

TYRE

& ENVIRONMENT

The information magazine by RecyBEM - the Dutch ELT-company

**ENVIRONMENTALLY-
FRIENDLY COLLECTION
AND PROCESSING**

**8 MILLION
CAR TYRES ANNUALLY**

**RAW MATERIALS
FOR THE FUTURE**

REDUCED **CO₂** EMISSIONS

Collecting end of life tyres
for a cleaner environment

End of
life tyres
get a
new lease
of life.

RecyBEM B.V.



BAND & MILIEU

FOREWORD



RecyBEM: An initiative by your tyre supplier

With pride I present this information magazine about RecyBEM on behalf of the Dutch tyre association (Vereniging Band en Milieu). In Tyre & Environment, you will learn how Dutch producers (tyre manufacturers and importers) are fulfilling their obligations set out in the Dutch legislation on waste

End of life tyres get a new lease of life

Did you know that in the Netherlands, we give your used tyres a new lease of life? Under the tagline "swapping old for new", RecyBEM ensures that some eight million used tyres annually are given a new lease of life through re-use, recycling or incineration with energy recovery. This represents as many used tyres as the number of new tyres sold annually. RecyBEM was founded in 2004 to fulfill legal obligations for producers to take responsibility for a cleaner environment. RecyBEM processes the collected tyres in the most advanced way possible.

management policies for end of life tyres (Besluit beheer autobanden). RecyBEM's collection and processing system is an initiative by the Dutch tyre suppliers. For each new tyre which the members of the Dutch tyre association bring into the Dutch market as a producer (tyre manufacturer or importer), RecyBEM collects one used tyre. As a result, market coverage is virtually one hundred percent. The tyres that are collected are processed in an environmentally-friendly way and given a new lease of life in a range of applications. The percentage of recycled raw materials destined for the manufacture of new tyres is increasing. End of life tyres are increasingly being processed into car parts for new cars. There could well be some recycled car tyres in your neighborhood, for example in the football club's artificial grass surface or in your local playground. Other European countries are also ensuring that their end of life tyres are processed in an environmentally-

friendly way. Dutch implementation of the environmental obligation has been a great success. We have one of the highest collection and recycling scores based on newly sold tyres. We are a leading example in Europe.

As chairman of the Dutch tyre association, I am proud that we are supporting the careful management of raw materials and waste on our planet. Together, we are closing the circle of tyres. Because our management system for end of life tyres results in a cleaner environment.

End of life tyres are thus given a new lease of life through re-use as a tyre, through recycling or as fuel in cement furnaces and power generation plants. RecyBEM reports excellent results. This is only possible due to effective collaboration throughout the entire chain. Over the years, RecyBEM has amassed a wealth of knowledge which contributes to the success of the RecyBEM-system. And looking to the future, RecyBEM intends to remain a knowledge partner in the tyre sector.

We encourage research into products, materials, applications and processing methods. Through these innovations, we optimize the use of sustainable and renewable raw materials, enabling us to restrict and prevent waste from end of life tyres. Resulting in the wanted positive effect for the environment.

Rob Oudshoorn, Chairman of the Dutch tyre association, Managing Director Apollo Vredestein B.V. Managing Director Apollo Vredestein B.V.



Frans van Lenten, Chairman of the Supervisory Board of the Dutch tyre association, Managing Director Van Den Ban Groep.

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RecyBEM

RecyBEM is the management company for the Dutch legislation on waste management for end of life tyres (Besluit beheer autobanden). We organize the collection and processing of used car tyres from the aftermarket. We work in a structured way to collect some eight million used tyres annually and process them in an environmentally-friendly way. As a result, we prevent scrap tyres from lying around in the environment, we reduce the need for primary raw materials from nature and we reduce CO2 emissions by doing so.

Thanks to effective collaboration with all the companies in the tyre chain, market coverage is virtually one hundred percent. For each new tyre which producers (tyre manufacturers and importers) bring into the Dutch market, we collect one used tyre. These tyres are then given a new lease of life through re-use, recycling or incineration with energy recovery. The principle behind this is “swapping old for new”.

As the management company for end of life tyres we have taken over all the responsibilities and obligations arising from the Dutch legislation of the members of the Dutch tyre association since 2004. We have established a collective collection and processing system for this purpose.

We collaborate with our certified collection companies to ensure the structured collection of used car tyres in the Netherlands. RecyBEM also works with certified recyclers to ensure that the tyres collected are processed

in an environmentally-friendly and environmentally-aware way.

Quality is our priority. In order to guarantee the quality standards of our partners within the chain and our own organisation, we are all ISO-certified.

As a management company for end of life tyres, we are responsible for organizing and managing the collection and processing of used car tyres. However, we see our social role with respect to waste and raw materials

management in broader terms. We therefore work with agencies able to remove other types of surplus tyres, such as truck and tractor tyres, from the market. We also track national and international market developments so that we are able to respond promptly to economic or (environmental) technical developments that may impact our sector or the member companies of the Dutch tyre association.

As a stakeholder, we regularly participate in research concerning materials, applications and processing methods.

Developments in the market come in rapid succession and we track these developments. We regularly conduct our own market research and market analyses. Where necessary, we invite specialist companies to carry out their own research. In doing so, we aim to take innovations in the used tyres sector to a higher level.

We promote innovations to recover raw materials and ensure a reduction in CO2 emissions.

In doing so, we aim to optimize environmental achievements. After all, we collect and process used tyres to create a cleaner environment, now and in the future.



Dutch legislation on end of life tyres (Besluit beheer autobanden)

Legal basis

The environment is important. Since the Nineties the environment, and in particular the waste management of car tyres, has been high on the Dutch political agenda. The Dutch government wanted to prevent landfill of tyres or tyres lying around in the environment. The Dutch legislation on end of life tyres offers the solution to this problem.



In response to the environmental problem posed by used tyres, the government introduced the first Dutch legislation on end of life tyres (Besluit beheer personenwagenbanden) in 1995. This legislation assigns the responsibility to the producers (tyre manufacturers and importers) to organize the management chain of end of life tyres. In order to further intensify these responsibilities, the Ministry of Environment (then ministerie van Volksgezondheid, Ruimtelijke Ordening en Milieu (VROM)) replaced this legislation in 2004 with the current legislation on end of life tyres (Besluit beheer autobanden). The goal of this decree, which is based on the Environment Management Act (Wet Milieubeheer), is to collect and process used tyres in an environmentally-friendly way. Responsibility for this rests with the producers of car tyres and the manufacturers and importers of caravans and trailers. The decree applies to private vehicle tyres from vehicles such as private cars

and light commercial vehicles (maximum 3500 kilos), trailers and caravans. Other tyres such as truck tyres, motorcycle tyres and tyres from car wrecks are not covered by the decree. For each new tyre which they bring into the Dutch market, producers are required to collect an end of life tyre and re-use or recycle it in an environmentally-friendly way. Under the terms of this legislation, at least twenty percent of the collected tyres must be re-used and destined for material re-use. RecyBEM has intensified this requirement and set out contractually that certified collection companies must destine at least ninety percent of the tyres collected for material and/or product re-use, whereby at least fifty percent of all tyres collected must be processed by RecyBEM-certified recyclers.

The Dutch legislation on end of life tyres: a legal requirement which makes it obligatory for producers to ensure a cleaner environment.



Tyre and Environment Organization

Dutch tyre association, the Tyre and Environment Foundation and the management organization RecyBEM

The Dutch tyre association (Vereniging Band en Milieu), the Dutch Tyre and Environment Foundation (Stichting fonds Band en Milieu) and the management organization RecyBEM are three independent organizations within the Tyre and Environment organization. The aims of the three parties involved come together in the fulfilling of the Dutch legislation on end of life tyres. These organizations all contribute to the success of the producer responsibility system in the Netherlands.

Dutch tyre association

The Dutch law on end of life tyres defines the legal framework and assigns the responsibility to the producers (tyre manufacturers and importers and manufacturers and importers of caravans and trailers) to organize the management chain of end of life tyres. They may fulfill this responsibility either individually or collectively. In order to comply with the requirements of the decree, the Dutch tyre association developed the RecyBEM system as a collective. This management system for the collection of used tyres came into operation in 2004.

Dutch Tyre and Environment Foundation and RecyBEM

The members of the Dutch tyre association have set up two organizations to ensure an effective implementation of the terms of the decree on end of life tyres. As a management organization, RecyBEM handles the collection of car tyres for each member of the Dutch tyre association. RecyBEM reaches agreements regarding how the tyres collected should be processed.

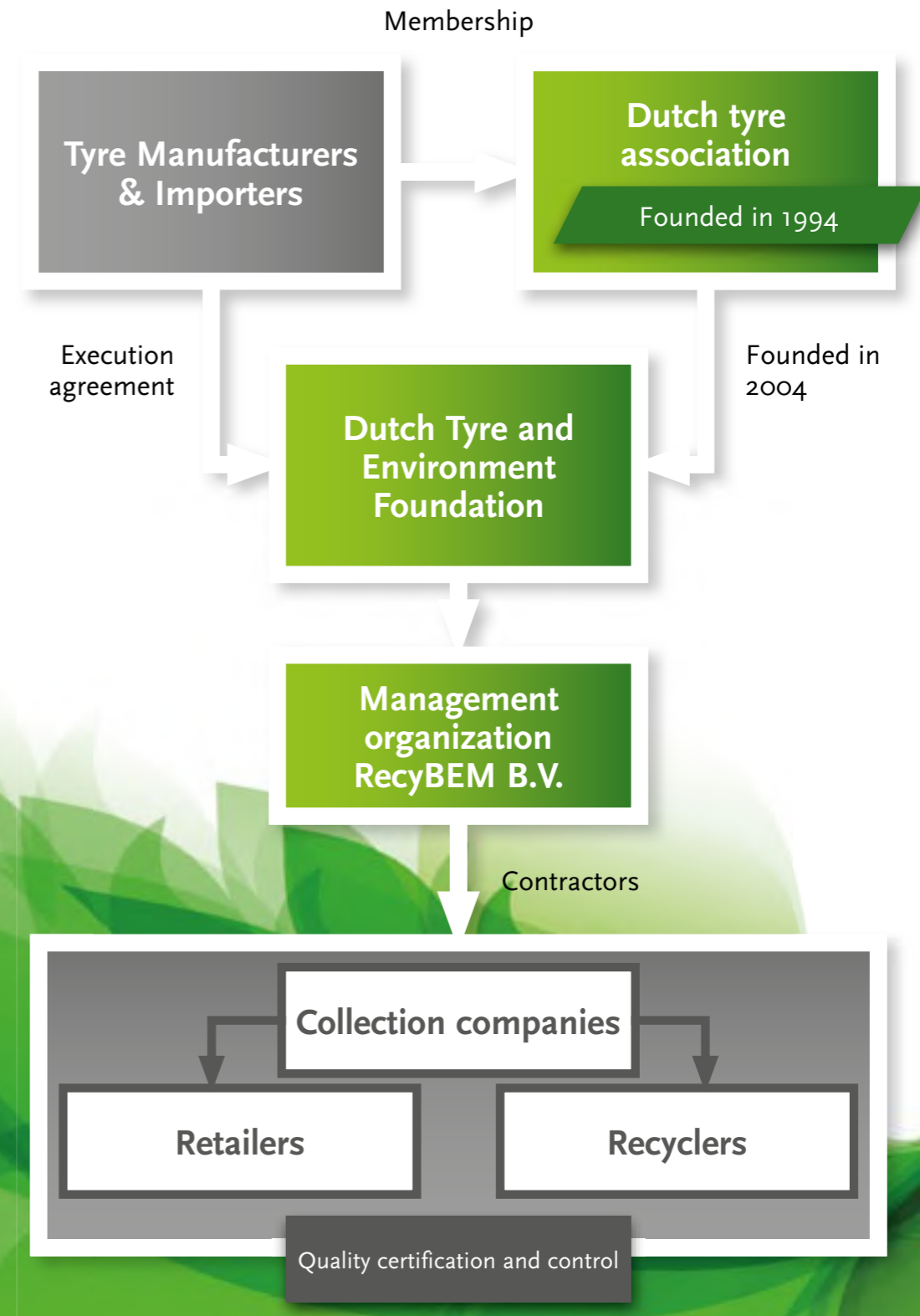
The Dutch Tyre and Environment Foundation (Stichting Fonds Band en Milieu) manages the finances. Members of the association pay the Tyre and Environment Foundation a contribution for each tyre which they bring into the Dutch market. This fund then finances the RecyBEM management company.

The Executive Board

The Tyre and Environment organization's Executive Board and Supervisory Board consists of representatives of producers and board members of the management organization. The collaboration in the Netherlands between producers, importers and distributors is unique in Europe. This is also evident in the composition of the organization's Executive Board and the Supervisory Board. Representatives of Apollo Vredestein, Continental, Goodyear and Michelin are seated in the Board together with representatives of Inter-Sprint and Van Den Ban.

To view all the members, visit www.recybem.nl/leden

Board members



RecyBEM in Europe

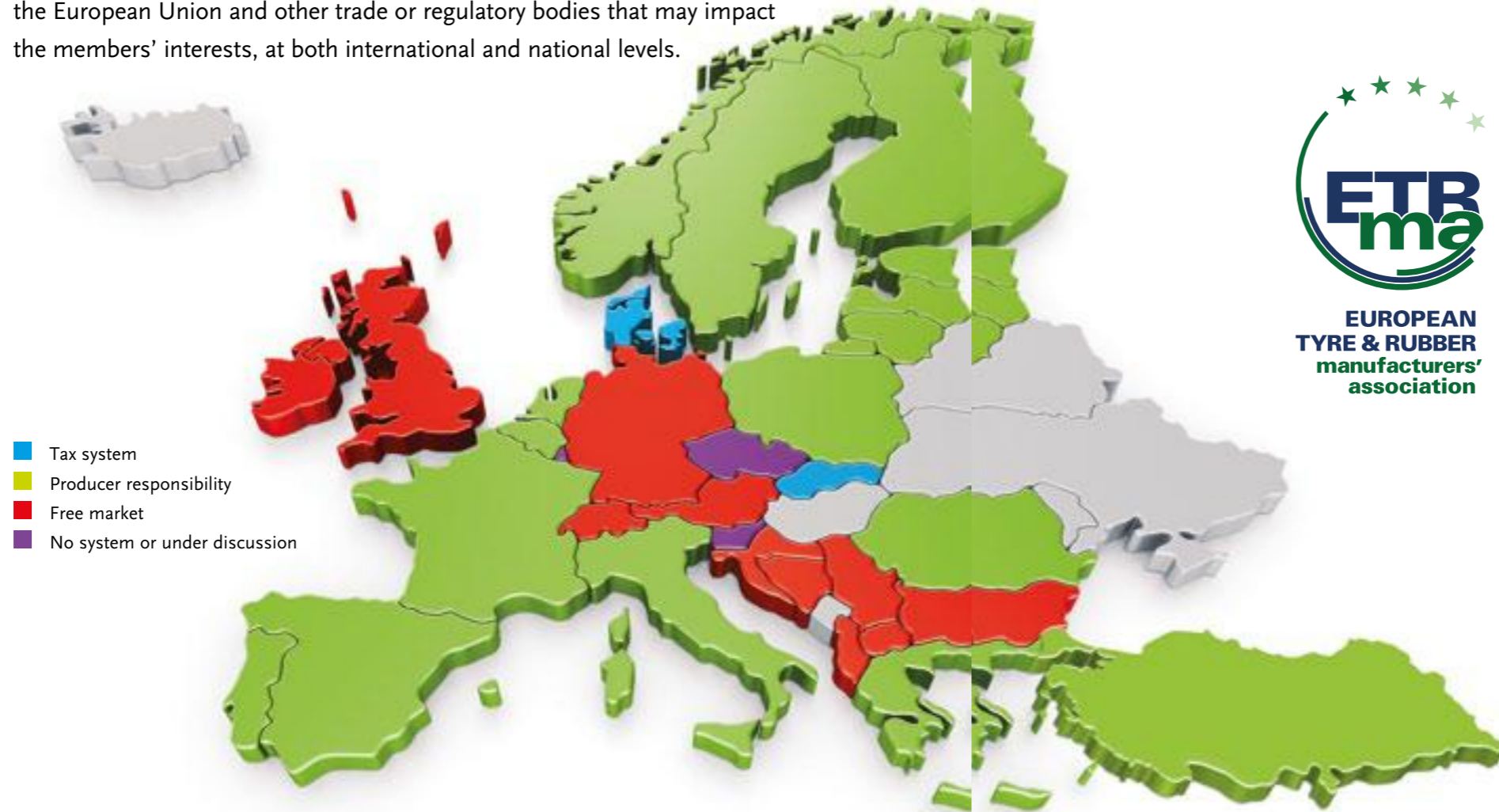
European Tyre & Rubber Manufacturers' Association (ETRMA)

“According to ETRMA, the European Tyre and Rubber Manufacturers Association, the RecyBEM system has proved to be the right producer responsibility answer in the Netherlands to environmentally and cost-efficiently manage the collection and treatment of end-of-life tyres. It has been and still is a model in Europe”

*Fazilet Cinaralp,
secretary-general of
ETRMA*



Europe is becoming increasingly important. The Netherlands is increasingly being affected by legislation coming from Brussels. RecyBEM is one of the ELT management organizations (End of Life Tyre) united under the European interest group for tyre and rubber manufacturers, the European Tyre & Rubber Manufacturers' Association. ETRMA activities focus on representation, co-ordination, communication, promotion and technical liaison on behalf of its members' tyre and rubber industry interests. ETRMA will be involved in monitoring and assessing together with its members the institutional, legislative/regulatory, judicial, administrative and other developments in the European Union and other trade or regulatory bodies that may impact the members' interests, at both international and national levels.



European end of life tyres management companies

The European “Landfill” Directive (EC Directive 1999/31) was an important incentive for establishing systems within Europe for processing used tyres. Within Europe, there are three different systems for managing end of life tyres; producer responsibility systems such as in the Netherlands, systems based on the free market and tax systems.



Netherlands



Belgium



Estonia



Finland



France



Greece



Italy



Poland



Portugal



Romania



Spain



Turkey



Sweden



Norway

Role as an ELT-management organization

Keeping the Netherlands clean of end of life tyres

The tyre industry takes the environment very seriously. RecyBEM assumes the legal responsibility for environmentally-friendly waste and raw materials management from the members of the Dutch tyre association (Vereniging Band en Milieu). We fulfill this role in a broad sense. We strive for a coordinated, collective and sector-wide fulfillment of the Dutch legislation on end of life tyres. We focus on prevention and innovation. This includes initiating research into new materials and processing possibilities, into reducing CO₂ emissions and into saving raw materials. This means that we play an important role both at the beginning and at the end of the tyre chain.

Producers (tyre manufacturers and importers) are responsible for managing car tyres in an environmentally-friendly way. We support them in closing the tyre circle by looking after every aspect of the used car tyres return flow. We collect end of life car tyres in accordance with the principle of “swapping old for new”. We collect tyres at retailers and local authority environmental depots. We then ensure that the tyres collected are processed in an environmentally-friendly way. And on behalf of the members of the Dutch tyre association, we are accountable to the Ministry of Environment (Ministerie van Infrastructuur en Milieu). We are supported by this Ministry and our trade partners in the distribution chain, including the industry organization for the tyre and wheel sector in the Netherlands (Vereniging VACO), the trade organization for

mobility (Bovag) and the trade association for the manufacturers and importers of road vehicles (RAI Vereniging). But we do more than that. We communicate with the Dutch government and the European Union on meeting producer responsibilities in the tyre industry. Our objectives also involve prevention and research. We aim to keep the Netherlands free from tyres lying around in the environment. To this end, we organize collection campaigns for tyre dumps and other projects to collect stray tyres. While there are very few tyre dumps in the Netherlands nowadays, we consider cleaning them to be one of our tasks. We also encourage and facilitate research to promote the use of rubber granulate, to update processing options and to optimize environmental performance.

R E C Y C L I N G

RecyBEM collects used tyres from the aftermarket at zero cost at retailers and local authority environmental depots. However we also consider it our social responsibility to remove other tyres, such as farm tyres and individual consignments of dumped tyres, from the environment to help create a cleaner environment.

Collecting from local authority environmental depots

Local authorities have environmental depots or environmental sites which accept used tyres. Our RecyBEM-certified collection companies collect used tyres from the aftermarket from these sites free of charge.

Collecting dumped tyres

Used tyres resulting from business activities such as pit tyres from farming and animal husbandry, and crash barriers for shipping, for safety purposes (race circuits and go-carting tracks), or tyres which have been dumped outside are recovered by the local or regional government's duty of enforcement. From a social and environmental perspective, we help to remove these tyres from the environment, for example, by funding the collection of dumped tyres, such as the mountains of tyres which we have cleared in Voerendaal and Tholen. Voerendaal's local authority approached RecyBEM to help remove an illegally dumped consignment of car tyres in an abandoned trailer. RecyBEM ensured that these tyres were cleared away. A cleaner environment benefits everyone.

collected by RecyBEM

Corporate social responsibility

A tree made of tyres

Artists are increasingly interested in using car tyres for artistic expression. RecyBEM supports a number of artists in creating their designs. Because creative thinking means exciting products.

Car tyres are an inspiration. This was demonstrated by the Rehearsing Revolution art project where the Authentic Boys analyzed the revolutionary potential of students at schools in Rotterdam. The design using our used car tyres was a true art experience which encouraged the students to think creatively.

One better known piece of art using old tyres is the rubber tree by graphic designer Marc ter Horst. He designed the tree as part of the Make a Forest initiative designed to stimulate global awareness of sustainable forestry management. Marc ter Horst designed a tree made of used car tyres. The rubber tree acts as a reference from the product (car tyre) to the source (nature). The design of the rubber tree artistically links the tyre with the environment. The rubber tree is exhibited in an artificial forest during the Dutch Design Week, a renowned annual (inter)national design festival held in Eindhoven. The art-tree proved to be a real eye-catcher!



Art using car tyres

Farmer, tyre and environment

Collecting farm tyres: “Keep it neat and tidy.
And good for the environment”

RecyBEM values a clean environment. As a result of our corporate social responsibility and commitment, we have taken the initiative of collecting farm tyres, such as car, truck or tractor tyres which are no longer required and which are polluting the horizon. Our campaign to collect car tyres (de Inzamelingsactie Boerenbanden) aims in keeping the horizon neat and tidy.

Improved technology and ongoing product development means that the use of old tyres to cover feed silos has been greatly diminished. As a result, there are plenty of farmyards with large stocks of tyres piled up which are no longer of any use. Tyres are also often left lying around after a business closes down. Despite the fact that these tyres are not covered by the law on end of life tyres and therefore by the RecyBEM-system. In 2007 RecyBEM worked with the Dutch agriculture and horticulture organization (LTO) to set up the collection campaign for farm tyres. There were so many waste or pit tyres on farmyards that they posed a threat to our environment. They were also having a negative impact on the natural beauty of the landscape. Our collection campaign set the right course towards clean farmyards, using the tagline “Keep it neat and tidy. And good for the environment”. This large-scale collection campaign resulted in the collection of almost 700,000 old tyres from agricultural businesses. The campaign is still running.

You can find out more about this collection campaign at www.recybem.nl and at www.boerenbanden.nl.



The collection and processing system



The RecyBEM system enables the members of the Dutch tyre association (Vereniging Band en Milieu) to implement the legal obligations arising from the decree on end of life tyres as effectively and efficiently as possible.

Collaboration within the tyre chain

RecyBEM works with companies throughout the entire tyre chain. This is what the collaboration looks like:

1. Producers (tyre manufacturers and Importers) bring new tyres into the Dutch market. Consumers return their old tyres to the retailer at zero cost.
2. Garages, tyre specialists, car accessories suppliers, car dealers and similar businesses in the tyre industry accept end of life tyres free of charge when they sell new tyres to consumers on the principle of "swapping old for new".
3. RecyBEM-certified collection companies collect the used tyres from the retailer at zero cost.
4. The tyres are sorted to extract reusable tyres at the collection company's premises.
5. Twenty to thirty percent of the tyres collected are tyres with value. The remaining tyres are scrap.
6. We process the tyres we collect in a number of ways. The tyres with value are given a new lease of life by being reused as tyres, second-hand tyres or retreaded. The scrap tyres are processed in various applications. Between sixty and seventy percent of the end of life tyres are given a new lease of life as raw materials following processing by RecyBEM-certified recyclers. Rubber granulate is used in a range of applications such as playground flooring and cattle matting. The remaining scrap tyres have an alternative purpose or are used as fuel in cement furnaces and power generation plants.

Collecting

RecyBEM works together with professional tyre collection companies. They ensure that used tyres are collected in a structured and efficient way.

Our certified collection companies meet stringent quality requirements which are set out contractually. The collection companies collect the used tyres from garages, tyre service companies, car dealers, car accessories suppliers and caravan and trailer dealers. At the collection companies' premises, the tyres are sorted to extract reusable tyres in terms of quality and size. The tyres with value are separated from the scrap tyres. The tyres with value are sorted for sale to a range of distribution channels. Tyres with value are given a new lease of life as second-hand tyres. Tyres with value can also have their lifespan extended if they are retreaded. Both re-use as second-hand tyres and retreading are examples of product recycling.

The collection companies remove the scrap tyres for processing. Under the terms of their contract, at least ninety percent of the tyres collected must be destined for material and product recycling and at least fifty percent of the tyres collected must be destined for material recycling. To ensure materials are recycled, the collection companies must offer the used tyres to certified recyclers. The certified recyclers process the tyres into high-grade rubber granulate. The Dutch law on end of life tyres requires only twenty percent material recycling.

The collection companies select their own recycler(s) and sign a business agreement with them. Recyclers must always be certified by RecyBEM.

The collection companies send us a monthly invoice for the tyres they have collected. They receive a fixed payment for each used tyre collected. The collection payment is based on a range of cost elements which we assess every two years as part of a market research project.

We set out these elements in 2004, in consultation with other organizations in the tyres industry, such as VACO. Each year, we check our certified collection companies' business operations. In addition, the independent certification organization SGS Nederland B.V. conducts an annual audit which includes our RecyBEM assessment criteria such as the quality standard ISO certification 9001: 2008. This has enabled our collection companies to further optimize their business operations and become increasingly professional.



Processing

RecyBEM works with certified recycling companies who handle the high-quality processing of the end of life tyres collected. As a result, the granulate from these old tyres is found in countless applications including asphalt, playground flooring and artificial grass surfaces.

The decree on end of life tyres makes producers (tyre manufacturers and importers) responsible for processing all end of life car tyres from the aftermarket in an environmentally-friendly way.

To ensure this, we work with certified recycling companies who meet stringent quality requirements. The certified recyclers separate the tyres into the basic components of rubber, steel and textiles. This enables them to process the whole tyre.

The rubber is broken down. This rubber granulate can be produced in various sizes, from coarse granules to the finest of powders. The rubber granulate has to meet stringent requirements. Recyclers innovate their business processes in order to produce even finer rubber granulate. This development means that rubber granulate is increasingly being used to replace natural raw materials. The collection companies recycle materials by having the tyres collected processed by certified recyclers.

We assess our certified recycling companies' administration on an annual basis. We assess whether they comply with our quality standards and whether they are meeting our requirements with respect to granulation. In addition, the independent certification organization SGS Nederland B.V. conducts an annual audit which also includes our RecyBEM assessment criteria such as quality standard ISO certification 9001: 2008.

The collection companies send most of the scrap tyres to certified recyclers. Collection companies may also process the scrap tyres by using them for an alternative purpose such as in road construction and hydraulic engineering, as pit tyres and as protection at go-carting tracks, or by burning them to recover energy. A tyre contains energy which is released through incineration. Some of the tyres collected go to cement furnaces and power generation plants where the used tyres serve as fuel in energy recovery operations.

Environmentally-friendly processing of used tyres

Lansink's ladder shows the preference on how to deal with used tyres in the Netherlands. The higher the method of processing is on the ladder, the better it is for the environment. The ladder is the Dutch standard for the optimal management of waste flows.

ONE STEP HIGHER ON THE LADDER WITH RECYBEM

Prevention has the highest priority. One step lower is *re-use*. Re-using allows a tyre to be returned to the market. Another step lower is *recycling*. With recycling, the raw materials are recovered from used car tyres. Where re-use and recycling are not an option, we aim to burn waste and recover the energy (*incineration +*). The least desirable solutions are incineration without recovering energy, landfill and dumping.

RecyBEM operates the following flows:

- Re-use as a second-hand tyre
- Retreading
- Alternative re-use
- Re-use of materials through recycling
- Thermal re-use with a high yield

When these flows are translated into the categories of Lansink's ladder, re-use as a second-hand tyre, retreading where a usable carcass is given a new profile, and re-use for an alternative purpose fall within the re-use category. Material re-use is the same as recycling. Thermal re-use with a high yield is ultimately the same as incineration with energy recovery (*incineration +*).

We collect some eight million used tyres in the Netherlands every year. Most of these tyres are recycled and re-used as materials. You can find out about how we process the tyres that are collected in the explanation on the ladder.



Lansink's ladder



Ad Lansink

In 1979 Ad Lansink, then a member of the Dutch House of Representatives, introduced the ladder which he used to clarify environmentally-friendly manufacturing and optimal recycling of waste materials. It was a great success since the ladder today remains an informative metaphor in environmental management.

Prevention

Innovations are optimizing the use of sustainable and renewable raw materials, enabling us to restrict and prevent waste from old tyres. We are making a lot of progress with research into the use of old tyres as a raw material in new tyres. This is a producer responsibility on the part of all the tyre manufacturers which we support.



Recycling

We recover the raw materials from end of life tyres. We use rubber in artificial grass surfaces, playground flooring and as a material for roads and other infrastructure. We have reported some excellent progress in recent years. In 2005, some thirty five percent of tyres were given a new lease of life in a different application. This percentage is currently between sixty and seventy percent.



Incineration

We successfully aimed to avoid burning end of life tyres without recovering energy. This has no added value and does not happen in the Netherlands.



Re-use

Used tyres which are technically and financially suitable are given a new lease of life as second-hand tyres or are retreaded. Along with VACO, we impose strict standards in this case. In the period from 2005 to the present, between twenty and thirty percent of the used tyres were given a new lease of life as a tyre.



Incineration +

Burning end of life tyres in cement furnaces and power generation plants allows us to recover energy. We use the energy and heat released to make cement or for district heating and electricity. In 2005, we processed almost thirty percent of the end of life tyres in this way. Today, we only burn ten percent with energy recovery.



Landfill

Sending end of life tyres to landfill is the least environmentally-friendly process. It was prohibited some time ago in the Netherlands and therefore does not happen. It has been banned in Europe since 2006.



Environmental performance

High-quality processing of end of life tyres

The RecyBEM-system retrieves excellent results for a cleaner environment.

What are these results? We recycle and re-use ninety percent of the tyres collected, which are the best processing methods according to Lansink's ladder.

The RecyBEM system yields 32 million kilos of rubber and steel as raw materials through recycling. Our system also provides energy through incineration with energy recovery. Our system leads to a reduction of almost 60,000 tonnes in CO₂ emissions. The CO₂ we save is equivalent to the emissions caused by driving 400 million kilometers. That's 10,000 times around the globe or the equivalent of planting 400,000 new trees.

The environmental performance in perspective

	Processed in an environmentally-friendly way, yields high-quality raw materials	This reduces CO ₂ emissions on a comparable level with the kilometers driven in a car	These kilometers in perspective
Netherlands - almost 10 million used tyres RecyBEM (aftermarket) and ARN (scrap tyres)	37 million kilos of high-quality raw materials, rubber and steel	This means an almost 70,000 tonne reduction in CO ₂ emissions comparable with driving 450 million kilometers by car	A distance equivalent to 11,500 times around the globe
RecyBEM - some 8 million used tyres from the after-market tyres covered by the decree on end of life tyres	32 million kilos of high-quality raw materials, rubber and steel	This means an almost 60,000 tonne reduction in CO ₂ emissions comparable with driving 400 million kilometers by car	A distance equivalent to 10,000 times around the globe
1 tonne of used tyres 135 used car tyres	500 kilos of high-quality raw materials, rubber and steel	This means a 1 tonne reduction in CO ₂ emissions comparable with driving 6,600 kilometers by car	The same distance as from The Hague to Chicago
4 used tyres the tyres from a single private car	15 kilos of high-quality raw materials, rubber and steel	This means a 30 kilo reduction in CO ₂ emissions comparable with driving 200 kilometers by car	The same distance as from Amsterdam to Brussels

* source: Ecotest

Most tyres are re-used as materials

According to the Dutch legislation on end of life tyres, processing must focus on material re-use, product re-use, beneficial alternative use or incineration (with energy recovery), whereby at least twenty percent of the tyres collected must be processed for material re-use.

In the Netherlands, we process far more tyres as material re-use. Between six and seven out of every ten tyres collected are processed into granulate and recycled in a range of different applications. As a result, we exceed all expectations with respect to the decree's environmental objectives.

RecyBEM scores highly on various environmental performance indicators

Quality is our priority. We process the tyres that are collected in the most advanced way possible, but we are constantly looking for potential improvements.

For example in the area of our CO₂ footprint. We use Ecotest to determine the burden on the environment. This enables us to look at those areas where we can optimize our environmental performance. We investigate the coherence between ecology (CO₂ footprint), recycling (raw materials recovery) and economics (costs). The Ecotest results demonstrate that RecyBEM is ensuring a cleaner environment:

- RecyBEM encourages recycling as a processing method.
- RecyBEM achieves a high percentage of material re-use by recycling sixty percent of the tyres collected. This is above the legally required twenty percent as defined in the Management of Car Tyres Resolution.
- RecyBEM achieves a high level of CO₂ emissions savings.
- RecyBEM ensures raw materials savings.

RecyBEM is also able to achieve high CO₂ emission savings through retreading. However, this processing method has a limited application, because of the strict requirements regarding the carcass of the used tyre. Therefore this only makes a small contribution to a cleaner environment. By encouraging recycling, RecyBEM discharges only ten percent of the end of life tyres to power generation plants and cement furnaces.

This is good for the environment. Despite the fact that this incineration method has comparable results in the area of CO₂ emissions savings, in the incineration process valuable rubber cannot be re-used.

Ecotest

Ecotest is a 'decision support tool' for policy-makers looking to substantiate decisions in the area of sustainability with product chain facts that are founded on practice. It was founded based on expertise in complex chains coupled with an understanding of the climate, raw materials, recycling and the economy. Ecotest offers the option of examining a chain in terms of the following aspects:

- Ecology (CO₂ footprint)
- Conservation of raw materials (recycling)
- Economics (costs)

Ecotest makes the impact of the product chain transparent by balancing these three elements against one another. In doing so, Ecotest uses only the most essential indicators from an LCA study (Life Cycle Assessment). This provides a better overview of the enormous number of environmental indicators.

RecyBEM has been processing tyres sustainably for many years. Ecotest quantifies this sustainability by weighing up the impact of the various chain options. For example, the differences between the chain options recycling and incineration of car tyres can be compared. We use Ecotest to calculate the impact on the chain of new and future processing possibilities.

For more information about Ecotest, visit www.ecotest.nu. The Ecotest car tyres results can be found at www.recybem.nl.



Re-use of materials through granulation

Recycling

RecyBEM strives to process end of life tyres in an environmentally aware and environmentally-friendly way. We support car tyres being processed in the most advanced way possible. The vast majority of the tyres collected are recycled, between sixty and seventy percent. Of all the car tyres collected each year, we recycle between 38,000 and 44,000 tonnes in an environmentally-friendly way our certified recyclers process them into rubber granulate. The discarded car tyres are converted into a new product.

Thanks to rubber's properties, such as elasticity and sustainability, the rubber granulate derived from recycled car tyres is used as a raw material in a number of applications.

You can come across rubber granulate in many different places surrounding you. For example on building and construction sites, such as in sound insulation and motion dampers in tall buildings.

In road construction and hydraulic engineering, for example an attenuating layer as a liner below tram rails and train tracks. In animal husbandry where rubber is used in the lining of cattle matting and in artificial grass surfaces as infill material.

Rubber granulate is also used in safety and protection systems such as in safety tiles, playground flooring, roofing tiles, terrace tiles, gallery tiles, marker tiles and indicator tiles. And not to mention shoes, bags, belts, diaries, pencil cases or corporate gifts. So there are countless opportunities to use raw materials from end of life tyres, all resulting in win-win situations.



Recycling in artificial grass surfaces

Exercise is becoming increasingly popular in the Netherlands. We exercise indoors, outdoors, on our own or as part of a team. And when we play sport outdoors, we increasingly come across old tyres that have been processed; for example on artificial grass surfaces where rubber granulate has been used as infill material. Why? Artificial grass surfaces with rubber infill material are low-maintenance, can be played on throughout the year and have a long lifespan. Rubber improves the technical sporting properties of artificial grass. This application also means we are working towards a cleaner environment.

The Netherlands has more than three hundred artificial grass football fields for competitions, Cruiff Courts and other smaller football fields. Rubber granulate derived from end of life tyres is found on a large number of these football fields. Rubber granulate is derived from end of life tyres. The old tyre is stripped of all its metal parts and nylon. The rubber that is left behind is broken down, resulting in a fine granulate with a granule size of between 0.6 and 2 mm. Rubber granulate is a common feature on artificial grass football fields, as well as artificial grass hockey fields, tennis courts, rugby fields, baseball fields and driving ranges.

Each square meter of artificial grass contains on average fifteen kilos of rubber granulate. That is equivalent to almost three old tyres. Rubber's properties, such as its elasticity and sustainability, mean it is ideal for use on sports fields. Its springiness reduces injuries and makes for a better game. Artificial grass sports fields also have a lifespan of ten to fifteen years. We feel research into the health and environmental risks of using rubber granulate as an infill material is extremely important. The results of this independent research confirm that rubber granulate from recycled car tyres does not pose any health and/or environmental risks, even in

the long term. Recycling and re-using tyres as rubber infill material on artificial grass surfaces yields environmental savings and has proven itself an effective alternative to scarce raw materials.

For more information on this subject, visit www.recybem.nl and www.vaco.nl.

Recycling in asphalt

The Netherlands has one of the highest concentrations of roads in the world with some 139 thousand kilometers of public road. Each year, some nine tonnes of asphalt are deposited on Dutch roads. The road network is very busy and has to deal with changing weather conditions. The use of rubber in asphalt provides our road network with a number of opportunities and benefits. It offers financial benefits in the short and long-term, reduces nuisance and improves the driver's ride experience. So what are we waiting for?

Twenty years ago, highway construction companies in the Netherlands installed a two-layer "ZOAB" road ("zeer open asphalt beton", or very porous asphalt concrete) that contained rubber from end of life tyres. The rubber was intended to improve the asphalt. Finely-ground old tyres were added to the bitumen and asphalt was then created by adding sand and stones.

However various health and safety issues among road builders resulted in them no longer using rubber granulate in road construction.

Thanks to technological developments, rubber in asphalt is now making a comeback. Adding rubber to asphalt ensures a road surface that provides better springiness. The rubber dampens vibrations and reduces noise. A number of tests using rubber in asphalt have been carried out in the Netherlands in recent years.

In Kloosterzande, three sections of road have been laid using experimental surfaces made from rubber developed in Japan.

In Enschede, a test has been conducted using rubber in asphalt and one test was carried out alongside the A50 near Apeldoorn with a so-called "super silent road surface".



source: Genan

This road surface was both porous and elastic. The aim of the experiment was to achieve the highest possible noise reduction of eight decibels, which is four decibels quieter than ZOAB.

The experiment was a success since the rubber achieved a noise reduction of nine decibels. The rubber therefore means that the road is far quieter. Using rubber in asphalt also delivers financial benefits in the medium and long term.

The roads are more elastic which reduces the incidence of grooves and cracks forming.

The roads require less servicing. And the traffic flows better so there are fewer jams!

Recycling in other applications

Sports arenas

Rubber granulate is used as infill in artificial grass surfaces used for football, hockey, tennis, rugby, baseball and on driving ranges. However players of other sports also benefit from rubber's properties. Rubber has exceptional properties for use as flooring in fitness areas, ballet and dance studios, sports halls and gyms. The floors have excellent

properties to break falls and absorb vibrations from, for example, power plates and weights. On athletics courts and hard court tennis courts, rubber is often mixed with polyurethane. As a result, these sports arenas also offer good elasticity.




High quality rubber granulate for track applications

Playgrounds

Playgrounds are required to meet stringent requirements and safety is at the forefront. When children are playing, they sometimes fall over. A playground with a rubber granulate subfloor reduces the potentially serious consequences of a fall. Rubber granulate safety tiles also ensure children's safety in playgrounds.

Playground equipment can also be made from rubber granulate. Using rubber granulate derived from end of life tyres not only makes playgrounds that bit safer, it also makes them more sustainable!




Safe subfloors in playgrounds

Cattle matting

Rubber granulate is also on the increase in animal husbandry where rubber is being processed into cattle matting/stable matting. The rubber matting gives cattle a comfortable bed and promotes cattle welfare. The rubber has a damping effect, is soft and ensures the matting has a long lifespan.

Cattle matting made from rubber granulate is a great alternative to standard mattresses.



Rubber in cattle matting

Re-use

Re-use gives used tyres a new lease of life. Tyres with value are considered for re-use if they can be used again for the original purpose for which they were manufactured. Discarded tyres are used again as tyres if they are technically and financially suitable for re-use. Twenty to thirty percent of the tyres collected are eligible for product re-use.

After recycling, re-use is therefore the biggest processing method within the RecyBEM system. Each year, our RecyBEM-certified collection companies ensure that almost two million of the tyres they collect enjoy a new lease of life as a second-hand tyre or thanks to retreading. In addition to these tyres with value, scrap tyres can also be re-used.

A small proportion of the tyres collected are used for an alternative purpose in that our collection companies send these scrap tyres for use in road construction and hydraulic engineering, as pit tyres, or as crash barriers at go-carting tracks. These alternative uses also extend the lifespan of the tyres that are collected without the tyre being processed.

Second-hand tyres

Our certified collection companies sell tyres with value globally for re-use as tyres.

These second-hand tyres have a tread profile that is at least at equal to or greater than the legal lower limit of 1.6 millimeters. Re-use extends the tyre's lifespan.

This means that the raw materials and energy required to manufacture a new tyre are saved.



source: Vereniging VACO

Second-hand tyres and re treading

Retreading

If the tread on a used tyre is worn down but the carcass has retained its full potential, the tread can be renewed. Our collection companies carefully sort the tyres and check whether the carcass on the tyres collected has suffered any damage before they consider retreading.

Using specialist tools, the worn down tread is first rubbed off the tyre. The manufacturing process is then the same as that for new tyres. Retreading is a good way of extending a tyre's lifespan. The raw materials used in the original tyre are exploited to the maximum and not needing to manufacture a new tyre saves energy, so retreading results in a considerable reduction in CO₂ emissions. This processing method has a limited application, however, because of the strict requirements regarding the carcass of the used tyre.

Alternative re-use



Go-carting tracks

Scrap tyres are used along go-carting track circuits. Many go-carting tracks make their circuit safe by installing crash barriers; sometimes with red and white crash barriers, and sometimes with black. Piles of tyres also ensure racers' safety.

Alternative re-use

We also use whole or shredded scrap tyres for different purposes than those they were manufactured for. A small proportion of the tyres collected - around one to two percent - are used for other purposes; for example as crash barriers at go-carting tracks, crash barriers on boats and at quay sides or are used in road construction and hydraulic engineering.

More alternatives

There are other alternatives when it comes to re-using scrap tyres. Livestock farmers use old tyres to make silos air-tight. Thanks to rapid technological developments, fewer farmers are using pit tyres. The Netherlands is also predominantly a water-loving country and scrap tyres are used on boats as a crash barrier or on quay sides top provide protection.

However it is in African countries in particular that the opportunities for alternative re-use of old tyres seem endless.

Tyres have been used in exceptional alternative applications abroad for many years. In Africa, the local markets feature a range of everyday products made from old tyres, including soles on shoes and slippers. Car tyres are also used as planters and flower containers. With just a little work, craftsmen turn old tyres into dishes, vases, ashtrays, carafes, baskets, photo frames or ingenious woven chairs. And tomato plants flourish good in a nursery garden made from piles of tyres.

Re-use in road construction and hydraulic engineering

Can you make a sound barrier or bank up a road using old tyres? Yes, you can. Whole or shredded old tyres are used in road construction and hydraulic engineering. The scrap tyres form a filler layer for retaining walls or banked up roads and are also used to reinforce highway constructions such as tunnels, particularly in Scandinavian countries like Finland.

The end of life tyres ensure good water drainage and provide the underground with a robust and cushioning base. The effective drainage also means that the road surface has a longer lifespan, as the layers underneath freeze more slowly and therefore crack less quickly. *

source: Suomen Rengas Kerrätys



Incineration with energy recovery



Burning scrap tyres generates energy and saves

Do you turn on the heating on a winter's evening? The heat could come from your used tyres. A tyre contains a lot of energy and this energy can be recovered through incineration. Some of the tyres collected replace coal in coal-fired power stations and in cement furnaces. Other industries, such as steel manufacturers, also use scrap tyres as a fuel in place of fossil fuels.

Car tyres which cannot be re-used or recycled are burned and the energy which is released and the materials are used as an alternative fuel in the cement industry and in power generation plants. We process some ten percent of the tyres collected each year in this way; equivalent to 6200 tonnes of car tyres. That makes this the least significant processing method within the RecyBEM system. Energy and environmental experts are now encouraging the incineration of scrap tyres and energy recovery because of the high energy value. Incineration takes place under controlled conditions with minimum emission of harmful substances. One adjunct to incineration in a cement furnace is that it also involves recycling, as the steel from the tyres replaces the iron ore needed to make cement.

raw materials

Cement furnaces

The cement industry is often on the lookout for alternatives to reduce fossil fuel consumption, while at the same time guaranteeing cement quality.

Our certified collection companies transport both whole and shredded tyres to cement furnaces, mainly in Germany. By using end of life tyres as a fuel in cement furnaces, we are helping to preserve natural resources.

This application preserves fossil fuels such as petroleum coke, coal and heavy fuel oil. Generating energy and preserving raw materials mean a reduction in CO₂ emissions.

Incineration is also becoming increasingly cleaner thanks to controlled and minimal emissions of hazardous substances.

Power generation plants

Shredded tyres are used in power generation plants to generate heat and electricity. The heat produced is then put to good use, because the heat generated can be used for district heating. Our collection companies transport tyres to Sweden in particular for this purpose. By processing end of life tyres in a power generation plant, we reduce fuel consumption compared with a standard energy plant where electricity is generated separately and heat is lost as a waste product.

Steel manufacturers and other companies

Companies, including steel manufacturers, are increasingly discovering the benefits of using energy generated from end of life tyres. For example ArcelorMittal uses scrap tyres instead of coal in the Electric Arc Furnace (EAF – a furnace where the contents are heated through electric refraction). Given that carbon is the biggest component in tyres, tyres are the perfect replacement for coal in steel production. The carbon in the tyres combines with the surrounding oxygen and prevents oxidation, while the steel from the tyres is recycled. As a result, the steel producer preserves natural resources such as coal and the company reduces its costs, as well as CO₂ emissions and global warming. This efficient use of resources and the innovative nature of the technology sets a leading example to other companies.

* source: Aliapur





Innovation to close the chain

RecyBEM strives to optimize environmental performance and encourages new technologies

We carry out regular research into products, materials, applications and processing technologies and participate in research which is relevant to the end of life tyre industry. We also encourage the development of new technologies. Research into devulcanisation and pyrolysis of rubber granulate is important in the quest to close the tyres circle. These innovations enable us to produce advanced rubber which can replace natural and synthetic rubber. This is a challenge for the future given that raw materials are scarce and valuable.

Devulcanisation

Two Dutch universities, the University of Twente and the University of Groningen, are working together to research the devulcanisation of rubber from end of life tyres. By breaking down the sulphur compounds without decoupling the polymers, rubber can be returned to its original state. Devulcanisation thus facilitates recycling. The major aim of the research is to ensure that the rubber from scrap tyres can be re-used in new tyres. This enables us to save valuable raw materials and thus close the tyre circle, so we are happy to support this kind of research.

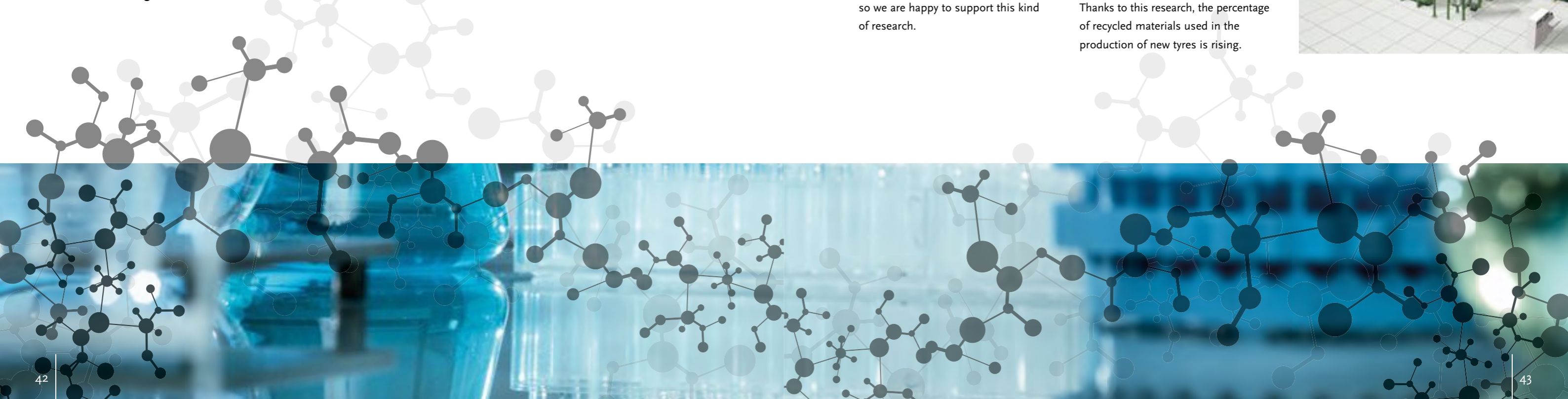
Pyrolysis

Pyrolysis is a process whereby rubber granulate from car tyres is heated in a closed, oxygen-free chamber. Instead of being burned, organic material is converted into gas. Lightweight hydrocarbons such as methane and ethane remain gaseous. The remaining solid materials, carbon and steel, are separated out, cleaned and upgraded into products.

Pyrolysis is a challenge because it can be used to recover original materials, so this is important research into closing the circle.

Thanks to this research, the percentage of recycled materials used in the production of new tyres is rising.

We expect innovations like these to result in a considerable reduction in CO₂ emissions per tyre, making this saving comparable to recycling.



Old tyres **make new car parts**

The car is part of everyday life in the Netherlands; more and more people now have one. Technological developments in car and car parts production are coming thick and fast.

Europe is aiming to grow the use of recycled products. Recycled car tyres are increasingly being used in combination with plastics in a range of car parts.

All cars have a lot of plastic parts. Research began in France in 2004 into whether these car parts could be made from a compound of plastic and rubber granulate. The research has been successful since the first prototypes using rubber parts are now on the road. This innovation has developed a compound where plastics are combined with rubber granulate. It not only delivers additional functionality thanks to the rubber's elastic properties, it also yields financial benefit. Rubber granulate is cheaper than most of the

plastics currently used in car parts. There are countless applications: the compound can be used to manufacture various parts in the engine compartment (bonnet, head cover), in the bodywork (wheels, spoilers) and even for external vehicle noise. As a result, scrap tyres are increasingly being used in new cars. *

* source: Aliapur





BOVAG

“As a trade organization BOVAG is concerned with sustainable mobility and, within that framework, it prioritizes concern for the environment. As colleagues in the mobility sector, BOVAG and RecyBEM represent organizations in mobility retail by setting the quality standard and acting as an expert partner in the sector”.
Gijs Bosman, specialist in technology and sustainability at BOVAG.

Ministry of Environment (Ministerie van Infrastructuur en Milieu)

“As Secretary of State for the Environment I am very pleased with the way in which RecyBEM implements the Dutch legislation on end of life tyres. RecyBEM is achieving excellent results which means that we in the Netherlands no longer have a problem with scrap tyres. Prior to 2004, old car tyres were still a major headache and dumping and burning were the norm. RecyBEM now collects some eight million tyres annually, which are then processed using advanced methods. According to the rules, at least twenty percent of the weight in material terms must be re-used; RecyBEM achieves sixty percent annually. The RecyBEM system delivers raw materials (32 million kilos of rubber and steel) and energy through recycling and incineration with energy recovery. This benefits both the environment and the economy”.
Joop Atsma, Secretary of State for the Environment.

Stakeholders talk about RecyBEM

The Dutch Tyre and Rubber Manufacturers' Association (NVR)
(Nederlandse Vereniging van Rubberfabrikanten)
“The Dutch Tyre and Rubber Manufacturers' Association is highly focused on how the Netherlands complies with the producer responsibilities according to the decree on end of life tyres. RecyBEM provides an excellent example of how to meet these producer responsibilities with respect to the management of used tyres in an efficient, targeted and collective way”.
Joost Kester Jacobs, sector coordinator NVR.

RAI Association (Rai Vereniging)
“RAI Association, the trade association for, among others, the manufacturers and importers of road vehicles has a large number of members who are also a member of the Dutch tyre association (Vereniging Band en Milieu). Through RecyBEM, these members are able to comply with their obligation with respect to the Dutch legislation on end of life tyres easily and effectively”.
Eugène Moerkerk, staff member Sustainability & Technology at the RAI Vereniging.

Association VACO (Vereniging VACO)
“VACO, the industry organization for the tyres and wheels sector, greatly values its collaboration with RecyBEM. VACO and RecyBEM work closely together to optimize the collection and processing structure for end of life tyres and, where possible, stimulate high-quality processing. In recent years, the two organizations have also commissioned a range of joint research projects, the results of which will benefit the entire industry. RecyBEM is an important discussion partner in various (international) consultations where the interests of VACO members are represented”.
Ruud Spuijbroek, General Secretary VACO.

AFTERWORD

Collecting end of life tyres for a cleaner environment, now and in the future

As a producer responsibility organization for the Dutch legislation on end of life tyres, RecyBEM takes on all the obligation from the decree from the members of the Dutch tyre association (Vereniging Band en Milieu). We collect some eight million used tyres annually and we ensure these tyres are processed in an environmentally-friendly way. As a result, scrap tyres are not left outside, fewer primary raw materials have to be found in nature and CO2 emissions are reduced. We believe that it is our task in the future as well to ensure a cleaner environment.

Eight million tyres collected annually

In 2004, the ministry for Environment (VROM; now the ministry for Infrastructure and the Environment) introduced the decree on end of life tyres (Besluit beheer autobanden). With a market coverage of virtually one hundred percent, implementation by RecyBEM has been a success. For each new car tyre which a producer (tyre manufacturer or importer) brings into the Dutch market, RecyBEM collects a used tyre. There are some eight million of them each year. The successful implementation of the decree is down to the discipline in the tyre industry and the effective collaboration between competitors. Apollo Vredestein, Continental, Goodyear/Dunlop and Michelin not only collaborate with one another, they also work with the distributors Van Den Ban and Inter-Sprint. It is unique for an entire sector to join forces to deliver on a major social interest. The ministry for the Environment is especially pleased with our achievements and with the implementation of the Dutch legislation on end of life tyres. We opted for the most practical execution of a chain solution.

Processed in an environmentally-friendly way

The certified collection companies play a key role in the tyres chain. They collect and sort all tyres collected and handle the administration. According to the decree, twenty percent of the tyres collected must be destined for material re-use; our collection companies achieve no less than sixty to seventy percent. That is a fantastic achievement. We hold our RecyBEM-certified collection companies responsible for ensuring that at least ninety percent of the tyres collected are destined for material and product re-use, and that at least fifty percent of the tyres collected must be destined for material re-use. Six to seven out of every ten tyres collected are given a new lease of life when the rubber granulate is used as a raw material in new applications. Furthermore, another twenty to thirty percent of the tyres collected are given a new lease of life, generally as second-hand tyres or sometimes thanks to retreading.

Reduced CO2 emissions and raw materials savings

RecyBEM strives for the most advanced processing possible of scrap tyres. We recycle and re-use ninety percent of the tyres we collect. The RecyBEM system provides raw materials (32 million kilos of rubber and steel) and energy through recycling and incineration with energy recovery. This leads to a reduction of almost 60,000 tonnes in CO2 emissions. The CO2 we save is thus equivalent to the emissions caused by driving 400 million kilometers. That's 10,000 circumnavigations of the globe or the equivalent of planting 400,000 new trees.

Optimizing environmental performance in the chain

Our aim in the future is also to optimize environmental performance throughout the chain. In this context, we fund a range of research projects into new methods of processing used tyres. We also encourage innovations designed to recover raw materials and reduce CO2 emissions. This offers opportunities to optimize environmental performance throughout the chain. After all, we clearly want to close the car tyres circle!



Eight million end of life tyres are collected annually...



...that is the total of all used car tyres collected in the Netherlands

...the equivalent of the surface area of 400 football fields

...processed in an environmentally-friendly way

...which provides 32 million kilos of high-grade raw materials

...which means a reduction of almost 60,000 tonnes in CO₂ emissions

...CO₂ savings as a result are the equivalent of the emissions caused by driving 400 million kilometers (10,000 times around the globe) or planting 400,000 new trees

End of
life tyres
get a
new lease
of life.

In the Netherlands all used tyres from the aftermarket are collected by RecyBEM and processed in an environmentally-friendly way on the principle of "swapping old for new". RecyBEM-certified collection and recycling companies carry out these activities. RecyBEM is an initiative by your tyre supplier.

www.recybem.nl

RecyBEM B.V.



BAND & MILIEU