GTA Innovation cv

A Background Essay about Used Tyres and Related Matters

Used Tyres still a Problem?

Just 1990 was enough for aprox. 65.000 tonnes of used car tyres in the Netherlands only. Stacked this would give a tower of aprox. 15 kilometres high. What happens nowadays with used car tyres? Can this material be re-used in new rubber products, or can it only be 'down cycled', is it only usable for e.g. road construction purposes? Or should it even be incinerated?

Now there are many different kind of processes usable to be able to re-use rubber for all kinds of purposes. Only a very small percentage is really recycled, really re-used in rubber products like tyres. Reason for that is the change of structure and therewith the (un)usability of the product specifics. Rubber changes by aging during use, but also through the recycling process. The moulding of a rubber product cannot be thermically be readjusted like some plastics. Compared to plastics the recycling of rubber and finding purposes for the recycled material is a lot harder to accomplish.

The Netherlands

Like each country, the Netherlands has also to deal with used car tyres. Until now, only small scale solutions are found for recycling these tyres, resulting in an accumulation of used rubber (tyres).
The Netherlands, in principle, are not used to have a used tyre problem anymore, the by legislation required minimum of 20% recycling is readily met. The Netherlands is one of the most innovative countries concerning tyre-recycling solutions in Europe. The abundance of used tyres is being re-cycled in many ways; by export, incineration and granulating (storage / re-use).

In Europe the average of used-tyres are still Landfilled 35 %, the complementary 65 % is incinerated gaining energy (23 %), recycling (21 %), retreading (11 %) and re-use / export (10 %).

Collecting Used Tyres

In the Netherlands operates a, by tyre-user payed, tyre-collecters enterprise lead by “Vereniging Band en Milleu” (BEM). In this way illegal dumping of obsolete tyres is mainly avoided. Since April 2004 the customer does not have to pay anymore for depriving of the tyre. The contribution is already added in selling price’s of new tyres.

United Kingdom

UK also has large problems with depriving of used car tyres. Due to legislation which has to prevent Landfilling completely within a few years, a huge problem occurs.

UK seeks Ideas on Recycling Tyre Mountain

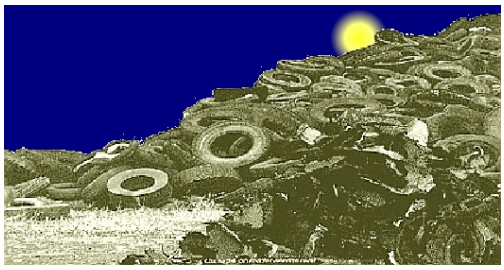
What can you do with approximately 500 million used tyres? Answers please, urgently, to the Department of Trade and Industry, which fears that a massive rubber mountain will build up rapidly in the next three years as EU legislation demands that tyres are no longer dumped in landfill sites.
One of Britain's leading transport laboratories yesterday came up with more than 50 ideas, ranging from sound insulation, artificial reefs, house-building materials and making slopes for golf courses, to plugging the gaps in coastal and river defences, drainage, road surfacing and insulation.
John Vidal, environment editor, The Guardian
Thursday February 26, 2004

World Wide

Worldwide comprehension on this issue is not really present. Due to lower priority and lack of economical necessity , no initiatives are taken to solve this problem. In the USA are used-tyres even seen as a welcome addition to fuel needed in electrical power-plants. Environmental reflections are no issue yet , due to economical benefits!

The Used Tyre Mountain

The European Tyre Recycling Association (ETRA) estimates are that about 250,000,000 post-consumer tyres are accumulated each year in Western European countries and comparable amounts amassed in Eastern Europe, North America, Latin America, Asia, the Middle-East, totaling approximately 1,000,000,000 new arisings per year.
Historic stockpiles are estimated to be well over 1,000,000,000 within the EU. For many years new accumulations are added to the billions that had been stockpiled or buried in designated landfills as well as the uncounted millions found in illegal dumping sites, warehouses, and through-out mountains and valleys, worldwide.



EU Landfill Ban Looms Nearer

The banning of tipping tyres into landfill sites is getting nearer. Under this EU Directive, all memberstates must comply with the Directive which states that whole tyres cannot be landfilled after 2003, and shredded tyres cannot be landfilled after 2006. With this ban looming nearer, it is vital that alternative ways of recycling and processing of used tyres are found. With around 420,000 tonnes of used tyres arising each year, and currently close to 150,000 tonnes going to landfill, time is running out.

In addition to the Landfill Directive the End-Of-Life Vehicle Directive, or ELV as it is known, has recently been ratified by the EU. This Directive is aimed at the vehicle manufacturers who are required to take back their vehicles at the end of their life, ensuring that 75% initially of the vehicle can then be recycled. This includes, obviously, the tyres.

REG UK has just finished its 7th landfill cell-lining project at Winterton, Humberside. Despite treacherous conditions, between August and December REG's labour team manually placed into position just over 750,000 tyres over an area of 13,500 square metres. The tyres were laced into one another to a height of 1.3 metres. This use of tyres replaces conventional use of aggregate as a drainage medium for the lining of a new landfill cell, and as such, is exempt from the forthcoming EU Landfill Directive. Currently in the UK, this use of used tyres is becoming more popular, and is set to increase.
Source : REG website

About ETRA

The European Tyre Recycling Association (ETRA) is the only European organisation devoted exclusively to tyre and rubber recycling. Founded on 23 September 1994 with 19 members in 5 countries; now in its ninth year, ETRA has about 250 members in 46 countries. They are besides most of the EU Member States, Argentina, Australia, Canada, Czech Republic, Egypt, India, Israel, Japan, Korea, Kuwait, Malaysia, Malta, Mexico, Puerto Rico, Russia, Qatar, Saudi Arabia, South Africa, Switzerland, Tartarstan, Thailand, United Arab Emirates, Ukraine and the USA.

ETRA membership reflects both the public and private sectors involving an environmentally safe disposal of post consumer tyres. Policy and decision makers as well as those charged with organising and connecting the links in the chain are represented. With a focus on both material and energy recovery, ETRA members include collectors, retreaders, manufacturers of recycling equipment, research bodies, developers, users of new technologies as well as users of the materials in an expanding number of products and applications.

The mission of the association is to formalise tyre recycling as an independent, multi-sectoral industry involved in a long chain of activities which protect the environment and enhance the quality of life through the creation of new businesses and jobs. This is accomplished through a focused advocacy and cooperative actions to improve professional standards and to develop quality guidelines for products and materials. A principal goal is to assist in the realisation of cost effective as well as environmentally sound tyre recycling projects.

ETRA Primary Objectives

- to serve in an advocacy role for the tyre recycling industry in contacts with public and private bodies and the consumer public
- to defend the interests of the tyre recycling industry in regard to legislation
- to promote the tyre recycling industry and seek new, sustainable ways to expand existing markets
- to provide relevant information about developments and technologies to members and other interested parties and groups
- to promote the use of recycled rubber in a range of products and applications
- to aid in the development and promotion of industry standards for tyre recycling
- to provide assistance to groups and individuals in the tyre recycling industry
- to provide a communication link between tyre recycling professionals and government bodies, professional associations worldwide, association members and the public at large;

The mechanisms include exchanges of information and experiences in face to face contact at conferences, seminars, workshops and study tours as well as with printed materials which include a quarterly newsletter, monographs, reports, etc., which discuss new and advanced technologies, collection and sorting systems, funding sources, and job availability, as well as problems, issues and pitfalls. Study groups are formed on current topics of interest and concern to the industry and provide direct assistance to members about efficient systems of tyre recycling.

ETRA is recognised by the EU Commission as the organisation representing tyre recycling in Europe and participated in the EU Recycling Forum and in the preparation of the UNEP Basel Convention 'Guideline for the Identification and Management of Used Tyres'. In 2000, ETRA initiated a CEN Workshop Agreement (CWA) for the standardisation of post consumer tyre materials and representative applications. The final CWA was published in May 2002. In November 2002, the CWA received a prEN designation, indicating that it will soon become an EN.

ETRA members subscribe to a 'Sustainable Development Charter' for the environmentally sound management of post consumer tyres.

Annual Accumulation by EU State (2001)

Each Member State reports annually on the arisings and disposition of post consumer tyres.

State	Tyre arisings in tonnes	Population
Austria	51,000 t	8,054,800
Belgium	70,000 t	10,143,000
Denmark	41,200 t	5,251,000
Finland	32,300 t	5,116,800
France	401,000 t	58,265,400
Germany	640,000 t	81,845,000
Greece	58,500 t	10,474,600
Ireland	32,000 t	3,591,200
Italy	434,500 t	57,330,500
Luxemburg	3,100 t	412,800
Netherlands	67,500 t	15,492,800
Portugal	52,000 t	9,920,800
Spain	280,000 t	39,241,900
Sweden	62,000 t	8,837,500
UK	435,000 t	58,684,000
Total	**2,659,100t**	**372,662,100**

Information on the annual accumulation and valorisation of post consumer tyres in the EU has improved over time. Early information was largely based on estimates of new car and truck tyre sales. Little attention was paid to other tyre categories or sources.

Since 2000, data have become more accurate and reliable although some inconsistencies still exist. This information is valuable to both the public and private sectors.

Government authorities are responsible for the environmentally sound management of post consumer tyres and use the information:
- to develop policy, goals and regulations
- to project valorisation targets
- to define existing capacity and determine the capacity required to fulfill national goals.

The private sector often provides the financial resources to attain those goals and utilises the data for market analysis and projections, for investment planning, i.e., expanding existing facilities or constructing new ones.

The public and private sectors often work together to develop strategies for investment as well as to plan and implement laboratory and field research programmes.

What to Do with Used Tyres

For many years people are looking for applications in which used-tyre rubber can be used, to have any benefit of this inexhaustible source. Whether rubber is re-used or not, eventually it will not prevent the tyre mountain and granulate mountain of rising. As long as there is new rubber compound needed to produce tyres the mountain will continue to grow. Re-use of rubber will be hampered by quality demands on rubber products. Recycled rubber has to follow many steps to accomplish total re-use and even then mixing with “virgin” product is preferred.

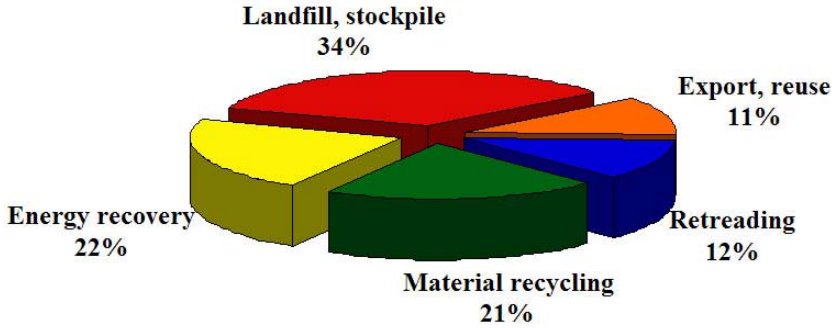
Ways of Recycling

Rubber can be adapted in many ways to make it suitable for re-use, many processes have been tried out, but eventually no process has been developed yet to be chemically and economically suited for total re-use.

- Granulation, mechanically
- Granulation, cryogenic
- Granulation, prior to other processes
- Devulcanisation, by heat and inert environment
- Plasma techniques, change surface to accomplish better re-bonding
- Microwave techniques, heat treatment.
- Pyrolyse, heat treatment by metal melting

Some of these processes are patented, like devulcanisation held by DSM

Estimates of EU Tyre Disposal Routes



The above are EU averages for the five principal disposal routes for post-consumer tyres. The actual breakdown in each state varies in function of national policy and regulations concerning material recycling and/or energy recovery, specific needs and treatment capacity.

Traditionally, there have been five basic disposal routes:
Exporting of part-worn tyres is generally directed from wealthier towards poorer countries. Although it is expected that this practice will be limited in future, the export of tyre casings for retreading will continue.

Retreaded tyres ensure the same standards of use and wear as new tyres. A new tyre contains about 4.8 kg of rubber compound. Retreading reapplies 2-3 kg of new rubber compound to rebuild the tyre and create new tread patterns.

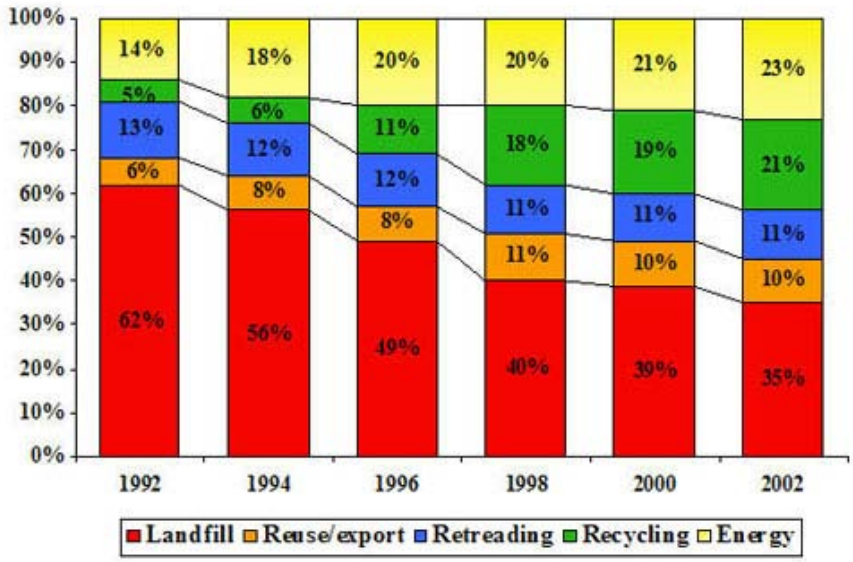
Material recycling is comprised of two parts: the production of materials from post-consumer tyres, and their use, according to European standards, in civil engineering, construction and rehabilitation applications, and in the manufacture of myriad consumer and industrial products.

Energy recovery facilities including electricity generation plants, cement kilns, paper or pulp mills, etc., use tyres as a secondary non-fossil fuel. Pyrolysis combines the benefits of energy recovery and material recycling obtaining carbon materials, oil and steel.

Landfilling, the disposal of waste onto or into land, is no longer an option in the EU for post-consumer whole tyres (2003) or shredded tyres (2006) under the Landfill Directive (199/31/EC).

ETRA supports a range of uses for post-consumer tyres including retreading, recycling and energy reclamation.
Source: ETRA Website

The Evolution of Disposition Routes 1992 - 2002



In 1992, approximately 65% of reported arisings in the then 12 States were destined for landfills and only 35% were disposed by other means.

Ten years later, in 2002, the situation was completely reversed in the 15 States: approximately 65% of post-consumer tyres were disposed by reuse/export, retreading, material recycling or energy recovery and slightly less than 35% were destined for landfills.

The two principal means of valorisation, material recycling and energy recovery, accounted for about 44% of all arisings.

Prospects are that reliance on landfills will continue to decline. Almost every State has created guidelines to improve post-consumer tyre management with the target of zero landfilling in the EU before the end of the first decade of the twenty-first century: over half of the current States already valorise more than 50% of annual arisings primarily by material recycling or energy recovery, five have achieved zero-landfilling and three more are within 5% and could attain zero landfilling by 2006.
A majority of current and candidate States is now seeking ways to expand existing treatment capacity in order to accommodate the increased flow that is anticipated during the next decade.
Source: ETRA Website

Applications of Recycled Rubber

New Tyre Manufacturing

Increasingly larger amounts of uncontaminated natural and butyl rubber wastes, primarily from truck tyre treads, are granulated, treated and refined for reuse in the manufacture of new tyres. Recycling research centres are developing new techniques and formulae to produce materials which are competitive in both cost and wearability.

Uses in Automobiles

Considerable amounts of recycled tyre rubber are reused in the manufacture of new cars. Granulate is mixed with other materials to produce many car parts. Small amounts are used in new car tyres. Larger quantities are used in brake linings, steering wheels, flexible tubing, battery casings, door facings, mats, seat-belt housings, moulded items such as beverage and coin holders, arm rests, storage compartments, exhaust connectors and mountings, as well as in many parts of the music systems.

Noise Barriers

A variety of noise barriers are fabricated from used tyres. The majority of designs utilise cut tyres, some mix the tyres with other waste products such as old railroad ties, worn skis, dairy containers, etc. In some an armature is built of ties and skis, halved tyres are attached and filled with soil and compost then planted with greenery and vines. They have proven to be successful sound absorbers and to significantly reduce noise along highways and high speed train tracks.

Trains and Trams

Recent research and developments with recycled rubber granulates have led to several new products which can be utilised on both train and tram tracks. Each has the capacity of reducing both the noise and the vibrations which emanate from the vehicles. Test results indicate that noise can be reduced up to 40%, while vibrations can be limited up to 30%, making their use a good investment particularly in heavily populated city centres and along high speed train routes.

Porous Asphalt Mix

Also known as drainage asphalt, this asphalt mix has a very high void content which allows rainwater to drain off at the surface, reducing splash and spray. Tyres maintain contact with the paved surface under any conditions, avoiding aqua-planing at high speeds on wet roads. It also reduces rolling noise within and outside of the vehicle as well as light reflections.

Road Furniture and Signposting

Road furniture, such as speed bumps, speed stripping and ballards constitute a relatively new development in the use of rubber granulate in civil engineering projects. Also added to the list are weighted sign supports which are being used at railroad crossings and on motorways. Expansion joints on bridges and motorways are also an important new use.

Porous Drainage Pipes

Porous drain pipes manufactured from recycled tyre granulate are used in the construction of roadways, streets, residential and commercial developments. Consumer grade products, for home improvement or do-it-yourself projects are rapidly arriving on the market. Easy to handle, non-biodegradable, resistant to moisture and mold, the pipes can remain in place for many years without replacement.

Roadway Filter Drains

A new product made of bitumen bound shredded and/or chopped tyres is being used instead of the conventional stone or gravel drainage as a topping to roadside filter drains. The application is especially successful in areas where there is a high risk of vehicle overruns such as slip roads. It is cost-effective to install and can considerably reduce highway maintenance costs.

Outdoor Sports Surfaces

Recent developments in mixing granulated rubber with a broad variety of elastomers and polymers have produced a new generation of all-weather sports playing surfaces. These surfaces have the added benefit of reducing the severity of injuries sustained in play due to their resiliency. The surfaces are easily installed and inexpensive to maintain.

Paving Blocks

A range of new paving materials has been developed from tyre granulates. Easy to install, skid proof, water resistant, mold and mildew proof, resilient and easily maintained, these paving materials are used for patios, pool areas, and garden paths, among other public and private applications. Available in many colours, textures and shapes, they are an inexpensive alternative to more costly concrete, slate or moulded pavers. Many systems can be placed directly on soil without the need for costly pre-installation preparation.

Roofing Materials

A broad array of roofing products and materials such as underlinings and tiles has traditionally used recycled rubber in their manufacture. New technologies permits the use of a range of mixes which include recycled tyre granulate, virgin materials as well as a variety of new and recycled elastomers and polymers. The products are weather, mold and mildew resistant and do not suffer ill effects from the ultra-violet rays from the sun.

Convention and Exhibition Centres

Conventioneering and exhibitions require long hours of standing and walking great distances on hard surfaces. Several new products manufactured from recycled tyre rubber provide a more comfortable alternative to concrete blocks. The material is not only resilient, which reduces the foot, leg and muscle stress which often accompanies attendance at these events, but reduces noise levels, insulates against heat and cold, and improves general comfort. Heavy equipment for moving or on display, do not mar the material.

Indoor Sports Surfaces

Wooden gymnasium floors are rapidly being replaced by a composite made from recycled automobile and truck tyres. Easy to install and inexpensive to maintain, these products are used in schools as well as in commercial arenas. The material does not interfere with the game play and offers players a more resilient surface. It has also been shown to reduce the severity of injuries sustained in accidents. An added benefit is the accompanying reduction of noise which often makes indoor competitions difficult for spectators. In common areas e.g., entries, dressing rooms, etc., it does not stain nor is it harmed by spilled liquids.

Interior Floor Coverings

Recycled rubber has been used for many years in the manufacture of floor tiles, carpet backings and under-lays. Many commercial and industrial sites, health and research facilities utilise flooring made from recycled rubber because of their characteristics of limiting sound penetration, resiliency, water proofing, resistance to solvents, acids, oil, etc., low maintenance costs and long life. New uses include pedestrian and seating areas as well as entries at airports and railway stations.

Footwear

Footwear manufacturers have been using considerable amounts of rubber for many years and new uses have recently been added. A new cushioning system is used almost exclusively in men’s and women’s luxury shoes and in top-of-the-line sneakers or plimsolls, and tennis shoes for the whole family. It is basically an inner sole made from rubber granulate which lines the shoe and cushions the foot to reduce stress and discomfort.

Camping Equipment

A broad range of outdoor camping equipment utilises rubber granulate. The exterior shell of tents, interlining, protective mats, flooring and tarpaulins are all made from various forms of recycled rubber, some from fine cryogenic powders. Air mattresses, inflation pumps and hoses, cords and netting used in camping and hiking activities are made from a variety of recycled rubber products.

Playground Equipment
Many different types of playground equipment contain recycled materials, including rubber. Several new items are being produced for playgrounds, primarily because of their safety and low maintenance characteristics. Among the newest products are child-size trampolines which incorporate rubber in the mat, rim and feet. Portable hopscotch mats are popular for temporary and multiple use sites because they can be easily stored when not in use. Slides made from recycled composites are more colourful and easier on little bottoms.

Water Sports
Many water sports rely on products manufactured from rubber because of its inherent characteristics. Some older products remain favourites: goggles, swim fins, snorkels, and the proverbial inner tube have all been around for many years. New products include water resistant radios, storage containers, inflatable boats, kayaks, etc.

Entertainment Equipment
Binoculars made with recycled rubber bodies are designed for use in damp and humid climates. Eye-pieces, bellows, and attachments of many brands of binoculars and video cameras are made from rubber, much of which is recycled product. Cameras, cases, stands, lights, timers, etc., are also made from rubber and granulate.

Office furniture and Equipment
Granulate made from used tyres and retread buffings are recycled into a broad array of office furniture, equipment and supplies. Desks, table and counter tops, chair backs, posts, and supports are made from moulded granulate. Granulate is also mixed with other elastomers to manufacture computer key boards, monitor housings, photocopier trays, etc. as well as many office supplies such as trays, stapler cases, floor and desk mats, among others.

Solid Rubber Wheels
The solid wheels and tyres used on a wide range of commercial and consumer products including suitcases, baggage carts, lawn mowers, trash bins, toys, wheel barrows, household and office equipment, appliances, and many other mobile items are manufactured from recycled truck and car tyre granulate mixed with selected polymers and elastomers. The life expectancy of the tyres often exceeds that of the item on which they are mounted.

Roller Blades
Many manufacturers of roller blades, the 1990's up date of the roller-skate which feature a series of horizontally aligned narrow wheels instead of the standard chunky wood or plastic four wheels, are made from recycled tyre granulate. Several manufacturers also fabricate the wheel housings as well from recycled rubber, which is frequently mixed with recycled elastomers and polymers.

Recycled Rubber Slipsheet
A patented application which has been developed by **GTA** **Innovation cv**, and meets the main economical demands and also provides an ecological bonus.

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