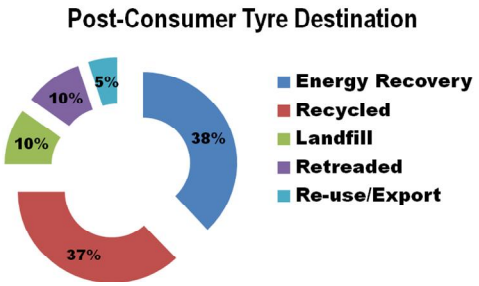
Environmental Technologies

ANAGENNISIS

The challenge

An estimated one billion tyres are produced every year and a similar number reaches their service life. Post-Consumer Tyre arisings for EU countries are 3,400,000 tonnes/year (2010), i.e. roughly one car tyre per person/year. Only 37% of these tyres are currently recycled whilst nearly half are incinerated for energy recovery or landfilled, resulting in negative environmental impact.



Tyres are made of vulcanised rubber reinforced with high-strength corded steel wire and polymer textile fibres. Rubber extracted from tyres through mechanical shredding is a highly durable, strong and flexible material. This makes it an ideal aggregate to produce highly-deformable strong concrete, but its lateral dilation damages concrete. Steel/polymer fibres of the right dimensions can also be recycled and used in concrete for shrinkage crack control, but there is a lack of efficient processes to clean, sort and classify these fibres.

Recycled rubber from tyres

Tyre Polymer Fibres

At a glance

Title: Innovative Reuse of All Tyre Components in Concrete

Instrument: FP7-ENV-2013-two-stage Turning waste into a resource through innovative technologies, processes and services

Total Cost: €4,455,005

EC Contribution: €3,119,690

Duration: 42 months

Start Date: 01 January 2014

Consortium: 17 partners from 8 countries

Project Coordinator: Prof. Kypros Pilakoutas

Project Web Site: -

Key Words: Post-Consumer Tyre; Rubber-filled reinforced concrete; Reused Tyre Steel Fibre concrete; Reused Tyre Polymer Fibre concrete

Research and Innovation

Finding appropriate markets to utilise new concrete products and achieving market acceptance is also important and requires proof through demonstration.

Project Objectives

This project aims to develop innovative solutions to reuse all tyre by-products in high-value innovative concrete applications with reduced environmental impact. This will be achieved by:

1. Developing novel highly-deformable confined rubberised concrete materials, and recycle steel and wire reinforcement for concrete applications.

2. Developing highly-deformable RC elements using rubberised concrete and recycled fibres suitable for integral bridge elements and base isolation systems for vibration/seismic use.

3. Developing Reused Tyre Steel Fibre (RTSF) concrete mixes for use in slabs-on-grade, precast concrete, sprayed concrete and screeds.

4. Developing Reused Tyre Polymer Fibre (RTPF) concrete mixes for shrinkage crack control in concrete elements, precast concrete, sprayed concrete and screeds.

5. Undertaking at least five mini-Demonstration Projects in several countries using the developed materials/applications.

6. Developing/implementing standardised design guidelines and life cycle assessment (LCA) and life cycle cost analysis (LCAA) protocols.

Methodology

Anagennisis is divided in the following seven Work Packages (WP):

WP1 performs initial analytical work and pilot studies to determine the desired properties from tyre constituent materials.

WP2 examines experimentally the behaviour of unconfined and confined concrete, and develops a range of innovative applications for highly deformable elements.

WP3 develops new applications for RTSF and other fibre blends for applications in which industrial steel fibres are currently used.

WP4 aims to find, for the first time, a use for RTPF in concrete. Main challenges include a) cleaning the RTPF, 2) introduction of the fibres into concrete mixes, and 3) identification of suitable applications.

Based on the work of WP2-4, WP1 also attempts the LCA/LCCA for the developed materials and applications.

WP5 performs well-monitored mini-Demonstration Projects for industry and end users to show how the tyre by-products can be used in advanced construction applications.

WP6 and WP7 deal with Dissemination and Knowledge Management and Effective Management, respectively.

Expected Results

Anagennisis will provide:

- Breakthrough innovation in novel technologies & products with high potential to achieve a greener economy.

- Reduced waste production and pressure on raw materials from the construction industry.

- Improved resource efficiency and reduced environmental impacts

- More sustainable consumption

- Substantial contribution towards the sustainable supply of raw materials of economic importance.

- Improved communication and transfer of knowledge to policy making, business and to the general public.

Project Partners	
1. The Univ. of Sheffield, GB	10. Technical Univ. 'Gheorghe Asachi' of Iasi, RO
2. Imperial College, GB	11. Cyprus Univ. of Technology, CY
3. Twincon Ltd, GB	12. Zebra General Constructions Ltd, CY
4. Faculty of Civil Engineering-Univ. of Zagreb, HR	13. Adriatica Riciclaggio e Ambiente Abruzzo srl, IT
5. Arkada Ltd, HR	14. European Tyre Recycling Association, FR
6. Gradmont Ltd, BA	15. COMSA SAU, ES
7. Werkos Ltd, HR	16. Fhecor Ingenieros Consultores SL, ES
8. Dulex Ltd, HR	17. ZYP Ingeniería Geomática SL, ES
9. Gumiimpex -GRP Ltd, HR	