

EcoLanes - “Economical and sustainable pavement infrastructure for surface transport”



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Outline

- Concrete road pavements and fibres from tyre-steel cord
- [EcoLanes overview](#)
- [Benefits from EcoLanes](#)

Surface transport infrastructure

- EU infrastructure: €600bn up to 2010 for **maintenance** and **extension** of network

- respond needs of enlarged EU
- benefit single market



- Road pavements main element of infrastructure

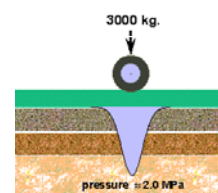
- Flexible: **Asphalt concrete**
- Rigid: **Portland cement concrete**



Road pavements

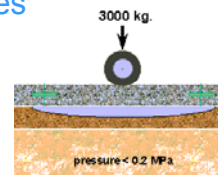
Flexible pavements:

- Deep foundations / multi layer construction
- Energy consumption due to transportation of materials
- **Increasing cost** of asphalt due to high oil prices



Rigid pavements

- Single layer
- Generally last longer
- May require asphalt topping due to **noise / comfort** issues



Conventional rigid pavements more expensive than flexible

Rigid pavements

- Use steel reinforcement to
 - improve mechanical properties
 - reduce pavement depth
- Steel fibres reduce costs associated with rebar placement
- Concrete mixes
 - wet / slip forming (laborious - require side formwork)
 - dry / roller compaction (fast – cost effective)
- Difficult to add fibres in roller-compacted concrete



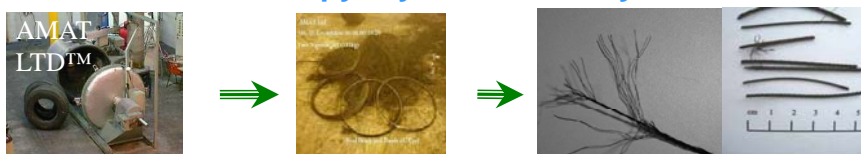
EcoLanes background:

- University of Sheffield research on tyre recycling (<http://www.shef.ac.uk/tyre-recycling>)

Tyre shredding: **SRSF**

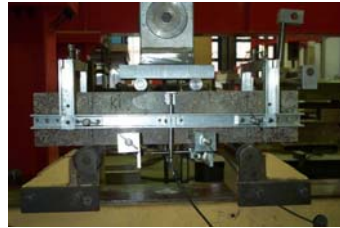
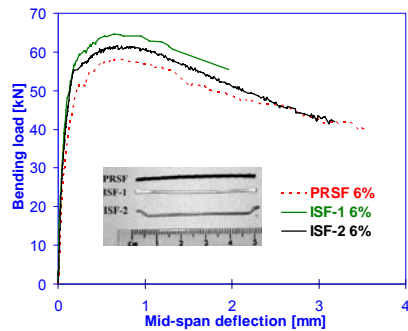


Microwave induced pyrolysis of whole tyres: **PRSF**



EcoLanes background

UoS research proved that tyre-fibres (e.g PRSF) can be **as effective as** industrially-produced fibres (ISF).



EcoLanes background

- **Aggregate Industries Ltd UK (AI) / Holcim**
 - Precast concrete products
 - Contractors for all types of pavement surfacing and construction
 - Major supplier of aggregate / asphalt / cement
 - But interested in concrete road pavements
 - future competitiveness (uncertain future of asphalt)
 - environmental issues (CO₂ trading scheme)

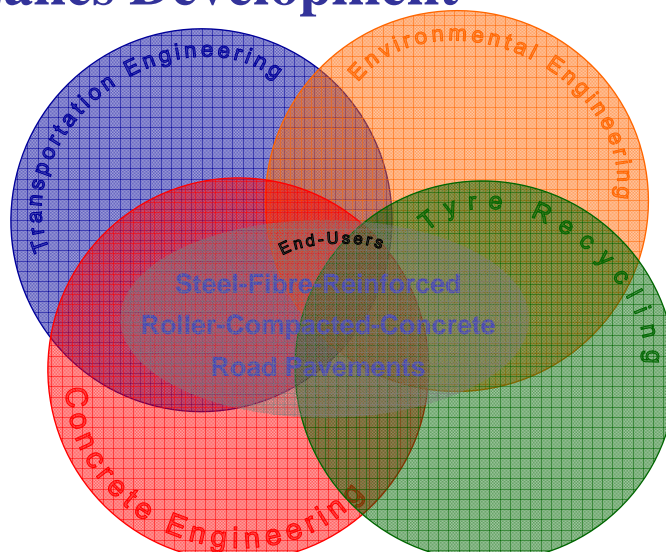
EcoLanes background

•AI's interest in road pavements

- research collaboration between AI and UoS
- funded a year's Fellowship for further research & preparation of proposals on concrete roads



EcoLanes Development



No.	Participant organisation name	Country
1	The University of Sheffield (concrete)	United Kingdom
2	Akdeniz University (environmental)	Turkey
3	Technical University "Gheorghe Asachi" Iasi (transportation)	Romania
4	European Tyre Recycling Association (environmental policy)	France
5	Aggregates Industries UK Ltd (concrete materials & pilot demonstration)	United Kingdom
6	Antalya Municipality (demonstration)	Turkey
7	Romanian National Road Authority (demonstration)	Romania
8	Adriatica Riciclaggio e Ambiente s.r.l.* (tyre recycler)	Italy
9	Public Works Department (demonstration)	Cyprus

EcoLanes Outline

Call: FP6-2005-Transport-4

Type of instrument: Specific Targeted Research Project (STREP)

9 partners, 9 work packages, 633 man-months total cost ~€2.5m

Reference Number: 031530

Submitted: 1 September 2005

Evaluated: October 2005

Contract Negotiations: March – August 2006

Start of contract: 1 October 2006

End of contract: 30 September 2009



EcoLanes Objectives

Develop infrastructure for surface transport using:

- Roller-compacted techniques based on existing asphalt laying equipment
- Steel fibre reinforced concrete
- Concept of long-lasting-rigid-road-pavements

The project aims to reduce:

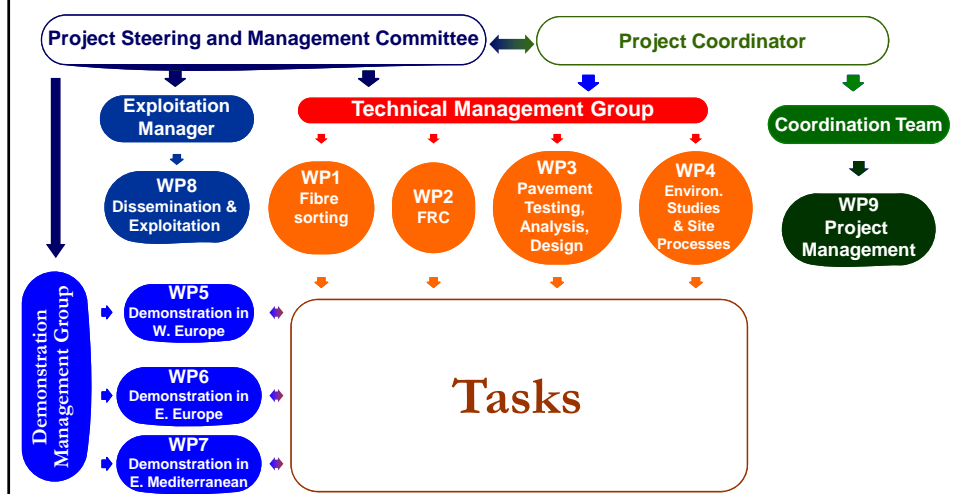
- Construction costs by 10-20%
- Construction time by 15%
- Energy consumption in road construction by 40%,
- Maintenance

And to

- Use waste materials
- Make tyre recycling more economically attractive



EcoLanes work plan



WP 1: Fibre Sorting

Leader: **AD.RI.A** (Italian Tyre Recycler)



Develop techniques and equipment:

- Post-processing steel fibres extracted from tyres
- Arrive at fibres suitable for incorporation in concrete

WP 2: Fibre-reinforced Concrete

Leader: **The University of Sheffield** (United kingdom)



Develop steel fibre-reinforced concrete mixes:

- Suitable for **slip forming** and **roller compaction**
- Use recycled materials, low energy cements

WP 3: Pavement testing, analysis and design

Leader: **Technical University of Iasi** (Romania)

Develop *long-lasting-rigid-road-pavement* concept:

- Accelerated load tests
(facility ALT-LIRA)
1.5 million cycles: 30 years
(600 trucks /day)
- Durability (climate) tests
- Develop design guidelines for LLRRPs



WP 4: Environmental studies & site processes

Leader: **Akdeniz University** (Turkey)

Develop life-cycle cost tool to assess environmental impact:

- Site construction processes
- Long-last-rigid pavements (LLRRP)

Develop optimised processes for constructing LLRRPs:

- Use of existing asphalt equipment



WP 5 - 7: Demonstrations

Leaders: **Aggregate Industries** (UK), **DRDPIASI** (RO),
Antalya Municipality (TR)

- Construct four concrete roads in rural and urban European environments
- Eliminate the problem of road deterioration due to cold and wet environments
- Eliminate the problem of asphalt displacement due to hot weather



WP 8: Dissemination and Exploitation

Leaders: **European Tyre Recycling Association**
(France), **Sheffield University Enterprises Ltd** (UK)

- Focus the project on developing solutions needed for transport infrastructure
- Develop technology implementation plan (IPR)
- Disseminate research findings:
 - website (<http://ecolanes.shef.ac.uk>)
 - 2 industrial seminars



WP 9: Project Management

Leader: **The University of Sheffield** (United Kingdom)

- Optimise application of technical resources
- Ensure compliance with the project objectives
- Ensure efficient communication within the project
- Ensure that all aspects of the EC requirements for communication and reporting are met

EcoLanes expected output

Tyre-recycled steel fibres:

- Processes & machinery to sort and clean shredded fibres

Steel-fibre-reinforced RCC rigid pavements

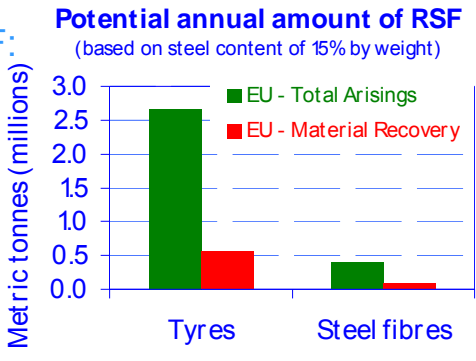
- Processes and machinery to disperse steel fibres in RCC
- Use of waste materials
- Analysis and design software for concept of LLRRPs

Surface transport infrastructure

- Reduction of construction time and cost
- Reduction of energy consumption during construction

Benefits for tyre recyclers

- Price of industrial fibres: €650 ~ €14000 per tonne
- Initial market value of RSF: €150 ~ €300 per tonne
- Economic benefits for tyre recycling industry



Benefits for tyre recyclers

Use of recycled tyre-cord in concrete construction

- Provide sustainable market for recycled tyre-cord
- Encourage material recovery of large amounts of tyres
- Facilitate implementation of EC directives



Benefits for construction industry

- Low-cost steel-fibre reinforcement
- Economic method for road construction
- Reduction of industry's CO₂ emissions
- Access to construction innovation

The presentation is available online :
<http://ecolanes.shef.ac.uk/diss.htm>

Thank You

Background Notes

