Promotion of Responsible Management of used tyres by the Tyre Industry

Used tyres: a valuable resource with a wealth of potential

November 2003
Used Tyres: A valuable resource with a wealth of potential

, representing the interests of tyre producers in Europe, has been very active in promoting economically feasible and environmentally sound solutions to end of life tyres treatment. Assisting Member States meeting the provisions of the EC Directive (1999/31/EC) banning from landfill whole tyres from July 2003 and shredded tyres from July 2006, industry efforts have been intensified over the past few years. Environmentally sound options for managing end of life tyres have furthermore to be promoted throughout the enlarged Europe.

1/ A Tyre: a Complex and High-tech Safety product

Despite the fact that the tyre is one of the essential players in the domain of mobility (almost 80% of goods and people that are transported on land are moved by tyre borne vehicles), the construction of tyre and its manufacturing process are almost totally unknown to the general public.

This complex and high-tech safety product represents a century of manufacturing innovation, which is still on-going. The tyre comprises many materials, the very best the metallurgical, textile and chemical industries can produce. There is no room for even the slightest defect and it is an extremely complex process to develop and manufacture the product.

From a materials point of view, the tyre is a mixture of synthetic and natural rubber, to which are added a range of specific substances to ensure performance, durability and safety. These include mineral oil, reinforcing fillers (carbon black and silica) and vulcanizing agents (sulphur) which act as catalysts to accelerate the vulcanization process.

Tyre composition
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2/ Which tyres are to be recovered?

When tyres are taken off vehicles, they become “part-worn tyres” or “end of life tyres”.

The part-worn tyre is a tyre, which is reusable, as a second-hand purchase or re-usable after reprocessing (retreading). It can be reused as it is for its original purpose when a residual tread depth remains\(^1\). Otherwise it can be reprocessed under a procedure whereby new tread is vulcanised on-to the casing and it becomes a retreaded tyre\(^2\).

The end of life tyre is a non-reusable tyre in its original form. It enters a waste management system based on product/material recycling, energy recovery or goes to landfill (2006 at the latest\(^3\)); these tyres are to be recovered.

3/ Tyre environmental impact: key benefits from a life cycle assessment approach

In order to have a better knowledge of the impacts of tyres on the environment and to further develop appropriate solutions for end of life scenarios, the European tyre industry proactively decided to conduct a life cycle assessment study on a passenger car tyre in 2000 & 2001. The BLIC LCA study, concluded in May 2001, was performed by PRé Consultants of the Netherlands and was critically reviewed by another prestigious LCA specialist, CIT Ekologik from Gothenburg, Sweden.

When looking at the findings of the study on end of life scenarios, it is stated that end of life tyres processing routes have a low environmental impact.

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\(^1\) In general it is not possible to specify a minimum tread depth which would be valid for all types of tyres. Different minimum legal remaining tread depth are set in different countries. Within the EU it can be referred the Council Directive 89/459/EEC relating to the tread depth of tyres of certain categories of motor vehicles and their trailers.

\(^2\) The European Commission is currently drafting a proposal for a Directive on mandatory application on the basis of UN/ECE Regulations 108 and 109

\(^3\) Excluding tyres used as engineering material and bicycle tyres and tyres with an outside diameter above 1400 mm.
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The best option is tyre recycling, which means that the benefits are greater than the environmental load caused by the recycling process. As for incineration in power plants and in cement kilns, this energy recovery option has a neutral effect on the environment.

The conclusions have re-confirmed where priorities should lie in efforts to protect the environment i.e. promotion of material recycling and energy recovery from end-of-life tyres.

4/ End of life tyre recycling options

Every year about 2,600,000 tonnes of used tyres (part worn + end of life tyres) are generated in Europe, of which 2,000,000 tons are end-of-life tyres for which value recovery has to be maximized. This amounts to approximately 200 million units (source: BLIC).


Currently, several end-of-life processing routes are being developed to create environmentally friendly solutions. Amongst the different tyre recycling options, prevention remains the priority. Thanks to intensive research from tyre producers, several developments have been made to increase tyre wear resistance, improving its durability and have reduced its environmental impact.

4.1/ Market applications for Material Recycling

The applications for material recycling from end of life tyres have significantly developed over the last decade and their applications currently represent around 24 % of recycling activity, compared with 4 % in 1992. End of life tyres can be used whole, shredded or in powdered rubber.

- Use in the steel and metal-working industries
  Shredded tyres are used in electric bow furnaces as a substitute to anthracite, as the contained carbon is necessary for the production of steel. This growing market application has great potential and is complementary to the geographical distribution of cement kilns.

- Civil engineering applications
  The use of whole or shredded tyres in civil engineering projects has expanded over the last 10 years through several applications such as:
  - Coastal protection projects - erosion barriers, artificial reefs and off-coast breakwaters
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- Foundations for roads
- Reinforcing embankments alongside roads

This market has good potential for development but this depends largely on the ability of the industrial players involved to convince the authorities and the road constructors of the advantages of the application.

- Miscellaneous uses
  The tread can be used on rail and tram tracks to reduce both noise and vibrations but also in shoe soles, shock absorbers or shock absorbing mats.
  Whole tyres are traditionally used on farms as silage clamps.

Applications requiring reduced particle size

Two methods of size reduction are mechanical shredding and grinding at ambient temperature or grinding at very low temperatures (the cryogenic method). According to the size of the crumb rubber, it is usual to speak of shreds, chips, granulate and powders.

The real challenge for recycled powdered rubber is to develop applications in which the characteristics of the secondary material supports the requirement of the final product.

New technologies and material blends are used to incorporate powdered rubber into other rubber based products:
- Wheels for caddies, dustbins, wheelbarrows, lawn mowers, etc
- Artificial floor covering for sports arenas
- Urban furniture and signposting
- Paving blocks and roofing materials
- Flooring for stables
- Protective flooring (schools, playgrounds etc); safety, sport and recreational mats

Rubber-modified asphalt for road surfacing: the added powdered rubber enhances the longevity of the road surface and provides a quieter ride and improved safety in wet conditions.

4.2/ Market applications for energy recovery

End of life tyres represent an alternative supplementary fuel, with the same energy content as coal, with lower percentages of sulphur compared to coal. A tonne of tyres is equivalent to a tonne of good quality coal or 0.7 tonne of fuel oil.
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This recovery option now represents around 27% of the solutions chosen to manage end of life tyres compared to 14% in 1992.

- **Use in electric power stations as a dedicated fuel**
  End-of-life tyres are used as alternative fuel for coal.

- **Use in electric power stations**
  When end-of-life tyres are used as a supplementary fuel source to coal, in general no modification is required to the installation.

- **Use in cement kilns**
  Whole or shredded tyres are used as supplementary fuel to traditional combustibles in cement kilns. This application utilizes all the components of the tyre. The combustible components of the tyre are incinerated for heat generation whereas other substances of the tyre – silica and steel cord – are used as secondary raw materials in the cement production replacing the natural resources glass sand and ferric oxide. Accordingly the utilization of tyres in the cement industry is characterized by a material recycling rate of about 25%.
  In Europe today there are currently 250-300 cement works, which could potentially utilize the equivalent of the total number of end-of-life tyres generated annually.
  This application does require some mechanical modifications to the plant, which are relatively important and costly, anything from 1 to 1.5 million €uro according to whether whole or shredded tyres are used.

5/ European End of Life Tyres Management Network
The tyre industry believes that responsibility for waste management needs to be shared equally amongst economic operators and other stakeholders. Most products, tyres included, have a chain of players rather than a single economic operator managing the process, each of whom exercises control over a part of the production process, distribution, use and end-of-life processes.

As a result of this, BLIC members have intensified their actions and reinforced the role of national consortia and companies dealing with the management of end of life tyres. These national structures, composed of key economic operators, from tyre manufacturers, importers, retailers, to collectors and recyclers, aim at promoting the collection and recovery of end of life tyres, through participating in research and development activities and in acting quite naturally as the counterparts to local Authorities.

In the enlarged Europe, there are three system: cases in which the free market working efficiently (e.g. in Germany), cases with state system (tax) (eg in Denmark or in Hungary), cases with a developing/already in place take-back system, as in most of the European countries, through a producer responsibility approach. In this last case, non-profit associations of tyre producers/ importers and other stakeholders show good results (North European countries or in Portugal).

<table>
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<th>NATIONAL CONTACT POINTS</th>
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<td>RECYTYRE</td>
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The tyre industry has also developed its contacts with industry partners and authorities in Candidate Countries and provides assistance for the implementation of the acquis communautaire regarding end of life tyres and sharing its experience in helping the promotion of environmental and economic recovery systems.

<table>
<thead>
<tr>
<th>Country</th>
<th>Arisings (000 t)</th>
<th>Reuse/Export %</th>
<th>Retreading %</th>
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For further information or clarification, please contact:
Mrs F. Cinaralp, Secretary General
BLIC-European Association of the Rubber Industry
Avenue des Arts 2 box 12 B- 1210 Brussels
Tel. +32 2 218 49 40 Fax. +32 2 218 61 62
info@blic.be www.blic.be