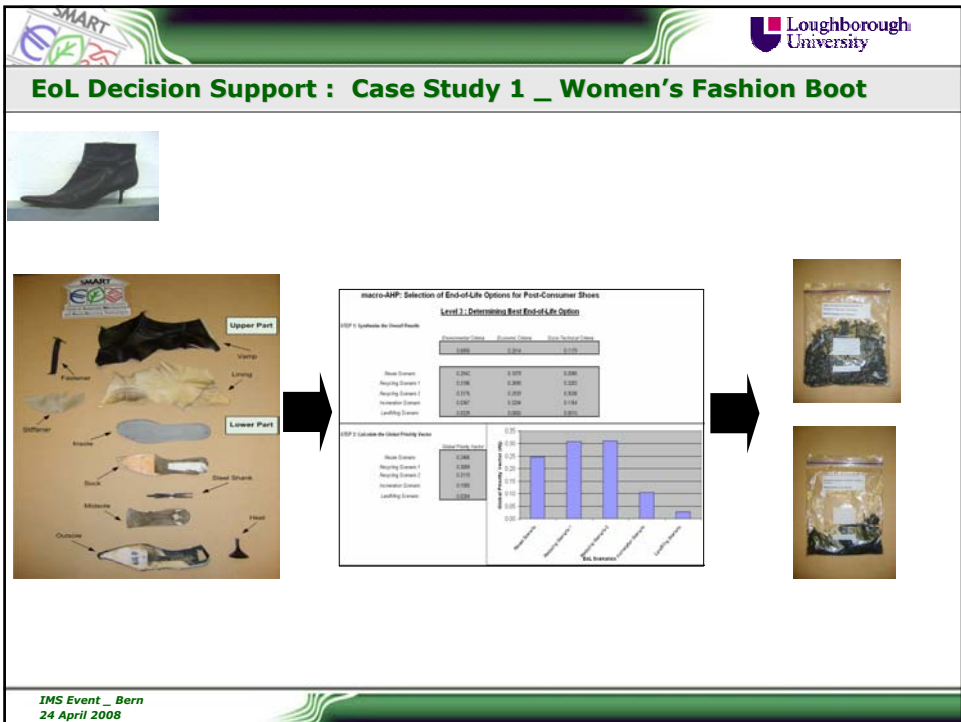
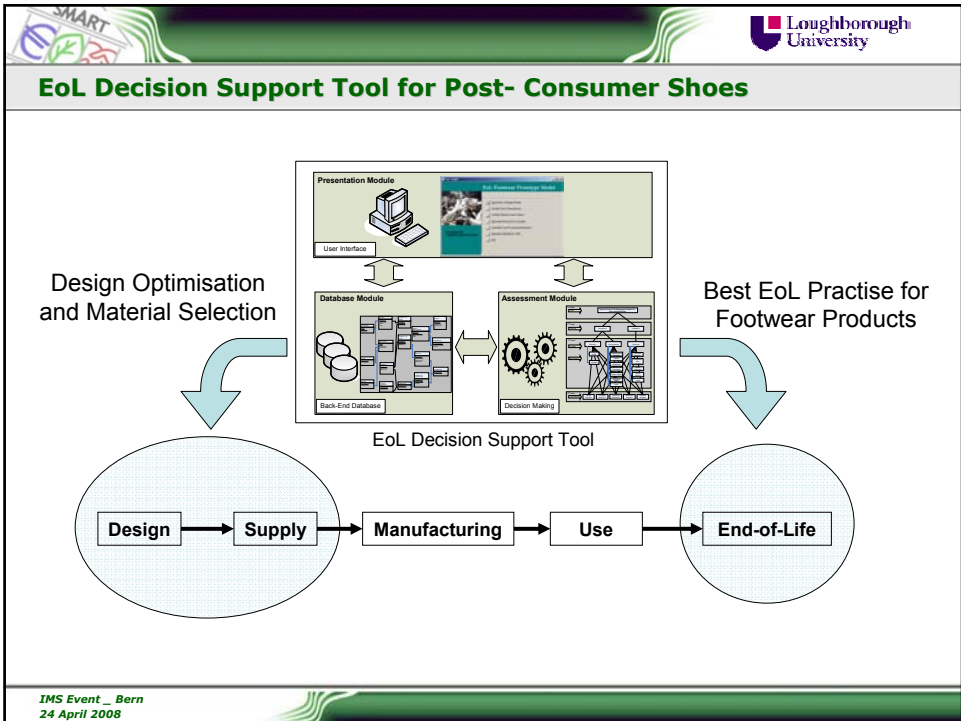
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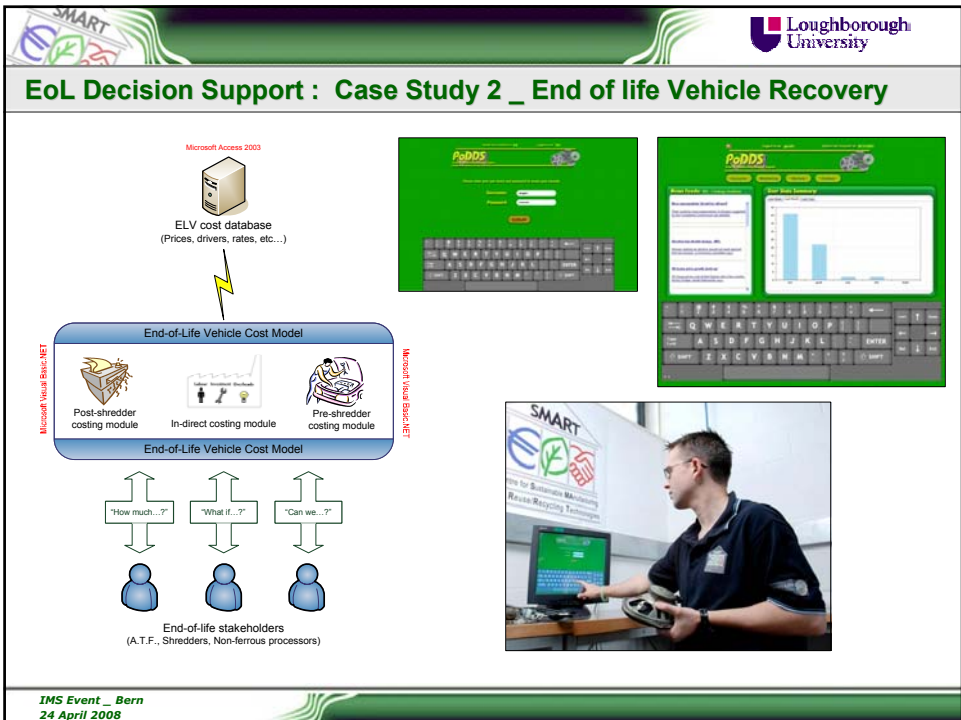
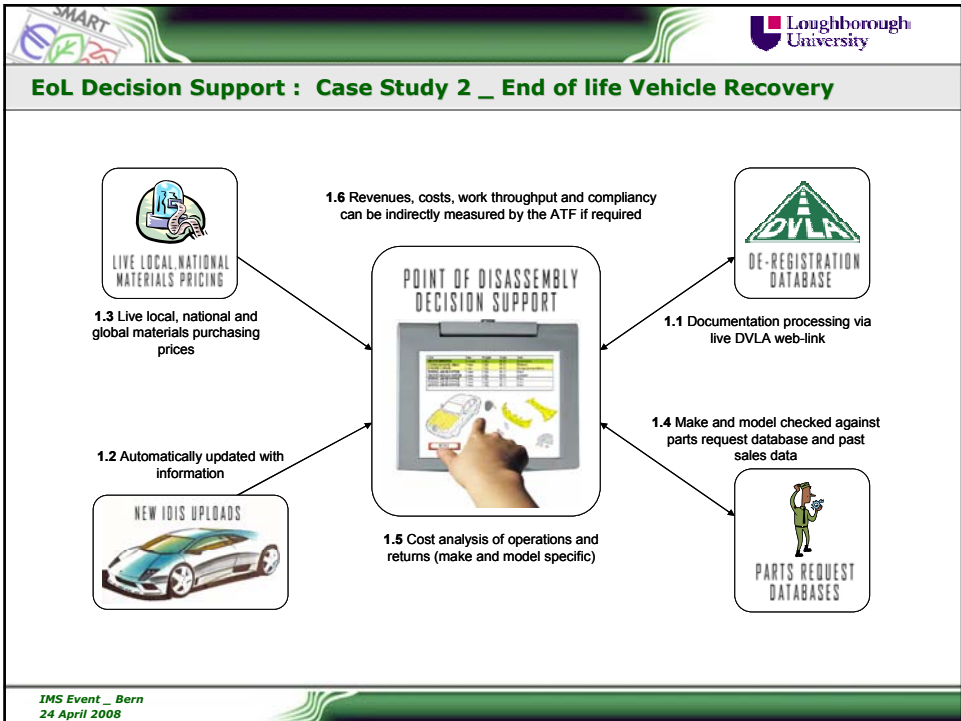
End-of-life Decision Support Systems

- The current end-of-life product processing is based on legislative de-pollution requirements followed by value recovery based on **large-scale fragmentation and separation technologies**.
- The potential to recover **additional encapsulated value** via more traditional recovery methods, such as disassembly, **have been negated due to uncertainties** in 'potential recoverable value' versus 'cost of processes and labour'.
- The existing solutions to provide '**decision support**' at end-of-life are infeasible to apply in practice or have been developed for a specific product family.
- Hence, the objective of the international collaborative area would be to consider the most effective methods of **automating the decisions making involved in end-of-life processing** across various industrial sectors.

EoL Options for Post- Consumer Shoes







The Next Generation of EoL Recovery and Automation Technologies

- The decision as to whether an end-of-life product should be **dismantled or shredded** involves a number of competing issues based on the product characteristics and the economics of the available recycling technologies.
- **Automation is becoming increasingly necessary** in the recovery industry due to the expected growth in the scale of reclamation activities.
- To date a great deal of **emphasis** has been placed on **upstream design initiatives** (design for dismantling, design for modularisation) to facilitate part recovery.
- Yet, the reality is that the EOL **product recovery sector has moved away** from this practice and embraced more automated post-fragmentation technologies, and hence a case for '**Design for Shredding**'.
- It is widely accepted that **post-fragmentation recovery** of EOL products is **mainly in its infancy**, which highlights the requirements for a global research effort to improve recycling technologies.

EoL Automation : Case Study _ Nike ReUSE A SHOE Scheme





Sustainable Business Models for Product Recovery

- Fundamental questions have been asked about **the long-term viability of traditional manufacturing business models based on the 'mass production and consumption of cheaply produced goods'**.
- In a number of industrial sectors, the manufacturers must accept **the financial responsibility for the cost** of collection, recycling and safe disposal of their products at the end of their functional life.
- Hence, the need for **new sustainable business models** that meets the legislative, environmental and ethical standards whilst safeguarding the future prosperity of manufacturing companies.
- These issues together with **global impact of such new business models within both developing and developed countries** requires consideration by the international research community.



Sustainable Business Model : Case Study _ Sustainable Tooling

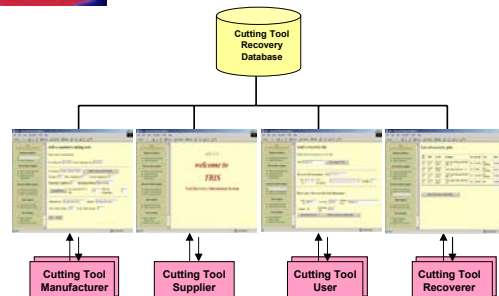


SupplyPoint



Service Provision VS Product Ownership

- Integrated tool supply and recovery chain
- Business models to support tool leasing
- Sustainable use of material
- Web based information management system to support tool recycling



The SMART Approach : Sustainable Consumption !

Best waste management approach = Avoided generating the waste in the first place

"We need to close the gap between the consumer "wants vs needs", through considerations for product personalisation, life extension, and service provision."



These photos from photographer Peter Menzel's innovative work *Material World*, show two families, one from Thailand and one from the US, in front of their homes with all of their possessions on display.

Sourced from www.menzelphoto.com

Concluding Remark

" We are rapidly running out of carpets to sweep our rubbish under !!?"



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IMS Event - Bern
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Thank you